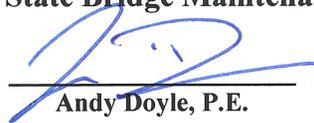


Bridge Structures Maintenance Plan

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Bridge Structures Maintenance Program

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Glossary

Bridge Office	Office of Bridges and Structures
BMU	Bridge Maintenance Unit
DBMC	District Bridge Maintenance Crew
LRFD	Load Resistance Factor Design Bridge Specifications
PM	Preventive Maintenance
SBME	State Bridge Maintenance Engineer
Structure	Bridge and/or Bridge Culvert

Bridge Structures Maintenance Program

Goal

The goal of this program is to extend the useable life of bridge structures in the State of Georgia. This program uses the FHWA *Bridge Preservation Guide, FHWA-HIF-11-042* as a starting point.

Overview

In order to implement an effective program, many changes may have to occur simultaneously. These changes will be with numerous offices within the Department. This will require an introduction to this program by District and Area staff prior to full implementation. However, much of the condition preventive maintenance items listed later in this document can be achieved while this coordination effort is taking place.

This document will cover the many parts to this program:

- Bridge Maintenance / Preservation website.
- Bridge and Culvert Maintenance Manual.
- Selection of Maintenance Level.
- Useful Life.
- Preventive Maintenance – Cyclical PM Activities
- Preventive Maintenance – Condition PM Activities
- Inspections
- Emergency Maintenance

Bridge Structures Maintenance and Rehabilitation Repair Manual.

The *Bridge Structure Maintenance and Rehabilitation Repair Manual* is available online. This resource can be used by District and Area staff to perform maintenance and preventive maintenance on bridge structures.

Web Page for “Bridges and Bridge Culvert Maintenance”

This page will provide “one stop” structure maintenance information.

The objective of this page is to provide GDOT and local government bridge maintenance personnel comprehensive documentation related to maintenance of structures on one page. Documents which are the responsibility of the Bridge Maintenance Unit (BMU) to maintain will

be on the page. In addition, there will be links to all other documents and web pages that are related to maintenance of bridge structures.

Links on this page:

- Bridge Structure Maintenance Manual
- Traffic Control
- Foreman Maintenance Manual
- Qualified Products List (QPL)
- Source
- Standard Bridge Plans
- Standard Construction Details
- Levels of the Bridge and Bridge Culvert Maintenance Plan

Selecting the Maintenance Level for Each Structure

The inventory for the Department includes 6,600+ structures (approximately 4,500 bridge and 2,100 bridge culverts) with an average age of approximately 43 years. These bridge structures were designed and built using many different specifications. Combine this with the reduction of maintenance personnel and decreasing funding, a program has to have many levels of maintenance for structures. The issue is determining what level of maintenance is right for each structure.

3 Categories of Importance

The Office of Bridges and Structures has defined the categories as follows:

- **Critical** – structure with a high cost to build/replace or loss would have major effect to the area, structure that is
 - Cable stay
 - post-tensioned (internal and external)
 - steel box
 - on single access route
 - on a state border
 - Lake structure
 - Long (over 500 feet)
- **Essential** – loss of structure would affect commerce or emergency response, structure that is on
 - STRANET routes
 - interstate (mainline, ramps, overhead)
 - selected commerce routes
 - evacuation routes
- **Other** – all other structures not included in Critical or Essential

Minimum Element Condition State

Each category Importance has a minimum allowable condition state for the National Bridge Elements portion of its inventory. The National Bridge Elements (NBE) are the primary structural components of the bridge. These elements are listed in the current version of the

AASHTO Guide Manual for Bridge Element Inspection. For each importance level, the bridge should maintain all NBE components at or above the following levels:

Minimum Allowable Condition Code

<u>Importance</u>	<u>Minimum Allowable Condition State</u>
Critical	< 25% in Condition State (CS) 2
Essential	<75% in CS 2
Other	<50% in CS 3

Useful Life

Useful life is defined as the period during which an asset is expected to be usable for the purpose it was acquired. It may or may not correspond with the item's actual physical life or economic life.

Useful Life of a Structure

The SBME is responsible for determining the end of useful life of each structure and may use but is not limited to the following criteria:

- Cost of maintenance and/or rehabilitation versus the cost of a replacement structure
- Structure is in the current STIP for replacement
- Structure is posted
- Structure is structurally deficient
- Any NBE Element is coded with 30% of the element in Condition State 4.
- A majority of condition states of the bridge structure are listed as poor or severe
- Age of the structure is greater than 50 years
- Design of the structure is less than HS-20

Essential Maintenance

Once a structure has reached the end of its useful life, only essential maintenance will be performed.

Essential maintenance consists of:

- Keeping debris off the bridge deck and away from the substructure
- Maintaining the deck drains
- Emergency maintenance

Changes

- Office of Maintenance will modify HMMS to get Essential Maintenance from BIMS and add Importance to HMMS structure reports.
- Districts will change maintenance policies/procedures to perform only essential maintenance on the structure.

Bridge Preservation

Bridge preservation is defined as actions or strategies that prevent, delay or reduce deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life. Preservation actions may be preventive or condition-driven.

Preventive Maintenance

Preventive Maintenance (PM) is a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without substantially increasing structural capacity).

Examples of PM activities may include but are not limited to the following:

- *Bridge Washing or Cleaning*
- *Sealing Deck Joints*
- *Facilitating Drainage*
- *Sealing Concrete Deck*
- *Epoxy Injection of Concrete Cracks*
- *Painting Steel*
- *Removing Channel Debris*
- *Lubricating Bearings*

Examples of condition based preventive maintenance activities include but are not limited to:

- *Sealing or replacement of leaking joints*
- *Installation of deck overlays*
- *Installation of cathodic protection (CP) systems*
- *Complete, spot, or zone painting/coating of steel structural elements*
- *Installation of scour countermeasures*

Cyclical Preventive Maintenance Activities

Activities performed on a pre-determined interval and aimed to preserve existing bridge element or component conditions. Bridge element or component conditions are not always directly improved as a result of these activities, but deterioration is expected to be delayed.

To promote Cyclical PM activities, BMU will

- Identify structures requiring the maintenance activities shown below.
- review inspection reports and if needed, visit the site to determine if the maintenance is required at this time
- coordinate with District and determine if District can do the work
- create a project and Let
- As the Department implements this policy, cycles can be adjusted based on bridge performance.

Cyclical Preventive Maintenance Activates can include the following activities.

- **Pressure wash.** Every six years a bridge should be evaluated to see if it needs to be pressured washed on all or some of the bridge surfaces.
- **Deck and joints – cleaning and washing**
 - Snow / Ice events – for those structures that experience a snow / ice event that required de-icing, the structure should be cleaned at the end of the snow / ice season.

- Area Maintenance should clean joints once a year.
- Bridge decks should be cleaned once every two years.
- **Deck drains** – Deck drains should be cleaned once a year.
- **Concrete Members** --With the exception of the deck, pressure wash and paint all concrete surfaces of the bridge:
 - Above the Fall Line, the bridge should be evaluated on a 10 year cycle
 - Below the Fall Line, the bridge should be evaluated on a 15 year cycle
- **Metal expansion joints** (any expansion joint that is anchored into the deck, edge beam, or back wall) – evaluate on the following cycles:
 - Less than 8 Percent of Trucks –on a 30 year cycle
 - Equal to or greater than 8 Percent of Trucks –on a 20 year cycle
- **Expansion joints**
 - Less than 8 Percent of Trucks – evaluate for replacement of joint on a 15 year cycle
 - Equal to or greater than 8 Percent of Trucks – evaluate for replacement of joint on a 10 year cycle
- **Paint structural steel** – The following schedule should be used to evaluate the need to paint steel members:
 - Above the Fall Line and in counties adjacent to the coast
 - Bridge with a continuous steel unit, 20 year cycle
 - Bridge with all simple spans, 25 year cycle
 - Below the Fall Line
 - Bridge with a continuous steel unit, 30 year cycle
 - Bridge with all simple spans, 35 year cycle
- **Other Deck Maintenance**—The following items should be considered on bridge decks in addition to the items previously listed:
 1. Sealant – evaluate 1 year after bridge deck is poured
 2. First Polymer Overlay
 - Less than 8 Percent of Trucks – evaluate after 10 years after Sealant
 - Equal to or greater than 8 Percent of Trucks – evaluate after 5 years after Sealant
 3. Second Polymer Overlay
 - Less than 8 Percent of Trucks – evaluate after 25 years after First Polymer Overlay
 - Equal to or greater than 8 Percent of Trucks – evaluate after 15 years after First Polymer Overlay
 4. Modified Latex Overlay
 - Less than 8 Percent of Trucks – evaluate after 25 years after Second Polymer Overlay
 - Equal to or greater than 8 Percent of Trucks – evaluate after 15 years after Second Polymer Overlay

Condition Based Preventive Maintenance Activities

Activities that are performed on bridge elements as needed and identified through the bridge inspection process.

The BMU is coding element level data with inspections. The basic terminology, in keeping with the *AASHTO Guide Manual for Bridge Element Inspection*, these conditions are generically considered:

<u>Condition State</u>	<u>General Condition</u>
1	Good
2	Fair
3	Poor
4	Severe – load capacity implications

Condition Based Preventive Maintenance Activities can include the following activities

- **Clean and reseal deck joints** – Once the deck joints reach :
 - For concrete beams:
 - 50 % of joints reach condition state 2 **with** any amount in condition state 3
 - Greater than 10% in condition state 3.
 - For steel beams:
 - Once 5% of joints reach condition state 2.
- **Install Deck Overlays** – Evaluate installing a deck overlay under the following conditions:
 - Once greater than 50% of the appropriate deck element is in condition state 2.
 - Once the wearing surface is coded as 50% or greater in condition state 2.
- **Replace edge beams**
 - Once edge beams are coded as 50% or greater in condition state 2.
- **Repair expansion joint**
 - Metal expansion joints: Once 50% of the joint system is in condition state 2 – fair.
 - Non-metal joints: Once greater than 10% of the joint system is in condition state 3 – poor, or if greater than 50% of the joint system is in condition state 2.
- **Patch spalls**
 - If the bridge deck is coded as 20% or greater in condition state 2, it should be evaluated for patching.
- **Paint Structural Steel**
 - Bridges with 20% of steel protective coating in condition state 3, and above the fall line, the structure should be evaluated for full bridge painting
 - Bridges with 35% of steel protective coating in condition state 3, and below the fall line, the structure should be evaluated for full bridge painting
 - If the joint system is coded as 50% in condition state 2 or worse, and the steel protective coating is coded as 10% or greater in condition state 3, the bridge should be evaluated for spot or zone painting.
- **Pressure wash / Paint Concrete members** – Once 35 % of the Concrete Protective Coating is in Condition State 3 – Poor.

- **Installation of Scour Countermeasures**—Any structure that is identified as scour critical or having an unknown foundation (Item 113 coded as 1, 2,3, or U) AND has a scour defect flag applied to the substructure should be evaluated for potential scour countermeasure.
- **Fracture Critical retrofit** – in the *Bridge Preservation Guide* (Publication No. FHWA-HIF-11-042), FHWA lists fracture critical retrofit as an acceptable example of a preventative maintenance activity. Any fracture critical bridge should be evaluated to determine if the remaining useful life of the structure warrants retrofitting the fracture critical members.
- **Overlay of deck** – evaluate once 10 percent of the previous polymer overlay has reached condition state 4.
- **Hydro-demolition of deck** -- 35% of deck element is in condition state 3.
- **Full deck replacement** -- 20% or greater of the deck element is in condition state 4.