Municipal Advisory Board

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HDPE
MUNICIPAL
ADVISORY
BOARD

MAB Guidelines for PE 4710 Pipe Bursting of Potable Water Mains

(MAB-5-2019)

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FOREWORD

This guide was developed by the Municipal Advisory Board (MAB) and published with the help of the members of the Plastics Pipe Institute, Inc. (PPI).

This document is intended as a guide for engineers, users, contractors, code officials, and other interested parties for use in the design, construction, and installation of high-density polyethylene (HDPE) pressure water piping systems. The local utility or engineer may need to modify this document to adapt the document to local conditions, operations, and practices.

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The MAB serves as an independent, non-commercial adviser to the Municipal & Industrial (M & I) Division of the PPI. Once adopted, MAB will consider revising this document from time to time, in response to comments and suggestions from users. Please send suggestions for improvements to Camille George Rubeiz, PE, F. ASCE, at crubeiz@plasticpipe.org.

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MAB-05:

MAB Guidelines for PE 4710 Pipe Bursting of Potable Water Mains

PART 1 – GENERAL

1.1 The MAB-5 Guidelines are for static pipe bursting and to replace potable water mains using HDPE piping systems that conform to AWWA standards. The Guidelines can be adopted in full in conjunction with the **MAB Model Specifications for PE 4710 Buried Potable Water Service, Distribution and Transmission Pipes and Fittings**, or modified by the specifier to fit the project. These Guidelines are for use by utilities while developing project specifications. The guidelines include means and methods which may not pertain for an individual project or situation. These Guidelines can also be utilized for sewer force main replacement. The Owner will assess the potential risk and adjust these Guidelines accordingly.

1.2 DESCRIPTION

Scope – This section specifies high-density polyethylene pipe (HDPE) and fittings for water utility use as indicated on the drawings, and as specified herein. The primary installation method is static pipe bursting. The means and methods, including the testing for acceptance shall conform to all applicable standards as noted herein with the intention of providing a leak-free system to the owner.

1.3 SUBMITTALS

Quality Assurance / Control Submittals: It is imperative the specifier understands and evaluates the risks of performing a static pipe bursting project and understands the importance of requiring and evaluating contractor qualifications.

i. Minimum Contractor qualifications shall include:
   a) Being actively engaged with at least _____projects per year in the installation of HDPE pipe using the static pipe bursting method within the past three (3) years. [Users to specify the appropriate number of projects based on their experience, risk tolerance, sensitivity of project, etc. Typical range of 1 to 3 projects per year]
   b) Performing _____ feet or more of potable water main replacement using the process of static pipe bursting. Documentation to verify the contractor's experience shall be provided to the Owner. [Users to specify the appropriate footage based on their experience, risk tolerance, sensitivity of project, etc. Typical range of 10,000 to 30,000 ft. NASCO and IPBA require 50,000 ft.]
   c) Submitting three (3) project reference sheets with municipal contacts including similar scope of work within the past 3 years.
   d) Submitting Certificate of training endorsed by the static pipe bursting equipment manufacturer.
   e) Submitting Certificate of HDPE fusion training endorsed by the fusion manufacturer and per ASTM F3190.

ii. Pipe Bursting Planning

Contractor shall submit a plan to the Owner on a marked-up copy of the Project Drawings showing the Contractor's construction phasing and plans at the Pre-Construction Meeting. Plan details should include:

- Pit locations for pipe insertion and burst machine location.
- Pit locations for service re-connects.

- Schedule of when various sections are to be rehabilitated.
- Distances of each pull.
- Isolating points used to seal the system during the pipe burst.
- Temporary services plan and/or pre-chlorination guidelines.
- Staging area for fusing and material storage including moving pipe to burst locations. [Recommend that Users consider Staging areas during design phase which may include parks, alleys, ROW easements, parking lots. Also, include information to describe transportation of pipe strings to limit community impact which could include safety, traffic control, etc.]
- Information about the pipe bursting system to be used such as tonnage and tooling.
- Bursting machine shoring system.
- Risk management plan that covers specific risks.
- Tracer wire

PART 2 – EXECUTION

2.1 INSTALLATION

A. Pipe Bursting Installation: The pipe bursting operation described within provides guidance on the basic process. It is to be understood that the need to make exceptions or additions to this process are common. These changes are made to accommodate nonstandard conditions. The contractor experience requirements make it reasonable to put the responsibility of devising these exceptions upon the contractor.

B. Installation of Tracer Wire. The Contractor shall be required to install tracer wire during pipe bursting operations including along all pits for connections. The tracer wire shall be installed simultaneously with the polyethylene piping system. Tracer wire shall be properly spliced at each end connection and each service connection. Care should be taken to adequately wrap and protect wire at all splice locations. No bare tracer wire shall be accepted. Provide Magnesium alloy anode for cathodic protection that conforms to the requirements of ASTM B843. Install tracer wire per local and manufacturer's requirements.
   i. Tracer wire shall be 3/16-inch, 7 x 7 (or stronger) Stranded Copper Clad Steel Extreme Strength with 4,700 lb. break load, or braided stainless steel (A304 or A316), with minimum 50 mil HDPE insulation thickness.

C. Pit Location and Excavation
   i. Burst pit and insertion pit locations shall be placed such that excavations are minimized. This may be accomplished by placing either or both of these pits at the point of a service connection, valve or hydrant location.
   ii. Initial burst lengths shall be 400 feet (+/-) 50 feet in length for first 2 bursts to determine soil pipe friction and specific site conditions that may impact bursting lengths. After site specific factors are evaluated, longer burst runs may be performed.
   iii. All pits shall be shored to ensure worker safety per OSHA or other local regulations.
   iv. All pits shall be roped off and or covered when not active per OSHA or local regulations to ensure public safety.
   v. Traffic control shall be accommodated for by Contractor as per the Contract specifications. Safe traffic passage around pit excavations that are located in or adjacent to streets or highways shall meet Right-of-way Department requirements.

Parking of related employee vehicles, trucks and auxiliary and equipment shall be such that congestion and traffic delays are minimized.

vi. Utilities intersecting the existing pipe shall be exposed using an excavation technique appropriate for the utility. As a general rule, both horizontal and vertical distance between the pipe to be burst and the existing adjacent pipe should be at least two diameters of the replacement pipe. If adjacent utilities are within this area, or the adjacent utility location is unknown, the excavation (Utility Crossing Pit) shall be excavated prior to commencement of bursting. Worker entry shoring is not required, except as determined by OSHA, however appropriate safety precautions should be made.

D. Bursting Machine Location and Shoring: Bursting machines of the static pull style require preparation and planning for the bursting pit that they are to operate from.
   i. Forward face of the Burst Pit or the surface that the machine bears against while pulling back, shall be shored in a safe manner. This shoring shall maintain perpendicular burst machine alignment to the pipe during pullback. Any loss of perpendicular alignment during pull shall result in stopping of the bursting process and improvement of the forward face shoring.
   ii. Rearward shoring shall be provided to react rod thrust forces during payout. While these forces are substantially lower than pullback forces, shoring must be used to stabilize the bursting machine so as to maintain perpendicular alignment of the machine during payout. The weight of the machine cannot be depended on to react thrust forces. Existing pipe at rear face of pit may only be utilized for rearward shoring if scheduled for replacement.
   iii. Pipe face for Cast Iron, Ductile Iron or PVC shall be cut off using a saw or similar device to produce a square face for the bursting machine forward face to bear against. Final separation of cast iron pipe with a wedge may provide a clean face. Existing Pipe shall be removed in sufficient length to accommodate burst machine.
   iv. Burst machine must be positioned so as to have rod centerline at approximate centerline of Existing pipe.
   v. Rod Box delivery and removal between temporary rod storage location and Burst Pit must be accommodated for with appropriate lifting equipment and techniques. Additionally, movement and or placement of lifting machine must be included in Traffic Control plans.

E. Rod Payout Operation
   i. Rod payout is the process of assembling a string of rods and pushing them in a step wise manner from Burst Pit, through the interior of the existing pipe to Insertion Pit.
   ii. Lifting of rod boxes into or out of the Burst Pit shall be performed per OSHA or other applicable requirements with respect to equipment and method.
   iii. Threads shall be cleaned of foreign matter before assembly.
   iv. Counting of Rods during payout, or quantity of rods per box shall be monitored such that the operator is aware of the distance between the burst machine and the lead end of the rod string.
   v. Thrust force should be monitored by the operator. Should an unexpected sudden and significant increase in thrust force be experienced, the process shall be halted. The operator or contractor shall review the results with the Owner to remedy in an attempt to determine if offsets, valves or other features or obstruction exist that may cause the rod string to leave the pipe.
      A. Front end of the rod string should be located by distance from the Burst Pit. Location should be painted and compared to as built plans.

B. Appropriate action should be taken to remedy the cause. This action may include an additional pit at the obstruction to determine the cause, and remove or accommodate for the obstruction. The decision may be to continue thrusting if the obstruction is believed to be encrustation.

vi. Existing pipe in the Insertion Pit shall be cut or broken prior to arrival of the rod string. Sufficient length shall be removed so as to allow the Burst Tooling to enter the existing pipe and bend the product within the allowable radius specified by the pipe manufacturer. The second end of the existing pipe in the Insertion Pit shall be positioned or worked so as not to damage the product pipe as it travels through the Insertion Pit.

vii. Workmen shall not enter the Insertion Pit when the rod string is nearing the Pit. A workman shall be in visual or radio contact with the burst machine operator so as to have the payout halted in a position that allows attachment of the Burst tooling. Burst tooling style shall be chosen based on anticipated properties of existing pipe and existing pipe repairs.

A. Cast Iron or Asbestos Concrete existing pipe anticipated to be free of either Ductile Iron repair sections or Dressor Style Couplings may use a simple conical burst head with a single or double longitudinal blade.

B. Ductile Iron, PVC or existing pipe with Ductile Iron repair sections or Dressor Style Couplings require use of a rolling blade cutter (slitter) ahead of the conical expander.

F. Tooling and Attachment

i. The new HDPE pipe shall be moved into position for attachment to the rod string. Appropriate traffic or pedestrian control will be exercised along the path of the HDPE pipe.

ii. The lead and second rod shall be painted orange or yellow so as to give notice to the burst machine operator position of the Burst Tooling.

iii. Attachment of the Burst Tooling to the rod shall be through the use of removable pin joint allowing the tooling to pivot to the rod axis.

iv. Burst head diameter will be on average 15% over size to the outside diameter of the new HDPE pipe. Actual size is left to the discretion of the contractor. A greater outside diameter allows for reduced pipe friction but increases bursting forces with increased soil displacement.

v. Attachment of the HDPE pipe to the Burst Tooling shall be with a swivel that permits rotation to relieve torsional (twist) stress on the HDPE pipe.

vi. Burst Head shall slide on the rod string such that the rear of the burst head overlaps the forward end of the HDPE pipe to eliminate the chance of damage to the HDPE pipe.

G. Pullback Operation

i. The Burst Machine operator will begin the pullback with the approval of the Insertion Pit Observer. Progress will be made at a slow rate until the Observer sees the Burst Tooling has completely entered the Existing Pipe.

ii. As the Burst Tooling nears any Utility Crossing Pit, an observer in radio or visual contact with the Burst Machine Operator will monitor and control movement of the Burst Tooling past the utility.

iii. Should the forward shoring upon which the bursting machine bears yield sufficiently to bring the Bursting Machine out of square to the existing pipe, the shoring will be reworked.

H. Tooling Removal

i. Burst Machine Operator shall note rod count and anticipate entry of painted rods into the Burst Pit. As the Pin Joint Connection nears the Burst Machine forward face, the burst is to be halted. Load on the forward face is relieved by reversing the rod direction slightly.

ii. The Burst Machine Shore Plate is to be removed, allowing the tooling to enter a cage or the hull of the Burst Machine. The tooling string will be disassembled and removed, in sections if necessary until the Product Pipe face has been pulled beyond the face of the Burst Pit. The distance past the face of the Burst Pit shall be at the discretion of the contractor anticipating the length required for connection/fusing.

2.2 DOCUMENTATION FINALIZATION

A. Within (15) days of completion of the job, all records including manifests, marked up construction plans or documents pertinent to describing the system as installed shall be provided to the Owner.

_____ The End _____