

## 28. Bridge Management

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### 28.1. Responsibilities

This chapter briefly discusses the responsibilities of DOT&PF units that are involved with managing Alaska's bridges.

#### 28.1.1. Bridge Section

The Bridge Management Unit is responsible for the state's bridge management activities. These include:

- collecting technical data during inspections. The state inspects all bridges on public roads except for those that are federally owned;
- developing and distributing inspection reports;
- developing program work recommendations, which are provided to the regions and local agency bridge owners;
- reporting on bridge performance measures as part of the state Office of Management and Budget's "Key Performance Indicators" for DOT&PF;
- responding to internal and external bridge data inquiries;
- developing and prioritizing bridge rehabilitation and replacement lists to decision-makers;
- identifying and assisting the regions with programming bridge rehabilitation projects;
- load rating bridges; and
- assisting Measurement Standards and Commercial Vehicle Enforcement with evaluating overweight permit requests.

#### 28.1.2. Program Development

The Division of Program Development uses the information provided by the Bridge Section to include bridge projects in the Statewide Transportation Improvement Plan (STIP).

#### 28.1.3. Regional Offices

Department regional offices use the information provided by the Bridge Section to help develop their proposed overall program of capital-improvement projects for DOT&PF funding.

#### 28.1.4. Maintenance Division

The DOT&PF Maintenance & Operations (M&O) electronically extracts work candidates from the AASHTOWare Bridge Management (BrM) database for use in the Statewide Maintenance Management System.

## **28.2. BrM Software**

AASHTOWare Bridge Management (BrM) is an AASHTO bridge management software package that relies upon collected condition data and cost data for bridge elements (e.g., girders, piers, railings). DOT&PF administers and maintains the BrM database in the Oracle environment

State DOTs may use this data to identify least-cost (optimal), long-term preservation and improvement policies for a network of bridges.

DOT&PF currently uses BrM to warehouse the state's NBI data and to collect and store all element-level bridge inspection data.

BrM stores inventory and inspection information on bridges in a relational database that supports modeling, analysis, and reporting tools to facilitate project, budget, and program development. BrM assists in the formulation of network-wide preservation and improvement policies for use in evaluating the needs of each structure in the network, and makes project recommendations for DOT&PF program of capital projects. BrM analyzes the impact of various project alternatives on the performance of individual structures or a network of structures.

### **28.2.1. Bridge Management Process**

The bridge management process begins with the building of a relational database that includes importing NBI data and adding element-level inspection information.

DOT&PF uses this information to develop prioritized lists that are provided to the Division of Program Development and the regions for use in preparing project scopes. A brief discussion of the prioritization model is included in Appendix 28.A.

### **28.2.2. Elements**

In its use of element-level inspection data, BrM subdivides the main components of a typical bridge (e.g., deck, superstructure, substructure) into numerous elements to add more detail and precision.

DOT&PF's bridges can be defined from a set of National Bridge Elements (NBEs), Bridge Management Elements (BMEs), and (Agency-Developed Elements (ADEs), as defined by the *AASHTO Manual for Bridge Element Inspection*.

### **28.2.3. Bridge Inspection**

Chapter 26 discusses the Alaska Bridge Inspection Program.

## 28.3. Federal-Aid Program

Federal Highway Administration (FHWA) funds are eligible for use for replacement, rehabilitation, seismic retrofit, preservation, scour countermeasures and application of anti-icing or deicing compositions to highway bridges on and off federal-aid highways.

### 28.3.1. Sufficiency Rating/Structural Deficiency/Functional Obsolescence

The sufficiency rating (SR) is based on a 0 to 100 scale (100 being best), and is calculated using a formula that incorporates four factors:

- structural adequacy and safety (55 percent),
- serviceability (30 percent),
- essentiality for public use (15 percent), and
- special reductions (up to 13 percent).

#### Structurally Deficient

In general a bridge is categorized as structurally deficient (SD) if the bridge:

1. is in relatively poor condition due to deterioration or damage;
2. has insufficient load-carrying capacity (whether due to the bridge being of older design or due to deterioration); or
3. frequently floods, causing significant traffic delays.

Structurally deficient bridges may require significant maintenance attention, rehabilitation, or replacement. These bridges often require load posting (See Chapter 27).

However, the classification of a bridge as structurally deficient does *not* usually mean that it is in danger of collapse or that it is unsafe.

#### Functionally Obsolete

In general a bridge is categorized as functionally obsolete (FO) if the bridge:

- is narrow,
- has inadequate under clearances,
- is poorly aligned with the adjacent roadway, and/or
- can no longer adequately service today's traffic,
- occasionally floods, causing significant traffic delays.

Functionally obsolete bridges may not provide the lane widths, shoulder widths, vertical clearances, etc.,

adequate to serve traffic demand, or the bridge may not be able to handle occasional roadway flooding without causing traffic delays.

By rule, bridges that qualify as both structurally deficient and functionally obsolete are categorized and reported solely as structurally deficient.

For additional coding information, refer to the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*, Report No. FHWA-PD-96-001.

### 28.3.2. MAP-21

#### National Highway Performance Program

In 2012, the *Moving Ahead for Progress in the 21<sup>st</sup> Century Act* (MAP-21) became law. MAP-21 consolidated several FHWA funding programs, including the Highway Bridge Program, into the National Highway Performance Program (NHPP).

The cornerstone of MAP-21's highway program transformation is the transition to a performance and outcome based federal-aid program. States will invest resources in projects to achieve individual targets that collectively will make progress toward national goals.

For bridges, the Secretary, in consultation with States, Metropolitan Planning Organizations (MPOs) and other stakeholders, will establish performance measures for bridge conditions. States (and MPOs, where applicable) will set performance targets in support of those measures, and state and metropolitan plans will describe how program and project selection will help achieve the targets.

#### Performance Based NHS

MAP-21 establishes a performance basis for maintaining and improving the NHS.

States are required to develop a risk and performance based asset management plan for the NHS to improve or preserve asset condition and system performance. The plan development process must be reviewed and recertified at least every four years.

The Secretary will establish performance measures for Interstate and NHS pavements, NHS bridge conditions, and Interstate and NHS system performance. States will establish targets for these measures, to be periodically updated.

MAP-21 requires minimum standards for conditions of Interstate pavements and NHS bridges by requiring

states to devote resources to improving their condition until the established minimum is exceeded.

MAP-21 establishes the minimum standards for NHS bridge conditions – if more than 10 percent of the total deck area of NHS bridges in a state is on structurally deficient bridges, the state must devote a portion of NHPP funds to improve conditions.

### **Surface Transportation Program**

MAP-21 continues the STP, providing flexible funding that may be used by states and local governments for projects to preserve or improve conditions and performance on any federal-aid highway, bridge projects on any public roads, facilities for nonmotorized transportation, transit capital projects and public bus terminals and facilities.

Fifty percent of state STP funds must be distributed to areas based on population (suballocated), with the remainder to be used in any area of the state.

Also, a portion of state STP funds (equal to 15 percent of the state FY 2009 Highway Bridge Program apportionment) must be set aside for bridges not on federal-aid highways (off system bridges), unless FHWA determines that the state has insufficient needs to justify this amount.

### **28.3.3. Prioritization Model**

See Appendix 28.A.

## **Appendix 28.A**

### **Prioritization of Structurally Deficient Bridges**

Factors included in the model used to generate prioritized lists of bridges for rehabilitation and/or replacement are:

1. Structural condition - NBI Items 58 (Deck), 59 (Superstructure), 60 (Substructure)
2. Importance (on or off the NHS)
3. ADT
4. Bypass/detour length

Functional obsolescence is not considered in the prioritization model because many narrow bridges are adequate for their ADT. The decision to address functional obsolescence is left to the regions or owners who are most familiar with the use of a bridge. State 3R standards may also require widening when bridges are included within the limits of a larger roadway project.

The load posting status is not considered in the prioritization model because a load posted bridge may be meeting the needs for the level of service it sees and may not require strengthening. The load posting status is provided so that the regions or owners most familiar with the use of a bridge can take this information into account when developing a program. State 3R standards may also require strengthening when bridges are included within the limits of a larger roadway project.

Closed bridges are included in the lists to give a complete accounting of the eligible bridges but not ranked. Closed bridges typically have low ratings but many have been closed with no action taken by the owner to reopen them. The decision to address closed bridges is left to the regions or owners who are most familiar with the needs of the traveling public affected by the closed bridge.

It is possible to look at the data in a variety of ways: All Bridges, All State Owned Bridges, State Owned Bridges On-System, State Owned Bridges Off-System, State DOT Owned Bridges, State DOT Owned-Southcoast Region, State DOT Owned Bridges-Central Region, State DOT Owned-Northern Region, and Non-State Owned Bridges.

## Model for Prioritization of Structurally Deficient Bridges

Parameters used and method of calculation is provided below:

### Start

If the NBI Deck Rating is  $\geq 4$ , then 1; else

If the NBI Deck Rating is  $\leq 3$ , then 3

Multiplied by:

If the NBI Superstructure Rating is  $\geq 5$ , then 1; else

If the NBI Superstructure Rating is = 4, then 2; else

If the NBI Superstructure Rating is  $\leq 3$ , then 5

Multiplied by:

If the NBI Substructure Rating is  $\geq 5$ , then 1; else

If the NBI Substructure Rating is =4, then 2; else

If the NBI Substructure Rating is  $\leq 3$ , then 5

Multiplied by:

$(ADT/5000)^{0.25}$

Multiplied by:

If on NHS, then 3; else 1

Multiplied by:

If the Detour Length is  $\geq 120$  miles then 2; else

If the Detour Length is  $> 50$  miles then 1.5; else

If the Detour Length is  $\leq 50$  miles, then 1

### End

Culverts, Pedestrian Bridges, Railroad Bridges, Tunnels and Minor Structures are not included in the prioritized lists.

## Additional Guidance on 23 CFR 650 D – Programs – Bridge – FHWA

### **Highway Bridge Replacement and Rehabilitation Program (23 CFR 650.409)**

The National Bridge Inventory will be used for preparing the selection list of bridges both on and off of federal-aid highways. Highway bridges considered structurally deficient or functionally obsolete and with a sufficiency rating of 80 or less will be used for the selection list. Those bridges appearing on the list with a sufficiency rating of less than 50.0 will be eligible for replacement or rehabilitation while those with a sufficiency rating of 80.0 or less will be eligible for rehabilitation. To be considered for the classification of deficient bridge, a structure must be of bridge length, and had not been constructed or had major reconstruction within the past 10 years.

### **General Qualifications**

In order to be considered for either the structurally deficient or functionally obsolete classification, a highway bridge must meet the following:

#### 1. Structurally Deficient

- A condition rating of 4 or less for:
  - Item 58 – Deck,
  - Item 59 – Superstructures,
  - Item 60 – Substructures, or
  - Item 62 – Culvert and Retaining Walls<sup>1</sup>
- An appraisal rating of 2 or less for:
  - Item 67 – Structural Condition, or
  - Item 71 – Waterway Adequacy<sup>2</sup>

#### 2. Functionally Obsolete

- An appraisal rating of 3 or less for:
  - Item 68 – Deck Geometry,
  - Item 69 – Underclearance<sup>3</sup>, or
  - Item 72 – Approach Roadway Alignment.
- An appraisal rating of 3 for:
  - Item 67 – Structural Condition, or
  - Item 71 – Waterway Adequacy<sup>2</sup>

A bridge classified as structurally deficient is excluded from the functionally obsolete category.

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<sup>1</sup> Item 62 applies only if the last digit of Item 43 is coded 19.

<sup>2</sup> Item 71 applies only if the last digit of Item 42 is coded 0, 5, 6, 7, 8, or 9.

<sup>3</sup> Item 69 applies only if the last digit of Item 42 is coded 0, 1, 2, 4, 6, 7, or 8.

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