

Water Systems – Special Topics

Purpose and Background

There are many choices in pipe material when designing a municipal facility such as a water system, a sanitary sewer system or a storm sewer system. Do you know what the “best” pipe material is? Many designs now call for PVC pipe. But what kind of PVC should you use? What about use of ductile iron pipe – is it an outdated material with no applications? Or how about welded steel or high density polyethylene (HDPE)? Once you’ve decided on a pipe material, what kind of joints should you require? Are all joints “created equal?”

Proper selection of a pipe material can save your client or municipality money. Improper selection of a pipe material can cost your client or municipality money. It can also lead to premature (or immediate) failure and create a liability that could be avoided. Continued development means more water lines, sewer lines and storm sewers. In addition, many municipalities have ongoing programs to replace pipes that are at or beyond their expected useful life. Proper selection of pipe material can ensure adequate future service life at the most economical cost. This seminar will provide information needed to make a more educated decision on the appropriate selection of pipe material for a variety of applications. These topics will be covered in Day 1 of the seminar.

Water hammer is also a concern in many pressurized systems. Sudden changes in velocity can create pressures (both high and low) that are well beyond the normal operating range of a system. Failure to account for these infrequent events can result in failure of key components of the system. Appropriate design of a pressure system requires an analysis of the potential for water hammer along with an understanding of the options available to mitigate these extreme pressures. The seminar will provide information needed to analyze water hammer and select appropriate mitigation measures. These topics will be covered in Day 2 of the seminar.

Seminar Instructor

MARK PETERSON, P.E. is currently a special-projects engineer with Advanced Engineering and Environmental Services in Helena, Montana. He has been practicing engineering for 38 years and is registered in Montana, Wyoming, North Dakota, South Dakota and Minnesota. He has worked in state government in highway design and subdivision review. He has also worked as a consultant for over 20 years. He has taught courses in storm drainage for municipalities and regulatory agencies and currently teaches courses for ASCE in detention pond design, pipe material selection, storm sewer design, practical hydrology and storm water treatment. He has also been published in the ASCE Journal of Hydraulic Engineering. Mark earned his BS and MS degrees from Montana State University.

- For group training, contact John Wyrick (JWyrick@asce.org) or Stephanie Tomlinson (STomlinson@asce.org)

Summary Outline

DAY 1

Pressure Pipe Selection for Municipal Utilities

- Water Pipe. For each material, course will cover specifications, available sizes, available pressure ratings, safety factors, joint types, fittings, connections to different kinds of pipe, corrosion protection (interior and exterior), differences in nominal diameters, and friction factors.
- Pipe materials include:
 - * Ductile Iron
 - * PVC
 - * HDPE
 - * Welded Steel
- Additional discussion will cover thrust restraint including thrust blocks and restrained joints, how to calculate the force created, how to determine the restraint necessary, and what options are available for restrained joints.
- Installation discussion will cover minimum and maximum cover, testing requirements, allowable pipe joint deflections and pipe buoyancy.

Learning Outcomes

- Be able to select the appropriate pipe materials for a pressure pipe
- Determine the appropriate joint type for different pipe applications
- Determine the magnitude of thrust forces and how they are mitigated
- Determine the impacts of water hammer on water transmission and distribution systems
- Determine the common approaches to mitigating water hammer

Who Should Attend?

The pipe material course is for anyone involved with the design of water projects that include pressure pipes, including design engineers, technicians, regulatory officials and architects. The water hammer course is for engineers involved in design, review or operation of water systems that include pump stations and pressure pipelines.

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DAY 2

Water Hammer

- General introduction to transients
- Causes of transients
- How fast they move through the system (wave speed)
- Magnitude of pressures
- How different pipe materials impact the magnitude of the pressures
- Modeling transients with computer software (including results from examples)
- Transient issues with low pressure systems (like sewer force mains)
- Limiting transients through design
- Limiting transients through operation
- Devices to limit transients
- Pressure relief valves
 - * Air/vacuum valves
 - * Surge anticipation valves
 - * Pressure tanks
 - * Storage tanks (within the system)

Seminar Benefits

- Understand the four primary pipe products (ductile iron, PVC, HDPE and steel) used for pressure applications
- Learn to select an appropriate joint type for the different pipe materials and applications
- Understand the different safety factors used for different pipe materials
- Learn how to determine the minimum and maximum cover for pressure pipes
- Learn how water hammer develops and the types of systems where problems are most common
- Learn how different pipe materials impact the magnitude of water hammer
- Learn the tools available to mitigate water hammer

ASCE seminars are available for On-Site Training. For details regarding On-Site Training and/or needs-based training opportunities, please contact:

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