

# Strategic Plan for the Committee on Bridges and Structures

As approved by the Strategic Management Committee, September 22, 2018

## Goal 1: Extend Bridge Service Life

To better understand the processes that decrease the serviceability of existing bridges and highway structures, and to develop approaches to preserve (maintain and rehabilitate) the existing system and extend the life expectancy of new bridges by managing these processes.

1.1 Identify the processes which decrease service life

1.2 Identify the most effective existing and most promising emerging materials and preservation (maintenance and rehabilitation) methods to extend service life

Implementation Actions:

1. Review ongoing research on bearing and expansion joint performance and determine action items
2. Review ongoing research and develop revised acceptance criteria for grouting voids in non-post tensioned applications
3. Develop research statements on fiber reinforced polymer reinforcement of prestressed concrete bridge elements
4. Work with ASTM to develop specifications on fiber reinforced polymers
5. Advance use of innovative grades of steel (e.g., stainless steel)
6. Develop guidance on lightweight bridge deck systems for covered bridge rehabilitation

1.3 Identify methods to determine the optimum time to apply preservation methods

Implementation Actions:

1. Develop guidance for bridge preservation decision making

1.4 Develop and implement specifications, guidelines, and trial applications to assist states in deploying the most effective materials and methods

Implementation Actions:

1. Update guide on fiber reinforced polymer strengthening
2. Develop guidelines on composite fiber reinforced polymers and basalt fiber reinforced polymers
3. Develop service life design specifications
4. Develop guidance on use of titanium for bridge strengthening
5. Develop guidance on preservation of historic bridges
6. Update specifications on methods to detect and protect foundations against scour (with Committee on Design Technical Committee on Hydrology & Hydraulics)

7. Rewrite mechanically stabilized earth (MSE) wall design specifications

## Goal 2: Assess Bridge Condition

To collect appropriate information necessary to characterize the condition of the structure (both superstructure and substructure), to understand the impact on condition from maintenance and preservation actions, and to develop systems to enable owners to efficiently manage assets

2.1 Identify promising cost-effective information modeling and manage technologies for bridge-condition assessment.

Implementation Actions:

1. Further develop movable bridge element-level inspection criteria
2. Develop advanced field evaluation tools for condition assessment of wood members
3. Update the *Manual for Bridge Evaluation* to include provisions for tunnel load rating and FRP load rating
4. Compile best practices for post-fire tunnel structural inspections

2.2 Develop data format best practices for maintenance and preservation action data.

2.3 Implement and evaluate prototype technologies

Implementation Actions:

1. Revisit fracture control plan for steel bridges
2. Update specifications to include non-destructive technologies for evaluating full penetration welds in existing bridge structures

2.4 Recommend actions based upon the evaluations.

Implementation Actions:

1. Coordinate with the Committee on Maintenance regarding implementation of *Guidelines for Maintaining Small Movement Bridge Expansion Joints*
2. Review ongoing research and update the *Manual for Bridge Element Inspection*
3. Update *Manual for Bridge Evaluation* to incorporate best practices in bridge evaluation

2.5 Deploy multiple information systems to collect, model, and manage bridge condition information.

Implementation Actions:

1. Continue support of FHWA Long Term Bridge Performance Program
2. Explore the use and support the deployment of small unmanned aerial systems in bridge inspection
3. Develop guidelines for deployment of bridge condition data within Bridge Information Management (BIM) related technologies in transportation

### **Goal 3: Maintain and Enhance a Knowledgeable Workforce**

To understand the existing approaches to acquisition, management, and dissemination of bridge design, repair, maintenance, and preservation knowledge, and to develop new or more effective approaches consistent with the evolving bridge engineering community and emerging technology.

#### **3.1 Identify, develop, and deploy enhanced professional and undergraduate training strategies**

Implementation Actions:

1. Conduct webinar on implementation of Service Life Design for Bridges
2. Conduct workshops on implementation of research recommendations and new AASHTO specifications
3. Compile best practices for development, retaining, and training tunnel maintenance and operations staff

#### **3.2 Identify and implement strategies for the establishment of a bridge engineering knowledge database, develop a national program for guiding the training of bridge engineers, and establish and maintain a collaboration between academia and the bridge engineering community.**

Implementation Actions:

1. Develop educational models of the four significant wooden truss designs

#### **3.3 Identify, develop, and deploy successful mentoring and succession planning strategies**

### **Goal 4: Maintain and Enhance the AASHTO Specifications**

To provide clear, concise technical guidance to the practicing bridge engineer, to understand the limit states required for safer, serviceable, and economical bridges and highway structures, and to develop enhanced reliability-based design and evaluation provisions addressing these limit states in a clear and concise manner relatively consistent with traditional highway-bridge practice and effort while incorporating new or enhanced construction materials and processes.

#### **4.1 Define all of the limit states (including the service limit states) and their associated performance requirements.**

Implementation Actions:

1. Document the state of the practice in seismic design of non-conventional bridges

4.2 Complete calibration of the design specifications utilizing existing or developed databases for maintenance and operation (including geotechnical issues).

Implementation Actions:

1. Review ongoing research and update multiple provisions of *the LRFD Bridge Design Specifications* as recommended
2. Address discrepancies in specifications for wind loads for temporary works and LRFD design loads
3. Review ongoing research and implement recommendations regarding design and construction of temporary bridges
4. Review development of *FHWA Manual on Refined Analysis*
5. Fully update the *LRFD Movable Bridge Design Specifications*
6. Review ongoing research and provide guidance regarding remote operations of movable bridges
7. Review ongoing research and update the *LRFD Construction Specifications* as recommended

4.3 Develop a performance-based design and construction specifications and accompanying design manual.

Implementation Actions:

1. Review ongoing research regarding the design of bridge rails and bridge pier shielding and revise existing specifications accordingly

4.4 Develop and deploy performance standards for security design of major bridges and hazard awareness and recovery of bridges.

Implementation Actions:

1. Update *Bridge Security Guidelines*
2. Broaden focus of T-1 Technical Committee on Bridge Security & Hazards to provide focus on intentional and unintentional resiliency hazards
3. Identify and establish relationships within AASHTO, TRB, and other agencies to leverage resiliency research and implementation
4. Develop guide on tsunami loading of bridges
5. Develop and adopt new seismic maps for design specifications
6. Coordinate as appropriate with the Committee on Transportation System Security and Resilience on above actions

## **Goal 5: Accelerated Bridge Delivery and Construction**

To understand the time-constraints, durability, and economy of traditional bridge systems and their delivery and construction methods, and to develop enhanced systems and accelerated methods overcoming traditional time-constraints while maintaining or enhancing safety, durability, and economy.

5.1 Identify and develop strategies to overcome barriers (both technical and cultural) to the application of accelerated bridge construction techniques.

Implementation Actions:

1. Incorporate ongoing research findings on seismic specifications into *Guide Specifications for Accelerated Bridge Construction*
2. Review ongoing research and develop specifications for simplified connections between precast deck panels and beams

5.2 Identify the most promising emerging and effective existing accelerated bridge delivery and construction techniques and develop them into viable options

Implementation Actions:

1. Work with other AASHTO committees and outside groups on development of materials that support accelerated bridge construction
2. Work with other AASHTO committees and outside groups on potential streamlining of materials testing procedures via mobile labs or onsite testing

5.3 Identify benefit/cost parameters to indicate when accelerated construction is appropriate

Implementation Actions:

1. Coordinate with FHWA on the development of decision-making tools for states

5.4 Deploy the most effective accelerated bridge construction techniques.

## **Goal 6: Optimize Structural Systems**

To understand the advantages and limitations of traditional and emerging materials in terms of safety, durability, and economy; and to develop structural systems (optimized materials, details, components, structures, and foundations) for bridges and highway structures that efficiently employ these materials to assure a safe, minimum 75-year service life requiring minimal maintenance.

6.1 Identify beneficial and achievable material properties and develop optimized structural systems with these properties.

Implementation Actions:

1. Develop design, construction, and material provisions for disc bearings
2. Develop guidance on how to consider the uncertainties in soil and rock properties for design of foundations and walls

6.2 Identify and deploy beneficial and achievable structural characteristics for optimized safe, durable, and cost-effective structural systems.

Implementation Actions:

1. Review ongoing research on changes in material quality relative to resistance factors and revise specifications accordingly
2. Update structural supports specifications to include provisions for use of aluminum and high strength bolts
3. Develop design, construction, and material specification guidance on steel curved girders with tubular flanges
4. Review ongoing research and develop specifications for continuous flight auger piles
5. Update specifications to include the latest advances in materials and welding technology and techniques to optimize the fabrication of steel bridge members
6. Develop tunnel finish standards

6.3 Identify and mitigate barriers to deployment.

Implementation Actions:

1. Develop 5-year roadmap for expanded use of Ultra High Performance Concrete (UHPC)
2. Develop guidance on use of LED tunnel lighting

## **Goal 7: Model and Manage Information Intelligently**

To understand the complex systems of information that bridges represent, in terms of geometry, load-carrying capacity, condition, and history, and to better characterize these systems and future needs through modeling and management of the information.

7.1 Identify and assess information modeling and management techniques viable for highway bridge practice

Implementation Actions:

1. Develop research needs for a wide variety of Bridge Information Management (BIM) related topics and technologies

7.2 Develop standards, guidelines, and protocols to implement those techniques and tactics to overcome barriers to deployment.

Implementation Actions:

1. Develop 3D modeling standard for structural steel members
2. Develop national Bridge Information Management (BIM) for Bridges and Structures Exchange Standard
3. Work with pooled fund, FHWA, and the construction industries to deploy BIM related technologies in transportation

## **Goal 8: Contribute to National Policy**

To understand the functioning and decision-making consequences affecting transportation systems, to develop approaches to enhance the bridge engineers' contribution to policy development, and to implement national bridge performance measures.

8.1 Initiate studies of project delivery systems, oversize/overweight vehicles, and long term impact of construction on the environment.

Implementation Actions:

1. Review ongoing research on increases in truck loading and revise specifications accordingly
2. Review ongoing research on increases in size and weight of implements of husbandry and revise specifications accordingly

8.2 Develop and deploy strategies to facilitate and encourage the involvement of bridge engineers in public review and decision-making processes, including outreach to all stakeholders.

8.3 Develop bridge performance measures

Implementation Actions:

1. Work with FHWA to refine the national bridge performance measures based on element level data

8.4 Develop recommendations on oversize/overweight vehicle issues (including outreach to trucking associations) and project delivery systems

Implementation Actions:

1. Review FHWA study on autonomous vehicles and determine possible impacts to bridge specifications
2. Work with other committees to identify and address federal policies affecting freight movement and timely emergency response while ensuring the safe operation of the bridge inventory