

ASCE STANDARD

American Society of Civil Engineers

Standard Construction Guidelines for Microtunneling

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This document uses both Système International (SI) and customary units.



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Abstract: This standard guideline covers the planning, design, pipe materials, and construction of microtunneling. Microtunneling is defined as a trenchless construction method for installing pipelines. The North American definition of microtunneling describes a method and does not impose size limitations on such method. The tunnel may be considered a microtunnel if all of the following features apply to construction: the microtunneling boring machine is remote controlled, a laser guidance system is employed, a jacking system is used for thrust, and continuous pressure is provided to the face of the excavation to balance groundwater and earth pressures.

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The following Standards have been issued.

- ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
- ANSI/ASCE 2-91 Measurement of Oxygen Transfer in Clean Water
- ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
- ASCE 4-98 Seismic Analysis of Safety-Related Nuclear Structures
- Building Code Requirements for Masonry Structures (ACI 530-99/ASCE 5-99/TMS 402-99) and Specifications for Masonry Structures (ACI 530.1-99/ASCE 6-99/TMS 602-99)
- ASCE 7-98 Minimum Design Loads for Buildings and Other Structures
- ANSI/ASCE 8-90 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
- ANSI/ASCE 9-91 listed with ASCE 3-91
- ASCE 10-97 Design of Latticed Steel Transmission Structures
- SEI/ASCE 11-99 Guideline for Structural Condition Assessment of Existing Buildings
- ANSI/ASCE 12-91 Guideline for the Design of Urban Subsurface Drainage
- ASCE 13-93 Standard Guidelines for Installation of Urban Subsurface Drainage
- ASCE 14-93 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
- ASCE 15-98 Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
- ASCE 16-95 Standard for Load and Resistance Factor Design (LRFD) of Engineered Wood Construction
- ASCE 17-96 Air-Supported Structures
- ASCE 18-96 Standard Guidelines for In-Process Oxygen Transfer Testing
- ASCE 19-96 Structural Applications of Steel Cables for Buildings
- ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations
- ASCE 21-96 Automated People Mover Standards—Part 1
- ASCE 21-98 Automated People Mover Standards—Part 2
- SEI/ASCE 23-97 Specification for Structural Steel Beams with Web Openings
- SEI/ASCE 24-98 Flood Resistant Design and Construction
- ASCE 25-97 Earthquake-Actuated Automatic Gas Shut-Off Devices
- ASCE 26-97 Standard Practice for Design of Buried Precast Concrete Box Sections
- ASCE 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
- ASCE 28-00 Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction
- SEI/ASCE 32-01 Design and Construction of Frost-Protected Shallow Foundations
- EWRI/ASCE 33-01 Comprehensive Transboundary International Water Quality Management Agreement
- EWRI/ASCE 34-01 Standard Guidelines for Artificial Recharge of Ground Water

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FOREWORD

The material presented in this publication has been prepared in accordance with recognized engineering practices. This standard and commentary should not be used without first securing competent advice with respect to their suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty on the part of

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Glenn M. Boyce, Secretary and Editor
Robert D. Bennett
Daniel J. Dobbels
Dennis J. Doherty
D. Tom Iseley, Chair

Other individuals who served on the Standards Committee are

Maynard Akkerman
Anthony Almeida
Michael Argent
Joseph W. Barsoom
Michael G. Boyle
Mark H. Bruce
Ralph R. Carpenter
Joseph P. Castronovo
Henry R. Derr
Jeffrey S. Druckman
Eugene L. Foster
Sanjiv B. Gokhale
John L. Grady, Jr.
Ahmad Habibian
Paul F. Hadala
Randall J. Hartman

Technical editing was provided by Mary Schofield Nowee.

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manufacturing, education, government, design, and private practice.

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Paul M. Nicholas
Clifford L. Tubbs
Richard C. Turkopp
Michael G. Vitale

Jau S. Jin
Stephen J. Klein
Dexter C. Kubota
James K. Kwong
Keith A. London
Robert Lys, Jr.
A. Nicholas Marraffini
B. Larry McQueen
Michael P. Murphy
Gunnar J. Radel
Mark W. Schumacher
William B. Sherman
Donald E. Slater
Alberto G. Solana
Richard Thomasson

Gulf Coast Trenchless Association
North American Society for Trenchless Technology
Parsons Brinckerhoff
Wirth Soltau Microtunneling

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Standard Construction Guidelines for Microtunneling

PART I. GENERAL

1.0 Scope

1.1 This standard guideline covers the planning, design, pipe materials, and construction of microtunneling. Microtunneling is defined as a trenchless construction method for installing pipelines. The North American definition of microtunneling describes a method and does not impose size limitations on such method; therefore, a tunnel may be considered a micro-tunnel if all of the following features apply to construction:

- Remote controlled: The microtunneling boring machine (MTBM) is operated from a control panel, normally located on the surface. The system simultaneously installs pipe as spoil is excavated and removed. Personnel entry is not required for routine operation.
- Guided: The guidance system usually references a laser beam projected onto a target in the MTBM, capable of installing gravity sewers or other types of pipelines to the required tolerance, for line and grade.
- Pipe jacked: The pipeline is constructed by consecutively pushing pipes and MTBM through the ground using a jacking system for thrust.
- Continuously supported: Continuous pressure is provided to the face of the excavation to balance groundwater and earth pressures.

1.2 Part II of this standard guideline presents planning aspects for microtunneling.

1.3 Part III of this standard guideline presents design aspects for microtunneling.

1.4 Part IV of this standard guideline presents pipe material aspects for microtunneling.

1.5 Part V of this standard guideline presents construction aspects for microtunneling.

1.6 This standard guideline may be used as a reference by owners, engineers, contractors, and construction managers.

1.7 The guidelines in this document are intended for use by owners, engineers, and contractors familiar with the installation and pipe characteristics that affect the structural behavior of pipe for jacking installations and the significance of the installation requirements associated with the construction method. Before applying the

guidelines given in Parts II, III, IV, and V, the user should review the guidance and requirements given in this standard guideline and the commentary.

1.8 The values of dimensions and quantities are expressed in International System of Units (SI, or metric) units, which are to be regarded as standard. SI unit values are converted to English unit values, which are presented in parentheses after the SI units. The use of SI units is in accordance with ASTM Practice E 380. English units expressed in parentheses are supplied for information only and are not a part of this standard practice.

Some of the applicable standards referenced may have a double designation (Axxx/AxxxM) or separate inch-pound (English) and SI (metric) unit editions.

1.9 The commentary is provided adjacent to the applicable sections of this guideline for background and clarification.

2.0 Applicable Documents

2.1 American Society of Civil Engineers

ASCE Standard 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction

Geotechnical Baseline Reports for Underground Construction Guidelines and Practices, 1997.

MOP 46 Manuals and Reports on Engineering Practice—Pipeline Route Selection for Rural and Cross-Country Pipelines

MOP 60 Manuals and Reports on Engineering Practice—Gravity Sanitary Sewer Design and Construction

MOP 77 Manuals and Reports on Engineering Practice—Design and Construction of Urban Stormwater Management Systems

MOP 89 Manuals and Reports on Engineering Practice—Pipeline Crossings

2.2 American Society for Testing and Materials

2.2.1 Standards for Soil, Rock, and Groundwater Sampling and Testing

D 421 Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants

D 422 Test Method for Particle-Size Analysis of Soils

D 653 Terminology Relating to Soil, Rock, and Contained Fluids