

A.) GENERAL**DESCRIPTION:**

This specification shall cover the rehabilitation of existing water lines using the GRUNDOCRACK PIPE BURSTING SYSTEM. Pipebursting is a system by which the pneumatic burster unit, splits the existing pipe while simultaneously installing a new Polyethylene Pipe of the same size or larger size pipe where the old pipe existed, then reconnect existing water service house connections, television inspection of the Polyethylene Pipe and complete the installation in accordance with the contract documents. Only Pneumatically operated equipment with special advanced guide head technology for bursting point repairs, and rear expanders for the proper connection to the Polyethylene Pipe will be allowed for use. The pneumatic tool must be used in conjunction with a constant tension/variable speed winch. The winch shall have twin cable pulling capstans with twin hydraulic drive motors and twin gear boxes for independent operation of either 20, 10 or 5 tons, the size of the winch depends on the diameter of the pipe to be replaced. In no case is the constant tension on the winch to exceed 20 tons.

B.) QUALIFICATIONS:

- 1.) The contractor shall be certified by the particular Pipe Bursting System Manufacturer that such a company is a fully trained user of the pipe bursting system.
- 2.) Polyethylene pipe jointing shall be performed by personnel trained in the use of butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the polyethylene pipe. Training shall be performed by qualified representative.
- 3.) The Contractor shall hold the City and Engineering Firm harmless in any legal action resulting from patent infringements. The Contractor shall be licensed by Advantica Technologies' (previously called British Gas) pipe bursting patents (which are available from Advantica Technologies).

C.) SUBMITTALS:

Submit the following Contractor's Drawings:

- 1.) Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.
- 2.) Method of construction and restoration of existing water service connections. This shall include:
 - a.) Detail drawings and written descriptions of the entire construction procedure to install pipe, and install temporary service connection and reconnection of existing water service's, fire hydrants, and intersecting mains.
- 3.) Certification of workmen training for installing pipe.
- 4.) Method of construction with detailed drawings and written descriptions of the entire construction procedure to insert the pipe, pipe fusion techniques, non-fusion pipe joining techniques, and connections to water services, fire hydrants, and intersecting water mains. Drawings shall show, but are not limited to, excavation locations, access pits, dimensions, shoring, method of dewatering, adjacent utilities, and traffic control.
- 5.) Plans and procedures for supplying temporary water service.

D.) DELIVERY, STORAGE, AND HANDLING:

- 1.) Transport, handle, and store pipe and fittings as recommended by manufacturer.

- 2.) If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Engineer at the Contractor's expense, before proceeding further.
- 3.) Deliver, store and handle other materials as required to prevent damage.

E.) METHODS FOR NEW PIPE INSTALLATION:

The method approved for rehabilitation of existing water mains by pipe bursting and installation of new polyethylene pipe is T.T. Technologies GRUNDOCRACK SYSTEMS, (800-533-2078) or approved equal. See accompanying list for your closest trained contractor that is licensed by Advantica Technologies.

PLEASE NOTE THAT using an unlicensed contractor who does not have an Advantica Technologies method license that causes them to pay royalties to Advantica Technologies can put you in violation of Advantica Technologies patents.

If we may be of any further assistance, please feel free to contact us, or Peter McCallum, of Advantica Technologies, directly at 713-586-7000 or Mobil 403-238-6937.

F.) MATERIALS:

Polyethylene Plastic Pipe shall be AWWA C906 high density polyethylene pipe.

- 1.) Sizes of the insertions to be used shall be such to renew the water line to its original or greater than flow capacity.
- 2.) All pipe shall be made of virgin material. No rework except that obtained from the manufacturer's own production of the same formulation shall be used.
- 3.) The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- 4.) Prior to construction, Contractor shall submit for approval, the manufacturer's specific technical data with the complete information on resin, physical properties of pipe and pipe dimensions pertinent to this job. A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied. Water line pipe shall have a pipe diameter ratio of DR12.5.
- 5.) Material color shall be white, black or whatever is specified with interior of pipe having a light reflective color to allow easier/better viewing for television inspection.
- 6.) The physical appearance of the pipe having deformities such as concentrated ridges, discoloration, excessive spot roughness, pitting, varying wall thickness, etc., shall constitute sufficient basis for rejection. The pipe shall be homogeneous throughout, free from visible cracks, foreign inclusions and other defects. Pipe with gashes, nicks, abrasions or any such physical damage which may have occurred during storage and/or handling which are wider or deeper than 10% of the wall thickness, shall not be used and must be removed from the construction site.
- 7.) Any pipe that has been damaged or does not meet with the city's approval, shall be replaced at the Contractor's expense.
- 8.) Other pipe materials may be considered, the pipe bursting equipment manufacturer shall be consulted for feasibility. Ductile Iron, PVC and other pipe materials may be installed with the pipe bursting method. The pipe bursting installation method is modified to accommodate these pipe materials.

G.) EQUIPMENT:

The pipe bursting tool shall be designed and manufactured to force its way through existing pipe materials by fragmenting the pipe and compressing the old pipe sections into the surrounding soil as it progresses. The bursting unit shall be pneumatic and shall generate sufficient force to burst and compact the existing pipe line. See manufacturers specifications for what size tool should be used in what diameter of pipe, as well as parameters of what size tool for percentage of upsize allowed.

The pipe bursting tool shall be assisted by a constant tension twin capstan winch through the old line by a winch located at the receiving excavation. The bursting unit shall pull the polyethylene pipe with it as it moves forward. The bursting head shall incorporate a shield/expander to prevent collapse of the hole ahead of the PE pipe insertion. The pipe bursting unit shall be remotely controlled.

In water line applications, advanced guide head technology is mandatory for successful pipe bursting. The Guide Head insures effective bursting of point repairs, service saddles, and other common water main fittings.

The pipe bursting tool shall be pneumatic. The bursting action of the tool shall increase the external dimensions sufficiently, causing breakage of the pipe at the same time expanding the surrounding ground. This action shall not only break the pipe but also create the void into which the burster can be winched and enables forward progress to be made. At the same time the polyethylene pipe, directly attached to the sleeve on the rear of the burster, shall also move forward.

The burster shall have its own forward momentum while being assisted by winching. A hydraulic winch shall give the burster friction by which it can be moved forward. To form a complete operating system, the burster must be matched to a constant tension hydraulic winching system.

G.1) WINCH UNIT:

A winch shall be attached to the front of the bursting unit, connecting to or through the advanced guide head technology. The winch shall provide a constant tension to the burster in order that it may operate in an efficient manner. The winch shall have twin capstan with twin hydraulic drive motors and twin gear boxes for independent operation. The cable storage drum is strictly for cable storage and is not to be considered as part of the pulling system.

The winch shall be hydraulically operated providing constant tension throughout the operation. The winch shall be of the constant tension type and shall be fitted with a direct reading load gauge to measure the winching load.

The winch must automatically maintain a constant tension at a set tonnage reading.

The constant tension winch shall supply sufficient cable in one continuous length so that the pull may be continuous between approved winching points.

The winch, cable and cable drum must be provided with safety cage and supports so that it may be operated safely without injury to persons or property.

The contractor shall provide a system of guide pulleys and bracing at the exit pit to minimize cable contact with the existing line between launch and exit pits.

The supports to the trench shoring in the insertion pit shall remain completely separate from the winch boom support system and shall be so designed that neither the pipe nor the winch cable shall be in contact with them.

H.) LAUNCHING AND RECEIVING PITS:

- 1.) The location and number of launching and receiving pits shall be proposed by the Contractor and approved by the city prior to excavation. The pits shall be located such that their number shall be minimized and the footage of the new pipe installed in a single pull shall be maximized.
- 2.) Before any excavation is done for any purposes, the Contractor shall contact the various utility companies for determining field location of existing utilities.
- 3.) All work is to be completed within existing street rights-of-way or utility easement.
- 4.) Any damage to adjacent properties that are not part of this work shall be repaired and restored to it's original condition at the Contractor's expense.

- 5.) Where it is necessary to excavate to an additional depth for the placement and use of a fusion machine, or any other cause, the Contractor shall furnish and install trench shoring or bracing in compliance with OSHA standards.

H.1) INSERTION OF POLYETHYLENE PIPE:

- 1.) Prior to construction, the Contractor shall develop a temporary water system to supply water service to area residents and businesses during pipe bursting operations. It is anticipated that the system be fed from existing fire hydrants. The temporary system and hydrants shall be disinfected.

All buried utilities adjacent to the pipe operation shall be reviewed, and where necessary be excavated to relieve transient loading during the insertion operation. If any utilities are within 24" of the pipe to be burst, the Contractor shall excavate a pit at the location to check clearance. If adequate clearance does not exist between the existing water line and the subject utility, the Contractor shall employ substitute means to rehabilitate the existing water line.

For utilities crossing within 6" of the existing water line to be burst, soil shall be excavated and removed to relieve loading during the bursting operation.

- 2.) Any concrete encasements shall be excavated and broken out prior to the bursting operation to allow the steady and free passage of the pipe bursting head. All in-line valves and fittings shall be removed prior to the bursting operation.
- 3.) The new polyethylene pipe shall be inserted immediately behind the bursting head in accordance with the manufacturer's recommended procedures. The bursting tool shall be specifically designed and manufactured for the type of insertion process being used. It shall be utilized to guide and assist the bursting head during the operation. A pushing machine may be utilized to aid pipe insertion from the rear.

I.) SERVICE CONNECTIONS:

- 1.) All service connections on the existing water main that is to be burst or will be taken out of service, shall be connected to the temporary water system during bursting, disinfecting, testing and service reconnection operations. Temporary service connections shall be made at the meter pit.
- 2.) After the new polyethylene pipe has been installed, disinfected and tested, each existing service shall be connected to the new pipe in accordance with manufacturer's recommendations for side wall fusion.
- 3.) Accepted quantities for service connections will be paid for at the contract unit price which will be per each water service connection made.
- 4.) Work necessary to excavate and back-fill service connections will not be paid for separately, but will be included in the contract unit price for this item. The surface repair of the excavation will be paid for separately under the appropriate bid item.

J.) TESTING / DISINFECTIONS:

- 1.) The polyethylene pipe shall be pressure tested after the line and all fittings and valves have been installed. Connections may be left exposed for visual leak inspection. Chlorination to disinfect the new pipeline shall be according to all local standards and requirements.

- 2.) Pressure Testing Procedure Example for HDPE pipe:
The new pipeline shall be pressurized to 160 psi, and allowed to stand for a period of 4 hours to allow for the expansion of the pipe. The pressure shall be checked every 30 minutes. If the pressure has dropped to below 155 psi, it shall be restored to 160 psi. At the end of the 4-hour period, the pressure shall be dropped or restored to 150 psi. If after a period of one hour the pressure has remained above 142.5 psi without the addition of water, the line shall have passed the pressure test. If during the initial 4-hour pressurization period the pressure remains above 155 psi, (5 psi below the initial pressure), to the end of one 30-minute cycle and above 152 psi, (5% below the initial pressure), to the end of the next 30-minute cycle, without the addition of water, the line shall have passed the pressure test.

K.) APPURTENANCES:

- 1.) Accepted quantities for valves and fittings will be paid for at the contract unit price which will be per each appurtenance installed.
- 2.) Work necessary to excavate and back-fill appurtenances will not be paid for separately, but will be included in the contract unit price for this item.

L.) PIPE JOINING:

- 1.) The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted.
- 2.) All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment.
- 3.) The butt-fused joint shall be true alignment and shall have uniform roll-back beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the engineer and/or his representative prior to insertion. All defective joints shall be cut out and replaced at no cost to the City. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness, shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by the Engineer and/or his representative shall be discarded and not used.
- 4.) Terminal sections of pipe that are joined within the insertion pit shall be connected with Central Plastics Electrofusion Couplings or connectors with tensile strength equivalent to that of the pipe being joined.
- 5.) Sections of the polyethylene pipe shall be assembled and joined on the job site above the ground. Joining shall be accomplished by the heating and butt-fusion method in strict accordance with the manufacturer's printed instructions. Hot fusion joining of HDPE end sections, service taps and fittings may be performed in the excavations.
- 6.) Service connections installed on the new polyethylene pipe shall be accomplished by the side wall fusion method in accordance with the manufacturer's printed instructions or other types of fittings, designed for water pressure applications on the specific pipe material used.
- 7.) Where the polyethylene pipe is connected with ductile iron fittings or valves, an HDPE flange adapter shall be fused to the end of the pipe and the connection made with bolted flange components. All connections of the new pipe, to the existing water system, shall be restrained.

- 8.) All joints shall be inspected by the city before insertion. The pipe shall be joined on site in appropriate working lengths near the launching pit.

M.) PAYMENT:

- 1.) The inserted pipe shall be paid for per linear foot of the size pipe specified and shall include all pipe bedding, back-fill material, annulus sealing material and launching pits. Locating and reconstruction of services and all reconstructions of services shall be paid for per each connection made, including fittings and pipe.
- 2.) The work performed as prescribed by this item will be paid at the unit price per linear foot of water main by pipe bursting/replacement for the specified pipe diameter and location, per each for "Locate, reconstruct and reconnect" for the specified pipe diameter, which price shall be full compensation for the installation of the new pipe, furnishing and placing of all materials, labor, tools, equipment, cleaning, and preparation of the existing pipe to receive the new liner, and any other necessary to complete the project.
- 3.) Video inspection of final installed pipe shall be paid based on the cost per linear feet to TV the entire length of new pipe.
- 4.) The cost of any necessary temporary water service connections shall be considered subsidiary to the cost of pipe installation and shall not be a separate pay item.
- 5.) The launching and receiving pits shall be paid for per Each. A single "pit" may consist of two holes for the winch and the recovery of the pipe bursting machine. A pit may be used for both launching and receiving.
- 6.) Accepted quantities for the surface repair of the launching and receiving pits will be paid for at the contract unit price that will be the square yardage of surface disturbance. Contractor shall not be compensated for pits with disturbance areas in excess of 15 square yards, unless approved by the Project Engineer.
- 7.) The pipe installed through the pits shall be paid separately as pipe installed by the pipe bursting method.
- 8.) Work necessary to excavation and back-fill will not be paid for separately, but will be included in the contract unit price for this item. Native material excavated on-site shall be used for back-fill unless it is too wet or otherwise unsuitable, in which case imported fill, (pit run), shall be used and paid for by the ton.
- 9.) Accepted quantities of polyethylene pipe installed by pipe bursting will be paid for at the contract unit price, which will be the lineal foot of pipe installed, including the length through the launching/receiving pits.
- 10.) Work necessary to excavate and back-fill potholes at utility crossings will not be paid for separately, but will be included in the contract unit price for this item. The surface repair of the potholes will be paid for separately under the appropriate bid item