Second Edition

ASCE Manuals and Reports on Engineering Practice No. 106

Horizontal Auger Boring Projects

Horizontal Auger Boring Task Force

Edited by
Alan Atalah, Ph.D., P.E.
Lameck Onsarigo, Ph.D.

ASCE

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UTILITY ENGINEERING & SURVEYING INSTITUTE

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Prepared by the
Horizontal Auger Boring Task Force of the
Trenchless Installation of Pipelines Committee of the
Utility Engineering and Surveying Institute of the
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ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

UESI UTILITY ENGINEERING & SURVEYING INSTITUTE

Published by the American Society of Civil Engineers

Library of Congress Cataloging-in-Publication Data

Names: American Society of Civil Engineers. Horizontal Auger Boring Task Force, author. | Atalah, Alan, editor.
Title: Horizontal auger boring projects / prepared by the Horizontal Auger Boring Task Force of the Trenchless Installation of Pipelines Committee of the Utilities Engineering and Surveying Institute of the American Society of Civil Engineers, Task Committee Chair, Alan Atalah, Ph.D., P.E.
Description: Second edition. | Reston, Virginia : ASCE, UESI, [2017] | Includes bibliographical references and index. | Description based on print version record and CIP data provided by publisher; resource not viewed.
Identifiers: LCCN 2016044510 (print) | LCCN 2016042035 (ebook) | ISBN 9780784480236 (pdf) | ISBN 9780784414583 (soft cover : alk. paper) | ISBN 9780784480236 (PDF)
Subjects: LCSH: Pipelines–Design and construction. | Trenchless construction. | Boring.
Classification: LCC TA660.P55 (print) | LCC TA660.P55 M53 2017 (ebook) | DDC 621.8/672–dc23
LC record available at https://lccn.loc.gov/2016044510

Published by American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4382
www.asce.org/bookstore | ascelibrary.org

Errata: Errata, if any, can be found at https://doi.org/10.1061/9780784414583.

ISBN 978-0-7844-1458-3 (print)
ISBN 978-0-7844-8023-6 (PDF)

Manufactured in the United States of America.

23 22 21 20 19 18 17 1 2 3 4 5

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(As developed by the ASCE Technical Procedures Committee, July 1930, and revised March 1935, February 1962, and April 1982)

A manual or report in this series consists of an orderly presentation of facts on a particular subject, supplemented by an analysis of limitations and applications of these facts. It contains information useful to the average engineer in his or her everyday work, rather than findings that may be useful only occasionally or rarely. It is not in any sense a "standard," however; nor is it so elementary or so conclusive as to provide a "rule of thumb" for nonengineers.

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PREFACE

There are several different trenchless technologies. Horizontal auger boring (HAB) is one of these and is the focus of this manual of practice (MOP). The first ASCE MOP for auger boring projects was developed in 2004 by the Auger Boring Task Force of the ASCE Committee on Trenchless Installation of Pipelines (TIPS). This MOP was the first in a series of MOPs that have promoted best practices and developed a knowledge base for auger boring projects. Since then, there have been advancements in HAB technology. Therefore, the Auger Boring Task Force established by TIPS has issued this updated and comprehensive edition.

This MOP will assist engineers, contractors, and owners involved in new pipe installation projects that use the HAB method to design and carry out projects effectively and safely, in conformance with project requirements and site conditions. The objective of this manual is to present a clear understanding of the method, its capabilities, and limitations; outline important design and construction considerations; and identify potential problems along with prevention and mitigation measures. The task committee understands that various trenchless technologies may be combined to form hybrid trenchless methods. However, this MOP will focus on the mechanics of the basic HAB means and methods with currently available equipment. These guidelines are based on information compiled from manufacturers' literature, field experience, technical papers, and other related information, and from comments and reviews made by the Blue Ribbon Committee.

The task committee would like to thank all the task committee members and reviewers for their support, time, and effort.

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ACKNOWLEDGMENTS

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ABBREVIATIONS, ACRONYMS, AND INITIALISMS

A/O TV	acoustic/optical televiewer
AASHTO	American Association of State Highway Transportation Officials
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
BMTA	boring machine tunnel attachment
BVR	boulder volume ratio
CBS	controlled boring system
CCFRPP	centrifugally cast fiberglass reinforced plastic pipe
CVR	cobble volume ratio
DOT	Department of Transportation
DSC	differing site condition
DTH	down-the-hole
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GBM	guided boring method
GBR	geotechnical baseline report
GDM	geotechnical design memorandum
GDR	geotechnical data report
GIR	geotechnical interpretive report
GPR	ground-penetrating radar
GWT	groundwater table
HAB	horizontal auger boring
HEB	horizontal earth boring
HDD	horizontal directional drilling

HDPE	high-density polyethylene
HSA	hollow stem auger
ISRM	International Society of Rock Mechanics
ISTT	International Society for Trenchless Technology
LDBA	large-diameter boring attachment
LED	light-emitting diode
MIG	metal inert gas
MOP	manual of practice
MT	microtunneling
MTBM	microtunneling boring machine
NASTT	North American Society for Trenchless Technology
NDT	nondestructive testing
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PI	plasticity index
PJ	pipe jacking
PTM	pilot tube method
PVC	polyvinyl chloride
QL	quality level
RPMs	revolutions per minute
RQD	rock-quality designation
SBU	small boring unit
SBU-A	SBU-auger
SBU-M	motorized SBU
SBU-RH	SBU rock head
SPT	standard penetration test
SUE	subsurface utility engineering
TBM	tunnel boring machine
TIPS	trenchless installation of pipelines
UCS	unconfined compressive strength
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UT	utility tunneling
UTRC	Underground Technology Research Council

CHAPTER 1
GENERAL

There is a significant demand for underground infrastructure to transport our drinking water, wastewater, stormwater, natural gas, oil, and power. Once every four years, the American Society of Civil Engineers (ASCE) provides a comprehensive assessment of the nation's major infrastructure categories in the *Report Card for America's Infrastructure*. Using a simple A to F school report card format, the *Report Card* provides a comprehensive assessment of current infrastructure conditions and needs, assigns grades, and makes recommendations for how to raise the grades (ASCE 2013).

According to the 2013 *Report Card*, the grade for drinking water, wastewater, and stormwater systems improved slightly from a D– to a D from 2009 to 2013. Many of our drinking water, wastewater, and stormwater systems are nearing the end of their useful life. There are an estimated 240,000 water main breaks per year in the United States. If every pipe needed to be replaced, the cost over the coming decades could reach more than $1 trillion. Capital investment needs for the nation's wastewater and stormwater systems alone are estimated to total $298 billion over the next 20 years. Pipes represent the largest capital need and comprise three-quarters of the total infrastructure needs. Rehabilitating to extend life spans and upgrading and expanding the network with new pipes will address many of the sanitary sewer overflows, combined sewer overflows, and other pipe-related issues (ASCE 2013).

The grade for energy remains a D+; America relies on aging pipeline transmission and distribution systems, some of which originated in the 1880s. The increased demand for natural gas and oil will become a greater challenge after 2020 as the population increases (ASCE 2013). Even with