

# Bridge Rehabilitation

## Purpose and Background

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With rapid aging of the national highway infrastructure, state and local governments are spending more and more money on bridge rehabilitation. Currently, most states spend more money on bridge replacement and rehabilitation than building new bridges. This trend will certainly continue.

Bridge rehabilitation design differs from new bridge design in many ways. It requires a very high degree of knowledge and skill in structure condition evaluation, structural analysis, application of new materials, maintenance of traffic (staged construction), construction methods, and project lifecycle cost analysis. All of these are project specific, and require sound judgment to develop the best design alternative. Because of the complexity, most universities do not offer undergraduate or graduate courses on this subject.

This two-day seminar covers subjects such as: structure condition evaluation, bridge load rating and rehabilitation analysis, state-of-the-art rehabilitation techniques, alternative analysis models, new material applications, construction methods and constructability analysis, and project lifecycle cost analysis.

## Seminar Instructor

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**Jim J. Zhao, Ph.D., P.Eng, P.E., F.ASCE**, is Director of Engineering with Sheladia Associates in Maryland. He received his degrees from Tongji University, University of Ottawa, Université du Québec, and Bryson University. Mr. Zhao has over 30 years of experience in design, teaching and research in structural engineering and project management. He has authored several articles on bridge and structural engineering. He is licensed in the U.S. and Canada. He serves on ASCE-ACI joint committees on Concrete Bridge Design and on Prestressed Concrete Design. He is past-president of the Structural Engineering Institute, Maryland Chapter.

His recent publications include *Bridge Engineering*, the popular college textbook published by McGraw-Hill. He also co-authored *State-of-the-Art Report on Partially Prestressed Concrete*, ACI 423.5R-99; *Recommendations for Concrete Members Prestressed with Unbounded Tendons*, ACI 423.3R-96; *Analysis and Design of Reinforced Concrete Bridge Structures*, ACI 343R-95; and *Analysis and Design of Reinforced and Prestressed Concrete Guide-way Structures*, ACI 358.1R-03.

- To register your group, call John Wyrick (JWyrick@asce.org) or Stephanie Tomlinson (STomlinson@asce.org)

## Summary Outline

### DAY ONE

#### Introduction

- Define seminar objective
- Brief review of bridge rehabilitation procedures
- Bridge inspections
- Non-destructive bridge inspection methods
- Condition evaluation and load rating analysis
- Load rating calculation examples

#### New Materials and Techniques

- Substructure rehabilitation
- Superstructure rehabilitation
- Earthquake retrofitting design
- Applications of new construction materials and construction methods

### DAY TWO

#### Staged Construction

- MOT introduction
- Design procedures
- Construction consideration
- Bearings and deck joints
- Example problems and solutions

#### Decision Making Models

- Decision matrix
- Lifecycle cost analysis
- Risk analysis
- Replacement vs. rehabilitation
- Bridge Management System Examples

#### Case Studies

- Case study 1 Castlewood Canyon Bridge Rehabilitation, Douglas County, Colorado
- Case study 2 Kanawha River Bridge Replacement / Rehabilitation Project, Charleston, West Virginia

## Seminar Benefits

- Gain an understanding of overall bridge rehabilitation procedures
- Learn existing bridge condition evaluation and Bridge Management System (BMS)
- Learn decision-making models
- Learn state-of-the-art bridge rehabilitation techniques
- Conduct or supervise bridge inspections to meet National Bridge Inspection Standards
- Perform a bridge load rating analysis per AASHTO The Manual for Bridge Evaluation or using load test and finite element analysis
- Use decision making tools to select the best bridge rehabilitation alternative
- Perform a detailed bridge rehabilitation design using materials and new techniques

## Who Should Attend?

- Structural engineers
- Bridge designers
- Project managers
- Bridge owners
- Transportation policy or decision makers
- Other bridge engineering professionals will benefit from this seminar.

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