Purchasing Division

Invitation for Bid

IFB-4158-16-NJ
2016 Waterline Replacement Project

Responses Due:

Thursday, February 11, 2016
Prior to 2:00 PM MST

Accepting Electronic Responses Only
Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)
https://www.rockymountainbidsystem.com/default.asp

(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor MUST contact RMEPS to resolve issue prior to the response deadline. 1-800-835-4603)

Purchasing Representative:
Nicholas C Jones, Buyer
Nickj@gjcity.org
(970)244-1533

This document has been developed specifically to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction/Mesa County solicitations. All vendors are urged to thoroughly review this solicitation prior to responding. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

Invitation for Bids

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1. Instructions to Bidders

1.1. **Purpose:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the **2016 Waterline Replacement Project**. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

IFB Questions:
Nicholas C Jones, Buyer
Nickj@gjcity.org

1.2. **Mandatory Pre-Bid Meeting:** **Prospective bidders are required to attend a mandatory pre-bid meeting on Tuesday, February 2, 2016 at 10:00am**. Meeting location will be at City Hall in the City Council Auditorium, located at 250 N. 5th Street, Grand Junction, CO. This meeting also allows the Owner to know who is planning on submitting a bid for the project. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

1.3. **Prequalification Requirement:** Contractors submitting bids over $50,000 must be pre-qualified in accordance with the City's *"Rules and Procedures for Pre-qualification of Contractors*". All bids received by the specified time will be opened, but the City will reject bids over $50,000 from contractors who have not been prequalified. Application forms for prequalification are available at the Administration Office of the Department of Public Works, City Hall, 250 North Fifth Street, Room 245. Call 970-256-4126 or 970-244-1555 for additional information. Contractors who are currently prequalified with the Colorado Department of Transportation (CDOT) will meet the requirements for prequalification by the City, unless the City has information or basis to the contrary. Due to the time required to process applications, *all applications must be submitted no later than two weeks prior to the Response Due Date*. Application link: http://www.gjcity.org/PreQualification.aspx

1.4. **Submission:** ***Each bid shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/BidOpenings.aspx for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)

1.5. **Modification and Withdrawal of Bids before Opening:** Bids may be modified or withdrawn by an appropriate document stating such, duly executed and submitted to the place where Bids are to be submitted at any time prior to Bid Opening.

1.6. Printed Form for Price Bid: All Price Bids must be made upon the Price Bid Schedule attached, and should give the amounts both in words and in figures, and must be signed and acknowledged by the bidder.

The Offeror shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Price Bid Schedule provides a choice to be made by the Offeror, Offeror's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Price Bid Schedule must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Offeror's Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Contractor's Bid Form.

The contact information to which communications regarding the Bid are to be directed must be shown.

1.7. Exclusions: No oral, telephonic, emailed, or facsimile bid will be considered

1.8. Contract Documents: The complete IFB and bidder's response compose the Contract Documents. Copies of bid documents can be obtained from the City Purchasing website, http://www.gjcity.org/BidOpenings.aspx.

1.9. Additional Documents: The July 2010 edition of the "City Standard Contract Documents for Capital Improvements Construction", Plans, Specifications and other Bid Documents are available for review or download on the Public Works & Planning/Engineering page at www.gjcity.org. Electronic copies may be obtained on a CD format at the Department of Public Works and Planning at City Hall.

1.10. Definitions and Terms: See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.

1.11. Examination of Specifications: Bidders shall thoroughly examine and be familiar with the project Statement of Work. The failure or omission of any Offeror to receive or examine any form, addendum, or other document shall in no way relieve any Offeror from any obligation with respect to his bid. The submission of a bid shall be taken as evidence of compliance with this section. Prior to submitting a bid, each Offeror shall, at a minimum:

a. Examine the *Contract Documents* thoroughly;

b. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the Work;

c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;

d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;

e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

On request, the Owner will provide each Offeror access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Offeror's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Offeror deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Offeror shall be subject to prior approval of Owner and applicable agencies. Offeror shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The Owner reserves the right to require the Offeror to execute an access agreement with the Owner prior to accessing the site.

The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to the Owner and the Engineer by the owners of such underground

utilities or others, and the Owner does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Offeror shall be conclusively presumed to represent that the Offeror has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

1.12. Questions Regarding Statement of Work: Any information relative to interpretation of Scope of Work or specifications shall be requested of the Purchasing Representative, in writing, in ample time prior to the response time.

1.13. Addenda & Interpretations: If it becomes necessary to revise any part of this solicitation, a written addendum will be posted electronically on the City's website at http://www.gjcity.org/BidOpenings.aspx and electronically through the Rocky Mountain E-Purchasing website at www.rockymountainbidsystem.com. The Owner is not bound by any oral representations, clarifications, or changes made in the written specifications by Owner, unless such clarification or change is provided in written addendum form from the City Purchasing Representative.

1.14. Taxes: The Owner is exempt from State retail and Federal tax. The bid price must be net, exclusive of taxes.

1.15. Sales and Use Taxes: The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.

1.16. Offers Binding 60 Days: Unless additional time is required by the Owner, or otherwise specified, all formal offers submitted shall be binding for sixty (60) calendar days following opening date, unless the Bidder, upon request of the Purchasing Representative, agrees to an extension.

1.17. Collusion Clause: Each bidder by submitting a bid certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all bids shall be rejected if there is evidence or reason for believing that collusion exists among bidders. The Owner may, or may not, accept future bids for the same services or commodities from participants in such collusion.

1.18. Disqualification of Bidders: A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the Owner, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the Owner, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and

b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the Owner until such participant has been reinstated as a qualified bidder.

1.19. Public Disclosure Record: If the bidder has knowledge of their employee(s) or sub-contractors having an immediate family relationship with an Owner employee or elected official, the bidder must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the Owner.

1.20. Public Opening: Proposals shall be opened in the City Hall Break Room, 1st Floor, 250 North 5th Street, Grand Junction, CO 81501, immediately following the proposal deadline. Offerors, their representatives and interested persons may be present. Only the names and locations on the proposing firms will be disclosed.

2. General Contract Conditions for Construction Projects

2.1. **The Contract:** This Invitation for Bid, submitted documents, and any negotiations, when properly accepted by the Owner, shall constitute a contract equally binding between the Owner and Contractor. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The contract may be amended or modified with Change Orders, Field Orders, or Addendums.

2.2. **The Work:** The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

2.3. **Execution, Correlation, Intent, and Interpretations:** The Contract Documents shall be signed electronically by the Owner and Contractor. The Owner will provide the contract. By executing the contract, the Contractor represents that he/she has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the Owner are, and shall remain, Owner property. They are not to be used on any other project, and with the exception of one contract set for each party to the contract, are to be returned to the owner on request at the completion of the work.

2.4. **The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout the Contract Documents. The term Owner means the Owner or his authorized representative. The Owner shall, at all times, have access to the work wherever it is in preparation and progress. The Contractor shall provide facilities for such access. The Owner will make periodic visits to the site to familiarize himself generally with the progress and quality of work and to determine, in general, if the work is proceeding in accordance with the contract documents. Based on such observations and the Contractor's Application for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in the contract. The Owner will have authority to reject work which does not conform to the Contract documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require the Contractor to stop the work or any portion, or to require special inspection or testing of the work, whether or not such work can be then be fabricated, installed, or completed. The Owner will not be responsible for the acts or omissions of the Contractor, and sub-Contractor, or any of their agents or employees, or any other persons performing any of the work.

2.5. Contractor: The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.

2.6. Sub-Contractors: A sub-contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.

2.7. Award of Sub-Contractors & Other Contracts for Portions of the Work: As soon as practicable after bids are received and prior to the award of the contract, the successful Contractor shall furnish to the Owner, in writing for acceptance, a list of the names of the sub-contractors or other persons or organizations proposed for such portions of the work as may be designated in the proposal requirements, or, if none is so designated, the names of the sub-contractors proposed for the principal portions of the work. Prior to the award of the contract, the Owner shall notify the successful Contractor in writing if, after due investigation, has reasonable objection to any person or organization on such list. If, prior to the award of the contract, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the successful Contractor may, prior to the award, withdraw their proposal without forfeiture of proposal security. If the successful Contractor submits an acceptable substitute with an increase in the proposed price to cover the difference in cost occasioned by the substitution, the Owner may, at their discretion, accept the increased proposal or may disqualify the Contractor. If, after the award, the Owner refuses to accept any person or organization on such list, the Contractor shall submit an acceptable substitute and the contract sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the contract sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto prior to the award.

2.8. Quantities of Work and Unit Price: Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work, and are as such, estimates only. The Owner does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The Owner also reserves the right to make changes in the Work (including the right to delete any bid

item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.

2.9. Substitutions: The materials, products and equipment described in the *Solicitation Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Offeror submits a written request for approval to the City Purchasing Division at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Offeror shall set forth changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the Owner approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.

2.10. Supervision and Construction Procedures: The Contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.

2.11. Warranty: The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the Owner may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.

2.12. Permits, Fees, & Notices: The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws,

ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.

2.13. Responsibility for Those Performing the Work: The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all sub-contractors, their agents and employees, and all other persons performing any of the work under a contract with the Contractor.

2.14. Use of the Site: The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

2.15. Cleanup: The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of work he shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials.

2.16. Insurance: The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.

The Contractor shall file a copy of the policies or Certificates of Insurance acceptable to the Owner with the Engineer within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the Owner.

2.17. Indemnification: The Contractor shall defend, indemnify and save harmless the Owner, and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Contractor, or of any Contractor's agent, employee, sub-contractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Contractor shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.

2.18. Miscellaneous Conditions: Material Availability: Contractors must accept responsibility for verification of material availability, production schedules, and other pertinent data prior to submission of bid. It is the responsibility of the bidder to notify the Owner immediately if materials specified are discontinued, replaced, or not available for an extended period of time. OSHA Standards: All bidders agree and warrant that services performed in response to this invitation shall conform to the standards declared by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA standards, the Owner may require the services to be redone at no additional expense to the Owner.

2.19. Time: Time is of the essence with respect to the time of completion of the Project and any other milestones or deadlines which are part of the Contract. It will be necessary for each Bidder to satisfy the Owner of its ability to complete the Work within the Contract Time set forth in the Contract Documents. The Contract Time is the period of time allotted in the Contract Documents for completion of the work. The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Contract or such other date as may be established therein, or as established as entered on the Bid Form. The Date of Substantial Completion of the work or designated portions thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents.

2.20. Progress & Completion: The Contractor shall begin work on the date of commencement as defined in the Contract, and shall carry the work forward expeditiously with adequate forces and shall complete it within the contract time.

2.21. Payment & Completion: The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when he finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents.

2.22. Bid Bond: Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the state of Colorado, and made payable without condition to the Owner; or a **Bid Bond** written by an approved corporate surety in favor of the Owner. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount. Once a Bid is accepted and a Contract is awarded, the apparent successful bidder has ten calendar days to enter into a contractor in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result in forfeiture of the Bid Guaranty to the Owner as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

2.23. Performance & Payment Bonds: Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the

State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds singed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the Owner.

2.24. Retention: The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.

2.25. Liquidated Damages for Failure to Enter Into Contract: Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the Owner shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the Owner and the Successful Bidder of all claims arising from the Owner's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to re-advertise, or otherwise dispose of the Work as the Owner may determine best serves its interest.

2.26. Liquidated Damages for Failure to Meet Project Completion Schedule: If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the Owner for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the Owner. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the Owner's awarding of this Contract liquidated damages in the daily amount of **$350.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the Owner for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the Owner and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the Owner; perceived inefficiency of the Owner; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the Owner during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the Owner gives is written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the Contractor shall have fully completed all clean-up, and all items that were identified by the Owner in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall not be finished and the Contract time shall continue to accrue until the Owner gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the Owner shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the Owner may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.
Liquidated damages as provided do not include any sums to reimburse the Owner for extra costs which the Owner may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the Owner incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the Owner incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the Owner may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the Owner for all expenses thus incurred.

2.27. Contingency/Force Account: Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.

2.28. Protection of Persons & Property: The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from

damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.

2.29. Changes in the Work: The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by Change Order.

2.30. Claims for Additional Cost or Time: If the Contractor wishes to make a claim for an increase in the contract sum or an extension in the contract time, he shall give the Owner written notice thereof within a reasonable time after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall precede in accordance with the regulations on safety. No such claim shall be valid unless so made. Any change in the contract sum or contract time resulting from such claim shall be authorized by Change Order.

2.31. Minor Changes in the Work: The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.

2.32. Field Orders: The Owner may issue written Field Orders which interpret the Contract Documents in accordance with the specifications, or which order minor changes in the work in accordance with the agreement, without change in the contract sum or time. The Contractor shall carry out such Field Orders promptly.

2.33. Uncovering & Correction of Work: The Contractor shall promptly correct all work rejected by the Owner as defective or as failing to conform to the contract documents whether observed before or after substantial completion and whether or not fabricated installed or competed. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. If within one (1) year after the date of completion or

within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the contract documents, any of the work found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner. The Contractor shall bear the cost of making good all work of separate Contractors destroyed or damaged by such removal or correction. If the Owner prefers to accept defective or non-conforming work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the payment or contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.

2.30. Amendment: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.

2.31. Assignment: The Contractor shall not sell, assign, transfer or convey any contract resulting from this IFB, in whole or in part, without the prior written approval from the Owner.

2.32. Compliance with Laws: Bids must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements.

2.33. Confidentiality: All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.

2.34. Conflict of Interest: No public official and/or Owner employee shall have interest in any contract resulting from this IFB.

2.35. Contract Termination: This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation.

2.36. Employment Discrimination: During the performance of any services per agreement with the Owner, the Contractor, by submitting a Bid, agrees to the following conditions:

2.36.1. The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, handicap, or

national origin except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Contractor. The Contractor agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2.36.2. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that such Contractor is an Equal Opportunity Employer.

2.36.3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

2.37. Affirmative Action: In executing a Contract with the Owner, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.

2.38. Immigration Reform and Control Act of 1986 and Immigration Compliance: The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).

2.39. Ethics: The Contractor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.

2.40. Failure to Deliver: In the event of failure of the Contractor to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Contractor responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.

2.41. Failure to Enforce: Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.

2.42. Force Majeure: The Contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Contractor, unless otherwise specified in the contract.

2.43. Independent Contractor: The Contractor shall be legally considered an Independent Contractor and neither the Contractor nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner

shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, or agents. The Owner shall not withhold from the contract payments to the Contractor any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Contractor. Further, the Owner shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.

2.44. Nonconforming Terms and Conditions: A bid that includes terms and conditions that do not conform to the terms and conditions of this Invitation for Bid is subject to rejection as non-responsive. The Owner reserves the right to permit the Contractor to withdraw nonconforming terms and conditions from its bid prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

Items for non-responsiveness may include, but not be limited to:

a. Submission of the Bid on forms other than those supplied by the Owner;

b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;

c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;

d. Failure to acknowledge receipt of any or all issued Addenda;

e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;

f. Failure to list the names of Subcontractors used in the Bid preparation as may be required in the Solicitation Documents;

g. Submission of a Bid that, in the opinion of the Owner, is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;

h. Tying of the Bid with any other bid or contract; and

i. Failure to calculate Bid prices as described herein.

2.45. Evaluation of Bids and Offers: The Owner reserves the right to:

- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the Owner.

The Owner will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Offeror, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the Owner's satisfaction within the Contract Time.

The Offeror shall furnish the Owner all information and data requested by the Owner to determine the ability of the Offeror to perform the Work. The Owner reserves the right to reject the Bid if the evidence submitted by, or investigation of such Offeror fails to satisfy the Owner that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Offeror authorizes the Owner to perform such investigation of the Offeror as the Owner deems necessary to establish the responsibility, qualifications and financial ability of the Offeror and, by its signature thereon, authorizes the Owner to obtain reference information concerning the Offeror and releases the party providing such information and the Owner from any and all liability to the Offeror as a result of such reference information so provided.

The Owner reserves the right to reject the Bid of any Offeror who does not pass any evaluation to the Owner’s satisfaction.

If the Contract is to be awarded, it will be awarded to the Offeror who, by evaluation, the Owner determines will best meet the Owner's interests.

The Owner reserves the right to accept or reject the Work contained in any of the Price Bid Schedules or alternates, either in whole or in part.

2.46. Award of Contract: Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the Owner may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the Owner will issue a Notice of Award to the Successful Bidder which will be accompanied by the Contract and the Performance

and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder shall sign and deliver the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the Owner. Within ten (10) Calendar Days thereafter, the Owner will deliver the executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the Owner and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the Owner.

The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

2.47. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.48. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

2.49. Patents/Copyrights: The Contractor agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Contractor for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this IFB.

2.50. Remedies: The Contractor and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

2.51. Venue: Any agreement as a result of responding to this IFB shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.

2.52. Expenses: Expenses incurred in preparation, submission and presentation of this IFB are the responsibility of the company and cannot be charged to the Owner.

2.53. Sovereign Immunity: The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.

2.54. Non-Appropriation of Funds: The contractual obligation of the Owner under this contract is contingent upon the availability of appropriated funds from this fiscal year budget as approved by the City Council or Board of County Commissioners from this fiscal year only. State of Colorado Statutes prohibit obligation of public funds beyond the fiscal year for which the budget was approved. Anticipated expenditures/obligations beyond the end of the current Owner's fiscal year budget

shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

2.55. Cooperative Purchasing: Purchases as a result of this solicitation are primarily for the Owner. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Bid. The quantities furnished in this bid document are for only the Owner. It does not include quantities for any other jurisdiction. The Owner will be responsible only for the award for its jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The Owner accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

2.56. Keep Jobs in Colorado Act: Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

2.56.1. "Public project" is defined as:

(a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects

(b) for which appropriate or expenditure of moneys may be reasonably expected to be $500,000.00 or more in the aggregate for any fiscal year

(c) except any project that receives federal moneys.

3. Statement of Work

3.1. GENERAL: The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the 2016 Waterline Replacement Project. The Project generally consists of the installation of 3,580 LF of 18" dia. Fusible C-905 PVC SDR-25 waterline and 320 LF of 18" dia. C-905 PVC SDR-25 waterline. This work includes all fittings, valves, restraints, connections, appurtenances, disinfection, testing, asphalt and concrete replacements related to the construction of the new waterline.

NOTE: The descriptions of the pay items listed in the Price Bid Schedule for this Project may not agree with those listed in the Standard Specifications. Payment for all Work performed, as required in the Contract Documents, will be in accordance with the items and units listed in the Price Bid Schedule.

The performance of the Work for this Project shall conform to the General Contract conditions presented in the City of Grand Junction's Standard Contract Documents for Capital Improvements Construction, revised July 2010, except as specifically modified or supplemented herein or on the Construction Drawings.

3.2. PROJECT DESCRIPTION: The Project generally consists of the installation of 3,580 LF of 18" dia. Fusible C-905 PVC SDR-25 waterline and 320 LF of 18" dia. C-905 PVC SDR-25 waterline. This work includes all fittings, valves, restraints, connections, appurtenances, disinfection, testing, asphalt and concrete replacements related to the construction of the new waterline.

3.3. SPECIAL CONDITIONS:

3.3.1. Mandatory Pre-Bid Meeting: **Prospective bidders are required to attend a mandatory pre-bid meeting on Tuesday, February 2, 2016 at 10:00am**. Meeting location will be in the City Council Auditorium, located at City Hall, 250 N. 5th Street, Grand Junction, CO. This meeting also allows the Owner to know who is planning on submitting a bid for the project. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

3.3.2. Affirmative Action: The Contractor is not required to submit a written Affirmative Action Program for the Project.

3.3.3. Pricing: Pricing shall be all inclusive to include but not be limited to: all labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to each site), travel, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful completion of the project.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, and liquidated damages, etc.

3.3.4. Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to the project site(s), Grand Junction, CO.

3.3.5. Contractor must meet all federal, state, and local rules, regulations, and requirements for providing such services.

3.3.6. Contract: A binding contract shall consist of: (1) the IFB and any amendments thereto, (2) the bidder's response (bid) to the IFB, (3) clarification of the bid, if any, and (4) the City's Purchasing Department's acceptance of the bid by "Notice of Award" or by "Purchase Order". All Exhibits and Attachments included In the IFB shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The bidder expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

3.3.7. Time of Completion: The scheduled time of Completion for the Project is **61 Calendar Days** from the starting date specified in the Notice to Proceed.

Completion is achieved when site clean-up and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

The anticipated schedule for the Project is as follows:

Advertise for Bids:	Sunday, January 17, 24, & 31, 2016
Pre-Bid Meeting:	Tuesday, February 2, 2016 @ 10:00 a.m.
Inquiry Deadline:	Friday, February 5, 2016
Addenda Issued by:	Monday February 8, 2016
Bid Opening:	Thursday, February 11, 2016 @ 2:00 p.m.
City Council approval:	Wednesday, March 2, 2016
Notice of Award:	Thursday, March 3, 2016
Contract, Bond and Insurance Cert.	Monday, March 15, 2016
Preconstruction meeting:	Tuesday, March 15, 2016 @ 2:00 p.m.
Begin work:	Monday, March 28, 2016
Final Completion:	Friday, May 27, 2016

3.3.8. Working Days and Hours: The working days and hours shall be as stated in the General Contract Conditions, Section VI, or as mutually agreed upon in the preconstruction meeting.

3.3.9. Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.12. Contractor shall supply to Owner all copies of finalized permits.

3.3.10. Permits: The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

- *Colorado Department of Transportation (CDOT) - Special Use Permit.*

This permit is required for working in North Avenue. The Contractor shall be aware during the bidding process that CDOT may require the work within North Avenue right-of-way to be completed as night work and the trench backfill with CDOT's Structural Flow-Fill material.

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

- None

3.3.11. City Furnished Materials: The City will furnish the following materials for the Project:

- AutoCAD drawings for survey stake-out.

3.3.12. Project Newsletters: A newsletter for the Project will be prepared and distributed by the City prior to construction starting. It will include general information about the Project including interruptions in utility services, street closures, parking restrictions, project schedule, and the names and telephone numbers of the contacts for the City and Contractor. The newsletter will be mailed approximately one week before the Contractor commences work.

3.3.13. Project Sign: Project signs, if any, will be furnished and installed by the City.

3.3.14. Authorized Representatives of the City: Those authorized to represent the City shall include Purchasing Agent, Engineers, and Inspectors employed by the City, only.

3.3.15. Stockpiling Materials and Equipment: When approved by the Project Engineer, the Contractor may stockpile and store materials and equipment within public right-of-way. The Contractor shall be responsible for obtaining written permission to use private property for storage of materials and equipment. Copies of the above-mentioned agreements shall be submitted to the Project Engineer prior to use of the property.

3.3.16. Traffic Control: The Contractor shall provide and maintain traffic control in accordance with the approved Traffic Control Plan and the *Manual on Uniform*

Traffic Control Devices (MUTCD). The traffic control plan shall be presented to the Project Engineer at or prior to the pre-construction meeting for review and approval. The following requirements and limitations shall apply to the traffic control:

The Contractor shall give the City Project Engineer two-week's notice before closing a road to through traffic and/or a traffic lane so the City can send out an informational newsletter to the surrounding residents letting them know about the proposed road closure, as well as, so the City can potentially place variable message boards on the roads to warn motorists and local residents of the road closure.

Anticipated local streets needing closure during pipe fusion and pipe installation:

1. Intersection of Orchard Avenue and 23rd Street
2. Close eastbound Orchard Avenue between 21st Street and 28 Road.
3. Intersection of Orchard Avenue and 26th Street.
4. Southbound and northbound 28 Road depending on which side of street is being worked on.
5. Intersection of 28 Road and Hall Avenue.
6. Intersection of 28 Road and Mesa Avenue.
7. Intersection of 28 Road and Texas Avenue.
8. Intersection of 28 Road and Elm Avenue.
9. Intersection of 28 Road and Bunting Avenue.
10. Eastbound North Avenue. Shift traffic to the north westbound lanes and provide one lane for each direction. **Most likely will be night work per the CDOT Special-Use Permit.**

3.3.17. Traffic Detector Loops: The existing traffic detector loops in the 28 Road and North Avenue intersection will not be replaced. Prior to milling, the Contractor shall contact Tom Lanam, City Traffic Foreman, at 244-1573 so he can reset the controller cabinets to function without the traffic detector loops.

3.3.18. <u>Fusible PVC C-905:</u>

The City of Grand Junction has already purchased the 18" Fusible C-905 PVC pipe from Underground Solutions. Underground Solutions has the pipe stockpiled at their manufacturing plant. Underground Solutions is not a contractor and Underground Solutions does not install pipe, they only provide the fusion services. The Contractor for this project will be responsible for providing 'good' fusion support to Underground Solutions fusion technicians. In addition, the Contractor shall provide pipe handling support including the following:

- Equipment and personnel to offload pipe when it arrives onsite. Underground Solutions will provide equipment requirements and pipe handling instructions in advance of shipment. (See Appendix B)

- Equipment and personnel to support fusion activity: load sticks onto fusion machine and advance the string after each joint cools. A dedicated man and

machine is advised in order to achieve Underground Solutions' fusion estimate of (12 days).

- Diesel fuel for fusion machine. Underground Solutions' fusion technicians don't travel with fuel. Consumption is ~1.5 gal/hour or ~15 gal/day. All Bidders shall include the cost of fuel in their bid.

- Providing all necessary equipment, hydraulic equipment, materials and labor for pulling the Fusible pipe through the existing 24" pipe.

The Contractor shall only fuse 500-1,000 lineal feet of fusible pipe above ground at a time depending on location. The primary location where the Contractor needs to keep the above ground fused pipe to a 400-500 lineal foot minimum length is south of North Avenue and north of the entrance into the K-Mart complex, unless the Contractor gets written permission from the K-Mart complex to block the south entrance along 28 Road with fused pipe.

3.3.19. Uranium Mill Tailings: It is anticipated that radioactive mill tailings could potentially be encountered in North Avenue, Hall Avenue, Mesa Avenue, and in the intersection of 26th Street and Orchard Avenue.

Uranium Mill Tailings shall be disposed of per Section 202 of the City of Grand Junction's Standard Specifications for Road and Bridge Construction.

3.3.20. Fugitive Petroleum or Other Contamination: It is anticipated that soil contamination from fugitive petroleum or other contaminants will not be encountered with the Project.

3.3.21. Work Location Schedules: The City anticipates this waterline project being divided up into three sections of work for the fusible pipe installation. These proposed three sections are as follows:

1. Orchard Avenue – Station: 0+40 to 10+70
2. 28 Road – Station: 10+70 to 19+50
3. 28 Road – Station: 19+50 to 39+20

Prior to the final connections being made, the Contractor shall have passed the pressure, leakage and disinfection tests for each section and the section of pipeline flushed.

3.3.22. Storm Water Management Plan: If groundwater is encountered and requires dewatering, the dewatering pump shall have a filter sock attached to the end of the discharge hose. This will prevent sediment in the trench discharge water from entering into the drainages. The contractor will be responsible for monitoring the levels of sediment within the filter sock and replacing the filter sock when it reaches 50% of its holding capacity. It will also be the responsibility of the contractor to obtain the Dewatering Permit from the Colorado Department of Public Health and Environment if necessary.

Any of the materials to be installed or used for the installation of the flow line shall be stored within the construction area where the Contractor is working unless permission is granted to store materials elsewhere. Any glues and/or adhesives necessary shall be contained at all times within a spill proof and waterproof container when not being used.

All vehicle and equipment maintenance and fueling shall be performed in a designated area within the construction area. The fueling area shall exhibit Best Management Practices in order to minimize and/or eliminate the potential of fuel spillage. Any spillage of fuel onto the ground shall be immediately cleaned up and any contaminated soil disposed of properly at the Mesa County Landfill. Documentation of spills, leaks and overflows that result in the discharge of pollutants, including logging and reporting of the spill is required to the Water Quality Control Division at their toll-free 24-hour environmental emergency spill reporting line – 1-877-518-5608.

The Contractor shall clear the site of all on-site waste daily, including scrap from construction materials.

Concrete trucks will be required to wash out in a portable concrete washout pool supplied by the Contractor or the concrete truck shall wait to washout back at the concrete batching facility. The Contractor will be responsible for maintaining the washout pool. The washout pool shall be cleaned out and/or replaced when the washout pool reaches 50% of total capacity. The concrete washout pool needs to be dynamic and durable in its ability to be moved with the progress of construction.

The Contractor shall clear the site of all trash and litter daily. Portable toilets will be maintained (cleaned and emptied) by a local supplier.

3.3.23. Construction Equipment Storage: During non-working hours along Orchard Avenue and 28 Road, the Contractor will be allowed to store construction equipment and/or construction materials within the traffic controlled work zone within the City right-of-way. The Contractor will also be allowed to temporarily store construction equipment on the adjacent City streets that are perpendicular to Orchard Avenue and 28 Road during the non-working times.

3.3.24. Clean-Up: The Contractor shall clear the construction site of all trash and on-site waste daily, including scrap from construction materials.

3.3.25. Disposal of Asphalt/Millings: All removed asphalt and asphalt millings unless otherwise directed shall become to property of the Contractor.

3.3.26. Asphalt Removal and Temporary Asphalt Millings: Asphalt pavement shall be removed full-depth per the City's Standard Detail GU-03 using the "T" Top section. The pavement joints/edges from the milling process shall be located either at the edge or AT the center of the traffic lane. No longitudinal pavement joint/edge shall fall in the location of vehicle wheel paths.

3.3.27. City Water Department provided Hot Taps and Temporary Water Service: The City of Grand Junction's Water Department will provide all Hot Taps and Gate Valves for the laterals that are 6" and larger that will be connected to only the new Fusible PVC pipe. The Contractor shall coordinate and schedule this work accordingly with the City's Water Department. Coordinate hot taps with Ron Key, 970-270-6446. The Contractor shall provide a safe and workable trench area, per OSHA safety standards, for the City's crew's to work in and for the hot tap machine to adequately fit in. The City estimates that they can complete 3-4 hot taps per day if the Contractor has the Fusible PVC pipe exposed and the trench ready for the hot tap machine.

Once the hot tap and the gate valve assembly is installed by the City, the Contractor shall connect to the new gate valve and make the necessary connection into the existing lateral pipe and backfill the trench.

The City's Water Department will also provide temporary water services to adjacent businesses and residences that will be affected by the Fusible PVC waterline installation. The temporary water services will be disconnected when the Contractor is making the final service connection from the new 18" pipe to the existing service pipe or meter vault.

3.3.28. Existing 24" Waterline Pipe Material: Using As-Built drawings found on the City's GIS website, the City estimates the existing pipe material that the new 18" Fusible PVC pipe will be installed in is as follows:

- **28 Road**
  - North Ave. to Texas Ave. is 24" Ductile Iron Pipe (DIP)
  - Texas Ave. to Orchard Ave. is 24" Steel Pipe
- **Orchard Avenue**
  - 24th Street to 28 Road is 24" Steel Pipe

The Contractor shall verify the existing pipe material and size before PVC pipe fusion begins.

3.3.29. Schedule of Submittals: The Contractor at a minimum shall deliver these submittals at the pre-construction:

- Construction schedule submitted at or prior to the pre-construction meeting and updated as necessary to reflect actual conditions
- Hourly rate table for labor and equipment to be used on this project.
- Provide Traffic Control Plan for all phases of work
- Means and Methods Statement for Fusible PVC Installation
- Pipe (PVC)
- Fire Hydrant Assembly
- Copper Pipe and 2" HDPE Pipe
- 18" Butterfly Valves
- Gate Valves, Corporation Stops

- Fittings
- Pipe Bedding Gradation, Type A
- Inlet Basin Protection (Silt-Sack)

3.3.30. Existing Utilities and Structures: The location of existing utilities and structures shown on the Plans are approximate. It is the responsibility of the Contractor to locate and protect all structures and utilities in accordance with General Contract Condition Section 37. The Contractor shall coordinate with the utility companies any necessary relocation of utilities and schedule his work accordingly.

3.3.31. Incidental Items: Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

3.3.32. Draining Existing 24" Pipe: The Contractor will be required to drain the existing 24" Steel waterline before the City is able to camera the waterline, and before the slip-lining operations of the Fusible PVC pipe can begin. Since the water being drained is potable water, the Contractor will be allowed to discharge the water into the nearest storm drain inlet and/or into Indian Wash. The pumping will not be paid for separately, but shall be included in the cost of the project and include all necessary labor, equipment, and materials to successfully drain the existing 24" Steel waterline.

Since the existing 24" waterline will be under pressure, the Contractor can hot tap the existing 24" Steel waterline as a way to relieve the water pressure and as a way to discharge the water.

3.3.33. **Camera Inspect Existing 24" Waterline:** Once the existing 24" waterline is shut-off and drained; the City of Grand Junction will camera inspect the 24" waterline to see if there are any restrictions within the pipe that may cause difficulties during the slip-lining operations. The camera video will be shared with the Contractor. If restrictions are found within the existing pipe that need to be removed before slip-lining operations begin, the Contractor shall expose the existing 24" waterline at the location of the restriction and remove the restriction. The cost for removing restriction areas on the existing 24" waterline will not be paid for separately, but shall be included in the overall project cost. The City anticipates the only restrictions on the existing 24" waterline are the known in-line valves and elbow fittings per the as-built drawings and the locate marks.

3.4. SPECIAL PROVISIONS:

STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION:

The ***City of Grand Junction Standard Specifications for Road and Bridge Construction*** are hereby modified or supplemented for this Project by the following modifications to ***The Standard Specifications for Road and Bridge Construction***, State Department of Highways, Division of Highways, State of Colorado:

SP-1 SECTION 601 – STRUCTURAL CONCRETE

Section 601 of the Standard Specifications is hereby revised for this project as follows:

This CDOT Specification has been added to this Project:

The Contractor shall furnish a batch ticket (delivery ticket) with each load for all concrete. Concrete delivered without a batch ticket containing complete information as specified shall be rejected. The Contractor shall collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer or his representative at the end of each day. The Engineer or his representative shall have access to the batch tickets at any time during the placement. The following information shall be provided on each ticket:

1. Suppliers name and date
2. Truck number
3. Project name and location
4. Concrete class and designation number
5. Cubic yards batched
6. Type brand and amount of each admixture
7. Type, brand, and amount of cement and fly ash
8. Weights of fine and course aggregates
9. Moisture of fine and course aggregates
10. Gallons of batch water

The contractor shall add the following information to the batch ticket at time of placement:

1. Gallons of water added by the truck operator.
2. Number of revolutions of the drum for mixing
3. Discharge time

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER LINES, SANITARY SEWERS, STORM DRAINS, UNDERDRAINS AND IRRIGATION SYSTEMS

The City of Grand Junction ***Standard Specifications for Construction of Water Lines, Sanitary Sewers, Storm Drains, Underdrains and Irrigation Systems*** are hereby modified for this Project as follows:

SP-1 SECTION 102 – MATERIALS

Section 102 of the Standard Specifications is hereby revised for this project as follows:

Subsection 102.7b, PVC Water Distribution Pipe, shall include the following material specification:

PART 1 –GENERAL

1.01 DESCRIPTION

A SCOPE

1. This section specifies fusible polyvinylchloride pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by slip lining.

B REQUIREMENTS:

1. Contractor shall provide fusible polyvinylchloride pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification for installation by slip lining.
2. Contractor shall be responsible for all installation processes and procedures associated with the installation by slip lining in accordance with this specification.

C PIPE DESCRIPTION

1. Pipe Supplier shall furnish fusible polyvinylchloride pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.
2. Pipe shall conform to the following dimensionality and general characteristics table:

Pipe Description	Nominal Diameter (in.)	DR	Color	Pressure Class (psi)	Required Inner Diameter (in.)
Orchard Ave. & 28 Road	**18”**	**25**	**Blue**	**165**	**17.85”**

1.02 QUALITY ASSURANCE

A REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.

3. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI/AWWA C110/A21.10	American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
ANSI/AWWA C111/A21.11	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	AWWA Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C605	Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
AWWA C651	Standard for Disinfecting Water Mains
AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution
AWWA C905	Standard for Polyvinyl Chloride (PVC Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm Through 1200mm), for Water Distribution and Transmission
AWWA M23	AWWA Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

Reference	Title
ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2152	Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
NSF-14	Plastics Piping System Components and Related Materials
NSF-61	Drinking Water System Components--Health Effects
PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

B MANUFACTURER REQUIREMENTS

1. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

C FUSION TECHNICIAN REQUIREMENTS

1. Fusion Technician shall be fully qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

D SPECIFIED PIPE SUPPLIERS

1. Fusible polyvinylchloride pipe shall be used as manufactured under the trade names Fusible C-900®, Fusible C-905®, and FPVC®, for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion

process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051. Owner and engineer are aware of no other supplier of fusible polyvinylchloride pipe that is an equal to this specified pipe supplier and products.

E WARRANTY

1. The pipe shall be warranted for one year per the pipe supplier's standard terms.
2. In addition to the standard pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.

F PRE-CONSTRUCTION SUBMITTALS

1. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:
   1) Pipe Size
   2) Dimensionality
   3) Pressure Class per applicable standard
   4) Color
   5) Recommended Minimum Bending Radius
   6) Recommended Maximum Safe Pull Force
   7) Fusion technician qualification indicating conformance with this specification
2. The following WORK PLAN AND INFORMATION is required from the contractor and/or slipline installer. This WORK PLAN AND INFORMATION shall also be supplied to the pipe supplier, should it be requested:
   1) Work plan shall include for each sliplining installation all excavation locations, interfering utilities, excavation dimensions, flow bypass and traffic control schematics.
   2) At least 2 weeks prior to the start of work, the Contractor shall submit its sliplining schedule identifying daily work hours and working dates for each installation.
   3) Grout design mixes, installation plan, and contingency plan for the annular space grout to be used, if grout is to be used for annular space fill.

G POST-CONSTRUCTION SUBMITTALS

1. The following AS-RECORDED DATA is required from the contractor and/or fusion provider to the owner or pipe supplier upon request:
   1) Approved datalogger device reports
   2) Fusion joint documentation containing the following information:

a) Pipe Size and Thickness

b) Machine Size

c) Fusion Technician Identification

d) Job Identification

e) Fusion Joint Number

f) Fusion, Heating, and Drag Pressure Settings

g) Heat Plate Temperature

h) Time Stamp

i) Heating and Cool Down Time of Fusion

j) Ambient Temperature

2. The following AS-RECORDED DATA is required from the contractor and/or slipline installer to the owner or pipe supplier upon request:

1) Grout testing reports, if grout is to be used for annular space fill.

PART 2 – PRODUCTS

2.01 FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER

A Fusible polyvinylchloride pipe shall conform to AWWA C900, AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.

B Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

C Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.

D Fusible polyvinylchloride pipe shall be blue in color for potable water use.

E Pipe shall be marked as follows:

1. Nominal pipe size
2. PVC
3. Dimension Ratio, Standard Dimension Ratio, or Schedule
4. AWWA pressure class, or standard pressure rating for non-AWWA pipe, as applicable
5. AWWA standard designation number, or pipe type for non-AWWA pipe, as applicable
6. NSF-61 mark verifying suitability for potable water service
7. Extrusion production-record code

8. Trademark or trade name
9. Cell Classification 12454 and/or PVC material code 1120 may also be included

F Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

2.02 ~~FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR NON-POTABLE WATER NOT CONFORMING TO AWWA C905 DIMENSIONALITY~~

A ~~Fusible polyvinylchloride pipe shall conform to AWWA C900, ASTM D2241 or ASTM D1785 for standard dimensionality, as applicable. Testing shall be in accordance with the referenced AWWA standard.~~

B ~~Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.~~

C ~~Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.~~

D ~~Fusible polyvinylchloride pipe shall be purple in color for reclaim, reuse, or other non-potable water distribution or conveyance.~~

E ~~Pipe shall be marked as follows:~~

1. ~~Nominal pipe size~~
2. ~~PVC~~
3. ~~Dimension Ratio, Standard Dimension Ratio, or Schedule~~
4. ~~AWWA pressure class, or standard pressure rating for non-AWWA pipe, as applicable~~
5. ~~AWWA standard designation number, or pipe type for non-AWWA pipe, as applicable~~
6. ~~Extrusion production-record code~~
7. ~~Trademark or trade name~~
8. ~~Cell Classification 12454 and/or PVC material code 1120 may also be included~~
9. ~~For reclaim water service, the wording: "Reclaimed Water, NOT for Potable Use"~~

F ~~Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.~~

2.03 ~~FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR NON-POTABLE WATER CONFORMING TO AWWA C905 DIMENSIONALITY~~

A ~~Fusible polyvinylchloride pipe shall conform to AWWA C905 standard.~~

B ~~Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.~~

C ~~Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.~~

D ~~Fusible polyvinylchloride pipe shall be purple in color for reclaim, reuse, or other non-potable water distribution or conveyance.~~

E ~~Pipe shall be marked as follows:~~

1. ~~Nominal pipe size~~
2. ~~PVC~~
3. ~~Dimension Ratio, Standard Dimension Ratio, or Schedule~~
4. ~~AWWA pressure class~~
5. ~~AWWA standard designation number~~
6. ~~Extrusion production-record code~~
7. ~~Trademark or trade name~~
8. ~~Cell Classification 12454 and/or PVC material code 1120 may also be included~~
9. ~~For reclaim water service, the wording: "Reclaimed Water, NOT for Potable Use"~~

F ~~Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.~~

2.04 ~~FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR WASTEWATER NOT CONFORMING TO AWWA C905 DIMENSIONALITY~~

A ~~Fusible polyvinylchloride pipe shall conform to AWWA C900, ASTM D2241 or ASTM D1785 for standard dimensionality, as applicable. Testing shall be in accordance with the referenced AWWA standard.~~

B ~~Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.~~

C ~~Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.~~

D ~~Fusible polyvinylchloride pipe shall be green in color for wastewater use.~~

E ~~Pipe shall be marked as follows:~~

1. ~~Nominal pipe size~~
2. ~~PVC~~
3. ~~Dimension Ratio, Standard Dimension Ratio, or Schedule~~
4. ~~AWWA pressure class, or standard pressure rating for non-AWWA pipe, as applicable~~
5. ~~AWWA standard designation number, or pipe type for non-AWWA pipe, as applicable~~

6. ~~Extrusion production-record code~~
7. ~~Trademark or trade name~~
8. ~~Cell Classification 12454 and/or PVC material code 1120 may also be included~~

F ~~Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.~~

2.05 ~~FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR WASTEWATER CONFORMING TO AWWA C905 DIMENSIONALITY~~

A ~~Fusible polyvinylchloride pipe shall conform to AWWA C905 standard.~~

B ~~Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.~~

C ~~Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.~~

D ~~Fusible polyvinylchloride pipe shall be green in color for wastewater use.~~

E ~~Pipe shall be marked as follows:~~

1. ~~Nominal pipe size~~
2. ~~PVC~~
3. ~~Dimension Ratio, Standard Dimension Ratio, or Schedule~~
4. ~~AWWA pressure class~~
5. ~~AWWA standard designation number~~
6. ~~Extrusion production-record code~~
7. ~~Trademark or trade name~~
8. ~~Cell Classification 12454 and/or PVC material code 1120 may also be included~~

F ~~Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.~~

2.06 ~~FUSIBLE POLYVINYLCHLORIDE NON-PRESSURE PIPE FOR WASTEWATER OR SURFACE WATER~~

A ~~Fusible polyvinylchloride pipe shall conform to ASTM D3034 or ASTM F679.~~

B ~~Fusible polyvinylchloride pipe may instead conform to AWWA C900 or AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensionality, as applicable.~~

C ~~Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.~~

D ~~Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.~~

E ~~Fusible polyvinylchloride pipe shall be green in color for wastewater use. Fusible polyvinylchloride pipe shall be white in color for surface or storm water use.~~

F ~~Pipe shall be marked as follows:~~

1. ~~Nominal pipe size~~
2. ~~PVC~~
3. ~~Dimension Ratio, Standard Dimension Ratio, or Schedule~~
4. ~~Pressure class or standard pressure rating~~
5. ~~Standard designation number or pipe type~~
6. ~~Extrusion production-record code~~
7. ~~Trademark or trade name~~
8. ~~Cell Classification 12454 and/or PVC material code 1120 may also be included~~

G ~~Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.~~

2.07 FUSION JOINTS

A Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.

2.08 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

A Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.

B DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

1. See Section 102.7a in the City of Grand Junction's Standard Specifications for the Construction of Underground Utilities for information on Ductile Iron Fittings.

C ~~PVC GASKETED, PUSH-ON FITTINGS~~

~~Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C905.~~

1. ~~Acceptable fittings for use joining fusible polyvinylchloride pipe other sections of fusible polyvinylchloride pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the drawings.~~
2. ~~Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as indicated in the construction documents.~~
3. ~~PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guidelines.~~

D ~~FUSIBLE POLYVINYL CHLORIDE SWEEPS OR BENDS~~

1. ~~Fusible polyvinyl chloride sweeps or bends shall conform to the same sizing convention, diameter, dimensional tolerances and pressure class of the pipe being joined using the sweep or bend.~~
2. ~~Fusible polyvinyl chloride sweeps or bends shall be manufactured from the same fusible polyvinyl chloride pipe being used for the installation, and shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation. There shall be no gasketed connections utilized with a fusible polyvinyl chloride sweep.~~
3. ~~Standard fusible polyvinyl chloride sweep or bend angles shall not be greater than 22.5 degrees, and shall be used in nominal diameters ranging from 4 inch through 16 inch.~~

E ~~SLEEVE-TYPE COUPLINGS~~

1. ~~Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe, and may be restrained or unrestrained as indicated in the construction documents.~~
2. ~~Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.~~

F ~~EXPANSION AND FLEXIBLE COUPLINGS~~

1. ~~Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.~~
2. ~~Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.~~

G CONNECTION HARDWARE

Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

2.09 ~~CONNECTIONS FOR GRAVITY SANITARY SEWER AND NON-PRESSURE APPLICATIONS~~

A ~~The following connections are to be used in conjunction with tie-ins to other non-pressure, gravity sewer piping and/or structures, and shall be as indicated in the construction documents.~~

B ~~PVC GASKETED, PUSH-ON COUPLINGS~~

1. ~~Acceptable couplings for joining fusible polyvinylchloride pipe to other sections of fusible polyvinylchloride pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings as indicated in the construction documents.~~
2. ~~PVC gasketed, push-on fittings and/or restraint hardware must be~~

installed per the manufacturer's guidelines.

C FUSIBLE POLYVINYL CHLORIDE SWEEPS OR BENDS

1. Fusible polyvinyl chloride sweeps or bends shall conform to the same sizing convention, diameter, dimensional tolerances and pressure class of the pipe being joined using the sweep or bend.

2. Fusible polyvinyl chloride sweeps or bends shall be manufactured from the same fusible polyvinyl chloride pipe being used for the installation, and shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation. There shall be no gasketed connections utilized with a fusible polyvinyl chloride sweep.

3. Standard fusible polyvinyl chloride sweep or bend angles shall not be greater than 22.5 degrees, and shall be used in nominal diameters ranging from 4 inch through 16 inch.

D SLEEVE-TYPE COUPLINGS

1. Sleeve-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.

E EXPANSION AND FLEXIBLE COUPLINGS

1. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.

F CONNECTION HARDWARE

1. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

G CONNECTION TO SANITARY SEWER MANHOLES AND STRUCTURES

1. Fusible polyvinylchloride pipe shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out of the manhole or structure.

2. Connections to existing manholes and structures shall be as indicated in the construction documents.

   1) For a cored or drilled opening provide a flexible, watertight connection that meets and/or exceeds ASTM C923.

   2) For a knock out opening, provide a watertight connection (waterstop or other method) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means.

   3) Grout opening in manhole wall with non-shrink grout. Pour concrete collar around pipe and outside manhole opening. Provide flexible pipe joint or flexible connector within 2 feet of the collar.

3. ~~Connections to a new manhole or structure shall be as indicated in the construction documents.~~

   1) ~~A flexible, watertight gasket per ASTM C 923 shall be cast integrally with riser section(s) for all precast manhole and structures.~~

   2) ~~Drop connections shall be required where shown on drawings.~~

   3) ~~Grout internal joint space with non-shrink grout.~~

2.10 ~~GROUT~~

A ~~Grout for use as a filler of the annular space between the fusible polyvinylchloride pipe and the host pipe shall be a low-density, highly flowable mix. Grout shall meet the compressive strength requirements for the installation per the contract documents.~~

B ~~Testing requirements shall be in accordance with the contract documents. Contractor may incorporate grout additives to improve its flow properties, provided that strength property requirements are met.~~

2.11 PIPE PULL HEADS

A Pipe pull heads, if utilized, shall employ a positive through-bolt design assuring a smooth walled bolt against the pipe cross-section at all times.

B Pipe pull heads shall be specifically designed for use with fusible polyvinylchloride pipe, and shall be as recommended by the pipe supplier.

2.12 PIPE ROLLERS

A Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.

B A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and resist excessive sagging of the product pipe.

PART 3 --EXECUTION

3.01 DELIVERY AND OFF-LOADING

A All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

B Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and

type.

C Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.

D Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

E During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

F If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

3.02 HANDLING AND STORAGE

A Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

B Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.

C Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

D Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

E If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

F Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.03 FUSION PROCESS

A GENERAL

1. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
2. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
3. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.
4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
    a) HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
    b) CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
    c) GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
    d) DATA LOGGING DEVICE – An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.
5. Other equipment specifically required for the fusion process shall include the following:
    a) Pipe rollers shall be used for support of pipe to either side of the machine
    b) A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.
    c) An infrared (IR) pyrometer for checking pipe and heat plate temperatures.

d) Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

e) Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.

B JOINT RECORDING

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.04 PIPE CLEANING

A Host pipe shall be cleaned in accordance with all applicable standards and guidelines. Unless otherwise specified, all interior pipe surfaces shall be cleaned per AWWA M28.

B Hazardous materials shall be removed and disposed of per all applicable regulations.

C All pipelines shall be cleaned with as many passes as necessary to create a uniform interior host pipe surface free of all loose material and sharp edges. Any potentially deleterious areas of the host pipe should be removed or secured in place, prior to the insertion of the fusible polyvinylchloride pipe.

3.05 TV INSPECTION

A The host pipe shall be inspected by TV after or during the cleaning process in accordance with these specifications.

1. TV inspection after host pipe cleaning shall indicate condition of host pipe and suitability of host pipe for fusible polyvinylchloride pipe insertion.

2. Obstructions such as corporation taps, valves and valve bodies, and collapsed piping shall be remedied prior to insertion. Spot repairs shall be made in accordance with the drawings and these specifications.

3.06 FUSIBLE POLYVINYLCHLORIDE PIPE INSERTION AND INSTALLATION

A EXCAVATION AND ACCESS PITS

1. Access pit length shall be such that the minimum bending radius for the fusible polyvinylchloride pipe, per the pipe supplier is maintained. Sheeting, shoring and bracing requirements shall be in accordance with these specifications and applicable jurisdictional standards.

2. Access pit excavations shall be performed at all points where the fusible polyvinylchloride pipe will be inserted into the existing pipeline.

When possible, access pit excavations shall coincide with host pipe lateral connection points or other appurtenance installations.

B PULLING EQUIPMENT

1. The pulling mechanism shall be properly connected to the end of the fusible polyvinylchloride pipe via a pulling head or arrangement approved by the pipe supplier.

2. The maximum pulling tension on the fusible polyvinylchloride pipe shall not exceed the pipe supplier's safe pulling force as submitted for this project.

3. Immediately following the completion of an installation by sliplining, if possible, the pipe should be pushed back into the location of the insertion, at the pulling head, until a small amount of movement is realized at the insertion pit on the other side of the installation from the pulling equipment.

C FUSIBLE POLYVINYLCHLORIDE PIPE CARE

1. The fusible polyvinylchloride pipe shall be handled with care to minimize the possibility of it being cut, kinked, gouged, or otherwise damaged. The use of cables or hooks will not be permitted.

2. Sections of the fusible polyvinylchloride pipe damaged, cut, or gouged shall be repaired by cutting out the section of damaged pipe and rejoining.

3.07 ~~ANNULAR SPACE GROUTING~~

A ~~If required, the annular space between the outside of the fusible polyvinylchloride pipe and the inside of the existing host pipe shall be filled with a flowable grout in accordance with the contract documents.~~

B ~~If required, samples of grout shall be obtained in accordance with ASTM C495. One set of four standard cylinders shall be cast for each batch. Special handling and sampling procedures shall be followed if indicated by the grout manufacturer. The samples must meet the design compressive strength of the grout as outlined in this specification and per the grout manufacturer. Samples shall be tested in accordance with ASTM C495.~~

C ~~Grouting of the annular space shall be done in such a manner as to prevent damage, floating, or collapse of the fusible polyvinylchloride pipe. Grouting operations shall be properly vented. If the distance between grout points exceeds the Contractor's pumping capability additional grouting points shall be excavated. The fusible polyvinylchloride pipe at access pits, service connections, and grouting points shall not be grouted above the springline of the existing host pipe.~~

D ~~The fusible polyvinylchloride pipe shall be filled with water prior to the grouting procedure. This shall aid in keeping the fusible polyvinylchloride pipe from floating or collapsing during grouting operation and also aid in dissipating the heat of hydration and its effects on the fusible polyvinylchloride pipe as the grout cures. This can be done in~~

~~coordination with the testing performed on the fusible polyvinylchloride pipe.~~

3.08 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

A Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

1. Field verify location, size, piping material, and piping system of the existing pipe.
2. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.

B Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.09 PIPE SYSTEM CONNECTIONS

A Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

3.10 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

A Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.

B All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

C Equipment used for tapping shall be made specifically for tapping PVC pipe:

1. Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
2. Manually operated or power operated drilling machines may be used.

D Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.11 TESTING

A Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

B HYDROSTATIC TESTING AND LEAKAGE TESTING FOR PRESSURE PIPING

1. Hydrostatic and leakage testing for piping systems that contain mechanical jointing as well as fused PVC jointing shall comply with AWWA C605.

2. Unless agreed to or otherwise designated by the owner or engineer, testing pressure pipelines shall comply with Section 105.4 – Testing Pressure Pipelines in the City of Grand Junction's Standard Specifications for the Construction of Underground Utilities.

3. In preparation for pressure testing the following parameters must be followed:

   1) All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.

   2) The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.

C ~~LEAKAGE TESTING FOR NON-PRESSURE PIPING~~

1. ~~Gravity sanitary sewers that contain mechanical jointing in addition to fused PVC joints may need to be tested for excessive leakage.~~

2. ~~Gravity sanitary sewer leakage testing may include appropriate water or low pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of two feet. The air test, if used, shall be conducted in accordance with one of the following Standards:~~

   1) ~~ASTM F1417~~

   2) ~~UNI-B-6~~

3. ~~The testing method selected shall properly consider the existing~~

~~groundwater elevations during the test.~~

D ~~DEFLECTION TESTING FOR NON-PRESSURE PIPING~~

1. ~~After completion of the backfill, the engineer or owner may require that a deflection test be performed.~~

2. ~~Deflection tests should be conducted using a go/no-go mandrel. The mandrel's outside dimension shall be sized to permit no more than 7.5 percent deflection. The percent deflection shall be established from the base inside diameter of the pipe. If the internal beading of the fused joints for the pipe is not required to be removed, the mandrel shall account for this clearance as well. The mandrel shall be approved by the owner or engineer prior to use. Lines that permit safe entry may allow other deflection test options, such as direct measurements.~~

E DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

1. After installation, the pipeline, having passed all required pressure testing, shall be disinfected prior to being put into service. Unless otherwise directed by the owner or engineer, the pipeline will be disinfected per Section 106 – Disinfection of Waterlines in the City of Grand Junction's Standard Specifications for the Construction of Underground Utilities.

F PARTIAL TESTING

1. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the owner and engineer.

END OF SECTION

3.5. QUESTIONS REGUARDING SOLICIATION PROCESS/SCOPE OF WORK:

Nick Jones, Buyer
City of Grand Junction
970-244-1533
nickj@gjcity.org

4. Contractor's Bid Form

Bid Date: _____

Project: IFB-4158-16-NJ 2016 Waterline Replacement Project

Bidding Company: _____

Name of Authorized Agent: _____

Email _____

Telephone_____ **Address**_____

City_____**State**_____**Zip**_____

The undersigned Bidder, in compliance with the Invitation for Bids, having examined the Instruction to Bidders, General Contract Conditions, Statement of Work, Specifications, and any and all Addenda thereto, having investigated the location of, and conditions affecting the proposed work, hereby proposes to furnish all labor, materials and supplies, and to perform all work for the Project in accordance with Contract Documents, within the time set forth and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Contractor's Bid Form is a part.

The undersigned Contractor does hereby declare and stipulate that this offer is made in good faith without collusion or connection to any person(s) providing an offer for the same work, and that it is made in pursuance of, and subject to, all terms and conditions of the Instructions to Bidders, the Specifications, and all other Solicitation Documents, all of which have been examined by the undersigned.

The Contractor also agrees that if awarded the Contract, to provide insurance certificates within ten (10) working days of the date of Notification of Award. Submittal of this offer will be taken by the Owner as a binding covenant that the Contractor will be prepared to complete the project in its entirety.

The Owner reserves the right to make the award on the basis of the offer deemed most favorable, to waive any formalities or technicalities and to reject any or all offers. It is further agreed that this offer may not be withdrawn for a period of sixty (60) calendar days after closing time. Submission of clarifications and revised offers automatically establish a new thirty day (30) period.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: _____.

It is the responsibility of the Bidder to ensure all Addenda have been received and acknowledged.

Bid Schedule: 2016 Waterline Replacement Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	108.2	Water Main (2") (HDPE) (Service Line) (If lead service line is encounter, water service shall be replaced to meter) (Includes cost of connection to existing pipe)	10.	Lin. Ft.	$ _____	$ _____
2	108.2	Water Main (6") (C-900 PVC, DR-18) (Includes cost of connection to existing waterline / valve / fitting)	285.	Lin. Ft.	$ _____	$ _____
3	108.2	Water Main (8") (C-900 PVC, DR-18) (Includes cost of connection to existing waterline / valve / fitting)	85.	Lin. Ft.	$ _____	$ _____
4	108.2	Water Main (10") (C-900 PVC, DR-18) (Includes cost of connection to existing waterline / valve / fitting)	15.	Lin. Ft.	$ _____	$ _____
5	108.2	Water Main (18") (C-905 PVC, DR-25) (Includes cost of connection to existing waterline / valve / fitting)	140.	Lin. Ft.	$ _____	$ _____
6	108.2	Water Main (18") (Fusible C-905 PVC, DR-25) (Install Only) (Includes all equipment, labor, fuel, and materials for fusing pipe and pulling pipe through existing 24" steel pipe) (The City has already purchased the 18" Fusible pipe from Underground Solutions) The Bidder shall not include pipe material costs for this Bid Item.	3,650.	Lin. Ft.	$ _____	$ _____
7	108.2	Imported Trench Backfill (Class 3) (Includes haul and disposal of unsuitable excavated material) (Assumed Unit Weight = 133 lbs/ft^3)	300.	Ton	$ _____	$ _____
8	108.3	Gate Valve (6")	1.	Each	$ _____	$ _____
9	108.3	8" Blind Flange	1.	Each	$ _____	$ _____
10	108.3	18" x 6" Tee (MJ)	1.	Each	$ _____	$ _____
11	108.3	Butterfly Valve (18")	4.	Each	$ _____	$ _____
12	108.3	Elbow (6" x 22.5 deg) (MJ)	2.	Each	$ _____	$ _____
13	108.3	Elbow (6" x 45 deg) (MJ)	8.	Each	$ _____	$ _____
14	108.3	Elbow (8" x 45 deg) (MJ)	6.	Each	$ _____	$ _____
15	108.3	Elbow (18" x 22.5 deg) (MJ)	4.	Each	$ _____	$ _____

Bid Schedule: 2016 Waterline Replacement Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
16	108.3	Elbow (18" x 45 deg) (MJ)	6.	Each	$ _____	$ _____
17	108.3	Reducer (20" x 18") (MJ)	1.	Each	$ _____	$ _____
18	108.3	18" Solid Sleeve Coupling (MJ)	7.	Each	$ _____	$ _____
19	108.3	Fire Hydrant Assembly	6.	Each	$ _____	$ _____
20	108.4	3/4" Water Service Line (Type K Copper) (If Lead or Poly service line is encountered, water service shall be replaced to meter) (Includes cost of connection to existing pipe)	160.	Lin. Ft.	$ _____	$ _____
21	108.4	Tapping Saddle (18" x 3/4")	19.	Each	$ _____	$ _____
22	108.4	Tapping Saddle (18" x 2")	1.	Each	$ _____	$ _____
23	108.4	Corporation Stop (3/4")	19.	Each	$ _____	$ _____
24	108.4	Corporation Stop (2")	1.	Each	$ _____	$ _____
25	108.7	Granular Stabilization Material (Type B) (Crushed Rock) (Includes haul and disposal of unsuitable excavated material) (Assumed material unit weight = 138 lbs/ft^3)	200.	Ton	$ _____	$ _____
26	202	Removal of Bush	1.	Each	$ _____	$ _____
27	202	Removal of Tree	2.	Each	$ _____	$ _____
28	202	Abandon Pipe (Abandon pipe by plugging ends with concrete)	70.	Lin. Ft.	$ _____	$ _____
29	202	Abandon Existing Water Valve (Close valve, remove top half of existing valve box, fill cavity to finished subgrade with flow-fill material)	9.	Each	$ _____	$ _____
30	202	Remove Existing Fire Hydrant (Return Hydrant to City Shops)	6.	Each	$ _____	$ _____
31	202	Remove Existing Pipe (Various sizes and material type)	400.	Lin. Ft.	$ _____	$ _____
32	202	Remove Existing Water Valve	7.	Each	$ _____	$ _____

Bid Schedule: 2016 Waterline Replacement Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
33	202	Removal of Asphalt Mat (Planing) (T-Top Section) (2" Depth) (North Ave., 28 Road, Orchard Ave.) (Per City Standard Detail GU-03)	430.	Sq. Yd.	$ _____	$ _____
34	202	Removal of Asphalt Mat (Full-Depth) (Per City Standard Detail GU-03)	520.	Sq. Yd.	$ _____	$ _____
35	202	Removal of Concrete (Saw cut and remove concrete as shown) (Includes but not limited to curb, gutter, sidewalk, driveway, slabs, V-pan, curb ramps, intersection corners, aprons, and concrete walls.)	210.	Sq. Ft.	$ _____	$ _____
36	203	Disposal of Radioactive Material (City Shops Location)	100.	Cu. Yd.	$ _____	$ _____
37	206	Structure Backfill (Flow-Fill)	27.	Cu. Yd.	$ _____	$ _____
38	208	Storm Drain Inlet Protection (Silt-Sack) (Includes Maintenance & Removal of Inlet Protection)	10.	Each	$ _____	$ _____
39	208	Concrete Washout Facility	1.	Lump Sum	$ _____	$ _____
40	210	Repair damage to unlocated irrigation lines, various sizes and materials (1" to 12" dia.)	3.	Each	$ _____	$ _____
41	210	Reset Guardrail	50.	Lin. Ft.	$ _____	$ _____
42	210	Reset Sprinkler System (Complete in Place)	6.	Each	$ _____	$ _____
43	212	Sod (Includes 6" Thick Imported Topsoil placed prior to sod placement)	100.	Sq. Ft.	$ _____	$ _____
44	304	Aggregate Base Course (Class 6) (15" Thick) (4' wide +/-)	520.	Sq. Yd.	$ _____	$ _____
45	401	Hot Bituminous Pavement (Patching) (4" Thick) (Grading SX, PG 64-22, GYR=75) (Two 2" Lifts) (Bottom Two Mats) (See City Standard Detail GU-03)	520.	Sq. Yd.	$ _____	$ _____
46	401	Hot Bituminous Pavement (Patching) (2" Thick) (Grading SX, PG 64-22, GYR=75) (T-Top) (See City Standard Detail GU-03) (Top Mat)	430.	Sq. Yd.	$ _____	$ _____
47	407	Emulsified Asphalt (Tack Coat)	95.	Gallon	$ _____	$ _____

Bid Schedule: 2016 Waterline Replacement Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
48	608	Concrete Curb and Gutter (Match in Kind)	100.	Lin. Ft.	$ _____	$ _____
49	608	Concrete Curb, Gutter and Sidewalk (Match in Kind)	3.	Sq. Yd.	$ _____	$ _____
50	608	Concrete Drainage Pan (Match in Kind)	6.	Sq. Yd.	$ _____	$ _____
51	608	Cap Top Half of Sewer Pipe in concrete per Std. Detail GU-04 (20' long)	2.	Each	$ _____	$ _____
52	620	Portable Sanitary Facility	1.	Each	$ _____	$ _____
53	625	Construction Surveying	1.	Lump Sum	$ _____	$ _____
54	626	Mobilization	1.	Lump Sum	$ _____	$ _____
55	630	Traffic Control Plan	1.	Lump Sum	$ _____	$ _____
56	630	Traffic Control (Complete in Place)	1.	Lump Sum	$ _____	$ _____
57	630	Flagging	200.	Hour	$ _____	$ _____
MCR		Minor Contract Revisions	- - -	- - -	- - -	$ 70,000.00

Bid Amount: **$** _____

Bid Amount:

_____ **dollars**

Contractor's Name: _____

Contractor's Address: _____

Contractor's Phone #: _____

Appendix A
Project Submittals

PROJECT SUBMITTAL FORM

PROJECT: **2016 Waterline Replacement Project**

CONTRACTOR:

PROJECT ENGINEER: Lee Cooper

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
STREET CONSTRUCTION				
Hot Mix Bituminous Pavement Mix Design, (PG 64-22, 75 GYR.)				
Base course gradation, Proctor curve (Class 6)				
Structure Backfill (Flow-Fill) (CDOT Specification)				
Concrete Mix Design (CDOT Class D Concrete, 4,500 psi)				
WATERLINE CONSTRUCTION				
Pipe – AWWA C-900, DR-18 and AWWA C-905, DR-25				
Fittings – Elbows, Tees, Tapping Saddles, Corp. Stops, Crosses, Couplings, Curb Stops				
18” Butterfly Valve				
Valves – 6” Gate Valves				
Tracing Wire & Splices				
Service Line – ¾”, 1” Copper Tubing				
2” HDPE Water Service Pipe				
Pipe Bedding Gradation (Type A)				
Granular Stabilization Material (Type B)				
Valve Box				
Fire Hydrant Assembly				
EROSION CONTROL/STORMWATER MANAGEMENT				
Concrete Washout				
Storm Drain Inlet Protection				

PERMITS, PLANS, OTHER

Traffic Control Plan(s)				
Contractor's Construction Schedule				
CDPHE Dewatering Permit (If Necessary)				
Hourly Labor and Equipment Rate Tables				

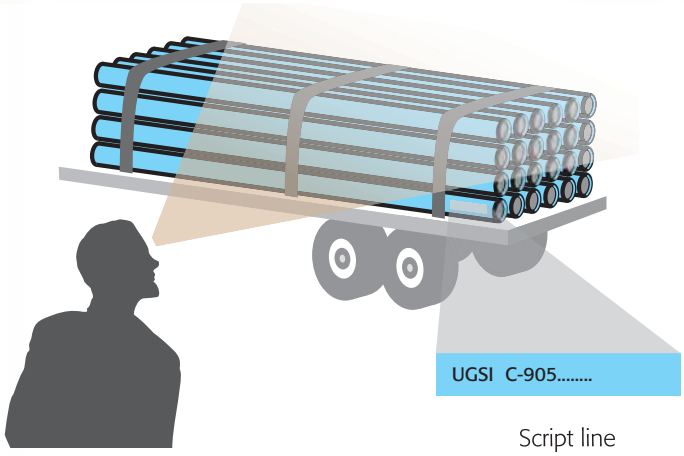
APPENDIX B

Fusible PVC C-905 Information

Pipe Handling

underground SOLUTIONS™

1) Inspect Shipment



Script line

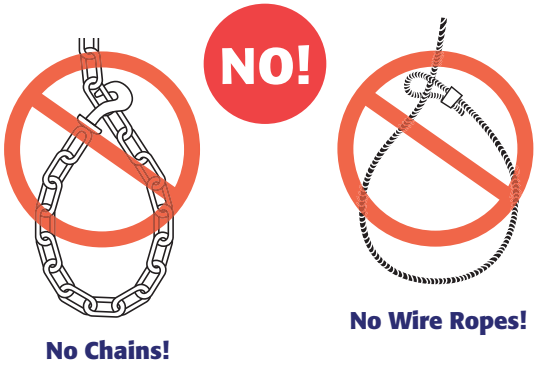
Inspect the pipe shipment prior to unloading for proper pipe size, type and color. Check for pipe damage or any other inconsistencies with the pipe load. Contact UGSI immediately if discrepancies are found.

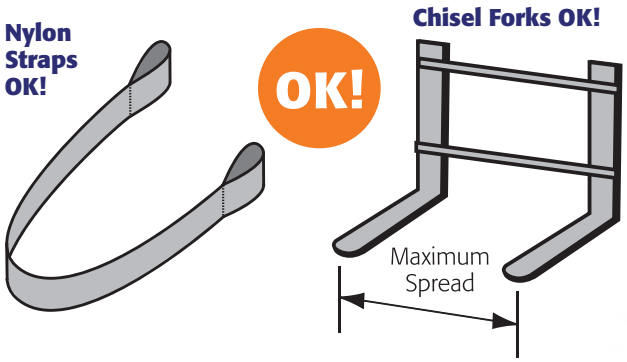
Be sure to check:

- Size (diameter)
- Thickness (DR Rating)
- Color
- Lengths
- Quantity

Problems? Call UGSI at (858) 679-9551

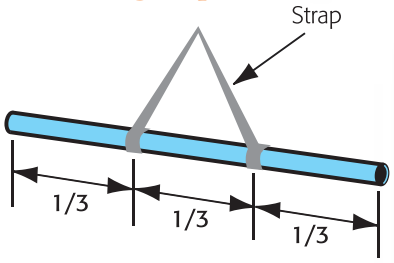
2) Lifting Mechanisms

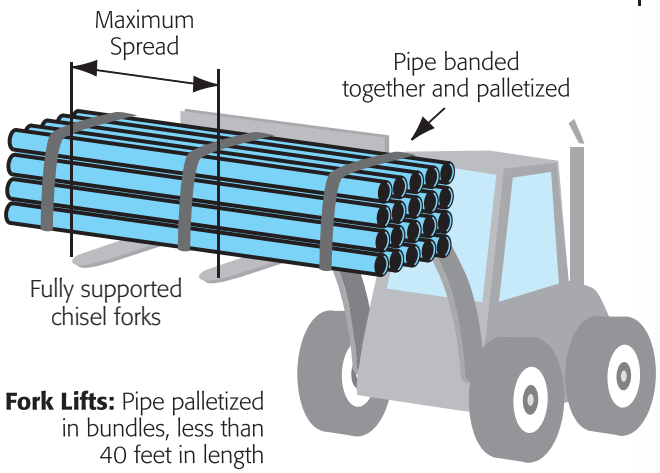




3) Moving and Unloading Pipe

Straps: For pipe lengths greater than 40 feet, as well as individual pipe lengths





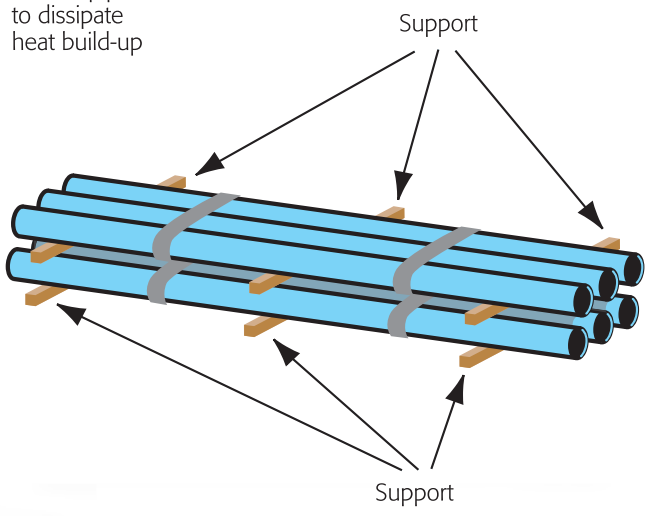
Fork Lifts: Pipe palletized in bundles, less than 40 feet in length

Machine rated for weight

4) Storage

If pipe is to be stored +1 year in direct sunlight, use opaque cover and allow air-circulation around pipe to dissipate heat build-up

Storage	
Pipe Diameter (inches)	Maximum Number of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2

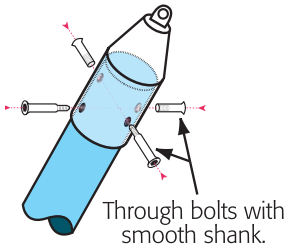


For detailed handling instructions: Please contact your local UGSI representative, or the Poway CA office at **(858) 679-9551**

Installation Procedures

1) Pulling Head Installation and Pipe End Sealing

Pull Head

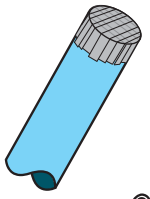


- Use UGSI recommended pulling head to achieve maximum allowable pull force recommendation for the pipe.
- Do not exceed maximum recommended allowable pull force for the given pipe selection.
- Do not exceed the maximum allowable bend radius for the given pipe selection.

Sealing Pipe End

Listed in the order of preference:

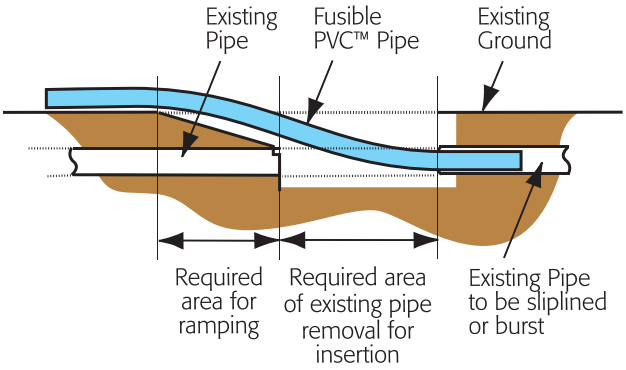
1) **Install Sewer plug.**



2) **Use Plastic and tape.**

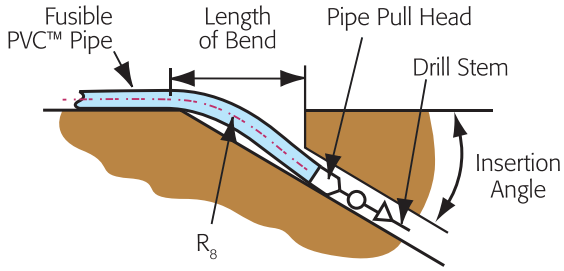
3) **Seal Pull Head.** Seal all holes with washers and/or silicon caulking.

2) 'S' Curve - Slip Line or Pipe Burst Insertion



- Determine 'S' curve length from depth of host pipe and size of Fusible PVC™ pipe, by contacting your UGSI representative.
- Determine required length of pipe removal, pit, and tail ditch from 'S' curve dimension, by contacting your UGSI representative.
- **For detailed installation procedures:** Please contact your local UGSI representative, or the Poway CA office at (858) 679-9551.

3) Horizontal Directional Drilling (HDD) Insertion



1) Determine entry point angle.
2) Determine factor from table based of angle of bore insertion.
3) Multiply the factor times the allow able bend radius of the Fusible PVC™ pipe being installed to determine the required length of bend prior to entry.
4) Consult UGSI website or local representative for the allowable bend radius for the product pipe, and detailed installation procedures.
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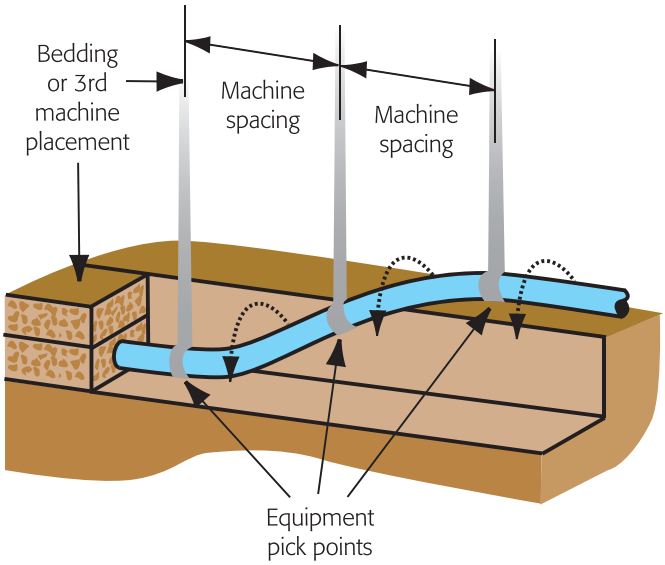
Curve Length Factor for Insertion Angle	
Degree of Insertion	Factor
6	.1
8	.14
10	.17
12	.21
14	.24
15	.26

4) Direct Bury Installation



1) Determine 'S' curve length from required offset and size of Fusible PVC™ pipe, by contacting your UGSI representative.
2) Use machines at beginning, middle and end of 'S' curve to lift and place pipe.
3) Or install by pulling pipe (See #2 illustration above).

For detailed installation procedures: Please contact your local UGSI representative, or the Poway CA office at **(858) 679-9551**

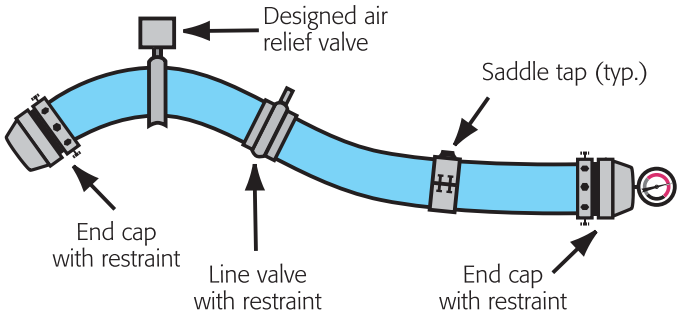
Hydrostatic Pressure Testing

underground SOLUTIONS™

1) Basics for Test

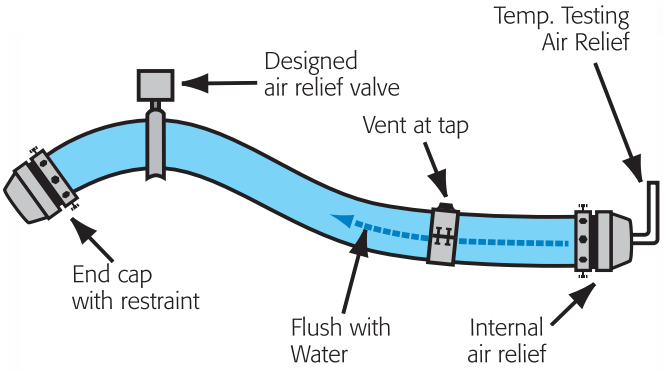
- Determine test pressure and duration from the standards having precedent over the installation.
- General Industry practice for testing is a 1 hour test at 150% of the long term working pressure for the pipeline.
- Perform all testing under supervision and adhering to all applicable safety standards.
- **WARNING** - Pressurized pipelines and attached appurtenances represent a possible safety hazard due to mis-installation, mis-handling, or mis-testing of the pipeline.
- It is recommended that all pipelines be tested AFTER installation and burial, if applicable.
- Testing is to be completed hydrostatically. Removal of air is mandatory.
- General guidelines for hydrostatic pressure testing of PVC water piping systems can be found under AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fitting for Water.

2) Check Appurtenances



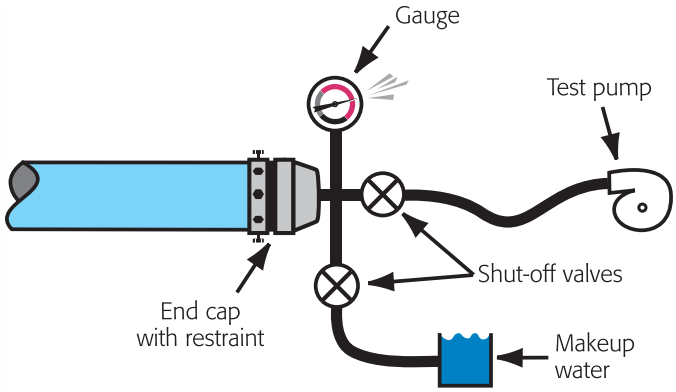
- All restraint devices are installed per manufactures's recommendations and appropriate torque.
- All devices are rated for test pressure.
- Set up test at lowest elevation.
- Remove air at the highest elevation(s).

3) Purge Air



- Use designed air relief valves, air flushing with water, temporary testing air relief at end caps, or taps in line.
- Assure all air is removed prior to test.
- Let air settle out of test water before final venting.

4) Perform Test



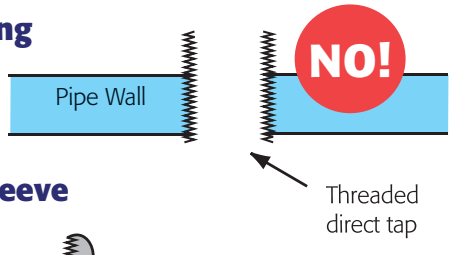
- Pressurize line.
- Hold for test period.
- Fix leaks, if any found.
- Retest if necessary.

For detailed testing procedures: Please contact your local UGSI representative, or the Poway CA office at **(858) 679-9551**

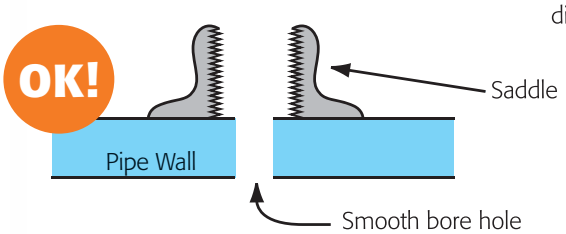
Tapping

1) Tapping Types for Pressure Application

Direct Tapping

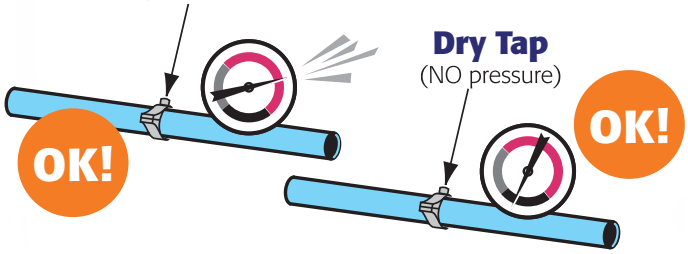


Saddle or Sleeve

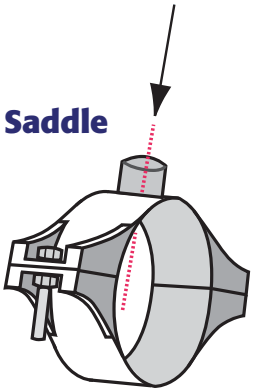


Wet Tap (under pressure)

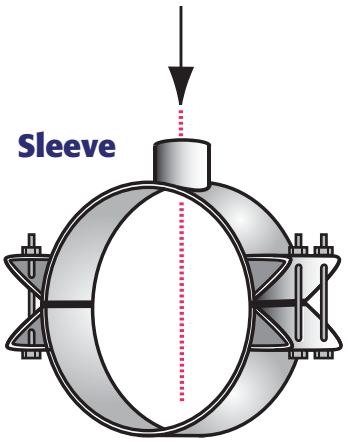
Dry Tap (NO pressure)



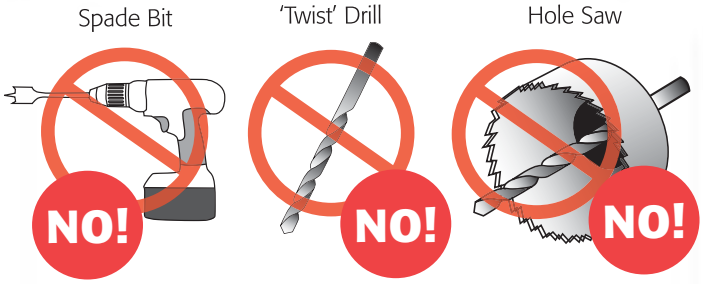
2) Saddles and Sleeves



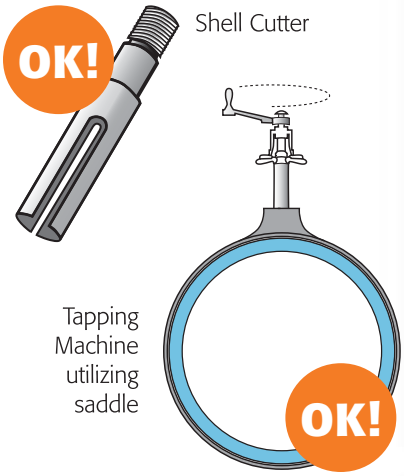
- Must be specifically designed for PVC.
- Install per manufacturer's instructions.
- UGSI recommends that all taps are performed with an appropriate saddle or sleeve.



3) Equipment



- Use appropriate Reed, Mueller, or approved equal tapping machine.
- Use appropriate PVC shell cutter, made for use with manufacturer specific tapping machine
- Use tapping machine per manufacturer's recommendations and instructions



4) Sizes Allowed

- If a greater size tap is required than is shown below, contact your UGSI representative, or the Poway, CA office, at (858) 679-9551.

Pipe Size	Recommended Tap Sizes					
	3/4"	1"	1-1/2"	2"	4"	6"
6"	X	X				
8"	X	X				
10"	X	X				
12"	X	X				
14"	X	X				
16"	X	X	X	X		
18"	X	X	X	X		
20"	X	X	X	X	X	
24"	X	X	X	X	X	
30"	X	X	X	X	X	X

For detailed tapping instructions: Please contact your local UGSI representative, or the Poway CA office at **(858) 679-9551**

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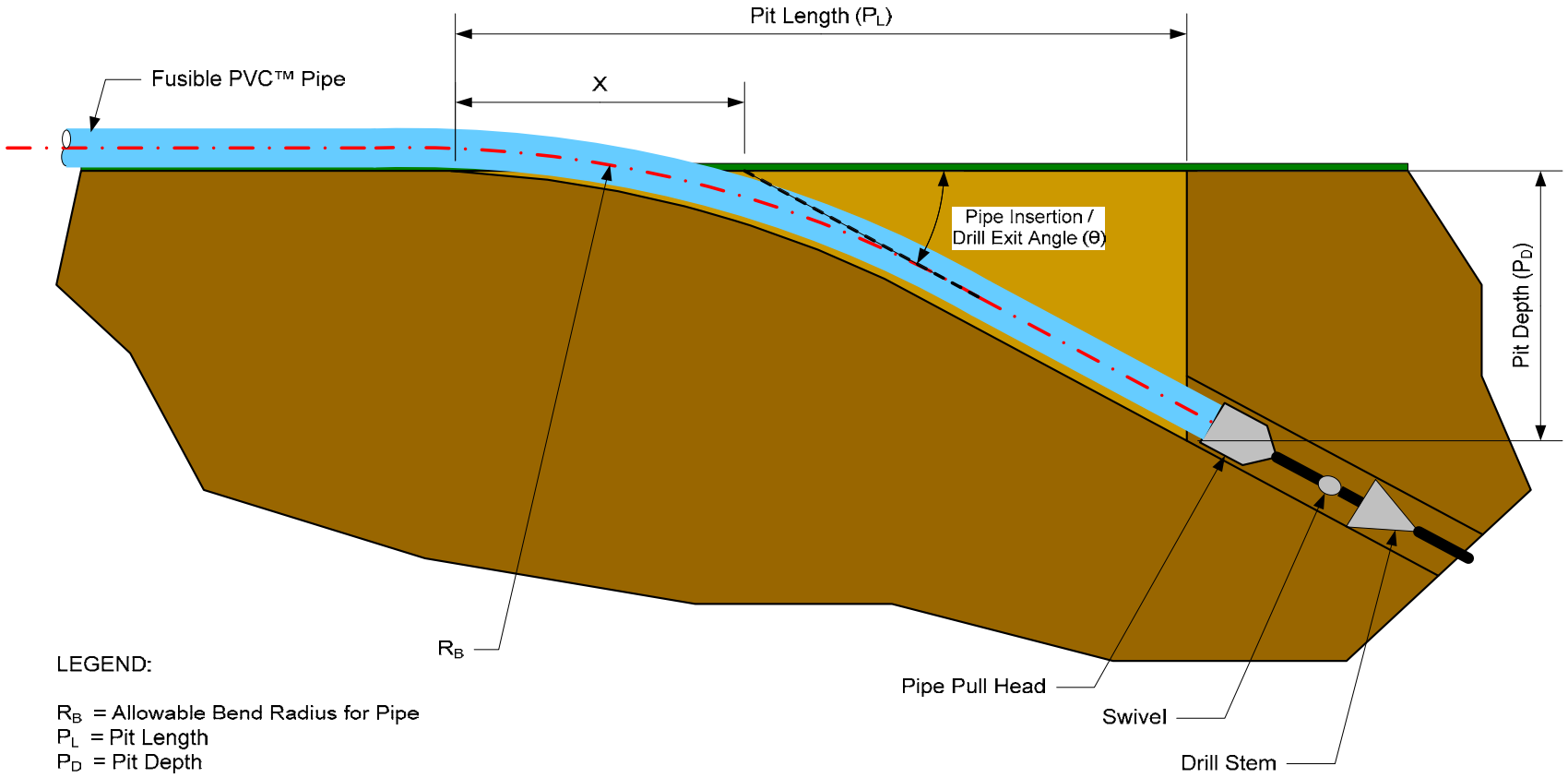
Example of Installation Tools Available

HDD Installation - Pipe Supported by Ground



LEGEND:

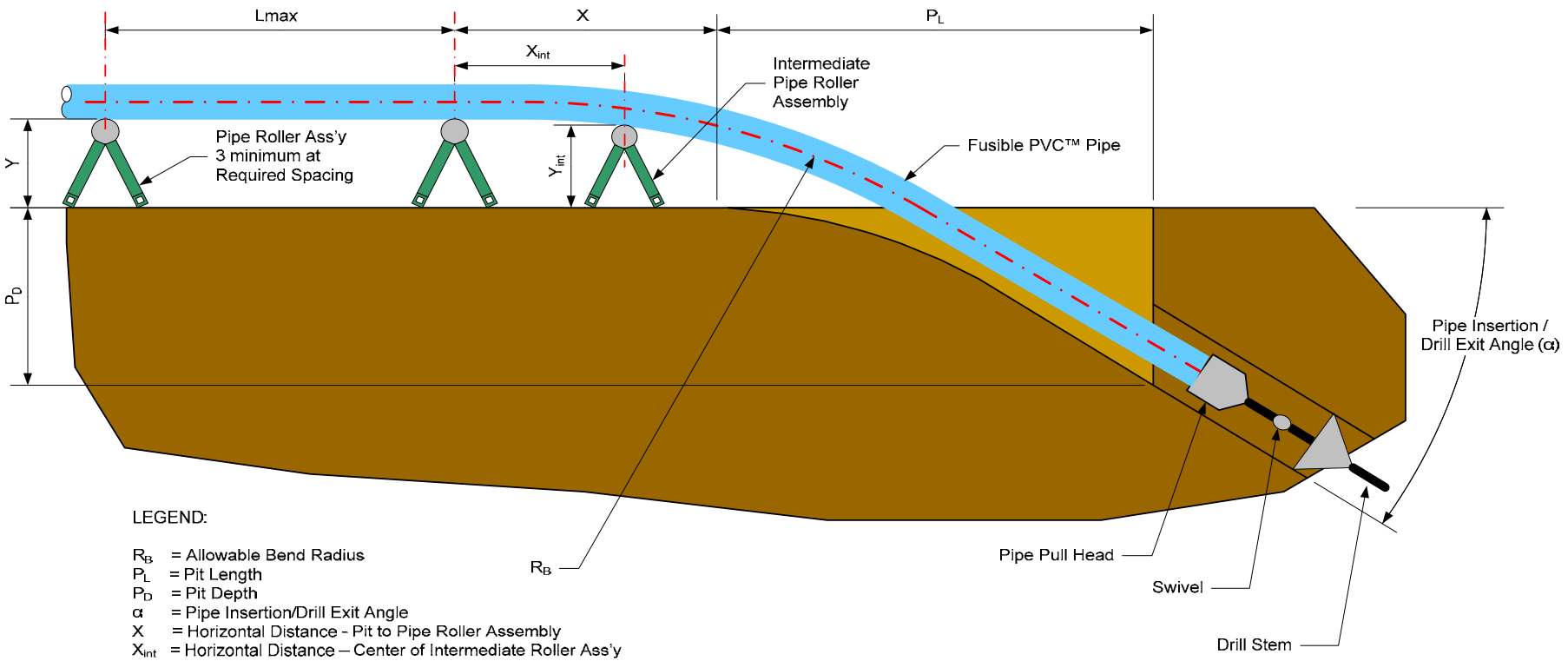
R_B = Allowable Bend Radius for Pipe
P_L = Pit Length
P_D = Pit Depth
θ = Pipe Insertion/Drill Exit Angle
X = Pit Start to Drill Stem Insertion/Exit

Pipe Type	**DIPS**	
Nom. Dia.	**8.00**	**in**
Pipe OD	**9.05**	**in**
Bend Radius (R_B)	**189.00**	**ft**
Insertion Angle	**13.00**	**degrees**

Pit Length (P_L)	**44.00**	**ft**
Pit Depth (P_D)	**6.00**	**ft**
Distance X	**22.00**	**ft**

Disclaimer Note:
The calculations for the pit sizing shown are based on minimum requirements of the pipe product being selected above and do not take into consideration any soil bearing conditions, access requirements, required shoring, or project specific information, all of which should be considered and adjusted as necessary for each project.

HDD Installation - Pipe Supported on Rollers



LEGEND:

R_B = Allowable Bend Radius
P_L = Pit Length
P_D = Pit Depth
α = Pipe Insertion/Drill Exit Angle
X = Horizontal Distance - Pit to Pipe Roller Assembly
X_{int} = Horizontal Distance – Center of Intermediate Roller Ass'y
L_{max} = Maximum Spacing Between Roller Assemblies
Y = Vertical Distance - Top of Pipe Roller Assembly
Y_{int} = Vertical Distance – Top of Intermediate Roller Ass'y

Pipe Type	**DIPS**	
Nom. Dia.	**8.00**	**in**
Pipe OD	**9.05**	**in**
Bend Radius (R_B)	**189.00**	**ft**
Insertion Angle	**13.00**	**degrees**
Roller Height (Y)	**24.00**	**in**
	2.00	**ft**

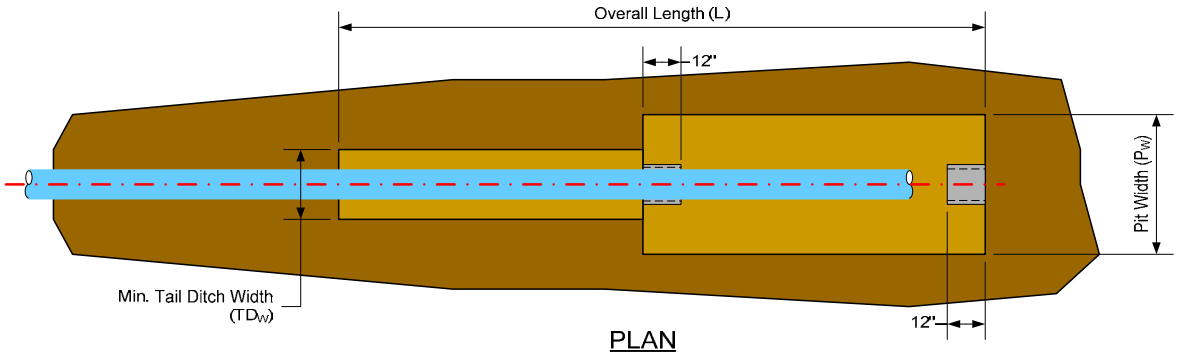
Lmax	**22.00**	**ft**
Distance (X)	**26.00**	**ft**
Distance - Xint	**5.00**	**ft**
Distance - Yint	**23.00**	**in**
Pit Length (P_L)	**18.00**	**ft**
Pit Depth (P_D)	**4.00**	**ft**

Disclaimer Note:
The calculations for the pit sizing shown are based on minimum requirements of the pipe product being selected above and do not take into consideration any soil bearing conditions, access requirements, required shoring, or project specific information, all of which should be considered and adjusted as necessary for each project.

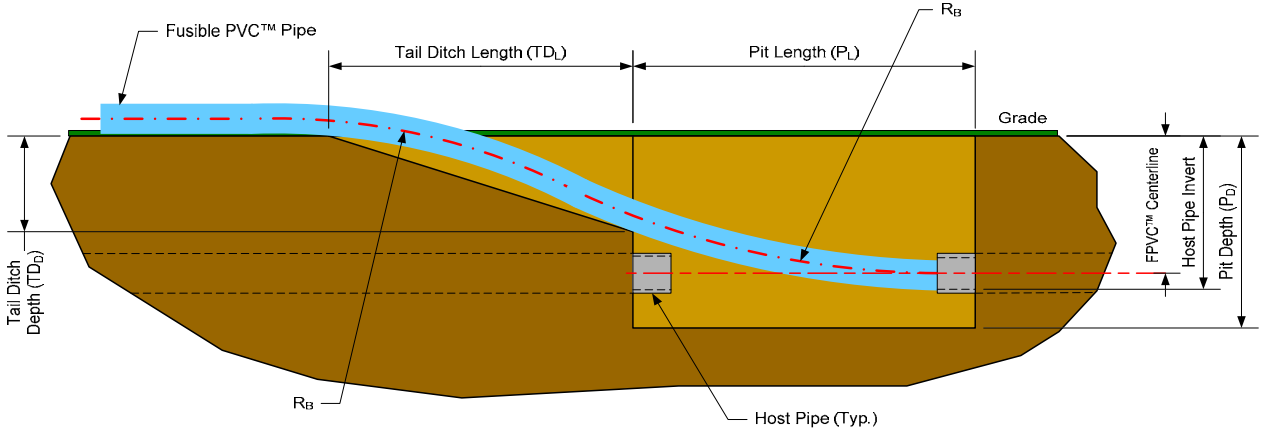
Slipline Installation - Pipe Supported on the Ground

Pipe Type	DIPS	
Nom. Dia.	8.00	in
Pipe OD	9.05	in
Bend Radius (R_B)	189.00	ft
Grade to Host Pipe Invert	5.00	ft
Host Pipe OD	13.20	in
Host Pipe ID	12.14	in
Host Pipe Wall	0.53	in
Grade to FPVC™ Centerline	4.62	ft
Overall Length (L)	54.00	ft
Min. Tail Ditch Width (TDw)	14.00	in
	1.17	ft
Pit Width (Pw)	44.00	in
	3.67	ft
Pit Length (P_L)	15.00	ft
Pit Depth (P_D)	6.00	ft
Tail Ditch Length (TD_L)	39.00	ft
Tail Ditch Depth (TD_D)	3.75	ft

Note:
For situations where the Host Pipe ID is 1" to 2" greater than the FPVC™ OD, consult the E&T Group for guidance & confirmation.



PLAN

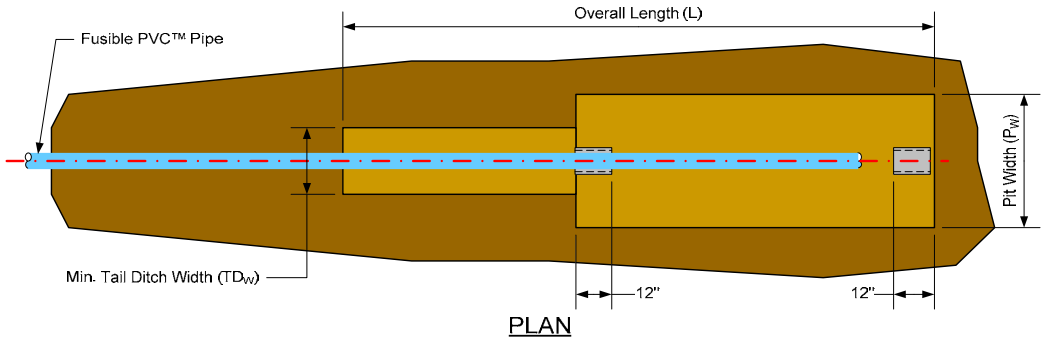


ELEVATION

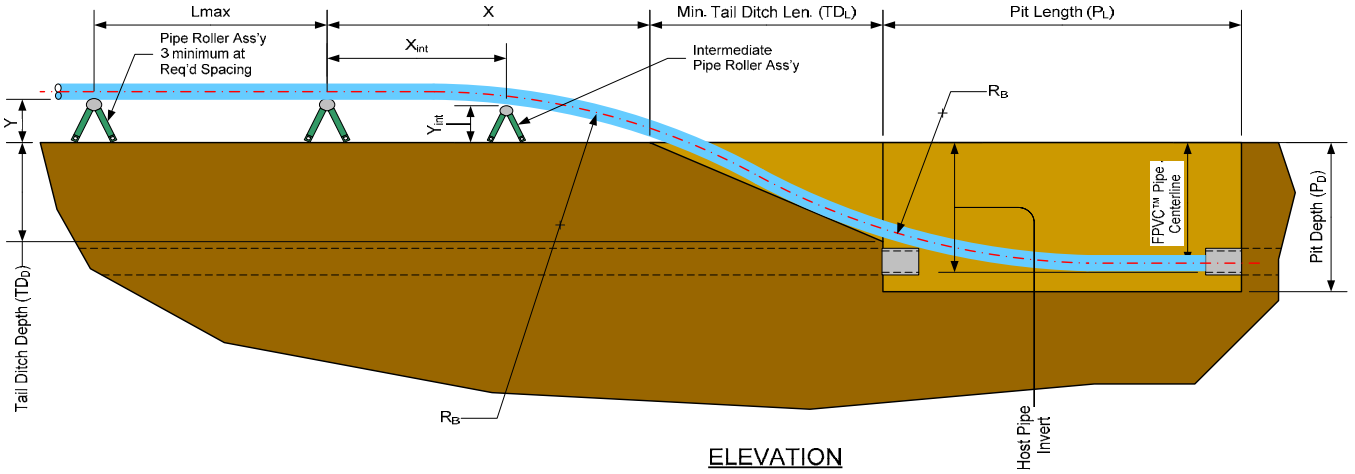
Disclaimer:
The calculations for the pit sizing shown are based on minimum requirements of the pipe product being selected above and do not take into consideration any soil bearing conditions, access requirements, required shoring, or project specific information, all of which should be considered and adjusted as necessary for each project.

Slipline Installation - Pipe Supported on Rollers

Pipe Type	DIPS	
Nom. Dia.	8.00	in
Pipe OD	9.05	in
Bend Radius (R_B)	189.00	ft
Roller Height (Y_3)	24.00	in
	2.00	ft
Grade to Host Pipe Invert	5.00	ft
Grade to FPVC™ Centerline	4.62	ft
Host Pipe OD	13.20	in
Host Pipe ID	12.14	in
Host Pipe Wall	0.53	in
Overall Length (L)	39.00	ft
Min. Tail Ditch Width (TDw)	14.00	in
	1.17	ft
Min. Tail Ditch Length (TD_L)	24.00	ft
Tail Ditch Depth (TD_D)	3.75	ft
	44.97	in
Pit Width (Pw)	44.00	in
	3.67	ft
Pit Length (P_L)	15.00	ft
Pit Depth (P_D)	6.00	ft
Lmax	22.00	ft
Distance - X	27.00	ft
Distance - Xint	13.50	ft
Distance - Yint	18.00	in



PLAN



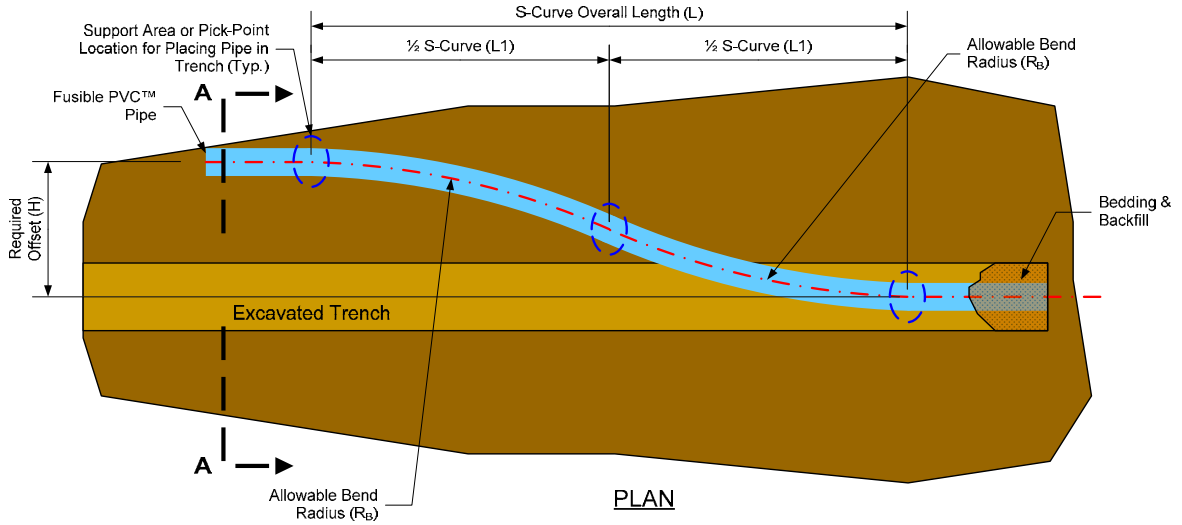
ELEVATION

Note:
For situations where the Host Pipe ID is 1" to 2" greater than the FPVC™ OD, consult the E&T Group for guidance & confirmation.

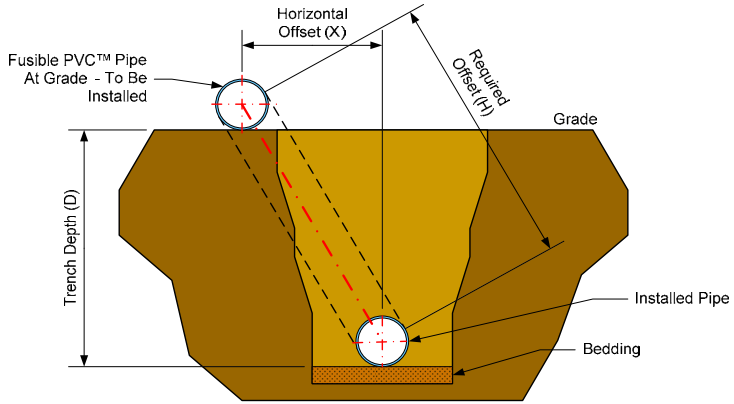
Disclaimer:
The calculations for the pit sizing shown are based on minimum requirements of the pipe product being selected above and do not take into consideration any soil bearing conditions, access requirements, required shoring, or project specific information, all of which should be considered and adjusted as necessary for each project.

Direct Bury (Open-Cut) Installation - Pipe Supported on the Ground

Pipe Type	**DIPS**	
Nom. Dia.	**8.00**	**in**
Pipe OD	**9.05**	**in**
Bend Radius (R_B)	**189.00**	**ft**
Trench Depth (D)	**5.00**	**ft**
Horiz. Pipe Offset (X)	**3.00**	**ft**
Required Offset (H)	**6.00**	**ft**
	72.00	**in**
1/2 S-Curve (L1)	**34.00**	**ft**
S-Curve Overall Length (S)	**68.00**	**ft**



PLAN



SECTIONAL ELEVATION A - A

Disclaimer:
The calculations for the trench sizing shown are based on minimum requirements of the pipe product being selected above and do not take into consideration any soil bearing conditions, access requirements, required shoring, or project specific information, all of which should be considered and adjusted as necessary for each project.

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Recommended Cutting Procedure for Fusible PVC™ Pipe

Recommended Cutting Procedure for Fusible PVC™ Pipe

Introduction

Fusible PVC™ pipe is made to water and wastewater industry PVC piping standards. Like regular PVC pipe, generally recommended practices for working with and handling PVC pipe apply to Fusible PVC™ pipe. However, lengths of Fusible PVC™ pipe, joined by butt-fusion, are subject to stresses not generally experienced by standard 20 foot lengths of bell and spigot PVC pipe. These stresses are related to the configuration of the pipe and/or the method of installation.

The purpose of this Operational Bulletin is to provide recommendations regarding the proper procedures and requirements for cutting Fusible PVC™ pipe.

Management of 'Bending' Stresses

Fusible PVC™ pipe is butt-fused together without mechanical joints or seals, therefore, Fusible PVC™ pipe assumes any changes in direction or grade by bending of the pipe barrel itself, rather than deflecting at joints or connections. Bending imparts longitudinal tensile and compressive stresses on the pipe. Considering that project sites tend to have some relief to them, and that most installations require some bending of the pipe either before, during, or after installation; these bending stresses need to be managed during the cutting of a Fusible PVC™ pipe string.

In an attempt to minimize the bending stresses, every effort should be made to create as straight of an alignment as possible on both sides of the pipe cut. If the adjacent pipe alignment cannot be fully straightened, resistive support on the outside of the curved section should be provided to offset the tensile stress on the outside of the curve, on both sides of the cut. The pipe should always be fully supported on both sides of the cut and, when possible, the pipe should be cut on level ground. When the pipe to be cut is cantilevered, such as the end of a pipe string that is supported from only one side; the unsupported side should be strapped to completely support the weight of the cantilevered end.

Management of 'Pulling' Stresses

The installation of the Fusible PVC™ pipe, particularly trenchless installations, will result in residual stresses in the pipe after the installation has been completed. Such residual stresses are the result of pulling the pipe into position, taking advantage of the tensile capacity of the pipe and joint.

In order to minimize or relieve the residual stresses from pulling, it is recommended that the lead end of the installed pipe length be pushed back gently in the reverse direction of the installation. This compressive force will act to relieve residual tension on the pipe after being pulled. Ideally, the back end of the installed pipe should move slightly, showing that the entire

pipe string has been compressively moved back through the final installation alignment. While this is ideal, it may not be possible in certain circumstances and installations, such as HDD installations.

Recommended Procedure for Cutting Fusible PVC™ Pipe

Regardless of the steps taken to relieve the 'bending' and/or 'pulling' stresses, it is possible that some residual stress might still remain in the Fusible PVC™ pipe string at the cut location. When the pipe is cut in the hoop direction, or perpendicular to the length of the pipeline, any unrelieved longitudinal stress will act to pull the pipe apart. This can result in separation of the pipe, prior to being cut the entire way through. The cutting creates an initiation point in the direction perpendicular to the orientation of the longitudinal stress, which can open the pipe in the hoop direction prior to the completion of the cut. While this phenomenon is sometimes advantageous in that it 'completes the cut' prior to having to actually cut the entire pipe wall section – the 'cut-ends' are not always clean and perpendicular – particularly in situations where the longitudinal stresses are uneven, such as with bent pipe.

To achieve as smooth of a cut face as possible, the following cutting procedure is recommended. This procedure will also help to confine the extent of the pipe separation to the intended cutting plane.

Referencing Figure 1, the following steps should be followed in order:

1. **ALWAYS DOUBLE-CHECK TO MAKE SURE THAT THE PIPE IS NOT INTERNALLY PRESSURIZED. ALL INTERNAL PRESSURE MUST BE RELIEVED.**
2. Considering the size of the cutting equipment that will be used to make the cut, position the pipe so that the bottom can be cut. Follow the management practices recommended above regarding the general position and nature of the pipe string and installation.
3. Using a tape, pipe cutting marker or other reference, mark on the pipe the intended cutting plane for the entire pipe circumference.
4. Score the pipe from the 9 o'clock to 6 o'clock positions to a depth of about ¼". Do not completely cut through the pipe.
5. Score the pipe from the 3 o'clock to 6 o'clock positions to a depth of about ¼". Do not completely cut through the pipe.
6. Score the pipe from the 12 o'clock to 3 o'clock positions to a depth of about ¼". Do not completely cut through the pipe.
7. Score the pipe from the 12 O'clock to 9 O'clock positions to a depth of about ¼". Do not completely cut through the pipe.
8. Cut the pipe completely from the 9 o'clock to 6 o'clock positions.
9. Cut the pipe completely from the 3 o'clock to 6 o'clock positions.
10. Cut the pipe completely from the 12 o'clock to 3 o'clock positions.
11. Cut the pipe completely from the 12 o'clock to 9 o'clock positions.

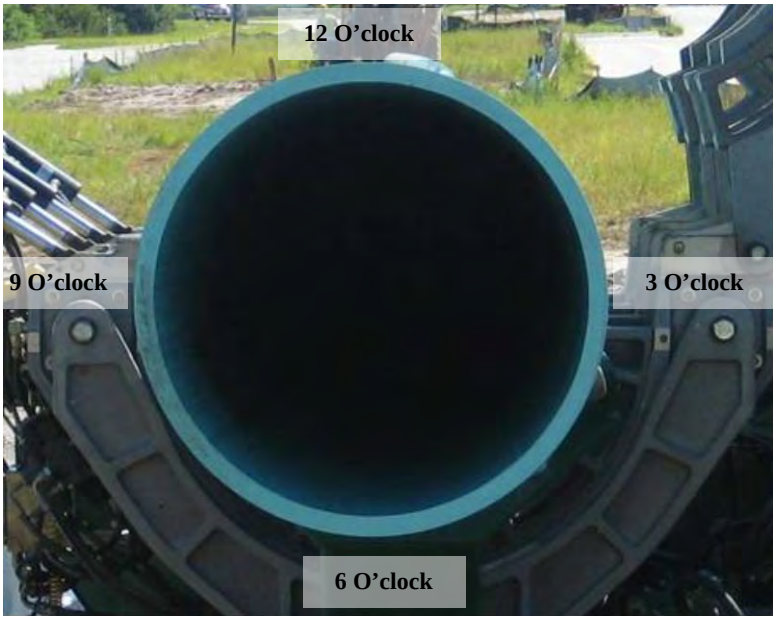

Figure 1

Figure 2, below, shows a 30" Fusible PVC™ pipe string that was cut using this method. Note the excavation under the pipe to allow the scoring and then ultimately the cutting of the full pipe section. Also note the full, level, soil support of the pipe on either side of the cut.

Figure 2

Fusible PVC™ Pipe Products

Fusible C-900®/ Fusible C-905®/ FPVC®

Handling & Installation Guidelines

underground SOLUTIONS®

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www.undergroundsolutions.com

Table of Contents

Detailed Pipe Handling Procedures and Information for Fusible PVC™

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Detailed Pipe Handling Procedures and Information for Fusible PVC™, including Fusible C-900®, Fusible C-905®, and FPVC™

1 Introduction

Stock lengths of Fusible PVC™ products, including Fusible C-900®, Fusible C-905®, and FPVC™ are handled in the same manner as traditional bell and spigot PVC with consideration for the 40 foot shipping lengths. They need to be loaded, off-loaded, strapped, moved, pulled and otherwise handled in the exact manner that bell and spigot PVC piping is handled.

There are several unique aspects of these products that do need to be considered, however. These include the 40 foot lengths that Fusible PVC™ is shipped in, as well as how the nature of the fusion joint used affects the handling of the pipe itself. Actual installation methods and parameters are discussed in Underground Solutions™ procedural document TP - 1 - 020 - Recommended Installation Procedures.

Underground Solutions™ Fusible Pipe Handling and Storage Instructions are based on industry experience and the recommendations as described in AWWA M23 Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition.

2 Shipping and Receipt of Shipment

Inspection of each load of pipe, prior to unloading, is the first step when the shipment arrives. After the shipment has been verified, it can then be unloaded and prepped for installation or temporary storage.

2.1 Inspection of the Shipment

Each pipe shipment should be inspected prior to unloading for appropriate quantity, pipe size and pipe type. Each pipe shipment should also be checked to see if the load has shifted or otherwise been damaged during transit. The bill of lading will list quantities and sizes of pipe being delivered.

Each piece of pipe will be marked with the following information: pipe size; DR or wall thickness; ”fusible” designation; UGSI or Underground Solutions, Inc. trade name; and the drinking water certification (if applicable). The pipe is color coded based upon intended application.

If there are discrepancies, quality issues beyond immaterial shipping and/or loading damage, or missing inventory, please contact Underground Solutions within 24 hours of receipt of the shipment. Any damage, missing material, etc., should be noted on the shipping bill of lading.

Please call the Underground Solutions, Inc. at (724) 353-3000and ask for Crystal Davis.

2.2 Off-Loading of Pipe Shipment

Remove restraints from the top unit loads. Beware of boards that may have come loose during shipment creating a potential hazard.

Use a forklift with chisel forks. The fork chisel should be checked to be sure it is not thicker than the gap between the units of pipe strapped together for shipping and handling purposes. The spread of the forks should be set at the maximum distance apart. Extend forks to remove each top unit from the truck.

Do not run forks too far under the units, as fork ends striking adjacent units may cause damage. Insure that the forks are fully engaged. If left bundled in units, unloading can be done with a single forklift so long as it is of sufficient capacity to handle the load. If sag exceeds recommendation (see Table 2.3 for allowable sag), then each piece of pipe should be unloaded individually.

When unloading individual pieces of pipe, the pipe should be supported at approximately the 1/3 point measured from each end of the pipe.

If a forklift is not available, a spreader bar with fabric straps capable of handling the load should be used. Recommended lift points when using fabric slings are at the points approximately 1/3 of the length measured from each end of the unit.

Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way. Use of hooks, chains, wire rope or any other handling device which might damage the pipe is strictly prohibited.

During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage (particularly during cold weather).

To unload lower units, repeat the above unloading process.

If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

In preparation for pipe installation, placement of the unloaded pipe should be as close to the area where fusion will take place as practical.

2.3 Sag Check

	Segment Height (Sag)	
Nom. Pipe Size	30' Length	40' Length
(DIPS)	(inches)	(inches)
4	13	23 1/2
6	9	16 1/2
8	7	12 1/2
10	5 1/2	10
12	4 1/2	8 1/2
14	4	7 1/2
16	3 1/2	6 1/2
18	3	5 1/2
20	2 1/2	5
24	2 1/2	4
30	2	3 1/2
36	1 1/2	3
42	1	2 1/2
48	1	2

	Segment Height (Sag)	
Nom. Pipe Size	30' Length	40' Length
(IPS)	(inches)	(inches)
3	18	32 1/2
4	14	25 1/2
6	9 1/2	17
8	7 1/2	13
10	6	10 1/2
12	5	9
14	4 1/2	8
16	4	7
18	3 1/2	6
20	3	5 1/2
24	2 1/2	4 1/2
30	2	3 1/2
36	1 1/2	3
42	1 1/2	2 1/2
48	1	2

Table 2.3 - Allowable Maximum Sag in Pipe Lengths During Unloading and Moving

Sag is the measurement of the pipe ends relative to the pipe center (see Figure 2.3). This can be accurately measured using string and a tape measure. With a pipe raised with the lifting device, stretch the string on the bottom of the pipe from one end to the other. Using the tape measure, measure the distance from the string to the bottom of the curved pipe section at the midpoint. This distance is the 'sag' of the pipe in its current configuration, and the distance should not be greater than what is listed in Table 2.3. A quick check is to take a 4 or 5 foot level and place it against the bottom of the pipe at the point of the most curvature. You should not be able to see a gap between the level and the pipe of more than about $1/64^{th}$ of an inch. If a large gap exists, a full length measurement of sag, as described below, should be performed.

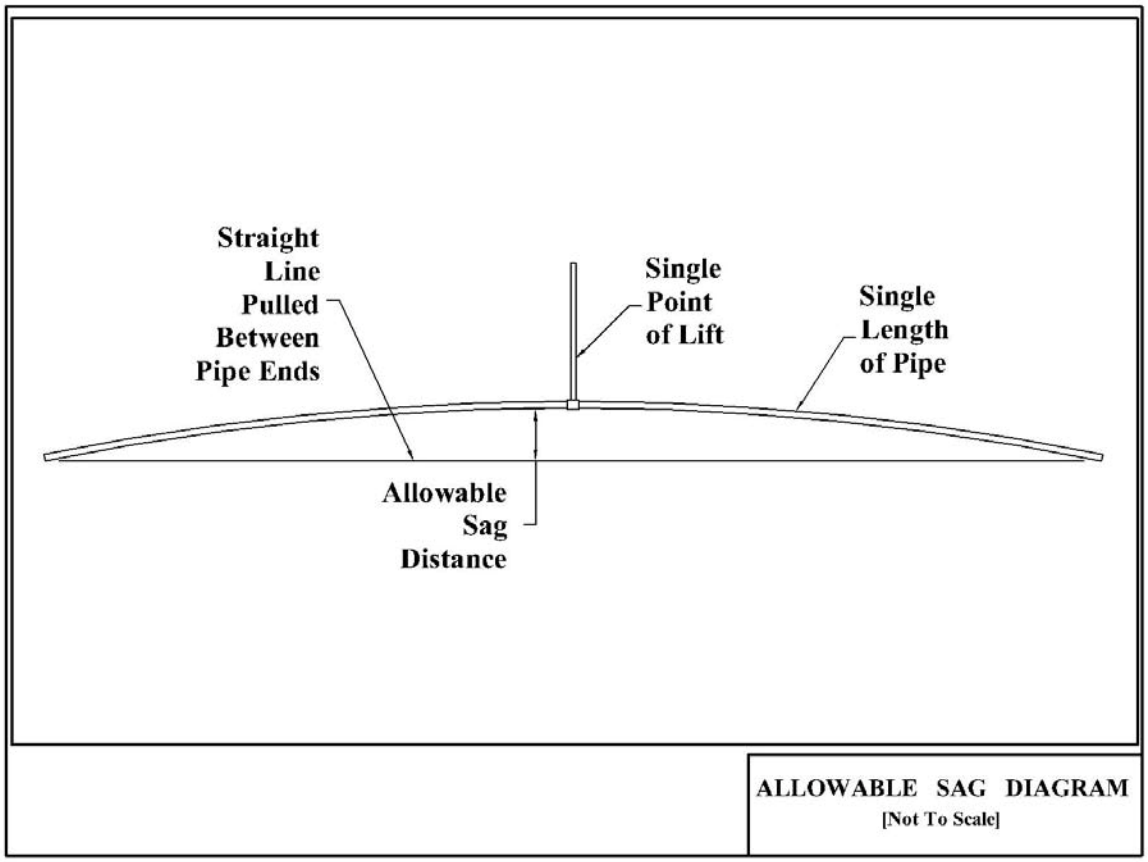

Figure 2.4 – Sag Illustration

If the sag is greater than the allowable sag, as indicated in Table 2.3, reconfigure your lifting mechanism with a wider spread, if it is a two point lifting device, or utilize a two point lifting device, if using a single point lifting device.

3 Storage Requirements

Pipe units should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer, if possible. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. Use racks or dunnage to prevent damage to the bottom during storage and to support the pipe or pipe unit. Supports should be spaced to prevent pipe bending. The pipe shall be stored in stacks no higher than that given in the following Table 3.1:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2

Table 3.1 – Stacking Parameters for Fusible PVC™

When exposure in excess of one year to direct sunlight is unavoidable, the pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent

excess heat accumulation. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter until the pipe is ready to be fused.

4 Summary

The proper handling, moving, and storing of Fusible PVC™ will assure the integrity of the pipe and provide the foundation for a successful project.

Recommended Installation Procedures for Fusible PVC™

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Recommended Installation Procedures for Fusible PVC™, including Fusible C-900®, Fusible C-905®, and FPVC™

1 Introduction

In most cases Fusible PVC™ is assembled at existing grade on the project site in long lengths prior to installation. This is the most efficient method for the butt-fusion procedure. As a result, the pipe must be moved from the layout at-grade assembly, to the final alignment for installation, normally below grade.

The insertion point is normally in a pit that provides access to the exit point of a horizontal directional drill (HDD) or the end of an existing pipeline for sliplining or pipe bursting type installations. Movement of the at-grade assembled Fusible PVC™ pipe from the surface to the prepared sub-base is also required in direct bury type installations.

This document will review the basic procedures Underground Solutions recommends to perform these installations with Fusible PVC™.

2 Pulling Parameters and Requirements for Fusible PVC™

All of the general installation methods with which Fusible PVC™ can be installed include some means of moving the assembled Fusible PVC™ pipe into final alignment in the ground. These installation procedures all rely on the allowable tensile pull force of the plastic pipe to accomplish this task.

2.1 Allowable Bend Radius

The safe allowable bending radius for Fusible PVC™ is a very important factor in the installation of the assembled pipe. This parameter dictates how much the pipe may be bent, not only during the installation phase and handling, but in the final alignment as well, which has a limiting effect on installation methods such as HDD and direct bury.

Underground Solutions has a document which explains the basis for the allowable bending radius in detail, but for the purposes of this document, allowable bending radius is based on the tensile properties of the plastic as described below. This information for each type of Fusible PVC™ pipe, as well as the document which describes the basis for this parameter, is available by contacting your Underground Solutions representative.

2.2 Safe Pulling Force

The amount of tensile load to be put into the pipe during a pull-in is called the safe pulling force. This value is a function of the cross-sectional area of the PVC pipe times a safe tensile stress. A requirement of PVC plastic used for AWWA C900 and AWWA C905 piping is to have a minimum tensile stress capability of 7000 psi. A safety factor of 2.5 is applied to this to derive the safe pulling stress. This value is 2800 psi. This is multiplied by the pipe area to come up with the Safe Pulling Force. The most common way to calculate the pipe area is to calculate the areas of the circles defined by the OD of the pipe and the ID of the pipe. The ID is arrived at by subtracting twice the minimum wall thickness from the OD. This information for each type of Fusible PVC™ pipe is documented; please contact your Underground Solutions representative for more details.

During installation there are multiple potential stresses on the pipe beyond the straight axial pull. There can be frictional resistance over ground and in the alignment, there could be bending stress, drag on the pipe due to buoyancy considerations, and so on. There also is the element of the unknown

within the alignment. These all are additive in their occurrence requiring this significant safety factor to account for the possibility of them.

2.3 Temperature Effects on Safe Pulling Force and Bend Radius

Fusible PVC™ pipe properties, like all PVC pipe properties are defined at a standard ambient temperature of 73.3°F. As temperature rises above this, two key properties relative to pull are affected. These are tensile strength and modulus of elasticity.

The tensile strength of thermoplastics drops as temperature rises. This means that on especially warm days with longer pulls, the temperature at the time of pull-in may lower the overall safe pull force. The temperature impacts are defined in the following Table 2.3.1:

Temperature (°F)	% of Recommended Pull Force
73.3	100
80	95
90	87
100	78
120	63
140	58

Table 2.3.1 – Temperature Impact on Safe Pull Force

As temperature rises, the modulus of elasticity is also affected. It too decreases as the temperature goes up. The effect of this decrease is that as the pipe warms it becomes more flexible. The change in modulus directly reflects the increase in flexibility. This can be applied to the bend radius used for bending limitations. The following Table 2.3.2 defines the change:

Temperature (°F)	% Change in Modulus
73.3	100
80	98
90	94
100	88
120	78
140	70

Table 2.3.2 – Temperature Impact on Modulus of Elasticity

The change in modulus can be directly applied to the bend radius. For a given pipe size, the bend radius can be reduced by multiplying the % based on temperature times the base bend radius. At 100ºF, for example, the bend radius would be reduced by 12%, meaning that it becomes more flexible.

2.4 Pulling Mechanism Connections

All installation methods, including HDD, pipe bursting, sliplining, and direct bury, must utilize a pulling mechanism to accomplish the installation. There are several methods available to attach the pulling mechanism to the pipe as reviewed below:

2.4.1 Nylon Strap

For open cut or movement on the surface, if the length is short and a minimum force is needed, the pipe can be pulled with a nylon strap. The tensile capability of the strap needs to

be known to compare to the relative force it may take to move the pipe.

2.4.2 Through-bolt with Linkage

In the case of sliplining short lengths in dry conditions, round head carriage bolts can be used to connect a chain link internally, to allow attachment of a cable for pull-in.

Care must be taken to make the bolted connection at least 12" from the end of pipe. This distance controls the amount of pipe wall in shear. If the connection is too close to the pipe end, it will rip out.

This method is only good for relatively short lengths in dry conditions. The connection, when under higher load, will tend to pull in toward the center of the pipe putting it into an oval shape. This also introduces pull out forces on the bolts and stress in the pipe wall that could lead to connection failure. In longer lengths a pull head must be used.

2.4.3 Pull-Head

For HDD and long pulls in all other methods, pull heads have been designed and fabricated for Fusible PVC™. The pull head is sized to take and effectively transfer the recommended safe pulling force from the head to the pipe.

Because PVC is a relatively hard thermoplastic compared to other plastics used with the heads, serrated grip type heads don't bite into the PVC with enough force to effectively transfer the full safe pulling stress of the Fusible PVC™. As a result these types are not recommended for use with Fusible PVC™. The pulling heads for use with Fusible PVC™ are designed with through bolts located to accommodate the recommended safe pulling forces. The bolts are smooth shank to eliminate stress concentrations caused by the edges of a threaded bolt or all-thread. The bolts are countersunk to provide a smooth pulling surface on the outside of the head. The bolts are made to connect inside the pulling head to allow double shear loading of the bolts at the pipe wall.

The pulling heads are sized to accommodate a specific pipe OD. The pipe OD plus the out-of-round tolerance are used to set the ID of the pull head. This assures a tight fit and also accommodates the allowable variances in the pipe OD. With larger pull heads (greater than 12-inches in diameter) an additional gap allowance of approx .05" is added due to the stiffness of the pipe. It is recommended that the pull head be removed and re-installed on the Fusible PVC™ pipe after each pull-in.

Pull-heads are available for rent or purchase from Underground Solutions, Inc. Please contact your Regional Sales Manager or our main office at 858-679-9551 about rental rates or sell price.

Figure 2.4.1 – Pull Head for Use with Fusible PVC™

The pull head should also be used when fusing long lengths together prior to installation. As the pipe gets longer and heavier, a strap may slip. The pull head provides support of the wall and will prevent ovaling and folding of the pipe if a through connection is needed for the pulling.

In most cases it is recommended that a swivel be placed between the pull head and the pulling mechanism to eliminate any torsion forces being transferred to the pipe. In the case of pipe bursting, additional isolations are recommended to prevent any compression forces being transmitted to the pipe.

For HDD installations and any other methods requiring a sealed pull head, several steps can be taken. Rubber hose washers or "O" rings can be placed under the bolt heads to act as a sealing gasket at these locations. The back end of the pull head can be sealed with a silicone caulk. Another preventive step is to close the end of the PVC pipe prior to installation of the pull head. This can be done with plastic sheeting and/or tape. See Figure 2.4.2 below:

Figure 2.4.2 – Sealing of Pipe End Prior to Pull Head Installation

3 Installation by Sliplining or Pipe Bursting Methods

In sliplining installation the pipe is normally fused on the surface. The insertion point is at a removed section of the host pipe. The host pipe, in most cases, is generally at a horizontal grade.

In pulling a fused pipe from at-grade to below grade and the final alignment, the pipe must bend generally in an "S" configuration, with two separate, but equal bending radii. The recommended bend radius for the pipe being inserted (shown as 'R_B' in Figure 3.1) is the parameter that defines the length of the insertion pit (shown as 'L' in Figure 3.1).

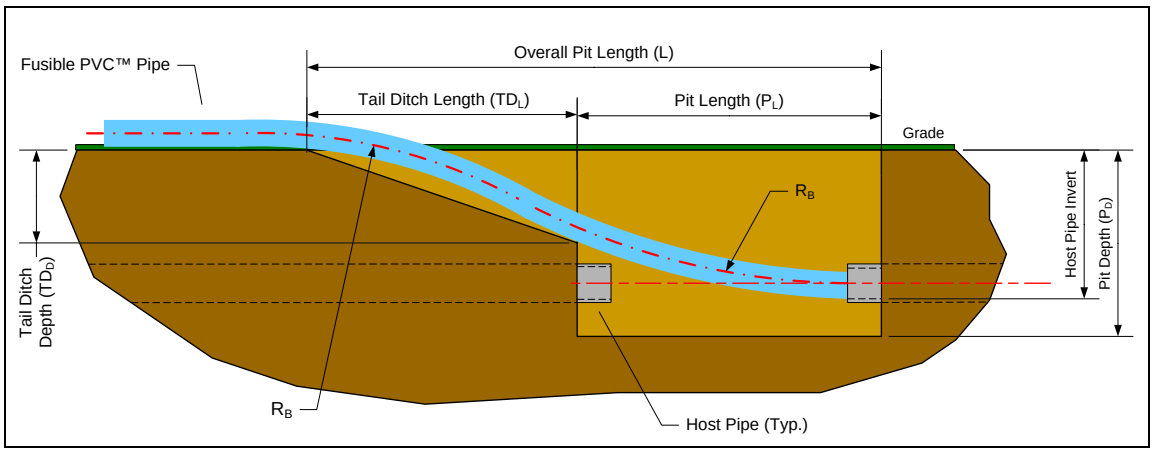

Figure 3.1 – Sliplining or Pipe Bursting Insertion

The reality of the installation may not dictate such a straightforward 'S' curve of the Fusbile PVC. A portion of the bending could happen above grade by supporting the pipe on pipe stands. This allows the bending to start prior to reaching the start of the pit. If the grade of the host pipe is greater than 0 %, sloping downward away from the installation, a lesser bend to enter the host pipe could be required. Also, if the host pipe is substantially larger than the Fusible PVC™ to be inserted, a portion of the bending could be accomplished inside the host pipe. Factors such as the sharp lip of a host pipe entrance or host pipe fragments leftover from pipe bursting may scratch the surface of Fusible PVC™. If a scratch in the surface of the Fusible PVC™ pipe is made greater than 10% of the pipe wall thickness, then you should contact your Underground Solutions representative immediately to determine the next course of action. **It is highly recommended that the installation of the new Fusible PVC™ pipeline be closely monitored.** Other issues that can influence the length needed for making such a transition are the ambient temperature (higher temperatures reduced the modulus of elasticity making the pipe more flexible). Contact your Underground Solutions representative for information regarding the parameters of your particular sliplining or pipe bursting installation.

4 Installation by Horizontal Directional Drill Methods

In HDD installations the pipe is normally joined at-grade. The insertion point is at the exit pit of the HDD bore.

In HDD applications, the entry point of the Fusible PVC™ is often defined by an entry angle. This is expressed in degrees from the horizontal. A typical entry angle is between 6º and 15º. The length of Fusible PVC™ required to make the transition from the horizontal fused alignment to the point of entry is shorter than for sliplining and pipe bursting insertions because there is a single curve involved and not a full 'S' curve. As in some slipline and pipe bursting applications, sometimes for an HDD where the drilled alignment is greater in diameter than the pipe being inserted, a portion of the bending can take place as the pipe enters the bore

hole. **As previously mentioned, it is highly recommended that the installation of the new Fusible PVC™ pipeline be closely monitored.**

The following Table 4.1 provides a factor to be used times the Fusible PVC™'s bend radius to determine the length required to make the transition into the bore hole:

Degree of entry point	Factor
6	.1
8	.14
10	.17
12	.21
14	.24
15	.26

Table 4.1 – HDD Bend Radius Factors

Contact your Underground Solutions representative for information regarding the parameters of your particular HDD installation.

5 Installation by Direct Bury Methods

The final installation method for Fusible PVC™ reviewed here is direct bury, or "Open Cut" method. Direct bury installations can be completed primarily in two ways.

5.1 Pull-in Method

The first is to perform a pull-in from the end of the trench. The pipe is fused ahead of the trench excavation in approximate alignment with the trench. In this approach, the insertion trench is the transition from the at-grade pipe fusion location to the cut trench bottom. The insertion trench follows the same geometry shown in the insertion configuration section for sliplining or pipe bursting (Section 3) of this document, as well as Figures 3.1 and 3.2. This technique works well when there is not enough room in the trench easements for fusion and lay-down area next to the trench. In many cases the spoils from the trench take up available room adjacent to the trench. The governing factor on insertion of this type is the insertion trench, and making sure the allowable bend radius of the pipe is not exceeded from the at grade elevation down to the final alignment elevation.

5.2 Placement Method

The second method is moving the pipe from *next* to the trench, *into* the trench and final alignment. In this case, the bend radius of the pipe is used to determine the location of the bends required to relocate the pipe. The distance to be moved is determined from the initial at-grade alignment location, and the final installed alignment location of the pipe.

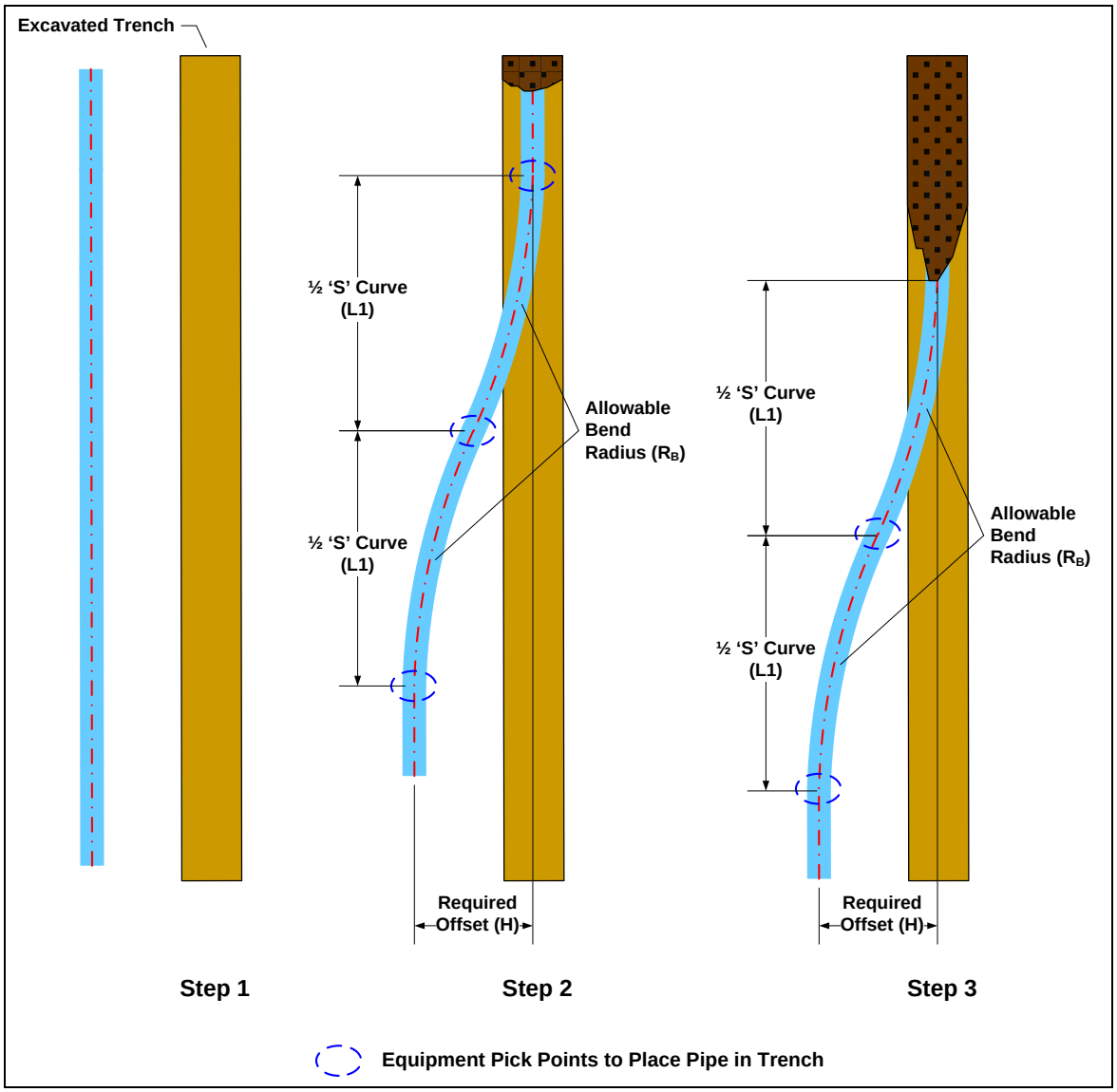

Figure 5.2.1 – Direct Bury Pipe Placement Installation Steps

The starting point for installation is the Fusible PVC™ laying next to an excavated trench (Step #1). The end of the pipe is lifted and placed in the trench and anchored or held for the initial pipe insertion (Step #2). After some length is placed the pipe will no longer need additional hold back from sliding. Two machines are then used to move the pipe into the trench (Step #3). The spacing of the machines are at the midpoint of the curve and the end as determined by the 'S' curve for the size of Fusible PVC™ being installed. The machines then leap frog down the alignment taking positions at the changes in the bend direction to move the pipe into the trench.

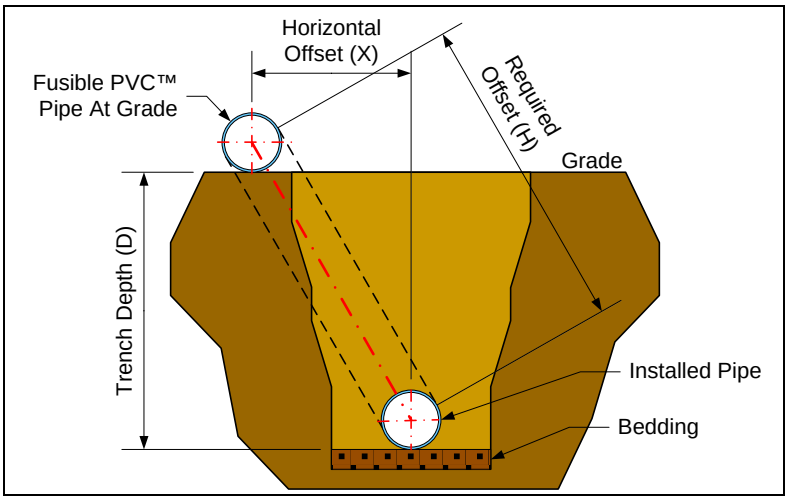

Figure 5.2.2 – Pipe Installation Cross Section with Theoretical 'S' Curve Determination

To determine the total length of the 'S' curve, the distance the pipe will move from the at-grade alignment to the trench and final installation alignment must be known. This can be determined from the depth of the trench and the distance from pipe to the center of the trench. Using the Pythagorean Theorem to determine the length of the hypotenuse of a right triangle, and using the 'depth of trench' and the 'horizontal offset distance' as the legs of the triangle (see Figure 5.2.2), provides this 'required offset distance' the pipe will be moved. This is then used to calculate the length of the 'S' curve for a particular size of Fusible PVC™.

Contact your Underground Solutions representative for specific information regarding your direct bury project and installation.

Recommended Tapping Procedures and Information for Fusible PVC™ Pipe

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Recommended Tapping Procedures and Information for Fusible PVC™ Pipe, Including Fusible C-900®, Fusible C-905®, and FPVC™

1 Introduction

Tapping of a pressure pipe is a critical and necessary operation for the installation and continued operation of a pressure pipe system. Tapping is the process of adding a branch line to a previously installed pressure line.

2 Background

There are four basic categories of tapping:

2.1 Direct Tapping

Direct tapping is the method of installing the branch tap directly into the pipe wall. In this method, the shut-off valve, or corporation stop, is threaded into the pipe wall. The extra step of cutting the threads adds a level of difficulty to this method.

Underground Solutions does NOT recommend direct tapping into Fusible PVC™ pipe.

2.2 Saddle or Sleeve Tapping

In this method, the pipe to be tapped is supported by a tap saddle or sleeve. The saddle/sleeve contains the threaded connection for the corporation stop. This results in a smooth bore into the tapped pipe. The saddle/sleeve is sized to fit the PVC pipe exactly and is made specifically for use with PVC pipe.

Underground Solutions requires the use of either a saddle or sleeve made specifically for PVC pipe when tapping Fusible PVC™ pipe.

2.3 Wet Tapping

This is the method of installing the tap while the line is under pressure. This means that the line can stay active and does not need to be drained. A tapping valve is installed on the sleeve/saddle to allow shut off of pressure once the tap is made.

Fusible PVC™ pipe IS able to be wet tapped.

2.4 Dry Tapping

This is the practice of tapping the pipe while not under pressure or full of liquid. With the line empty (or “dry”), the tapping is made and then pressurized after the tap is completed.

Fusible PVC™ pipe IS able to be dry tapped.

3 Equipment

Tapping machines normally come in two types: manually driven machines for 1" and smaller saddle taps and motor driven machines for larger taps. There are many manufacturers of tapping machines, and some will perform better than others.

In the ¾" to 1" tap size, a PVC cutter bit must be used. Both Reed Manufacturing and Mueller Co. make good quality tapping machines and bits in theses sizes.

For the Reed tapping equipment, Model DMPVC or DM2100 have proven to work well on PVC when using the proper cutter. Reed manufactures a PVC cutter for a standard ¾" and 1" corporation. The Reed catalog # is PL688 and the item # is 04385.

Fusible PVC™ pipe IS NOT TO BE tapped with hand held drills using wood drill bits or hole-saws.

Reed has various combinations of tap machines, as noted below. The critical feature is the proper PVC cutter tool. While older models could likely work properly with PVC, it is important to consult with the equipment supplier to be sure the PVC cutter bits are adaptable to the bit connection or arbor. If there is any question regarding the applicability of the PVC cutter tool, please contact your Underground Solutions, Inc. representative.

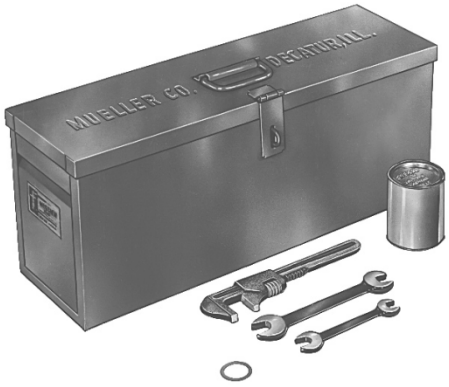
Reed Information: PVC Drilling Machine Shell Cutter

Shells cut through service saddles on PVC only. For use with Reed's DMPVC Drilling Machines. They also fit Mueller D® and PL-2 Machines.

Catalog No.	Item Code	Shell Size (in)	Nom. Corp. Size
PL688	04385	$^{11}/_{16}$	¾" NPT & AWWA
PL875	04386	$^{7}/_{8}$	1" NPT & AWWA

Figure 3.1 – PVC Drilling Machine Shell Cutters

Mueller Information: Mueller® E-5™ Drilling Machine



$^{7}/_{16}$" to 1-$^{7}/_{8}$" Inclusive

- Catalog number E-5 (Part No. 39330)
- Hand or power operation
- Used to drill through ½" to 2" corporation stops and service saddles
- 12-$^{1}/_{8}$" (308 mm) boring bar travel
- Has boring bar locking mechanism
- Use on cast iron or ductile iron pipe • cement-line cast iron or ductile iron pipe • cast iron OD PVC pipe • steel pipe • concrete pipe
- 500 psig (3447 kPa) maximum working pressure at 100°F (38°C)
- 250°F (121°C) maximum working temperature at 375 psig (2586 kPa)

Figure 3.2 – Drilling Machine

4 Large Diameter Tapping Equipment

Mueller Information: Mueller® Cl-12™ Drilling Machine

- Catalog number CL-12 (Part No. 39295)
- Hand or power operation
- Designed to use on pressurized or dry mains
- Used to cut 1-½" to 12" holes
- Use on cast iron or ductile iron pipe • cement-line cast iron or ductile iron pipe • cast iron OD PVC pipe • steel pipe • concrete pipe • A-C pipe
- Will make cuts through tapping valves from 2" to 12"
- 250 psig (1724 kPa) maximum working pressure at 100°F (38°C)
- 500°F (121°C) maximum working temperature at 150 psig (1034 kPa)

Size	Shell Cutter	Pilot Drill	Pilot Drill Extension
4"	537061	681919	537068
6"	537062	681919	537069
8"	682581	681919	537069
10"	682583	681919	537070
12"	682585	681919	537070

Mueller PVC Shell Cutters and Support Hardware

*Note: Cutter Hub P/N 83671 is needed with all sizes

Figure 4.1 – Mueller CL-12 Drilling Machine

The Mueller CL-12 is the preferred machine for taps larger than 2". This is primarily because of the PVC cutter bits available. Other machines with large diameter capacity do not have PVC cutter bits and rely on hole saws or standard metal bits to cut PVC.

The shell cutters and parts (indicated above) fit directly to the CL-12 arbor. They can also be adapted to larger Mueller tapping machines with additional arbor adapters.

The following table summarizes the equipment recommendations by size.

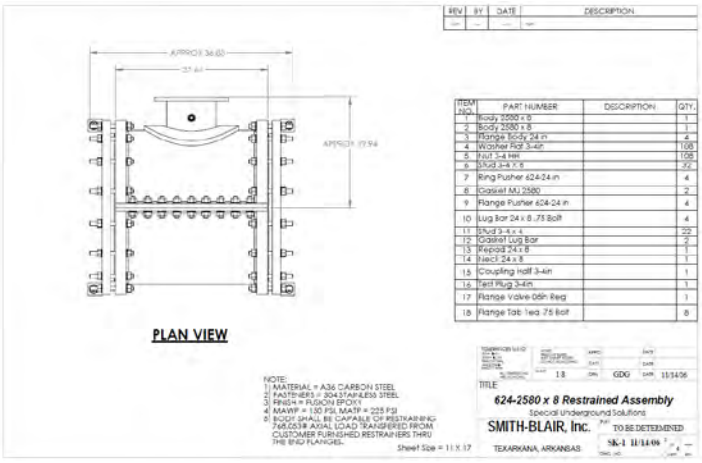
Tap Size / Pipe size	¾”	1”	1 ½”	2”	4”	6”
4”	X					
6”	X	X				
8”	X	X				
10”	X	X				
12”	X	X				
14”	X	X				
16”	X	X	X	X		
18”	X	X	X	X		
20”	X	X	X	X	X	
24”	X	X	X	X	X	
30”	X	X	X	X	X	X
36”	X	X	X	X	X	X

Table 4.2 Tap Size by Pipe OD

The Table above represents taps that can be made routinely with no additional precautions taken in the sizes of pipe shown. This applies to both pressure and non-pressure applications.

Tap sizes are limited due to the potential axial stress that can be present as a result of trenchless installation methods. There are several ways to increase the tap size by providing a means to transfer axial stress around the tap area. These methods include:

- Cutting the pipe and inserting a Tee fitting connected to the pipe using standard PVC restraints.
- Using a restrained tapping sleeve. These sleeves are a split design that surrounds the pipe to be tapped and is restrained connected back to the pipe. This sleeve also allows for equalization of pressure across the pipe wall. Because the tap sleeve will carry the entire axial loading, almost any size can be tapped into the pipe as a result.



- A restraining harness can be used to transfer the axial loading around a tap saddle. The size that can be utilized in this manner is limited to the space between connecting rods. The tap saddle is installed first then the restraining harness is placed around the tap area and tightened. The tap is then performed after axial load is transferred to the harness.

A split connection grip must be used on each side. The tap is done in the prescribed manner in this document.

Because the tapping provisions included here are a function of axial loading, they apply equally to non-pressure installations. However, in non-pressure installations, there are options to increase the tap size not applicable for pressure taps:

- An “Inserta Tee” type connection can be made when a restraint harness is used.
- A “Y” fitting can be cut into the line and restrained at each end.

Tapping Saddles

Figure 5.1 – Typical PVC Tapping Saddle

Tapping saddles are used for the installation of a corporation stop in a tapped pipe. Typically this is done on pipe sizes in the 4" to 12" range. The tap saddle is made to a specific inner diameter to match the outer diameter of the pipe. It fully supports the pipe and is sized so that the parts when bolted together cannot be over tightened on the pipe. The manufacturer's installation instructions must be followed. Tap saddles do not have U-bolt type configurations, which do not adequately support PVC pipe. **Tapping saddles MUST BE DESIGNATED FOR USE ON PVC PIPE.**

An example of manufacturer's materials description for tap saddles follows:

S90 Brass Saddle Features

- All brass conforms to AWWA Standard C800 (ASTM B-62 and ASTM B-584, UNS No. C83600-85-5-5-5)
- Style A Saddle body and strap permanently held together with silicon bronze pin for saddles sized 2" thru 8"
- Bolt is 5/16" slotted hex head silicon bronze for saddles size 2" thru 8"
- A three-piece bolted design is used for S90 Saddles sized 10" and 12" with 1-½" and 2" taps, two-piece for ¾" and 1" taps
- All 10" and 12" saddles are held together with ½" silicon bronze bolts (¾" hex head)

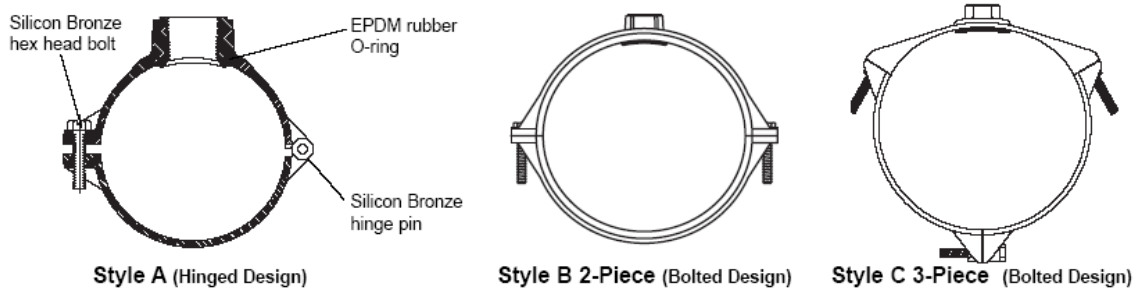
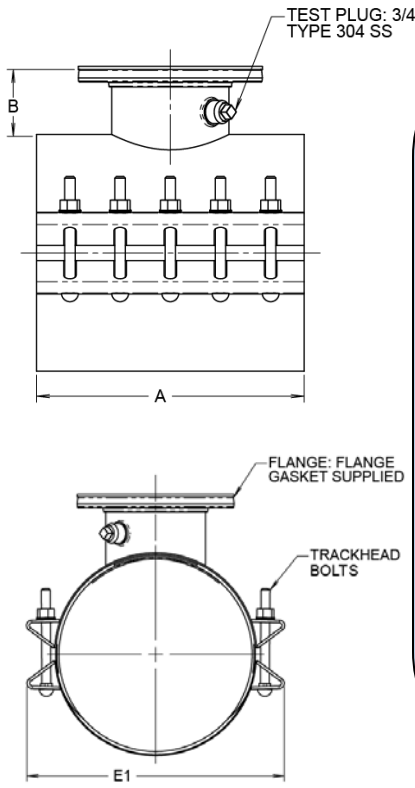


Figure 5.2 – S90 Brass Saddles with AWWA Taps for C900 PVC Pipe

5 Tap Sleeves

Tap sleeves are used for larger diameter taps and larger diameter pipe. The sleeve is a two-part assembly that bolts together and grips the pipe to be tapped. Because of this, the installation is different than the tap saddle. The bolts must be installed per manufacturer's torque requirements. The tap sleeve can be over-tightened, placing excess stress on the pipe and tap. **Over-tightening MUST BE AVOIDED for the tap sleeve to function properly.**



Material Specifications

Body:	Carbon Steel ASTM A283 Grade C. Optional: All 304 stainless steel.
Flanges:	AWWA C207 Class D. ANSI 150# drilling. Recessed for Tapping Valve per MSS-SP 60. Optional: Other types of Flanges, threaded outlets; MJ outlets.
Gasket:	Nitrile (Buna-N) NSF61 listed. Concave wedge gasket—compounded to resist water, oil, acids, alkalies, most (aliphatic) hydro-carbon fluids, and many chemicals.
Bolts, Nuts, Washers:	High strength low-allow steel with heavy semi-finished hex nuts to ASTM A-307 (ANSI A21.11) standards. Optional-type 304 stainless steel bolts and nuts are coated to prevent galling.
Finish:	Fusion bonded Flexi-Coat® epoxy, coated to an average of 12 mil thickness.

Figure 6.1 – Tap Sleeve and Material Specifications

6 Tap Procedure Using a Tap Saddle and Hand Operated Tap Machine

Tapping with a hand operated tap machine using a tap saddle, the following steps are normally followed:

1. Locate the tap saddle on the pipe and evenly tighten it to the pipe. Care should be taken not to over-tighten or exceed the torque recommendations of the tap saddle. Follow the manufacturer's recommendations. In locating the saddle on Fusible PVC™ pipe, the recommendation is to tap at least 12" from a fusion joint. This assures that the tap will seal properly around the pipe and is not interfered with by the fusion bead.
2. Screw the inlet side of the corporation stop into the saddle threads using the appropriate sealing aids on the threads (pipe dope, Teflon tape, etc,). Open the stop after installation.
3. Install the specified PVC cutter bit on the drilling machine.
4. Using the appropriate adapter and gasket, attach the drilling machine to the stop outlet threads. Follow the manufacturer's instructions.
5. Lower the boring bar to the pipe to be tapped.
6. Rotate the cutter while exerting finger pull pressure on the feed handle. The amount of pressure used should be approximately equal to pulling out a desk drawer. The rotation of the cutter to feed should be 1 full rotation of the cutter to 1/8 turn of the feed yoke.
7. Upon completion of the tap, withdraw the cutter.
8. Close the stop valve.
9. Remove the drilling machine.

7 Tapping Procedure Using a Tap Sleeve

When tapping a larger diameter pipe size, tap sleeves are used, and in most cases, used with a power operated tapping machine. The tap machines can be operated by hand, air motor, or hydraulic pump. The manufacturer's instructions must be followed. The steps to be followed are:

1. Install the tap sleeve on the pipe per manufacturer's instructions. The tap sleeve is normally a two-piece assembly with a ring gasket at the tap outlet providing the seal to the external surface of the pipe. The tap sleeve is made to fit tightly around the pipe but is not a fully supporting device like the tap saddle. It is extremely important to torque the mounting bolts to manufacturer's requirements. Over-tightened bolts can induce stress into the pipe being tapped.
2. Connect the tap valve to the tap sleeve. The tap valve is normally a specialty valve with a gasket-flanged connection to the tap outlet and an MJ type connection to the tap machine side. Flange adapters are made to connect the tap machine to a flanged valve arrangement.
3. Support the tap sleeve and valve independently from the pipe. Supports should be left in place after tapping.
4. Install the required PVC cutter and support hardware (pilot cutter, pilot adapter, etc.).
5. Attach the drilling machine to the tap valve or adapter.
6. Install temporary supports under the tap machine to support it independently from the pipe, sleeve, and valve.

7. Open the tapping valve.
8. Advance the cutter to the pipe being tapped.
9. Engage the cutter and cut the tap hole. On power operated tap machines, the advance rate and the cutting rate are set per manufacturer's recommendations. The travel distance is also set to prevent the cutter from gong through the pipe wall too far and cutting into the opposite side pipe wall. If using a hand-operated model, assure the proper advance rate, cutter rate and travel distance.
10. At completion of the tap, retract the cutter and close the tap valve.
11. Remove the tap machine.
12. Attach the new line.

8 Tap Results

The tap coupon should have a smooth straight side wall when removed from the tap machine. A rough side with the presence of striations are indications of a poor tap.

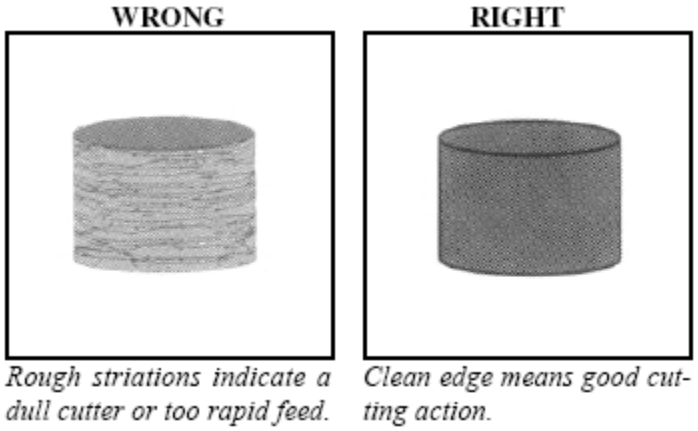


Figure 9.1 – Illustrated Tap Results