

# Lenoir City Utilities Board

## Standard Gas Specifications

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Prepared By:



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End of Section

**SECTION 01050  
FIELD ENGINEERING**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. Contractor shall provide field engineering services and establish grades, lines, and levels, by use of recognized engineering survey practices.
- B. The Owner will provide reference point information (if available) that was used as a part of the design. This information will be listed on the Plans. Additional field surveys needed to establish or re-establish reference points for construction is the responsibility of the Contractor and will be considered a part of laying out the Work.

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION**

**3.01 INSPECTION**

- A. Verify locations of survey control points prior to starting work. Promptly notify Owner of any discrepancies discovered.

**3.02 SURVEY REFERENCE POINTS**

- A. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to Owner.
- B. Promptly report to Owner the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control.
- C. The Contractor shall preserve all USGS, TVA, State of Tennessee, and private markers; do not remove or disturb any such markers without prior approval from the Owner. Any removal and replacement of such markers shall be at the expense of the Contractor. The re-establishment of these markers shall be performed by a surveyor licensed by the State of Tennessee, with a letter indicating the completion of work.

**3.03 STAKING**

- A. The Contractor shall be responsible for staking the project and preparing cut sheets as needed.

End of Section

## SECTION 01090 STANDARDS

### PART 1 GENERAL

1.01 Meet the requirements and recommendations of all Standards, Institutes, Associations, etc., referred to throughout these documents and specifications as if they were fully reproduced herein. Unless otherwise noted, the latest editions shall apply.

#### 1.02 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturers' Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGC	Association of General Contractors
AGMA	American Gear Manufacturers' Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ARI	Air Conditioning and Refrigeration Institute
ASA	American Standards Association
ASAE	American Society of Automotive Engineers
ASC	Association of Specialty Contractors
ASCII	American Standard Code for Information Interchange
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
CMAA	Crane Manufacturer's Association of America
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards
CSI	Construction Specifications Institute

EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FGMA	Flat Glass Marketing Association
FM	Associated Factory Mutual Laboratories
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
IRI	Industrial Risk Insurors
ISA	Instrument Society of America
JIC	Joint Industrial Council
MBMA	Metal Building Manufacturers' Association
MMA	Monorail Manufacturers' Association
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association or National Forest Products Association
NKCA	National Kitchen Cabinet Association
NPT	National Pipe Thread
NRCA	National Roofing Contractors' Association
NSF	National Sanitation Foundation
NSWMA	National Solid Waste Manufacturers' Association
NWMA	National Woodwork Manufacturing Association
OSHA	Occupational Safety and Health Administration
PPI	Plastics Pipe Institute
RIS	Redwood Inspection Service
SAE	Society of Automotive Engineers
SBCC	Standard Building Code Congress
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPII	Southern Pine Inspection Institute
SSBC	Southern Standard Building Code
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TDOT	Tennessee Department of Transportation
TIMA	Thermal Insulation Manufacturers' Association
UL	Underwriters' Laboratories
USG	United States Gypsum
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

**PART 2 PRODUCTS**

A. Not Applicable

**PART 3 EXECUTION**

A. Not Applicable

End of Section

**SECTION 01302  
SUBMITTALS AND SUBSTITUTIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

A. Work Included

1. Wherever possible throughout the contract documents, the minimum acceptable quality of workmanship and materials has been defined by a manufacturer's name and catalogue number, reference to recognized industry and government standards, or description of required attributes and performance.
2. To ensure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data and for their review by the Engineer.
3. Make all submittals required by the Contract Documents, and revise and resubmit as necessary to establish compliance with the specified requirements.

B. Related Work Described Elsewhere

1. Individual requirements for submittals are described in other pertinent sections of these specifications.

**1.02 SUBMITTALS**

A. Identification of Submittals

1. General: Consecutively number all submittals.
2. Internal Identification: On at least the first page of each copy of each submittal, clearly indicate the submittal number in which the item was included.
3. Resubmittals: When material is resubmitted for any reason, transmit under a new letter of transmittal utilizing the original submittal number followed by an A, B, C, etc., depending on the number of resubmittals of the original submittal required.

B. Shop Drawings and Coordination of Drawings

1. Deliver or mail all submittals to:

Lenoir City Utilities Board  
7698 Creekwood Park Boulevard  
Lenoir City, Tennessee 37772  
Attention: Gas Department

2. Before issuance of Certificate of Payment for Final Payment, deliver to the Design Engineer:
  - a. Waivers of Lien
  - b. Affidavit of payment of debts and claims

- c. Consent of surety company to final payment
  - d. Written guarantees and warranties
  - e. Marked-up record set of drawings showing every alteration or change from the original drawings and specifications
  - f. All certificates of compliance, as a condition of acceptance of the work.
3. Make submittals in strict accordance with the provisions of this section.

### **1.03 QUALITY ASSURANCE**

#### **A. Coordination of Submittals:**

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted, and verify that each item and the submittal for it conforms in all respects with the requirements of the bidding instruments.
2. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that this coordination has been performed.

### **1.04 SUBMITTAL SCHEDULE**

#### **A. Timing of Submittals:**

1. General: Make all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery. Submit shop drawings in accordance with the approved schedule of shop drawing submittals.
2. Engineer's Review Time: In scheduling, allow at least 20 calendar days for review by the Engineer following his receipt of the submittal.
3. Delays: Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the contract completion date.

### **1.05 SUBSTITUTIONS**

#### **A. Approval Required**

1. The contract is based on the standards of quality established in the contract documents.
2. All products proposed for use, including those specified by required attributes and performance shall require approval by the Engineer before being incorporated into the work.
3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Engineer.

#### **B. "Or Equal"**



1. Where the phrase "or equal", "or approved equal", or "approved substitute" occurs in the contract documents do not assume that materials, equipment, or methods will be approved as equal unless the item has been specifically approved for this work by the Engineer.
2. The decision of the Engineer shall be final.
3. See pertinent portions of the contract documents for additional information relating to substitutions.
4. Where equipment, materials, or methods do not specify "or equal", "or approved equal", or "approved substitute", substitutions may be submitted by the Contractor in accordance with this section.

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION**

- A. Not Applicable

End of Section

**SECTION 01310  
PROGRESS SCHEDULES**

**PART 1 GENERAL**

**1.01 SUBMITTALS**

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit at least 7 days prior to preconstruction conference.
2. Detailed Progress Schedule:
  - a. Submit initial Detailed Progress Schedule within 30 days after Effective Date of the Agreement.
  - b. Submit an Updated Progress Schedule at each update, in accordance with Section 1.03 Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
  - a. Contractor's certification that Progress Schedule submission is actual schedule being utilized for execution of the Work.
  - b. Progress Schedule: One legible copy.
  - c. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
4. Prior to final payment, submit a final Updated Progress Schedule.

**1.02 PRELIMINARY PROGRESS SCHEDULE**

- A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 90 days, and a summary of balance of Project through Final Completion.
- B. Show activities including, but not limited to, the following:
  1. Notice to Proceed.
  2. Permits.
  3. Submittals, with review time. Contractor may use Schedule of Submittals specified in Section 01302, Submittals and Substitutions.
  4. Early procurement activities for long lead equipment and materials.
  5. Initial Site work.
  6. Earthwork.
  7. Specified Work sequences and construction constraints.
  8. Contract Milestone and Completion Dates.
  9. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.

10. System startup summary.
  11. Project close-out summary.
  12. Demobilization summary.
- C. Update Preliminary Progress Schedule monthly; as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.
- D. Format: In accordance with Article Progress Schedule—Bar Chart.

### **1.03 DETAILED PROGRESS SCHEDULE**

- A. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.
- B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.
- C. When accepted by Engineer, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- D. Format: In accordance with Article Progress Schedule—Bar Chart.
- E. Update monthly to reflect actual progress and occurrences to date, including weather delays.

### **1.04 PROGRESS SCHEDULE—BAR CHART**

- A. General: Comprehensive bar chart schedule, generally as outlined in Associated General Contractors of America (AGC) 580, "Construction Project Planning and Scheduling Guidelines." If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.
- B. Format:
1. Unless otherwise approved, white paper, 11-inch by 17-inch sheet size.
  2. Title Block: Show name of project and Owner, date submitted, revision or update number, and name of scheduler.
  3. Identify horizontally, across the top of the schedule, the time frame by year, month, and day.
  4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
  5. Legend: Describe standard and special symbols used.
- C. Contents: Identify, in chronological order, those activities reasonably required to complete the Work, including as applicable, but not limited to:

1. Obtaining permits, submittals for early product procurement, and long lead time items.
2. Mobilization and other preliminary activities.
3. Initial Site work.
4. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s).
5. Subcontract Work.
6. Major equipment design, fabrication, factory testing, and delivery dates.
7. Delivery dates for Owner-furnished products, as specified in the Summary of Work.
8. Sitework.
9. Concrete Work.
10. Structural Work.
11. Asphalt Work.
12. Facilities retirement Work.
13. Gravity Sewer Testing activities.
14. Water Line Disinfection and Testing Activities.
15. Gas Line Testing Activities
16. Project closeout and cleanup.
17. Demobilization.

#### **1.05 PROGRESS OF THE WORK**

- A. Updated Progress Schedule shall reflect:
  1. Progress of Work to within 5 working days prior to submission.
  2. Approved changes in Work scope and activities modified since submission.
  3. Delays in Submittals or resubmittals, deliveries, or Work.
  4. Adjusted or modified sequences of Work.
  5. Other identifiable changes.
  6. Revised projections of progress and completion.
  7. Report of changed logic.
- B. Produce detailed subschedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as facility shutdowns.
- C. If Contractor fails to complete activity by its latest scheduled completion date and this Failure is anticipated to extend Contract Times (or Milestones), Contractor shall, within 7 days of such failure, submit a written statement as to how Contractor intends to correct nonperformance and return to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.
- D. Owner may order Contractor to increase plant, equipment, labor force or working hours if Contractor fails to:
  1. Complete a Milestone activity by its completion date.
  2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

## 1.06 NARRATIVE PROGRESS REPORT

### A. Format:

1. Organize same as Progress Schedule.
2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

### B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. Contractor's plan for management of Site (e.g., lay down and staging areas, construction traffic), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from Contractor-caused delays.

## 1.07 SCHEDULE ACCEPTANCE

### A. Engineer's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
  - a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
  - b. Specified Work sequences and constraints are shown as specified.
  - c. Specified Owner-furnished Equipment or Material arrival dates, or range of dates, are included.
  - d. Access restrictions are accurately reflected.
  - e. Startup and testing times are as specified.
  - f. Submittal review times are as specified.
  - g. Startup testing duration is as specified and timing is acceptable.

2. In all other respects, Engineer's acceptance of Contractor's schedule indicates that, in Engineer's judgment, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Engineer's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to Engineer's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.
- B. Unacceptable Preliminary Progress Schedule:
1. Make requested corrections; resubmit within 10 days.
  2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process, during which time Contractor shall update schedule on a monthly basis to reflect actual progress and occurrences to date.
- C. Unacceptable Detailed Progress Schedule:
1. Make requested corrections; resubmit within 10 days.
  2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process.
- D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Engineer's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

## **PART 2 PRODUCTS**

- A. Not Applicable

## **PART 3 EXECUTION**

- A. Not Applicable

End of Section

**SECTION 01400  
QUALITY CONTROL**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. General Quality Control.
  - 1. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.
- B. Workmanship.
  - 1. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
  - 2. Perform work by persons qualified to produce workmanship of specified quality.
  - 3. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.
- C. Manufacturers' Instructions.
  - 1. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with contract documents, request clarification from Engineer before proceeding.
- D. Manufacturers' Certificates.
  - 1. When required by individual specifications section, submit manufacturers' certificate, in duplicate, that products meet or exceed specified requirements.
- E. Manufacturers' Field Services.
  - 1. When specified in respective specification sections, require supplier or manufacturer to provide qualified personnel to observe field conditions; conditions of surfaces and installation; quality of workmanship; start-up of equipment; test, adjust, and balance of equipment; and as applicable, to make appropriate recommendations.
  - 2. A representative shall submit a written report to Owner listing observations and recommendations.
- F. Testing Laboratory Services.
  - 1. Owner shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual specification sections.

2. Services will be performed in accordance with requirements of governing authorities and with specified standards.
3. Reports will be submitted to Owner in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with contract documents.
4. Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage, and assistance as requested.
  - a. Notify Owner and testing laboratory 24 hours prior to expected time for operations requiring testing services.
  - b. Make arrangements with testing laboratory and pay for additional samples and tests for Contractors' convenience.

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION**

- A. Not Applicable

End of Section



**SECTION 01500  
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1 GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Sanitary Facilities
- B. Electricity, Lighting
- C. Water
- D. Barriers
- E. Security
- F. Temporary Controls
- G. Protection of Installed Work
- H. Water Control
- I. Cleaning During Construction
- J. Field Offices and Sheds
- K. Removal of Construction Facilities and Temporary Controls

**1.02 RELATED REQUIREMENTS**

- A. Summary of Work: Abandoned materials, storage, and Contractor's use of premises.
- B. Section 01710 - Cleaning.
- C. Owner's facilities can not be used by any of the contractor's or subcontractor's employees.

**1.03 SANITARY FACILITIES**

- A. Provide and maintain required temporary facilities and enclosures for job personnel that:
  - 1. Are weather tight, clean, and sanitary.
  - 2. Are provided with either natural light and ventilation or artificial light and mechanical ventilation.
  - 3. Are provided with toilet tissue in a suitable holder.
  - 4. Comply with applicable legal and health requirements.
- B. Remove temporary toilet facilities when work is complete.

**1.04 ELECTRICITY, LIGHTING**

- A. Connect to existing service, provide branch wiring and distribution boxes located to allow service and lighting by means of construction-type power cords.
  - 1. Make arrangements for and install the poles, wiring, switches, outlets, and other electrical equipment necessary.
  - 2. Pay for current used during construction period.
- B. Provide lighting for construction operations.
- C. Existing and permanent lighting may be used during construction. Maintain lighting and make routine repairs. Replace all lamps of all light fixtures used during construction at final inspection and give used lamps to the Owner for stock.
- D. Remove temporary electrical equipment when construction is completed.

**1.05 WATER**

- A. Provide service required for construction operations. Extend branch piping with outlets located so that water is available by use of hoses. Connect to existing facilities; extend branch piping with outlets located so that water is available by use of hoses.
  - 1. Contractor to contact LCUB for hydrant meter. Contractor is responsible for payment/deposit for required equipment and cost of water used at the current cost per gallon in accordance with LCUB's current rates.
  - 2. Make arrangements for and install the piping and equipment necessary.
- B. Remove temporary water facilities when construction is completed unless otherwise directed by Owner. Water will be provided by the Owner for standard, reasonable, project-related use only.

**1.06 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

**1.07 TEMPORARY CONTROLS**

- A. Coordinate, schedule, and perform work to cause the least practical interference with the public, fire protection service, public utility service, and Owner's operations. Coordinate all connections, cut-ins, alterations, or other interruption with designated representative of the Owner or utility service. Notify the representative 48 hours in advance and cooperate with him in minimizing the interruptions.
- B. Comply with the local requirements of EPA, the health department, or other regulatory requirement for construction operations relating to noise, pest, rodent, dust, and pollution controls.

**1.08 CLEANING DURING CONSTRUCTION**

- A. Construction cleaning shall be as specified in Section 01710.

**1.09 REMOVAL OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

**1.10 PAYMENT**

- A. No separate payment will be made for the materials, work, equipment, labor, etc., required herein for Construction Facilities and Temporary Controls. Include the costs thereof in the various lump sum prices on the Bid Form.

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION**

- A. Not Applicable

End of Section

**SECTION 01560  
EROSION AND POLLUTION CONTROL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period regardless of weather conditions.
- B. While formally identified as erosion control activities, this work encompasses that necessary to ensure that construction activities do not temporarily or permanently harm the waters of the State of Tennessee, nor properties of the Owner, nor adjoining owners.
- C. These activities, over which neither the Owner nor the Engineer has control during the bidding process, are related to the means and methods the Contractor uses to pursue the work and as such cannot be predicted in advance. For this reason, the Contractor must be solely responsible for conforming to related local, State, and Federal requirements.
- D. Any fines levied by the Federal, State, and/or local governments for non-conformance with their respective regulations related to erosion and pollution control shall be paid for by the Contractor.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Materials, installation, and maintenance of erosion and pollution control structures shall be in accordance with the Drawings and the "Tennessee Erosion and Sediment Control Handbook" (Tennessee Department of Environment and Conservation, latest edition).

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. The temporary erosion and pollution control provisions shown on the drawings are considered the minimum necessary, with the final design, implementation, and maintenance being the responsibility of the Contractor.
- B. The Contractor shall prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit or amend the project Notice of Intent (NOI) to include their project specific activities.

- C. Install temporary sediment traps where appropriate. Construct and maintain in accordance with the requirements of Tennessee Erosion and Sediment Control Handbook. Muddy water collected in sediment traps shall be held until it is at least as clear as the upstream water before it is discharged to surface waters. Discharge through a pipe or lined channel so that the discharge does not cause erosion and sedimentation.
- D. Install temporary diversion berms or diversion channels as necessary to divert storm water from running onto the disturbed areas and to divert runoff from disturbed areas to the temporary sediment traps.
- E. Apply temporary seeding whenever grading operations are temporarily halted for over 14 days and final grading of exposed surfaces is to be completed within one year. Apply temporary seeding to soil stockpiles.
- F. The Contractor is responsible for the installation and maintenance of site construction pollution prevention controls throughout the life of the project.

End of Section

**SECTION 01570  
WORK ZONE TRAFFIC CONTROL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The Work to be performed shall consist of providing, installing, maintaining, relocating, and removing temporary traffic control devices and services as ordered by the traffic control plan (TCP) and as required for the control and protection of public traffic through the Project work zone.
- B. Notification of the Work commence date and application for permission from the governing body having jurisdiction over the right-of-way is the responsibility of the Contractor.
- C. The Work to be performed under this Section will conform to Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and shall be subject to local codes, policies, and regulations of the agency having jurisdiction over the area where the Work is performed.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND/OR PRODUCTS**

- A. All signage, channeling devices, arrow displays, lighting devices, and other traffic control devices shall conform to the design requirements contained in the MUTCD which specifically govern such features as size, contrast, colors, shape, composition, use of symbols, etc. Use of "home made" or contractor-fabricated devices are prohibited.

**PART 3 EXECUTION**

**3.01 TRAFFIC CONTROL PLAN (TCP)**

- A. The Contractor shall submit the TCP along with a request for approval noting the date of proposed construction and the duration to the agency having jurisdiction.
- B. The Contractor shall obtain any and all necessary permits required for performance and execution of the TCP in coordination with the appropriate agencies.
- C. The Contractor shall install and maintain temporary traffic control devices adjacent to and within the Project work zone in accordance with the approved TCP and the MUTCD. Installation of the traffic control devices shall proceed in accordance with MUTCD phasing and shall be performed prior to the start of construction operations.

**3.02 TRAFFIC CONTROL DEVICES (TCD)**

- A. Furnish and place Traffic Control Devices before the start of construction operations.

- B. Install only those Traffic Control Devices needed for each stage or phase of construction as required by the TCP and the MUTCD.
- C. Relocate temporary or permanent Traffic Control Devices as required by the phasing of the Work. Remove devices that no longer apply to the Work in progress. Temporarily cover signs when they are not applicable to current conditions.
- D. Immediately clean, service, or replace any Traffic Control Device that is defaced, damaged, or when its retro reflectivity is reduced by 50% due to fading, dirt, etc. Keep all temporary Traffic Control Devices clean and serviceable.
- E. If required by the Work in progress maintain Traffic Control Devices 24 hours a day with adequate barricades, lights, arrows, etc. to protect the public from traffic hazards and accidents.
- F. Use flares and/or lights during times of low visibility to delineate traffic lanes and to guide traffic.
- G. Remove all temporary Traffic Control Devices upon completion of the Work and repair all damage caused by their installation.

### **3.03 CONSTRUCTION PARKING CONTROL**

- A. Control parking of construction personnel's vehicles and construction equipment to prevent interference with public traffic and public access to private drives, parking areas, sidewalks, residences, etc.
- B. Prevent parking on or adjacent to side streets or in non-designated areas. The Contractor at his expense will repair vehicle damage caused by the Contractor or his personnel to residential or private property.
- C. Schedule and coordinate delivery and off-loading of materials so as to not interfere with traffic outside of the Contractor's designated work zone or storage yard.

### **3.04 FLAGMEN**

- A. When the TCP requires provide flagmen or traffic control officers who are trained and equipped in accordance with the requirements of Part VI of the MUTCD.
- B. Flaggers shall use Type III or Type IV retro reflective Stop/Slow paddles. Use of flags is prohibited unless it is an emergency situation in low-speed, low-volume locations which can best be controlled by a single flagger.
- C. The flagger or traffic control officer shall wear a retro reflective vest at all times during traffic control operations.

End of Section

**SECTION 01600  
MATERIAL AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. Products.
- B. Transportation and Handling.
- C. Storage and Protection.
- D. Product Options.
- E. Products List.
- F. Substitutions.
- G. Systems Demonstration.

**1.02 QUALITY ASSURANCE**

- A. Approval Required
  - 1. The contract is based on the standards of quality established in the contract documents.
  - 2. All products proposed for use, including those specified by required attributes and performance, shall require approval by the Owner before being incorporated into the work.
  - 3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Owner.

**1.03 PRODUCTS**

- A. Products include material, equipment, and systems.
- B. Comply with specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a specification section shall be the same and shall be interchangeable.
- D. All materials shall be manufactured in the USA unless otherwise approved by LCUB.

**1.04 TRANSPORTATION AND HANDLING**

- A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.



- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

#### **1.05 STORAGE AND PROTECTION**

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions. Store mechanical and electrical equipment in a controlled environment as recommended by the manufacturer.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

#### **1.06 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.
- C. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications: No options, no substitutions allowed.
- D. Products Specified by Naming Only One Manufacturer: No options, no substitutions allowed.

#### **1.07 PRODUCTS LIST**

- A. Under provisions of Section 01302-Submittals and Substitutions, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

#### **1.08 SUBSTITUTIONS**

- A. During bidding period, the Owner will govern times for submitting requests for substitutions under requirements specified in this section.

- B. Concurrent with submission of product list, the Owner will consider requests from Contractor for substitutions. Subsequently, substitutions will be considered only when a product becomes unavailable due to no fault of Contractor. Confirmation of unavailable products must be in writing and certified by the manufacturer that the product is no longer available.
- C. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with contract documents.
- D. Request for substitution constitutes a representation that Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
  - 2. Will provide the same warranty for substitution as for specified product.
  - 3. Will coordinate installation and make other changes which may be required for work to be complete in all respects.
  - 4. Waives claims for additional costs which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals. Separate written request, must be submitted for any proposed substitutions or deviation from the contract documents.
- F. Owner will determine acceptability of proposed substitution, and the Engineer will notify Contractor of acceptance or rejection in writing within a reasonable time.
- G. Substitute products shall not be ordered or installed without written acceptance.
- H. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.
- I. Engineer will determine acceptability of substitutions.

#### **1.09 SUBMITTAL PROCEDURES**

- A. Engineer will review Contractor's requests for substitutions with reasonable promptness.
- B. During the bidding period, Engineer will record acceptable substitutions in Addenda.
- C. Upon proper submission, Engineer will notify Contractor, in writing, of decision to accept or reject requested substitution within 15 days.
- D. For accepted products, submit shop drawings, product data, and samples under provisions of Section 01302 - Submittals and Substitutions.

#### **1.10 SYSTEMS DEMONSTRATION**

- A. Prior to final inspection, demonstrate operation of each system to the Owner.
- B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

**PART 2 PRODUCTS**

A. Not Applicable

**PART 3 EXECUTION**

A. Not Applicable

End of Section

**SECTION 01700  
CONTRACT CLOSEOUT**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. Closeout Procedures
- B. Final Cleaning
- C. Project Record Documents
- D. Operation and Maintenance Data
- E. Warranties and Bonds
- F. Spare Parts and Maintenance Materials

**1.02 RELATED REQUIREMENTS**

- A. General Conditions: Fiscal provisions, legal submittals, and other administrative requirements.

**1.03 CLOSEOUT PROCEDURES**

- A. Comply with procedures stated in General Conditions of the contract and procedures specified in this section for issuance of Certificate of Final Completion.
- B. Owner will occupy designated portion of Project for the purpose of conduct of business, under provision stated in Certificate of Substantial Completion.
- C. When Contractor considers work has reached final completion, submit written certification that work is complete in accordance with contract documents and ready for Engineer observation.

**1.04 FINAL COMPLETION**

- A. The final inspection at the job site will be done by the Engineer once the following items are received from the General Contractor:
  - 1. Notification to Engineer that work is complete and ready for final inspection.
- B. Should Engineer inspection find work incomplete, he will promptly notify Contractor in writing listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second certification of final completion.
- D. When Engineer finds work is complete, he will consider closeout submittals.

**1.05 STATEMENT OF ADJUSTMENT OF ACCOUNTS**

- A. Submit final statement reflecting adjustments to Contract Sum indicating:
  - 1. Original Contract Sum
  - 2. Previous Change Orders
  - 3. Changes Under Unit Prices
  - 4. Deductions for Uncorrected Work
  - 5. Deductions for Liquidated Damages
  - 6. Other Adjustments to Contract Sum
  - 7. Total Contract Sum as Adjusted
  - 8. Previous Payments
  - 9. Sum Remaining Due
  
- B. Engineer will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by change orders.

**1.06 APPLICATION FOR FINAL PAYMENT**

- A. Submit application for final payment in accordance with provisions of Conditions of the contract.

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION**

- A. Not Applicable

End of Section

**SECTION 01710  
CLEANING****PART 1 GENERAL****1.01 DESCRIPTION**

- A. Work Included: Throughout the construction period, maintain the site in a standard of cleanliness as described in this section.
  - 1. Site generated debris will be cleaned and removed daily. No debris or waste will be allowed to be buried on site including along gas lines.
- B. Related Work Described Elsewhere: In addition to standards described in this section, comply with all requirements for cleaning up as described in various other sections of these specifications.

**1.02 QUALITY ASSURANCE**

- A. Inspection: Conduct inspection daily, and more often if necessary, to verify that requirements for cleanliness are being met.
- B. Codes and Standards: In addition to the standards described in this section, comply with all pertinent requirements of government agencies having jurisdiction.

**PART 2 PRODUCTS****2.01 CLEANING MATERIALS AND EQUIPMENT**

- A. Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

**PART 3 EXECUTION****3.01 PROGRESS CLEANING**

- A. General:
  - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
  - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for the construction of this work.
  - 3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
  - 4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

**B. Site:**

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service all arrangements to meet the requirements of paragraph 3.01.A.1, above.
3. Maintain the site in a neat and orderly condition at all times.

**3.02 FINAL CLEANING**

- A. Definition: Except as otherwise specifically provided, "clean" (for the purpose of all paragraphs under paragraph 3.02) shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
- B. General: Prior to the completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described under paragraph 3.01, above.
- C. Site: Unless otherwise specifically directed by the Owner, broom clean all paved areas on the site and all public paved areas directly adjacent to the site. Completely remove all resultant debris.
- D. Timing: Schedule final cleaning as approved by the Owner to accept a completely clean project.

End of Section

**SECTION 01720  
PROJECT RECORD DOCUMENTS**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. Maintenance of Record Documents and Samples.
- B. Submittal of Record Documents and Samples.

**1.02 RELATED REQUIREMENTS**

- A. General Conditions: Documents at the site.
- B. Section 01302 - Submittals and Substitutions: Shop drawings, product data, and samples.
- C. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

**1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES**

- A. In addition to requirements in General Conditions, maintain at the site for OWNER one record copy of:
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Field test records.
  - 7. Inspection certificates.
  - 8. Manufacturer's certificates.
  - 9. Record drawings with approved modifications to design drawings in red (See 1.04 B.)
  - 10. Pre-Construction and Construction Photographs.
  - 11. Verified GIS Data Collect by LCUB-approved staff.
- B. Maintain Record Documents in a clean, dry, and legible condition. Do not use Record Documents for construction purposes.
- C. Keep Record Documents and samples available for inspection by OWNER.

**1.04 RECORDING**

- A. Record information concurrently with construction progress. Do not conceal any work until required information is recorded by CONTRACTOR and verified by OWNER.
- B. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:



1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  2. Field changes of dimension and detail.
  3. Changes made by modifications.
  4. Details not on original contract drawings.
  5. References to related shop drawings and modifications.
- C. Specifications: Legibly mark each item to record actual construction, including:
1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
  2. Changes made by addenda and modifications.

### **1.05 TRACKING AND TRACEABILITY**

- A. Contractor shall implement an Owner-approved process for tracking all gas system materials installed such that the Owner will be able to trace any pipe, fitting, coupling, etc. that is installed within their gas distribution system. Tracking information shall include, but not be limited to, Manufacturer, date of manufacture, size, rating (i.e. DR 11), specific location of installation, date of installation, testing date, reference to record drawing(s), etc.

### **1.06 SUBMITTALS**

- A. At Contract closeout, deliver contractor red-line drawings, Record Documents and samples to OWNER.
- B. Transmit with cover letter in duplicate, listing:
1. Date.
  2. Project title and number.
  3. Contractor's name, address, and telephone number.
  4. Number and title of each Record Document.
  5. Signature of Contractor or authorized representative.
  6. Construction Photos.

### **PART 2 PRODUCTS**

- A. Not Applicable

### **PART 3 EXECUTION**

- A. Not Applicable

End of Section

**SECTION 02110  
CLEARING AND GRUBBING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This work consists of clearing, grubbing, removing, and disposing of all debris and of all vegetation that are within the designated construction areas, except for such objects that the Owner designates to remain. The work shall also include preserving and protecting from injury or defacement all vegetation and objects designated to remain.

**PART 2 PRODUCTS**

- A. Not Applicable.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Clear the entire construction area of all weeds, brush, briars, bushes, trees, stumps, and other protruding obstructions not designated to remain.
- B. Perform all clearing and grubbing operations in accordance with the applicable provisions for erosion control as shown on the drawings. The Contractor is responsible for locating disposal sites and for obtaining all related permits from site property owner and any agency having jurisdiction.
- C. The Contractor is solely responsible for the removal, hauling, and disposal of waste material. Completely dispose of all materials resulting from clearing and grubbing off the site, all at the Contractor's expense. The Owner shall not be liable for the improper disposal of waste material.
- D. Secure in writing any approval from a property Owner desiring disposal of debris on their private property.

End of Section

**SECTION 02221  
UNCLASSIFIED EXCAVATION FOR UTILITIES**

**PART 1 GENERAL****1.01 SUMMARY**

- A. All excavation for this project is considered UNCLASSIFIED.
- B. The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the Owner, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

**1.02 RELATED SECTIONS**

- A. Section 02110 - Clearing and Grubbing
- B. Section 02221 - Trenching, Backfilling, & Compacting
- C. Section 02930 - Seeding

**PART 2 PRODUCTS**

- A. Not Applicable

**PART 3 EXECUTION****3.01 PREPARATION OF THE SITE**

- A. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the Owner specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the Owner.
- B. In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the drawings, specifically listed in the specifications, marked on the site, or identified by the Owner. In no case damage or remove such growth without written permission from the Owner.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than 2

feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the Owner. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material and compact to the same density as the surrounding material.

- D. Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is specifically ordered by the Owner. Take special precautions to protect and preserve such growth throughout all stages of the construction.
- E. Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

### **3.02 UNSUITABLE MATERIALS**

- A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, pipe laying, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1- to 2-inch sized crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6 inches of this refill shall be Class A, Grade D aggregate crushed stone for bedding.

### **3.03 ROCKS AND BOULDERS**

- A. Should rock be encountered in the excavation, remove it by mechanical methods (no blasting is allowed).
- B. Excavate rock over the horizontal limits of excavation and to a depth of not less than 6 inches below the outside bottom of pipe up to 30 inches in diameter and not less than 12 inches below the outside bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with Class A, Grade D aggregate or other approved material, tamp to the proper grade, and make ready for construction. For monolithic concrete sewers or culverts and for structures, excavate rock to the outside bottom of the structure or sewer.

### **3.04 DISPOSAL OF MATERIALS**

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the Owner shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of at the Contractor's expense.
- B. Waste materials may be deposited in spoil areas at locations approved by the Owner. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02930 - Seeding.

- C. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat, workmanlike condition, as described below.
- D. The disposal of waste materials shall be considered an integral part of the excavation work and one for which no separate payment shall be allowed.

### **3.05 EXCAVATION FOR TRENCHES, MANHOLES, AND STRUCTURES**

- A. Unclassified excavation for pipelines shall consist of the excavation necessary for the construction of water, sewer, and other pipes and their appurtenances (including manholes, inlets, outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials; all of which shall conform to the applicable provisions set forth elsewhere in these specifications.
- B. The Contractor may, if he chooses, use a motor-powered trenching machine. If he does; however, he shall be fully responsible for the preservation or repair of existing utilities.
- C. Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings or specifically authorized by the Owner, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the Owner on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance specified in Section 02611 Part E. 2. When approved in writing by the Owner, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to nonvertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the width requirements outlined above. Any cut made in excess of the maximum width shall be at the expense of the Contractor and may be cause for the Owner to require that stronger pipe and/or a higher class of bedding be used at no cost to the Owner.
- D. For rigid pipe, shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel. Pipe bedding shall be thoroughly and completely tamped before backfilling. Bedding for DIP used shall consist of 6-inch envelope of Class A, Grade D aggregate up to the centerline of the pipe. Pipe bedding shall be thoroughly and completely tamped before backfilling.
- E. Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than two joints ahead of pipe laying.
- F. Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a 2-foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall,

at his own expense, fill the void with either concrete or granular material approved by the Engineer.

- G. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying. Perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the Owner deems necessary to maintain vehicular or pedestrian traffic.
- H. In all cases where materials are deposited along open trenches, place them so that in the event of rain or surcharge loading from such deposits no damage will result to the work and/or to adjacent property.
- I. Excavation for manholes and other structures may be performed with nonvertical banks except beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2-foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings.

### **3.06 THE DEWATERING OF EXCAVATION**

- A. Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the Engineer. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.
- B. All water pump or drained from the work shall be disposed of in a manner satisfactory to the Engineer without damage to adjacent property or other areas.
- C. If necessary, due to the volume of water containing sediment, or due to the location of pumping activities, construct a sediment trap (structure) to pump ground water into until sediment is no longer being removed with the water. Sediment shall not be discharged to the waters of the State.

### **3.07 BORROW EXCAVATION**

- A. Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations or whenever the backfill material from such excavations is unsuitable, then obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. In such cases, make suitable arrangements with the property owner and pay all incidental costs, including any royalties, for the use of the borrowed material. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the Engineer. All state and local regulation concerning borrow pits, drainage, and erosion control shall be strictly followed.
- B. Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the Engineer.

- C. Properly clear and grub borrow pits. Remove all objectionable matter from the borrow pit material before placing it in the backfill.
- D. The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work. No separate payment shall be made for this.

### **3.08 BACKFILLING**

- A. Begin backfilling after the line construction is completed and then inspected and approved by the Engineer. On each side of the line, from the top of the bedding material as specified in Paragraph B., the backfill material shall consist either of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or other objectionable materials and that has a size of no more than 2 inches. Place this backfill simultaneously on either side of the pipe in even layers that before compaction are no more than 6-inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. Backfill shall, at locations beneath concrete and asphalt driveways, roadways, sidewalks, parking areas, etc. or closely adjacent to pavement, consist of No. 57 crushed stone aggregate. Use of aggregate backfill shall be at the direction of the Engineer.
- B. For all site piping used, install No. 57 crushed stone bedding in a 6-inch envelope on all sides of the pipe to be compacted as outlined in Paragraph A. Then add the remaining backfill as described in the previous paragraph.
- C. At locations beneath or closely adjacent to pavement or at locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are 6 inches deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.
- D. If earth material for backfill is, in the opinion of the Engineer, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the Engineer considers too wet or otherwise unsuitable.
- E. Wherever excavation has been made within easements across private property, the top 1 foot of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials. Top soil shall be placed a minimum of 6 inches on top of this backfill material.
- F. Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Owner. On heavy-traveled roadways, cold mix or leveling course binder 2 inches thick shall be installed and maintained until permanent pavement is installed.
- G. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.

- H. Wherever pipes have diameters of 15 inches or less, do not use power-operated tampers to tamp that portion of the backfill around the pipe within 1 foot above the pipe.
- I. Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary, whenever directed to do so by the Engineer.
- J. Backfilling and clean-up operations shall closely follow pipe laying. Failure to comply with this provision will result in the Owner's requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- K. Compaction Requirements: Under buildings and two times the depth of pipe beyond, and under roads and two times the depth beyond the shoulder, compact to 95-percent maximum density in accordance with ASTM D698. In all other locations, compact to 90-percent maximum density.
- L. See Section 02611, Trenching, Backfilling, & Compacting for additional requirements.

### **3.09 MAINTENANCE**

- A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Engineer.
- B. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the Engineer. Continue such maintenance until final acceptance of the project or until the Engineer issues a written release.

### **3.10 SLOPES**

- A. Neatly trim all open cut slopes and finish to conform either with the slope lines shown on the drawings or the directions of the Engineer. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

End of Section



**SECTION 02415  
HORIZONTAL DIRECTIONAL DRILLING AND BORING**

**PART 1 GENERAL****1.01 DESCRIPTION**

- A. This section covers the work necessary for installation of pipelines by directionally controlled horizontal drilling or boring equipment.

**1.02 SCOPE OF WORK**

- A. Fabricate, directionally drill or bore and install the pipeline to the approximate lines and grades shown on the project plans.
- B. Pressure test the pipeline section before installation; Pressure test the pipeline section after installation.
- C. Clean up all affected sites, and restore all areas to pre-construction or better condition.
- D. The CONTRACTOR shall deliver the pipeline to OWNER in a clean and operable condition. The pipe shall be internally cleaned with a suitable type pig cleaner as approved by OWNER. The cleaning must be conducted with an OWNER approved pig. All water must be removed from the pipeline as required by OWNER.

**1.03 SUBMITTALS**

- A. The CONTRACTOR shall prepare a schedule for the work and submit it to OWNER for approval. The schedule shall include all major tasks to be performed including the following:
1. Rig mobilization and setup
  2. Pipe assembly
  3. Pilot hole drilling
  4. Pre-reaming
  5. Pretesting and pigging pipe before installation
  6. Pipe pulling
  7. Testing and pigging pipe after installation
  8. Restoration and demobilization
- B. At least 10 days prior to mobilization of equipment, the CONTRACTOR shall submit a detailed installation plan to OWNER for review and approval. This plan must also include a detailed description as to contingencies for potential fissures of drilling fluid.
- C. The CONTRACTOR will supply Material Safety Data Sheets (MSDS) for all material used in making up drilling fluids. The drilling fluid composition must meet all federal, state, and local laws and environmental regulations governing the use, handling, storage, and disposal of such material.

**1.04 PERMITS**

- A. The CONTRACTOR shall maintain and operate all construction equipment and perform all work within designated easements, temporary construction easements, working areas, public rights-of-way, and access roads.
- B. The CONTRACTOR shall be responsible for obtaining all permits and regulatory authorizations for activities off of the defined easements and working areas, including any permits required for mobilizing materials and equipment and disposal of drilling fluids and industrial debris. The CONTRACTOR will be responsible for paying all fines that may be imposed due to illegal discharge.

**PART 2 PRODUCTS****2.01 GENERAL**

- A. The CONTRACTOR shall provide all materials, equipment and labor for completing the drill/bore and for adequate protection of the work.

**2.02 EQUIPMENT AND MATERIALS TO BE FURNISHED BY CONTRACTOR**

- A. The CONTRACTOR shall furnish all equipment and material required to complete the Scope of Work which shall include but not be limited to the following:
  - 1. Drilling equipment
  - 2. Water pumps, hoses, fittings, storage tanks, filters, hay bales, and silt fencing (as required)
  - 3. Drilling fluids containment, collection, cleaning and disposal equipment, and material
  - 4. Fuel and lubricant
  - 5. Bentonite and related mixing equipment
  - 6. All welding equipment and materials as required
  - 7. All hydrostatic and pneumatic testing equipment and materials
  - 8. Sidebooms, cranes, backhoes, trucks and other equipment and materials necessary to load and unload pipe and to support and smoothly transition the pipe while being pulled into the reamed hole
  - 9. All equipment and materials necessary to restore project areas to pre-existing condition or better

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. General: The CONTRACTOR shall install the section of the pipeline by the horizontally dilled or bored, directionally controlled method of construction. This method shall consist of the drilling of a pilot hole within the designed tolerances for radius requirements, followed by enlargement of the hole to accommodate the product line.
- B. Instrumentation: The CONTRACTOR will at all times provide and maintain instrumentation which will accurately locate the pilot hole position relative to ground surface. Drill fluid flow

rate and pressure must also be monitored. CONTRACTOR shall maintain and provide to OWNER, upon request, access to the data generated by the downhole survey tools.

C. Tolerances:

1. Pipe installed by horizontal directional drilling or boring must be located as shown on the project drawings. The CONTRACTOR shall employ experienced personnel to operate the directional drilling or boring equipment and the monitoring and steering equipment. At the completion of the pilot hole, the CONTRACTOR shall provide OWNER with the coordinates of the pilot hole as specified.
2. A smoothly drilled pilot hole shall follow the design centerline of the pipe profile and alignment described on the project drawings.
3. The pilot hole (Borehole Entry Point) shall penetrate the ground surface at the approximate location shown on the project drawings.
4. The course of the pilot hole must stay within the given right-of-way at all points along the drilled route.
5. The CONTRACTOR shall have accurate working gauges, which register tensile force being used to pull the pipeline back through the reamed borehole. It is the CONTRACTOR's responsibility to prepare the reamed out hole such that pulling back operations do not exceed the tensile strength of the pipe. The CONTRACTOR shall provide estimated calculations for the pulling loads and allowable loads before pull back operations begin. If during the pipeline pulling process this force reaches 75% of the allowable load for the pipeline, the project inspector must be notified immediately. Logs must be kept intact referencing all forces exerted on the pipeline during the project.
6. The CONTRACTOR shall provide adequate supports along the stringing area to protect the pipe and allow free movement of the pipeline during pullback.
7. During pullback operations, CONTRACTOR shall monitor roller operation and use sidebooms if required to assist movement of the pipe. Situations which could cause damage to the pipe material shall be corrected immediately. Damaged pipe shall be repaired to the satisfaction of the OWNER or replaced by the CONTRACTOR before pulling operations resume.

### **3.02 DRILLING MUD AND CUTTINGS**

- A. The Horizontal Directional Drilling or Boring operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to water and land areas involved during the construction process. CONTRACTOR shall immediately contain and clean up any inadvertent returns.
- B. Disposal of drilling fluids shall be the responsibility of the CONTRACTOR and shall be conducted in compliance with all relative environmental regulations, easement and workspace agreements and permit requirements. All costs related to disposal shall be the responsibility of the CONTRACTOR.

- C. Transportation, makeup, and Material Safety Data Sheets (MSDS) for drilling fluids shall be provided to OWNER.
- D. Water supply is the CONTRACTOR's responsibility, whether purchased locally or hauled in.
- E. Drilling fluids must be free of all additives that will adversely affect the environment.

### **3.03 REAM AND PULL BACK**

- A. Pre-reaming: Pre-reaming operations shall be conducted at the discretion of the horizontal directional drilling or boring CONTRACTOR. All provisions of this specification relating to simultaneous reaming and pulling back operations shall pertain to pre-reaming operations.
- B. Pulling loads: CONTRACTOR shall be responsible for determining safe pulling loads required for proper installation. Such loads shall be minimized as required to prevent failure of the pipeline during installation.
- C. Torsional Stress: A properly sized and fully operational swivel will be installed between the reaming assembly at the end of the drill pipe, and the pipeline to restrict torsional stress from being transmitted to the pipeline.
- D. CONTRACTOR may opt to fill the pipeline with water (ballasting) as installation proceeds to help prevent buckling and reduce buoyancy. The CONTRACTOR must completely clean and dry the pipeline after installation.
- E. Pull Section Support: The pull section shall be supported as it proceeds during pull back so that it moves freely and the pipe material is not damaged.

### **3.04 CLEANUP, REPAIRS AND RESTORATION**

- A. The CONTRACTOR is responsible for leaving all areas affected by construction activities in a condition equal to or better than the condition before construction.
- B. The CONTRACTOR shall restore area around entry and exit pits as soon as work is completed. Fill to previous existing ground elevation and grade any areas where settlement occurs due to subsidence. Seed and straw as directed in Section 02930, Seeding.

End of Section

**SECTION 02444**  
**GALVANIZED CHAIN LINK FENCING**

**PART 1        GENERAL**

**1.01    SUMMARY**

- A.     Submit complete specifications and shop drawings for OWNER'S approval.
- B.     Fencing and all accessories shall be produced by a single manufacturer. Submit copies of the manufacturer's technical data, layout and installation instructions per Section 01302.
- C.     Refer to other Sections for work related to that specified under this heading.

**PART 2        PRODUCTS**

**2.01    POSTS, RAILS, AND BRACES**

- A.     All structural and roll formed shapes shall conform to the provisions of ASTM A123 for galvanized coating.
- B.     All tubular members shall comply with the provisions of ASTM A120, Schedule 40, for weight and coating or be high strength triple coated steel in accordance with ASTM A569.
- C.     End, Corner, and Pull Post: For fence up to and including 12 feet 0 inches in height, 3-1/2 inches by 3-1/2 inches roll formed corner section shall have a minimum bending strength of 452 pounds (2.875 inches outside diameter, Schedule 40 pipe with a minimum bending strength of 381 pounds at 6 feet).
- D.     Line Posts (10 feet 0 inches Maximum Spacing):
  - 1.     Fabric Up To 8 feet 0 inches in Height: C-section, standard roll formed, 1.875 inches by 1.625 inches with a minimum bending strength of 245 pounds (1.90 inches outside diameter, Schedule 40 or high strength pipe with a minimum bending strength of 117 pounds)
  - 2.     Fabric Over 8 feet 0 inches in Height: C-section, heavy roll formed, 2.25 inches by 1.70 inches with a minimum bending strength of 314 pounds (2.375 inches outside diameter, Schedule 40 pipe with a minimum bending strength of 201 pounds)
- E.     Gate Posts:
  - 1.     Gate Leaves Up To and Including 6 feet 0 inches Wide: 3-1/2 inches by 3-1/2 inches roll formed section (2.875 inches outside diameter, Schedule 40 or high strength steel pipe)

2. Gate Leaves Over 6 feet 0 inches and Up To and Including 13 feet 0 inches Wide: 4 inches outside diameter, Schedule 40 pipe or high strength steel pipe
  3. Gate Leaves Over 13 feet 0 inches and Up To and Including 18 feet 0 inches Wide: 6-5/8 inches outside diameter, Schedule 40 pipe or high strength steel pipe
  4. Gate Leaves Over 18 feet 0 inches Wide: 8-5/8 inches outside diameter, Schedule 40 pipe or high strength steel pipe
- F. Top Rail:
1. The top rail shall be a 1.625 inches by 1.25 inches roll formed section with a minimum bending strength of 192 pounds (1.660 inches outside diameter, Schedule 40 pipe with a minimum bending strength of 202 pounds at 10 feet).
  2. Furnish in the manufacturer's standard lengths of approximately 21 feet 0 inches, with couplings approximately 6 inches long for each joint. One coupling in each five shall have an expansion spring. Provide means for attaching top rails securely to each gate, corner, pull, and end posts. The top rail shall form a continuous brace from end to end to each run of fence.
- G. Tension Wire: 7 gage galvanized or aluminum coated coil spring wire
- H. Post Bracing Assembly: to match top rail. Brace rail assembly shall be complete with a 3/8 inch diameter rod and adjustable take-up.

## 2.02 CHAIN LINK FABRIC

- A. The fabric shall consist of one piece fabric widths for fences up to 12 feet 0 inches - 2 inches mesh, 9 gage or 11 gage, as indicated on the drawings.
- B. Selvage Edges: Fabric in heights 60 inches and less shall be knuckled at both selvages. Fabric 72 inches and more shall be knuckled at the bottom selvage and be twisted and barbed at the top.
- C. Finishes: heavy galvanized, 2.0 ounces of zinc per square foot, complying with ASTM A392, Class II, or aluminum coated with 0.40 ounces of aluminum per square foot, complying with ASTM A491, Class II

## 2.03 ACCESSORIES

- A. All accessories, except tie wires and barbed wire, shall be galvanized to comply with ASTM A153.
- B. Barbed Wire Supporting Arms: heavy pressed steel, complete with provisions for anchorage to tubular end, corner, and pull posts attaching 3 rows of barbed wire to each arm. Barbed wire arms are not required on roll formed terminal posts. Single arms shall be integral with a post top weather cap. Intermediate arms shall have a hole for the passage of the top rail. Arms shall be capable of withstanding, without failure, 250 pounds downward pull at outermost end of arm.

- C. Barbed Wire: 2 strand, 12-1/2 gage wire with 14 gage, 4 point round barbs spaced approximately 5 inches on center, with finishes as follows:
  - 1. Galvanized: ASTM A121, Class 3
  - 2. Aluminized: ASTM A585, Class 2
- D. Post Tops: pressed steel or malleable iron (designed as a weathertight closure cap for tubular posts). Where top rail is used, provide tops to permit the passage of the top rail.
- E. Stretcher Bars (for tubular end, corner, pull, or gate posts only): one-piece lengths equal to the full height of the fabric, with a minimum cross section of 3/16 inch by 3/4 inch. Provide one stretcher bar for each gate and end post and two for each corner and pull post.
- F. Stretcher Bar Bands: heavy pressed steel spaced not over 15 inches on center to secure stretcher bars to tubular end, corner pull, and gate post
- G. Wire Ties: For tying fabric to line posts, use 11 gage steel wire clips for C-section posts and a minimum 9 gage aluminum wire ties for tubular posts, spaced 14 inches on center. For tying fabric to rails and braces, use 9 gage aluminum wire ties spaced 24 inches on center. For tying fabric to tension wire, use 11 gage hog rings spaced 24 inches on center.

#### 2.04 GATES

- A. Fabricate gate perimeter frames of 1.90 inches outside diameter tubular members galvanized in accordance with ASTM A120. Provide additional horizontal and vertical members to ensure proper gate operation and to allow for attachment of fabric, hardware, and accessories.
- B. Assemble gate frames by welding or fittings and rivets for rigid connections. Use same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges, and tie at top and bottom edges. Attach stretcher bars to gate frame at not more than 15 inches on center. Attach hardware with rivets or by other means that will provide security against removal or breakage.
- C. Provide diagonal cross bracing that consists of 3/8 inch diameter adjustable length truss rods on gates where necessary to provide frame rigidity without sag or twist.
- D. Gate Hardware: Provide the following hardware and accessories, with a heavy galvanized finish, for each gate:
  - 1. Hinges: pressed steel or malleable iron to suit gate size, nonlift-off type, offset to permit 180 degrees gate opening. Provide one pair of hinges for each leaf.
  - 2. Latch: forked type or plunger bar type to permit operation from either side of the gate. Provide padlock eye as an integral part of the latch.
  - 3. Keeper: Provide a keeper for all vehicle gates that automatically engages the gate leaf and holds it in the open position until manually released.
  - 4. Double Gates: Provide gate stops for all double gates consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod

- or plunger bar. Provide locking device and padlock eyes as an integral part of the latch, with one padlock for locking both gate leaves.
5. Sliding Gates: Provide the manufacturer's standard heavy duty track, ball bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories, as required.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. The packing for all products shall be Level C.
- B. SET ALL POSTS IN A 3,000 PSI CONCRETE FOOTING. Trowel smooth the top of each footing at a 20 degrees angle from the post to the surrounding ground so as to shed water away from the post. The post shall extend to the full depth of the footing. The diameter and depth of footings for various fence heights shall be as specified on the drawings.
- C. INSTALL ALL FENCING TO THE LIMITS SHOWN ON THE DRAWINGS. Install end or corner posts at any break in the alignment greater than 20 degrees. Install intermediate posts between end or corner posts, spaced equally at a maximum of 10 feet center to center. Install end, corner, or gate posts on both sides of a gate. Only one end or corner post shall be installed at the junction of different heights of fence and shall be consistent with the largest post required at the junction. Install gates to allow a clear and level swing in either direction to their maximum limit. Set all posts with a vertical tolerance of less than 1 inch in 10 feet as measured with a plumb bob.
- D. All corner, terminal, and gate posts for fence 6 feet and higher shall have a midrail and 3/8 round adjustable truss rod to the next post.
- E. All gates shall have a full wraparound hinge system with a positive latch with provision for a padlock. Gates 5 feet and under shall have a self-closing mechanism.
- F. All fence shall have a bottom tension wire attached to the fabric and posts.

End of Section



**SECTION 02546  
BORING AND CASING FOR GAS LINES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The work to be performed hereunder shall consist of the installation of a casing pipe for the purpose of installing a gas line as shown on the Drawings or as called for in these specifications. It shall include the excavation of a boring pit, auger boring between the points specified on the Drawings, furnishing and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.
- B. The Owner will provide the necessary control points required by the Contractor for this construction. The Contractor will provide the detailed layout required to keep the tunnel or bore on grade.

**PART 2 PRODUCTS**

**2.01 CASING PIPE**

- A. The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have a minimum yield strength of 35,000 psi and shall have the minimum wall thickness shown in the following table:

<b>(For Highway H20 Loading)</b>			<b>( For Railroad E72 Loading)</b>	
<b>Carrier Pipe (inches)</b>	<b>Casing Pipe (inches)</b>	<b>Nominal Thickness (inches)</b>	<b>Casing Pipe (inches)</b>	<b>Nominal Thickness (inches)</b>
2	6	0.250	8	0.250
4	8	0.250	10	0.250
6	12	0.250	14	0.250
8	16	0.250	18	0.281
12	20	0.281	24	0.375
16	24	0.375	30	0.500
20	30	0.500	30	0.500
24	36	0.500	36	0.625
30	42	0.500	42	0.625
36	48	0.625	48	0.750
42	54	0.625	54	0.875
48	60	0.750	60	0.875

**2.02 CARRIER PIPE**

- A. The carrier pipe shall meet the standards specified in all Division 33 specifications herein.

**PART 3 EXECUTION****3.01 BORING**

- A. The boring shall be accomplished by means of auguring to the size, line, and grade shown on the Drawings.

**3.02 INSTALLATION OF CASING PIPE**

- A. Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints.
- B. Do not remove unacceptable casing without prior approval from the Engineer. If the removal of casing pipe is permitted, make proper provisions to prevent caving in of the earth surrounding the casing.

**3.03 INSTALLATION OF CARRIER PIPE**

- A. The carrier pipe(s) shall be furnished by the Contractor. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing. Spacers shall be used within the casing pipe. Casing Spacers shall be bolt style with a shell made in two sections of heavy T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" minimum thickness with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy 304 Stainless Steel. The supports shall be mig welded to the shell and all welds shall be passivated. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75" from the casing pipe wall at all times. A minimum of three spacers shall be placed on each joint of pipe. Casing spacers shall be made by Cascade Waterworks Mfg. Co. or Pipeline Seal and Insulator, Inc., Model S 12G-2. Each end of the casing pipe shall be sealed with a wrap-around end seal. (See Standard Drawing 1024).

**3.04 TUNNELING ALTERNATIVE**

- A. In the event boring and jacking is impossible because of pipe size, rock, or other factors and the highway department or railroad will not permit open cutting, make crossings by tunneling using liner plates. Conduct tunneling operations as approved by the railroad or highway department. If voids are caused by the tunneling operations, fill by pressure grouting or by other approved methods that will provide proper support.
- B. Galvanized Plates
  - 1. After the plates are formed to shape, the plates shall be galvanized on both sides by the hot dip process. A coating of prime western spelter, or equal, shall be applied at the rate of not less than 2 ounces per square foot of double exposed surface. If the average spelter coating as determined from the required samples is less than the amount specified above, or if any 1 specimen shows a deficiency of 0.2 ounce, the lot

shall be rejected. Spelter coating shall be of first class commercial quality free from injurious defects such as blister, flux, and uncoated spots.

2. The outside of the plates shall be given a bituminous coating meeting the AASHO M-190 specifications for bituminous protected corrugated metal pipe.

C. Design and Construction

1. Construct the tunnel by the tunnel method, and completely line on the inside with structural steel liner plates meeting all requirements specified hereinafter. The dimensions of the tunnel shall be as shown on the Drawings.
2. The tunneling operation is to commence from a pit that is a minimum of 12 feet long and 4 feet wider than the diameter of the tunnel, bottom to grade, and sheeted and shored, if necessary. Furnish line and grade stakes.
3. All excavation for the entire length of the tunnel shall be done by tunneling, and the work may be done from either or both ends of the conduit. Trim the periphery of the tunnel smooth to fit the outside of the steel liner plate as nearly as is practical, and fill all space outside of the steel liner plate with a sand cement grout mixture.
4. Install the steel liner plates immediately after the excavated material has been removed. Do not remove material more than 24 inches ahead of the installed liner plates.
5. Provide all necessary bracing, bulkheads, and/or shields to ensure complete safety to all traffic at all times during the progress of the work, and perform the work in such a manner as to not interfere with normal traffic over the work.
6. The steel lining shall consist of plates 16 inches wide, and each circumferential ring shall be composed of the number and length plates necessary to complete the required diameter.
7. The inside diameter of the completed ring shall be of a minimum size as called for as a casing pipe in Paragraph 2.1A, and no part of the plate or reinforcing ribs will be allowed to extend inside this net diameter.
8. The strength of the tunnel lining will be determined by its section modulus. In no case shall it be less than 0.0590 inch cubed per inch of plate width based on the average for 1 ring of plates. Thickness of the metal for these steel plates shall be not less than 10 gauge, allowing for standard mill tolerances. The tunnel strength shall be equal to AASHO railroad E80 loading at the depth of cover obtaining.
9. All plates shall be punched for bolting on both longitudinal and circumferential seams and shall be fabricated so as to permit complete erection from the inside of the tunnel. The longitudinal seam shall be of the lap type with offset equal to gauge of metal for the full width of the plate, including flanges, and shall have staggered bolt construction fabricated so as to allow the cross section of the plate to be continuous

through the seam. All plates shall be of uniform fabrication, and those intended for one size tunnel shall be interchangeable.

10. The material used for the construction of these plates shall be new and unused and suitable for the purpose intended. Workmanship shall be first class in every respect.
11. Install the carrier pipe to the line and grade shown on the Drawings. The carrier pipe shall be adequately blocked inside the tunnel so that no part of the carrier pipe touches the tunnel liner. The blocking shall be such that the carrier pipe cannot move horizontally or vertically. The blocking shall be installed within one foot on each side of the bell of the carrier pipe and at the center of each joint. The main portion of the support shall be stainless steel with a PVC liner between the support and the carrier pipe. Detailed plans and specifications shall be submitted showing the proposed bracing and support of the carrier pipe inside the tunnel. Each end of the tunnel liner shall be plugged with brick and mortar.
12. All tunnel liners shall have one 2 inch grout coupling in every ring. Grout back of the rings as required.

#### **PART 4 GUARANTEE OF WORK**

##### **4.01 SUMMARY**

- A. Guarantee a usable completed casing or tunnel between the points specified and to the line and grade specified. The allowable tolerance at the downstream end point of the bore shall be such that the invert of the carrier pipe may be positioned within a vertical area limited on the top by an elevation no higher than the elevation shown on the Drawings and on the bottom by an elevation no lower than the existing inlet pipe invert.
- B. The allowable tolerance at the upstream end point of the bore shall be such that the invert of the carrier pipe may be positioned at the elevation shown on the Drawings.

End of Section

**SECTION 02575  
PAVEMENT REPAIR**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The work specified by this section shall consist of repairing or replacing all damaged pavement, whether public or private. Dirt shoulders, roads, streets, drives, and walks are to be restored to their original condition as an incidental part of the installation of utilities. Repair damaged base on either side of a trench wherever necessary. Trim the oxidation surface to neat lines outside of the trench wall and repave the entire area as specified below and as shown on the drawings or on the standard drawings.
- B. Both these specifications and the drawings make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, construction methods, and materials specifications contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable. Refer to other sections for work related to that covered by this section.
- C. All pavement repair work must meet the requirements of the Loudon County Highway Department, Lenoir City Street Department, and/or all other local agencies having jurisdiction over the roadway being repaired. Where Loudon County Highway Department and/or Lenoir City Street Department requirements differ from the specifications herein, the more stringent of the two shall be used.

**PART 2 PRODUCTS**

- A. Mineral Aggregate Base: Type A Base, Grading D crushed stone (TDOT Specification Section 303);
- B. Bituminous Prime Coats: cutback asphalt, Grade RC-250, or material emulsified asphalt, Grade AE-P (TDOT Specification Section 402);
- C. Aggregate For Cover Material: Size 7, 8 or 78 (TDOT Specification Section 402) ;
- D. Tack Coat: Grade AE-3 (TDOT Specification Section 403);
- E. Bituminous Plant Mix Base (Hot Mix): Grading A, B, B (modified), or C, AS or CW, as directed by the Engineer (TDOT Specification Section 307);
- F. Asphaltic Concrete Surface: Grading D or E as specified (TDOT Specification Section 411).

**PART 3 EXECUTION****3.01 SUBGRADE**

- A. Before any base material is installed, compact the subgrade of the area to be paved to 95 percent of optimum density as determined by ASTM D698 (Standard Proctor).
- B. The backfill material shall contain no topsoil or organic matter. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection of 1 inch or more. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.
- C. When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1 foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

**3.02 BASE**

- A. Install a mineral aggregate base of the type specified above in accordance with TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

**3.03 SEAL COAT SURFACE**

- A. Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallons/square yard. Immediately after application, uniformly cover the entire area with Size 7 crushed stone chips at a rate of 12 pounds/square yard.
- B. Pavement repairs/replacements shall be thermally bonded with existing asphalt edges.

**3.04 ASPHALTIC CONCRETE BINDER**

- A. Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.38 to 0.42 gallons/square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs and gutters, walls, walks, trees, etc. If such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder to the thickness shown on the standard drawings or the plans.
- B. Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

**3.05 ASPHALTIC CONCRETE SURFACE**

- A. If the asphaltic concrete surface course is to be placed directly on the mineral aggregate base, place a bituminous prime coat as described above. If, however, the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under PRODUCTS at a rate of 0.05 to 0.10 gallons/square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs, gutters, walls, walks, trees, etc. If such splashing does occur, remove it immediately. After the prime or tack coat has been properly cured, apply the asphaltic concrete to the thickness shown on the drawings or standard drawings. Apply the surface course as described above for the binder course.

**3.06 SMOOTHNESS**

- A. The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4 inch in any direction when tested with a 12-foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

**3.07 SAMPLING AND TESTING**

- A. Submit to the Owner test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his approval of these reports before starting paving operations.
- B. Tests shall be made on the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests.
- C. When making surface tests, furnish one man to mark all surface defects for corrections.

End of Section

**SECTION 02611  
TRENCHING, BACKFILLING, AND COMPACTING**

**PART 1 GENERAL**

**1.01 RELATED WORK**

- A. Section 01050 – Field Engineering
- B. Section 01560 – Erosion and Pollution Control
- C. Section 01570 – Work Zone Traffic Control
- D. Section 01720 – Project Record Documents
- E. Section 02221 – Unclassified Excavation for Utilities
- F. Section 02311 – Control Blasting
- G. Section 33305 Polyethylene Gas Tee and Valve Installation
- H. Section 33320 Polyethylene Gas Main Tie-Ins
- I. Section 33345 Gas Service Lines
- J. Section 33720 Natural Gas Polyethylene Pipe Installation
- K. Section 02930 – Seeding

**1.02 JOB CONDITIONS**

- A. Provide for uninterrupted surface water flow during the work. Provide means whereby storm water can be uninterrupted in existing gutters and surface drains, or temporary drains.
- B. All pipe shall be installed in a dry trench. No extra compensation shall be allowed for trench dewatering.
- C. Immediately notify the Engineer of any unexpected subsurface or other unforeseen conditions. Discontinue work in area until Engineer provides notification to resume work.
- D. Existing utilities, poles, service lines, fences, structures, trees, shrubs, or other improvements encountered during the construction, whether above or below ground, shall be protected by the Contractor. Any item damaged or removed by the Contractor shall be repaired or replaced at the Contractor's expense to at least its original condition and to the satisfaction of the Owner. It shall be the Contractor's responsibility to locate any existing utilities in the path of construction.
- E. Adjacent structures which may be damaged by excavation work shall be underpinned or supported by other means.
- F. Excavations shall be protected by shoring, bracing, sheet piling, underpinning, or other



methods required to prevent cave in or loose dirt from falling into excavation.

**1.03 PERMITS**

- A. Permits shall be obtained from authorities having jurisdiction prior to any explosives being brought to the site. The Contractor shall be responsible for providing such insurance that is required to hold the Owner harmless from any claims that may arise due to blasting operations at the site. The minimum insurance requirement will be that which is outlined in the General Conditions.
- B. All conditions set forth in the Corps of Engineers 404 Permit and Tennessee Valley Authority 26A Permit (if applicable) shall be strictly adhered to. The Owner shall obtain the appropriate permit.

**1.04 QUALITY ASSURANCE**

- A. Adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this section shall be used.
- B. Equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner shall be used.

**PART 2 PRODUCTS**

**2.01 SANITARY SEWERS**

A. BEDDING MATERIAL

- 1. Angular gravel, crushed gravel, or crushed limestone meeting the following gradation requirements set forth in ASTM 33 shall be used:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4"	90 - 100
1/2"	20 - 55
3/8"	0 - 15
#4	0 - 5

- 2. Shall be used for bedding, haunching, and initial backfill of PVC pipe.
- 3. Shall be used for bedding and haunching of Ductile Iron Pipe.
- 4. Frozen materials shall not be used.

B. BACKFILL MATERIALS

- 1. Material excavated from the trench, free from large stones any dimension greater than

two (2") inches), clods, debris, or frozen lumps shall be used:

- a. For final backfill of PVC pipe.
- b. For initial and final backfill of Ductile Iron Pipe.

**C. CRUSHED STONE BACKFILL MATERIAL: UNDER ROADS OR AREAS TO BE PAVED**

- 1. Shall be used for final backfill for all pipe under roads and in areas indicated as future roads on the drawings.
- 2. Material shall be approved by the Engineer.

**2.02 WATER LINES**

**A. BEDDING MATERIALS**

- 1. Angular gravel, crushed gravel, or crushed limestone, meeting the following gradation requirements set forth in ASTM 33:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4"	90 - 100
1/2"	20 - 55
3/8"	0 - 15
#4	0 - 5

- a. Shall be used for bedding, haunching, and initial backfill of PVC and HDPE pipe.
  - b. Shall be used for bedding and haunching of Ductile Iron Pipe
- 2. Suitable materials excavated from the trench, free from large stones (any dimension greater than two inches), clods, debris, or frozen lumps may be used for bedding and haunching of water lines outside of paved areas with approval of Owner or Engineer.

**B. BACKFILL MATERIALS**

- 1. Material excavated from the trench, free from large stones (any dimension greater than two (2") inches), clods, debris, or frozen lumps shall be used:
  - a. For final backfill of PVC and HDPE pipe outside of paved areas.
  - b. For initial and final backfill of Ductile Iron Pipe outside of paved areas.
- 2. Borrow materials previously approved by the Engineer may be used for backfill material if suitable material is not available from trench.
- 3. Frozen materials shall not be used.

**C. CRUSHED STONE MATERIAL SHALL BE USED AS FOLLOWS:**

1. On road crossings where open cut crossings are made, crushed stone shall be used for bedding, haunching, and backfill. (See Standard Details).
2. In areas where rock excavation is required for installation of pipe, crushed stone shall be used for bedding, haunching, and initial backfill.
3. In other areas as directed by the Owner or Engineer and not otherwise required by the Contract Documents, crushed stone shall be replaced at a cost per ton previously agreed by the Owner and Contractor. The quantity of excavation work anticipated to be placed with crushed stone shall be mutually agreed to by the Contractor and the Engineer before excavation.

**D. TOPSOIL**

1. The final six inches of trench in non-paved areas shall be backfilled with topsoil and finished with crown. See Section 02612, Finish Grading for topsoil specification.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. Line and grade for trench shall be established.
- B. Location of all underground utilities, existing and proposed shall be located.
- C. Location of existing sewer laterals, manholes and service connections shall be located prior to commencement of trenching.
- D. Location of existing water services, meters, and appurtenances shall be located prior to commencement of trenching.

**3.02 PERFORMANCE**

- A. All earthwork and trenching operations shall comply with the requirements of OSHA Construction Standards for the construction industry (29 CFR part 1926).
- B. Unless otherwise shown on the drawings or required by the specifications or authorized by the Engineer, all work shall be done in open, vertical trenches. Any sheeting driven below the level of the top of the pipe shall not be disturbed or removed. The responsibility for assessing the need for sheeting and analyzing the stresses induced shall be the total responsibility of the Contractor.
  1. Trench sheeting left in place shall be backfilled to a level of 12 inches above the top of the pipe. It shall then be cut off and the upper portion removed.
  2. Sheeting for structures shall be left in place until backfill has been brought to a level of 12 inches above the top of the bottom footing. It shall then be cut off and removed.

- C. Clearing, including removal of surfacing and pavement, shall be done as necessary to carry on the construction in the proper manner. Material shall be removed only to minimum width necessary to allow adequate construction area. Concrete and asphalt shall be saw cut.
- D. Trenches shall be excavated to such depth as required by the drawings. Trenches for gas lines shall be excavated to such depth as required to provide a minimum of 36 inches cover in all directions from the pipe wall, unless otherwise indicated.
- E. Trench Width:
  - 1. Minimum Trench Width
    - a. Outside Diameter Less than 4-inches: trench 4 inches greater on each side of the pipe.
    - b. Outside Diameter 4-inches to 12-inches: trench 6 inches greater on each side of the pipe.
    - c. Outside Diameter 12-inches to 24-inches: trench 8 inches greater on each side of the pipe.
  - 2. Maximum Trench Width shall not be greater than the minimum trench width plus 8-inches nor greater than the minimum width required in order to insert the smallest trench box appropriate for the pipe installation.
- F. If rock is encountered in the trench, it shall be excavated in a manner approved by the Owner and as specified below:
  - 1. No separate payment for trench rock excavation will be made. Trench excavation shall be considered unclassified.
  - 2. Trench shall be undercut one foot where rock is in the trench and backfilled with crushed stone.
  - 3. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws, and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost of care to avoid damage.
  - 4. All drilling, blasting, and use of explosives shall be in strict accordance with OSHA standards for the construction industry (29 CFR part 1926).
- G. Excavated material suitable for backfilling shall be stockpiled no closer than 2 feet from the edge of the trench and shall not obstruct crosswalks, sidewalks, or street intersections, and shall not cause unreasonable interference with travel on the streets by occupants of adjacent property. Gutters and other drainage facilities shall not be obstructed. Free access shall also be maintained to fire hydrants, mailboxes, sewer and water manholes, gas meters, or other municipal facilities.

### **3.03 BEDDING, HAUNCHING, AND BACKFILLING**

- A. Pipe shall be installed as shown on the drawings.
- B. Bedding shall be shaped and compacted to 60 percent relative density, ASTM D2049, to

provide uniform bearing of the pipe. Bell holes shall be excavated to allow for unobstructed assembly of the joint. Bell holes shall be made as small as practical. After the joint has been made, bell holes shall be filled with bedding material.

- C. After pipe is jointed and aligned, haunching material shall be installed and compacted to 60 percent relative density, ASTM D2049. Ensure material is worked under the haunch of the pipe to provide adequate side support. Precautions shall be taken to prevent movement of the pipe during placement and compaction of haunching material.
- D. Initial backfill shall be hand placed and compacted to provide cover over the pipe as detailed. Pipe shall be protected from large particles of backfill material.
- E. Balance of backfill shall be placed by a method which will not damage or displace the pipe, nor cause bridging action in the trench. Backfill material shall be compacted with earthmoving equipment as material is placed so that excessive settlement of the trench material will not occur. Material shall be neatly mounded over the trench. Trench and settled areas shall be maintained as they occur. Finish grade shall be completed to eliminate uneven areas.
- F. Where pavement is to be placed over the backfilled trench as indicated on the drawings, the backfill shall be crushed stone under the full trench depth. Under future roads, compaction will be required up to within one foot of existing grade with remaining one foot backfill as per paragraph 3.03. E. above.
- G. See Section 02221, Unclassified Excavation for Utilities for addition requirements.

### **3.04 CREEK AND DITCH CROSSINGS**

- A. Construct pipe encasement as shown on typical details. Concrete shall be placed in the dry. Concrete: ASTM C94, 2500 psi, at twenty-eight (28) days.
- B. Construction methods that will minimize siltation and erosion shall be utilized.
- C. All backfill shall be granular material as specified for embedment material or crusher run stone.
- D. Clean up, grading, seeding, and other restoration work shall begin immediately and exposed areas shall not remain unprotected for more than seven (7) days.

### **3.05 TESTING OF BACKFILL**

- A. A testing laboratory or the Owner shall verify compaction of the bedding and haunching material after placement and compaction.

End of Section

**SECTION 02612  
FINISH GRADING****PART 1 GENERAL****1.01 RELATED WORK**

- A. Section 02221: Unclassified Excavation for Utilities
- B. Section 02611: Trenching, Backfilling, and Compacting
- C. Detailed Specification Sections

**1.02 SITE COMPACTION TESTING**

- A. Testing of compacted fill materials shall be performed by an independent testing laboratory appointed and paid for in accordance with Detailed Specification Section.
- B. When work of this section or portions of work are completed, notify the testing laboratory to perform density tests. Do not proceed with additional portions of work until results have been verified.
- C. If, during progress work, tests indicate that compacted materials do not meet specified requirements, remove defective work, replace, and retest at no cost to Owner.

**1.03 SAMPLES**

- A. Submit minimum ten (10 lb.) pound samples of each type of excavated fill material to be used. Forward samples to testing laboratory, packed tightly in containers to prevent contamination.
- B. If recent test results are available for fill materials to be used, disregard sample submission and submit such test results to the testing laboratory for approval. Such test results are to clearly indicate types of materials and composition, hardness, compactability, and suitability for proposed usage.

**1.04 PROTECTION**

- A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks, pavement, utility lines, and structures. Correct damage at no cost to the Owner.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones and foreign matter; acidity range (pH) of 5.5 to 17.5; containing a minimum of four (4%) percent and a maximum of twenty-five (25%) percent organic matter. Use topsoil stockpiled on site if conforming to these requirements.

**PART 3 EXECUTION****3.01 SUB-SOIL PREPARATION**

- A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, and etc., in excess of three (3") inches in size. Remove sub-soil which has been contaminated with petroleum products.
- B. Cut out areas, to sub-grade elevation, which has been contaminated with petroleum products.
- C. Bring sub-soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- D. Slope grade away from building minimum two (2") inches in ten (10') feet unless indicated otherwise on drawings.
- E. Cultivate sub-grade to a depth of three (3") inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.
- F. Compact sub-soil to the following:
  - 1. Under Topsoil: 85 percent modified Proctor, ASTM D1557.
  - 2. Under Streets, Drives, and Parking Areas: 95 percent modified Proctor ASTM D1557.
  - 3. Under Walks: 85 percent modified Proctor, ASTM D1557.

**3.02 PLACING TOPSOIL**

- A. Place topsoil in areas where seeding and planting is to be performed. Place to the following minimum depths, up to finished grade elevations.
  - 1. Six (6") inches for seeded areas.
  - 2. Twenty-four (24") inches for shrub beds.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of sub-grades.
- D. Remove stone, roots, grass, weeds, debris, and other foreign material while spreading.
- E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may be caused by grading equipment.
- F. Lightly compact placed topsoil.

**3.03 SURPLUS MATERIAL**

- A. Remove surplus sub-soil and topsoil from site.

- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

End of Section



## **SECTION 02930 SEEDING**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. This work shall consist of supplying and placing soil additives, seed, and mulch as specified on prepared ground in accordance with the Plans and these Specifications. All non-construction areas that show signs of excessive erosion and all newly graded earthen areas that are not to be paved, stabilized, or sodded, shall be seeded unless otherwise indicated on the Plans or as directed by the Engineer.

#### **1.02 RELATED SECTIONS**

- A. Section 02221 – Unclassified Excavation for Utilities

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Grass Seed: Use a drought tolerant hybrid Kentucky 31 Fescue (Jaguar, Lancer, Rebel II, Falcon II, etc.). Supplement with an annual rye or other appropriate mixture to assure stabilization during the winter season. Furnish seed in new bags or bags that are sound and not mended; no “below standard” seed accepted.
- B. Fertilizer: Use a slow-release starter fertilizer in standard containers that are clearly marked with name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.
- C. Lime: Use lime containing a minimum of 85% calcium carbonate and magnesium carbonate, 85% of which passes a No. 10 mesh sieve.
- D. Mulch: Stalks of rye, oats, wheat, or other approved grain crops properly cured prior to baling, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Before starting seeding operations on any area, final dressing and placing of topsoil shall have been completed in accordance with the applicable Specifications. Seed, fertilize, lime, and mulch within 30 days of attainment of finish grade.

- B. Apply temporary seeding whenever grading operations are temporarily halted for over 14 days and final grading of exposed surfaces is to be completed within one year. Also apply temporary seeding to soil stockpiles.

### **3.02 PREPARATION**

- A. Each area to be seeded shall be scarified, disked, harrowed, raked or otherwise worked until it has been loosened and pulverized to a depth of not less than 2 inches and brought to the lines and grades indicated on the Plans or directed by the Engineer. This operation shall be performed only when the soil is in a tillable and workable condition.
- B. Apply fertilizer at the rate of 1 pound of nitrogen per 1,000 square feet, and lime at the rate of 50 pounds per 1,000 square feet, shall be uniformly incorporated in the soil for a depth of approximately 1 inch. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. Do not apply lime without a soil test.

### **3.03 SEEDING**

- A. Seed shall be sown as soon as preparation of the seed bed has been completed. It shall be sown uniformly by means of a rotary seeder, hydraulic equipment, or other satisfactory means. Seed shall be sown at the rate of 6 to 8 pounds per 1,000 square feet.
- B. No seeding shall be done during windy weather or when the ground surface is frozen, wet or otherwise non-tillable.
- C. When seeding during February 1 through April 1 and October 1 through November 30, add an additional 3 pounds per 1000 square feet of annual rye grass. No seeding shall be performed during December and January unless otherwise permitted.

### **3.04 MULCHING**

- A. When the mulching material is hay or straw, it shall be spread evenly over the seeded area at an approximate rate of 2 bales (100 pounds minimum) per 1,000 square feet for straw and 150 pounds per 1,000 square feet for hay immediately following the seeding operations. The Engineer depending on the texture and condition of the mulch material and the characteristics of the area seeded may vary this rate.

### **3.05 MAINTANENCE**

- A. All seeded areas shall be cared for properly to the Engineer's satisfaction until acceptance of the work. Areas, which have been previously seeded and mulched in accordance with this Section, but which, have been damaged or failed to successfully establish an acceptable stand of grasses shall be repaired as directed by the Engineer. All material and labor required to repair seeded areas made necessary by negligence on a part of the Contractor will be furnished by the Contractor at no cost.

- B. If within 60 days of the planting less than 50% is successful, rework the ground, re-fertilize, reseed, and re-mulch.

**3.06 CLEANUP AND PROTECTION**

- A. After the completion of seeding, the area shall be cleaned of all rubbish, excess material, and any other items that will mar the appearance of the projects as in accordance with the General Specifications.

End of Section

**SECTION 03303  
CONCRETE FOR UTILITIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This item shall include furnishing and installing concrete blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations shown on the drawings and/or as directed by the Owner.
- B. Submit concrete mix design, including all add mixtures with past strength data for review per the requirements of Section 01302, Submittals and Substitutions.

**PART 2 PRODUCTS**

- A. Not Applicable.

**PART 3 EXECUTION**

**3.01 SUMMARY**

- A. Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements listed below.
  - 1. Strength: The strength of concrete shall be 4,000 psi unless otherwise shown on the drawings.
  - 2. Durability: All concrete exposed to weather shall be air entrained.
  - 3. Slump: Concrete shall be proportional and produced to have a slump of 3-inches with a 1-inch tolerance.
  - 4. Admixtures: Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture [retarding (normal or accelerating) depending on placing temperature] may be used if approved by the Owner.
  - 5. Reinforcing Steel: Yield strength of reinforcing steel shall be 60,000 psi.

End of Section

**SECTION 33050  
GENERAL INFORMATION (GAS)**

**PART 1 GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Basic Gas requirements specifically applicable to Division 33 Sections, in addition to Division 1-General Requirements.
- B. General and procedural requirements for work specified under Sections of Division 33 shall be as required herein.

**1.02 DEFINITIONS**

- A. OWNER - The OWNER is the Lenoir City Utilities Board.
- B. CONTRACTOR - The CONTRACTOR is the person, firm or corporation with whom OWNER has entered into the Agreement.
- C. RESIDENT PROJECT REPRESENTATIVE (RPR) - The RESIDENT PROJECT REPRESENTATIVE is the authorized representative of the Lenoir City Utilities Board who is assigned to the site or any part thereof.

**1.02 CONTRACTOR'S RESPONSIBILITY**

CONTRACTOR agrees to assume responsibility for liability, workmanship, and quality concerning work Subcontracted to others. Before any portion of the Work is sublet, submit in writing the name of proposed Subcontractor to OWNER for consideration and approval thereof.

**1.04 CODES AND FEES**

- A. All work shall be installed in accordance with the applicable provisions CFR 49 Part 192 Minimum Federal Safety Standards and related Lenoir City Utilities Board standards incorporated by reference.
- B. CONTRACTOR shall be responsible for obtaining any local permits required for the performance of the Work.

**1.05 QUALITY CONTROL**

Qualifications: Where qualifications are specified in an individual specification section, provide required data for CONTRACTOR and all Subcontractors as required by the Owner.

**1.06 GUARANTEE**

- A. CONTRACTOR warrants and guarantees to OWNER that all Work will be in accordance with the Contract Documents and will not be defective. Notice of all

- defects shall be given to CONTRACTOR promptly upon discovery thereof. All defective Work whether in place or not, may be rejected, corrected, or accepted as provided in this Article and the Contract Documents.
- B. Access to Work- OWNER and his Resident Project Representative, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspection, and testing. CONTRACTOR shall provide proper and safe conditions for such access.
- C. Test and Inspections:
1. CONTRACTOR shall give OWNER a minimum of 48 hours notice of the readiness of the Work for all required inspections, tests, or approvals.
  2. If any applicable law or regulation requires any portion of CONTRACTOR's Work to be specifically inspected, tested, or approved, CONTRACTOR shall assume full responsibility therefore, pay all cost in connection therewith, and furnish OWNER the appropriate certificates of inspection, testing, or approval.
  3. All inspection, tests, or approvals shall be performed by an organization acceptable to OWNER.
  4. If any Work is covered that requires inspection, testing, or approval, it must, if requested by OWNER, be uncovered for such inspection and testing. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given timely written notice of his intention to cover the Work and OWNER has not acted with reasonable promptness (within 48 hours) in response to such notice.
  6. Neither inspections nor observations by OWNER or his Resident Project Representative shall relieve CONTRACTOR from his obligation to perform the Work in accordance with the Contract Documents.
- D. OWNER may stop work. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated. The right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party. Neither the existence of this right nor the exercise or the failure of exercise of this right to stop the Work shall preclude the exercise of any other rights or remedies of OWNER or constitute a waiver of any rights or remedies of OWNER.
- E. Correction or Removal of Defective Work-If required by OWNER or his Resident Project Representative, CONTRACTOR shall promptly, as directed, either correct all defective Work or if the Work has been rejected by OWNER or his Resident Project Representative remove it and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect, and consequential costs of such removal and/or correction.

- F. One Year Correction Period: If within the one year warranty period, beginning at the date of Substantial Completion, any work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with the OWNER's instructions correct such defective Work. If CONTRACTOR does not promptly comply with the terms of such instructions, or if in an emergency where delay would cause serious risk of loss or damage, OWNER may have such defective Work repaired and/or replaced; then all direct, indirect, and consequential costs will be paid by CONTRACTOR.

## **PART 2 PRODUCTS**

- A. Not Used

## **PART 3 EXECUTION**

### **3.01 MATERIALS/EQUIPMENT INSTALLATION**

- A. All materials used in the installation of the natural gas system shall be pre-approved by the OWNER prior to installation. The OWNER also has pre-approved materials suppliers that currently furnish all materials based on approved status. Approval of new items for installation in the gas distribution system normally takes a minimum of sixty days for approval.
- B. Install all material and equipment in accordance with applicable manufacturer's drawings and recommendations, OWNER's installation details and drawings, and industry codes, standards, etc.

### **3.02 ALTERATIONS AND ADDITIONS TO FACILITIES**

- A. Make alterations and additions to existing facilities work as indicated and as required to accommodate new construction and to clear all interference therewith. This includes disconnecting, removing, relocating, rerouting, extending, reworking, reconnecting, or otherwise altering existing gas facilities as required, whether indicated on the drawings or not.

### **3.03 CONTINUITY OF EXISTING GAS SERVICE, AND SALVAGED EXISTING MATERIALS**

- A. Arrange all work to interfere as little as possible with OWNER's normal operations. Do not interrupt existing gas service at any time without OWNER's prior approval. During a scheduled service interruption, complete all necessary work to restore gas service as soon as possible. CONTRACTOR shall obtain approval of the OWNER prior to any work on existing facilities. CONTRACTOR shall not "open" or "close" any valve. Valves shall only be operated by the OWNER's representative.
- B. Promptly haul away from OWNER's premises, right-of-way, property, etc., all demolished materials, equipment, and excavation spoils neither indicated nor required to be reused in the completed Project. OWNER may at its sole discretion select certain removed materials retained for future use. Before removing any materials and

equipment determine from OWNER or RPR which of these materials and equipment (if any) OWNER desires to retain.

**3.04 PROTECTION AND MAINTENANCE**

- A. Work as installed shall be protected at all times. Pipe openings shall be closed with water tight caps or plugs until permanent connections are made. All new facilities shall be maintained in good working condition for the duration of the Project. Contractor shall be responsible for maintenance until the all work is accepted by the OWNER.

End of Section



**SECTION 33101  
STORAGE, HANDLING AND TRANSPORTING  
OF POLYETHYLENE GAS PIPE**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. It is most important that plastic pipe be stored and handled in such a way as to avoid damage.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

Adherence to the following steps will minimize damage to pipe:

- A. When loading and unloading pipe, use canvas or nylon slings. If a forklift is to come in direct contact with the pipe rather than a wood pallet, the forklift should be padded.
- B. Make sure the storage area or truck bed is clear of debris, etc. that could damage pipe.
- C. Store pipe in a manner which will minimize crushing or bending. Pipe should lay flat and be stacked no higher than 84-inches or it can be forced out of round. Do not stand pipe coils in a vertical position.
- D. During stringing operations, avoid dragging pipe over rocks, asphalt, concrete, or other abrasive material. Precautions should be taken with straight lengths to ensure pipe is not put in an excessive strain.
- E. Plastic pipe must be carefully inspected for cuts, gouges, deep scratches and other defects before use. The segment of pipe containing defects shall be cut out. The only exception is pipe with scratches and gouges less than 10% of the wall thickness deep can be used. Pipe may be repaired with patching saddles or other repair fittings.

A 10% reduction for LCUB's standard plastic pipes are as follows:

Size	SDR	Wall Thickness	10% Reduction	Fraction Eqv.
8-inch	11.5	0.750-inch	0.0750-inch	≅1/16-inch
6-inch	11.5	0.576-inch	0.05761-inch	≅1/16-inch
4-inch	11.5	0.3913-inch	0.03913-inch	≅1/32-inch
2-inch	11	0.2159-inch	0.02159-inch	≅1/64-inch
1¼-inch	11	0.151-inch	0.0151-inch	≅1/64-inch
1-inch	11	0.1195-inch	0.01195-inch	≅1/64-inch

¾-inch	11	0.1010-inch	0.01010-inch	≅1/64-inch
--------	----	-------------	--------------	------------

F. Medium density polyethylene gas pipe shall be installed within two years of the manufacture date shown on the pipe print line.

G. Shipping Instructions:

1. Pipe shall be completely covered during shipment if transported more than 50 miles.
2. Nesting of coiled pipe **not** acceptable.

End of Section

**SECTION 33105**  
**TRACER WIRE INSTALLATION FOR NON-ELECTRICALLY CONDUCTIVE PIPE**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. A coated copper clad steel tracer wire of #12 gauge (or larger) shall be installed with all buried plastic mains and services. The tracer wire shall be laid within 6 inches of the plastic pipe where practical and directly above if possible. Tracer wire should not be wrapped around pipe or connectors except at the riser. **Never** wrap tracer wire around polyethylene pipe or fittings.

**PART 2 PRODUCTS**

**2.01 TRACER WIRE**

- A. Tracer Wire shall be #12 AWG copper clad steel insulated wire.

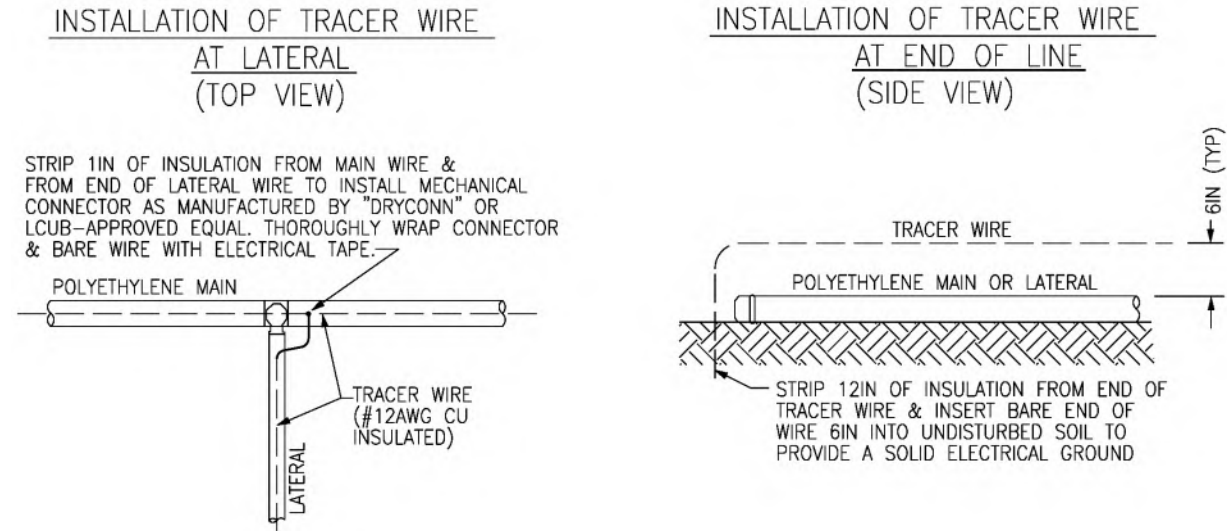
**2.02 WARNING TAPE**

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6-inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored yellow for gas. Warning tape required (in addition to tracer wire) for all open cut installations of gas lines.

**PART 3 EXECUTION (See Figures 1-33105-a, 2-33105-b, 3-33105-c, and 4-33105-d)**

The contractor shall install a #12 (or larger) insulated tracer wire, in the trench above the polyethylene pipe. The tracer wire shall be approximately 6 inches above the pipe where practical. The tracer wire shall be installed so that electrical continuity is maintained throughout the piping system. As few connections as possible shall be made in the tracer wire. Connections will be made by stripping the insulation back one inch and joining the two ends using an approved mechanical connector that is pre-filled with dielectric silicone sealant making them waterproof and corrosion proof. All mechanical connectors shall be the DryConn #90120 connectors as manufactured by "Copperhead" or approved equal. **Twisting of copper wire will not be acceptable.** To complete this connection, wrap all exposed wire thoroughly with electrical tape. A minimum 5-foot of additional tracer wire will be coiled, buried and terminate at the ends of the gas pipeline. Of the 5-foot tracer wire section at the ends of the pipeline, one foot of insulation will be stripped back, prior to burial. When installation is complete, the entire system must be tested for continuity in the presence of a LCUB inspector. LCUB will require re-excavation and improvement to areas that do not trace well and/or show low or poor continuity. Tracer wire shall be high-strength copper clad steel conductor that is specifically made for underground utility locating purposes, and shall be #12 AWG HS-CCS HDPE 30 mil as manufactured by "Copperhead Industries, LLC" or approved equal, and shall be insulated with a 30 mil, high

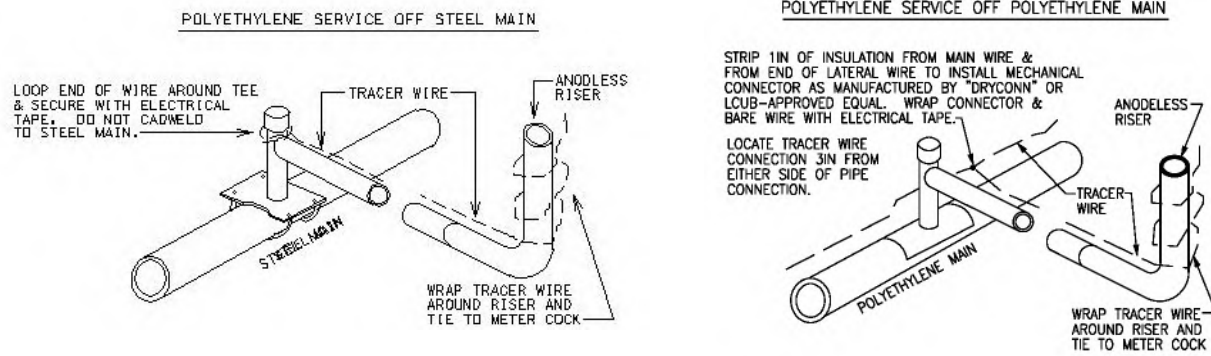
density, high molecular weight polyethylene yellow insulation and rated for direct burial use at 30 volts. Heavier wire may be required for directional drilling and pipe bursting.



Notes:

- I. Locate tracer wire connection 3" from either side of pipe connection.

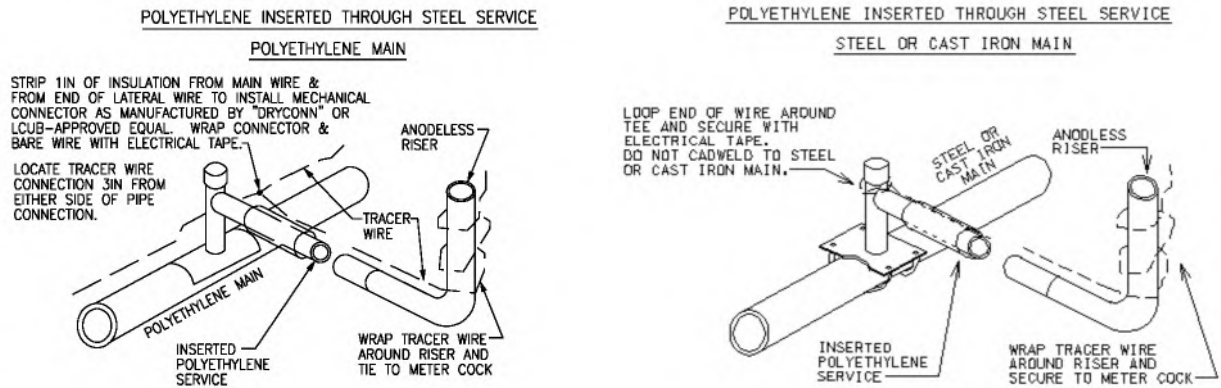
**Figure 1-33105-a** (Tracer Wire Installation at Laterals and at Line Dead ends)



Notes:

- I. All tracer wire to be brought above ground at riser using tracer wire clamp specified in Section 33345.
- II. Tracer wire to be laid 6" directly above plastic pipe.

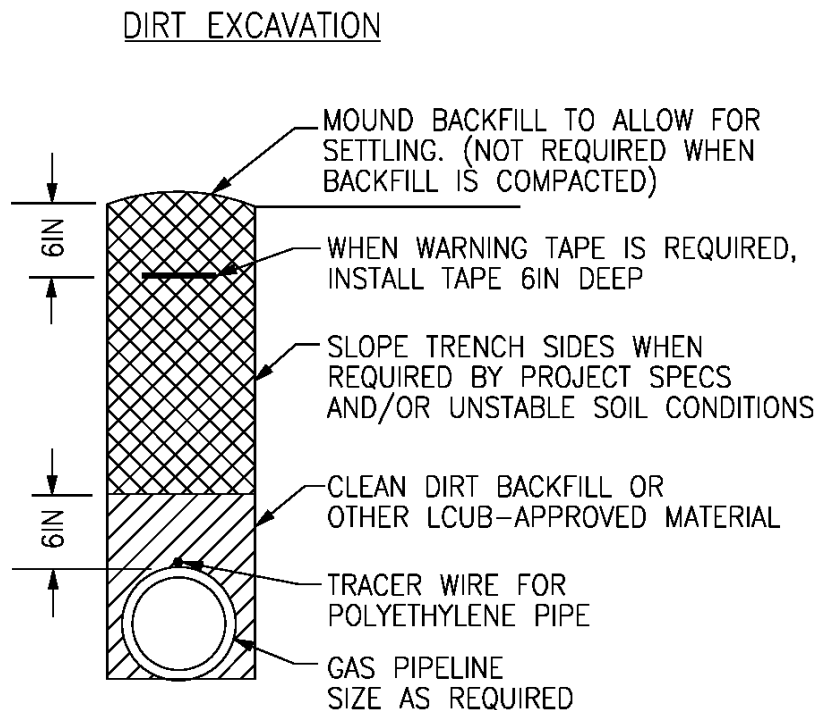
**Figure 2-33105-b** (Tracer Wire Installation Gas Polyethylene Pipe Services)



Notes:

- I. If inserting polyethylene in steel casing too small to include tracer wire, tracer wire shall be cadweld to both ends of steel casing 1-inch diameter or larger. Tracer wire shall be connected to steel casing smaller than 1-inch diameter using a grounding clamp.
- II. All tracer wire to be brought above ground at riser using tracer wire clamp specified in Section 33345.

**Figure 3-33105-c** (Tracer Wire Installation Inserted Polyethylene Services)



Notes:

- I. Trench to be backfilled and compacted in accordance with local governing body and/or project specifications.
- II. Warning tape shall be installed directly above the gas main or service, 6 inches below the finished grade.

**Figure 4-33105-d (Standard Trench Dimensions - Mains)**

End of Section

**SECTION 33265**  
**STATIC ELECTRIC DISCHARGE PROCEDURE FOR POLYETHYLENE PIPE**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. This procedure describes the precautions to be taken to reduce the potential for static electric discharge from polyethylene pipe where a hazardous atmosphere could exist. An approved method will be used to reduce static electricity.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

The following precautions should be taken to reduce the potential for static discharge:

- A. Anti-static solution should be applied to all exposed polyethylene pipe where a hazardous atmosphere could exist.
- B. A grounded conductor can be placed in direct contact with the entire section of exposed piping, except the area necessary for working on the pipe to maintain the anti-static solutions contact with the polyethylene pipe. The conductor shall be burlap, cotton cloth or other approved anti-static wrap thoroughly wet with the approved anti-static solution.
- C. Currently, anti-static solutions are available from Lyle and Normac. In addition a dilute solution of water and a dishwasher type detergent is an acceptable substitute.
- D. Efforts should be made to keep the tape wet during repairs.
- E. Do not vent gas using an ungrounded plastic pipe.

End of Section



**SECTION 33305  
POLYETHYLENE GAS TEE AND VALVE INSTALLATION**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. The Work to be performed herein shall consist of the installation of new or replacement polyethylene or steel natural gas tapping hardware and polyethylene valves in new and existing gas mains. All work shall be performed in accordance to this section and all additional OWNER standards and specifications that may or may not be referred to in this section.
- B. LCUB Standards and Specifications for Polyethylene Gas Tee and Valve Installation are intended to meet or exceed the Code of Federal Regulations title 49 part 192 – Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards (hereafter referred to as “MFSS”).

**1.02 DEFINITIONS**

- A. **“IPS”** means “Iron Pipe Size” (for polyethylene pipe nominal inside diameters).
- B. **“CTS”** means “Copper Tubing Size” (for polyethylene pipe nominal inside diameters).
- C. **“SDR”** means “Standard Dimension Ratio” (for the polyethylene pipe outside diameter divided by the minimum pipe wall thickness.)
- D. **“Socket Fusion”** means “the method of joining polyethylene pipe using a coupling with an inside diameter sized to the outside diameter of the pipe. A short length of outside surface of the pipe and the inside surface of the coupling are heated to a molten state. The pipe is then pressed into the opening of the coupling.”
- E. **“Butt Fusion”** means “the method of joining polyethylene pipe where two pipe ends are heated to a molten state and rapidly brought together under pressure to form a homogeneous bond.”

**PART 2 PRODUCTS**

**2.01 VALVE BOXES**

- A. All gas valves installed below grade shall be provided with a valve box to provide access to the operating nut.
- B. Valve boxes shall be 2 piece or 3-piece screw type with round or oval bases and 5-1/4 inch shafts. Valve boxes shall be cast iron. Valve box covers shall be marked “GAS” unless noted otherwise.

- C. Valve boxes shall be designed to accept extension section or repair extension as needed.
- D. Valves boxes shall be installed on all buried valves in accordance with the details shown on the standard drawings sheet.
- E. Valve box covers shall be cast iron and suitable for heavy traffic conditions. Covers shall have the word "GAS" cast on the exposed surface.
- F. In unpaved areas, valve boxes shall be installed with a concrete pad with minimum dimensions of 18-inch x 18-inch x 6-inches thick with four (4) - #4 bars in each direction, poured after final grade has been established.

### **PART 3 EXECUTION**

#### **3.01 DETAILS**

- A. See the following details located at back of these specifications including notes, and material lists for the valve and tee configurations as listed in the Table of Contents.

End of Section

**SECTION 33320  
POLYETHYLENE GAS MAIN TIE-INS**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. LCUB Standards and Specifications for Polyethylene Gas Main Tie-Ins are intended to meet or exceed the Code of Federal Regulations title 49 part 192 – Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards (hereafter referred to as “MFSS”).
- B. MFSS depths may be included in these standards as a reference for review purposes. LCUB standard requirements shall provide the minimum requirements for main tie-ins, unless they do not meet MFSS requirements. Main Tie-Ins installed at less than MFSS minimum depth due to underground structures, shall be approved by OWNER’s Engineering based on a design to provide the pipe with adequate additional protection to withstand anticipated external loads. All tie-ins not installed at less than minimum depth or at more than maximum depth shall be noted on the service card record.
- C. With prior approval from LCUB, Electrofusion couplings as manufactured by "Central Plastics" or approved equal may be used for connections to existing gas piping. When Electrofusion couplings are used, LCUB requires the use of an alignment clamp in order for the pipe to be restrained or sufficiently supported on each side in order to restrict movement and to alleviate/eliminate sources of stress and/or strain until both the fusion cycle and the cooling cycles are completed.

**PART 2 PRODUCTS**

See tables listed in Details.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Prior to making tie-ins, the depth of the main shall be confirmed to meet the MFSS minimum depth.
- B. See tracer wire installation requirements for polyethylene pipe in Section 33105.
- C. A 9# anode shall be installed at the tie-in to Steel mains. Anode shall be bedded in at least 6 inches of clean dirt or sand backfill. See Section 33720.

**3.02 TIE-IN DETAILS**

- A. See the details located at the back of these specifications including drawings, notes, and material lists for tie-ins as listed in the Table of Contents.

### 3.04 PURGING

- A. All purging shall be conducted in accordance with AGA's "Purging Principles and Practices."
- B. Gas shall be vented in a manner that will prevent Gas from entering a structure.
- C. Pipe shall be away from sources of ignition and grounded to reduce static discharge.
- D. All gas released during purging must be accounted for as being released to atmosphere.  
For all purging operations, Contractor shall provide the following information to LCUB:
  - Total time of venting/purging;
  - Size of pipe being purged;
  - Pressure at purging location;
  - Distance from purging location to nearest valve.

### 3.05 CATHODIC PROTECTION

- A. Steel mains shall have all exposed metal surfaces cleaned, primed, and coated according to manufacturer's recommendations (wax tape primer Item #372821 – 4" cold-applied wax tape) to prevent contact between metal surfaces and the surrounding backfill.
- B. A 9# anode shall be installed at the service connection to steel mains. Anode shall be bedded in at least 6 inches of clean dirt or sand backfill.
- C. Pipe-to-Soil potential readings shall be taken and recorded on the main inspection card record.

### 3.06 TAPPING/PURGING SAFETY

- A. A manned fire extinguisher shall be positioned, upwind if possible, from the purge point at all times during purging.
- B. Protective clothing should be worn by personnel on site – long-sleeve 100% cotton shirts, cotton or leather gloves, hard hats, and safety glasses are recommended at a minimum.

End of Section

**SECTION 33345  
POLYETHYLENE GAS SERVICE LINE INSTALLATION**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. The Work to be performed herein shall consist of the installation of new or replacement polyethylene natural gas service lines operating at or below 60 psig, which includes but not limited to the anodeless riser, meter cock/valve, service piping, tracer wire, excess flow valve (or service valve), and tapping saddle (or mechanical coupling/saddle) connection to existing facilities. All work shall be performed in accordance with this section and all additional OWNER standards and specifications that may or may not be referred to in this section.
- B. LCUB Standards and Specifications for Polyethylene Gas Service Line Installation are intended to meet or exceed the Code of Federal Regulations title 49 part 192 – Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards (hereafter referred to as “MFSS”).
- C. MFSS part numbers may be included in these standards as a reference for review purposes. LCUB standard requirements shall provide the minimum requirements for service line installation, unless they do not meet MFSS requirements.
- D. “Service Line” as defined by MFSS (192.3) means a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.

The aforementioned Sections shall also govern and are incorporated into this section by reference. In the event of a conflict between the referenced sections, the one requiring the highest quality of work shall control.

**PART 2 PRODUCTS**

See tables within this section for a list of required products.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Prior to making service connection to an existing main, the depth of the main shall be confirmed to meet the MFSS minimum depth. See minimum depth requirements for Gas mains in Section 33720. If the existing main does not meet the MFSS minimum depth, OWNER’s Engineering shall be contacted prior to making the service connection.
- B. Each service line that does not have a meter installed upon completion of the service installation shall be locked at the meter valve.

- C. New commercial services shall be ¾-inch minimum with a service shut-off valve of the appropriate size.
- D. See tracer wire installation requirements for polyethylene pipe in Section 33105.
- E. Service lines larger than ¾-inch shall be installed by specification requirements for mains.

**3.02 INSTALLATION DEPTHS**

- A. Service lines shall be installed to the standard depth as listed in the following table. Depth shall be measured from ground level to the top of the service line.

	State Right-of-Way	Lenoir City/Loudon Right-of-Way	Customer Property/LCUB Easement
Standard Depth	36-inches	30-inches	18-inches
MFSS Minimum Depth	18-inches	18-inches	12-inches
Maximum Depth	60-inches	60-inches	60-inches <sup>1</sup>

<sup>1</sup>It is not LCUB’s intent to have gas service lines installed deeper than 18-inches on Customer Property/LCUB Easement. Any depth greater than 18-inches must be approved by Owner’s Resident Project Representative.

- B. Service lines installed at less than the standard depth or more than the maximum depth shall be approved by OWNER’s Resident Project Representative based on individual site conditions.
- C. Service lines installed at less than the MFSS minimum depth due to underground structures, shall be approved by OWNER’s Engineering based on a design to provide the service pipe with adequate additional protection to withstand anticipated external loads.
- D. All installations of service lines at less than the standard depth or more than the maximum depth shall be noted on the service line installation form and/or record drawing.

**3.03 INSTALLATION RESTRICTIONS**

- A. Service lines shall not be installed under buildings, permanent structures, or future proposed structures.
- B. Polyethylene pipe shall be installed below ground.
- C. Anodeless risers are marked with a correct burial depth, denoted as “GROUND LEVEL HERE”. MFSS require finished grade to be at this level so that all polyethylene pipe is below ground and all steel piping without cathodic protection is above ground. Risers shall be vertically plumb.
- D. Service lines should run in the most direct (shortest) path feasible between the gas main and the meter location. Where possible, service lines should be as close as practical to perpendicular with the gas main.
- E. Each service line must be installed with at least 24 inches of horizontal separation from any other underground structure and 24 inches of vertical clearance from any other existing

utility. If this separation and clearance cannot be attained, the service line must be protected from damage that might result from the proximity of the other structure or utility.

- F. Each service line must be installed with enough clearance from any other underground structure to allow proper maintenance and to protect against damage that might result from proximity to other structures.
- G. In addition to meeting the requirements of paragraph E or F of this section, each plastic service line main must be installed with sufficient clearance, or must be insulated, from any source of heat so as to prevent the heat from impairing the serviceability of the pipe.

### 3.04 EXCESS FLOW VALVES

- A. An Excess Flow Valve (EFV) shall be installed on all new single-residential natural gas service lines and on all replacement single-residential natural gas service lines.
- B. The EFV size shall be determined by OWNER based on the customer's gas demand and service length.
- C. An EFV shall not be installed on service lines that are in areas, determined by OWNER, to experience contaminants in the gas that could interfere with the proper operation of the EFV.
- D. The EFV shall be installed in line with, and at the same depth as, the service line piping and directly on the tee connection off the tap.
- E. If space does not permit the EFV installation as described in part H, then the EFV shall be located as near as practical to the supply main, but **NOT** under paving or a road bed unless it is impracticable to do otherwise and approved by OWNER's Engineering. Even if the EFV must be installed under pavement, the EFV shall have mechanical connections.
- F. New service lines shall **NOT** be connected to an existing service line that contains an EFV unless the connection can be made between the existing gas main and EFV and is approved by OWNER'S Engineering prior to installation.
- G. All new and existing service lines that have been retrofitted/modified/reconnected shall be protected with individual EFV's. If an EFV is not present on an existing service line or stub, then a new service line may be connected to the existing service line or stub. When performing installations in this manner, the installer shall take care to follow the proper procedures as previously outlined in this section and to protect the maximum practical amount of pipe for BOTH service lines. These type installations shall also comply with all parts of this section – see especially 3.10.
- H. All residential service lines containing an EFV shall have a tag or other OWNER-approved EFV label attached to the riser/meter in plain sight for the ease of field verification of EFV presence.

- I. Gas service installation forms and/or record drawings shall indicate the existence of the EFV.

### **3.05 STANDARD SERVICE DETAILS**

#### **3.05.1 Polyethylene Service Connected to Polyethylene Main**

- A. Service line connection on polyethylene main shall be made by use of a polyethylene mechanical tapping tee for ¾-inch and 1-inch services, and a polyethylene sidewall fusion tapping tee for 1-1/4 inch and 2-inch services.
- B. All joints on service lines connected to polyethylene mains shall be made by mechanical type connections or butt fusion. (Butt fusion acceptable only for pipe larger than 2-inch).
- C. Backfill shall be well-compacted around the service tee and special care taken not to damage the piping during compaction.
- D. See Details G21 thru G24 for polyethylene services connected to polyethylene main.

#### **3.05.2 Polyethylene Service Connected to Steel Main**

- A. Joints on polyethylene services connected to Steel mains shall be made by mechanical type connections or butt fusion. (Butt fusion acceptable only for pipe larger than 2-inch).
- B. For service lines larger than 2-inch, special design will be prepared by OWNER's Engineering.
- C. Polyethylene pipe that is not encased shall have an electrically conducting #12 coated solid-copper tracer wire for locating the pipe while it is underground. Tracer wire should not be wrapped around the pipe, and contact with the pipe must be minimized. Tracer wire installed for pipe locating purposes must be resistant to corrosion damage.
- D. Polyethylene pipe that is encased in plastic shall also have a tracer wire. For 1-inch and larger steel encasement, the tracer wire shall be bonded to the steel casing, if it is impractical to install the tracer wire inside of the existing steel casing. For pipe smaller than 1-inch, tracer wire shall be connected by use of a grounding clamp.
- E. See Details G25 thru G27 for polyethylene services connected to steel main.

### **3.06 RISER LOCATION / INSTALLATION**

#### **3.06.1 General**

- A. When installing the service riser, make sure that the weight of the meter is supported by the steel riser and fuel line piping and not the plastic service line.
- B. Pre-bent anodeless risers shall be used for all service line applications, unless otherwise approved by OWNER. When other than anodeless risers are used, corrosion control

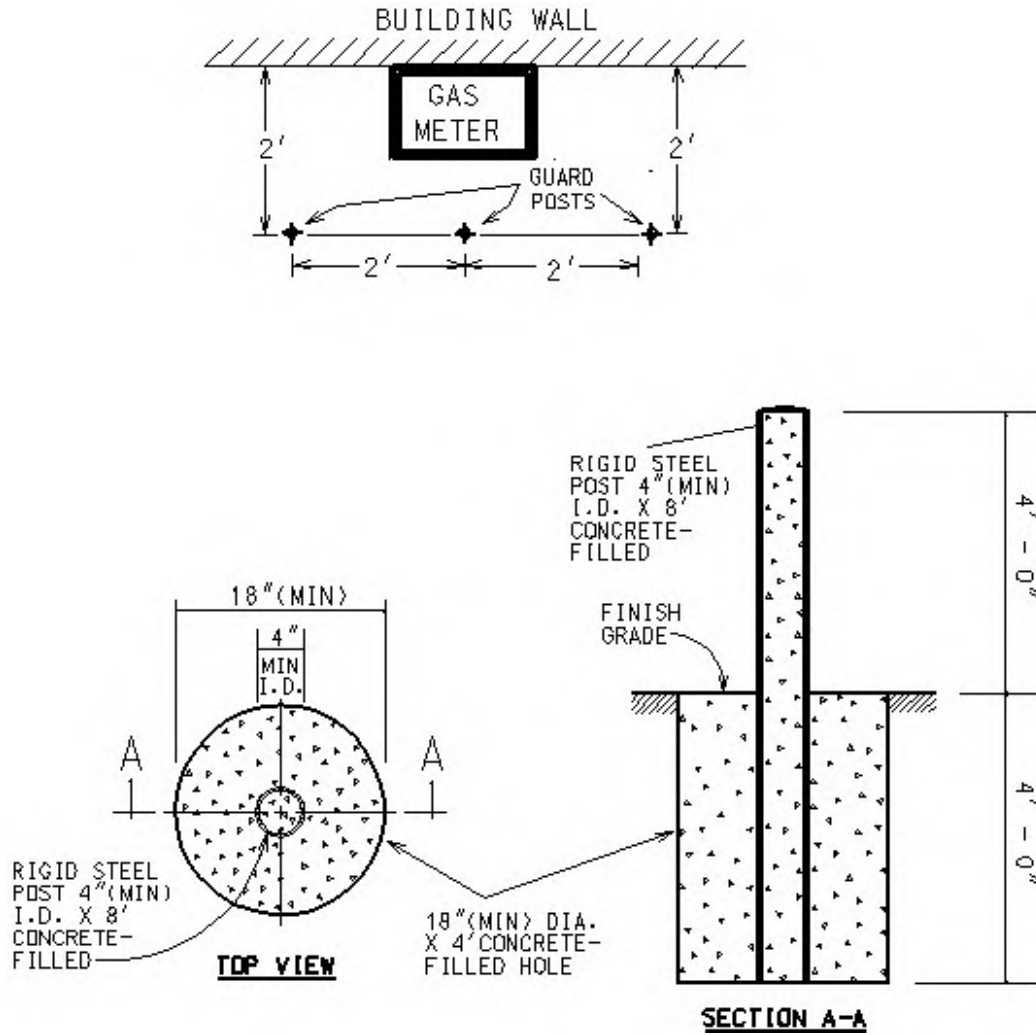


practices as approved by OWNER's RESIDENT PROJECT REPRESENTATIVE shall be observed.

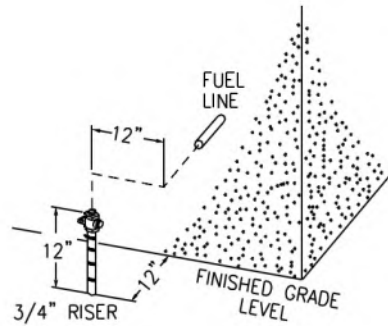
- C. Risers shall be installed a minimum of 3 feet from fresh air intake vents or any other opening to a structure.
- D. Risers shall be installed a minimum of 15 feet from fire hose connections.
- E. Risers shall be installed in a readily accessible, outdoor, ventilated, aboveground location protected from anticipated vehicular damage.
- F. Riser installations that should be avoided include: area directly below roof valleys. Roof downspouts, decks or building overhangs.
- G. Risers shall not be installed under stairways or other structure openings that may be utilized as emergency exits.
- H. Meter valve operating nut shall be aligned with the direction of the service facing away from the building.

### **3.06.2 Meter Bollards**

- A. Contractor shall furnish and install bollards as directed by the OWNER in areas where vehicular damage may be anticipated.
- B. The quantity and arrangement of the bollards shall be as directed by the OWNER's Engineer or Resident Project Representative.
- C. Guard posts shall be minimum 4-inch schedule 40 steel pipe.



**3.06.3 Standard Location of 3/4-inch Riser (Residential Connected Load 0-700,000 BTU/hr)**

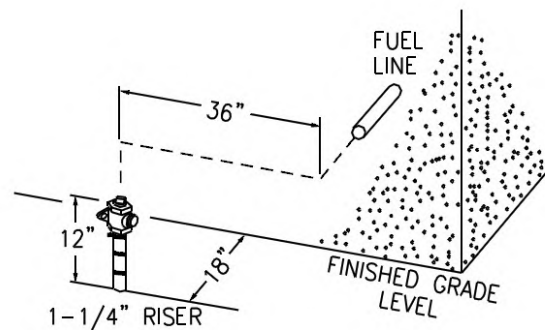


**Notes:**

- I. 3/4-inch threaded risers shall be located 12-inches left of customer's fuel line.

**3.06.4 Standard Location of 1-1/4-inch Riser**

(Residential or Commercial - Connected Load 700,000-1,100,000 BTU/hr)

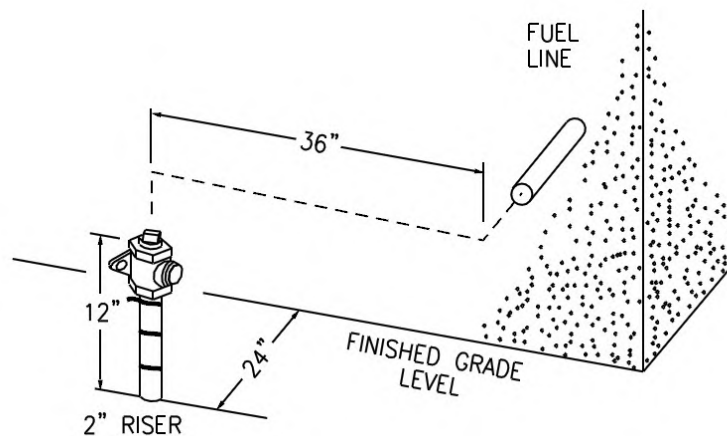


**Note:**

- I. 1 1/4-inch threaded risers shall be located 36-inches left of customer's fuel line.

**3.06.5 Standard Location of 2-inch Riser**

(Residential or Commercial - Connected Load 1,100,000-7,000,000 BTU/hr)



**3.07 TESTING**

- A. The complete service including service line connection to the main shall be tested at a minimum of 100 psig for the duration required in 3.07-C.
- B. The test procedure shall insure discovery of all leaks in the segment being tested.
- C. Test duration:

Pipe size	150 feet or less	Greater than 150 feet & up to 500 feet	Greater than 500 feet
¾-inch IPS/CTS	15 minutes	30 minutes	N/A
1"	30 minutes	1 hour	2 hours
2"	1 hour	2 hours	4 hours

For pipe sizes not listed in above table, use the next larger listed pipe size to determine test duration.

- D. An approved electronic pressure testing instrument with GPS capability (i.e., Kuhlman K2 or other OWNER approved instrument) shall be used for pressure testing all Service Lines. The CONTRACTOR shall provide a printout documenting the successful pressure test for each Service Line. The print out must be attached to the applicable Natural Gas Utility Service Sheet. Each Natural Gas Utility Service Sheet will have an individual pressure test print out.
- E. The gauge used for testing shall be 200 psig maximum measured in no more than 2-pound increments.
- F. If OWNERS’s Engineering determines that testing the complete service is not feasible, then the service line connection to the main may be given a leakage test at the operating pressure when placed in service. OWNER’s Engineering must approve testing the service line connection separately based on the individual site conditions.
- G. Threaded connections shall be soap-tested for leaks during the pressure test.

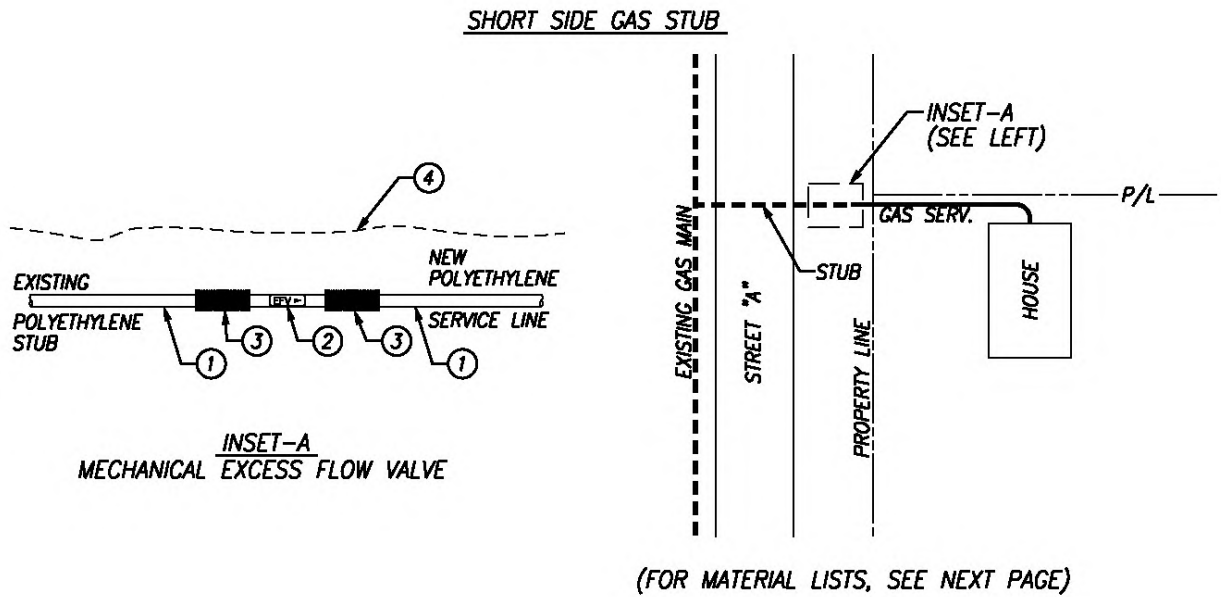
**3.08 TAPPING – SERVICE CONNECTED to POLYETHYLENE MAIN**

- A. Service connections to polyethylene mains must be allowed to completely cool before tapping the main.
- B. Service Saddle Caps should be hand tightened, according to manufacturer recommendation and then tighten ¼-turn with wrench to ensure that cap does not back off.

**3.09 TAPPING – SERVICE CONNECTED to STEEL**

- A. Use ¾-inch self-tapping outlet (valve tee) on Steel mains only. An OWNER-approved mechanical tapping tool shall be used for tapping of all 1-inch and larger services on steel mains.

**3.10 SHORT-SIDE STUB SERVICE CONNECTIONS**



**Figure 3.10-a.**  
(Polyethylene Stub Connection - EFV)

Notes:

- I. For service lines larger than 2-inch, special design will be prepared by OWNER's Engineering.
- II. Compact sidefills around and under tie-in area.

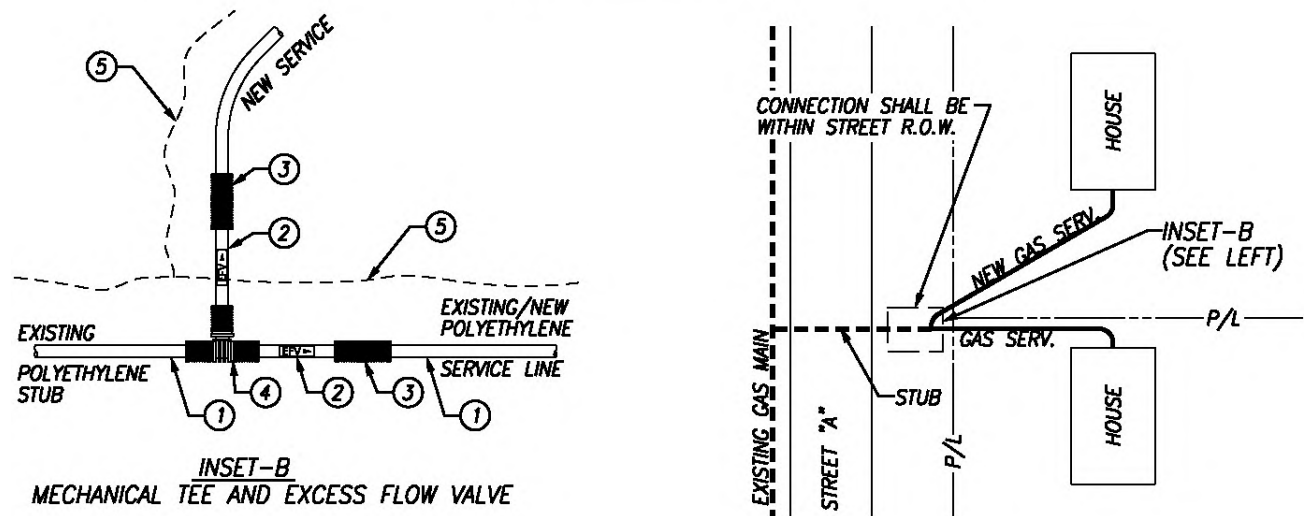
**Materials List for Figure 3.10-a.**  
**¾-inch IPS Polyethylene Stub Connection - Mechanical EFV**

Item	Quantity	LCUB Item #	Description
1	1-Lot		¾-inch IPS Pipe
2	1		400 scfh – ¾-inch Excess Flow Valve
			800 scfh – ¾-inch Excess Flow Valve
3	2		¾-inch Mechanical Coupling
4	1-Lot		#12 Coated Copper Clad Steel Tracer Wire

**Materials List for Figure 3.10-a.**  
**1-inch Polyethylene Stub Connection - Mechanical EFV**

Item	Quantity	LCUB Item #	Description
1	1-Lot		1-inch IPS Pipe
2	1		800 scfh – 1-inch Excess Flow Valve
			1800 scfh – 1-inch Excess Flow Valve
3	2		1-inch Mechanical Coupling
4	1-Lot		#12 Coated Copper Clad Steel Tracer Wire

**SHORT SIDE GAS STUB**



**Figure 3.10-b.**

(Polyethylene Stub Additional Service Connection – EFV)

Notes:

- I. For service lines larger than 2-inch, special design will be prepared by OWNER's Engineering.
- II. Compact sidefills around and under tie-in area.
- III. Existing service shall be retested from point of disconnection to the meter cock. Disconnect existing meter/regulator and plug riser prior to testing. Prior to testing, seal meter cock with plug installed as required in 3.06.1-D. Also see 3.07.

**Materials List for Figure 3.10-b.**

**¾-inch IPS Polyethylene Stub Added Service Connection - EFV**

Item	Quantity	LCUB Item #	Description
1	1-Lot		¾-inch IPS Pipe
2	2		400 scfh – ¾-inch IPS Excess Flow Valve
			800 scfh – ¾-inch IPS Excess Flow Valve
3	5		¾-inch IPS Mechanical Coupling
4	1		¾-inch IPS Mechanical Tee
5	1-Lot		#12 Coated Copper Clad Steel Tracer Wire

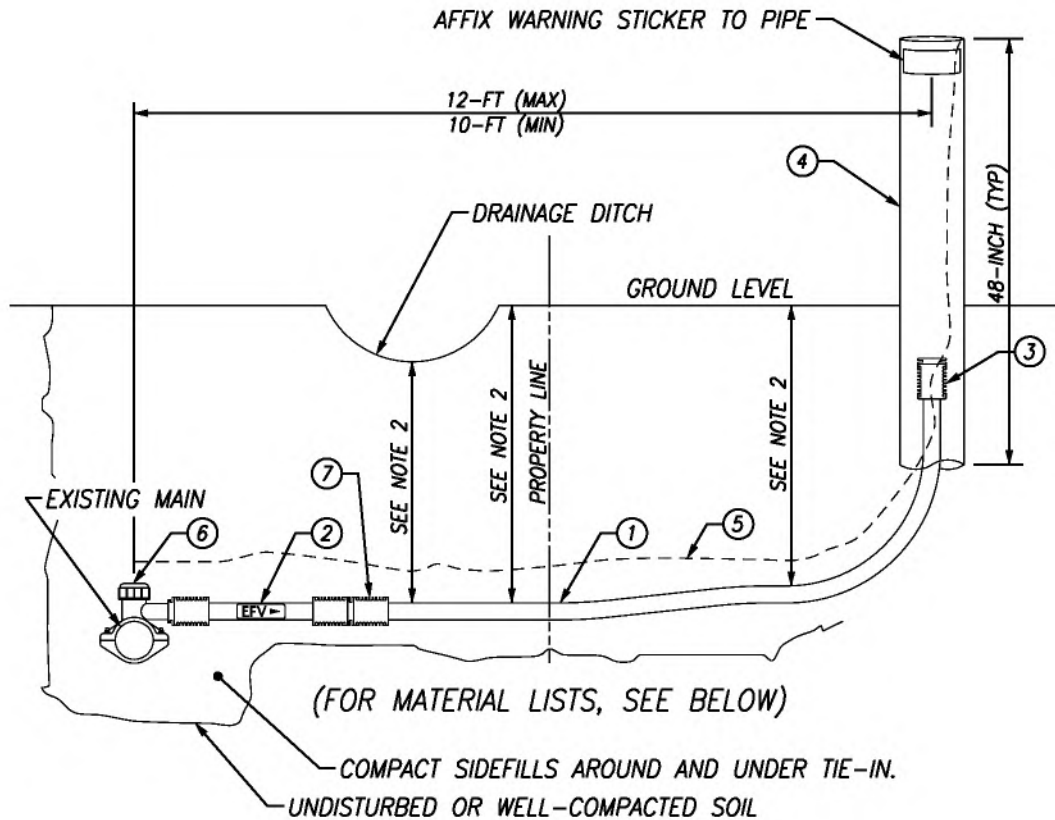
**Materials List for Figure 3.10-b.**

**1-inch Polyethylene Stub Added Service Connection - EFV**

Item	Quantity	LCUB Item #	Description
1	1-Lot		1-inch IPS Pipe
2	2		
3	5		1-inch IPS Mechanical Coupling
4	1		1-inch IPS Mechanical Tee

5	1-Lot	#12 Coated Copper Clad Steel Tracer Wire
---	-------	--

**3.11 SERVICE STUBS**



**Figure 3.11-a.**  
(Polyethylene Service Stub to Mains)

Notes:

1. If outside of paved roadway surface, EFV connection shall be off spigot of tapping tee.
2. For depth requirements see 3.02.
3. For other types of service connections, see Details G22 through G29.
4. Test service stub prior to tapping main, see 3.07.
5. Tracer wire to extend to top of 4-inch location marker pipe.

**Materials List for Figure 3.11-a.**  
**¾-inch IPS Polyethylene Service Stub to Mains**

Item	Quantity	LCUB Item #	Description
1	1		¾-inch IPS Pipe
2	1		400 scfh – ¾-inch IPS Excess Flow Valve
			800 scfh – ¾-inch IPS Excess Flow Valve
3	1		¾-inch IPS Mechanical Cap
4	1		4-inch Polyethylene Pipe

5	1-Lot		#12 Coated Copper Clad Steel Tracer Wire
6	1		1 ¼-inch x ¾-inch IPS Mechanical Tapping Tee
			2-inch x ¾-inch IPS Mechanical Tapping Tee
			4-inch x ¾-inch IPS Mechanical Tapping Tee
			6-inch x ¾-inch IPS Mechanical Tapping Tee
			8-inch x ¾-inch IPS Mechanical Tapping Tee
7	1		¾-inch IPS Mechanical Connector

**Materials List for Figure 3.11-a.**

**1-inch Polyethylene Service Stub to Mains**

Item	Quantity	LCUB Item #	Description
1	1		1-inch IPS Pipe
2	1		
3	1		1-inch Mechanical Cap
4	1		4-inch Polyethylene Pipe
5	1-Lot		#12 Coated Copper Clad Steel Tracer Wire
6	1		1 ¼-inch x 1-inch Mechanical Tapping Tee
			2-inch x 1-inch Mechanical Tapping Tee
			4-inch x 1-inch Mechanical Tapping Tee
			6-inch x 1-inch Mechanical Tapping Tee
			8-inch x 1-inch Mechanical Tapping Tee
7	1		1-inch IPS Mechanical Coupling

**3.12 RECONNECTION OF EXISTING POLYETHYLENE SERVICES TO NEW MAINS**

- A. Existing Polyethylene Services shall be reconnected by mechanical connection only.
- B. Services shall be tested according to Section 3.07 from the point of disconnection to the meter, prior to reconnection.

**3.13 SERVICE CONDEMNATION – GENERAL**

- A. Condemned service pipe shall be purged from the point of condemnation to the riser.
- B. Gas service riser shall be cutoff below ground and sealed using foam pack.
- C. Condemned service pipe shall be sealed at the main end using an owner approved expandable plug.
- D. Service tee tap shall be re-opened and the outlet shall be sealed using a LCUB approved cap.

**LCUB Approved Caps**

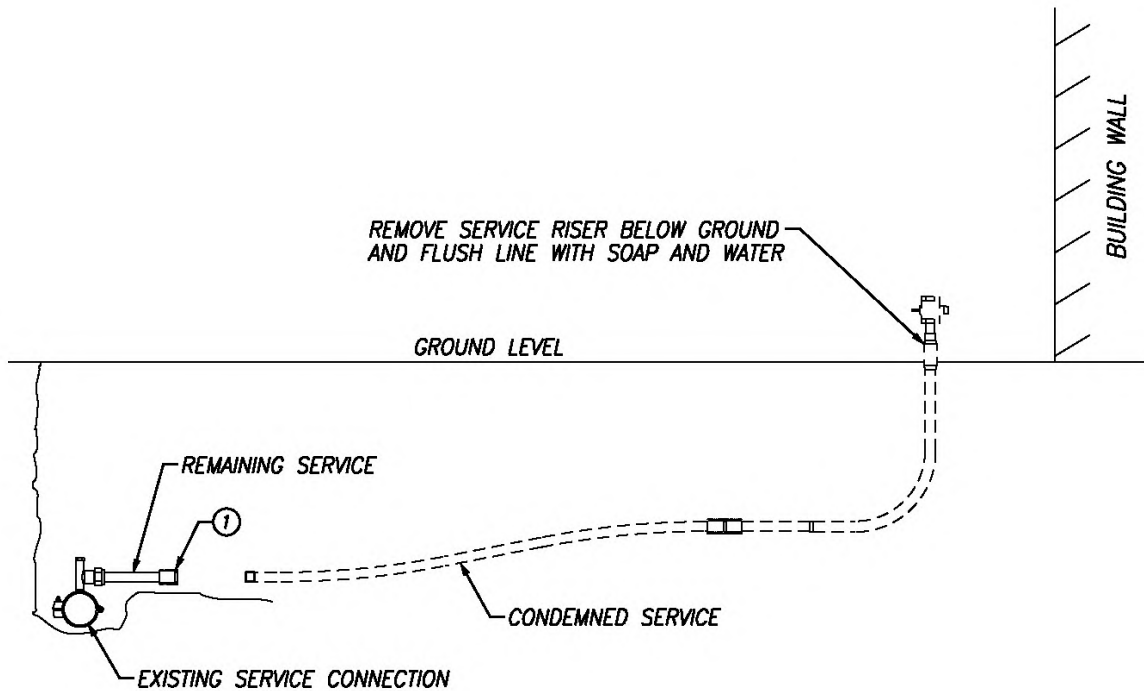
<u>Service Size</u>	<u>Service Type</u>	<u>LCUB Item #</u>	<u>Description</u>
¾-inch IPS	PL		Mechanical Cap
1-inch IPS	PL		Mechanical Cap



1 ¼-inch IPS	PL		Mechanical Cap
2-inch IPS	PL		Mechanical Cap
¾-inch	ST		Companion Lock Cap
1-inch	ST		Companion Lock Cap
1 ¼-inch	ST		Companion Lock Cap
2-inch	ST		Companion Lock Cap

- E. For Steel services, install an anode on the service. Do not cadweld to extrude service lines, see 3.14.
- F. For services with plug tees, the plug tee shall be removed and the tap shall be sealed using an approved leak repair clamp.
- G. All condemned service taps shall be marked by attaching a 3M EMS 4-inch Extended Range 5-foot Ball Marker – Gas 1405-XR to the tap tee. The marker ball shall be attached to the end of the remaining active service if less than 5-feet deep. If the depth of the service is greater than 5-feet, the marker ball shall be placed directly above the end of the service at 5-feet deep.
- H. All exposed metal surfaces shall be cleaned, primed, and coated according to manufacturer’s recommendations (wax tape primer – 4-inch cold-applied wax tape) to prevent contact between metal surfaces and the surrounding backfill.

**3.14 EXTRUDE SERVICE CONDEMNATION**



**Figure 3.14-a.**  
(7/8" Extrude Service Condemnation)

Notes:

1. After installing cap, reopen tap in service tee to allow future sleeving of the gas main.
2. Soap test all fittings.
3. Install anode on service using grounding clamp. Do not cadweld to service line.
4. All exposed metal surfaces shall be cleaned, primed, and coated according to manufacturer's recommendations (wax tape primer – 4" cold-applied wax tape) to prevent contact between metal surfaces and the surrounding backfill.

**Materials List for Figure 3.14-a.**  
**Extrude Service Condemnation**

Item	Quantity	LCUB Item #	Description
1	1		¾-inch Mechanical Cap
	1		1-inch Mechanical Cap

**3.15 PURGING**

- A. All purging shall be conducted in accordance with AGA's "Purging Principles and Practices."
- B. Gas shall be vented in a manner that will prevent Gas from entering a structure.
- C. Pipe shall be away from sources of ignition and grounded to reduce static discharge.

**3.16 CATHODIC PROTECTION**

- A. Saddles on steel mains shall have all exposed metal surfaces cleaned, primed, and coated according to manufacturer's recommendations (wax tape primer 4-inch cold-applied wax tape) to prevent contact between metal surfaces and the surrounding backfill.

**3.17 AS-BUILT RECORDS - SERVICE CARD**

- A. Records shall be maintained on all new piping system installations and repairs and/or changes to the existing piping systems in sufficient detail to provide historical information, physical locating, fittings used (including Excess Flow Valves), and other pertinent data necessary for the safe and continuous operation and maintenance of the gas system. Cathodic protection and test data reports shall be neat, legible, and accurate. Properly completed service record cards shall be provided for all natural gas service lines installed, modified, and/or connected to a Gas Main or Stub by OWNER or OWNER-approved Contractor for all projects. Service card records shall be completed by Contractor's installer on the job site; and returned to OWNER within 3 working days.

**3.18 SAFETY**

- A. CONTRACTOR shall have a readily available 20 cubic foot or greater ABC fire extinguisher at the job site for use during purging and tapping activities according to the LCUB or OWNER-approved Operator Qualification Program.
- B. CONTRACTOR must wear appropriate personal protective equipment (PPE) for the applicable task. At a minimum, CONTRACTOR must don American National Standards Institute (ANSI) approved hard hat, safety glasses, and safety-toed footwear while performing construction work or provide a job hazard analysis detailing the work and differing PPE.
- C. CONTRACTOR must don an appropriate class of high visibility vest while performing work in the road or road right-of-way or provide a job hazard analysis detailing the work and differing PPE.
- D. CONTRACTOR must don ANSI approved hard hat and safety glasses over a Nomex or CarbonX full-face balaclava, leather gloves with a sufficient cuff to cover bare wrists, safety-toed boots, and an HRC-2 or greater overall or provide a job hazard analysis detailing the work and differing PPE when working or anticipated to work in a gaseous atmosphere.

End of Section

**SECTION 33350**  
**NATURAL GAS POLYETHYLENE PIPE JOINING PROCEDURES**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. The work in this section shall consist of joining polyethylene pipe as well as testing pipe afterwards. Also included is the cleaning of the pipe as well as the site after work is completed.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

**3.01 POLYETHYLENE PIPE JOINING**

- A. In order to become a qualified gas line installer for LCUB's gas system, Contractor must perform three procedures at LCUB's facility while being observed by LCUB's gas personnel. Procedures must be performed each calendar year in order for the Contractor to remain qualified.
- B. Polyethylene pipe must be joined using a qualified joining procedure and by persons qualified on that procedure.
- C. Procedure Qualification - Title 49 CFR, Part 192.283(a) requires that all joining methods for polyethylene pipe be qualified. The polyethylene pipe manufactures have developed qualified procedures for heat fusion of PE 2406 pipe. LCUB has adopted the Plexco Pipe procedure for all socket, saddle, and butt fusion of polyethylene pipe and fittings. LCUB has adopted Central Plastics Procedures for electrofusion. All heat fusion joints will be visually inspected to determine if they have the same appearance as a joint properly made under the qualified procedure.
- D. Joiner Qualification - Title 49 CFR, Part 192.285 requires persons making either heat fusion or mechanical joints be qualified using applicable joining procedures mentioned above. Each person will be required to qualify for each of the joints they are expected to make. The qualifying procedure for polyethylene pipe joiners will consist of the following:
1. Training and experience with the qualified procedure by LCUB.
  2. Making a specimen joint according to the qualified procedure.
  3. Visual inspection of the specimen joint to determine if it has the same appearance as a joint properly made under the qualified procedure.

4. For heat fusion joints, three longitudinal straps, 1 inch wide, cut from the joint will be examined for defects and then deformed by back bend, root bend, or torque. If failure indicates outside the joined area, the joint is acceptable.
5. For service saddle tee fusion, the test specimen will be secured and struck with a 3 lb. hammer.

### **3.02 QUALIFICATIONS OF PERSONS**

- A. Qualification of persons making joints for each procedure will remain qualified unless the qualified joiner did not make a joint under the applicable procedure during any 12 month period or has had three joints or three percent of the joints found unacceptable.
- B. Mechanical couplings designed for use in polyethylene natural gas piping systems have qualified installation procedures developed by the manufacturer. These procedures shall be followed for installation. All field mechanical joints will be visually inspected to determine if they have the same appearance as a joint properly made under the qualified procedure. All mechanical couplings used in plastic piping systems shall be designed with a pullout resistance greater than or equal to that required by Title 49 CFR, Part 192.283(b).
- C. On all joints made in the field, the person making the joint shall use a Sharpie type marker to sign their name, employee number, last four digits of social security number, installation date and company name on the pipe next to the joint.

End of Section

**SECTION 33500**  
**CATHODIC PROTECTION TEST POINTS AND**  
**ANODE INSTALLATIONS FOR NATURAL GAS PIPELINE**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. This Section describes the proper procedures for installing cathodic protection (CP) test points and anodes along coated steel natural gas mains and services. All work shall be carried out in accordance with this Section, as well as with additional LCUB Standards and Specifications that may or may not be referenced in this Section.
- B. A test point is defined as any point in the pipeline network where electrical examination of buried metallic piping is carried out to determine level of CP. Test points can include valves, risers, test stations, aboveground sections of pipe (e.g., at service risers, regulator stations), and other locations. A test station is a specific type of test point that is accessible from aboveground, installed in a test box, and has terminals for electrical connection to the steel pipe.
- C. Installation of CP test points on natural gas mains must meet the Code of Federal Regulations (CFR) Title 49, Part 192.469. All natural gas mains with cathodic protection must have sufficient test points or other contact points to determine the adequacy of CP through electrical measurements.
- D. This Section shall be applied to both new facilities and existing locations being repaired or replaced. The different types of test points for galvanic and impressed current CP systems shall be installed as shown in this Section or as outlined in project-specific design/construction drawings. While this Section describes general test point installation requirements, LCUB will specify the exact location and type to be installed for each project. LCUB will also specify whether permanent reference electrodes and/or anodes will be installed with each test station.
- E. Unless otherwise noted, the CONTRACTOR shall provide all products and materials needed for the execution of the Work described herein. All materials shall meet or exceed the specified characteristics, unless the CONTRACTOR has approval from LCUB's Corrosion Personnel.
- F. Whenever a test station is installed at a transition between coated steel to plastic piping, a tracer wire shall be connected from the end of the plastic pipe to the test station. See tracer wire installation requirements for polyethylene pipe in Section 33105, Tracer Wire Installation for Non-Electrically Conductive Pipe.
- G. The CONTRACTOR shall be responsible for compliance with the Underground Utility Damage Prevention Act.
- H. The CONTRACTOR shall be responsible for meeting all safety requirements.

- I. The CONTRACTOR shall be responsible for meeting all applicable Operator Qualification requirements.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. All products and materials used on LCUB's natural gas system must meet or exceed current LCUB Standards and Specifications. Installation or application of products on LCUB's natural gas system shall be performed in compliance with manufacturer's recommendations. Any deviation must be approved in advance by LCUB's Corrosion Personnel.
- B. The following materials are needed for installation of a standard test point:
  1. Plastic test box
  2. Solid copper wires for test point (red, white, black, blue, orange, and/or green AWG #12 wires, as specified in the individual material lists)
  3. Pin brazing kit, if installing a casing-type test station
  4. Thermite welding powder
  5. Coating material: 2888 RG specialty polymer coating (preferred) OR wax tapes
  6. Blocks or bricks
  7. LCUB-approved natural gas valve jacket and flush fit drop-turn locking lid (ASTM A-48 Class 30 or Class 35) or test station marker
  8. LCUB-approved yellow paint
  9. Sand backfill material
- C. The following materials are needed for installation of a standard reference electrode:
  1. M.C. Miller IonX copper/copper sulfate reference electrode, with a minimum of twenty-five feet of AWG #12 orange wire
- D. The following materials are needed for installation of a standard set of anodes:
  1. Split bolts as needed to connect more than one anode on a header cable
  2. Cable splice kit (SpliceRight) Header cable
  3. Magnesium anodes with attached wires (e.g., 17-pound anodes for pipes with diameter  $\geq$  12-inch, 9-pound anodes for pipes with diameter  $\geq$  4-inch and 3-pound anodes for service risers)

- E. The following materials are also needed for installation of 3-pound anodes:
  - 1. Blunt-edged putty knife
  - 2. Hose clamp
  - 3. Galvanized metallic sheet screw
  - 4. 3-pound Magnesium anode (high potential)
  - 5. Additional materials may be required for specific types of test points, as outlined in material lists included herein.
  
- F. The following minimum tools and equipment will be necessary to complete the tasks:
  - 1. Excavation equipment
  - 2. Wire brush or metal file
  - 3. Flint gun for ignition of thermite
  - 4. Exothermic welding furnace
  - 5. Flathead screw driver, pliers, and wrenches

### **PART 3 EXECUTION**

#### **3.01 MATERIALS/EQUIPMENT INSTALLATION**

- A. This Section outlines the procedures for installing test points, reference electrodes, and anodes. The following requirements apply to all types of test points:
- B. Test points shall not be installed where accessibility would be difficult or unsafe, such as under buildings, permanent structures, proposed future structures, or in high traffic areas.
- C. To prevent electrical shorts or reduce the influence of stray current, test points shall be installed with at least 36 inches of clearance from any other underground structure. If clearance cannot be obtained, CONTRACTOR shall notify OWNER's Corrosion Personnel.
- D. For all installations, once the pipe has been exposed, complete a Corrosion Observation and a pipe-to-soil potential reading, documenting the results on a Corrosion Card or Natural Gas Utility Service Sheet (NGUSS). The completed form shall be given to the LCUB's Corrosion Personnel or RPR as soon as work is completed.
- E. The CONTRACTOR shall notify the OWNER's Corrosion Personnel when test stations and other types of test points are ready for final hookup. To facilitate testing, any anode wires shall remain attached to the pin (not yet connected to wire from the pipe). Corrosion Personnel will conduct tests to make sure that none of the anodes or wires is



damaged or broken. If tests indicate damage, the entire wire and/or anode shall be replaced and retested at the CONTRACTOR's expense.

**3.02 PROCEDURES TO INSTALL A STANDARD TEST STATION**

- A. The basic installation of a standard test station is shown in Figure 1, along with an associated materials list.

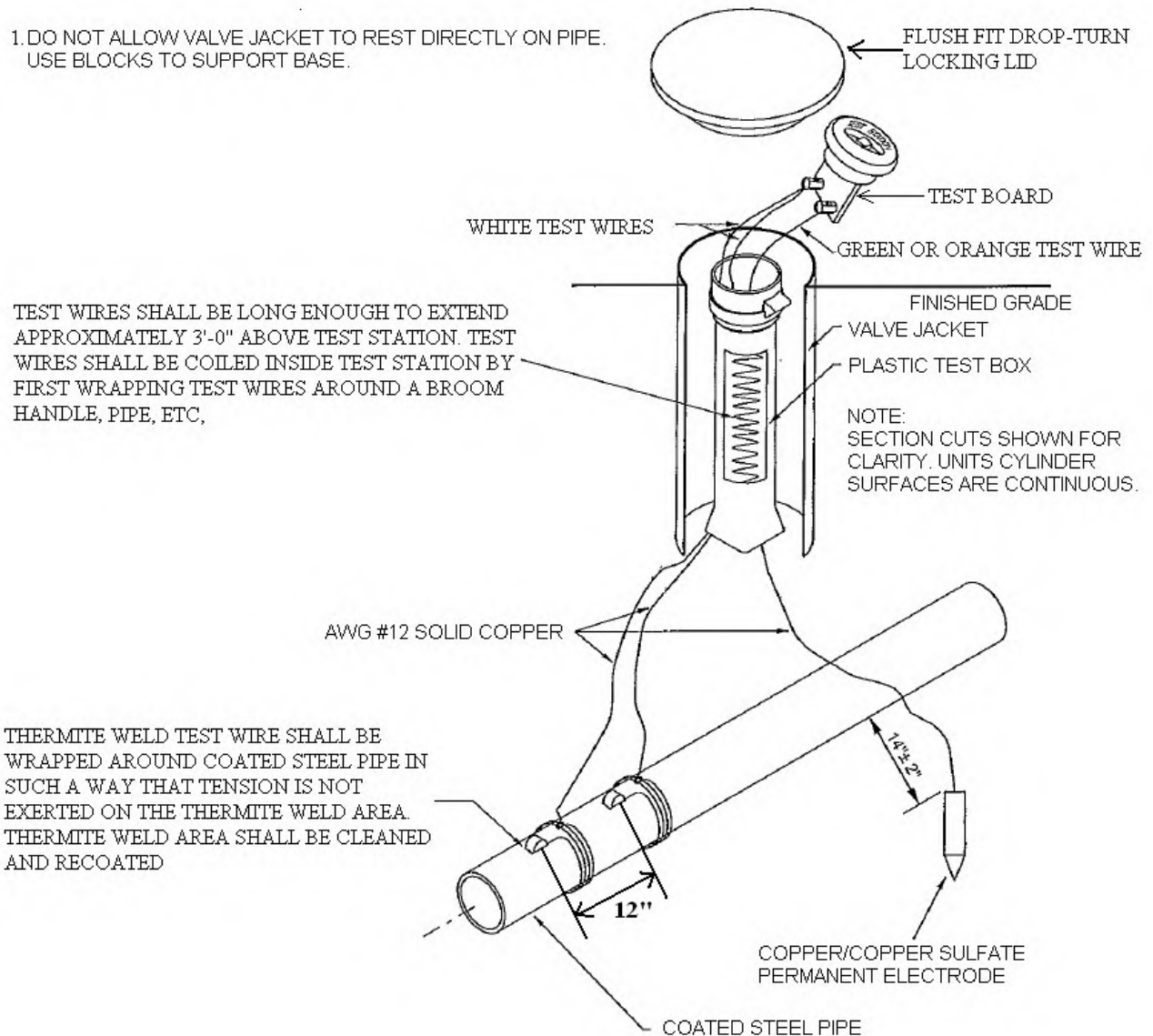


Figure1. Standard test station with permanent electrode

<b>Item</b>	<b>Quantity</b>	<b>LCUB Item #</b>	<b>Description</b>
1	2		AWG #12 solid copper white test wires
2	1		AWG #12 solid copper green or orange test wire
3	1		Plastic shaft test box
4	1		Copper/copper sulfate permanent electrode
5	1		Natural gas valve jacket
6	1		Natural gas valve jacket Lid

Drawings for other types of test stations are listed in Table 1 and are included as Attachments A through K. The Corrosion Personnel shall determine exact locations and types to be installed for each project. The basic instructions below apply to all types of test stations, but CONTRACTOR shall refer to the appropriate drawings for material lists, instructions on wire placement, and any special conditions.

**Table 1. Types of Test Stations**

<b>Attachment</b>	<b>Type of CP</b>	<b>Type of Test Point</b>
A	Both galvanic and impressed	Test station at insulated joint (flange)
B	Both galvanic and impressed	Test station at foreign line crossing
C	Both galvanic and impressed	Test station at casing along coated steel carrier pipe without anodes
D	Galvanic	Test station at insulated joint (flange) with anodes
E	Galvanic	Test station on pipe with monolithic insulator
F	Galvanic	Test point at crossing between two coated steel pipes
G	Galvanic	Test station at crossing between a coated steel pipe on galvanic anodes and steel pipe on rectifier
H	Galvanic	Test station at casing along coated steel carrier pipe with anodes
I	Galvanic	Test station at transition between plastic and coated steel pipe
J	Galvanic	Test station at foreign line crossing with multiple anodes on LCUB's natural gas main
K	Galvanic	Test station at location between two parallel and unconnected natural gas coated steel mains

- B. As noted in paragraph 1.01 G., utility locate requests must be performed in accordance with the Tennessee Underground Utility Damage Prevention Act for locating underground utilities. Respect all utility locate marks, and excavate carefully so as not to damage the coating of the steel piping.

- C. Clean the exposed pipe with a wire brush and/or metal file, removing the protective coating where test wires will be attached.
- D. Attach test wires as shown in Figure 1. Each test wire shall be installed in a continuous length. The test wire shall be properly secured to the pipe and wrapped around with 50 percent overlap. Test wires shall be long enough to extend approximately three feet above the test box to prevent test wires from being unduly stressed or broken during backfilling and future excavation. Each set of test wires shall be thermite welded carefully to the steel pipe, using fifteen milligrams (mg) of thermite powder in the mold. When attaching test wires to casings, utilize a pin brazing process instead.
- E. Reapply coating anywhere the coating was removed and where pipes and wires were welded. Coating shall be applied according to the manufacturer's recommendations. The coating material shall be 2888 RG specialty polymer coating on fusion bonded epoxy pipes and wax tape on pipes with other kinds of coating (e.g. Yellow jacket, coal tar coating etc).
- F. If instructed by Corrosion Personnel, install a reference electrode following procedures outlined in Section 3.02 and as shown in Figure 1.
- G. If instructed by Corrosion Engineer, install anodes following procedures outlined in Section 3.04.
- H. Backfill one foot around the coated steel pipe with sand, free from gravel and debris.
- I. Blocks or bricks shall be used to support base of the test box installed, and the test wires shall be coiled inside the box.
- J. Sand, clean dirt, or other earthen materials may be used to backfill the rest of the excavation to the ground surface in accordance with Section 02611-Trenching, Backfilling and Compacting.
- K. Test stations installed on mains located in pavement including, but not limited to, within a roadway, sidewalk, or parking area, shall be installed within a LCUB-approved natural gas valve jacket and lid. The lid and jacket shall be flush-mounted to the pavement surface, and the lid shall be painted with approved yellow paint. See Figure 2 (a-b) for a photograph depicting the correct installation of the jacket and lid. Light-weight rims can be used for the jackets located behind the curb, but heavy-duty cast iron rims shall be used for jackets located in roadways.
- L. Alternatively, test stations installed in grass or gravel shall be installed inside an approved test station marker used for marking test points and the pipeline.

The marker must protrude at least 36" from the ground surface, although a taller marker may be needed to maintain visibility in vegetated locations. See Figures 3 and 4 for photographs depicting the correct installation of the test station marker.

**3.03 PROCEDURES TO INSTALL A REFERENCE ELECTRODE**

- A. If instructed by Corrosion Personnel, install an M.C. Miller IonX copper/copper sulfate reference electrode, with twenty-five feet of #12 test wire, as shown in Figure 1. The electrode shall be placed according to the manufacturer's standard, approximately 14 inches from the pipe with the ceramic tip oriented downwards. Note that if anodes are also to be installed, they should be placed on the opposite side of the pipe (as discussed in Section 3.04) and soil around pipe must be damped. Package bag on anode must be removed during installation process.
  
- B. Backfill with native soil that is free from debris up to 12 inches above the electrode. The backfill around the copper/copper sulfate electrode shall be dampened after soil has been compacted. The permanent reference electrode wire shall be connected to the pin on the test station box.

### 3.04 PROCEDURES TO INSTALL ANODES

If instructed by Corrosion Personnel, install anodes as described below and as shown in Figure 5.

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE.  
USE BLOCKS TO SUPPORT BASE.

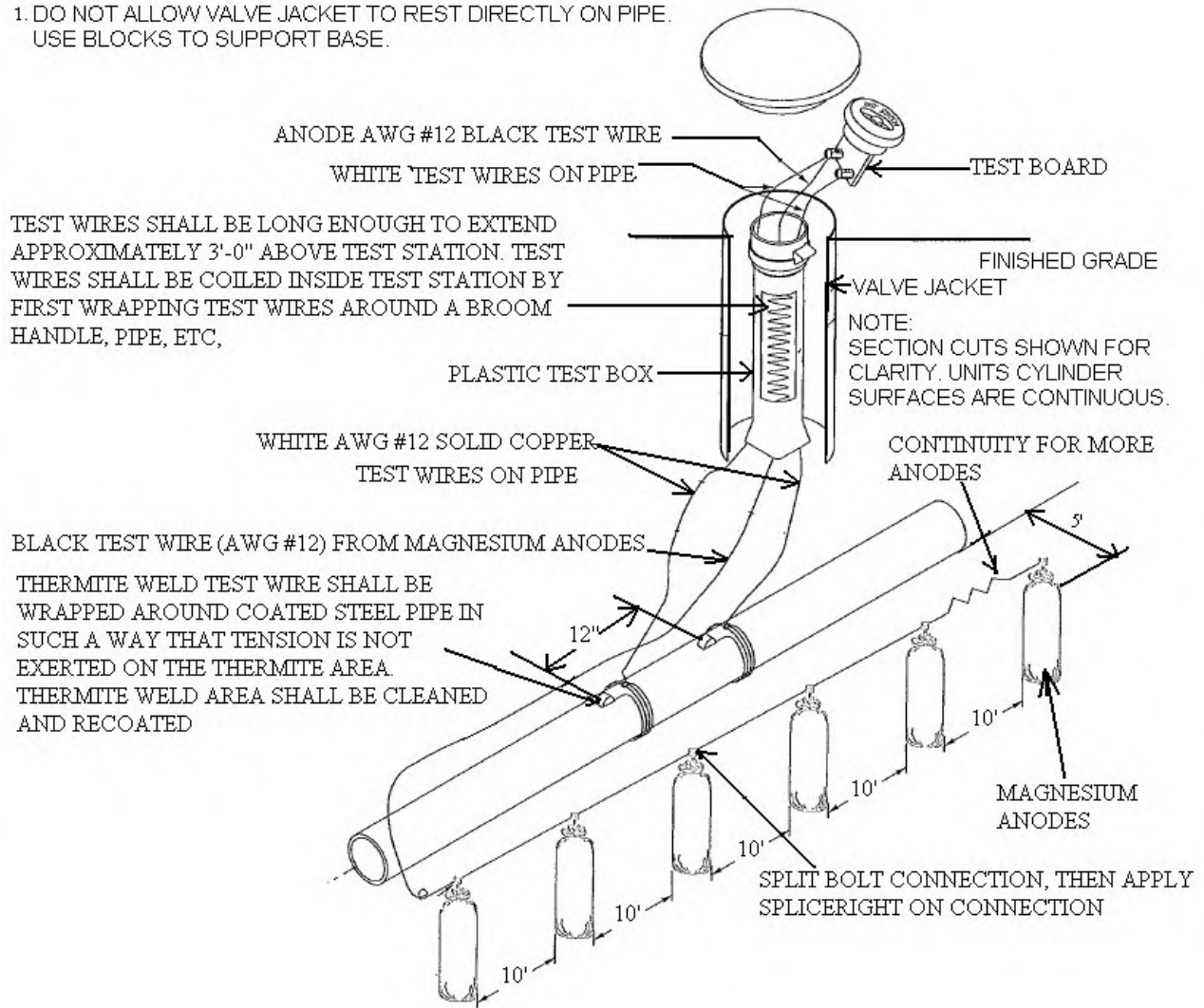


Figure 5. Typical test station with multiple galvanic anodes

**Materials List**

Item	Quantity	LCUB Item #	Description
1	1		AWG #12 black header cable
2	2		AWG #12 solid copper white wires
3	7		AWG #12 solid copper black wires
4	6		Split bolts
5	≥6		Magnesium anodes
6	1		Natural gas valve jacket
7	1		Plastic shaft test box
8	1		Lid

Place the anodes five feet away from the pipe either vertically or horizontally, as shown in Figures 6 and 7, respectively. Anodes should be spaced five feet apart when installing two anodes. A distance of ten feet shall be maintained between anodes when installing more than two anodes at a test station. Note that if a permanent reference electrode is also installed, the anodes shall be installed on the opposite side of the pipe.

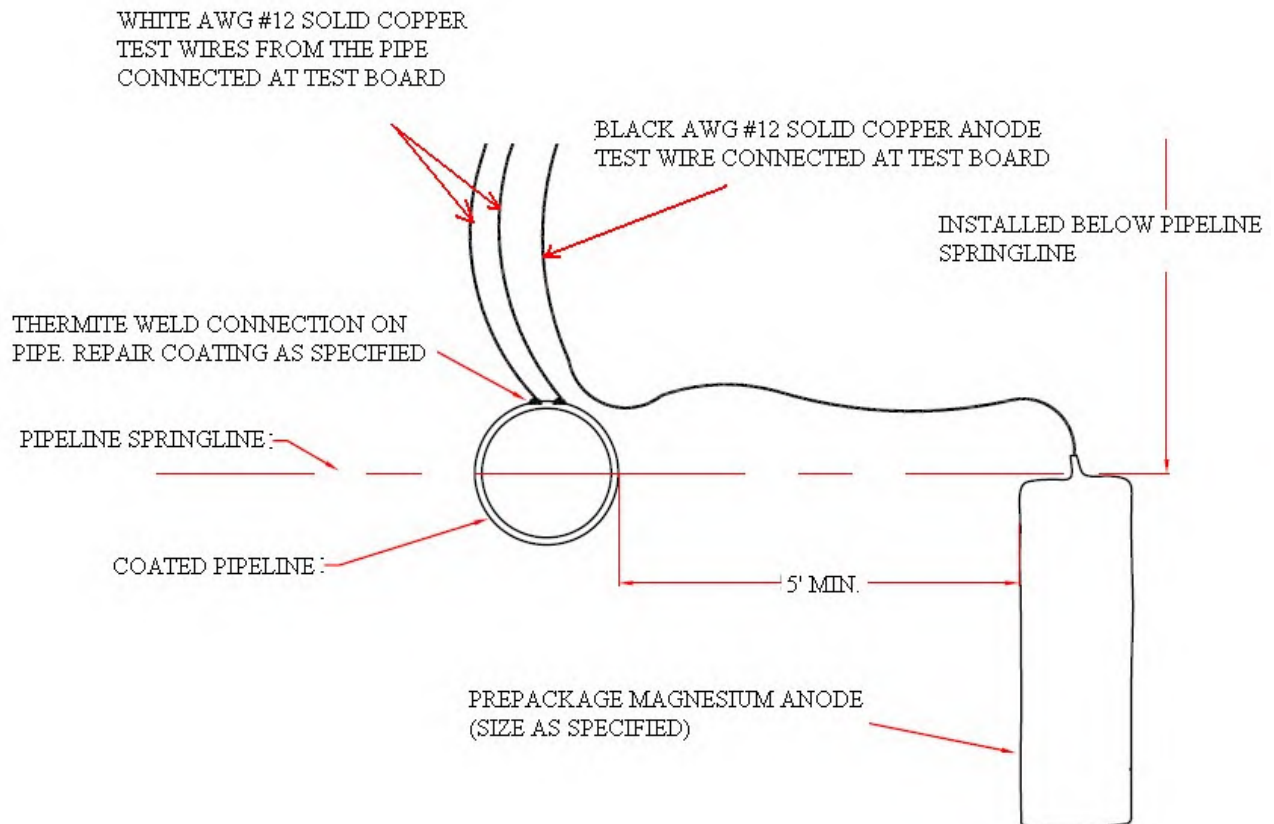


Figure 6. Magnesium anode installed vertically

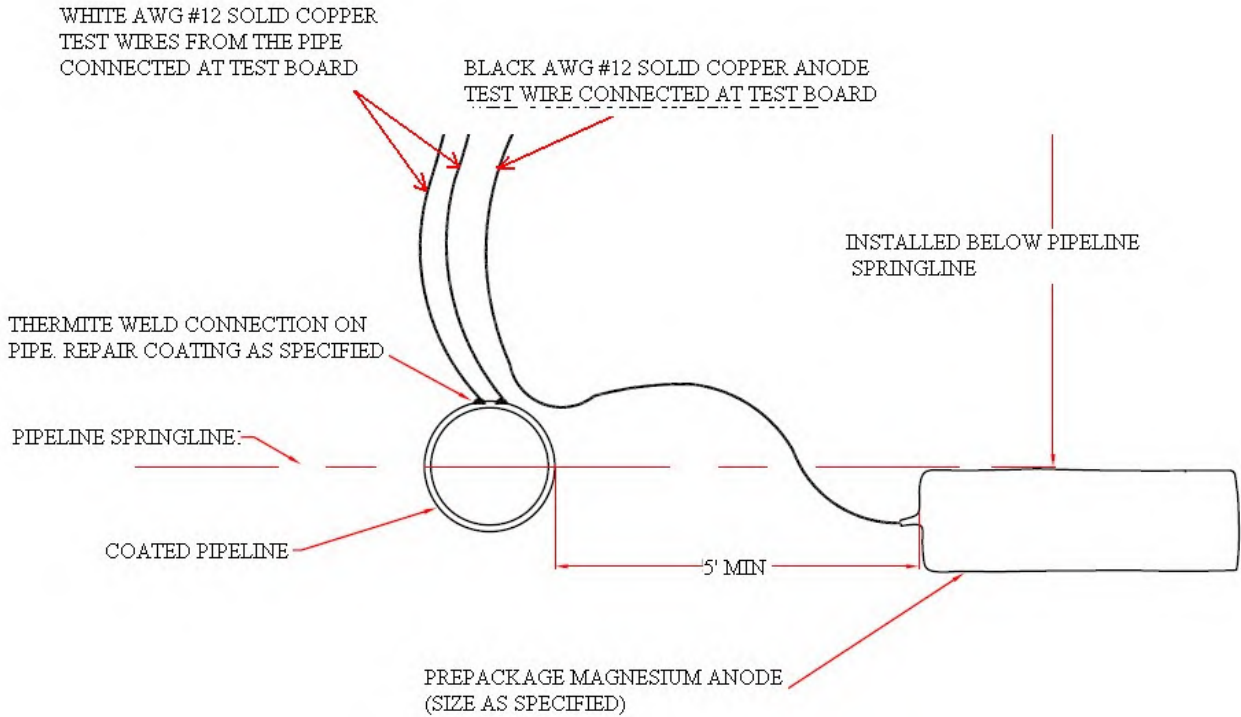


Figure 7. Magnesium anode installed horizontally

Use a split connector to attach the anode wires to the header cable. Following manufacturer recommendations, apply a cable splice kit to the connection, as shown in Figure 8.

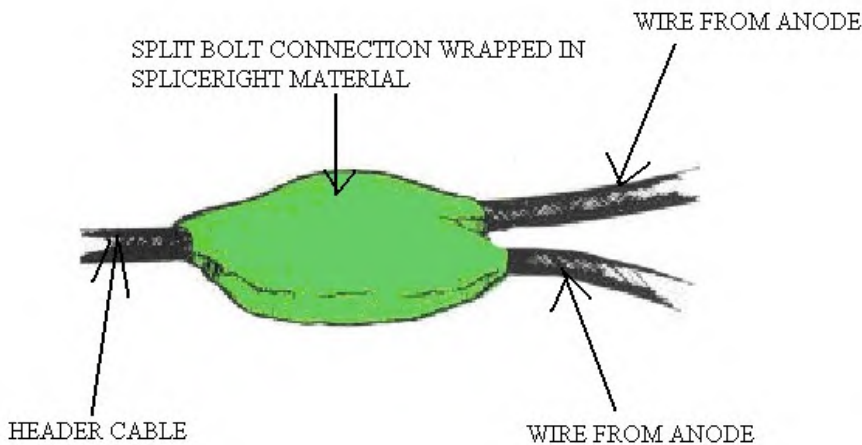


Figure 8. Application of SpliceRight at split bolt connection to prevent corrosion

The wires from the header cable connecting the anodes shall be attached to the pin on the test station box. Anodes shall not be connected directly to the pipe.

Soil around the installed anodes shall be dampened to activate the anode. Backfill with native soil, free from gravel and debris.

### **3.05 PROCEDURES TO INSTALL AN ANODE ON A SERVICE RISER**

- A. Three-pound anodes shall be installed on steel service risers. These anodes are available in bag, similar to standard anodes; this should be installed three to five feet from the service riser.
- B. The CONTRACTOR shall install three-pound "bag-type" anodes on service risers, when directed by LCUB Corrosion Personnel.
- C. When attaching three-pound anodes to a service riser, remove only the coating at the contact point and weld test wire from the anode onto the pipe (provide a disconnection point). A blunt-edged putty knife or similar tool can be used to remove the coating. Once the anode is buried, the wires shall be wound around the riser and connected to the riser with the hose clamp. Re-coat the area after installing the anode using 2888 RG specialty polymer coating or LCUB-approved equivalent.
- D. Before installing 3-pound bag-type of anode on a service, the CONTRACTOR or UGC personnel shall take a pipe-to-soil potential reading and document the results on a Natural Gas Utility Service Sheet. After installation is complete, the CONTRACTOR shall notify the RPR, and UGC shall notify LCUB Corrosion Personnel, so that a second reading may be obtained by a Corrosion Personnel at the same location.
- E. Figure 9 depicts a test point on a service with an anode installed.
- F. Follow the anode installation instructions outlined in Section 3.03. No more than one anode shall be installed on the service riser; therefore header cable or split connector is not necessary.
- G. If the area is paved, pavement shall be removed, respecting the utility locate markings. Before burying the bag-type anode, unwind the test wire and ensure the test wire length is sufficient to reach the riser. If the area needs to be re-paved, anode test wire shall be run through a protective plastic sleeve.



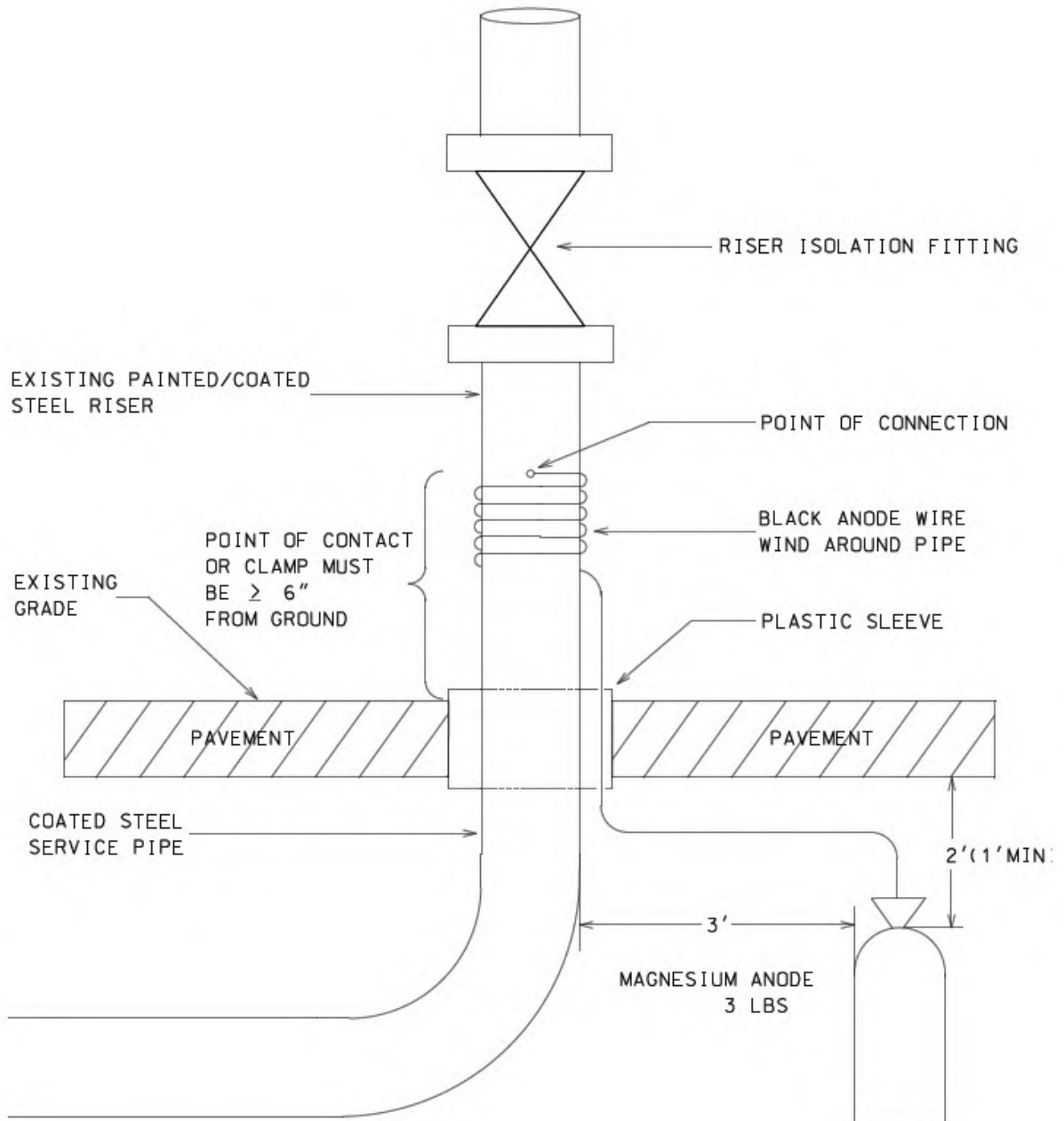


Figure 9. Example of a service test point with installed anode

**Materials List**

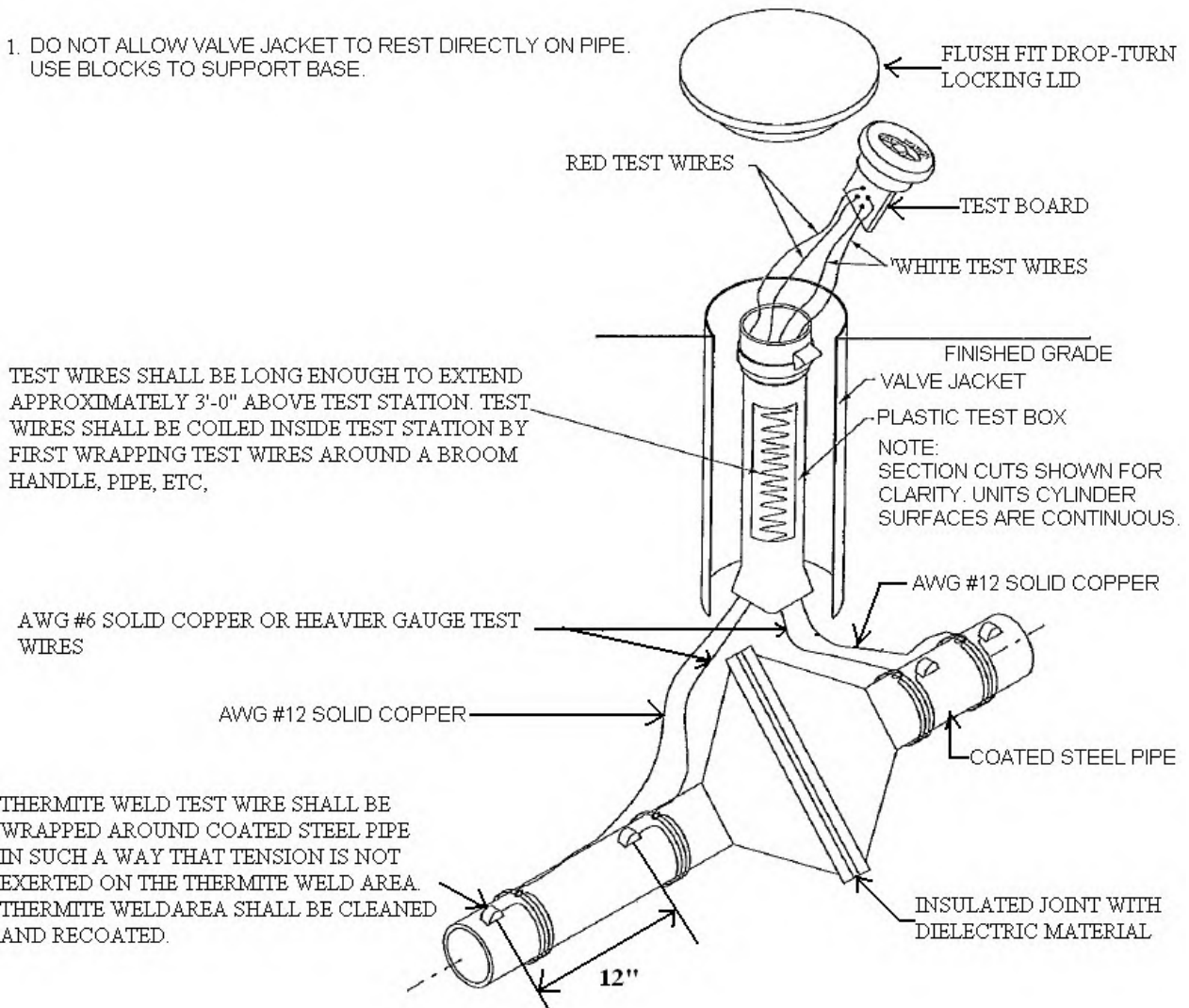
Item	Quantity	LCUB Item #	Description
1	1		Bag magnesium anode, including AWG # 12 solid copper black test wire.

**PART 4 RECORDS**

- A. Records created during installation of CP test points shall be documented neatly, legibly, and accurately.
- B. Once natural gas steel piping has been exposed, complete a Corrosion Observation and a pipe-to-soil potential reading, documenting the results on a Corrosion Card or Natural Gas Utility Service Sheet (NGUSS). The completed form shall be given to the OWNER's Corrosion Personnel or (RPR).
- C. After installation of test stations or anodes on services, contact the RPR. OWNER's Corrosion Personnel will conduct tests to make sure that none of the anodes or test wires is damaged or broken. Corrosion Personnel will also conduct final pipe-to-soil readings.

**Attachment A. Test station at insulated joint (flange)**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

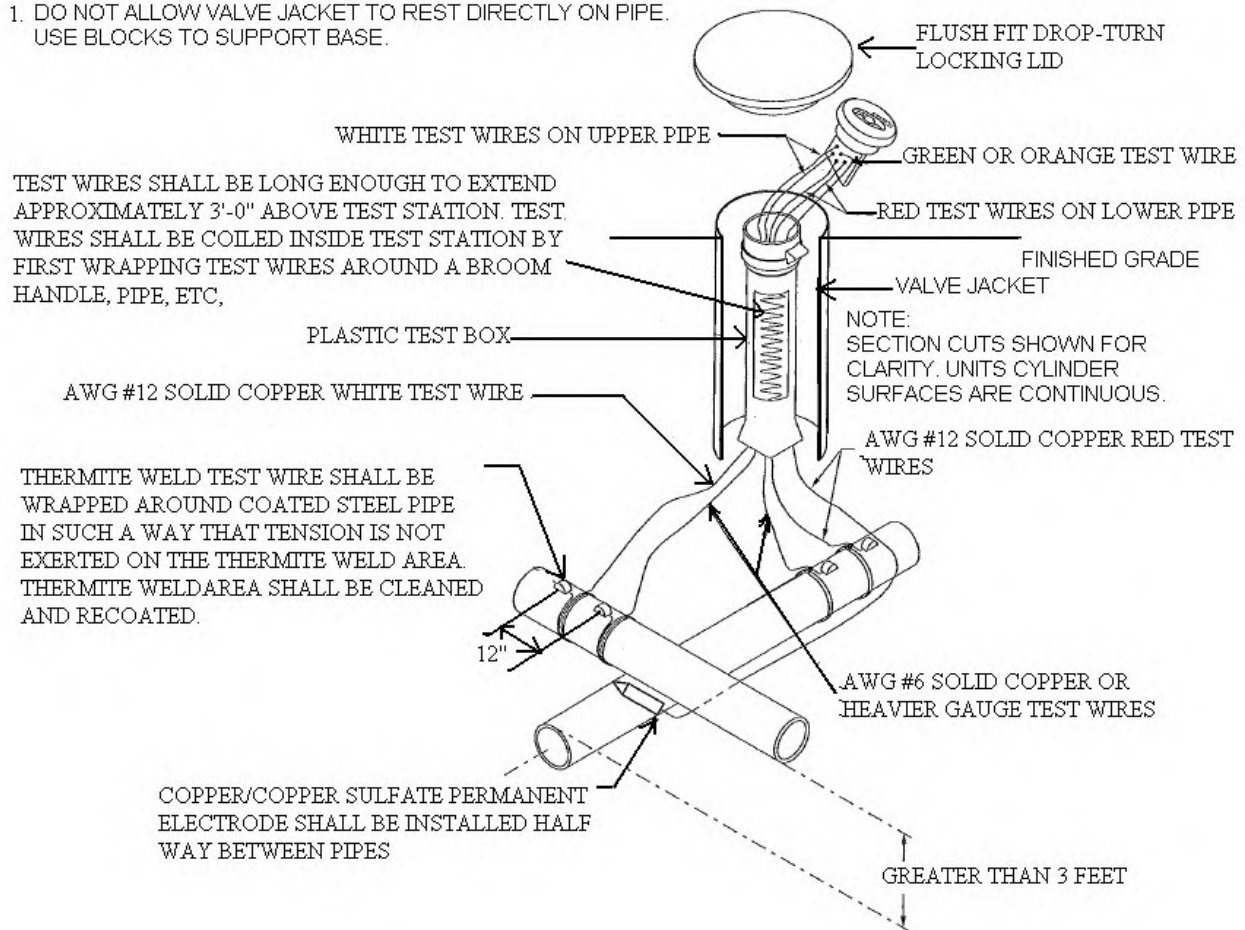


**Materials List**

Item	Quantity	LCUB Item #	Description
1	1		AWG #12 solid copper red wire
2	1		AWG #6 solid copper red wire
3	1		AWG #12 solid copper white wire
4	1		AWG #6 solid copper white wire
5	1		Plastic shaft test box
6	1		Natural gas valve jacket
7	1		Natural gas valve jacket Lid

**Attachment B. Test station at foreign line crossing**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

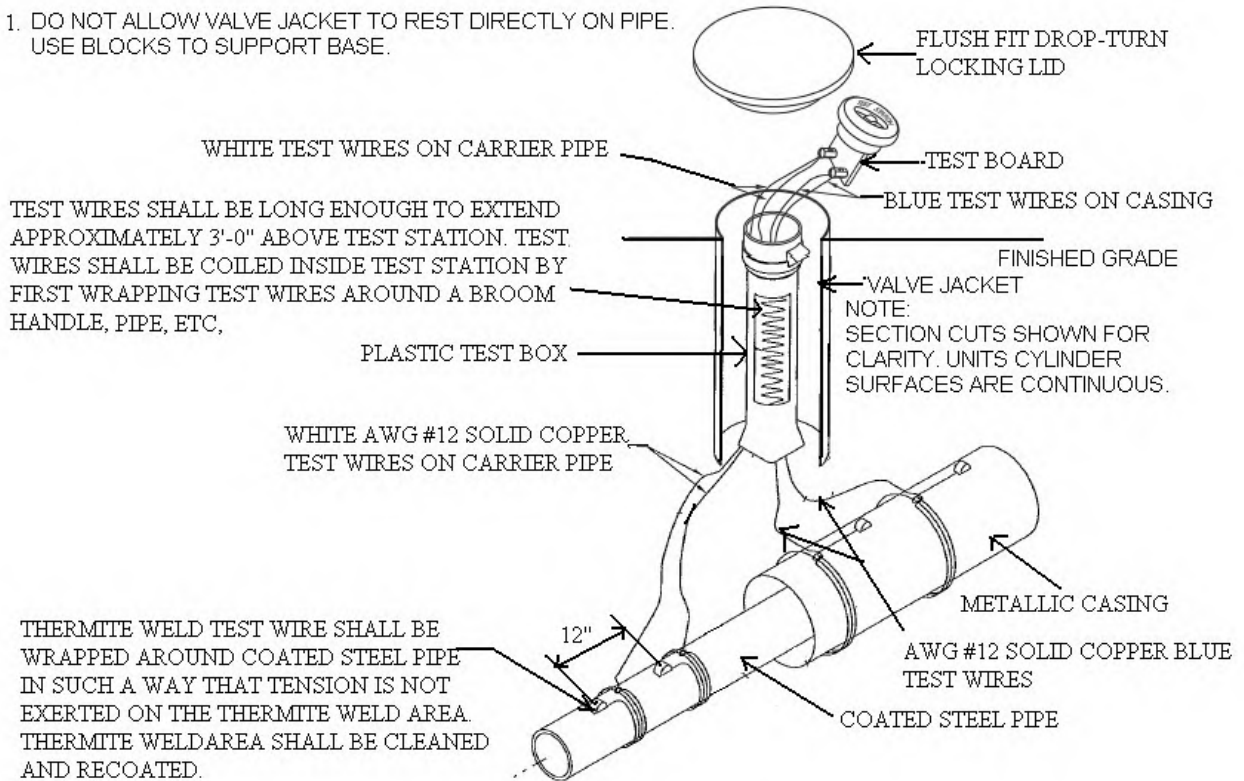


**Materials List**

Item	Quantity	LCUB Item #	Description
1	1		AWG #12 solid copper red wire
2	1		AWG #6 solid copper red wire
3	1		AWG #12 solid copper white wire
4	1		AWG #6 solid copper white wire
5	1		AWG #12 solid copper green or orange wire
6	1		Plastic shaft test box
7	1		Permanent copper/copper sulfate electrode
8	1		Natural gas valve jacket
9	1		Natural gas valve jacket Lid

**Attachment C. Test station at casing along coated steel carrier pipe**

- DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

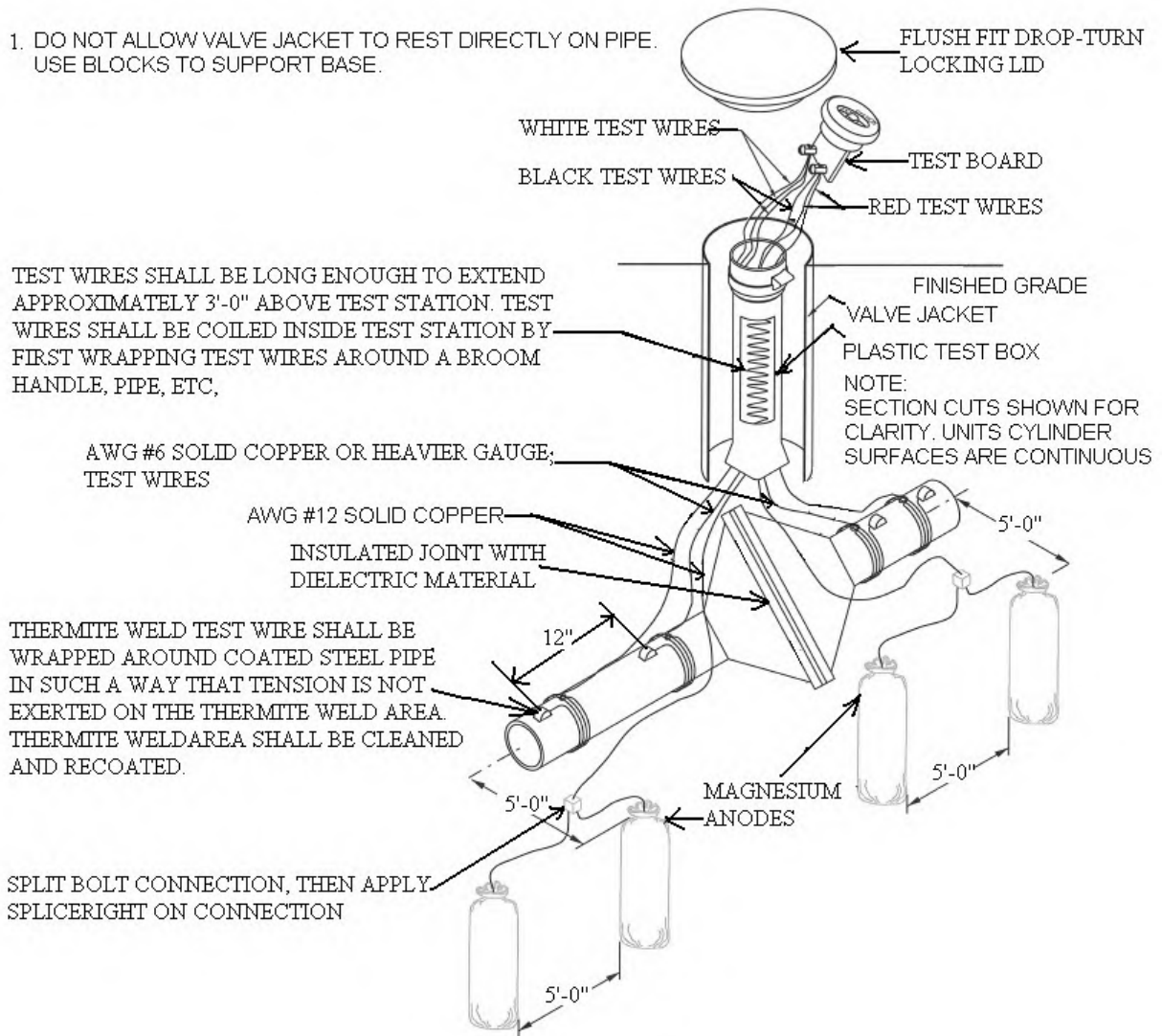


**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG # 12 solid copper blue wires
2	2		AWG #12 solid copper white wires
3	1		Plastic shaft test box
4	1		Natural gas valve jacket
5	1		Natural gas valve jacket Lid

**Attachment D. Test station at insulated joint (flange) with anodes**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.



**Materials List**

Item	Quantity	LCUB Item #	Description
1	1		AWG #12 solid copper red wire
2	1		AWG #6 solid copper red wire
3	1		AWG #12 solid copper white wire
4	1		AWG #6 solid copper white wire
5	1		Plastic shaft test box
6	4		Magnesium anodes
7	1		Cable splice kit (SpliceRight) by Royston
8	1		Natural gas valve jacket and locking lid
9	2		Split bolts

**Attachment E. Test station on pipe with monolithic insulator**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

RED TEST WIRES CONNECTED TO PIPE ON LEFT SIDE OF ISOLATOR.  
BLACK TEST WIRES (AWG #12) FROM MAGNESIUM ANODES

FLUSH FIT DROP-TURN LOCKING LID

WHITE TEST WIRES CONNECTED TO PIPE ON THE RIGHT SIDE OF ISOLATOR

TEST WIRES SHALL BE LONG ENOUGH TO EXTEND APPROXIMATELY 3'-0" ABOVE TEST STATION. TEST WIRES SHALL BE COILED INSIDE TEST STATION BY FIRST WRAPPING TEST WIRES AROUND A BROOM HANDLE, PIPE, ETC,

FINISHED GRADE  
VALVE JACKET  
NOTE: SECTION CUTS SHOWN FOR CLARITY. UNITS CYLINDER SURFACES ARE CONTINUOUS.

PLASTIC TEST BOX

AWG #12 SOLID COPPER TEST WIRES;

AWG #6 SOLID COPPER OR HEAVIER GAUGE TEST WIRES

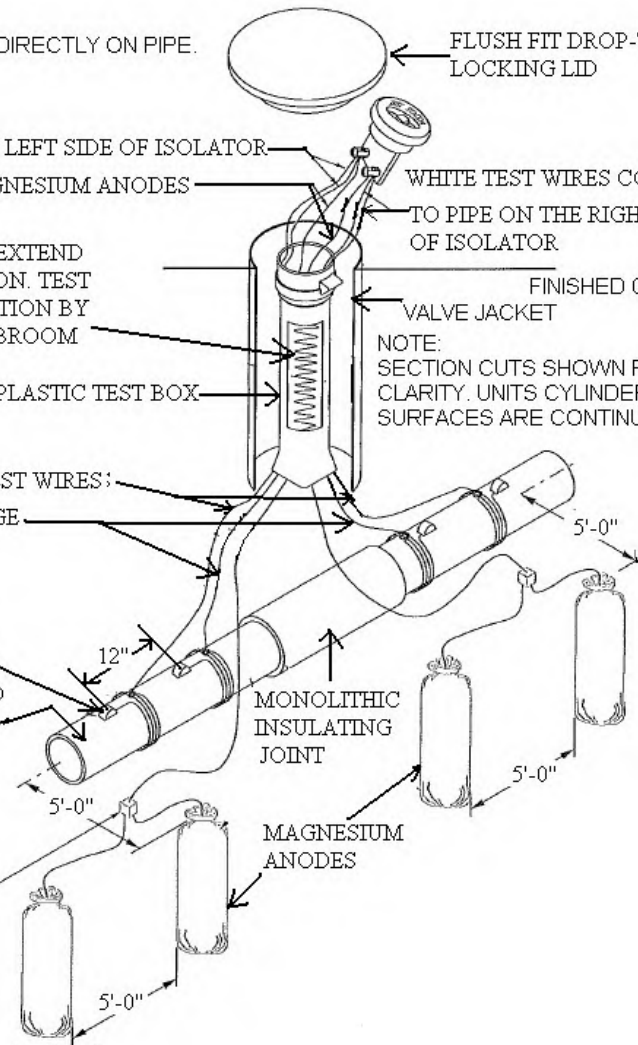
THERMITE WELD TEST WIRE SHALL BE WRAPPED AROUND COATED STEEL PIPE IN SUCH A WAY THAT TENSION IS NOT EXERTED ON THE THERMITE WELD AREA. THERMITE WELD AREA SHALL BE CLEANED AND RECOATED.

COATED STEEL PIPE

MONOLITHIC INSULATING JOINT

MAGNESIUM ANODES

SPLIT BOLT CONNECTION, THEN APPLY SPLICE RIGHT ON CONNECTION

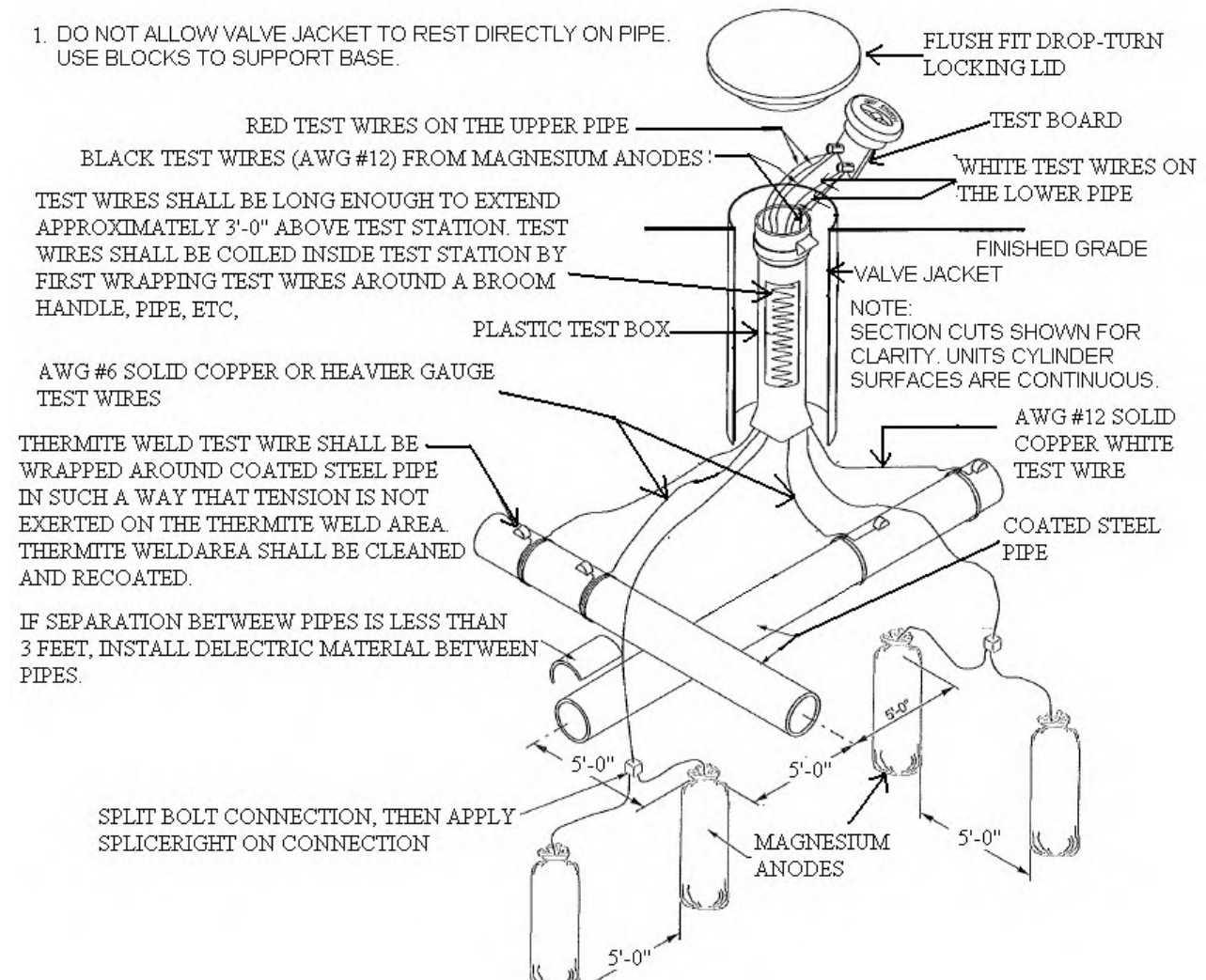


**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper red wires
2	2		AWG #12 solid copper white wires
3	2		AWG #12 solid copper black wires
4	2		Split bolts
5	4		Magnesium anodes
6	1		Plastic shaft test box
7	1		Cable splice kit (SpliceRight) by Royston
8	1		Natural gas valve jacket and locking lid
9	2		Split bolts

**Attachment F. Test station at crossing between two coated steel pipes**

- DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.



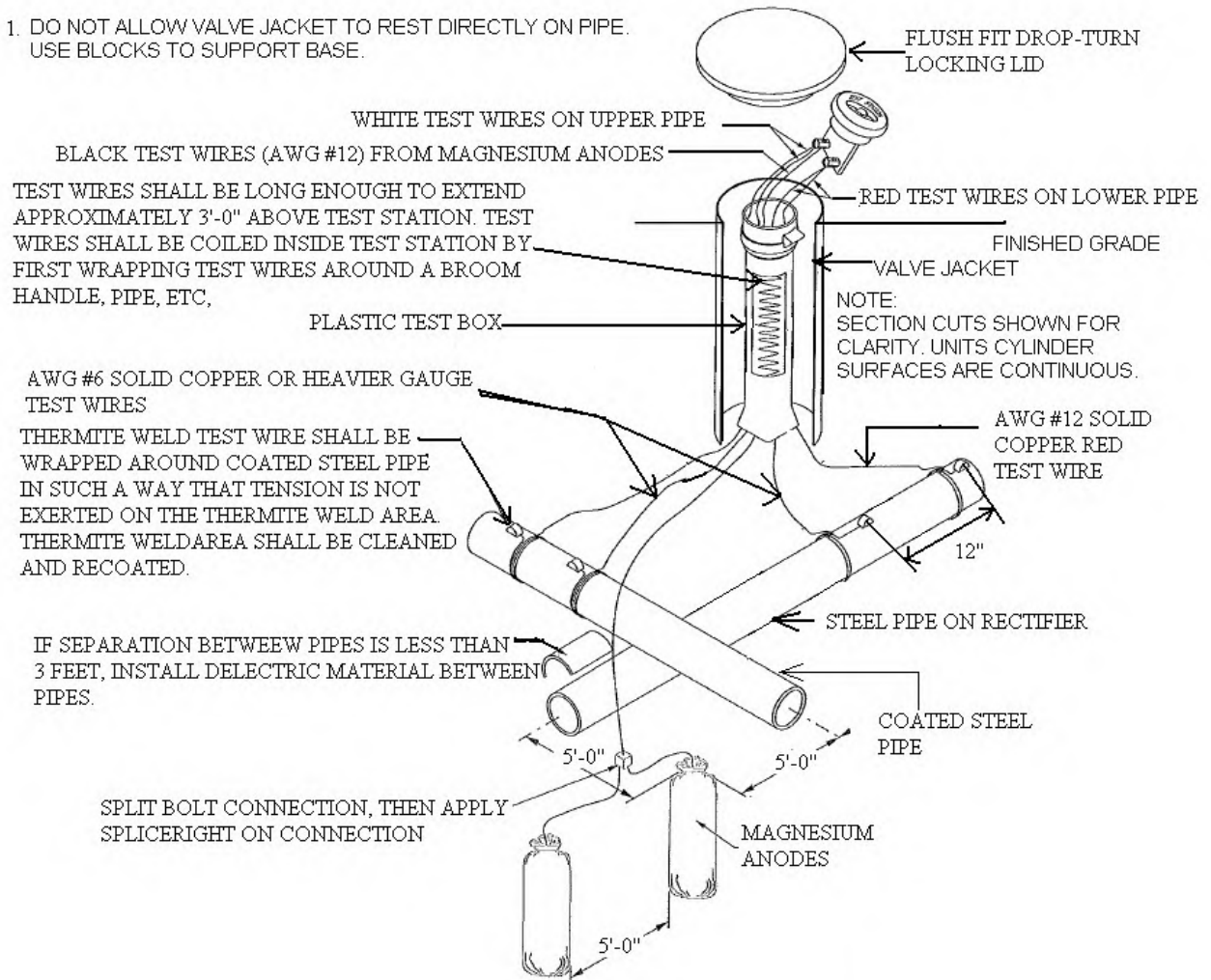
**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper red wires
2	2		AWG #12 solid copper white wires
3	2		AWG #12 solid copper black wires
4	2		Split bolts
5	4		Magnesium anodes
6	1		Plastic shaft test box
7	1		Half split cylinder (Insulator, plastics)
8	1		Cable splice kit (SpliceRight) by Royston
9	1		Natural gas valve jacket and locking lid
10	2		Split bolts



**Attachment G. Test station at crossing between a coated steel pipe on galvanic anodes and steel pipe on rectifier**

- DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

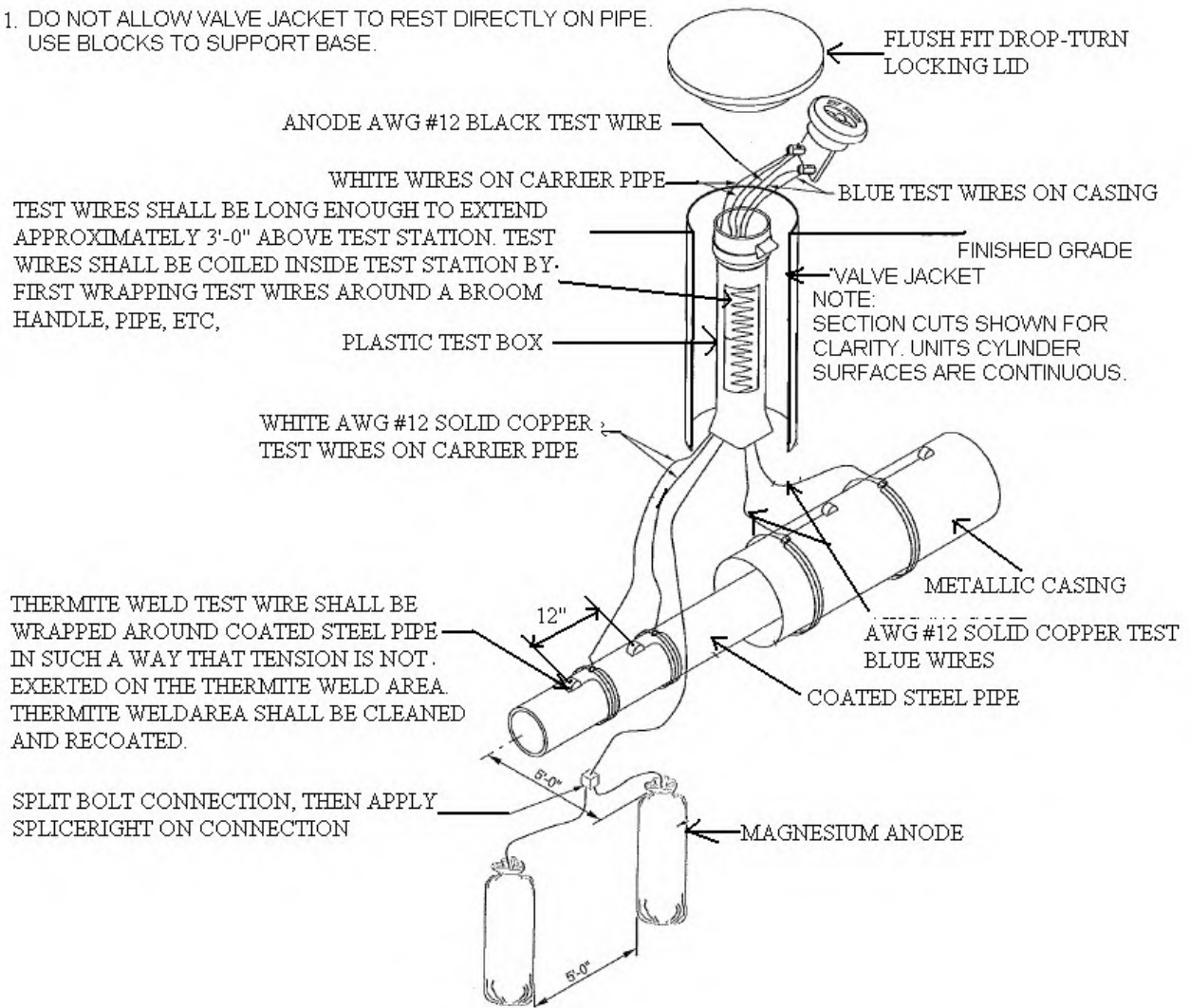


**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper red wires
2	2		AWG #12 solid copper white wires
3	1		AWG #12 solid copper black wire
4	1		Split bolts
5	2		Magnesium anodes
6	1		Plastic shaft test box
7	1		Half split cylinder (Insulator, plastics)
8	1		Cable splice kit (SpliceRight)
9	1		Natural gas valve jacket and locking lid

**Attachment H. Test station with anodes at casing along coated steel carrier pipe**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

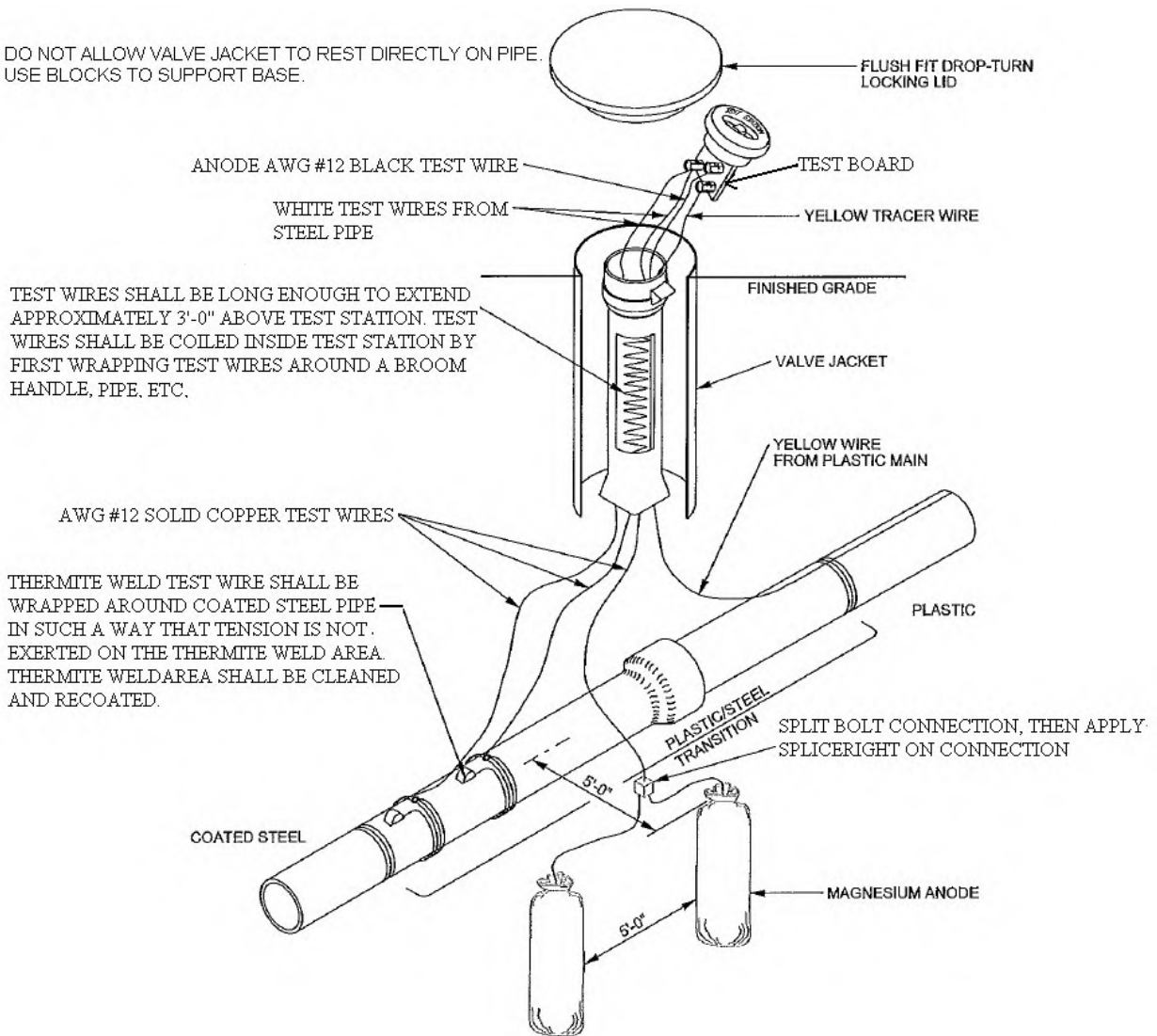


**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper blue wires
2	2		AWG #12 solid copper white wires
3	1		AWG #12 solid copper black wire
4	1		Split bolt
5	2		Magnesium anodes
6	1		Plastic shaft test box
7	1		Cable splice kit (SpliceRight)
8	1		Natural gas valve jacket and locking lid

**Attachment I. Test station at transition between plastic and coated steel pipe**

- DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

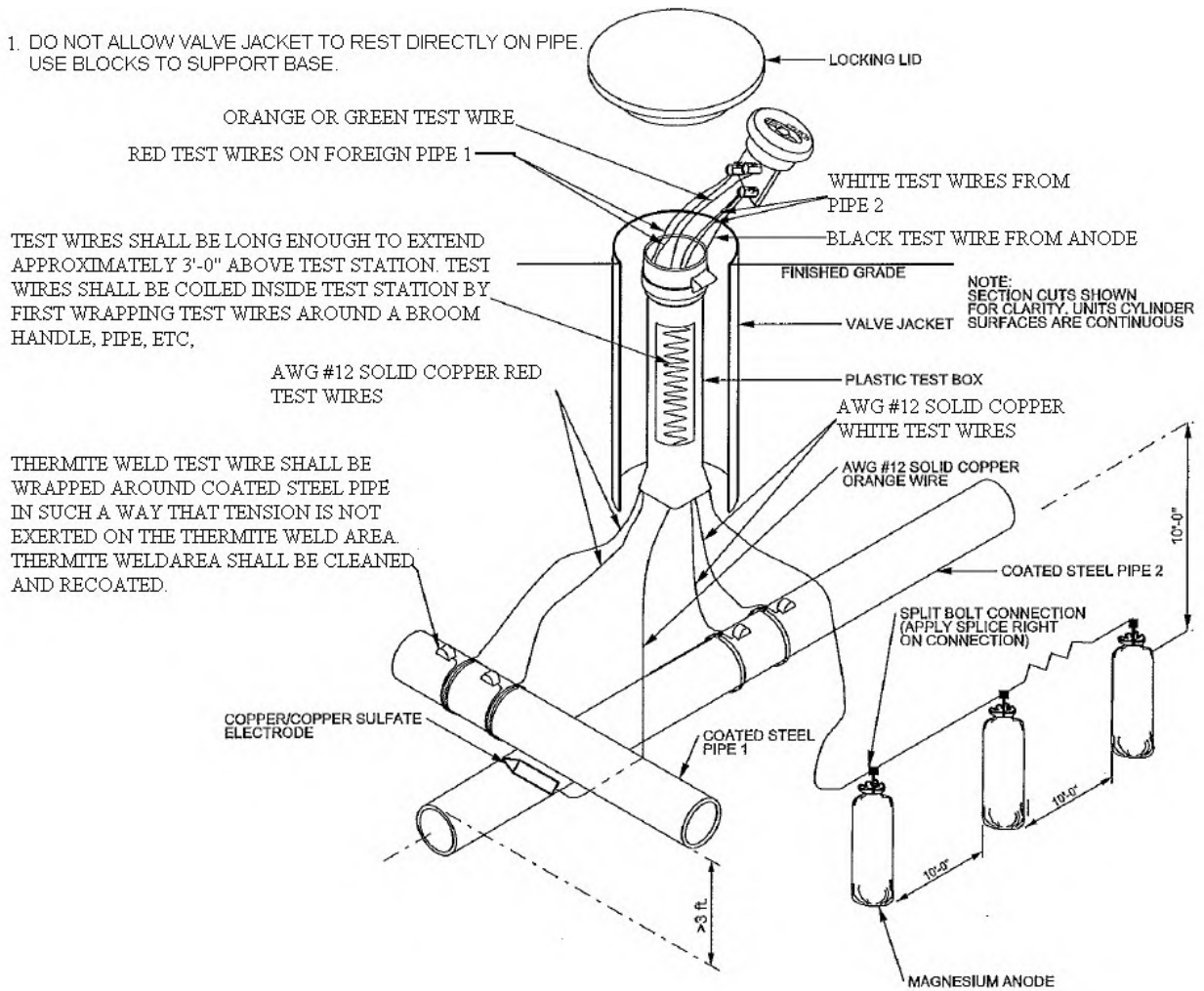


**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper yellow wires
2	2		AWG #12 solid copper white wires
3	1		AWG #12 solid copper black wire
4	1		Split bolt
5	2		Magnesium anodes
6	1		Plastic shaft test box
7	1		Natural gas valve jacket and locking lid
8	1		Cable splice kit (SpliceRight)

**Attachment J. Test station at foreign line crossing with multiple anodes on LCUB's gas main**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.



**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper red wires
2	2		AWG #12 solid copper white wires
3	1		AWG #12 solid copper black wire
4	3		Split bolts
5	≥ 3		Magnesium anodes
6	1		Plastic shaft test box
7	1		Natural gas valve jacket and locking lid
8	1		Permanent Cu/CuSO4 Electrode

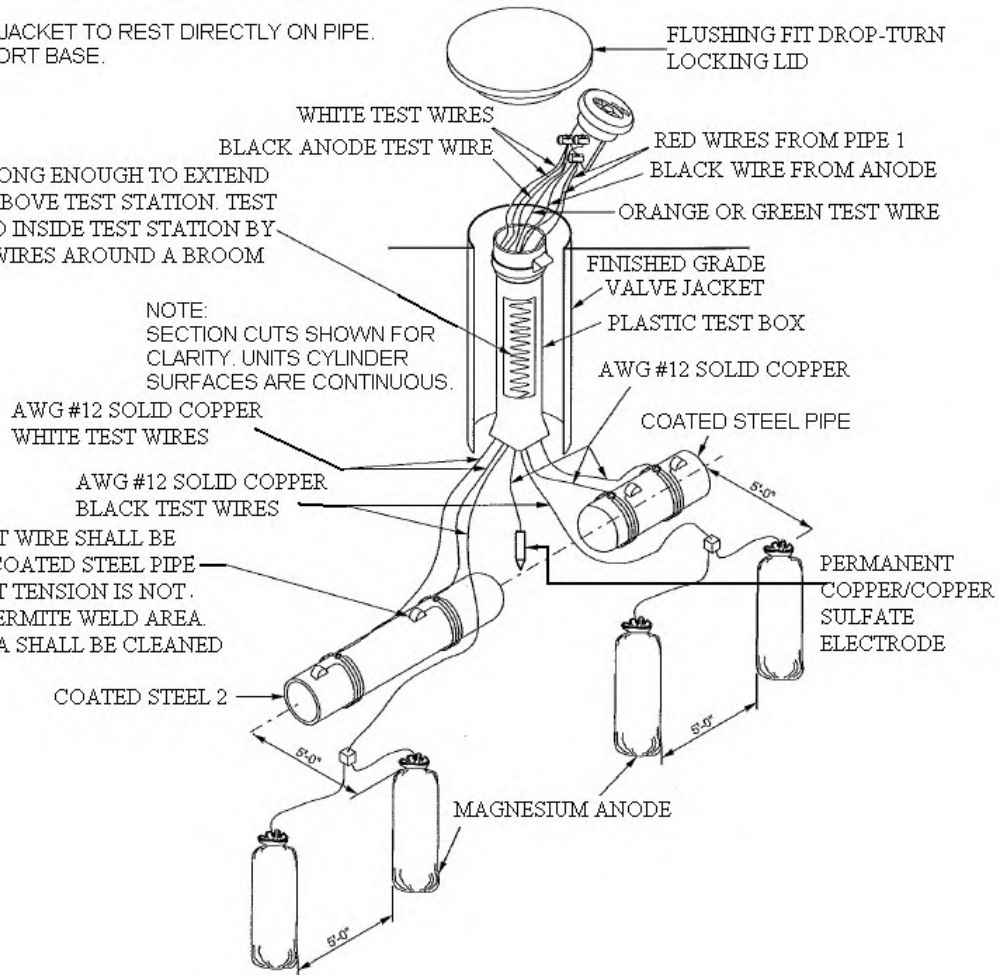
**Attachment K. Test station at location between two parallel and unconnected natural gas coated steel mains (Galvanic CP)**

1. DO NOT ALLOW VALVE JACKET TO REST DIRECTLY ON PIPE. USE BLOCKS TO SUPPORT BASE.

TEST WIRES SHALL BE LONG ENOUGH TO EXTEND APPROXIMATELY 3'-0" ABOVE TEST STATION. TEST WIRES SHALL BE COILED INSIDE TEST STATION BY FIRST WRAPPING TEST WIRES AROUND A BROOM HANDLE, PIPE, ETC.

NOTE: SECTION CUTS SHOWN FOR CLARITY. UNITS CYLINDER SURFACES ARE CONTINUOUS.

THERMITE WELD TEST WIRE SHALL BE WRAPPED AROUND COATED STEEL PIPE IN SUCH A WAY THAT TENSION IS NOT EXERTED ON THE THERMITE WELD AREA. THERMITE WELD AREA SHALL BE CLEANED AND RECOATED.



**Materials List**

Item	Quantity	LCUB Item #	Description
1	2		AWG #12 solid copper red wires
2	2		AWG #12 solid copper white wires
3	1		AWG #12 solid copper black wire
4	2		Split bolts
5	4		Magnesium anodes
6	1		Plastic shaft test box
7	1		Natural gas valve Jacket and Locking Lid
8	1		Permanent Cu/CuSO4 Electrode

End of Section

**SECTION 33720  
NATURAL GAS POLYETHYLENE PIPE INSTALLATION**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Proper installation of polyethylene piping is imperative for a long and trouble-free service life. Since polyethylene has less inherent strength than steel, special care must be taken to minimize external stresses in polyethylene pipelines. It is especially important for construction personnel to carefully examine the installation and be able to recognize and correct potential stress points. Since polyethylene pipe will contract about one inch per 10 degree F. temperature change per 100 feet of unrestrained pipe, it is also imperative that allowances be made during construction for pipe contractions. This is especially critical when using mechanical couplings or inserting polyethylene pipe through abandoned pipe. In warm weather, polyethylene should be allowed to cool to ground temperature before making final tie-ins. When possible, keep pipe in a compressive mode. **Polyethylene pipe shall not be installed above ground whether exposed or inserted in an above ground casing.**

**PART 2 PARTS**

Not Used.

**PART 3 EXECUTION**

**3.01 TRENCHING, LAYING, AND BACKFILLING - DIRECT BURIAL**

- A. Natural gas lines shall be installed in locations to provide a minimum of 24 inches of horizontal separation between any other underground structure and 24 inches of vertical clearance between all other existing utilities.
- B. When trenching, an appropriate trench width shall be provided in order to perform a close examination of sidewalls and contour of trench line.
- C. Polyethylene pipe shall be laid and continuously supported on undisturbed or well-compacted soil. Do not use blocks or allow pipe to rest on rocks or large clods of dirt because this will set up shearing stresses in the pipe during backfilling.
- D. In rock excavation, pad the trench line with at least 4 inches of sand.
- E. Normal cover for polyethylene mains within the street right-of-way shall be as listed in paragraph 3.09. Normal cover for service lines shall be as required in Section 33345. Any installation at less than the normal cover shall be approved by the OWNER.
- F. When fusing coil ends, join the coils so that the curvature of one coil is directly opposite the curvature of the other coil. This will minimize bending stresses at that joint.

- G. Allow fusion joints to cool as required in the pipe manufacturer's joining procedures before stressing pipe either by lowering into trench or pressure testing.
- H. When lowering pipe in trench, pipe shall not be subjected to excessive twisting and bending stresses. At low temperatures, flexibility of the piping is greatly reduced and could be damaged by excessive force.
- I. Allow for contraction by "snaking" pipe from one side of the trench to the other.
- J. Prior to beginning backfilling, the entire trench shall be examined to make sure the pipe is continuously supported at all points on undisturbed or well-compacted soil.
- K. Initial backfill material should be placed and compacted in layers. Backfill material within 6 inches of the pipe shall be free from refuse, large rocks, sharp rocks, large dirt clods, construction debris, stumps, trash, or any material that could cause damage to the pipe. The particle size shall not exceed the following: ½ inch for pipe to 4 inch, ¾" for pipe 6 to 8 inch, 1 inch for pipes 10 to 16 inch and 1 ½" for larger pipes.
- L. Backfill material at least 6 inches from the polyethylene pipe should be placed and spread in approximately uniform layers in a manner as to fill the trench completely. Large rocks, clods and other debris greater than 3 inches in diameter shall be removed. When compacting backfill, special care shall be exercised to prevent damage to the polyethylene pipe. When heavy equipment (such as hydrohammers, vehicle wheels, etc.) is used to compact backfill, provide a cushion of at least 12-inches of backfill. Pressurizing the pipe prior to backfill will also help prevent crushing of the pipe.
- M. Backfill materials and practices should be in compliance with ASTM D2774, "Standard Practice for Installation of Thermoplastic Pressure Piping".
- N. A tracer wire of #12 coated copper clad steel shall be installed with all buried polyethylene mains and services. The tracer wire shall be laid within 6-inches of the polyethylene pipe where practical and directly above if possible.
- O. When transporting welded pipe segments to open trench, special care should be taken not to drag pipe over rough ground or roadway that can damage pipe.
- P. Special care should be given during construction to keep debris out of the pipeline. Sealing the ends of the pipeline or fusing caps on the ends of the pipeline during construction should be done at a minimum to keep debris out of the pipeline.
- Q. All installations methods which place a tensile load on polyethylene pipe shall be done in accordance with ASTM F1804, "Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe during Pull-in Installation".

### 3.02 SERVICE LINES

See Section 33345

### 3.03 BORING

See Section 02415, Horizontal Directional Drilling and Boring  
See Section 02546, Boring and Casing for Gas Lines

### 3.04 CATHODIC PROTECTION OF METALLIC COMPONENTS IN POLYETHYLENE SYSTEMS

All metallic valves, couplings, and other metallic fittings used in polyethylene systems shall be factory or field coated and cathodically protected. Anodes shall be installed to protect these metallic fittings.

### 3.05 TIE-INS

- A. When tying into an existing polyethylene system, the preferable tie-in method shall be by heat fusion. All tie-ins using mechanical fittings shall be approved by the Owner.
- B. Normally, when tying into existing steel systems, the preferable tie-in method shall be to use a factory-fabricated transition fitting that is arc-welded to the steel pipe and heat-fused to the polyethylene. The transition between steel and polyethylene shall rest on undisturbed or well-compacted soil. Precautions need to be taken to prevent excessive heat build-up on transition fitting during arc welding to protect integrity of polyethylene portion.
- C. All squeezing-offs of polyethylene pipe shall be in accordance with acceptable industry standards and manufacturer recommendations as approved by the OWNER. Squeeze off tools shall comply with ASTM F1563, "Standard for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing".

### 3.06 USE OF CLEANING "PIGS"

Cleaning pigs shall be used on all main extensions prior to final tie-in to ensure that no debris is in the pipeline. OWNER'S Resident Project Representative shall be on site when pigging to ensure that all debris has been removed from pipeline.

### 3.07 TESTING

- A. All mains shall be tested at a minimum of 100 psig for the duration required in 3.08 C.
- B. The test procedure shall insure discovery of all leaks in the segment being tested. If required by OWNER, CONTRACTOR shall submit a plan detailing the proposed test, which would include a sketch of the main to be tested, valve locations and the location of test gages and pressure recording charts. The plan must be approved by OWNER prior to testing.
- C. Test duration: All main line piping shall be tested for a 24-hour period and charted unless otherwise directed by Owner's Resident Project Representative.
- D. An approved electronic pressure testing instrument with GPS capability (Kuhlman K2 or other Owner approved) shall be used for testing all mains. The Contractor shall provide a printout documenting the successful test for each main.



- E. The gauge used for testing shall be 200 psig maximum measured in no more than 2 pound increments.
- F. No testing shall be conducted against active valves.
- G. The final tie-in joint shall be soap-tested at system operating pressure.

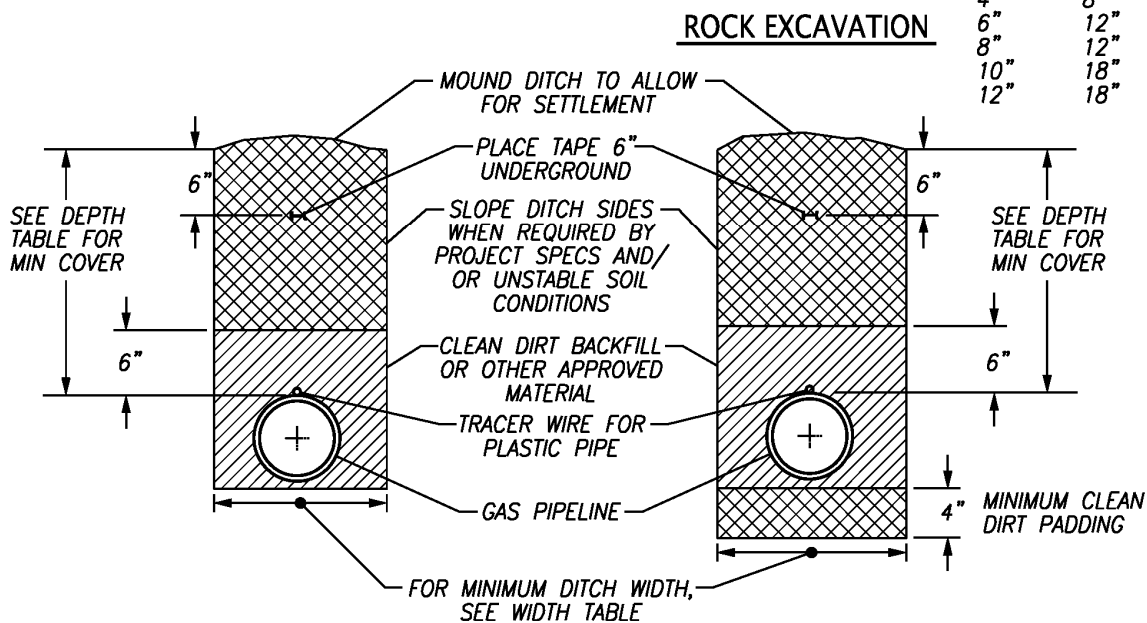
### 3.09 INSTALLATION DEPTHS

A. Mains shall be installed to the standard depths as listed in the following tables. Depth shall be measured from ground level to the top of the main.

	State Right-of-Way	LCUB/Loudon County Right-of-Way	Customer Property/ LCUB Easement
Standard Depth	36 inches	30 inches	36 inches
MFSS Minimum Depth	24 inches	24 inches	24 inches
Maximum Depth	60 inches	60 inches	60 inches

#### WIDTH TABLE

PIPE SIZE	DITCH WIDTH	
	DIRT (MIN)	ROCK (MIN)
≤2"	6"	12"
3"	8"	12"
4"	8"	12"
6"	12"	18"
8"	12"	18"
10"	18"	24"
12"	18"	24"

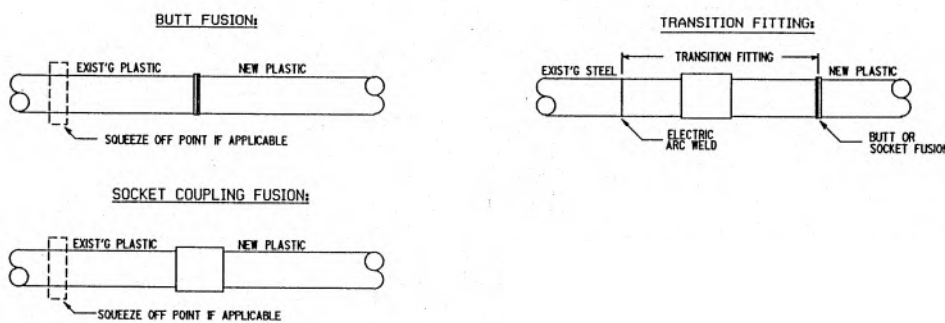


Notes:

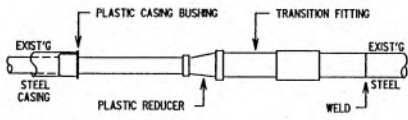
- I. Trench to be backfilled and compacted in accordance with local governing body and/ or project specifications.
- II. **Warning tape shall be installed directly above the gas main or service, 6 inches below the finished grade.**

**3.10 UNDERGROUND CLEARANCE**

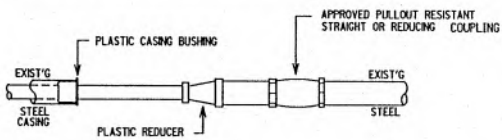
- A. Each main or service line must be installed with at least 24 inches of horizontal separation between any other underground structure and 24 inches of vertical clearance from any other existing utility. If this separation or clearance cannot be attained, the line must be protected from damage that might result from the proximity of the other structure or utility.
- B. Each main or service line must be installed with enough horizontal separation from any other underground structure to allow proper maintenance and to protect against damage that might result from proximity to other structures.
- C. In addition to meeting the requirements of paragraph A or B of this section, each plastic main or service line main must be installed with sufficient horizontal separation and vertical clearance, or must be insulated, from any source of heat so as to prevent the heat from impairing the serviceability of the pipe.



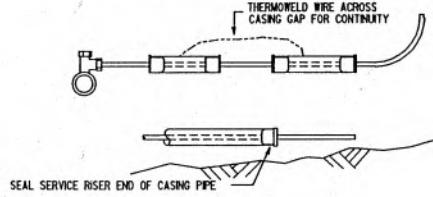
**ALL FUSED AND WELDED TIE-IN**



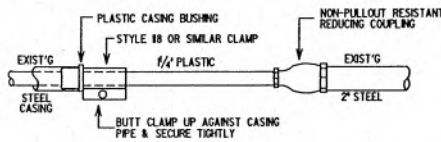
**APPROVED PULLOUT RESISTANT MECHANICAL COUPLING TIE-IN**



**TYPICAL INSERTED SERVICE LINE**

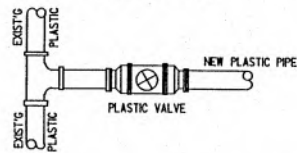


**TYPICAL APPROVED APPLICATION OF NON-PULLOUT RESISTANT MECHANICAL COUPLING FOR SLEEVING 2" MAIN WITH 1/4" PLASTIC**

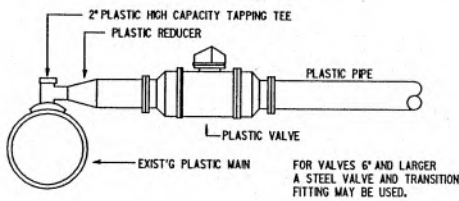


NOTES:  
1- COMPACT SIDEFILLS AROUND PROTECTIVE BRIDGING SLEEVE.

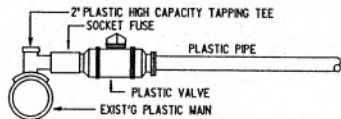
**LATERAL CONNECTION TO PLASTIC MAIN OF SAME DIAMETER**



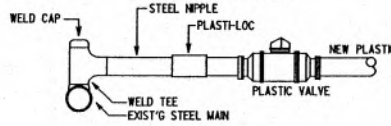
**LATERAL CONNECTION TO PLASTIC MAIN OF LARGER DIAMETER**



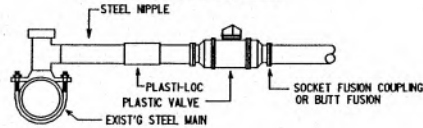
**2" LATERAL CONNECTION TO PLASTIC MAIN OF SAME OR LARGER DIAMETER**

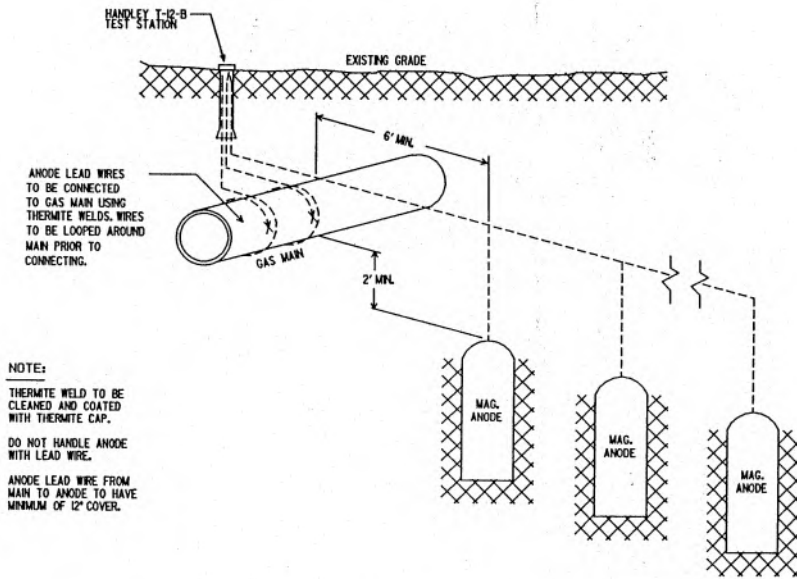


**LATERAL CONNECTION TO STEEL OF SAME DIAMETER**

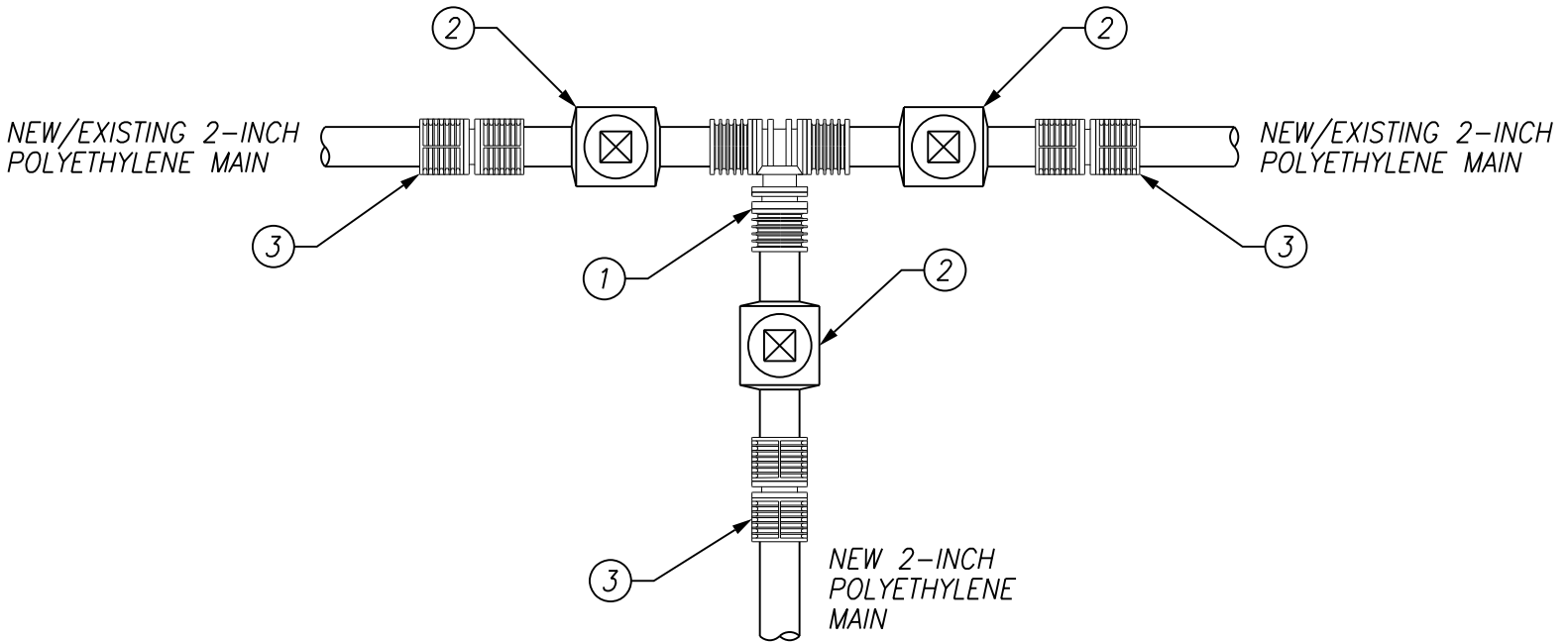


**LATERAL CONNECTION TO STEEL MAIN OF LARGER DIAMETER**





End of Section



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1280	2-INCH POLYETHYLENE MECHANICAL TEE
2	3	0400	2-INCH POLYETHYLENE VALVE
3	3	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING



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LENOIR CITY, TN 37772  
TELEPHONE 844.687.5282

APPROVED BY: LCUB

DRAWN BY: FMA

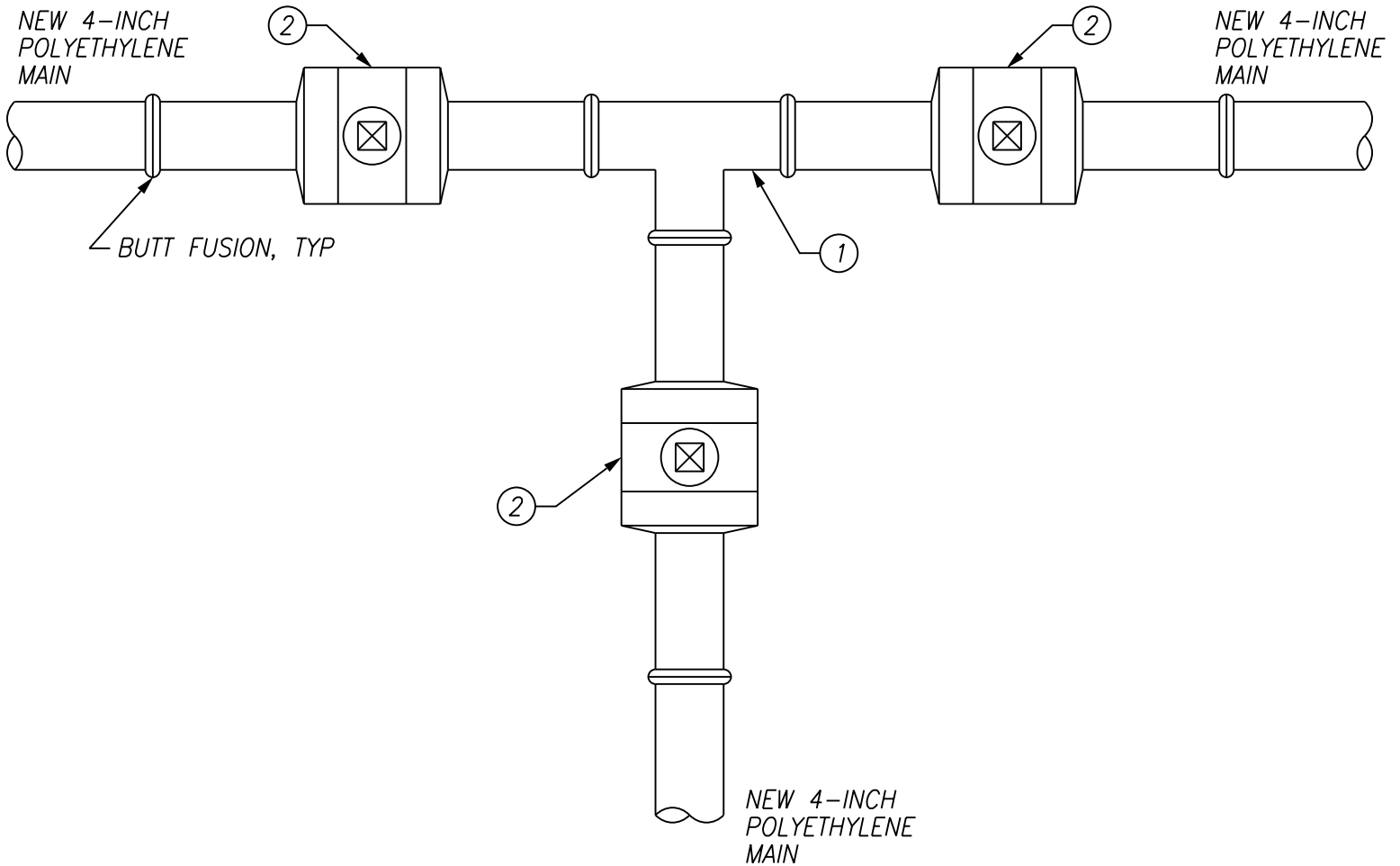
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**3-VALVE INSTALLATION  
ON NEW/EXISTING 2-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:

**G1**



NOTES:

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1215	4-INCH POLYETHYLENE TEE
2	3	0405	4-INCH POLYETHYLENE VALVE



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APPROVED BY: LCUB

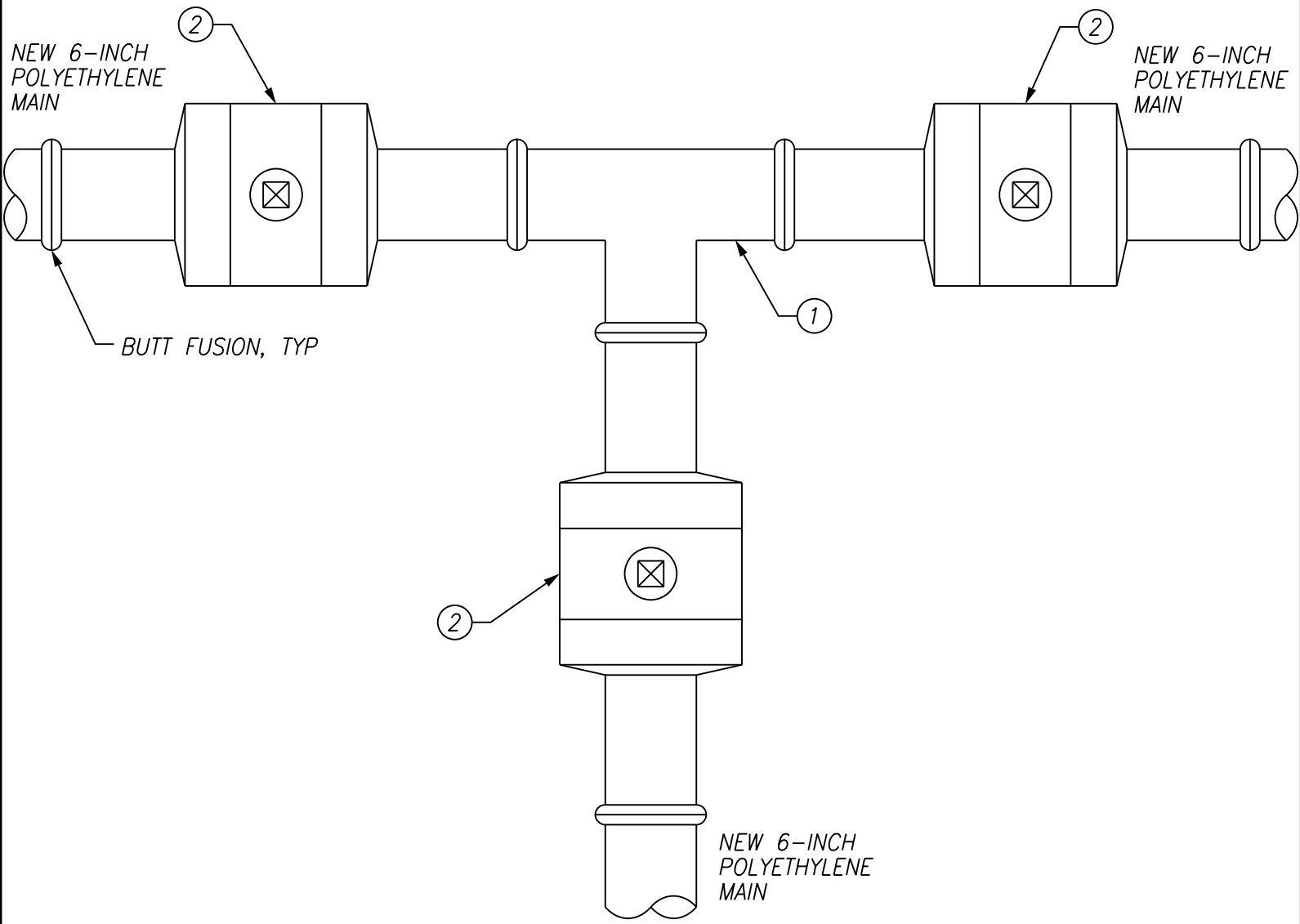
DRAWN BY: FMA

Scale: NTS

**3-VALVE INSTALLATION  
ON NEW 4-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G2**



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1220	6-INCH POLYETHYLENE TEE
2	3	0410	6-INCH POLYETHYLENE VALVE



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APPROVED BY: LCUB

DRAWN BY: FMA

Scale: NTS

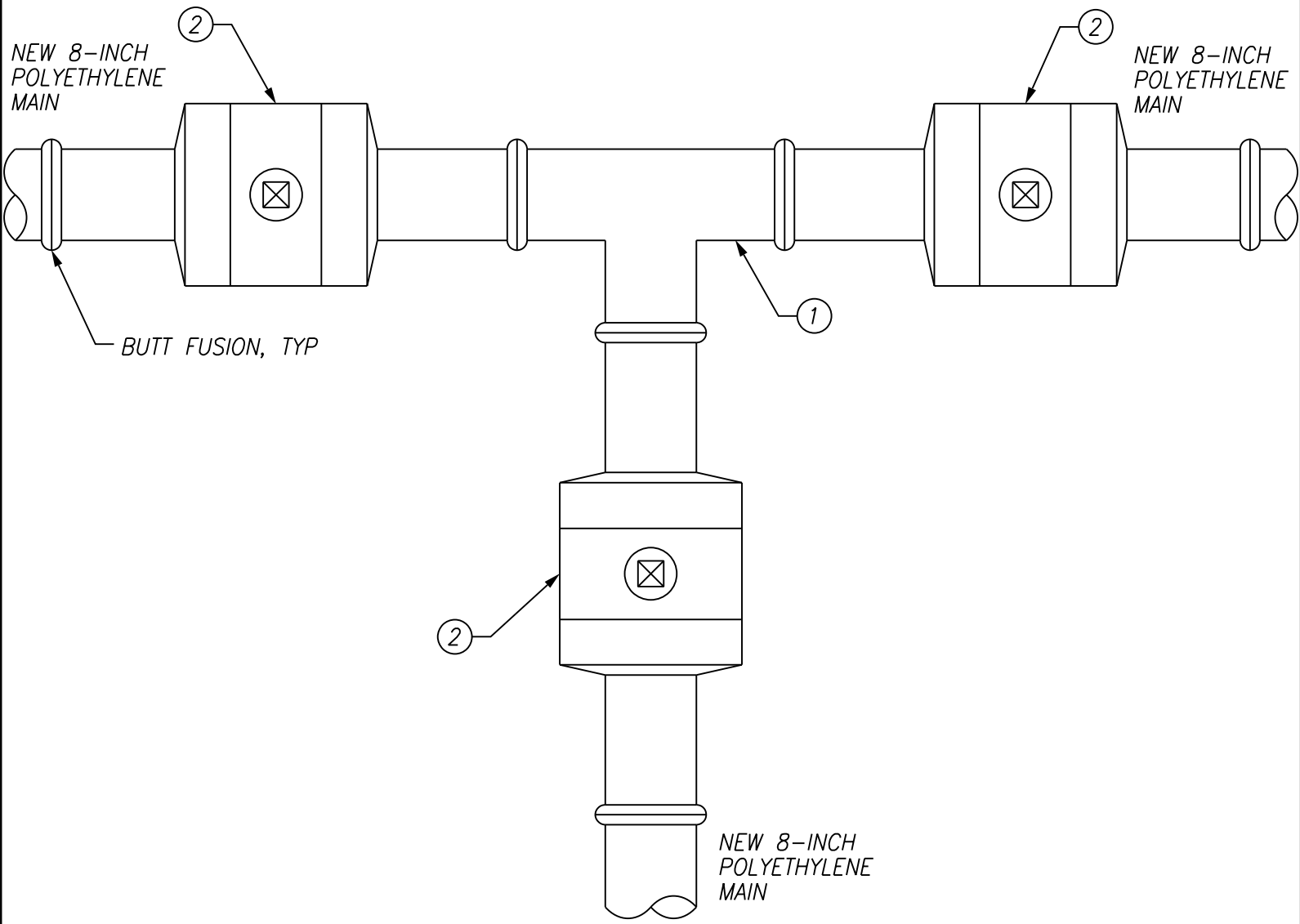
**3-VALVE INSTALLATION  
ON NEW 6-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:

**G3**





**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	8-INCH POLYETHYLENE TEE
2	3	-	8-INCH POLYETHYLENE VALVE

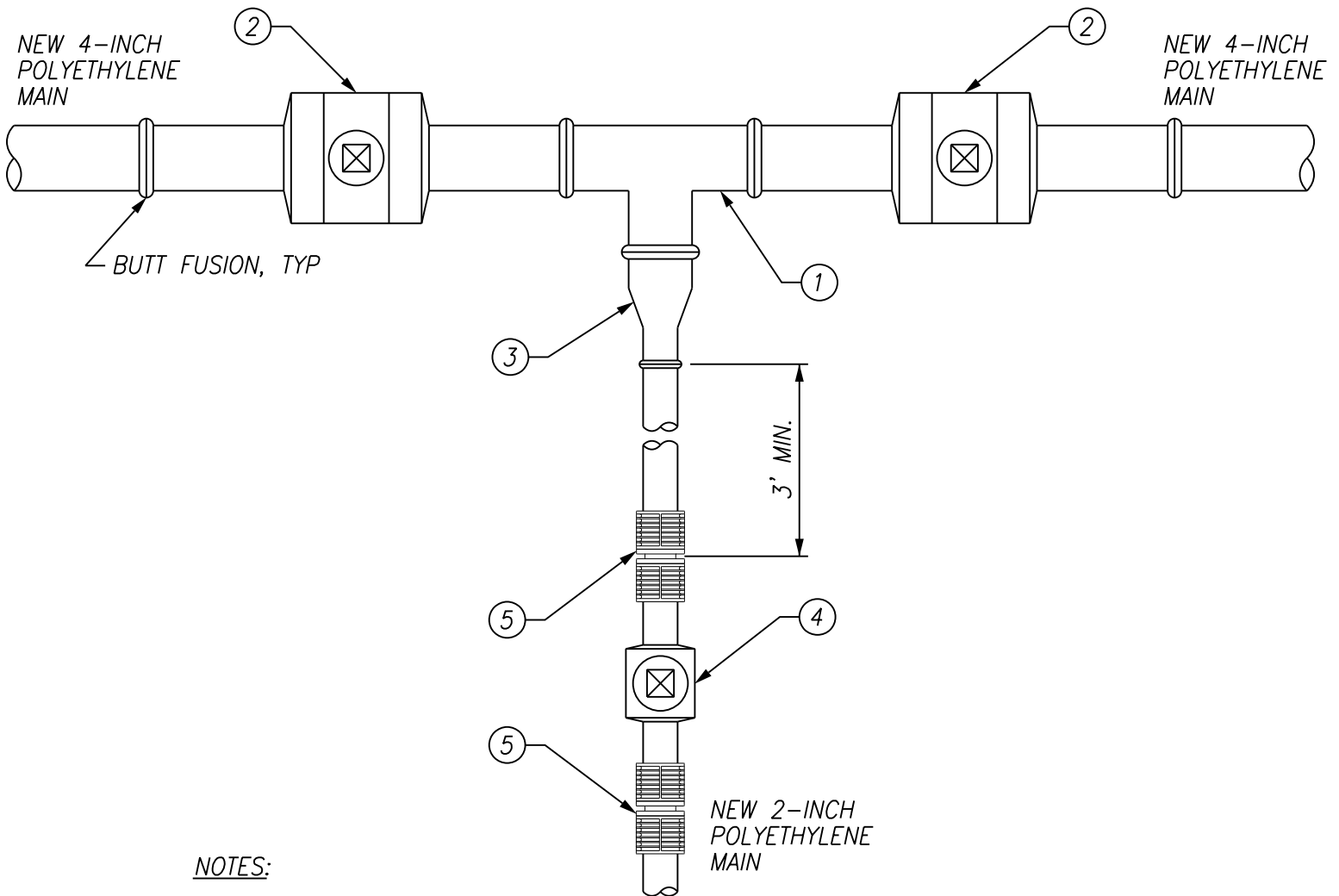


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APPROVED BY: LCUB      DRAWN BY: FMA      Scale: NTS

**3-VALVE INSTALLATION  
ON NEW 8-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17  
DRAWING NUMBER:  
**G4**



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 2-INCH CONNECTIONS MAY BE BUTT FUSION IN LIEU OF MECHANICAL AS APPROVED BY OWNER.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1215	4-INCH POLYETHYLENE BUTT FUSION TEE
2	2	0405	4-INCH POLYETHYLENE VALVE
3	1	0910	4-INCH X 2-INCH POLYETHYLENE REDUCER
4	1	0400	2-INCH POLYETHYLENE VALVE
5	2	1575	2-INCH MECHANICAL COUPLING



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TELEPHONE 844.687.5282

APPROVED BY: LCUB

DRAWN BY: FMA

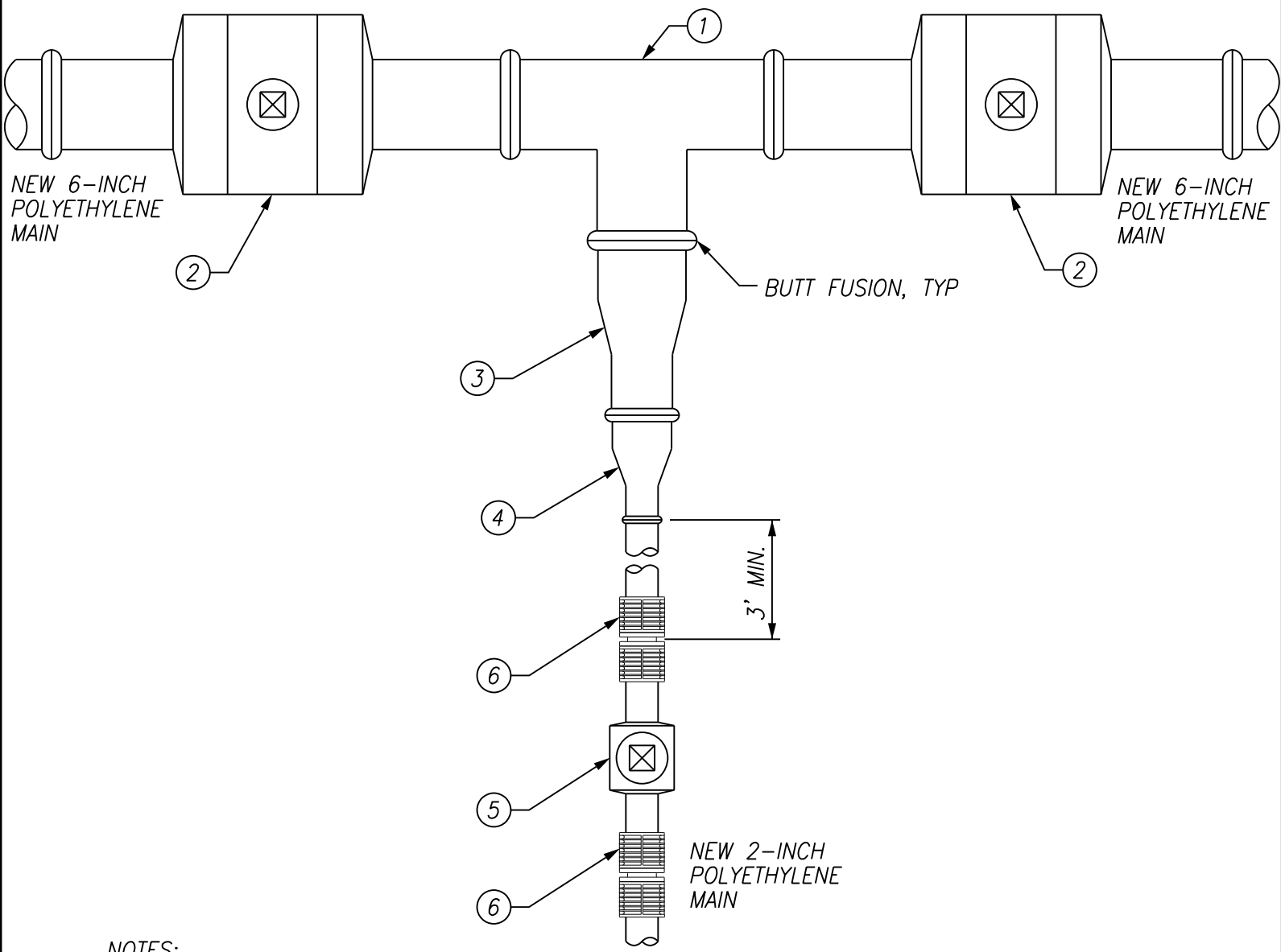
Scale: NTS

**3-VALVE INSTALLATION  
ON NEW 4-INCH TO 2-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:

**G5**



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 2-INCH CONNECTIONS MAY BE BUTT FUSION IN LIEU OF MECHANICAL AS APPROVED BY OWNER.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1220	6-INCH POLYETHYLENE BUTT FUSION TEE
2	2	0410	6-INCH POLYETHYLENE VALVE
3	1	0915	6-INCH X 4-INCH POLYETHYLENE REDUCER
4	1	0910	4-INCH X 2-INCH POLYETHYLENE REDUCER
5	1	0400	2-INCH POLYETHYLENE VALVE
6	2	1575	2-INCH MECHANICAL COUPLING



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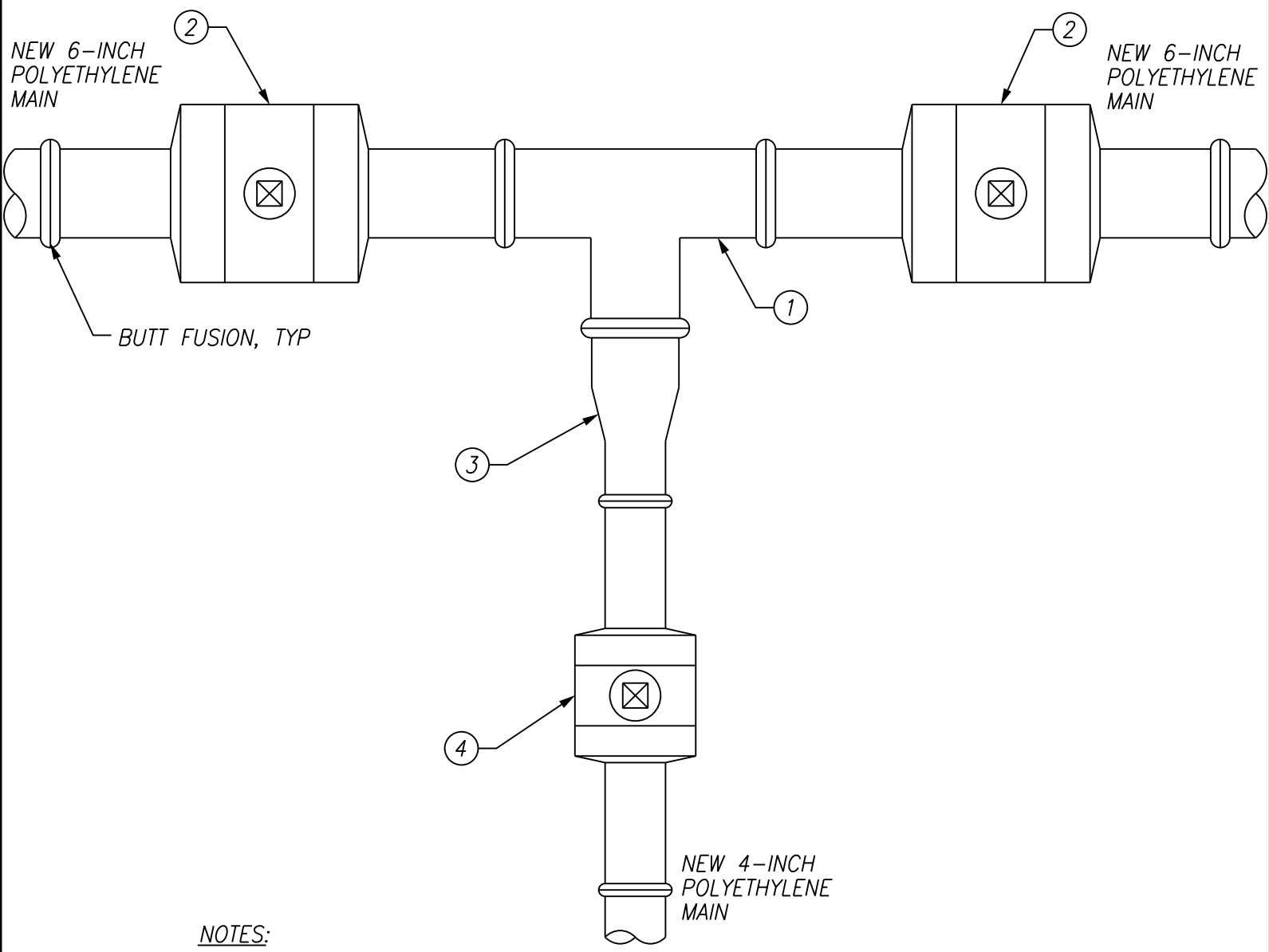
DRAWN BY: FMA

Scale: NTS

**3-VALVE INSTALLATION  
ON NEW 6-INCH TO 2-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G6**



NOTES:

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1220	6-INCH POLYETHYLENE BUTT FUSION TEE
2	2	0410	6-INCH POLYETHYLENE VALVE
3	1	0915	6-INCH X 4-INCH POLYETHYLENE REDUCER
4	1	0405	4-INCH POLYETHYLENE VALVE



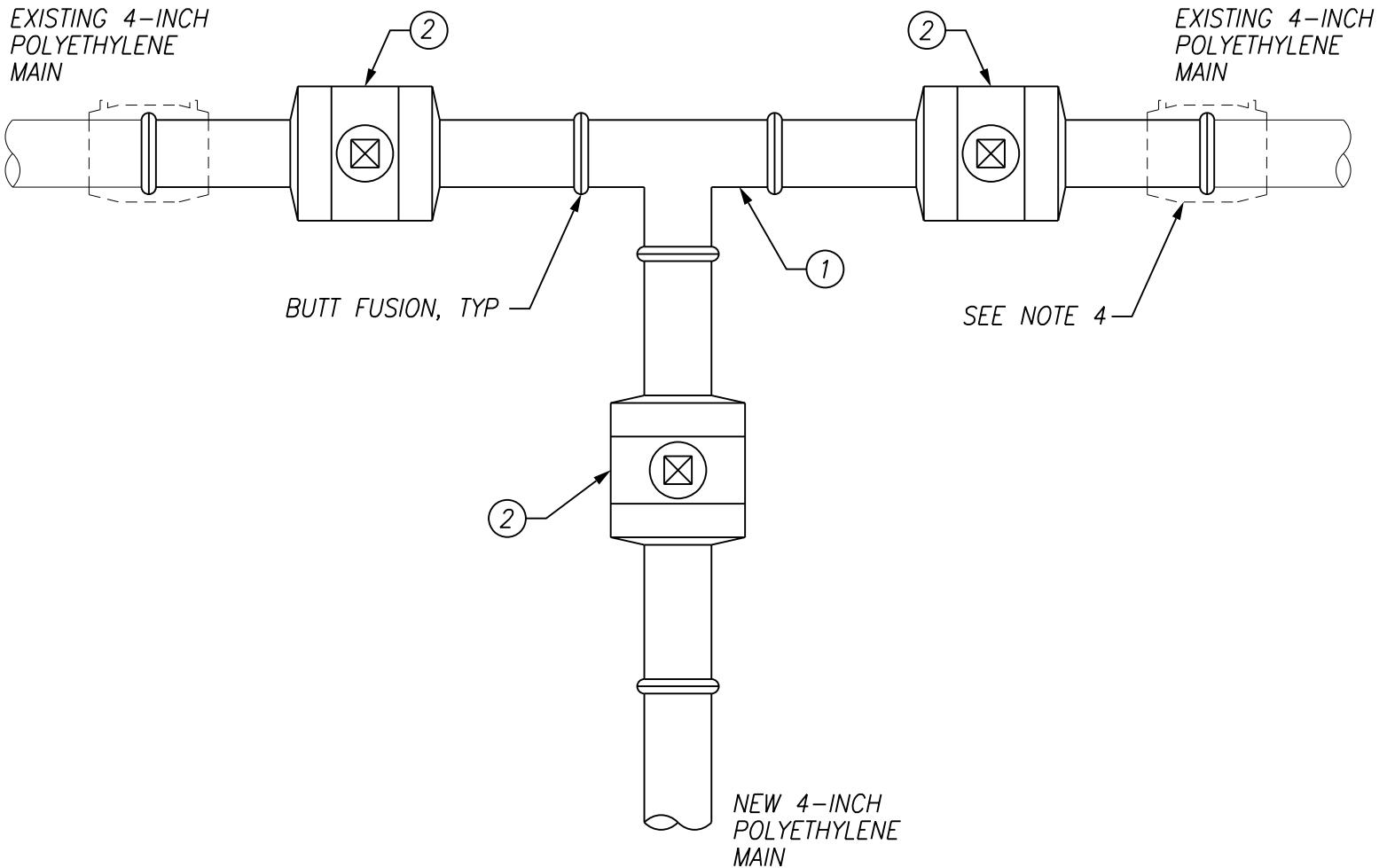
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LENOIR CITY, TN 37772  
TELEPHONE 844.687.5282

APPROVED BY: LCUB      DRAWN BY: FMA      Scale: NTS

**3-VALVE INSTALLATION  
ON NEW 6-INCH TO 4-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G7**



NOTES:

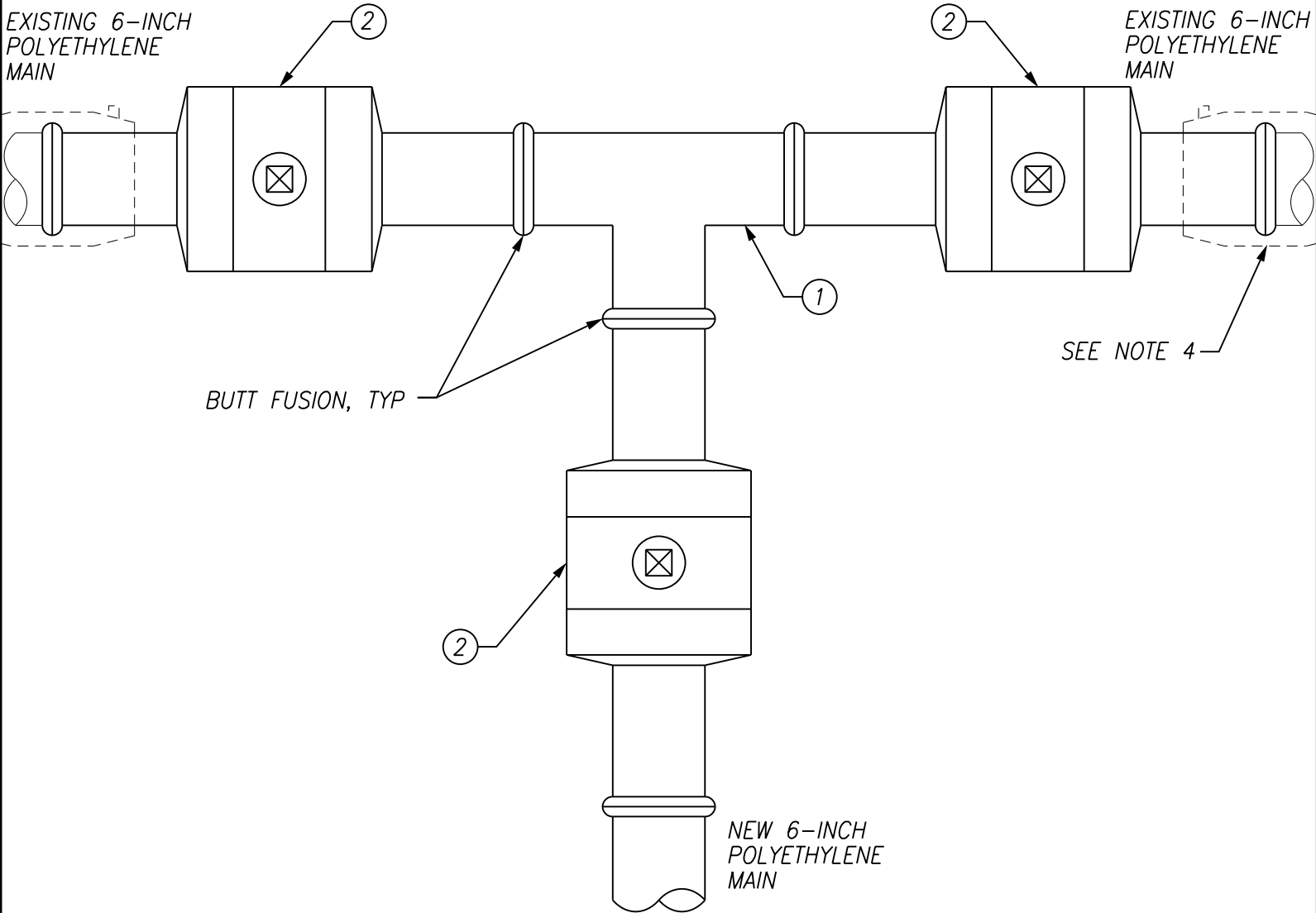
1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 4-INCH ELECTRO FUSION SLEEVES (LCUB ITEM #1590) MAY BE USED ON EACH SIDE OF 4-INCH VALVES TO BE INSTALLED ON THE EXISTING MAIN (REF. SPECIFICATION SECTION 33320, PART 1.01 C.).

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1215	4-INCH POLYETHYLENE TEE
2	3	0405	4-INCH POLYETHYLENE VALVE



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
NEW 4-INCH POLYETHYLENE MAIN AND VALVE ON EXISTING 4-INCH POLYETHYLENE MAIN				Date:	11/06/17
				DRAWING NUMBER:	G8



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 6-INCH ELECTRO FUSION SLEEVES (LCUB ITEM #1595) MAY BE USED ON EACH SIDE OF THE 6-INCH VALVES TO BE INSTALLED ON THE EXISTING MAIN (REF. SPECIFICATION SECTION 33320, PART 1.01 C.).

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1220	6-INCH POLYETHYLENE TEE
2	3	0410	6-INCH POLYETHYLENE VALVE



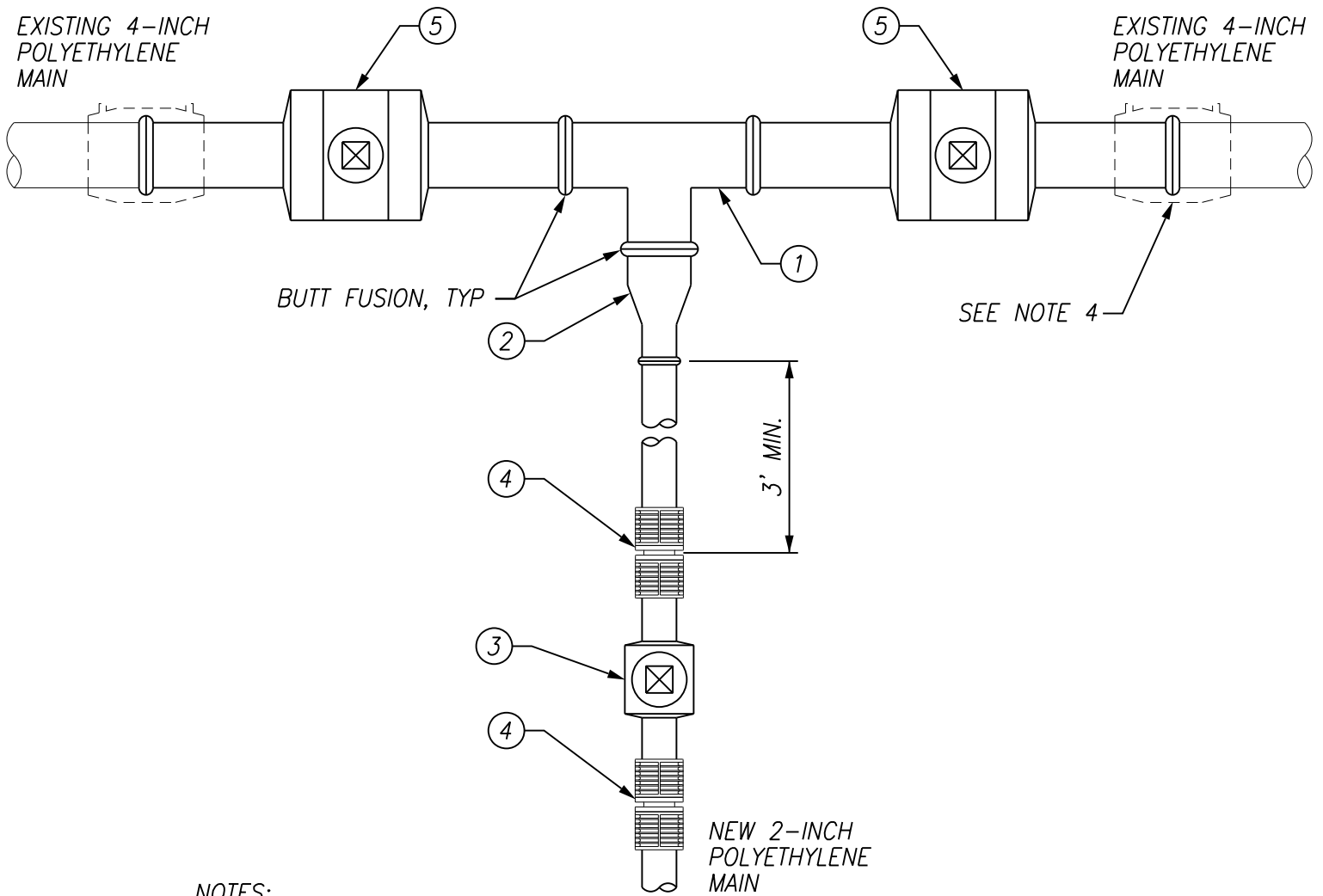
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APPROVED BY: LCUB      DRAWN BY: FMA      Scale: NTS

**NEW 6-INCH POLYETHYLENE MAIN AND VALVE ON EXISTING 6-INCH POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G9**



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 4-INCH ELECTRO FUSION SLEEVES (LCUB ITEM #1590) MAY BE USED ON EACH SIDE OF 4-INCH VALVES TO BE INSTALLED ON THE EXISTING MAIN (REF. SPECIFICATION SECTION 33320, PART 1.01 C.).

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1215	4-INCH POLYETHYLENE BUTT FUSION TEE
2	1	0910	4-INCH X 2-INCH POLYETHYLENE REDUCER
3	1	0400	2-INCH POLYETHYLENE VALVE
4	2	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING
5	2	0405	4-INCH POLYETHYLENE VALVE

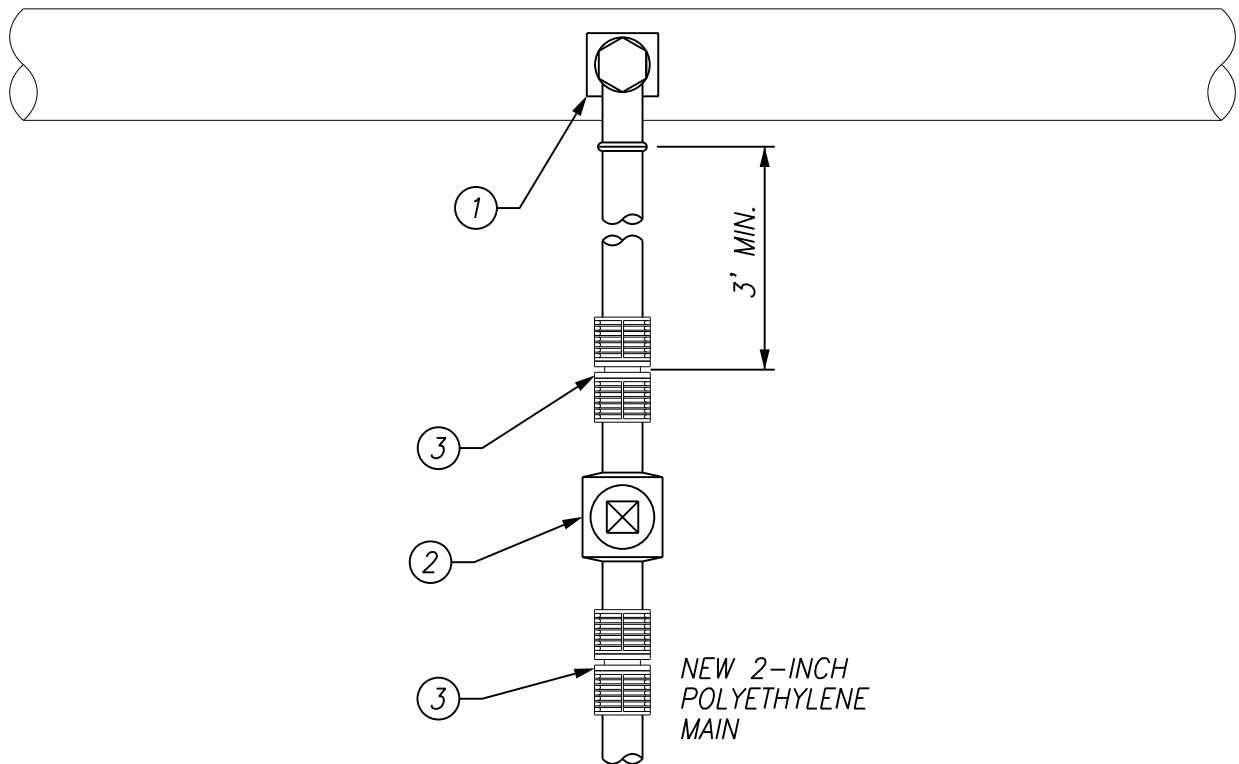


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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>NEW 2-INCH POLYETHYLENE MAIN AND VALVE ON EXISTING 4-INCH POLYETHYLENE MAIN</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G10</b>

EXISTING 6-INCH  
POLYETHYLENE  
MAIN

EXISTING 6-INCH  
POLYETHYLENE  
MAIN



NOTES:

1. COMPACT ALL SIDEFILL AROUND POLYTHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVE AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	0640	6-INCH X 2-INCH FUSION TAPPING TEE
2	1	0400	2-INCH POLYETHYLENE VALVE
3	2	1575	2-INCH MECHANICAL COUPLING



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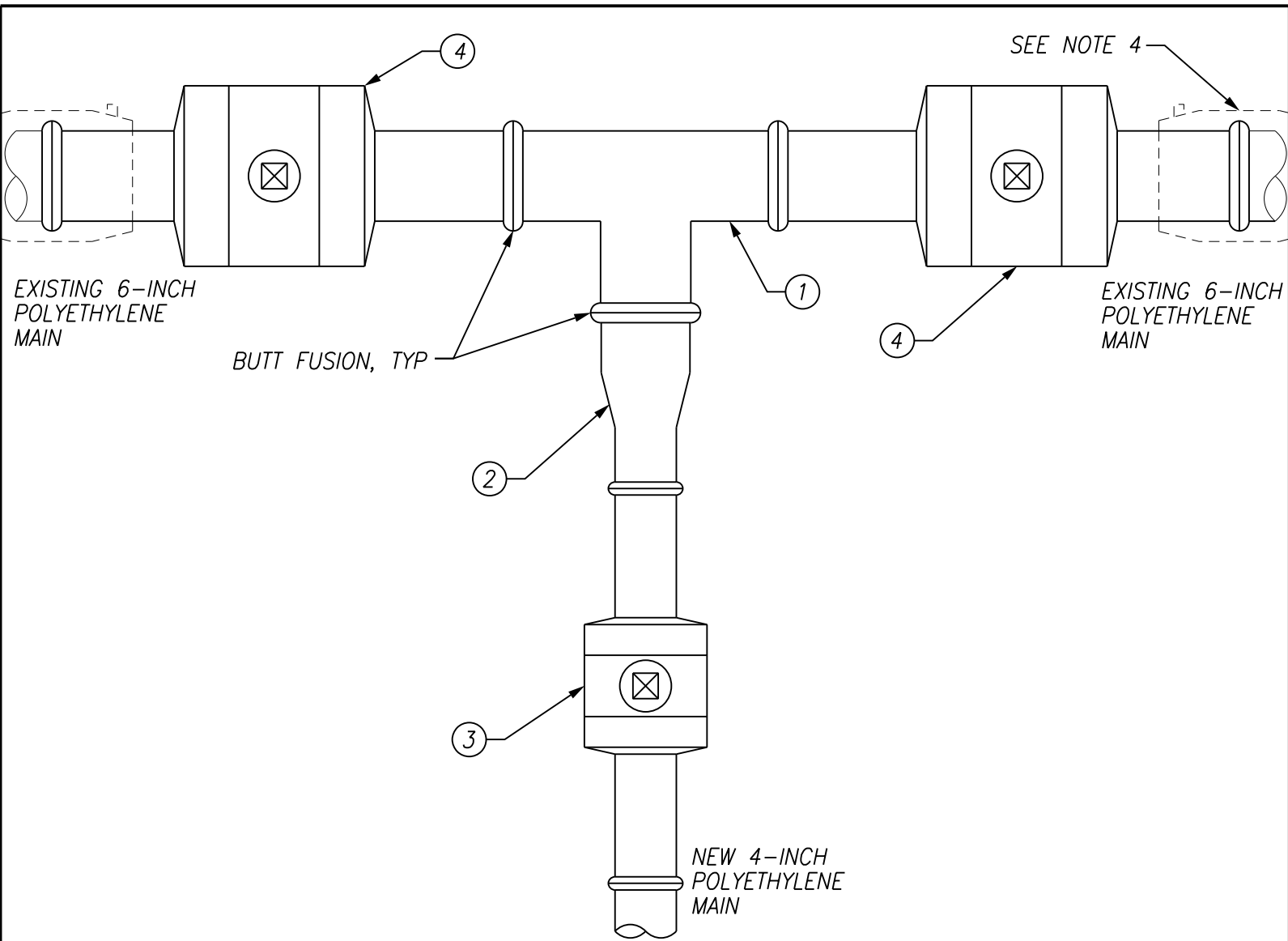
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**NEW 2-INCH POLYETHYLENE  
MAIN AND VALVE ON EXISTING  
6-INCH POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G11**





NOTES:

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. CLUSTER VALVES AS NEAR TO TEE AS FEASIBLE, UNLESS OTHERWISE APPROVED BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
4. 6-INCH ELECTRO FUSION SLEEVES (LCUB ITEM #1595) MAY BE USED ON EACH SIDE OF 6-INCH VALVES TO BE INSTALLED ON THE EXISTING MAIN.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1220	6-INCH POLYETHYLENE BUTT FUSION TEE
2	1	0915	6-INCH X 4-INCH POLYETHYLENE REDUCER
3	1	0405	4-INCH POLYETHYLENE VALVE
4	2	0410	6-INCH POLYETHYLENE VALVE



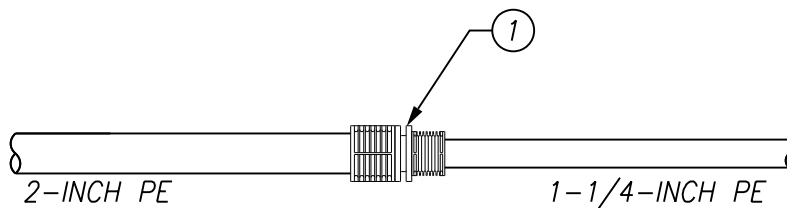
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APPROVED BY: LCUB      DRAWN BY: FMA      Scale: NTS

**NEW 4-INCH POLYETHYLENE MAIN AND VALVE ON EXISTING 6-INCH POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G12**



NOTES:

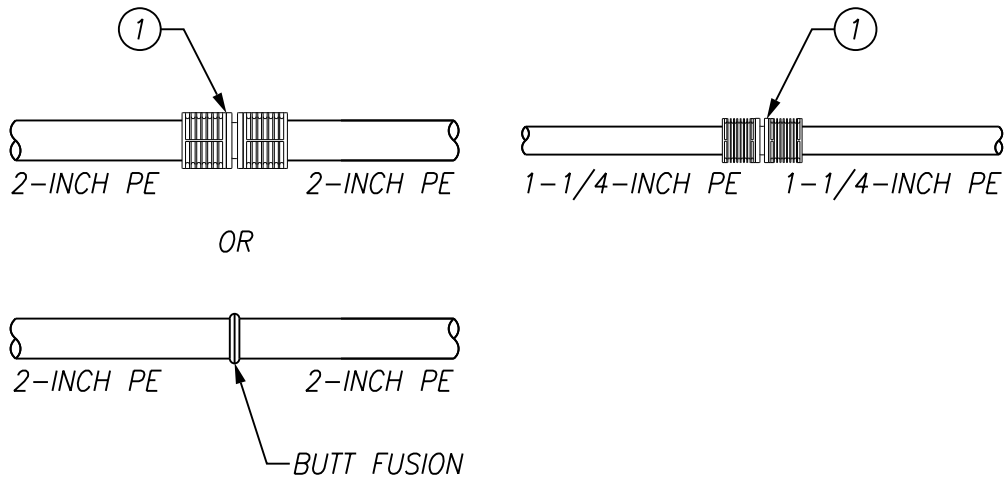
1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	2-INCH X 1-1/4-INCH POLYETHYLENE MECHANICAL REDUCER



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH POLYETHYLENE STRAIGHT TIE TO 1-1/4-INCH POLYETHYLENE MAIN</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G13</b>



NOTES:

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

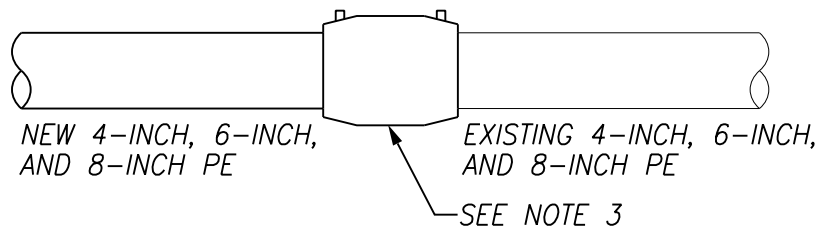
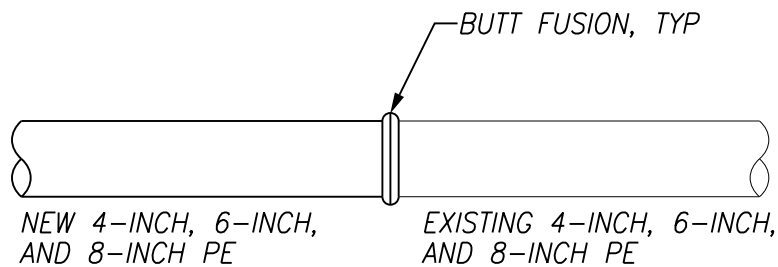
ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	1-1/4-INCH POLYETHYLENE MECHANICAL COUPLING



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH TO 2-INCH AND 1-1/4-INCH TO 1-1/4-INCH POLYETHYLENE MAIN STRAIGHT TIE-INS</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G14</b>



NOTES:

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
3. A 4-INCH, 6-INCH, OR 8-INCH ELECTRO FUSION SLEEVE MAY BE USED AS APPROVED BY OWNER (REF. SPECIFICATION SECTION 33320, PART 1.01 C.).



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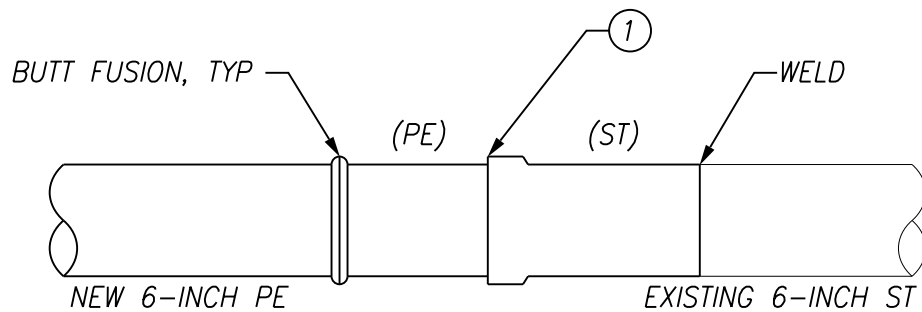
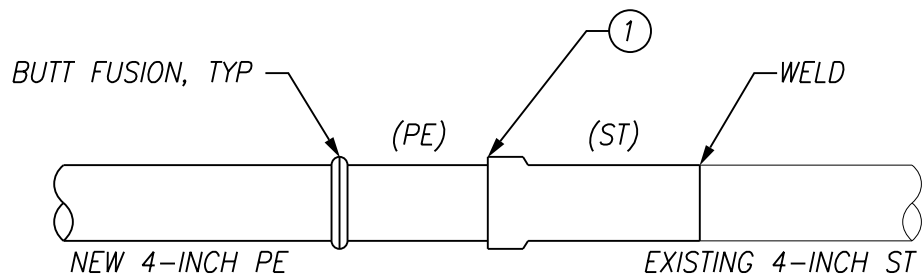
DRAWN BY: FMA

Scale: NTS

**4-INCH TO 4-INCH, 6-INCH  
TO 6-INCH AND 8-INCH  
TO 8-INCH POLYETHYLENE  
STRAIGHT MAIN TIE-INS**

Date: 11/06/17

DRAWING NUMBER:  
**G15**



**NOTES:**

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
3. ALL STEEL FITTINGS TO BE COATED AND WRAPPED AND CATHODICALLY PROTECTED.
4. THE LARGEST STEEL PIPE SIZE WITHIN LCUB'S SYSTEM IS 6-INCH DIAMETER.
5. CADWELD TRACER WIRE INSTALLED FOR NEW POLYETHYLENE PIPE TO EXISTING STEEL PIPE.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	4-INCH POLYETHYLENE X 4-INCH STEEL TRANSITION FITTING

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	6-INCH POLYETHYLENE X 6-INCH STEEL TRANSITION FITTING



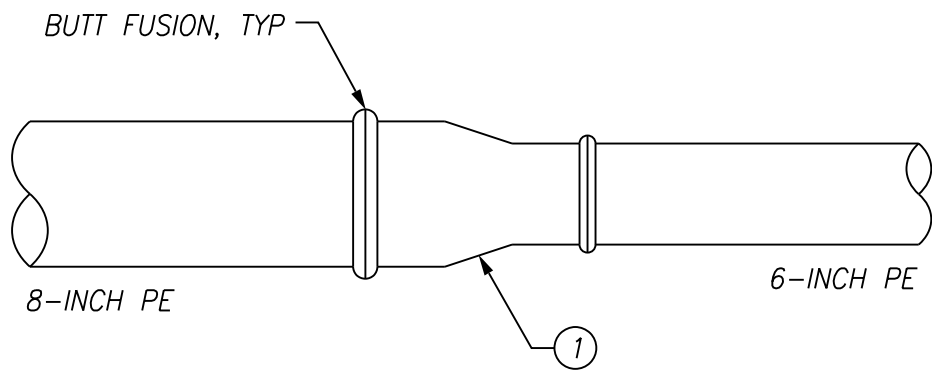
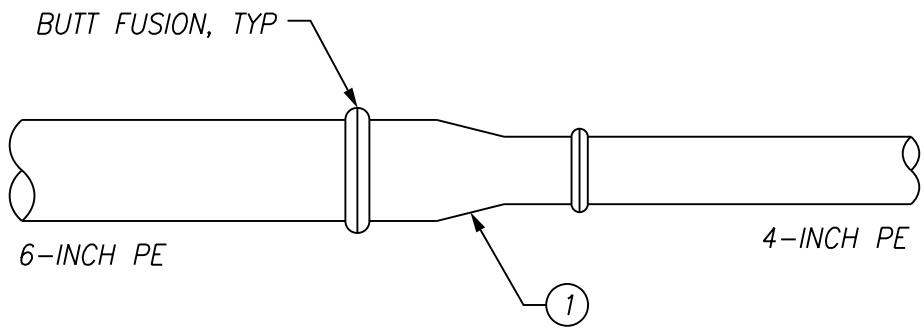
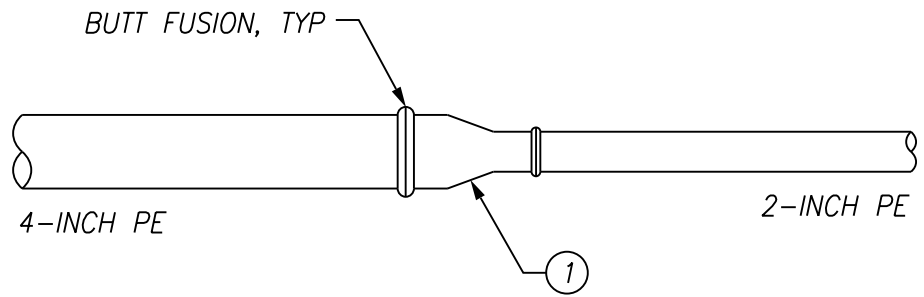
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LENOIR CITY, TN 37772  
TELEPHONE 844.687.5282

APPROVED BY: LCUB      DRAWN BY: FMA      Scale: NTS

**4-INCH TO 4-INCH  
OR 6-INCH TO 6-INCH  
POLYETHYLENE STRAIGHT  
TIE-IN TO STEEL MAIN**

Date: 08/08/19

DRAWING NUMBER:  
**G16**



NOTES:

1. COMPACT ALL SIDEFILL AROUND POLYETHYLENE COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	0910	4-INCH X 2-INCH POLYETHYLENE BUTT FUSION REDUCER

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	0915	6-INCH X 4-INCH POLYETHYLENE BUTT FUSION REDUCER

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	8-INCH X 6-INCH POLYETHYLENE BUTT FUSION REDUCER



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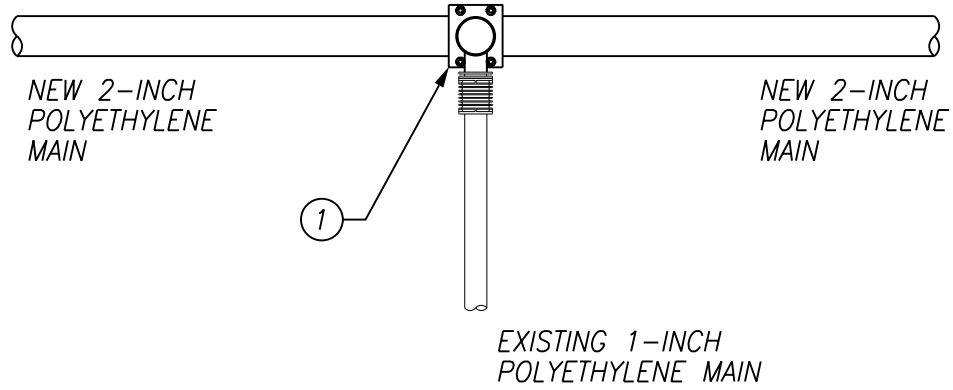
DRAWN BY: FMA

Scale: NTS

4-INCH x 2-INCH, 6-INCH x 4-INCH, AND 8-INCH x 6-INCH  
POLYETHYLENE MAIN  
STRAIGHT TIE-IN

Date: 11/06/17

DRAWING NUMBER:  
**G17**



NOTES:

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	-	2-INCH X 1-INCH POLYETHYLENE MECHANICAL TAPPING TEE



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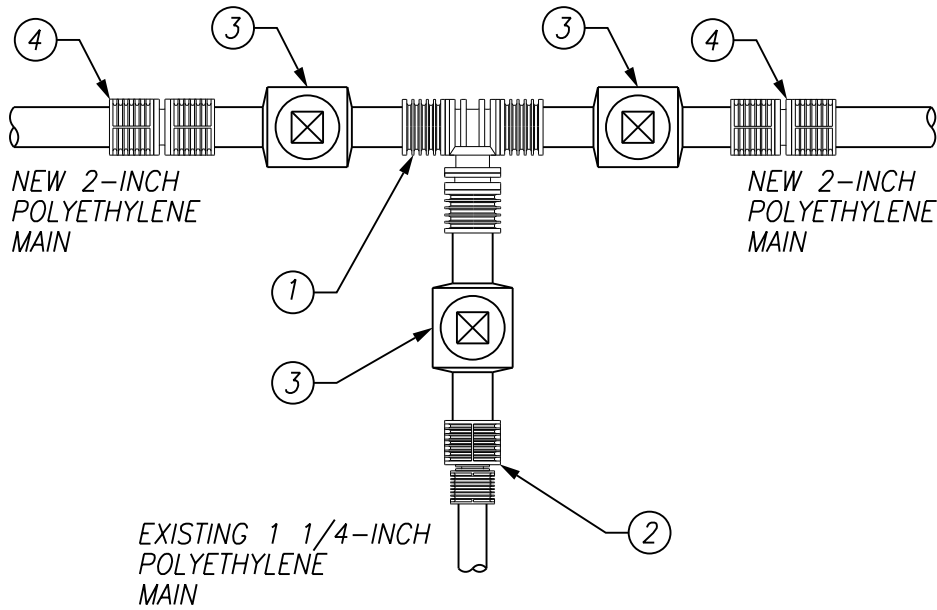
DRAWN BY: FMA

Scale: NTS

**2-INCH POLYETHYLENE  
TEE TIE-IN TO 1-INCH  
POLYETHYLENE MAIN**

Date: 11/06/17

DRAWING NUMBER:  
**G18**



NOTES:

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. LOCATE VALVE AS NEAR TEE AS FEASIBLE, UNLESS APPROVED OTHERWISE BY OWNER'S ENGINEERING.
3. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.

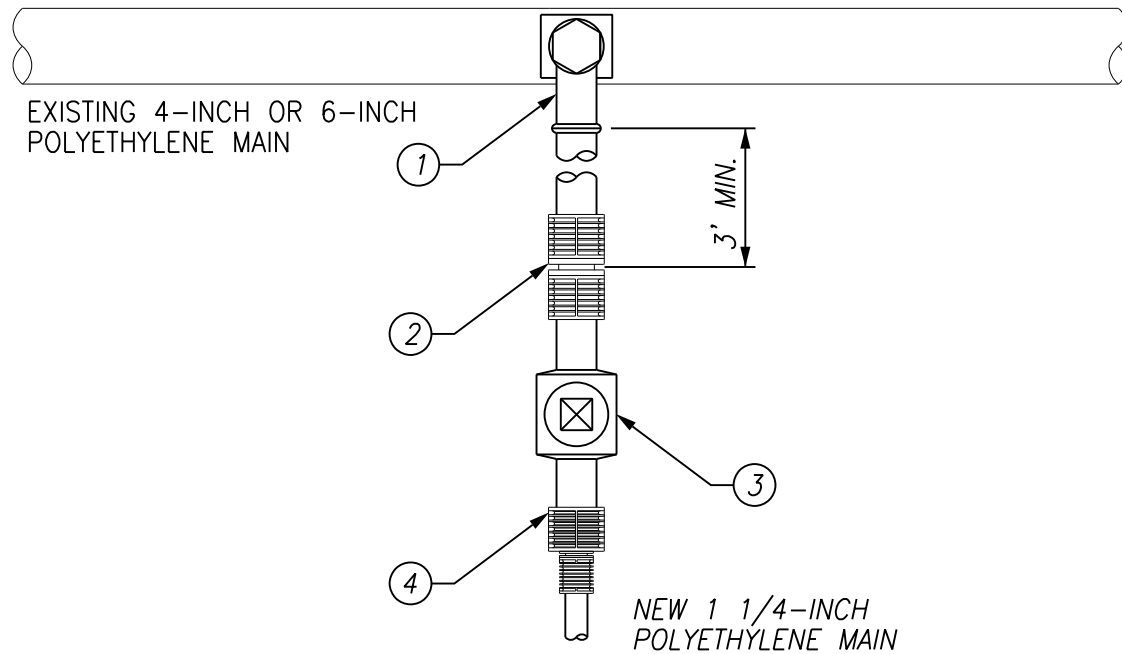
ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	1280	2-INCH POLYETHYLENE MECHANICAL TEE
2	1	-	2-INCH X 1 1/4-INCH POLYETHYLENE MECHANICAL REDUCER
3	3	0400	2-INCH POLYETHYLENE VALVE
4	2	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH POLYETHYLENE TEE TIE-IN TO 1 1/4-INCH POLYETHYLENE MAIN</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G19</b>





**NOTES:**

1. COMPACT ALL SIDEFILL AROUND PLASTIC COMPONENTS PRIOR TO BACKFILLING.
2. TRACER WIRE AND CONNECTIONS NOT SHOWN ON ABOVE DRAWING.
3. 2-INCH CONNECTIONS MAY BE BUTT FUSION IN LIEU OF MECHANICAL AS APPROVED BY OWNER.

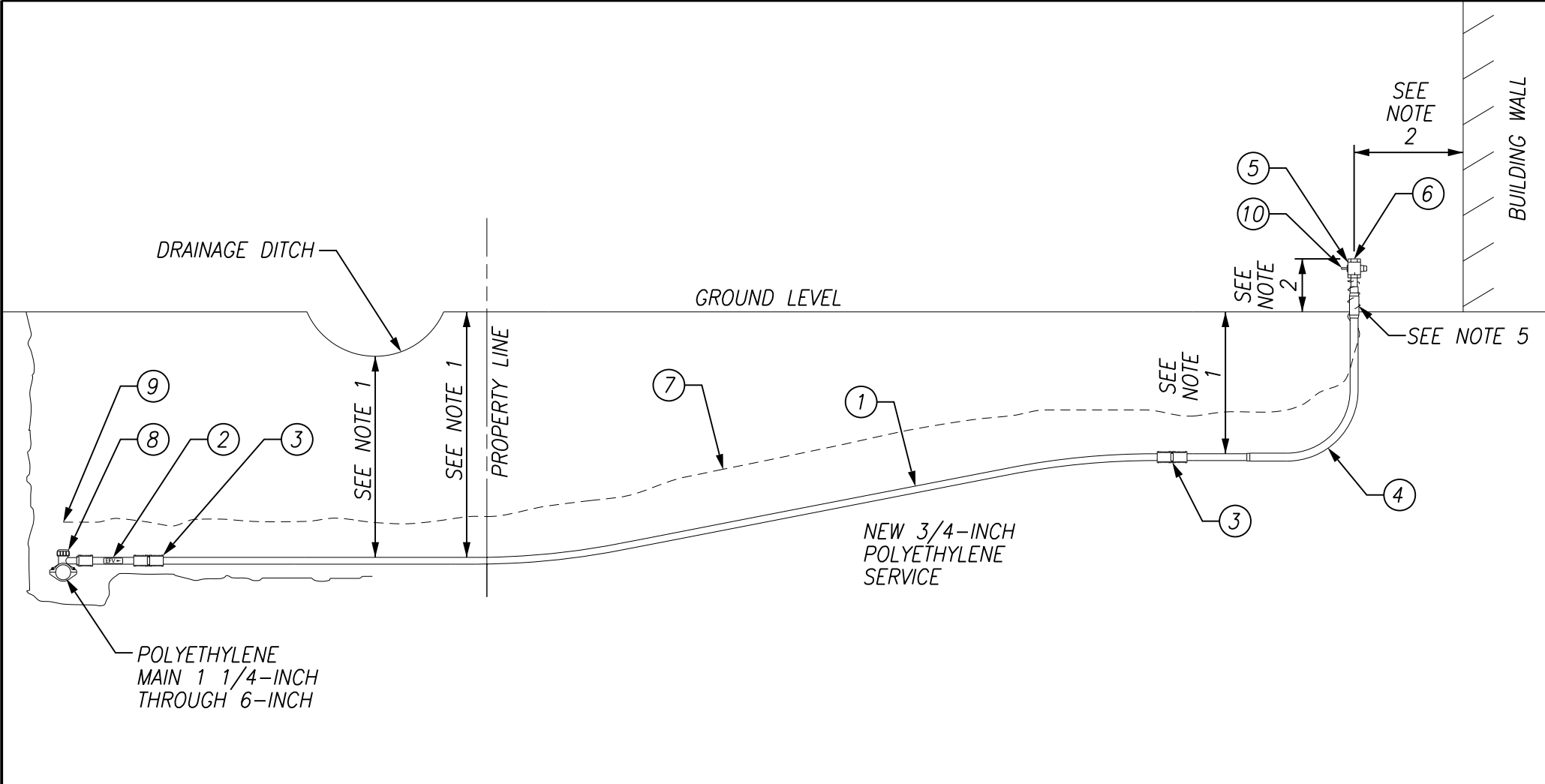
ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	0625	4-INCH X 2-INCH POLYETHYLENE TAPPING TEE
2	1	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING
3	1	0400	2-INCH POLYETHYLENE VALVE
4	1	-	2-INCH X 1 1/4-INCH MECHANICAL REDUCER

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1	0640	6-INCH X 2-INCH POLYETHYLENE TAPPING TEE
2	1	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING
3	1	0400	2-INCH POLYETHYLENE VALVE
4	1	-	2-INCH X 1 1/4-INCH MECHANICAL REDUCER



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>4-INCH AND 6-INCH POLYETHYLENE TEE TIE-INS TO 1 1/4-INCH POLYETHYLENE MAINS</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G20</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.

**LCUB**  
Going the Extra Mile

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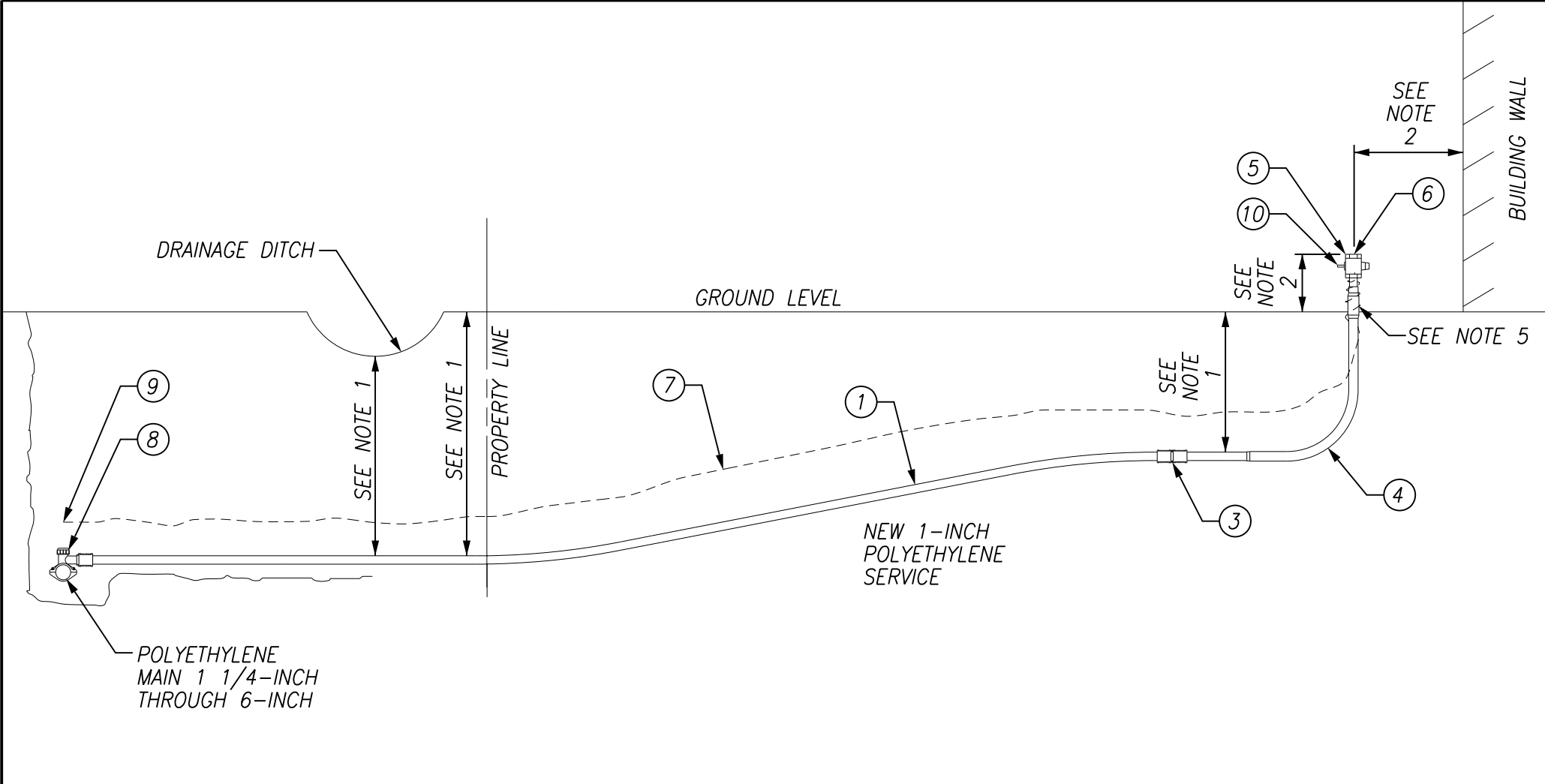
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>3/4-INCH POLYETHYLENE RESIDENTIAL SERVICE ON POLYETHYLENE MAINS (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G21.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0005	3/4-INCH IPS PIPE
2	1	0022	3/4-INCH IPS EXCESS FLOW VALVE (EFV)
3	2	1550	3/4-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0015	3/4-INCH IPS x 3/4-INCH ANODELESS SERVICE RISER
5	1	0020	3/4-INCH METER VALVE
6	1	-	3/4-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	1 1/4-INCH x 3/4-INCH IPS MECHANICAL TAPPING TEE
		0665	2-INCH x 3/4-INCH IPS MECHANICAL TAPPING TEE
		0670	4-INCH x 3/4-INCH IPS MECHANICAL TAPPING TEE
		0675	6-INCH x 3/4-INCH IPS MECHANICAL TAPPING TEE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>3/4-INCH POLYETHYLENE RESIDENTIAL SERVICE ON POLYETHYLENE MAINS (2 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G21.2</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.

 <p><b>LCUB</b> Going the Extra Mile</p>	<p>7698 CREEKWOOD PARK BLVD. LENOIR CITY, TN 37772 TELEPHONE 844.687.5282</p>

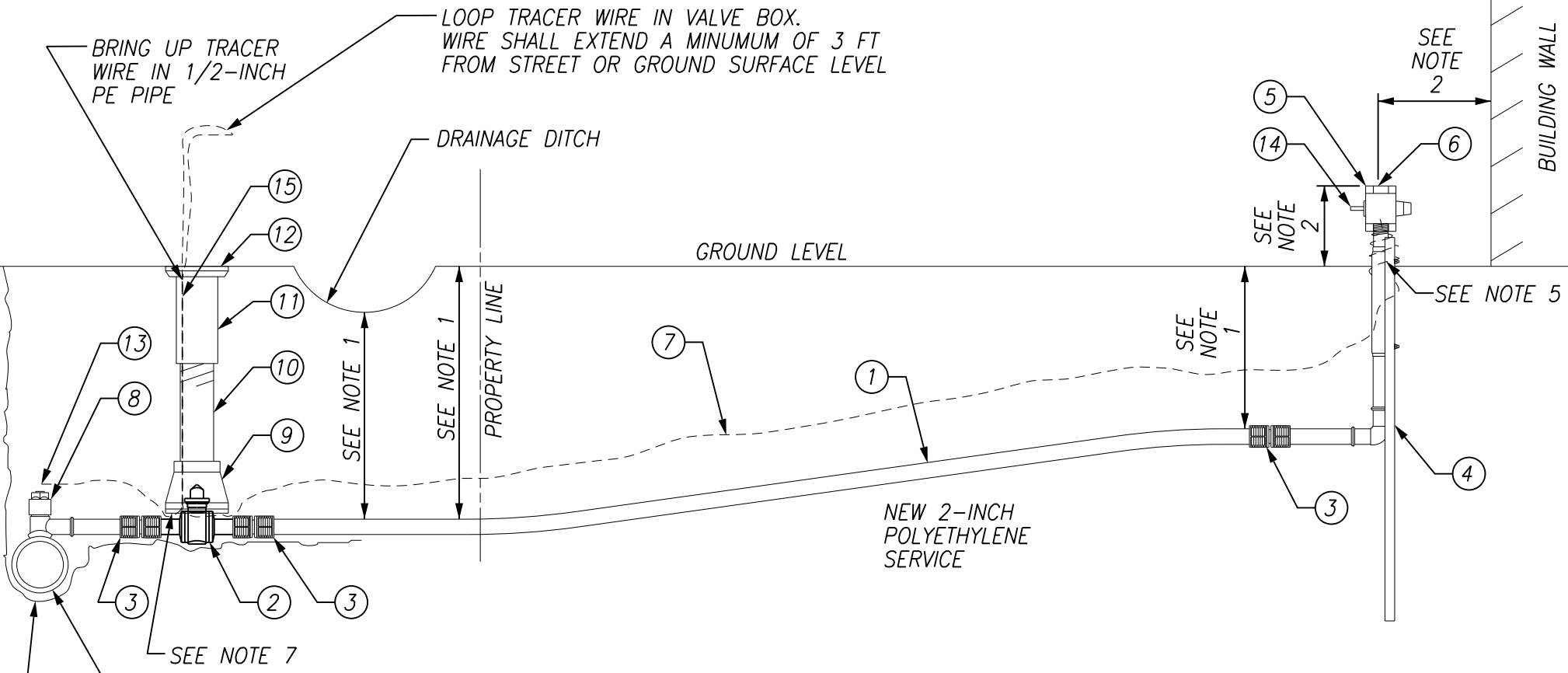
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<p><b>1-INCH POLYETHYLENE RESIDENTIAL SERVICE ON POLYETHYLENE MAINS (1 OF 2)</b></p>				Date:	11/06/17
				DRAWING NUMBER:	<b>G22.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0300	1-INCH IPS PIPE
2	-	-	-
3	1	1560	1-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0075	1-INCH IPS x 1-INCH ANODELESS SERVICE RISER
5	1	-	1-INCH METER VALVE
6	1	-	1-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	1 1/4-INCH x 1-INCH IPS MECHANICAL TAPPING TEE
			2-INCH x 1-INCH IPS MECHANICAL TAPPING TEE
			4-INCH x 1-INCH IPS MECHANICAL TAPPING TEE
			6-INCH x 1-INCH IPS MECHANICAL TAPPING TEE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK



7698 CREEKWOOD PARK BLVD.  
LENOIR CITY, TN 37772  
TELEPHONE 844.687.5282

APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>1-INCH POLYETHYLENE RESIDENTIAL SERVICE ON POLYETHYLENE MAINS (2 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G22.2</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.
6. SERVICE LINE VALVE SHALL BE 24-INCHES FROM SERVICE CONNECTION TO MAIN.
7. DO NOT ALLOW VALVE BOX TO REST DIRECTLY ON PIPE OR VALVE. TO SUPPORT VALVE BOX, BACKFILL TRENCH AROUND VALVLE WITH #57 CLEAN STONE UP TO TOP OF VALVE BODY, AND SET VALVE BOX BASE ON STONE.

**LCUB**  
Going the Extra Mile

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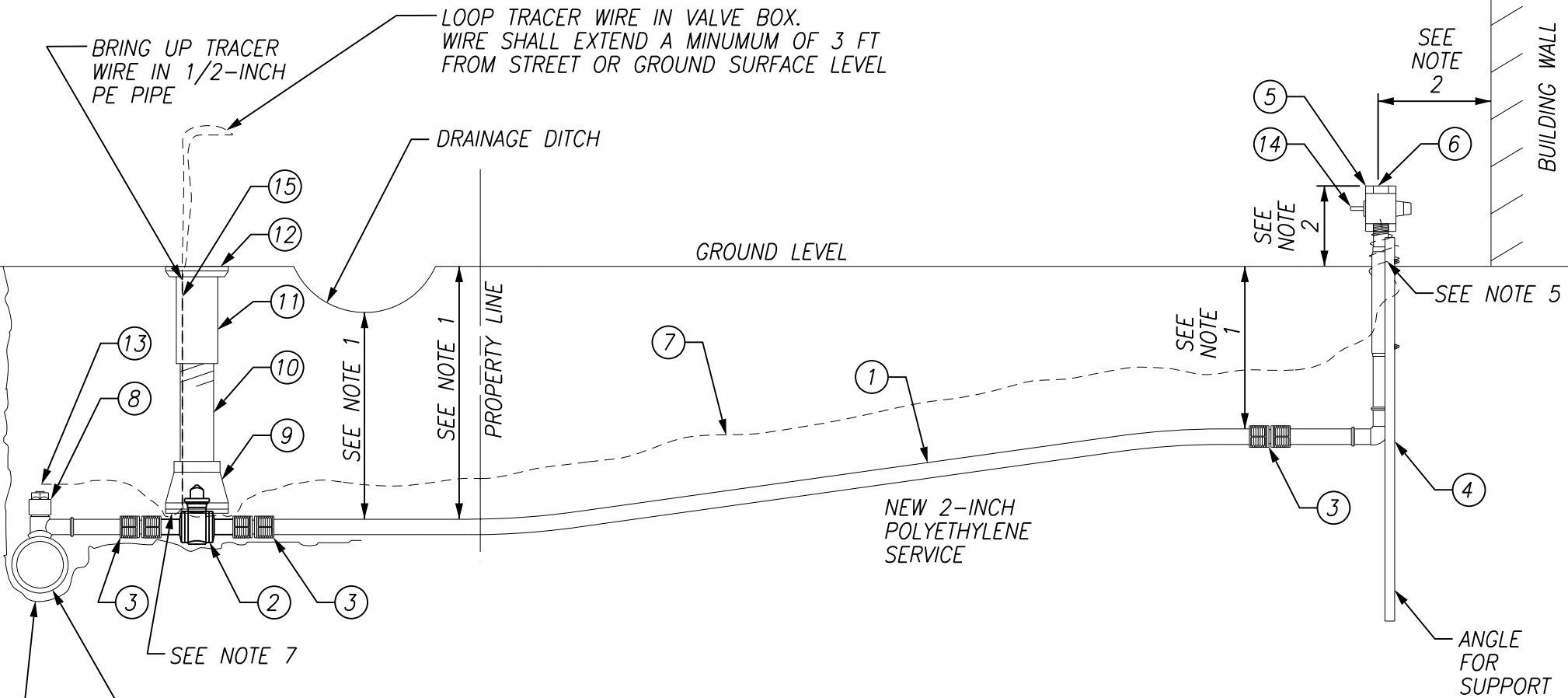
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH POLYETHYLENE COMMERCIAL SERVICE ON POLYETHYLENE MAINS (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G23.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0310	2-INCH IPS PIPE
2	1	0400	2-INCH IPS VALVE
3	1	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0080	2-INCH IPS x 2-INCH ANODELESS SERVICE RISER
5	1	-	2-INCH METER VALVE
6	1	-	2-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8		0625	4-INCH x 2-INCH IPS FUSION TAPPING TEE
		0640	6-INCH x 2-INCH IPS FUSION TAPPING TEE
		-	8-INCH x 2-INCH IPS FUSION TAPPING TEE
9	1	2500	VALVE BOX BASE
10	1	2510	VALVE BOX MIDDLE SECTION
11	1	2530	VALVE BOX TOP SECTION
12	1	2550	VALVE BOX CAST IRON LID
13	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
14	1	-	METER VALVE LOCK
15	1	-	1/2-INCH PE PIPE FOR TRACER WIRE



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2- INCH POLYETHYLENE COMMERCIAL SERVICE ON POLYETHYLENE MAINS (2 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G23.2</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.
6. SERVICE LINE VALVE SHALL BE 24-INCHES FROM SERVICE CONNECTION TO MAIN.
7. DO NOT ALLOW VALVE BOX TO REST DIRECTLY ON PIPE OR VALVE. TO SUPPORT VALVE BOX, BACKFILL TRENCH AROUND VALVE WITH #57 CLEAN STONE UP TO TOP OF VALVE BODY, AND SET VALVE BOX BASE ON STONE.


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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH POLYETHYLENE          COMMERCIAL SERVICE          ON POLYETHYLENE MAINS          (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G24.1</b>

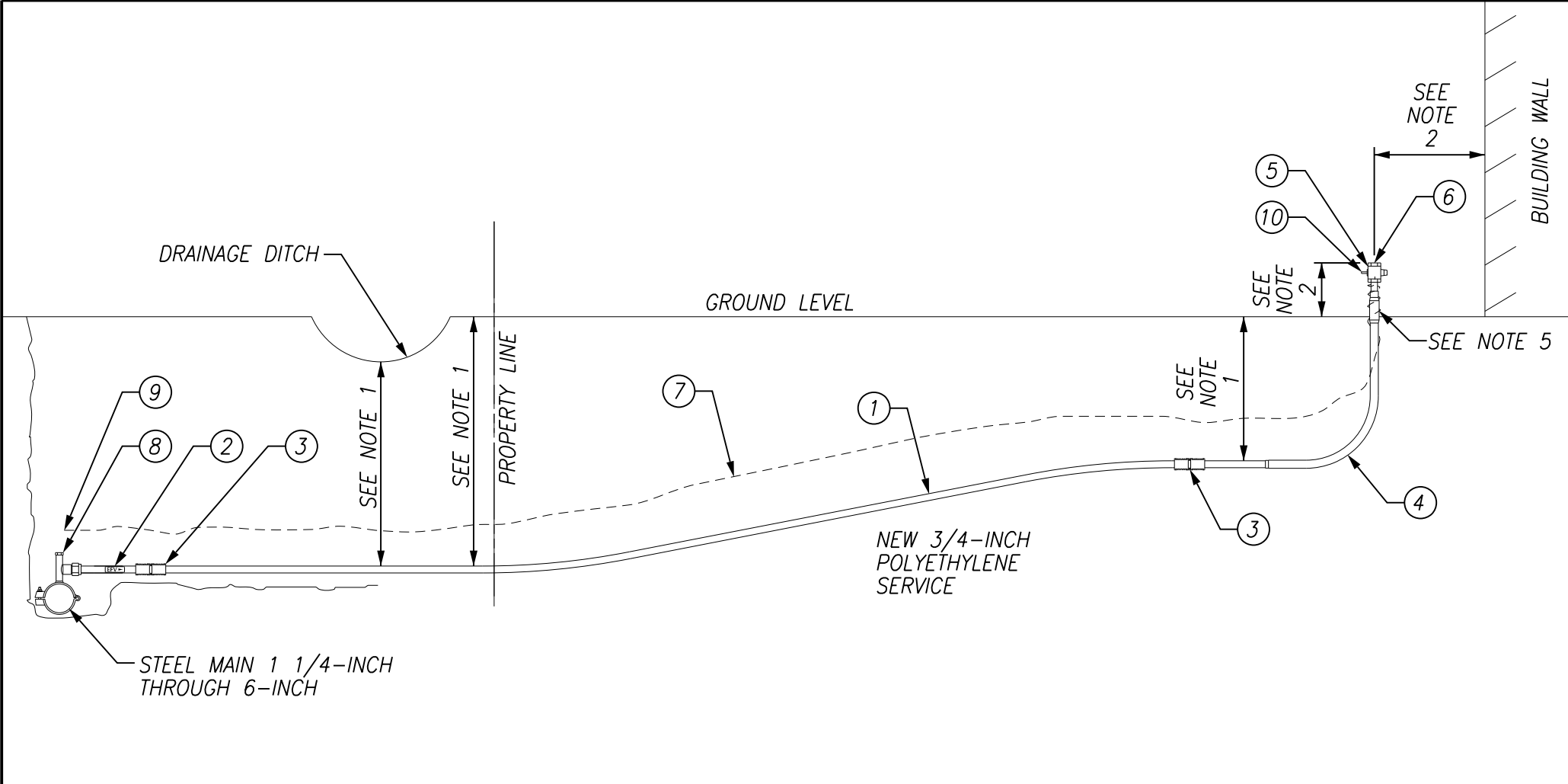


ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0310	2-INCH IPS PIPE
2	1	0400	2-INCH IPS VALVE
3	1	1575	2-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0080	2-INCH IPS x 2-INCH ANODELESS SERVICE RISER
5	1	1620	2-INCH METER VALVE
6	1	-	2-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8		-	4-INCH x 2-INCH IPS TAPPING TEE
		-	4-INCH x 2-INCH IPS TAPPING TEE
		-	8-INCH x 2-INCH IPS TAPPING TEE
9	1	2500	VALVE BOX BASE
10	1	2510	VALVE BOX MIDDLE SECTION
11	1	2530	VALVE BOX TOP SECTION
12	1	2550	VALVE BOX CAST IRON LID
13	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
14	1	-	METER VALVE LOCK
15	1	-	1/2-INCH PE PIPE FOR TRACER WIRE



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>2-INCH POLYETHYLENE COMMERCIAL SERVICE ON POLYETHYLENE MAINS (2 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G24.2</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.
6. FOR CATHODIC PROTECTION, SEE SPECIFICATION 33345, PART 3.14.

**LCUB**  
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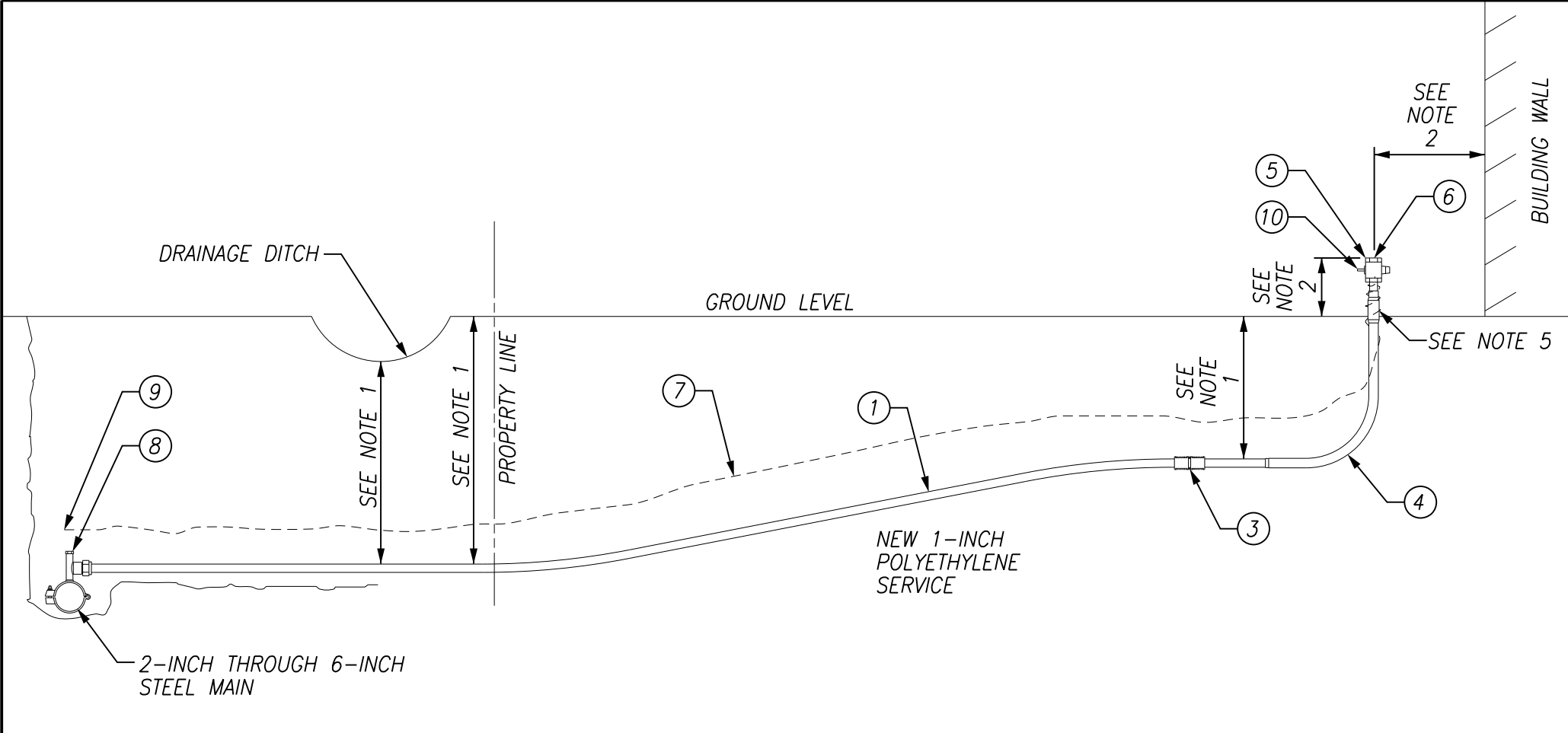
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>3/4-INCH POLYETHYLENE RESIDENTIAL SERVICE ON STEEL MAINS (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G25.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0005	3/4-INCH IPS PIPE
2	1	0022	3/4-INCH EXCESS FLOW VALVE (EFV)
3	1	1550	3/4-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0015	3/4-INCH IPS x 3/4-INCH ANODELESS SERVICE RISER
5	1	0020	3/4-INCH METER VALVE
6	1	1870	3/4-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	2-INCH STL x 3/4-INCH SERVICE SADDLE
		-	4-INCH STL x 3/4-INCH SERVICE SADDLE
		-	6-INCH STL x 3/4-INCH SERVICE SADDLE
		-	8-INCH STL x 3/4-INCH SERVICE SADDLE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK



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APPROVED BY: LCUB	DRAWN BY: FMA	Scale: NTS
<b>3/4-INCH POLYETHYLENE RESIDENTIAL SERVICE ON STEEL MAINS (2 OF 2)</b>		Date: 11/06/17
		DRAWING NUMBER: <b>G25.2</b>



**NOTES:**

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.
6. FOR CATHODIC PROTECTION, SEE SPECIFICATION 33345, PART 3.14.



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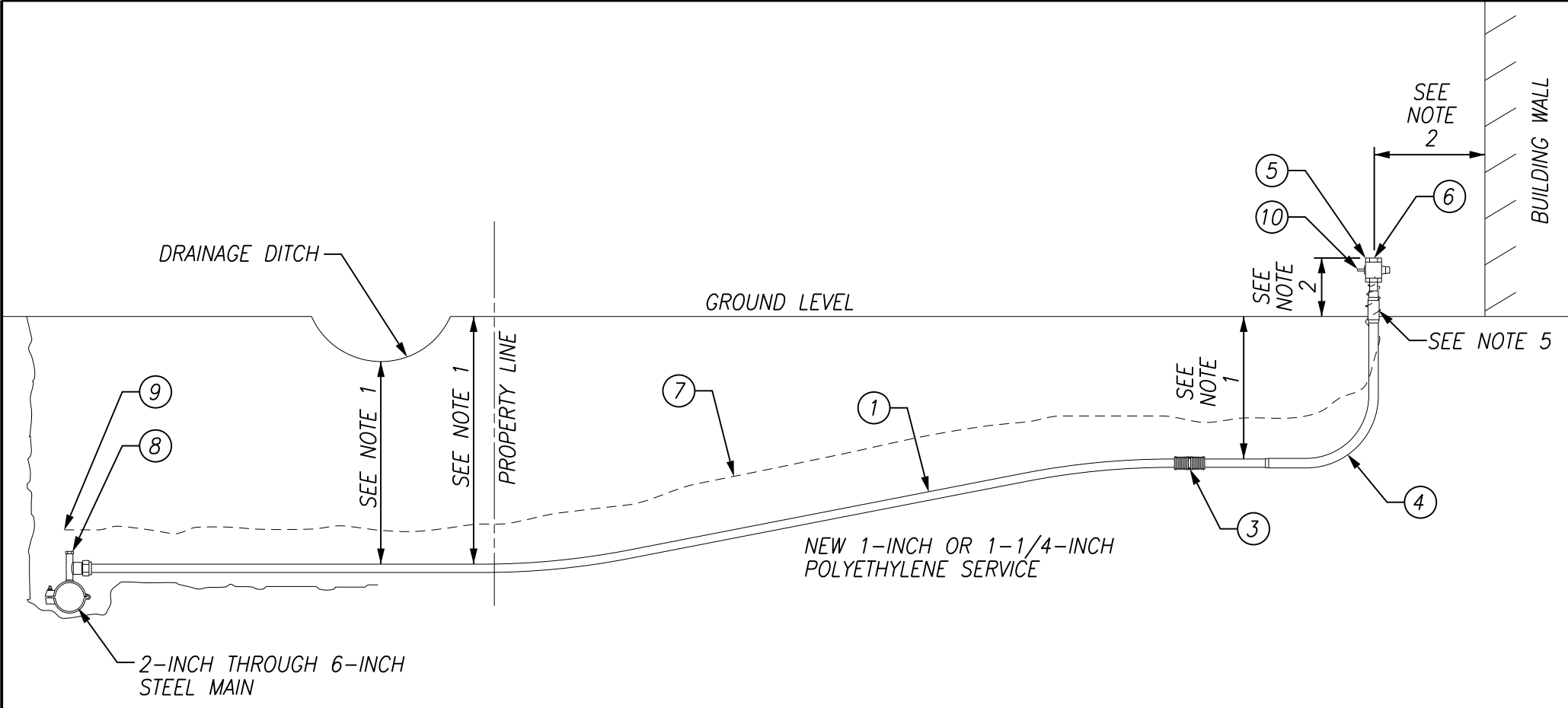
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>1-INCH POLYETHYLENE RESIDENTIAL SERVICE ON STEEL MAINS (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G26.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0300	1-INCH IPS PIPE
2	-	-	-
3	1	1560	1-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0075	1-INCH IPS x 1-INCH ANODELESS SERVICE RISER
5	1	1600	1-INCH METER VALVE
6	1	-	1-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	2-INCH STL x 1-INCH SERVICE SADDLE
		-	3-INCH STL x 1-INCH SERVICE SADDLE
		-	4-INCH STL x 1-INCH SERVICE SADDLE
		-	6-INCH STL x 1-INCH SERVICE SADDLE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>1-INCH POLYETHYLENE RESIDENTIAL SERVICE ON STEEL MAINS (2 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G26.2</b>



NOTES:

1. FOR DEPTH REQUIREMENTS SEE SPECIFICATION 33345, PART 3.02.
2. FOR LOCATION REQUIREMENTS SEE SPECIFICATION 33345, PART 3.06.
3. COMPACT SIDEFILLS AROUND AND UNDER TIE-IN.
4. TEST COMPLETE SERVICE LINE PRIOR TO TAPPING MAIN, SEE SPECIFICATION 33345, PART 3.07.
5. WRAP TRACING WIRE AROUND RISER.
6. FOR CATHODIC PROTECTION, SEE SPECIFICATION 33345, PART 3.14.

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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>1-INCH OR 1 1/4-INCH POLYETHYLENE COMMERCIAL SERVICE ON STEEL MAINS (1 OF 2)</b>				Date:	11/06/17
				DRAWING NUMBER:	<b>G27.1</b>

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	0300	1-INCH IPS PIPE
2	-	-	-
3	1	1560	1-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	0075	1-INCH IPS x 1-INCH ANODELESS SERVICE RISER
5	1	1600	1-INCH METER VALVE
6	1	-	1-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	2-INCH STL x 1-INCH SERVICE SADDLE
		-	4-INCH STL x 1-INCH SERVICE SADDLE
		-	6-INCH STL x 1-INCH SERVICE SADDLE
		-	8-INCH STL x 1-INCH SERVICE SADDLE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK

ITEM	QUANTITY	LCUB ITEM #	DESCRIPTION
1	1-LOT	-	1-1/4-INCH IPS PIPE
2	-	-	-
3	1	-	1-1/4-INCH POLYETHYLENE MECHANICAL COUPLING
4	1	-	1-1/4-INCH IPS x 1-1/4-INCH ANODELESS SERVICE RISER
5	1	-	1-1/4-INCH METER VALVE
6	1	-	1-1/4-INCH PLUG
7	1-LOT	-	#12 COATED COPPER CLAD STEEL TRACER WIRE
8	1	-	2-INCH STL x 1-1/4-INCH SERVICE SADDLE
		-	4-INCH STL x 1-1/4-INCH SERVICE SADDLE
		-	6-INCH STL x 1-1/4-INCH SERVICE SADDLE
		-	8-INCH STL x 1-1/4-INCH SERVICE SADDLE
9	1	-	3-WAY MECHANICAL TRACER WIRE CONNECTOR
10	1	-	METER VALVE LOCK



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APPROVED BY: LCUB

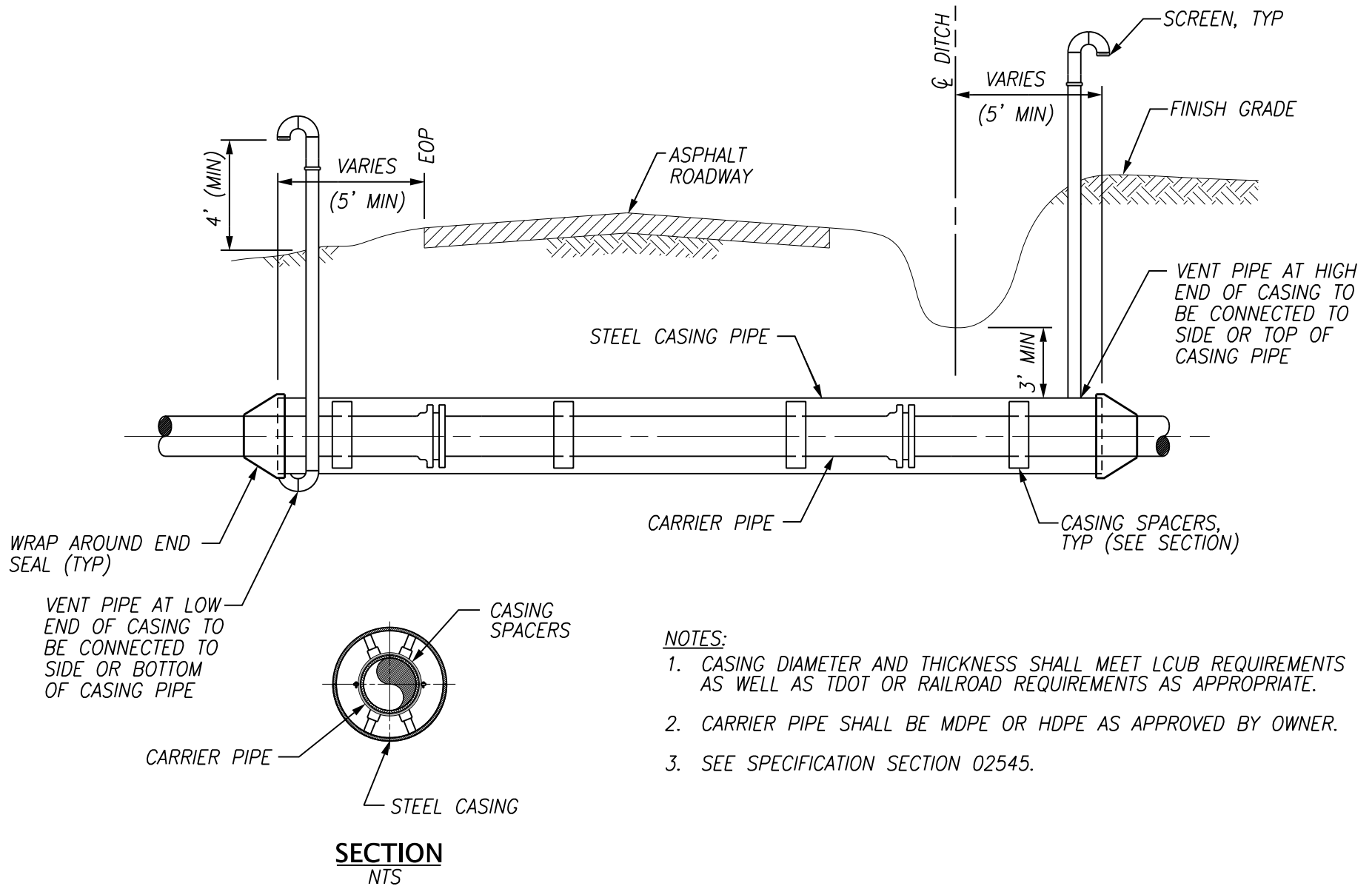
DRAWN BY: FMA

Scale: NTS

**1-INCH OR 1 1/4-INCH  
POLYETHYLENE COMMERCIAL  
SERVICE ON STEEL MAINS  
(2 OF 2)**


Date: 11/06/17

DRAWING NUMBER:  
**G27.2**



**NOTES:**

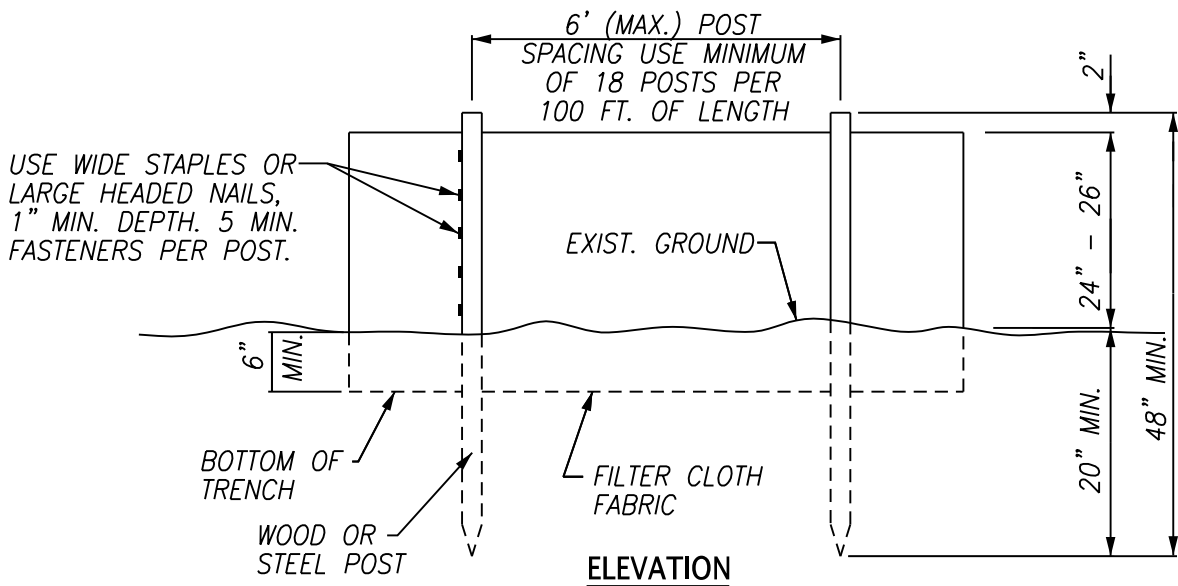
1. CASING DIAMETER AND THICKNESS SHALL MEET LCUB REQUIREMENTS AS WELL AS TDOT OR RAILROAD REQUIREMENTS AS APPROPRIATE.
2. CARRIER PIPE SHALL BE MDPE OR HDPE AS APPROVED BY OWNER.
3. SEE SPECIFICATION SECTION 02545.


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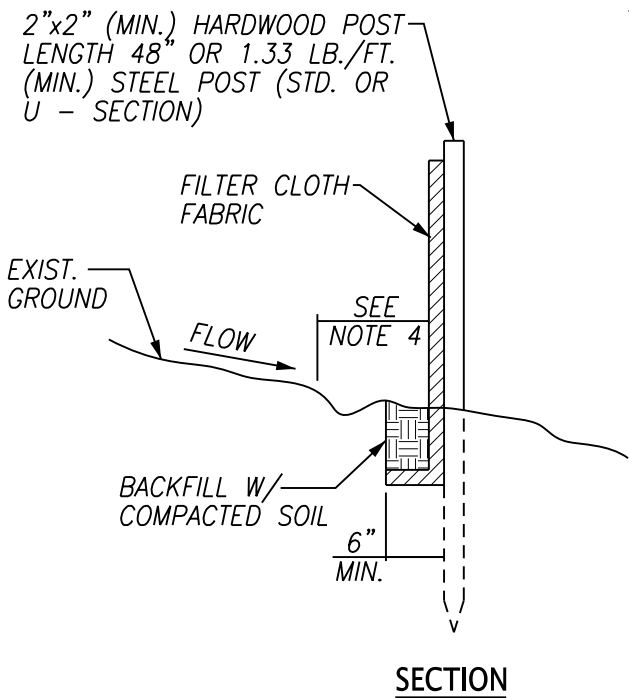
APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>STEEL CASING PIPE DETAIL</b>				Date:	07/30/21
				DRAWING NUMBER:	<b>G28</b>





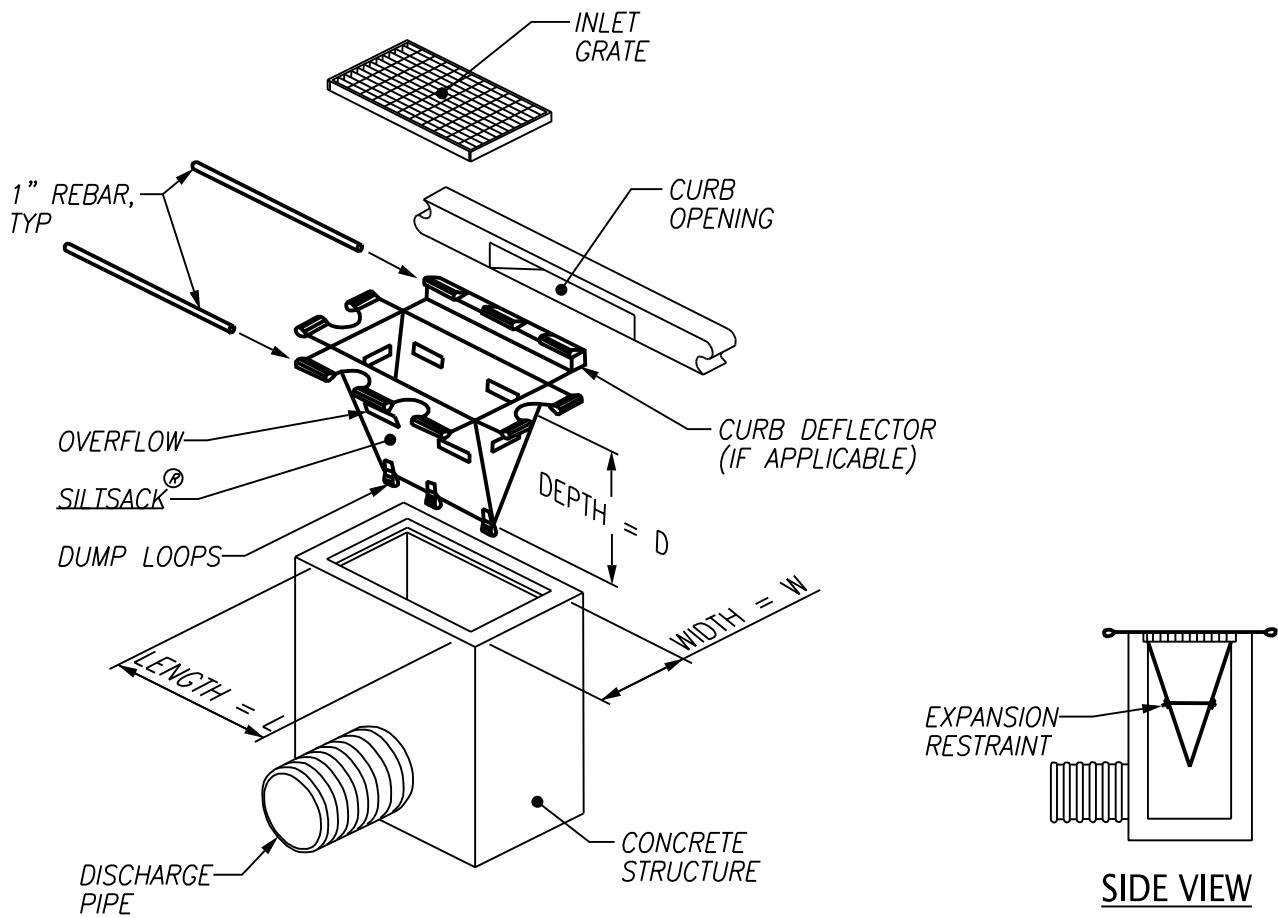
**NOTES:**

1. SILT FENCE SHALL BE PRE-ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.
2. SILT FENCE SHALL HAVE AN APPROVED BACKING OR A BUILT-IN REINFORCED STRUCTURE AS RECOMMENDED BY THE MANUFACTURER TO SUPPORT THE GEOTEXTILE FABRIC.
3. ONCE PERMANENT VEGETATION IS ESTABLISHED, REMOVE THE SILT FENCE, BACKFILL TRENCH WITH TOPSOIL, AND APPLY SEED AND MULCH TO ALL DISTURBED AREAS. LEGALLY DISPOSE OF REMOVED FENCE OFF-SITE.
4. PLACE SILT FENCE AT LEAST 5 TO 7 FEET AWAY FROM STEEP OR LONG SLOPES TO IMPOUND STORMWATER RUNOFF.
5. POST SPACING SHALL BE 4 FEET MAXIMUM WITHIN A DRAINAGE CHANNEL.
6. TURN LAST 7 TO 10 FEET OF SILT FENCE UPHILL.



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>SILT FENCE</b>				Date:	07/30/21
				DRAWING NUMBER:	<b>G29</b>



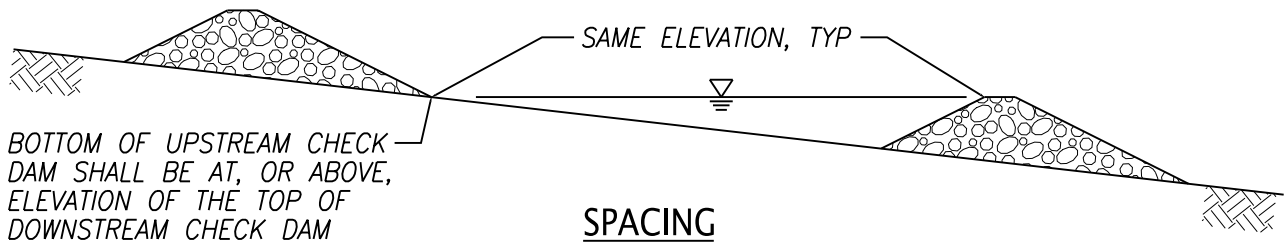
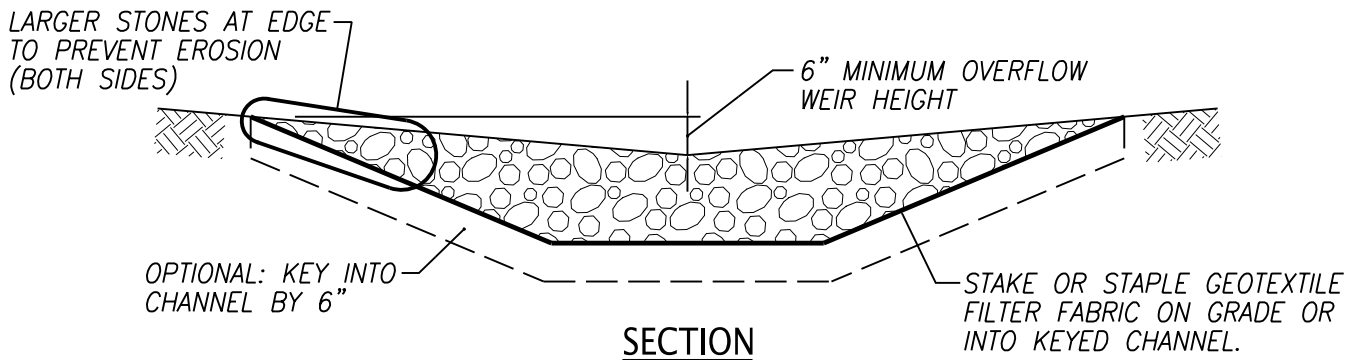
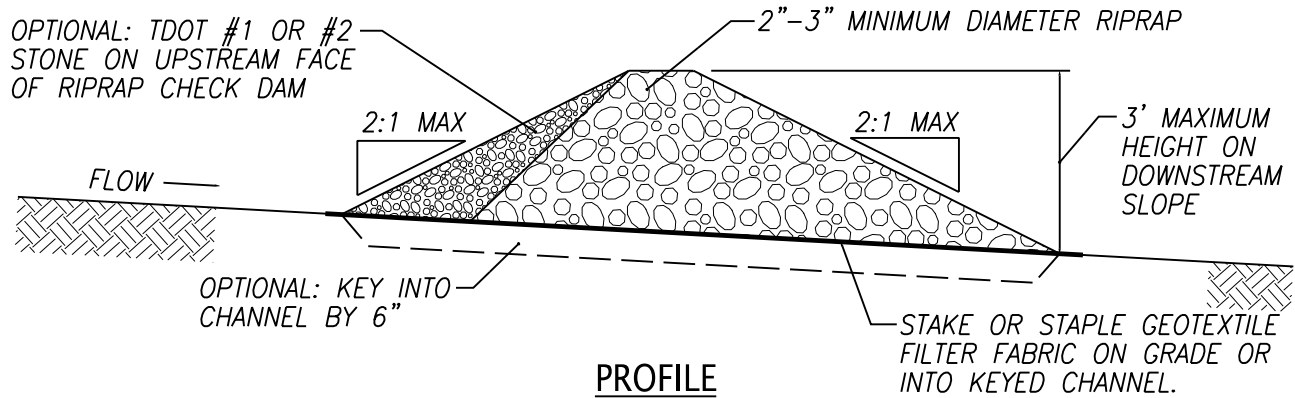
NOTES:

1. THE INLET SEDIMENT CONTROL DEVICE SHALL BE SILTSACK® OR EQUIVALENT, FOR USE ON STORM STRUCTURES LOCATED IN PAVED AREAS WHERE THERE IS A POTENTIAL FOR RECEIVING SEDIMENT LADEN RUNOFF.
2. REMOVE ONCE PERMANENT VEGETATION IS ESTABLISHED.



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>INLET SEDIMENT CONTROL DEVICE</b>				Date:	07/30/21
				DRAWING NUMBER:	<b>G30</b>



**NOTES:**

1. GEOTEXTILE SEPARATION FABRIC SHALL BE GEOTEX 801 (8 OUNCE NON-WOVEN) BY PROPEX OR EQUAL.
2. CONSTRUCT, MAINTAIN, AND REMOVE IN ACCORDANCE WITH THE TENNESSEE EROSION & SEDIMENT CONTROL HANDBOOK.



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>TEMPORARY ROCK CHECK DAM</b>				Date:	07/30/21
				DRAWING NUMBER:	<b>G31</b>

NOTES:

1. ALL WORK TO BE PERFORMED WILL BE IN ACCORDANCE WITH THE LENOIR CITY UTILITIES BOARD NATURAL GAS DEPARTMENT (CURRENT EDITION) SPECIFICATIONS AND DETAILS.
2. PRE-CONSTRUCTION CONFERENCE SHALL BE CONDUCTED WITH THE LENOIR CITY UTILITIES BOARD REPRESENTATIVES, DESIGN ENGINEER, AND UTILITY CONTRACTOR PRIOR TO ANY UTILITIES CONSTRUCTION ACTIVITIES BEGINNING.
3. NATURAL GAS LINE MATERIALS, INSTALLATION, TESTING AND FILLING PER LENOIR CITY UTILITIES BOARD GAS DEPARTMENT STANDARDS (CURRENT EDITION).
4. ALL CONSTRUCTION AND TESTING ACTIVITIES MUST BE OBSERVED BY A RESIDENT PROJECT REPRESENTATIVE (RPR) AS DESIGNATED BY LCUB. WORK PERFORMED WITHOUT DESIGNATED RPR OVERSIGHT AND APPROVAL SHALL NOT BE ACCEPTED BY LCUB.
5. ALL COSTS INCURRED BY LCUB FOR PROJECT-RELATED RPR AND GENERAL ENGINEERING SERVICES DURING CONSTRUCTION SHALL BE REIMBURSED BY THE PROPERTY OWNER/DEVELOPER.
6. ALL PROJECT CLOSEOUT DOCUMENTS MUST BE PROVIDED BY THE OWNER/DEVELOPER PRIOR TO LCUB ACCEPTING OWNERSHIP OF NEW FACILITIES AS FOLLOWS:
  - A. RECORD DRAWINGS WITH APPROVED MODIFICATIONS TO DESIGN DRAWINGS IN RED
  - B. RPR DAILY REPORTS
  - C. CONSTRUCTION PHOTOS
  - D. RPR TESTING REPORTS
  - E. PRE-CONSTRUCTION AND CONSTRUCTION PHOTOGRAPHS
  - F. VERIFIED GIS DATA COLLECTED BY LCUB-APPROVED STAFF
  - G. ASSOCIATED EASEMENT DOCUMENTS
7. CONTRACTOR SHALL PROVIDE EROSION AND SEDIMENT CONTROL FOR ALL EXCAVATIONS.
8. CONTRACTOR SHALL PERFORM ALL NATURAL GAS LINE TAPS REQUIRED.
9. ELECTRO-FUSION COUPLINGS NOT ALLOWED WITHOUT PRIOR APPROVAL FROM LCUB.
10. BLASTING NOT PERMITTED.
11. CONTRACTOR IS RESPONSIBLE FOR EMPLOYING ALL TRAFFIC CONTROL MEASURES AS NECESSARY IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01570-TRAFFIC REGULATIONS, AND MUTCD.
12. DEVELOPER (OWNER) AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR ANY EXISTING NATURAL GAS DISTRIBUTION IMPROVEMENTS REQUIRED TO PROVIDE ADEQUATE PRESSURE AND FLOW (VOLUME) TO THE NEW DEVELOPMENT AND MAINTAIN EXISTING DISTRIBUTION SYSTEM PRESSURES AND FLOWS.
13. DEVELOPER (OWNER) AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ALL NATURAL GAS TAPS, SERVICE LINES, RISERS, AND CASINGS PER LCUB STANDARD SPECIFICATIONS FOR THE NEW DEVELOPMENT.
14. ASSOCIATED NATURAL GAS FEES FOR DEVELOPMENT PROJECTS SHALL BE, BUT NOT LIMITED TO, TAPS, CAPITAL RESERVE, SPECIAL ASSESSMENT, ETC. AND SHALL BE BILLED AT THE END OF EACH PROJECT PHASE AND PAYMENT SHALL BE DUE FROM DEVELOPER AT THAT TIME. NATURAL GAS SERVICE SHALL NOT BE MADE LIVE UNTIL PAYMENT IS RECEIVED IN FULL.
15. LCUB HAS THE RIGHT TO REQUIRE A LARGER DIAMETER PIPE SIZE OR STEEL PIPE BASED UPON HYDRAULIC ANALYSIS, DEPTH, SOIL, AND FUTURE CONDITIONS.
16. DEVELOPER (OWNER) AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING THREE (3) WAY VALVE CLUSTERS AT ALL ROADWAY INTERSECTIONS IN ACCORDANCE WITH LCUB STANDARD NATURAL GAS SPECIFICATIONS AND DETAILS.
17. RIGHT-OF-WAYS AND EASEMENTS NEEDED FOR THE NATURAL GAS LINE THAT FALLS INSIDE/OUTSIDE OF THE PROPERTY SHALL BE SIGNED AND FURNISHED PRIOR TO START OF PROJECT.
18. CONTRACTOR SHALL FIELD VERIFY AND POTHOLE ALL UTILITIES AS INDICATED BY DRAWING, GIS, TENNESSEE ONE-CALL, ETC.
19. DEVELOPMENT PHASING SHALL BE APPROVED ONLY BEFORE P.E., LCUB, AND TDEC STAMPS ARE APPLIED AT THE BEGINNING OF THE PROJECT. NO RE-PHASING WILL BE ALLOWED OR APPROVED AFTER CONSTRUCTION OF A PROJECT HAS BEGUN.



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APPROVED BY:	LCUB	DRAWN BY:	FMA	Scale:	NTS
<b>GENERAL GAS NOTES</b>				Date:	04/11/23
				DRAWING NUMBER:	<b>G32</b>