Resources and Required Reading

*Concrete Pipe Handbook* Chapter 8, Resource #01-102 Book
*Concrete Pipe Design Manual* Chapter 5, Resource #01-101 Book

Video & Brochure  *The Concrete Pipe Advantage: Quality You Can Count On*  Resource #07-221 (CD ROM), 07-222, (Brochure)

ASTM C 822 (Terminology & Definitions)
ASTM C 76 (Manufacturing)
ASTM C 443 ASTM C 990 (Joints for RCP)
ASTM C 497 (Test Methods for RCP)
ASTM 1479 & AASHTO Section 27 (Installation of RCP)

Note: All of the above referenced ASTM Standards can be found in “2008 Selected ASTM Standards on Concrete Pipe”, Resource #09-100 Book

Suggested Reading

AASHTO M 170 (Manufacturing)
AASHTO M 315 & M 198 (Joints for RCP)
AASHTO T 280 (Test Methods for RCP)

Introduction

Standards and specifications are critical to any product and are of high importance to the design engineer, the owner, the installer, and the manufacturer. In this segment of the training we will briefly discuss how the various agencies and / or groups develop standards and specifications and categorize and discuss the most commonly used specifications for our industry. Many engineers and designers will appreciate it if you can be a resource for them with respect to the national specifications and standards. Our hope is that, when or if you are called upon by the specifier, you will be equipped with the knowledge needed to help him or her write and craft project specifications that are both technically correct and beneficial to our industry.

Knowing how to find and utilize the national standards and specifications will be helpful as you proceed to the advanced level training modules to follow. In many of the following training sessions you will need to refer to specific specifications or standards for concrete pipe and competitive products to help you understand aspects of our products and/or the competitive products more clearly. You will see many of the more commonly used specifications or standards being referred to many times throughout the remainder of the training program.

General Discussion/Definitions of Standards, Specifications, Contract Documents

Almost all projects that are constructed, begin from a set of contract documents. The contract documents normally contain a detailed description of the project scope of work, bidding instructions, contractual issues and details, technical specifications and detailed drawings. The contract documents explain to the builder and subcontractors how to properly bid and construct...
the project correctly. The desired outcome of clear and correct contract documents is a finished project that meets the intent of the designer, meets the needs of the owner and serves the end users of the completed site/project/building.

**Most Technical Specifications** contain detailed performance requirements, procedures, responsibilities, testing requirements and any detailed written instructions that cannot be included on the plan documents themselves; they almost always make reference to National Standards. Normally, project technical standards are written for all of the critical work tasks or products to be used and required by the detailed plans to complete the project.

**Standards** are the backbone of the technical specifications. Product Standards allow the design engineer to confidently rely on the work of professional organizations, technical societies, industry associations, or consumer groups who work within their organizations to develop consensus standards for various products and/or testing procedures.

**Consensus standards** are defined as, a standard produced by a body selected, organized, and conducted in accordance with the procedural standards of due process. In standards and development practice, a consensus is achieved when substantial agreement is reached by concerned interest according to the judgment of a duly appointed review authority.

The procedures for standards of due process ensure all points of view are considered in accordance with rules and regulations, and the entire process is reviewed for conformance with these procedures before any standard is approved or modified. A full consensus standard will be technically correct, complete and will have high credibility when critically examined.

**American Society for Testing and Materials (ASTM)**

**American Association of State Highway and Transportation Officials (AASHTO)**

ASTM & AASHTO standards are two of the most commonly referred groups of standards for our products as well as other competitive drainage products. It is of great importance that you and the design engineers you come into contact with understand how both of these organizations develop and approve standards or make improvements or modifications to existing standards. Chapter 8 of the *Concrete Pipe Handbook* contains several sections that explain the processes and member qualifications for those involved in the development of standards of both ASTM and AASHTO. Both ASTM and AASHTO standards are critically reviewed and have proper research to support their documents and have extensive review and approval processes for initial standard development and or any proposed revision.

ACPA staff and volunteer members from many of the RCP producers serve on ASTM committees or Liaison committees of AASHTO. As producer representatives on the ASTM committees, we can have direct input and can discuss standard needs and improvements. However, as producers, we cannot serve on any AASHTO Committee as those committees are made up solely of officials from state highway and transportation agencies or ex officio members from the Federal Highway Administration. Volunteers from pipe producers and or associations can serve on liaison committees to AASHTO. These liaison committees can request action by the AASHTO committee and can provide information or research as requested or needed by the AASHTO Committee to help them in the development of particular standards.

**Other standards organizations**
Canadian Standards Association (CSA) is a national organization made up of volunteer members from business government, labor, consumers, and association and operates similar to ASTM.

The American Society of Civil Engineers (ASCE) and other professional engineering associations also develop design standards, product and process standards that can play an important role in our industry.

Some materials and products have no ASTM or nationally accepted standards and engineers must turn to industry or trade associations for standards.

There are also Federal Standard groups. The United States Federal Standardization Document System is one such federal standards group. Its standards are classified into three categories; Federal Specifications, Federal Standards, and Qualified Products Lists. Federal specifications usually cover concrete pipe by reference to ASTM standards, and describe essential and technical requirements for items, materials or services bought by the federal government. Obviously it would be common to see these types of standards used on projects constructed on federal lands or operations.

Many design professionals and organizations craft their own detailed technical specifications that may reference or incorporate items found in the national standards previously mentioned. There are site specific issues, geologic issues, or other regional issues that may require engineers or organizations to refine and or add details to address their specific concerns and client needs. The Corps of Engineers, Federal Aviation Administration, the Federal Highway Administration, and State Departments of Transportation, as well as local municipalities, write and maintain their own technical specifications and standard drawings.

ASTM Concrete Pipe Standards
An ASTM standard is the result of a particular standardization effort and is a document containing a set of conditions to be fulfilled or an object for comparison. In the ASTM C13 Committee on Concrete Pipe, four types of standards are promulgated:

- Specifications (materials, manufacturing & purchasing)
- Method of Tests (materials, structural, finished product performance)
- Definitions (Terminology)
- Recommended practices (testing component performance, installation, marking, curing, etc.)

An ASTM specification can cover any three of the following functions: Purchasing, Standardization, or Technical data. The most common topics covered by an ASTM specification are scope, referenced documents, classification of materials, materials and manufacture, chemical requirements, physical requirements, permissible variations, workmanship and finish, repairs, rejection, and marking.

AASHTO Concrete Pipe Standards
The majority of AASHTO standards that deal with RCP are the responsibility and work product of and developed by the Operating Subcommittee on Materials and Operating Subcommittee on Bridges and Structures. Many of the ASTM standards regarding manufacturing and or materials testing are reviewed and accepted by the AASHTO Subcommittee on Materials. The Bridges and Structures subcommittee of AASHTO is primarily responsible for structural design issues. The
AASHTO subcommittee on Construction also may share responsibility for installation and field inspection standards and can work hand in hand with the Materials or Bridge Subcommittee as requested on standards addressing proper installation, field inspection or testing requirements. Most State Departments of Transportation use or reference AASHTO specifications.

**AASHTO & ASTM Specs That Impact our Industry Daily**

To understand the impact and significance of standards and specifications, we should review in-depth the different types of specification in more detail. We need to identify and study the specifications or standards that impact us on how our products are to be designed, properly manufactured, installed, and inspected at the plant and in the field. There are several different types of specifications that we need to understand to allow us to help and assist designers, installers, or owners as the needs arise. The types of specifications we need to consider are as follows:

- Design Specifications
- Manufacturing Specifications
- Material Specifications
- Installation Specifications
- Testing Specification for both materials & Structures

**Design Specification**

Both ASCE and AASHTO have standards that deal with the design aspects of RCP. In one or more of our advanced training modules we will cover all aspects of concrete pipe design. At that time you will be referred to and required to read the design standards that engineers and designers must use to properly consider and design concrete pipe. Until you understand the basic design concepts, we do not feel it would be useful to have you review those specifications at this time.

**Material & Manufacturing Specifications**

In the first section of this training section, we discussed materials and production methods. Part of your required reading for that section included ASTM C-76 (this is the most widely utilized and referred to manufacturing standard for round diameter reinforced concrete pipe) and several ASTM Standards covering the key material components of concrete pipe.

Your required reading for this training section includes AASHTO M170 which is very similar to ASTM C-76. ASTM C 76 and its sister specification AASHTO M 170 are manufacturing and purchase specifications only. Some very important sections of note include:

- Sect. 5 Basis of Acceptance
- Section 6 Materials
- Section 7 Design
- Section 8 Reinforcement
- Section 9 Joints
- Concrete Testing
- Section 15 Rejection

Your production staff knows these specifications well and uses and refers to them daily. We highly suggest you fully familiarize yourself with the contents and requirements of ASTM C-76
& AASHTO M 170. There are other concrete pipe manufacturing standards for other shapes (Elliptical, Arch, Box Culvert) as well as manufacturing specifications for pipe for a specific D-Load or for Pipe Designed by the Direct Design Method.

**Installation Specification**
Both ASTM and AASHTO have specifications that discuss the proper methods for the installation of Concrete pipe. ASTM 1479-01 *Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations* explains the proper and most current methods for RCP Installation. AASHTO Section 27 *Concrete Culverts* covers the work items required to furnish, install and inspect RCP.

Both of these key installation specifications cover every aspect of the installation process; foundation requirements, bedding, pipe placement, and backfill. Both specifications go into great detail to explain the various installation requirements that are available for the designer and installer to utilize when installing our products. AASHTO Section 27 includes Section 27.6 *Field Inspection* that clearly defines proper installation and post installation requirements for RCP. By reading and studying these two specifications you will be better prepared for the Installation course of this Training Module.

**Testing Specifications (Materials and Structure)**
There are test methods set forth for the material components of RCP, completed RCP product, components used in conjunction with RCP, and even test methods that confirm the field performance of installed RCP.

*ASTM C-497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile* includes test methods used for the production and quality control of RCP. These tests are completed to properly evaluate all the various properties required for the completion of a quality finished product. C-497 includes and discusses the following critical test procedures: Three-Edge Bearing Test Method, Core Strength Test Method, Absorption Test, Hydrostatic Test Method, Cylinder Strength Test, Joint Shear Test.

There are test methods covered in ASTM for almost all of the components of RCP, as well as test methods to confirm conformance of the installed product including joint materials and joint tightness. Many of these performance specifications will be covered in detail as we progress through the training.

**Summary of Standards and Test**
Producers, Installers, Design Engineers, and owner agencies depend and rely on accurate product standards and test methods for the successful completion of almost every project constructed. Due to our long history and continued use, our products and their components are well understood and the standards for our products have continued to improve and develop over the past 100 years.

As you complete your training, you will come to understand that almost every aspect of our product development has been built on a very conservative approach. It is not enough to say you produce a quality product; you must be able to document that strength and quality through testing. It is not enough to say your installation gives the installer flexibility; you must be able to back that up with national standards and research. It is not enough to say our product is a structure; you must be able to prove that statement by actual finish product testing. By properly
utilizing our National Standards, we can honestly say and prove we have the strongest, most
durable, most installation friendly product available in the storm drain market today.

More Wise Words of Mr. Lincoln… “I’ll study and get ready, and then the chance will
come.”
As you complete our training modules, we want you to take your knowledge to the decision
makers that can help us gain market share in the storm drain industry. Lincoln was a very
ambitious man, who never let minor or major set backs of his pursuits slow him down. It was
said of him “His ambition was a little engine that knew no rest.” We are hopeful you too, will be
inspired to take your cause to the right audience and by doing so, keep our industry and its
products in front of the others that are in pursuit.