

# ***Water Hammer in Transmission and Distribution Systems***

## **Purpose and Background**

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Water hammer is 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.

## **Seminar Instructor**

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**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](mailto:JWyrick@asce.org)) or Stephanie Tomlinson ([STomlinson@asce.org](mailto:STomlinson@asce.org))

## Summary Outline

- 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)

## 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

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## 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

## 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.

**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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