

PIPELINES 2007

Advances and Experiences with Trenchless Pipeline Projects

PROCEEDINGS OF THE ASCE INTERNATIONAL CONFERENCE
ON PIPELINE ENGINEERING AND CONSTRUCTION

July 8–11, 2007
Boston, Massachusetts

SPONSORED BY
The Pipeline Division of the American Society of Civil Engineers

EDITED BY
Lynn Osborn, P.E.
Mohammad Najafi, P.E.

ASCE *American Society
of Civil Engineers*

1801 ALEXANDER BELL DRIVE
RESTON, VIRGINIA 20191-4400

PIPELINES 2007

Advances and Experiences with Trenchless Pipeline Projects

PROCEEDINGS OF THE ASCE INTERNATIONAL CONFERENCE
ON PIPELINE ENGINEERING AND CONSTRUCTION

July 8–11, 2007
Boston, Massachusetts

SPONSORED BY
The Pipeline Division of the American Society of Civil Engineers

EDITED BY
Lynn Osborn, P.E.
Mohammad Najafi, P.E.

ASCE *American Society
of Civil Engineers*

1801 ALEXANDER BELL DRIVE
RESTON, VIRGINIA 20191-4400

This is a preview. [Click here to purchase the full publication.](#)

Copyright and Disclaimer

ISBN-13: 978-0-7844-0934-3

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document.

ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefore. This information should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing this information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

Copyright © 2007 by the American Society of Civil Engineers.
All Rights Reserved.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies and reprints.

You can obtain instant permission to photocopy ASCE publications by using ASCE's online permission service (www.pubs.asce.org/authors/RightslinkWelcomePage.html). Requests for 100 copies or more should be submitted to the Reprints Department, Publications Division, ASCE, (address above); email: permissions@asce.org. A reprint order form can be found at www.pubs.asce.org/authors/reprints.html.

American Society of Civil Engineers
ASCE International Headquarters
1801 Alexander Bell Drive
Reston, VA 20191-4400 USA

Call Toll-Free in the U.S.: 1-800-548-2723 (ASCE)
Call from anywhere in the world: 1-703-295-6300
Internet: <http://www.pubs.asce.org>

Foreword

The Pipeline Division of the American Society of Civil Engineers (ASCE) is pleased to present the *Proceedings* of the **Pipelines 2007** International Conference, entitled “**Advances and Experiences with Trenchless Pipeline Projects**.” This conference was held July 8-11, 2007, at the Westin Boston Waterfront Hotel in Boston, Massachusetts.

Pipelines 2007 was a well-attended and memorable event in the history of ASCE Pipeline conferences in which approximately 120 papers were presented. The conference technical program focused on application of existing and emerging technologies for asset management, trenchless technologies, condition assessment, pipeline renewal, pipeline protection, and risk assessment. In addition, five workshops on pipeline and manhole coating and lining systems, emerging concepts on pipeline renewal design, design and construction of pipe ramming projects, plastic pipe design concepts for water systems and standardizing asset management and repair for municipal infrastructure were presented.

The success of this conference was the result of volunteer work and efforts of many pipeline professionals. Most of all, the **Moderators and Reviewers** played a major role by organizing sessions, and participating in the submission and review process of the papers. The **Conference Steering Committee** worked for two years to plan and organize the conference.

All papers published in these *Proceedings* were reviewed by at least two pipeline professionals, including the **Session Moderators and the Conference Steering Committee** members. All papers are eligible for discussion in the *ASCE Journal of Transportation Engineering* and are also eligible for **ASCE Awards**. Appreciation is extended to all who worked so hard to bring this exceptional conference together. The high quality of papers presented is due to obvious efforts of the **Authors, Moderators, and Paper Reviewers**.

The dedication and hard work of ASCE staff, especially **Elaine Watson**, ASCE Conference Manager, **John Segna**, Director, Technical Activities Department and **Donna Dickert**, Manager, Proceedings Production, are greatly appreciated.

Special thanks go to all sponsors of the conference including the **Center for Underground Infrastructure Research and Education (CUIRE) at the Department of Civil and Environmental Engineering at The University of Texas at Arlington** for providing the resources and support for this conference. In particular, we appreciate the efforts of **Behnam Hashemi**, CUIRE Research Assistant, who spent many long hours coordinating the review process.

On behalf of the Conference Steering Committee,

Lynn Osborn and Mohammad Najafi

John Struzziery and Tim Stinson

Technical Program Co-Chairs

Conference Co-Chairs

Acknowledgments

Moderators and Reviewers

David G. Abbott, Jason Consultants International, Inc.
Samuel Ariaratnam, Arizona State University
Sam Arnaout, Hansen Pipe and Precast
Bruce Bennett, Vanderweil Engineers
Gary Bousquet, San Diego County Water Authority
Enrique Cabrera, Universidad Politecnica de Valencia, Spain
Ralph Carpenter, American Cast Iron Pipe and American Spiral Weld Pipe
Joe Castronovo, Jones & Carter, Inc.
Wayne Dillard, Burns & McDonnell
Russ Ford, Lockwood, Andrews & Newnam
Sanjiv Gokhale, Vanderbilt University
John D. Hair, J.D. Hair and Associates, Inc.
Keith Hanks, City of Los Angeles
Steve Henning, Standard Cement Materials
Raymond Hutchinson, MWH
David Jeong, Oklahoma State University
Ed Kampbell, Rehabilitation Resource Solutions
David Kozman, RS Lining Systems, LLC
Steven Kramer, Jacobs Civil
Dick Krzys, Benjamin Media
Tom Marti, Underground Solutions
Terry McArthur, HDR Engineering, Inc.
Robert Morrison, Jason Consultants International
Mohammad Najafi, The University of Texas at Arlington
Henry Nodarse, Bernardin, Lochmueller & Associates, Inc.
Rafael Ortega, Lockwood, Andrews & Newnam
Lynn Osborn, Insituform Technologies
Omar Pineda-Porras, University of Illinois at Urbana-Champaign
Alison Ratliff, HDR Engineering, Inc.
Camille Rubeiz, Plastics Pipe Institute
George Ruchti, American Cast Iron Pipe and American Spiral Weld Pipe
Jim Rush, Benjamin Media
Bill Shook, AP/M Performance
Lawrence Slavin, Outside Plant Consulting Services
Robert Stein, Stein & Partner
Patrick Stevens, ADS Environmental Services
Timothy M. Stinson, S E A Consultants Inc.
Nick Strater, Haley & Aldrich
John Struzziery, S E A Consultants Inc.
Joseph Strauch, Gannett Fleming, Inc.
Mark Wade, Wade & Associates / CH2M HILL
Dawn Wetzel, Gannett Fleming
Mehdi S. Zarghamee, Simpson Gumpertz & Heger Inc.

International Pipelines Conference 2007 Steering Committee

Conference Co-Chairs

John Struzziery, P.E.

S E A Consultants, Inc.

John.Struzziery@seacon.com

Tim Stinson, P.E.

S E A Consultants, Inc.

Tim.Stinson@seacon.com

Technical Program Co-Chairs

Lynn Osborn, P.E.

Insituform Technologies, Inc.

losborn@insituform.com

Mohammad Najafi, P.E.

Center for Underground Infrastructure

Research & Education (CUIRE)

Department of Civil & Environmental Engineering

The University of Texas at Arlington

najafi@uta.edu

Sponsorship Co-Chairs

Tom Iseley, Ph.D., P.E.

Consultant

tom.iseley@att.net

Ralph Carpenter

American Ductile Iron Pipe

American SpiralWeld Pipe

RCarpenter@acipco.com

International Chair

Randy Robertson, P.E.

Cyntech Anchor Systems Inc.

rrobertson@cyntechcorp.com

Exhibit Chair

Henry Nodarse, P.E.

Bernardin, Lochmueller & Associates, Inc.

hnodarse@blainc.com

Publicity-Marketing Chair

Robert Carpenter

Oildom Publishing Company of Texas, Inc.

rcarpenter@oildompublishing.com

Local Arrangements Co-Chairs

Irene McSweeney Woodfall

Boston Water & Sewer Commission
woodfallim@bwsc.org

Stephen McKelvie
PB Water
mckelvie@pbworld.com

2006 Conference Chair Liaison

David Prosser, P.E.
American Concrete Pressure Pipe Association
dprosser@acppa.org

2008 Conference Chair

Tom Iseley, Ph.D., P.E.
tom.iseley@att.net

Ralph Carpenter
American Ductile Iron Pipe
American SpiralWeld Pipe
RCarpenter@acipco.com

ASCE Staff

Elaine V. Watson, Manager, Conference & Meeting Services
Verna Jameson, Senior Coordinator, Technical Activities
Sheana Singletary, Program Administration
Mark Geiger, Conference Coordinator
Amilyne Caslin, Registration & Onsite Services Coordinator

Contents

Planning, Design, and Construction: Renewal

Atlanta Projects

Atlanta's Consent Decrees Drive a Substantial Commitment to Trenchless Sewer Rehabilitation

R. J. Hunter and W. H. Sukenik

Atlanta's SSES and Integrated Sewer Rehabilitation Selection Process

R. E. Hutchinson, H. K. El-Sayegh, and L. Chambers

Clean Water Atlanta Enterprise GIS

Clare Brown and Keith Toomer

Hydraulic Modeling - A Tool for Addressing the Consent Decree

Alberto Bechara, Brent Brewer, Lancelot Clark, and Kai Iaukea

Sewer Renewal

Fast-Track Pipeline Rehabilitation Using a Carbon Filter Reinforced Polymer (CFRP) Strengthening System

Scott F. Arnold and John J. Galleher, Jr.

Trenchless Rehabilitation of Large Brick Conduits in Boston

Stephan Shea

Pipelines, Trains, and Automobiles: Rehabilitation of an 18" Sewer with No Excavation - Howard Street Sewer Project, Framingham, MA

Alan Wells and Eileen Cahill

Innovative Renewal Technologies

Successful Rehabilitation Project Utilizes Multiple Methods from the Trenchless Toolbox Case Study of an Infrastructure Renewal Program

Joseph A. Strauch and Jeremy S. Miller

Turn-Key Condition Assessment and Rehabilitation/Replacement Solution for an Effluent Force Main

Brian Mergelas, Neal Stubblefield, Marjorie Craig, Robert Morrison, and Cameron White

PCCP Inspection: Prioritizing Risk, Assessing Shutdown Impacts, and Executing the Inspection

Bethany A. Williams, Ron L. Ablin, and Brandy A. Kelso

Renewal Design

Increase Your Design "Bottom Line" with Trenchless Solutions

H. Guy

Sewer Hydraulic Design Criteria

Richard E. Nelson

Validation of a Decision Support System for Method Selection in Utility Construction

J. Matthews, E. Allouche, and Z. Duan

Reliability and Quality

Steel Water Pipe - The Importance of Fabricator Certification

Lawrence P. O'Shea and George Ruchti

Temporary Diversion Systems: Reliability is *Everything*

Michael Delzingaro

Carbon Fiber Liner Quality Control for Repair of PCCP

Heath Carr

Failure Analysis

Robotic RFEC/TC Inspection of Transmission Mains with Reducers: Practical Aspects

Allison Psutka, Xiangjie Kong, Lily Gao, and Dave Caughlin

Sewer Pipeline Operational Condition Prediction Using Multiple Regression

Fazal Chughtai and Tarek Zayed

Investigation of the Failures of the Deep Sewers and Service Laterals in California

Jey K. Jeyapalan and Sri K. Rajah

Cost Analysis

Cost Comparison of Pipeline Asset Replacement: Open-Cut and Pipe-Bursting

Hosun Lee, Mohammad Najafi, and Johnny Matthys

Rising Water and Wastewater Pipeline Construction Costs: A Survey of the DFW Metroplex Marketplace

I. Marty S. Paris and Lauren A. Hampson

Optimal Scheduling of Pipe Replacement, Including Opportunity, Social, and Environmental Costs

E. Cabrera, M. A. Pardo, E. Carbrera, Jr., and R. Cobacho

Design Life Prediction

Study on Mechanical Property of Corroded Pipeline

Y. F. Fan, J. Zhou, and Z. Q. Hu

Wastewater Collection System Rehabilitation and Replacement (R&R) Program Prioritization

John T. Caldwell

Structural Condition Models for Sewer Pipeline

Fazal Chughtai and Tarek Zayed

Renewal Investigations

Trenchless Water Pipe Condition Assessment Using Artificial Neural Network

Zong Woo Geem, Chung-Li Tseng, Juhwan Kim, and Cheolho Bae

Research on Safety Evaluation Model of the Main Underground Pipelines in Shanghai, China

C. G. Yang, B. S. Ma, M. Najafi, and C. Zeng

102-Inch Cliff Pipe Rehabilitation

Cort Lambson, Mike Mickelson, Nathaniel Jones, and Adam Murdock

Planning, Design, and Construction: New Construction

Microtunneling and HDD

Twin 30-Inch Ductile Iron Pipe HDD Crossings of the Historic San Marcos River

Kathy Pontesso and Ralph Carpenter

Pipe Jacking in Difficult Urban Waterfront Conditions

Rafael C. Castro, Tennyson M. Muindi, Geoffrey Hughes, and Philip H. Albert

Horizontal Directional Drilling with Ductile Iron Pipe

Jami D. Pompeo

Innovative Record Length Twin 60-Inch Microtunnel Drives beneath US 50 and High School in West Sacramento: Combine Direct-Jacked Carrier Pipe and Casing and Carrier in Single Drive

Daniel Breg, David Bennett, Jason Junkert, and Humera Arshad

Geotechnical Investigations

Procedures for Utilizing Vacuum Technology Safely and Effectively

Arvid Veidmark III

Constructability of Large Diameter Pipelines in an Urban Environment: A Case Study

John A. Purciello

Sound Baseline Geotechnical Investigation and Interpretation Offers Most Valuable Liability Management in Pipeline Projects

Jey K. Jeyapalan and Michael C. Welch

Horizontal Directional Drilling Projects

Horizontal Directional Drilling Installation of Segmented PVC Watermain Pipe in Richmond, Canada

James Young and Preston Creelman

Davenport Ranch, Austin, Texas: Crossing Lake Austin Using Horizontal Directional Drilling

Spenta Irani, Paul Savard, Mike Boyle, and Phil Salyers

Simplified Methodology for Selecting Polyethylene Pipe for Mini (or Midi) - HDD Applications

Lawrence M. Slavin

Planning and Design of New Construction Projects I

Design-Build and Trenchless - A Perfect Solution!

H. Guy

HDD in an Urban Environment: The Bellevue Pump Station Force Main Project

James U. Chae, Shahrzad F. Namini, and Eric N. Schey

Planning Methodology for Small Diameter Pipelines in an Urban Environment

Neil J. A. Woodroffe and Samuel T. Ariaratnam

Challenging Projects

Seymour-Capilano Water Filtration Project: Steel - The Product of Choice

Goran Oljaca and Jim V. Young