

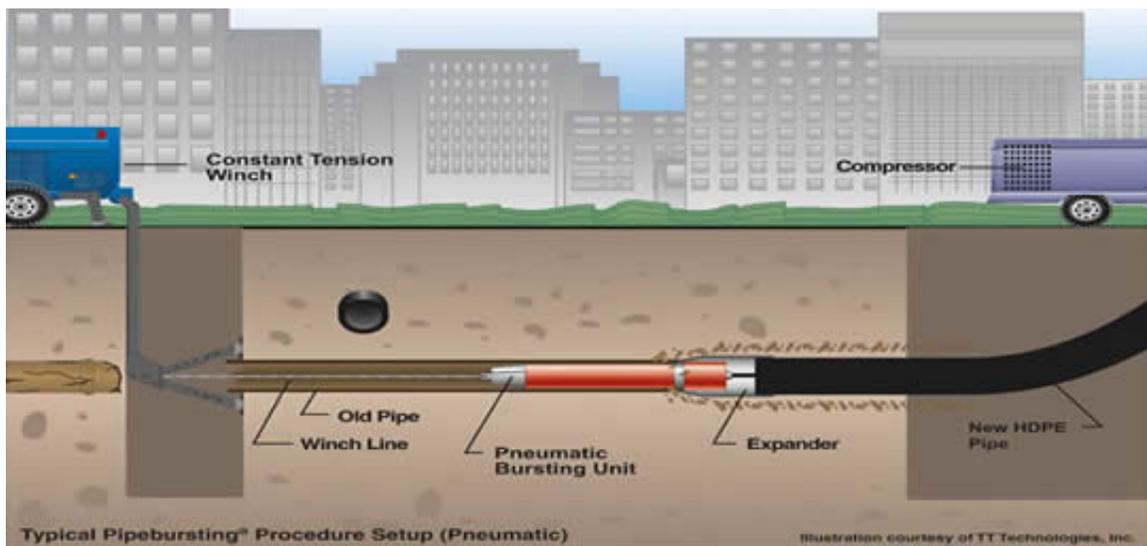
## Appendix N

### PIPE BURSTING CONSTRUCTION TECHNIQUE

Pipe bursting was first developed in the UK in the 1980s for the replacement of cast iron gas mains and has since been used more commonly for water and sewer pipes. An existing pipe is replaced size-for-size or up-sized with a new pipe in the same location.

Pipe bursting, which can be either pneumatic, hydraulic expansion or static pull, fractures a pipe, compressed the soil around the pipe and displaces the fragments outwards while a new pipe is drawn in to replace the old pipe.

The size of the pipe currently being replaced by pipe bursting typically ranges from 2 inches to 36 inches; although the bursting of larger diameters is increasing (pipes up to 48 inches diameter have been replaced). When cast iron is burst, a liner is inserted during the process to prevent damage to the new pipe. The process is very often used for service line replacement. A diagrammatic illustration appears below.



Source: TT Technologies, Inc.

#### Process

Typical pipe bursting involves the insertion of a conically shaped tool (bursting head) into the old pipe. The head fractures the old pipe and forces its fragments into the surrounding soil. At the same time, a new pipe is pulled or pushed in behind the bursting head. The base of bursting head is larger than the inside diameter of the old pipe to cause the fracturing and slightly larger than the outside diameter of the new pipe, to reduce friction on the new pipe and to provide space for maneuvering the pipe. The rear

of the bursting head is connected to the new pipe, while its front end is connected to a cable or pulling rod.

The bursting head and the new pipe are launched from the insertion pit, and the cable or pulling rod is pulled from the reception pit. The cable/rod pull together with the shape of the bursting head keeps the head following the existing pipe, and specially designed heads can help to reduce the effects of existing sags or misalignment on the new pipeline.

### **Strengths**

- Pipes suitable for pipe bursting are typically made of brittle materials, such as clay, cast iron, or some plastics.
- Theoretically there is not a limit in size of pipe to be burst.
- Pipe bursting is typically carried out in 300 to 400 foot lengths, which corresponds to a typical distance between sewer manholes. However, much longer runs have been replaced, reportedly up to 1500 feet.
- The technique is stated to be more cost effective when there are few lateral connections or service connections, when the old pipe is structurally deteriorated, and when additional capacity is needed.

### **Weaknesses**

- The bursting operation can cause ground heave or settlement above, or at some distance from the pipe alignment.
- Typical pneumatic pipe bursting may create considerable ground vibrations on the surface above the bursting operation.
- Difficulties can arise in expansive soils.
- The most critical conditions for ground displacement are when the pipe to be burst is shallow and ground displacements are primarily directed upward.
- Close proximity of other service lines, point repairs that reinforce the existing pipe with ductile material or a collapsed pipe at a certain point along the pipe will present issues.
- The bursting head should not pass closer than 2.5 feet from buried pipes and 8 feet from sensitive surface structures.
- The ground displacements tend to be localized, however, and to dissipate rapidly away from the bursting operation.

- The limit on pipe size depends on a cost effectiveness comparison to conventional replacement and the ability to provide sufficient energy to break the existing pipe and compress the soil while simultaneously pulling in a new pipe.
- It is sometimes necessary to install a sleeve with the burst head, so that pipe fragments do not damage the new polyethylene pipe.
- Ductile iron and steel pipes are not suitable for pipe bursting.