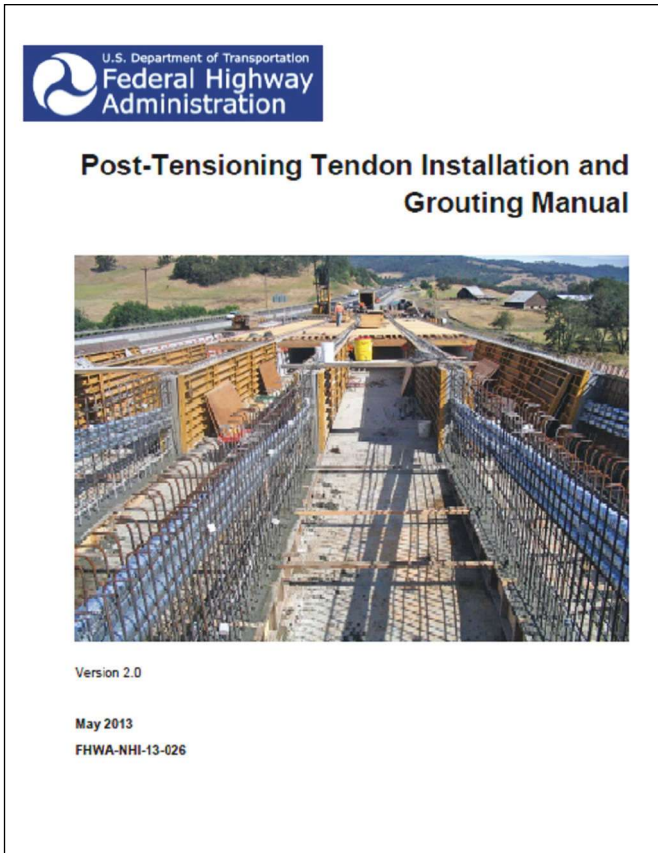


# FHWA Initiatives

Advancing the state of practice in bridge design

by Reggie Holt and Dr. Brian Kozy, Federal Highway Administration



*Post-Tensioning Tendon Installation and Grouting Manual.*

The Federal Highway Administration (FHWA) Office of Bridges and Structures routinely develops training and guidance on engineering technologies that improve the safety, durability, and longevity of our nation's bridges. FHWA has recently completed several technology deployment projects intended to advance the state of practice for bridge engineering. This article provides a general overview of a few of these projects, as well as describing other on-going projects.

## POST-TENSIONING MANUALS AND TRAINING

The recent advances in post-tensioning (PT) technologies have resulted in many FHWA deployment activities focused on this topic. The products listed below cover multiple aspects of post-tensioned bridges, including design, construction, and inspection.

*Post-Tensioning Tendons module is part of the Bridge Inspection Refresher Training.*

## Post-Tensioning Tendon Installation and Grouting Manual and Training

This manual includes state-of-the-art information relative to materials, PT systems, construction practices, and grouting of PT tendons for bridges. The manual is targeted at owners and private company personnel that may be involved in the design, inspection, construction, or maintenance of bridges that contain PT tendons. This manual serves as a reference and guide to designers, inspectors, and construction personnel for PT materials, installation, and grouting of bridge tendons.

Complementary web-based training for this manual is under development. The estimated available date for this training is May 2015 on the National Highway Institute's (NHI) website.

## Post-Tensioning Tendon Inspection Training Module

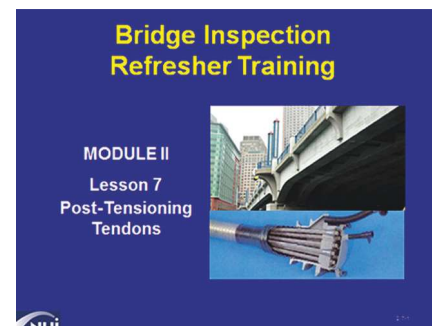
A 30-minute lesson was developed on routine inspections of post-tensioned bridges. The lesson provides an introduction to PT principles and components as well as a list of good inspection techniques. In addition, the lesson provides guidance on routine inspection findings that would initiate supplementary investigations such as in-depth or special inspections. The techniques highlighted in this lesson can be performed by a typical inspection crew. This lesson is part of the Bridge Inspection Refresher Training course and can be scheduled through the NHI.

## BRIDGE ANALYSIS AND DESIGN MANUALS AND TRAINING

Over the last few decades, significant advancements have been made in the way that bridge engineering analysis and design can be performed. Engineering practitioners today, with the aid of advancing computer technology, are able to solve engineering problems of great complexity and produce designs and analysis that are more refined and more reliable than in the past. The products listed below promote practical implementation of advanced techniques for improved bridge engineering.

## LRFD Seismic Analysis and Design of Bridges Reference Manual and Training

This manual is intended to provide a technical resource for bridge engineers responsible for both force-based and displacement-based seismic analysis and design. The manual covers fundamental





U.S. Department of Transportation  
Federal Highway Administration

Publication No. FHWA-NHI-15-004  
October 2014

**NHI Course No. 130093 and 130093A**

**LRFD Seismic Analysis and Design of Bridges Reference Manual**

Developed following:

AASHTO LRFD Bridge Design Specifications 6th Ed., 2013 Interim  
AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Ed., 2014 interim  
AASHTO Guide Specifications for Seismic Isolation Design, 2010



*LRFD Seismic Analysis and Design of Bridges Reference Manual.*

topics such as engineering seismology, seismic and geotechnical hazards, capacity design, structural dynamics, and methods for modeling and analyzing bridges subject to earthquake ground motions. It also discusses the requirements and recommendations of the seismic provisions in each of the *AASHTO LRFD Bridge Design Specifications*, *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, and *AASHTO Guide Specifications for Seismic Isolation Design*. There is complementary, instructor-led training that can be scheduled through the NHI.

**Cable-Stayed Bridge Seminar and Design Guidelines**

This one-day seminar is intended to provide participants with an introduction to planning, design, and construction of long-span, cable-stayed bridges. The seminar provides an overview of the features of cable-stayed bridges; their construction and maintenance considerations; and analyses needed to design these highly redundant structures including special aerodynamic studies. Major topics covered include: bridge configurations, construction methodology, component details, analysis, aerodynamics, design methodology, construction engineering, and maintenance and inspection. As part of the seminar, participants receive a

copy of *FHWA Design Guidelines for the Arch and Cable-Supported Signature Bridges*. During the seminar, participants will become familiar with the features of cable-stayed bridges. They will also better understand construction and maintenance considerations, as well as analyses needed to design and construct cable-stayed bridges. This seminar can be scheduled through the NHI.

**LRFD for Highway Bridge Superstructures Manual and Training**

This course is a combination of instructor-led discussions and interactive exercises, and includes a comprehensive reference manual. It includes load and resistance factor design (LRFD) theory applied to design examples and illustrates step-by-step LRFD design procedures. Exercises and example problems are based on components of overall comprehensive bridge design examples using AASHTO LRFD. This course explains the background and methodology of the LRFD design and promotes proper application of code provisions.

An update to this course to incorporate the 7th Edition of the *AASHTO LRFD Bridge Design Specification* is in the final stages. The estimated release date for this instructor-led training and reference manual is July 2015. This training can be scheduled through the NHI.

**FUTURE ACTIVITIES**

FHWA has many projects underway intended to develop additional guidance, manuals, and training on bridge engineering. These projects include the topics of: refined analysis of bridge structures, design of post-tensioned box-girder bridges, advanced topics in precast concrete element design, system reliability in bridge systems, enhanced PT systems, bridge strengthening, and bridge durability design. A list of the expected soon-to-be-completed manuals and training are listed below:

- *Post-Tensioned Bridge Design* manual
- *Manual on Refined Analysis of Bridges*
- *Engineering for Stability in Bridge Construction*
- *LRFD for Highway Bridge Superstructures* Web-based Training

**More Information**

Courses listed below can be found on the National Highway Institute's (NHI's) website <https://www.nhi.fhwa.dot.gov/default.aspx>.

**Post-Tensioning Tendon Installation and Grouting Manual and Training**

Course No. 1301103 is expected to be available through the NHI in May 2015.

The document can be viewed/downloaded electronically from <http://www.fhwa.dot.gov/bridge/construction/pubs/hif13026.pdf>.

**Post-Tensioning Tendon Inspection Training Module**

This lesson is part of the Bridge Inspection Refresher Training course (No. 130053A) and can be scheduled through the NHI.

**LRFD Seismic Analysis and Design of Bridges Reference Manual and Training**

There is complementary, instructor-led training (Course No. 130093) that can be scheduled through the NHI.

The document can be viewed/downloaded electronically at <http://www.fhwa.dot.gov/bridge/seismic/nhi130093.pdf>.

**Cable-Stayed Bridge Seminar and Design Guidelines**

This seminar (Course No. 130096) can be scheduled through the NHI. All seminar participants receive a copy of *FHWA Design Guidelines for the Arch and Cable-Supported Signature Bridges*.

**LRFD for Highway Bridge Superstructures Manual and Training**

Course No. 130081 is expected to be available through the NHI in July 2015.

Stay tuned for future notifications of new products in upcoming *ASPIRE™* articles.