Pipe Bursting Projects

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Prepared by
The Pipe Bursting Task Force of
the Trenchless Installation of Pipelines (TIPS)
Committee of the American Society of Civil Engineers

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PREFACE

This Manual of Practice (MOP) was prepared by the Pipe Bursting Task Force of the ASCE Committee on Trenchless Installation of Pipelines (TIPS), under supervision of the Pipeline Division. This manual describes current pipe bursting practices used by engineers and construction professionals in designing and constructing pipelines under roads, railroads, streets, and other man-made and natural structures and obstacles. The Trenchless Installation of Pipelines (TIPS) Committee under leadership of Dr. Ahmad Habibian, P.E. (Past Chair) and Mr. Timothy Stinson, P.E. (Current Chair) is credited for the efforts leading to this publication. The committee would like to thank contributors, task committee members, and blue ribbon reviewers, whose names follow, for their support, time, and efforts.

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PART 1
GENERAL

1.1 INTRODUCTION

Pipe bursting is a well-established trenchless method that is widely used for the replacement of an existing and deteriorated pipe with a new pipe of the same or larger diameter. Many factors should be reviewed thoroughly before pipe bursting projects are considered and released for bid. Engineers should consider different options and select the most cost-effective and environmentally friendly methods for bid. The method selection should not be left to only the judgment of the contractor. This manual will help engineers and owners in the method selection process.

Pipe bursting is especially cost-effective if the existing pipe is out of capacity. This method can be used advantageously to reduce damage to pavements and disruptions to traffic, hence reducing the social costs associated with pipeline installations. There are, however, limits to the use of the pipe bursting method, and various conditions challenge the successful use of its application. This manual provides information that is essential for the engineer as well as the contractor for the successful and safe execution of pipe bursting projects.

Although the pipe bursting method is commonly used for replacing an existing pipe, it has not been covered adequately by manuals, guidelines, or standards. The need to develop a comprehensive manual for pipe bursting projects arose as a result of steady advancements in the field and the lack of proper engineering guidelines. This manual, developed by the Pipe Bursting Task Force of the ASCE Committee on Trenchless Installation of Pipelines (TIPS), is a major step toward promoting best practices and creating a knowledge base for pipe bursting projects. This manual will assist engineers, contractors, and owners in designing and carrying

out projects effectively and safely in conformance with project requirements and site conditions by providing an understanding of the method and its capabilities and limitations. In addition, this manual outlines design and construction considerations and identifies potential problems and prevention measures, thereby instilling confidence in the appropriate use of the method. These guidelines are based on information obtained from manufacturers' literature, technical papers and other related information, and from comments and reviews made by industry experts.

1.2 HISTORY OF PIPE BURSTING DEVELOPMENT

Pipe bursting was first developed in the UK in the late 1970s by D. J. Ryan & Sons in conjunction with British Gas, for the replacement of small-diameter, 3- and 4-in. (75- and 100-mm) cast iron gas mains (Howell 1995). The process involved a pneumatically driven, cone-shaped bursting head operating by a reciprocating impact process. This method was patented in the UK in 1981 and in the United States in 1986. While the original patents expired in April, 2005, new proprietary pipe bursting methods have been developed and patented. When it was first introduced, this method was used only in replacing cast iron gas distribution lines; it was later employed to replace water and sewer lines. By 1985, the process was further developed to install up to 16-in. (400-mm) outer diameter (OD) medium-density polyethylene (MDPE) sewer pipe. Replacement of sewers in the UK using sectional pipes as opposed to continuously welded polyethylene pipe was described in a paper by Boot et al. (1987). The total footage of pipe replaced using pipe bursting in the United States is growing at approximately 20% per year, the majority of which is for sewer line replacement.

1.3 WHAT IS PIPE BURSTING?

Pipe bursting is defined as a replacement method in which an existing pipe is broken by brittle fracture, using mechanically applied force from within. The pipe fragments are forced into the surrounding ground. At the same time, a new pipe of the same or larger diameter is drawn in, replacing the existing pipe. Pipe bursting involves the insertion of a conically shaped tool (bursting head) into the existing pipe to shatter the existing pipe and force its fragments into the surrounding soil by pneumatic or hydraulic action. A new pipe is pulled or pushed in (depending on the type of the new pipe) behind the bursting head.

The base of the bursting head is larger than the inside diameter (ID) of the existing pipe and slightly larger than the outside diameter (OD) of the new pipe to reduce friction and to provide space for maneuvering the