

Load and Resistance Factor Rating of Highway Bridges

Purpose and Background

The AASHTO *Manual for Evaluation of Bridges* (MBE) incorporates provisions specific to the Load and Resistance Factor Rating (LRFR) method developed to provide uniform reliability in bridge load ratings, load postings, and permit decisions. Many states are currently making their transition to the LRFR methodology following the provisions contained in the AASHTO MBE. Bridges designed using the LRFD method should be load rated using LRFR for reporting to the National Bridge Inventory.

The purpose of this course is to concentrate on the fundamentals of load rating highway bridges using the latest LRFR provisions in the AASHTO MBE. The course will begin with an overview of the AASHTO MBE, load rating methods, and introduce the load and resistance factor philosophy for new bridge designs and for load rating of existing bridges. The LRFR approach is broken down into its basic components and a detailed explanation is provided on how and why each component was developed. LRFR live load models, load factors, distribution factors, load combinations, and rating provisions for steel and concrete bridges will be reviewed. Posting and permitting procedures specific to LRFR will be described. Examples with detailed step-by-step explanations will be used to illustrate the LRFR rating procedures. Fatigue evaluation methods for steel bridges and load rating of bridges by load testing are additional topics included in this course that follow the requirements of Sections 7 and 8 of the AASHTO MBE. Participants will also be instructed on the use of refined methods of analysis in load ratings and permitting, and their potential benefits.

Seminar Instructor

BALA SIVAKUMAR, P.E., M.ASCE, is Vice President and Director of Special Bridge Projects for HNTB Corporation. Mr. Sivakumar was the architect of the LRFR evaluation philosophy and was the Principal Investigator / Primary author for developing the *AASHTO Manual for Bridge Evaluation* and the *AASHTO Load and Resistance Factor Rating Manual* (2003). He served as the Principal Investigator of NCHRP Project 12-63 that was initiated in 2003 to propose revisions to AASHTO legal loads and loads for posting of bridges. Five new legal load models developed under this project were adopted by AASHTO as new national posting loads. He was also the lead developer for the National Highway Institute's 2 and 4 day courses on LRFR. Mr. Sivakumar serves as Consultant to AASHTO Technical Committee T18 on *Bridge Management, Evaluation & Rehabilitation* to assist with the maintenance and ongoing development of the *AASHTO Manual for Bridge Evaluation*. He has served as the lead engineer on several statewide load rating programs. He has developed and delivered LRFR and seminars, training courses, and workshops for over 30 state DOTs. He has provided technical assistance to several DOTs with their load rating policies and transition to LRFR.

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

Summary Outline

DAY ONE

- Introduction to load rating of highway bridges
- Overview of the AASHTO *Manual for Evaluation of Bridges*
- Requirements for load rating bridges and NBI reporting
- Inspection and data collection for load rating
- Elements to be load rated
- Loads to be considered when load rating bridges
- Load rating methods – past and present
- Introduction to the Load and Resistance Factor philosophy
- Reliability index and calibration of load factors
- LRFD design live load and distribution of live loads
- LRFR rating equation
- Load models and load factors for LRFR
- Limit states for LRFR ratings

DAY TWO

- Member resistances for LRFR
- Incorporating member deterioration in the analysis
- Resistance modification factors and redundancy factors
- Rating of slab bridges
- LRFR posting procedures
- LRFR overweight permitting procedures
- Steel bridge LRFR rating example
- Concrete bridge LRFR rating example
- Fatigue evaluation for steel bridges
- LRFR provisions for truss bridges
- Overview of load testing and refined analysis methods

Seminar Benefits

- Understand the requirements for bridge evaluation contained in the AASHTO MBE
- Understand the fundamentals of the LRFR methodology
- Understand the fundamentals of structural reliability and calibration of the LRFR Specifications
- Understand the new technologies introduced in the AASHTO MBE
- Learn how to interpret and apply the MBE LRFR provisions to bridge load rating
- Learn through easy-to-follow rating examples with detailed explanations
- Get the latest information on load rating research and software
- Learn how to load rate bridges for legal loads and permit loads and superloads using the latest LRFR
- Learn how to evaluate bridges for fatigue cracking
- Learn how to load rate bridges by load testing to achieve enhanced capacity
- Learn how to utilize refined analysis methods to improve load ratings
- Obtain an understanding of how to plan and implement effective load rating and permitting policies and procedures using the latest MBE in your state

Who Should Attend?

- Bridge inspectors, load rating engineers, and designers
- Junior engineers/Structural engineers
- Senior managers/Project managers
- Bridge owners
- Transportation policy makers and decision makers
- Program managers responsible for implementing capital and maintenance programs
- Other bridge engineering professionals
- Engineers in related fields interested in learning about the latest in bridge engineering

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John Wyrick, Director
On-Site Training Worldwide
ASCE Continuing Education
Tel.: 703-295-6184
Email: jwyrick@asce.org

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