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Pipelines
for Water Conveyance and Drainage

ASCE

Edited by
Roger W. Beieler, P.E.

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Pipelines for Water Conveyance and Drainage

Prepared by
the Task Committee on Pipelines for Water Conveyance and Drainage of
the Irrigation Delivery and Drainage Systems Committee of
the Irrigation and Drainage Council of
the Environmental and Water Resources Institute of
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CONTENTS

PREFACE

This manual, ***Pipelines for Water Conveyance and Drainage***, includes a discussion of twenty topics for various pipe materials. The topics discussed include industry standards, available pipe sizes, standard lengths, allowable internal pressures, external load capabilities, protective linings, protective coatings, joints, fittings, hydraulic resistance factor, allowable leakage rates, repair methods, installation requirements, backfill requirements, special considerations, industry groups, and reference materials.

The need for a concise listing and description of the most commonly used types of pipe for water conveyance and drainage purposes was recognized by ASCE members in the late 1990s. Several new pipe materials were being introduced and new standards for these materials were being developed. Many of the new materials offered several advantages compared to the materials currently available, including reduced cost, longer life, improved flow characteristics, and ease of installation. In addition, manufacturers of existing pipe materials often modified and improved their products to make them more competitive.

The pipe materials discussed herein include concrete pipe, steel pipe, ductile iron pipe, polyvinyl chloride (PVC) pipe, molecularly oriented PVC pipe, high density polyethylene (HDPE) pipe, polyethylene profile wall pipe, PVC and polypropylene profile wall pipe, corrugated polyethylene pipe, vitrified clay pipe, clay drain tile, fiberglass pipe, and corrugated metal pipe. The intent of the manual is to provide design engineers, utility managers, educators, and planners a concise listing and description of the most commonly used types of pipe for water conveyance and drainage purposes.

Acknowledgments

Many individuals donated time and effort to prepare this manual since the need for such a manual was recognized in the late 1990s. The ASCE

and EWRI members who contributed include staff from the U.S. Bureau of Reclamation, industry groups, American Water Works Association (AWWA), Agricultural Research Service, pipe manufacturing companies, water supply agencies, and consulting firms.

This manual was prepared by a subcommittee of the Irrigation Delivery and Drainage Systems Technical Committee. The technical committee is one of several committees in the Irrigation and Drainage Council of the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE).

CHAPTER 1
INTRODUCTION

PURPOSE AND SCOPE OF MANUAL

The purpose of this manual is to provide design engineers, utility managers, educators, and planners with a concise listing and description of the most commonly used types of water conveyance and drainage pipe that are commercially available in the United States. Also provided are listings of the most commonly used standards for manufacturing the pipe, useful publications pertaining to the design and installation of pipe, and industry groups that promote and distribute research data on their type of pipe.

During the preparation of this manual, the Pipeline Manual Task Committee obtained information from many sources. These sources include associations for standards and practices, governmental agencies, professional societies, educational institutions, consultants, pipe manufacturers, and industry groups.

Chapter 13, titled Resource Directory, is a compilation of the most active organizations involved with water conveyance pipe design and fabrication. Street addresses, phone and fax numbers, e-mail, and internet website addresses are listed. This information is current as of the date the manual was published (2013).

Before starting a pipeline construction project, managers and owners should make certain that the pipe installation crew has copies and are familiar with the latest pipe installation manuals.

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products mentioned herein. Trade or manufacturer's names appear solely because they help to make the manual more useful to the reader.

TYPES OF PIPE

The following types of pipe are discussed in this manual:

- Concrete pipe,
- Welded steel pipe,
- Ductile iron pipe,
- Solid wall polyvinyl chloride (PVC) pipe,
- Solid wall molecularly oriented polyvinyl chloride (PVCO) pipe,
- High density polyethylene (HDPE) pressure pipe,
- Polyethylene profile wall pipe,
- PVC profile wall pipe,
- Polypropylene profile wall pipe,
- Corrugated polyethylene pipe,
- Vitrified clay pipe,
- Clay drain tile,
- Fiberglass pipe,
- Corrugated steel pipe, and
- Corrugated aluminum pipe.

ALTERNATIVE PIPE MATERIALS

Recognizing that a variety of types of pipe may be suitable for a given situation, many water districts, municipalities, and other government agencies often prepare construction contract documents that allow a contractor to furnish one of several equivalent types of pipe for installation on a particular job. By allowing the contractor to choose the least costly type of pipe, the cost of the overall contract will be reduced. Note that the least cost for an installed pipeline is determined by several factors:

- Cost to manufacture the pipe,
- Cost to deliver the pipe to the job site,
- Ability of the manufacturer to deliver the pipe in a timely manner,
- Cost of labor and equipment to install the pipe,
- Types of suitable backfill material and relative degree of compaction required,
- Cost of corrosion control,
- Cost of locating and repairing any leaks that become evident during testing, and
- Cost to repair defects that become evident during the warranty period.