



## COURSE NUMBER

FHWA-NHI-135090

## COURSE TITLE

### Hydraulic Design of Safe Bridges

The National Highway Institute's (NHI) 3-day 135090 Hydraulic Design of Safe Bridges course provides participants with an intensive training on the hydraulic analysis and design of bridges. The goal of this course is to provide information needed to safely build bridges, while optimizing costs and limiting the impact to property and the environment.

This engaging course includes 12 mandatory lessons that are standard to the course and 3 optional lessons that allow the host agency to customize the course to their particular needs. The optional lessons are: a lesson intended for coastal states with bridges crossing tidal waterways; a lesson that supplements the Unsteady Flow Modeling Concepts lesson and provides additional knowledge of the requirements for one-dimensional unsteady flow modeling; and a lesson that supplements the Scour and Stream Instability Concepts lesson, which enables participants to identify situations requiring sediment transport computations as part of the bridge hydraulics analysis. The host agency will select two optional lessons for the delivery of this course.

Material for this 3-day course is primarily derived from the Hydraulic Design Series No. 7 (HDS 7), Hydraulic Design of Safe Bridges, which is provided to course participants. The course covers significant aspects of bridge hydraulic design including: regulatory topics, specific approaches for bridge hydraulic modeling, hydraulic model selection, bridge design impacts on scour and stream instability, and sediment transport.

Prior to the beginning of the 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 this course.

## OUTCOMES

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

- Describe the ways hydraulic design affects bridge performance and public safety
- Describe hydraulic conditions that occur in the vicinity of bridges
- Identify regulatory requirements and design constraints important to bridge projects
- Describe the input requirements for one-dimensional models
- Identify conditions when one-dimensional modeling is adequate to develop accurate hydraulic results for safe bridge design
- Describe the effects of atypical bridge hydraulic conditions on bridge design
- Perform a qualitative risk assessment for a bridge replacement project
- Describe the properties and input requirements for two-dimensional models
- Distinguish conditions requiring two-dimensional modeling to develop accurate hydraulic results for safe bridge design
- Define the types of scour and stream instability that affect bridge design
- Identify how hydraulic variables are obtained from one- and two-dimensional models
- Assess whether a replacement bridge design alternative will have adequate hydraulic capacity to meet design criteria
- Distinguish conditions requiring unsteady flow modeling to develop accurate hydraulic results for safe bridge design
- Describe additional analyses that contribute to the hydraulic aspects of safe bridge design
- Determine the minimum required foundation depth based on scour conditions
- Assess the likelihood of a bridge project causing adverse hydraulic impacts downstream
- Demonstrate strategies for communicating hydraulic recommendations to various stakeholders

## TARGET AUDIENCE

The target audience for 135090 Hydraulic Design of Safe Bridges is primarily members of Federal or State departments of transportation. This typically includes hydraulic engineers with a wide range of experience; however, structural and geotechnical engineers would benefit from an understanding of many of the topics in this course. The complexity of some of the engineering decisions made can have significant impacts on structural and geotechnical designs. Additionally, many other segments of the national and international engineering community may find this course

valuable. Federal, State, and local highway hydraulic engineers responsible for maintaining the integrity of highway bridges against possible hydraulic related problems will rely on this course and HDS 7 for guidance. Consultants who perform bridge engineering work are also encouraged to attend.

**TRAINING LEVEL:** Intermediate

**FEE:** 2020: \$375 Per Person; 2021: \$375 Per Person

**LENGTH:** 3 DAYS (CEU: 1.8 UNITS)

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

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