WISCONSIN DEPARTMENT OF TRANSPORTATION

BUREAU OF STRUCTURES

Bridge Preservation Policy Guide

Version 1.02

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Bridge Preservation Policy Guide

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Team contributing to the development

WisDOT Central Office
Shiv Gupta, P.E.
Travis McDaniel, P.E.
Joseph Barut, P.E.
David Genson, P.E.
Richard Marz, P.E.

WisDOT Regional Offices
David Bohnsack, P.E.
John Bolka, P.E.
Thomas Hardinger, P.E.
Dan Jashinsky, P.E.

Consultant
Jose Aldayuz, P.E.
Michael Baker International, Inc.

FHWA Liaison
Joe Balice, P.E.
Regional Bridge Engineer

Next Generation Bridge Management
Project Manager
William Oliva, P.E.
Chief, Structures Development

Project Sponsor
Scot Becker, P.E.
Director, Bureau of Structures

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1.0 - OVERVIEW

WisDOT Bridge Preservation Policy Guide provides goals, measures, and strategies for the preservation of bridges. This document contains criteria that is used to identify condition based and non-condition based cyclical preservation, maintenance, and improvement work actions for bridges. These actions maximize project and system-wide life cycle cost and performance of bridges.

Bridges are key components of our highway infrastructure. As of April 2015, Wisconsin had 14,085 bridges, of which 37 % were owned by WisDOT. The average age of these bridges is 36 years. The aging infrastructure is expected to deteriorate faster in the coming decades with increased operational demand unless concerted efforts are taken to preserve and extend their life. In addition, the state bridge infrastructure is also likely to see an increased funding competition among various highway assets. As a result, WisDOT must emphasize a concerted effort to preserve and extend the life of bridge infrastructure while minimizing long-term maintenance costs.

WisDOT Bureau of Structures (BOS) initiated the Next Generation Bridge Management System (NGBMS) project to address several requirements of the 2012 Federal Transportation Bill identified as Moving Ahead for Progress in the 21st Century Act (MAP-21). The bill focuses on implementing a risk-based transportation asset management program with an emphasis on pavements and bridges. This policy guide was developed as part of the NGBMS to support implementation of the bridge preservation related aspects of MAP-21.

This policy guide will also provide WisDOT personnel with a framework for developing preservation programs and projects using a systematic process that reflects the environment and conditions of bridges and reflects the priorities, and strategies of the department.

A well-defined Bridge Preservation program will also help WisDOT use federal funding for Preventative Maintenance (PM) activities by using a systematic process of identifying bridge preservation needs and its qualifying parameters as identified in FHWA's Bridge Preservation Guide. This guide will promote timely preservation actions to extend and optimize the life of bridges in the state.

2.0 – GOALS AND STRATEGIES OF BRIDGE PRESERVATION

The main goal of a bridge preservation program is to maximize the useful life of bridges in a cost effective way. To meet this goal, many of the strategies are aimed at applying the appropriate bridge preservation treatments and activities at the proper time resulting in longer service life at an optimal life cycle cost. Federal Transportation Legislation (MAP-21) promotes the goal of maintaining or preserving infrastructure assets "in a state of good repair". Preservation of assets is one of the tools that will be used to achieve an overall transportation investment strategy. There are a number of

related goals that have been developed that address the priorities of the department and our stakeholders.

The Goals of the WisDOT Bridge Preservation Program are:

- Maintain bridges in a "state of good repair" using low-cost effective strategies.
- Implement timely preservation treatments on structurally sound bridges to promote optimal life cycle cost and extend service life. This will reduce the need for major rehabilitation and replacement.
- Limit adverse impacts to traffic operations and various stakeholders.
- Promote and support budgeting of preventive maintenance activities
- Establish performance goals and monitor progress related to preservation of bridges.
- Optimize the benefits and effectiveness of long-term maintenance investment in achieving bridges in good condition.

To achieve the goals of the bridge preservation program, WisDOT will use data driven strategies. This approach is aimed at applying the appropriate bridge preservation treatments and activities at the proper time. These strategies are also aimed at maximizing efficiency and effectiveness of the program.

The Strategies include:

- Regular analysis of the bridge inventory data to establish conditions and trends related to performance.
- Develop and maintain criteria for eligible preservation activities
- Define preservation program and project needs
- Develop estimates of needed financial resources at the Project/Program level.
- Prioritize, plan, and perform preservation treatments.
- Group preservation maintenance projects to promote economy and minimize the inconvenience to the public
- Identify preservation needs that complement maintenance, repair, and rehabilitation actions and timelines.
- Securing approval and support from key stakeholders in the use of Federal and State funding for systematic preventive maintenance and preservation activities.
- Consider preservation at the bridge design stage

3.0 - Bridge Preservation Actions

This Policy Guide focuses on bridge preservation actions that relates to preventive maintenance and element rehabilitation. Cyclical and Condition Based Activities are sub-sets of Preventative Maintenance as shown in Figure 1. Descriptions of these preservation actions can be found in section 7.0 – Definitions.

Major rehabilitation, bridge replacement, improvement, and new bridge construction projects are addressed by other WisDOT Bridge Programs.

Figure 1 WisDOT Bridge Preservation Actions

4.0 - Bridge Preservation Goals, Objectives and Performance Measures

This policy outline clear goals that we strive to attain, objective to help achieve our goals, and ultimately measure that help us understand our progress.

Bridges with a condition rating of poor (NBI Rating < 5) are considered deficient. Deficient bridges that are open for operations are safe; however, these structures may need corrective action to ensure current and future operation. Maintaining safe and dependable operations is a high priority for the department.

Therefore, our department has the goal to maintain 95% of the state owned bridges in fair or better condition (NBI ratings 5 or higher). This goal is specific to state bridges included in the National Bridge Inventory. This goal may be extended to bridges less than 20 feet and buried structures (Box Culverts) at a later time.

4.1 Condition-Based Objectives

Condition based preventive maintenance activities are performed on bridge elements as needed and identified through the bridge inspection process.

To promote the goal of maintaining 95% of the state system bridge inventory in fair or better condition, there are a number of performance objectives for the bridge elements that will promote this goal. These objectives are as follows:

- Maintain 95 % of the following bridge decks in good or fair condition (per NBI condition rating). This target may be measured using NBE condition data when one cycle of deck elements data are available:

Decks/Slabs			
El. No.	**Element Name**	**Units**	**Type**
12	Reinforced Concrete Deck	ft^2	NBE
13	Prestressed Concrete Deck	ft^2	NBE
38	Reinforced Concrete Slab	ft^2	NBE
8039	Prestressed Concrete Slab	ft^2	ADE

- Maintain 90 % of the overall length of the following expansion joints in condition state 2 or better:

Joints			
El. No.	**Element Name**	**Units**	**Type**
300	Strip Seal Expansion Joint	ft	BME
301	Pourable Joint Seal	ft	BME
302	Compression Joint Seal	ft	BME
303	Modular Joint	ft	BME
304	Open Expansion Joint	ft	BME
305	Assembly Joint without Seal	ft	BME

- Maintain 90 % of the following coated steel surfaces for superstructures in condition state 2 or better:

Steel Protective Coatings			
El. No.	**Element Name**	**Units**	**Type**
515	Steel Protective Coating (Other)	ft^2	BME
8516	Painted Steel	ft^2	AD/BME

- Maintain 95% of the following bearing elements in condition state 2 or better:

Bearings			
El. No.	**Element Name**	**Units**	**Type**
310	Elastomeric Bearing	EA	NBE
313	Fixed Bearing	EA	NBE
314	Pot Bearing	EA	NBE
315	Disk Bearing	EA	NBE

The proposed condition objectives are based on a snapshot of the NBI and CoRe Element data for the decks, joints, and steel girders and bearings taken in February, 2015. In the future, these targets may be revised when at least one full cycle of NBE data is available after April 2016.

4.2 Cyclical Activities Objectives

Cyclical based activities are performed on a set pre-determined interval and aimed to preserve existing bridge element or component conditions. These type of activities may not improve the condition of the bridge element or component directly but will delay their deterioration.

One cyclical objective will be to Seal 25 % of the bridge deck area of eligible concrete decks and slabs in good or fair condition with waterproofing penetrating sealant every 4 years

4.3 Performance Measures

Performance measures in the WisDOT *Bridge Preservation Policy Guide* are consistent with the objectives of the program and reflect the experience and input of the WisDOT Regional Bridge Maintenance Staff as well as consideration of other DOT's insight and experience.

The following table depicts the objectives and program performance:

Table 1 Objective and Performance Measures

Objective	Target/Goals	Performance Measure
Maintain bridges in good or fair condition	95% of bridges	Percentage of bridge in good or fair condition(NBI rating 5 or higher)
Maintain bridge decks in good or fair condition	95% of bridge decks	Percentage of bridge decks in good or fair condition (NBI Rating 5 or higher)
Maintain expansion joints in condition state 2 or better	90% of the overall length of expansion joints	Percentage of strip seal joints (based on overall length) in condition state 2 or better
Maintain coated steel surfaces in condition state 2 or better	90% of coated steel surfaces	Percentage of coated steel surfaces in condition state 2 or better
Maintain bearings in condition state 2 or better	95 % of bearings in condition state 2 or better	Percentage of bearings in condition state 2 or better
Seal eligible concrete decks (NBI rating 6 or higher) with sealant every 4 years	Seal 25% eligible concrete decks	Number of decks sealed (sq. ft of deck area) each year during a 4 year period

4.4 PRESERVATION PROGRAM BENEFITS

Each objective and measure proposed in Table 1 is aimed at extending the life of the main bridge components by performing timely cyclical or condition-based (corrective) preservation actions. The cost of performing preservation actions is minor when compared to premature replacement or rehabilitation of bridge components. The benefits of each objective are discussed below:

- Maintaining 95% of bridge decks in good or fair condition is an asset management approach that should extend the service life of decks by 30-40 years and promote the MAP21 objectives. Experience has shown that decks designed for a 75 years life expectancy last for 40-50 years without preservation actions. Appropriate corrective actions taken as part of deck preservation could possibly extend the life significantly. The costs of such corrective actions are substantially less than the costs of prematurely replacing the decks.

- The objective of maintaining 90 % joints in good or fair condition will focus on a program that will help in minimizing the damage on bridge superstructure and substructure components. Leaking joints cause significant deterioration and damage to bridge components that include girders, bearings, and substructures. There is significant cost each year in repairing structural elements that have deteriorated prematurely as a result of leaking joints. Experience has shown that timely preservation actions can delay superstructure and substructure deterioration by 8-12 years.

- Maintaining protective paint systems is important. The structural components of the steel bridges will corrode and lose load carrying capacity if left unprotected or partially-protected. Protective paint coatings systems should have a service life of 25-40 years for the protection of structural steel. The objective of maintaining 90% of coated steel surfaces in good or fair condition will aim at creating a paint program for extending the life of steel components up to 100 years.

- Bridge bearings are a key component. Bearings support bridge supper structures and allow for expansion of the superstructure. Experience has shown that loss of lubrication, tipping, or corrosion of bearings can cause harm to the deck and superstructure. The proposed measure of keeping 95 % of bearings in good or fair condition will help WisDOT maintain bridges in a state of good repair.

- Objective of sealing 25 % of all eligible concrete decks at 4 year intervals will help delay deck deterioration and prolong deck life. Sealing decks every 4 years at a minor cost can delay deck deterioration by 10-12 years that will promote increase deck life

5.0 - Bridge Preservation Activities, Eligibility and Need Assessment Criteria

The bridge preservation activities included in this document relate to deck, superstructure and substructure elements. Table 2 shows the most common bridge preservation activities that are considered cost effective when applied to the appropriate bridge at the appropriate time as well as considered eligible for bridge preservation funding. Additionally, these activities, together with the eligibility and prioritization criteria discussed in this section, will form a basis to generate an eligibility list of bridges that are candidates for cyclical and condition based PM actions.

Table 2 Bridge Preservation Activities

Bridge Component	Bridge Preservation Type	Activity Description	Preventive Maintenance Type	Action Frequency (years)
All	Preventive Maintenance	Sweeping, power washing, cleaning	Cyclical	1-2
Deck	Preventive Maintenance	Deck washing	Cyclical	1
		Deck Sweeping		1
		Deck Sealing/Crack Sealing		4-5
		Thin polymer (Epoxy) overlays		10
		Drainage cleaning/repair		As needed
		Joint cleaning		
		Deck Patching	Condition Based	1- 2
		Chloride extraction		1 -2
		Asphalt overlay with membrane		12-15
		Polymer modified Asphalt overlay		6-12
		Joint seal replacement		10
		Drainage cleaning/repair		1
	Repair or Rehab Element	Rigid concrete overlays	Condition Based	As needed
		Structural Reinforced concrete overlay		
		Deck joint replacement		
		Eliminate joints		
Super	Preventive Maintenance	Bridge approach restoration	Cyclical	2
		Seat and beam ends washing		2
	Repair or Rehab Element	Bridge rail restoration	Condition Based	As needed
		Retrofit rail		
		Painting		
		Bearing restoration (replacement, cleaning, resetting)		
		Superstructure restoration		
		Pin and hanger replacement		
		Retrofit fracture critical members		
Sub	Preventive Maintenance	Substructure Restoration	Condition Based	As needed
		Scour Counter Measure		
		Channel Restoration		

5.1 Eligibility Criteria

This policy guide includes two distinct matrices outlining eligibility criteria for preservation activities shown in Tables 3 and 4. The first matrix relates to concrete deck/slab activities and the second matrix covers other bridge component activities. Bridge inspection information and data that is managed in the HSI system will be used to develop reports that quantify needs at the program and project level. This method will also serve to develop reports to monitor progress related to performance goals.

The deck/slabs matrix shown in Table 3 is based on the NBI Item 58—Condition Rating for decks and total deck/slab distress area. The distress area on a deck is quantified using inspection defects including delamination, spalls, cracking, and scaling. Other deck inspection methods such as chain drag sounding, ground penetrating radar (GPR) surveys, infrared (IR) surveys, and chloride potentials may also be used in quantifying deck defects.

The matrix shown in Table 4 is based on listed NBI condition ratings and specific inspection element condition states. As with decks, information and data from HSI will be used with this matrix as well.

Table 4 also makes reference to "Defects". For a better understanding of this concept, the reader is referred to Appendix D of the *AASHTO Manual for Bridge Element inspection*. This Appendix describes the element materials defined for this guide and the defects that may be observed for each condition state. Included are individual materials, such as reinforced and prestressed concrete, steel, timber, masonry, and other materials

These matrices guide the user to select a preservation activity and also show the potential enhancement to the NBI values and anticipated service life increase as a result of that activity. Note that even though some preservation activities list no change to the potential result to the condition rating of NBI items, there is an inherit benefit both in the short and long term of these preservation activities to extend the current condition and ultimately extend the life of the bridge.

Sound engineering judgment is needed to decide if the recommended action is best suited for extending the life of the bridge. Other factors may need to be considered in the decision making process such as: deck age, size, deck design, and type of reinforcement, functional class, ADT, detour lengths, corridor plans, and operation issues including traffic control. Specific deck/slab actions should be matched to the condition of the existing deck, deck material, age, and anticipated service life.

Table 3 - Concrete Deck/Slab Eligibility Matrix

	NBI Item 58	Deck Element Distress Area (%) ①	Preservation Activity	Benefit to Deck from action	Application Frequency (in years)
Concrete Deck/Slab	≥7		Deck Sweeping/Washing	Extend Service Life	1 to 2
			Crack Sealing	Extend Service Life	3 to 5
			Deck Sealing	Service life extended	3 to 5
			Polymer Modified Asphalt Overlay	Service life extended	12 to 15
			Polymer Overlay	Service life extended	8 to 12
	=6		Deck Sweeping/Washing	Extend Service Life	1 to 2
		<20%	Crack Sealing	Extend Service Life	3 to 5
		<20%	Deck Sealing	Service life extended	3 to 5
		<5% ②	Deck Patching	Service life maintained	As needed
		<5%	Deck Patching, Cathodic Protection	Extend Service Life	As needed
		<10%	HMA w/ membrane	Improve NBI (58) ≥ 7	8 to 12
		<20%	Polymer Modified Asphalt Overlay	Improve NBI (58) ≥ 7	12 to 15
		<20%	Concrete Overlay	Improve NBI (58) ≥ 7	12 to 30
	=5	<20% ②	Deck Patching	Service life maintained	As needed
		<20% ②	Deck Patching, Cathodic Protection	Extend Service Life	As needed
		20 to 25% ③	Concrete Overlay	Improve NBI (58) ≥ 7	12 to 30
		20 to 25% ③	Structural Concrete Overlay ④	Improve NBI (58) ≥ 7	12 to 30
	≤ 4	<40%	Deck Replacement ⑤	Improve NBI (58) = 9	25 to 50

① **Use NBI and deck distress area together to determine the repair action.**

② Refers to deck defects of delaminations and spall and refer to defect 1080.

③ The maximum area of deck delamination is 25 %. When WisDOT fully transitions to elements, this will refer to defect 1080.

④ Consult BOS - not for deck girder bridges.

⑤ Consider remaining bridge conditions to determine if activity is desirable and cost effective.

Table 4 - Other Bridge Elements Eligibility Matrix

NBI Item	Element	NBI Criteria	Defect	Element Defect Condition State Criteria	Repair Action	Potential Benefits to NBI or CS	Anticipated Service Life Years
Deck	Joints	Item 58 ≥ 5	2350	CS2, CS3, or CS4	Joint Cleaning	CS1or CS2	
			2310	CS2, CS3, or CS4	Joint Seal Replacement/Restoration ⑦	CS1	5 to 8
			2310 or 2360	CS3 + CS4 ≥ 10%	Joint Replacement④	CS1	10 to 20
				All Condition State	Joint Elimination ④	Elimination	15 to 25
	Railing	Item 58 ≥ 5		CS3 or CS4	Railing Restoration	CS1 or CS2	3 to 10
				CS3 or CS4	Railing Replacement/Retrofit ⑧	CS1	10 to 20
Super	Steel Elements	Item 59 ≥ 5		N/A	Superstructure Washing/Cleaning	NA	1 to 2
			3440	CS2 + CS3 Area> 5% ⑥	Painting - Spot	CS1	1 to 5
				CS3 Area ≤ 25% ⑥	Painting - Zone	CS1 ①	5 to 7
				CS3 Area ≥ 25% ⑥	Painting - Complete	CS1 ②	15 to 20
		Item 59 ≥ 4		CS2, CS3, or CS4	Superstructure Restoration ③	NBI ≥ 7	5 to 20
	Bearings	Item 59 ≥ 5		CS3 or CS4	Bearing Reset/Repair	CS1 or CS2	1 to 5
				CS2 or CS3	Bearing Cleaning/Painting	CS1 or CS2	5 to 7
				CS3 or CS4	Bearing Replacement	CS1or CS2	10 to 15
Sub		Item 60 ≥ 5		N/A	Substructure Washing/Cleaning	NA	1 to 2
			3440	CS2+CS3+CS4 Area > 5% ⑥	Painting - Spot	CS1	1 to 5
			3440	CS3 Area > 25% ⑥	Painting - Complete	CS1 ②	10 to 20
				CS2 or CS3 or CS4	Substructure Restoration ⑤	NBI ≥ 7	5 to 20
			9290	CS1 or CS2	Pier Protection ⑨	NBI ≥ 7	5 to 20
				CS3 or CS4	Scour Counter Measure⑩	NBI ≥ 7	5 to 20

① Increase NBI only if combine with structural steel repairs.

② Complete painting only if combined with structural steel repairs to improve the component NBI ≥ 7.

③ Superstructure restoration includes all work related to the superstructure including but not limited to strengthening, pin and hanger replacement, retrofit FC member, etc.

④ Combined with deck overlay or replacement project.

⑤ Substructure restoration includes all work related to the substructure including but not limited to fiber wrapping, strengthening, crack injection, encapsulation, etc.—regardless of material type.

⑥ Element condition state for steel protective coating.

⑦ Includes but is not limited to end block/paving block replacement.

⑧ Must bring railing to current standards or have an approved exception to standards.

⑨ Examples are pier protection dolphins and fender systems.

⑩ Provide scour countermeasures after repairing any other substructure defects.

5.2 Development of Bridge Eligibility Lists and Prioritization

BOS will develop a candidate list of eligible bridges for the cyclical and the condition based PM activities using selection criteria discussed in Section 5.1. The candidate list shall be prepared based on the most recent NBI and the element level condition assessment data that are stored in HSI.

The criteria for element rehabilitation or condition based repairs shall primarily be based on bridge safety and risk considering long term performance factors such as scour, fracture critical components, load rating capacity, etc. The condition based activities for the bridges shall include the recommendation of a minimal action and an optimum action where applicable. The condition based activities shall be prioritized by assigning an optimum year and a critical year applicable for that action. The cyclical based activities shall be assigned an optimal activity year.

Cyclical preventive maintenance activities will involve selecting and prioritizing qualified projects identified using preliminary selection criteria and considering various programs' parameters, corridor preservation strategy, available funding resources and regional flexibility. Other factors such as functional classification, traffic volumes, detour lengths, etc. should be considered when developing and prioritizing a preservation project.

5.3 Identification of Preservation Needs

The identification of preservation needs will start with the development of bridge eligibility reports. The goal of identification is to develop the preservation needs for two scenarios:

- The unconstrained budget scenario.
- The constrained budget scenario.

The unconstrained budget scenario determines all preservation needs at the region level, assuming no budget limit. This scenario will forecast the total preservation needs in a multiyear basis. The constrained budget scenario will provide specific projects that will be placed in a program as shown in Figure 2.

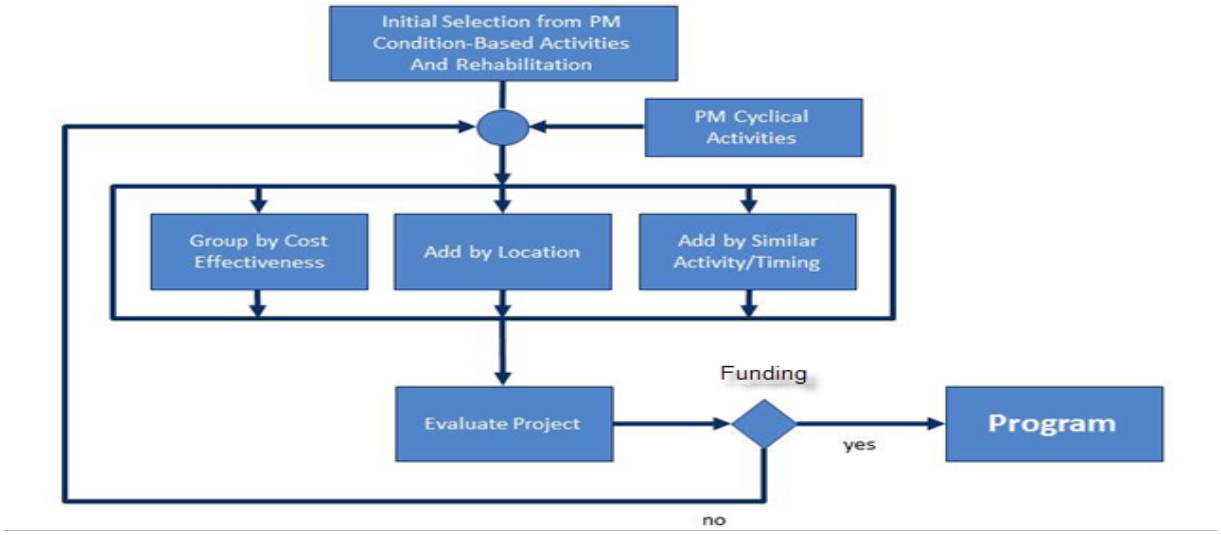

Figure 2. Project Development Diagram

The programming of projects will start with the development of eligibility reports as described in Section 5.2. This set of projects will be combined into a group along with constrained cyclical preventive maintenance activities.

Each Region should bundle projects by cost, location and/or similar activity and timing. This approach would potentially benefit from economy of scale and incorporation into other regional project efforts. The identification of state-wide bridge preservation needs will be done by aggregating the regional bridge preservation needs.

6.0 - Funding Resources and Budgeting

The experiences of several states have shown that having commitments for funding preservation programs extends the life of bridges and defers untimely replacement. Having a commitment for funding of bridge preservation will help WisDOT optimize the overall bridge program.

We promote the idea of recognizing and prioritizing preservation opportunities as part of the planning and programming functions of the department at the Division and Regional level. Through this organizational approach to implementation, preservation will yield the greatest system wide benefits.

7.0 – DEFINITIONS

Bridge Program

The WisDOT Bridge Program includes preservation, rehabilitation, improvement or major rehabilitation, replacement and new bridge construction actions.

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.

NBI Condition Rating

The FHWA coding guide describes the condition ratings used in evaluating four main components of a bridge as decks, superstructure, substructure, and culverts. The condition ratings are used to measure the deterioration level of bridges in a consistent and uniform manner to allow for comparison of the condition state of bridges on a national level.

The condition ratings are also known as NBI ratings and are measured on a scale of 0 (worst) to 9 (excellent). For WisDOT bridges and culverts, an NBI rating of 4 is classified as poor, an NBI rating of 5 or 6 is classified as fair, and an NBI rating of 7 or higher is classified as 'good'.

Element Condition State

A condition state categorizes the nature and extent of damage or deterioration of a bridge element. Whereas the NBI condition ratings are provided for four major components of bridges described elsewhere, the element level data.

The 2013 *AASHTO Manual for Bridge Element Inspection* describes a comprehensive set of bridge elements mainly categorized as National Bridge Elements (NBE), Bridge Management Elements (BME) and Agency Develop Elements (ADE) and their corresponding four condition states. The element condition states1 to 4 are described as good (CS1), fair (CS2), poor (CS3), and severe (CS4).

Highway Structures Information System	Highway Structures Information System (HSI) is the system developed by WisDOT for managing the inventory and inspection data of all highway structures. The inspection data is collected in accordance with the NBIS and *2013 AASHTO Manual for Bridge Element Inspection.*
State of Good Repair (SGR)	State of Good Repair (SGR) is a condition in which the existing physical assets, both individually and as a system (a) are functioning as designed within their useful service life, and (b) are sustained through regular maintenance and replacement programs. SGR represents just one element of a comprehensive capital investment program that also addresses system capacity and performance. *Source: U.S. DOT Secretary Mary Peters July 25, 2008 letter to Congress*
Systematic Preventive Maintenance Program (SPM)	Systematic Preventive Maintenance (SPM) is a planned strategy of cost-effective treatments to highway bridges that are intended to maintain or preserve the structural integrity and functionality of bridge elements and/or components, and retard future deterioration, thus maintaining or extending the useful life of bridges. An SPM program is based on a planned strategy that is equivalent to having a systematic process that defines the strategy, how it is planned, and how activities are determined to be cost effective. An SPM program may be applied to bridges at the network, highway system, or region-wide basis and have acceptable qualifying program parameters. The details on an SPM program and qualifying parameters are found in FHWA's *Bridge Preservation Guide.*

Preventive Maintenance(PM)	Preventive maintenance 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). Preventive maintenance activities include cyclical (non-condition based) and condition-based activities.
Cyclical PM Activities	Cyclical PM Activities are those 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.
Condition Based PM Activities	Condition Based PM Activities are those activities that are performed on bridge elements as needed and identified through the bridge inspection process.
Rehabilitation	Rehabilitation is described as major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects as defined in the Code of Federal Regulation (CFR) 23 clause 650.403.
Improvement or Major Rehab	Bridge improvement is a set of activities that fixes the deterioration found in a structure and improves the geometrics and load-carrying capacity to at least the minimum criteria set in these guidelines, but may not provide improvement that meets new construction standards.
Replacement	Replacement of an existing bridge with a new facility constructed in the same general traffic corridor is considered total Replacement. The replacement structure must meet the current geometric, construction, and structural standards as defined in the Code of Federal Regulation (CFR) 23 clause 650.403.
New Bridge Construction	The construction of a new bridge is defined as bridge construction that does not replace or relocate an existing bridge as described in FHWA's MAP-21 STP.