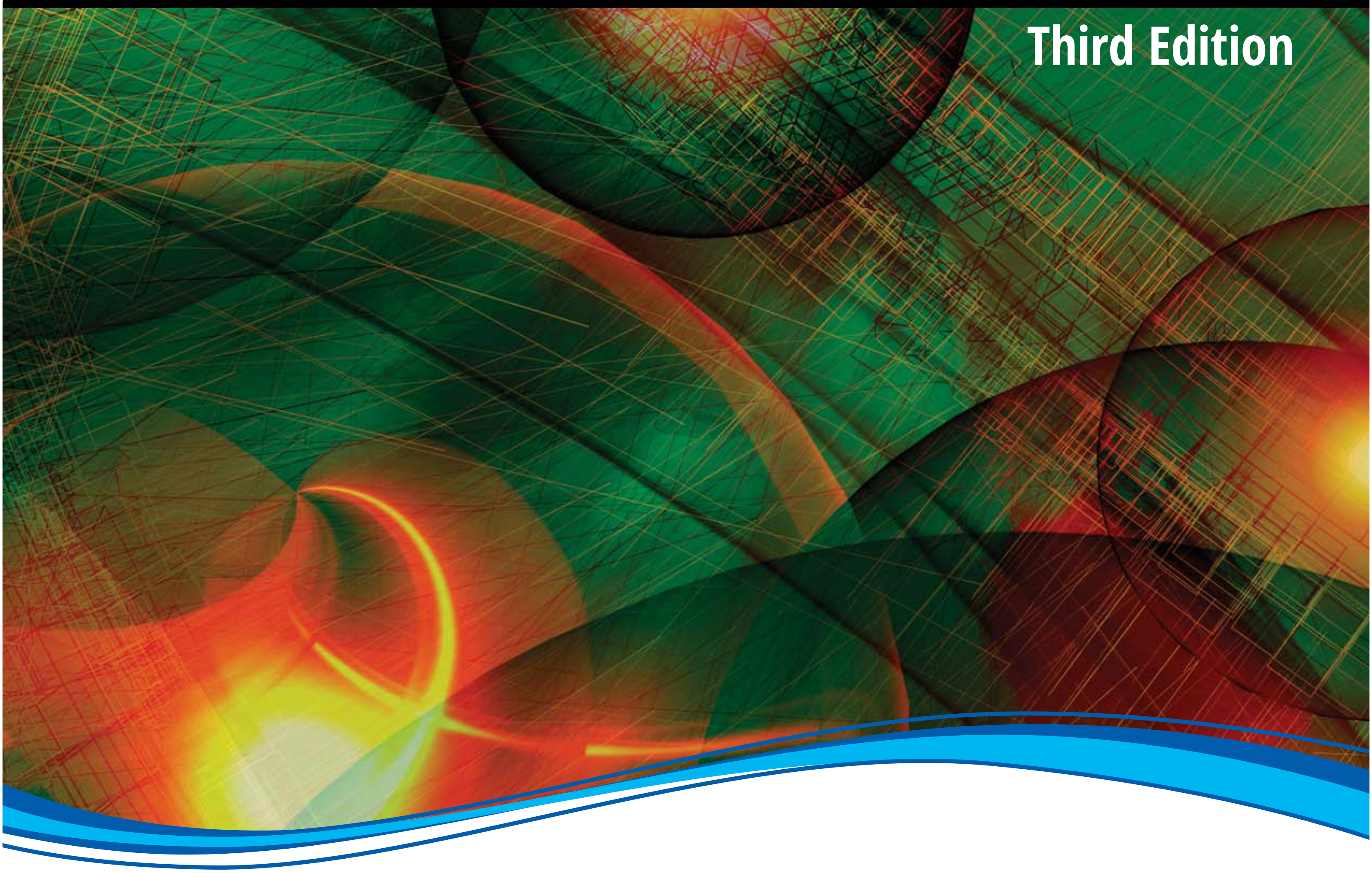
M28

Rehabilitation of Water Mains

Third Edition



American Water Works Association

Manual of Water Supply Practices

M28

Rehabilitation of Water Mains

Third Edition

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Manual of Water Supply Practices — M28, Third Edition

Rehabilitation of Water Mains

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Foreword

The water industry in the United States is faced with quite a challenge. Much of its buried infrastructure is aged and approaching the end of its useful life. Water system pipeline infrastructure primarily installed in the 1950s and 1960s or earlier has served its communities well. Across the country, water mains provide water to communities with day and night reliability except for the occasional water main interruption. However, that is changing as the pipelines have met or are already exceeding the expected life spans of the pipeline materials. Increasing failures of aged pipeline networks may reach a performance level unacceptable to customers and burdensome to the operators of the systems.

Conventional pipeline replacements of older pipeline infrastructure have not occurred fast enough, largely owing to financial constraints. Failures are now impacting major transmission mains. As a result, communities now are faced with an almost insurmountable challenge to perform the inevitable task of replacing these key and critical water main pipelines. Coupled with reductions in revenue and a slowly recovering economy, the task is especially daunting. Water main rehabilitation may offer part of the solution by renewing more pipe at less cost.

Water main rehabilitation is not a new concept. Cement–mortar lining of water main pipelines is one of the oldest rehabilitation methods. The oil and gas industry was the first to develop systems and techniques beyond cement–mortar lining to rehabilitate critical pipeline networks without the use of conventional open-trench construction. The wastewater industry was the next utility group to firmly adopt pipeline rehabilitation techniques. The expansion of various technologies among these pipe-focused industries created numerous companies, processes, and materials as many groups scrambled to "build a better mousetrap." The fervor that resulted saw the installation of millions of feet of pipeline rehabilitation products in communities across the country and overseas.

The water industry, particularly in the United States, is the last to fully realize the economic, social, and community benefits of rehabilitation. Conventional construction has its place and continues to be utilized on a widespread scale; however, water main and water service rehabilitation has been steadily increasing in use and effectiveness. Companies that were engaged in the wastewater pipe rehabilitation process expanded their technologies to develop products that could withstand the internal pipeline pressures as well as be approved for potable water use. The number of rehabilitation projects being performed is expected to grow as the price of raw materials has risen and competition for limited space in public right-of-ways has increased with other buried utilities (including systems that have moved from aerial to burial).

The second edition of the M28 *Water Main Rehabilitation* manual, published in 2001, provided an expanded exposure of the technologies present at the time. The intent of the manual was to provide an overview of the processes used, considerations for what rehabilitation process to use, and suggestions for a successful project. This third edition of the manual continues with the same intent. It updates technologies since the last edition, expands categories to encompass available, proven processes, and provides exposure to other rehabilitation considerations such as keyhole technology and cathodic protection. The goal of the manual is to provide engineers, contractors, and decision makers with an overview of the processes used for water main rehabilitation. It is recognized that different pipe installations and types will warrant different rehabilitation options. These considerations are explained in detail including a decision flow chart to aid in the process and get the user to a narrow, more situation-specific set of options for their project.

It is recognized that the water main rehabilitation industry is continually offering new technologies to assist communities with rehabilitating their water pipeline infrastructure. This manual specifically addresses only those technologies with a proven track record within the water industry that can be employed by a water utility to successfully rehabilitate water mains. No attempt was made to evaluate one method of water main rehabilitation over another, and no attempt was made to evaluate relative costs between competing systems. It remains for the user of the manual to decide which system will best suit a specific project. In 2011, the AWWA Water Main Rehabilitation Committee decided to not consider any more new and upcoming technologies for chapter discussion. Because the field is up and coming, there are always new technologies that have been tried overseas that are taking hold here in the North American market.

The chair of the committee, Jon Turner, would like to thank the Executive Committee in place at the time of the manual preparation and to thank contributing authors responsible for new material supplied to continue to provide an up-to-date water main rehabilitation manual for water industry professionals.

Executive Committee

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Mike Queen, Vice Chair
Leonard Assard, Secretary
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Acknowledgments

The Water Main Rehabilitation Committee acknowledges these individuals for their persistence and dedication as standing subcommittee members assigned to take the lead for updating the M28 manual:

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Chapter 1

Pipeline Renewal Methods

Pipeline renewal is typically accomplished by one of two approaches: rehabilitation or open-trench construction, although other trenchless methods are also used. Trenchless technology is a type of subsurface construction work that requires little or no surface excavation and no continuous trenches. This chapter provides guidance in selecting between rehabilitation and open-trench construction and in determining which rehabilitation method is most appropriate for meeting goals.

The renewal of water mains is performed for three primary reasons:

1. Water Quality Improvement: to improve the quality of the water received by the consumer
2. Hydraulic Improvement: to increase the hydraulic capacity of the pipeline
3. Structural Improvement: to reduce leakage, decrease repair frequencies, lessen risk of property damage, and improve reliability.

Compared with conventional open-trench replacement, pipeline rehabilitation methods are often less expensive and less disruptive to the community; however, rehabilitation is not appropriate for all situations.

As described in other chapters in this manual, many different water main rehabilitation techniques exist, offering a variety of benefits. The best choice of method for each situation will depend on several factors, including: (1) the reason for the rehabilitation, (2) comparative costs, (3) site conditions, and (4) expected life-cycle performance.

This chapter provides guidance in selecting a pipeline renewal method, including a series of decision trees that can be used to help determine which types of methods should be considered.