

1.0 GENERAL**1.1 DESCRIPTION:**

This specification shall cover the rehabilitation of existing sanitary sewers using the GRUNDOCRACK PIPE BURSTING SYSTEM. Pipe bursting is a system by which the pneumatic bursting tool fractures the existing pipe while simultaneously installing a new Polyethylene Pipe of the same size or larger size pipe where the old pipe existed, then reconnects existing sewer service house connections, television inspection of the Polyethylene Pipe and completes the installation in accordance with the contract documents. Only pneumatically operated equipment with either front or 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 20, 10 or 5 tons. The size of the winch depends on the diameter of the pipe to be replaced.

1.2 QUALIFICATIONS:

- 1.2.1 The contractor shall provide proof of training by the particular Pipe Bursting System Manufacturer that such a company is a fully trained in the use of the pipe bursting system.
- 1.2.2 Polyethylene pipe joining 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.

1.3 SUBMITTALS:

Submit the following Contractor's Drawings:

- 1.3.1 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.
- 1.3.2 Method of construction and restoration of existing sewer service connections. This shall include:

Detail drawings and written descriptions of the entire construction procedure to install pipe, bypass sewage flow and reconnection of sewer service connections.
- 1.3.3 Proof of workmen training for installing pipe.
- 1.3.4 Television inspection reports and videotapes made prior to pipe bursting and after new pipe installation.

1.4 DELIVERY, STORAGE, AND HANDLING:

- 1.4.1 Transport, handle, and store pipe and fittings as recommended by manufacturer.
- 1.4.2 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.
- 1.4.3 Deliver, store and handle other materials as required to prevent damage.

1.5 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), www.tttechnologies.com or approved equal. Contact TT Technologies, Inc. for a list of contractors in your area.

1.6 MATERIALS:

Polyethylene Plastic Pipe shall be high density polyethylene pipe and meet the applicable requirements of ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, ASTM D1248, ASTM D3350.

- 1.6.1 Sizes of the insertions to be used shall be such to renew the sewer to its original or greater than flow capacity.
- 1.6.2 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.
- 1.6.3 The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- 1.6.4 High Density Polyethylene Pipe (HDPE) manufacturers recommend minimum wall thickness of SDR 17 for pipe bursting installations.
- 1.6.5 Material color shall be white, black or as specified by the engineer.
- 1.6.6 Other pipe materials may be considered, the pipe bursting equipment manufacturer shall be consulted for feasibility.

1.7 TESTS:

Tests for compliance with this specification shall be made as specific herein and in accordance with the applicable ASTM Specification. A certificate with this specification shall be furnished, upon request, by the manufacturer for all material furnished under this specification. Polyethylene plastic pipe and fittings may be rejected to meet any requirements of this specification.

1.8 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 manufacturer's 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 pulled through the sewer by a winch located at the either upstream or downstream manhole. 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.

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 a temporary void into which the bursting tool 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 bursting tool, shall also move forward.

The bursting tool shall have its own forward momentum while being assisted by winching. A hydraulic winch shall give the bursting tool a force of constant tension so that it can be moved forward. To form a complete operating system, the bursting tool must be matched to a constant tension hydraulic winching system.

1.9 WINCH UNIT:

A winch shall be attached to the front of the bursting tool, connecting to or through the advanced guide head technology. The winch shall provide a constant tension to the bursting tool 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 winch shall be hydraulically operated providing a constant tension throughout the operation. The winch shall be of the constant tension type but shall be fitted with a direct reading load gauge to measure the winching load. The winch must be able to be operated by a remote control if needed.

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.

The winch shall have twin capstan with twin hydraulic drive motors and twin gear boxes for independent operation. In no case shall the winch cable storage spool be considered part of the twin capstan pulling system.

2.0 SEWER SERVICE CONNECTIONS:

All sewer service connections shall be identified and located prior to the pipe insertion to expedite reconnection. Upon commencement, pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the engineer and/or his representative. Upon completion of insertion of the new pipe, the contractor shall expedite the reconnection of services so as to minimize any inconvenience to the customers.

Sewer service connections shall be connected to the new pipe by various methods. The saddles should be made of a material compatible with that of the pipe. Fusion of saddle connection to the main is the only means of assuring complete leak free joint is obtained.

- 2.0.1 Electrofusion saddles as manufactured by Central Plastics or approved equal, shall be installed in accordance with the manufactures recommended procedures.
- 2.0.2 Conventional Fusion saddles as manufactured by Central Plastics, Phillips Driscopipe, or Plexco shall be installed in accordance with the manufacturers recommended procedures.
- 2.0.3 Connection of the new service lateral* to the mainline shall be accomplished by means of a compression-fit service connection. The service connection shall be specifically designed for connection to the sewer main being installed, and shall be INSERTA TEE as manufactured by Fowler Manufacturing Co. Hillsboro, Oregon, (503) 357-2110; or approved equal. Install using procedures and equipment as referenced in manufacturer's written installation instructions.

*TYPES AVAILABLE FOR ALL MAINLINES:

TYPES	GASKETTED BELL SDR 35	GASKETTED BELL IPS/SCH 40
PVC Hub	ASTM D3034 SDR 35	ASTM D3034 SDR 26
Rubber Boot	ASTM C443	ASTM C443
Band	301 SS	301 SS
Screw	305 SS	305 SS
Housing	301 SS	301 SS
Gasket	ASTM F477	ASTM F477

PREPARATION

2.1 BYPASSING SEWAGE:

- 2.1.1 By-Pass Pumping: The Contractor, when and where required, shall provide diversion or bypassing for the pipe bursting/replacement process. The pumps and by-pass lines shall be of adequate capacity and size to handle all flows. All costs for by-pass pumping, required during installation of the pipe shall be subsidiary to the pipe reconstruction item.
- 2.1.2 The Contractor shall be responsible for continuity of sanitary sewer service to each facility connected to the section of sewer during the execution of the work.
- 2.1.3 If sewage backup occurs and enters buildings, the Contractor shall be responsible for clean-up, repair, property damage cost and claims.

2.2 TELEVISION INSPECTION:

Television inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by closed circuit color television. Television inspection shall include the following:

- 2.2.1 Pre-pipe bursting videos by contractor.
- 2.2.2 Post Videotapes to be submitted to the city before final invoice. Normal pipe bursting practice includes videotaping and evaluation of the existing pipe during the design phase of the project or prior to commencement of pipe bursting operations. (See Item 2.2.1 above)
- 2.2.3 Videotapes to remain property of the city; Contractor to retain second copy for his use.
- 2.2.4 All flows tributary to reach of sewer being inspected are to be completely by-passed around the reach during inspection if necessary and required by the City.
- 2.2.5 Post construction videotape upon completion of reconstruction of each reach of sewer with the voice description, as appropriate with stationing of services indicated. Data and stationing to be on video.
- 2.2.6 Should any portion of the inspection tapes be of inadequate quality or coverage, as determined by the City the Contractor will have the portion re-inspected and video taped at no additional expense to the City.

2.3 CONSTRUCTION METHOD:

- 2.3.1 The Contractor shall install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances will the pipe be stressed beyond its elastic limit. Winch line is to be centered in pipe to be burst with adjustable boom.
- 2.3.2 The installed pipe shall be allowed the manufacturer's recommended amount of time, but not less than four (4) hours, for cooling and relaxation due to tensile stressing prior to any reconnection of service lines, sealing of the annulus or backfilling of the insertion pit. Sufficient excess length of new pipe, but not less than four (4) inches, shall be allowed to protrude into the manhole to provide for occurrence. Restraint of pipe ends shall be achieved by means of Central Plastics Electrofusion couplings (800) 654-3872. The Electrofusion couplings shall be slipped over pipe ends against manhole wall and fused in place. Installation of Electrofusion couplings shall be done in accordance with the manufacturers recommended procedures.
- 2.3.3 Launch and Receiving Excavations:
Launch pits need to be long enough to properly align the bursting tool with the existing pipe and to allow the HDPE pipe enough space to begin a graceful "S" Bend out of the pit and transition to a "tail ditch" at the street above. A good rule of thumb to use for the "tail ditch" is to multiply the depth of the existing pipe by a factor of 4. The product is an approximate minimum launch pit length plus "tail ditch".

Tail Ditch Example: Existing pipe is 8' deep; 8' depth x 4 = 32' graduating tail ditch.

Note: The tail ditch only needs to accommodate the outside diameter of new pipe.

The receiving pits; however, need to be long enough to easily remove the bursting tool/expander combination leaving a couple of feet of the HDPE pipe to work with.

A.) **Windowing Method**

Up to 12" diameter PE pipe, the Contractor shall use the "windowing" method where necessary, to prevent damage to surrounding infrastructure. This method is described in TT Technologies, Inc.'s "Pipe Bursting Operation Manual." Both entrance and exit procedures may be conducted.

Underground utility locates must be performed prior to determining the necessity and feasibility of the "windowing" method.

B.) **Tool Removal Back to Starting Pipe via Being Pulled Back Out of the newly Installed PE Pipe**

Contractor shall use the GRUNDOCRACK PCG System when an exit pit is difficult due to underground utility placement or surrounding infrastructure. The PCG System uses a pneumatic tool with a special head expander. The PCG tool also uses a remote controlled reverse procedure to allow reversing the GRUNDOCRACK tool for removal back through the newly installed HDPE. In all cases, the tool must have the ability to operate in reverse to prevent damage to the HDPE during removal

C.) **Service Connections**

Excavations for laterals should be to depth of 1 foot below the lateral. This will help to prevent uneven expansion of the soil by the bursting tool. This will minimize the potential of creating a hump in the new pipe at lateral connections. In some soil conditions, it will be important to only dig the lateral to the invert of the host pipe. This will help minimize the potential of creating sags at lateral connections. These are usually lateral connections where leakage has been occurring for some time causing the soil to be softer than the rest of the pipeline.

2.4 FIELD TESTING:

- 2.4.1 After the existing sewer is completely replaced, internally inspect with television camera and videotape as required. The finished tape shall be continuous over the entire length of the sewer between two manholes to be free from visual defects.
- 2.4.2 Defects which may affect the integrity or strength of the pipe in the opinion of the Engineer shall be repaired or the pipe replaced at the Contractor's expense.

2.5 PIPE JOINING:

- 2.5.1 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.

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.

- 2.5.2 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.
- 2.5.3 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.

2.6 MEASUREMENT AND PAYMENT:

- 2.6.1 The inserted pipe shall be paid for per linear foot of the size pipe specified and shall include all pipe bedding, backfill material, annulus sealing material and launching pits. Locating and reconstruction of

services and all reconnections of services shall be paid for per each connection made, including fittings and pipe.

- 2.6.2 The work performed as prescribed by this item will be paid at the unit price per linear foot of sanitary sewer 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.
- 2.6.3 Video inspection of final installed pipe shall be paid based on the cost per linear feet to T.V. the entire length of new pipe.
- 2.6.4 The cost of any necessary by-pass pumping shall be considered subsidiary to the cost of pipe installation and shall not be a separate pay item.