



## COURSE NUMBER

FHWA-NHI-135056

## COURSE TITLE

### Culvert Design

The National Highway Institute's (NHI) 3-day Culvert Design course provides participants with an in-depth, hands-on understanding of how to hydraulically size and design a highway culvert. The course covers a range of design topics, including allowable headwater at the inlet, permissible outlet velocity, energy dissipation measures, aquatic organism passage, mechanisms of culvert failures, and repair and rehabilitation options.

Material for this 3-day course is primarily derived from the Hydraulic Design Series No. 5 (HDS 5), Hydraulic Design of Highway Culverts textbook, which is provided to participants. Additional references used throughout this course include Hydraulic Engineering Circular No. 14 (HEC-14); Hydraulic Design of Energy Dissipators for Culverts and Channels; HEC-26, Culvert Design for Aquatic Organism Passage; and HEC-9, Debris Control Structures, Evaluation, and Countermeasures. Course topics include culvert design principles and procedures and debris control structures. Throughout the course, participants engage in a number of workshops where problems are completed, both long-hand and with a computer using the FHWA HY-8 Culvert Hydraulic Analysis and Design Program. Additionally, a portable hydraulic flume is set up in the classroom for the participants to observe hydraulic principles associated with various culvert configurations, aquatic organism passage features, and culvert linings.

At the end of this course, participants will be able to apply fundamental engineering concepts, methods, and the HY-8 computer program to analyze and design culvert crossings meeting a variety of hydraulic and environmental design criteria.

Prior to taking this course, participants are strongly encouraged to enroll in the Web-based training (WBT) entitled, 135091 Basic Hydraulic Principles Review. Mastery of the concepts covered in this WBT is important to successful completion of the Instructor-led training.

## OUTCOMES

Upon completion of the course, participants will be able to:

- Justify the importance of culvert design
- Explain the overall culvert design process
- Summarize basic hydraulic concepts
- Discuss factors influencing hydraulic performance and design of culverts
- Explain how to calculate culvert outlet velocity
- Apply nomographs and computer methods to design a roadway culvert
- Design culverts that meet aquatic organism passage (AOP) requirements
- Assess impacts of repair and rehabilitation of culverts on hydraulic performance
- Design energy dissipator and debris control structures for culverts
- Design culverts for various situations
- Discuss culvert failures and how they can be prevented

## TARGET AUDIENCE

This intermediate-level training course is intended for hydraulic engineers, transportation engineers, and highway designers involved with roadway drainage and culvert design. Environmental scientists with an interest in aquatic organism passage may also benefit from participation in this course.

**TRAINING LEVEL:** Intermediate

**FEE:** 2017: \$900 Per Person; 2018: N/A

**LENGTH:** 3 DAYS (CEU: 2 UNITS)

**CLASS SIZE:** MINIMUM: 20; MAXIMUM: 30

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