

Bridge Preservation – Implementation Strategies

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Common Definitions

- **Bridge Preservation**
- **Preventive Maintenance**
- **Rehabilitation**
- **Replacement**
- **State of Good Repair**
- **Structurally Deficient**
- **General Condition Ratings**
- **Condition States**

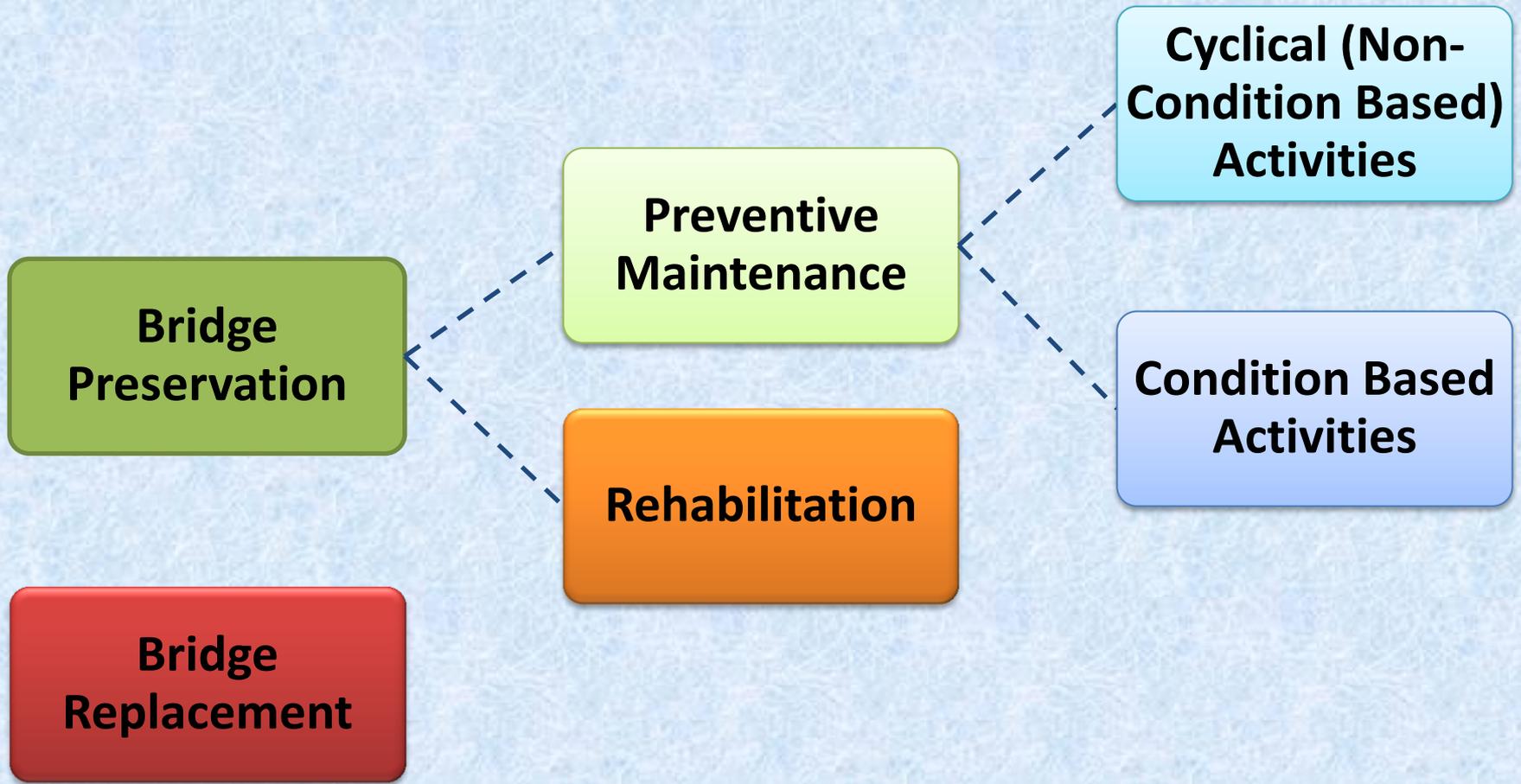
Bridge Preservation Definition

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 useful life. Preservation actions may be preventive or condition-driven.

- This Definition was adopted by ASHTO SCOH in Sep. 2011



Bridge Preservation Classification



Preventive Maintenance

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).

Source: AASHTO Subcommittee on Maintenance.



Preventive Maintenance

- Preventive maintenance (PM) is considered a component of preservation
- PM includes cyclical and condition based activities
- Examples of condition based PM activities include:
 - Sealing or replacing leaking joints
 - Installation of deck overlays
 - Complete, spot, or zone painting of steel elements
 - Scour countermeasures installation
 - etc.



Preventive Maintenance

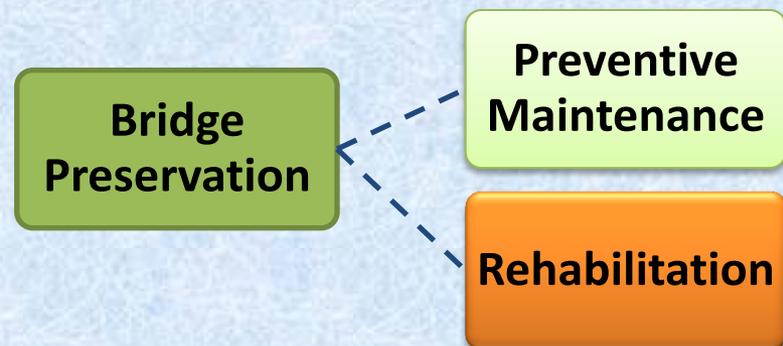
Cyclical PM Activity Examples	Commonly Used Frequencies
Wash/clean bridge decks or entire bridge	1 to 2 Years
Install deck overlay on concrete decks such as:	10 to 15 Years
- Thin bonded polymer system overlays	
- Asphalt overlays with waterproof membrane	10 to 15 Years
- Rigid overlays such as silica fume and latex modified	20 to 25 Years
Seal concrete decks with waterproofing penetrating sealant	3 to 5 Years
Zone coat steel beam/girder ends	10 to 15 Years
Lubricate bearing devices	2 to 4 Years
Coat timber elements with wood preserver sealant	1 to 2 Years

Rehabilitation

Rehabilitation involves major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects.

Source: 23 CFR 650.403(c).

- Bridge rehabilitation activities are considered bridge preservation.
- Functional improvements such as adding a travel lane or raising vertical underclearance are not considered preservation.



Replacement

Total replacement of a structurally deficient or functionally obsolete bridge with a new facility constructed in the same general traffic corridor...

Source: 23 CFR 650.405(b)(1)

- Bridge replacement is not considered a preservation activity.



State of Good Repair (SGR)

A condition in which the existing physical assets, both individually and as a system (a) are functioning as designed within their useful service life, (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: Secretary Mary Peters July 25, 2008 letter to Congress on this topic



State of Good Repair (SGR)

SGR for bridges would mean: the existing physical conditions of bridge elements, components or entire bridges are such that the bridges (a) are functioning as designed and (b) are sustained through regular maintenance, preservation, and replacement programs.



Structurally Deficient (SD)

A bridge is deemed SD if:

- A bridge component (deck, superstructure, substructure or culvert) having an NBI general condition rating of a 4 or less (poor condition), or
- Structural Evaluation or Waterway Adequacy rated a 2 or less (a bridge with a very low load rating capacity, or a bridge that is subject to overtopping with significant or severe traffic delays).



General Condition Ratings (GCRs)

GCRs are used to describe the existing, in-place bridge or culvert as compared to the as-built condition. The materials used in the bridge are considered as well as the physical condition of the deck, superstructure and substructure components. This information is used to determine GCRs on a numerical scale that ranges from 0 (failed condition) to 9 (excellent condition) as described in the FHWA Coding Guide.

General Condition Ratings (GCRs)

Code	Description	Commonly Employed Feasible Actions
9	EXCELLENT CONDITION	Preventive Maintenance
8	VERY GOOD CONDITION No problems noted.	
7	GOOD CONDITION Some minor problems.	
6	SATISFACTORY CONDITION Structural elements show some minor deterioration.	Preventive Maintenance; and/or Repairs
5	FAIR CONDITION All primary structural elements are sound but may have some minor section loss, cracking, spalling or scour.	

General Condition Ratings (GCRs)

Code	Description	Commonly Employed Feasible Actions
4	POOR CONDITION Advanced section loss, deterioration, spalling or scour.	Rehabilitation or Replacement
3	SERIOUS CONDITION Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.	
2	CRITICAL CONDITION Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored the bridge may have to be closed until corrective action is taken.	

General Condition Ratings (GCRs)

Code	Description	Commonly Employed Feasible Actions
1	IMMINENT FAILURE CONDITION Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.	Rehabilitation or Replacement
0	FAILED CONDITION Out of service - beyond corrective action.	

Condition State (CS)

CS categorizes the nature and extent of damage or deterioration of a bridge element. The AASHTO Guide Manual for Bridge Element Inspection, first edition, 2011, provides detailed information on bridge elements and their corresponding condition states. According to this guide manual, each bridge element can have four condition states. The higher the condition state, the higher the severity of the damage and/or deterioration.

Condition State (CS)

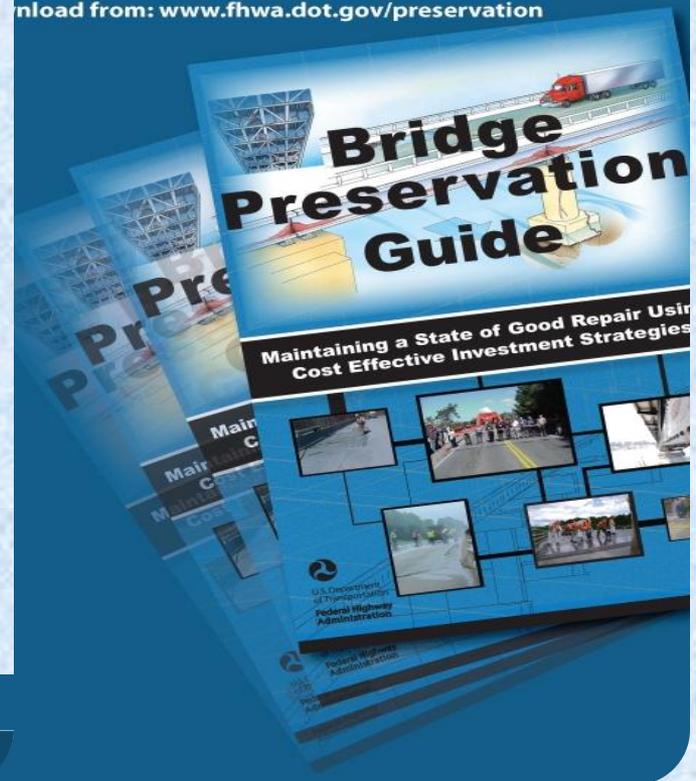
Condition State	Description	Commonly Employed Feasible Actions
1	Varies depending on element – Good	Preventive Maintenance
2	Varies depending on element – Fair	Preventive Maintenance or Repairs
3	Varies depending on element – Poor	Rehabilitation
4	Varies depending on element - Severe	Rehabilitation or Replacement

Bridge Preservation Guide

Copies can may ordered from
the FHWA Report Center
Email : Report.center@dot.gov
Telephone: (814) 239-1160

Copies may be downloaded from
<http://www.fhwa.dot.gov/bridge/preservation/guide/guide.pdf>

Copies of the FHWA Bridge Preservation Guide.
Publication No. FHWA-HIF-11-042
239-1160
Report.Center@dot.gov
Download from: www.fhwa.dot.gov/preservation



Consequences of Deferring Maintenance & Preservation

- Condition Gets Worse
- Leads to Limited Alternatives
- Most Costly

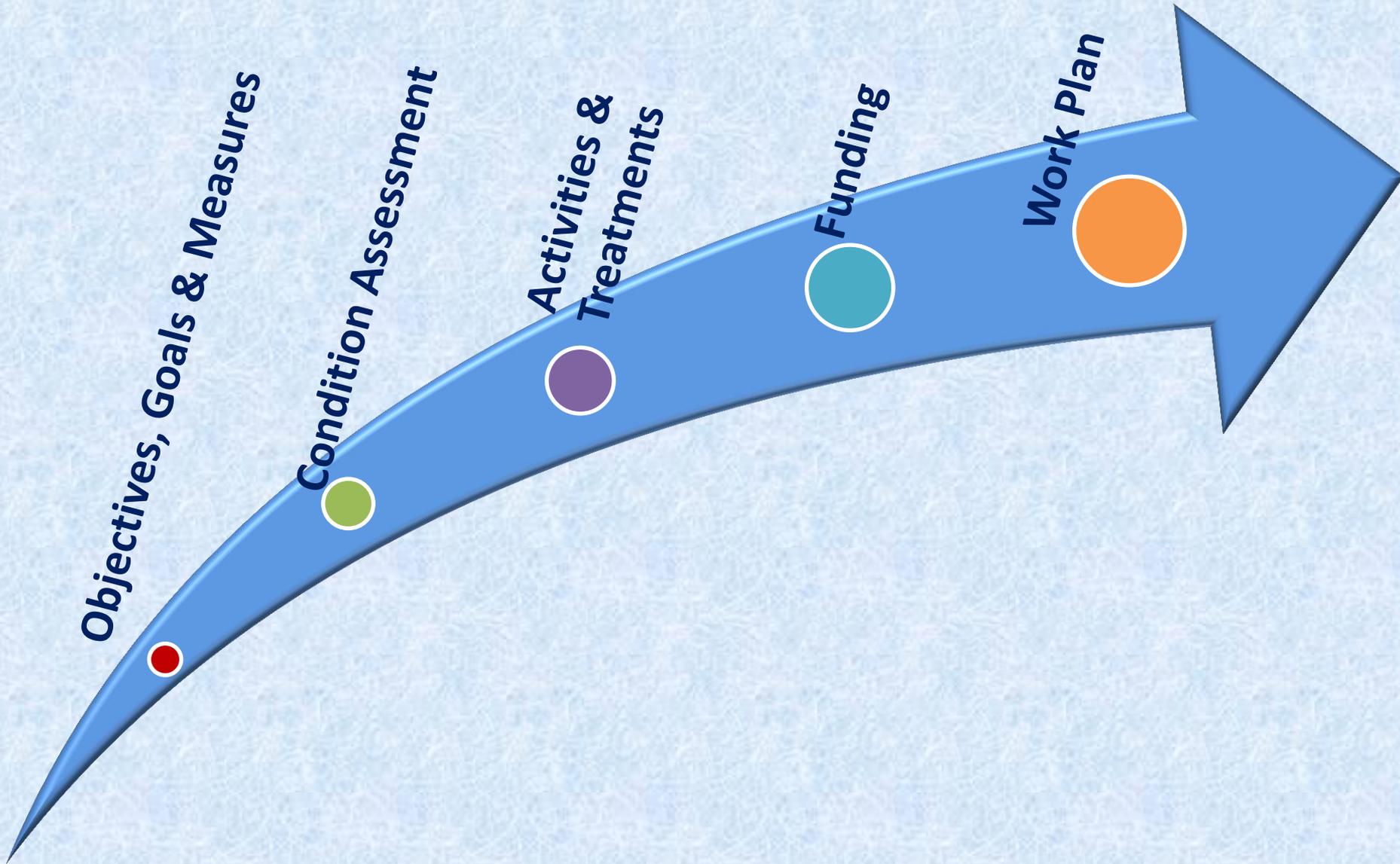


Why Bridge Preservation?

- Cost Effective
- Minimum Traffic Disruption
- Lower User Costs
- Public Safety
- Reduce Need to Replace



Implementation Strategies for Bridge Preservation Program



Implementation Strategies – Objectives

Example Objective: Implement timely preservation treatments on structurally sound bridges, thereby extending their useful life.



Structurally sound may be defined as having an overall NBI general condition rating of 5 or greater for the deck, superstructure, substructure, or culvert components, or AASHTO Element Condition State of 1 or 2 for the elements associated with the deck, superstructure, substructure, and culvert units.

Implementation Strategies – Goals & Measures

Example of Program Goal: Maintain 90 percent of bridges in a state of good repair.

- **Measure:** Percent of bridges with element condition state ≤ 2 .
- **Measure:** Percent of bridges with NBI general condition rating ≥ 6 .



Implementation Strategies – Goals & Measures

Considerations:

- Current Condition of the Bridge Inventory
- Historical Condition and Funding Trends
- Available Resources
- Customers & Stakeholders Input



Implementation Strategies – Condition Assessments

Condition Assessment Through:

- Safety Inspection (NBIS)
- Element Level Inspections

Considerations:

- Inventory and Condition Data Attributes
- Quality and Currency of Data
- Quality and Expertise of Staff
- Integration with Other Systems such as BMS, AMS, Traffic, Planning, etc.

Implementation Strategies – Work Activities

- **Identify Feasible and Cost Effective Activities & Treatments, and**
- **Classify Activities Under Major Programs For Ease of Management.**
 - For Example Work Activities Can be Classified Under Three Programs: Preventive Maintenance, Rehabilitation, and Improvement

Implementation Strategies – Work Activities Examples

Preservation		Improvement
Preventive Maintenance	Rehabilitation	
Bridge Cleaning/Washing	Deck Repairs and Installation of Thin Bonded Overlay	Bridge Replacement
Deck Joint Maintenance/Repairs	Deck Repairs and Installation of Rigid Bonded Overlay	Bridge Widening/Raising
Deck Joint Replacement	Deck Repairs and Installation of Thin Bonded Overlay, and Cathodic Protection	Bridge Relocation
Deck Surface Repairs	Deck Repairs and Installation of Rigid Bonded Overlay and Cathodic Protection	Culvert Replacement
Rail Maintenance/Repairs	Superstructure Rehabilitation	Culvert Extension
Crack Sealing	Superstructure Repairs and Painting	
Deck Sealing	Retrofitting Fatigue Prone Details/Fracture Critical Members	
Installation of Thin Bonded Deck Overlay	Substructure Rehabilitation	
Installation of Rigid Bonded Deck Overlay	Culvert Rehabilitation	
Superstructure Maintenance/ Surface Repairs	Culvert Lining/Sleeving	
Superstructure Spot/Zone Painting	Substructure Repairs and installation of Pile Jacketing	
Complete Superstructure Painting		
Substructure Maintenance/ Surface Repairs		
Culvert Cleaning		
Channel Debris Removal		
Installation of Scour Countermeasures		
Pile Jacketing		

Implementation Strategies – Work Activities

Considerations:

- Activities that will facilitate achievement of goals
- Condition threshold for bridge elements, components, or entire bridge
- Bridge material types
- Frequencies



Implementation Strategies - Funding

Determine Needs and Funding Levels

- Identify Unmet Needs
- Determine Funding and Resources Needs for Meeting Your Program Goals
- Compare the Unmet Needs and Targeted Needs with Allocated Funds (Authorized Budget)
- Develop Short and Long-term Plans
- Seek or Make Adjustments to Budget

Implementation Strategies - Funding

Determine Needs and Funding Level

Considerations:

- Means for estimating the cost and the reliability of cost data.
- Network level vs. Project level estimates
- Adequacy and sustainability of funding levels to achieve desired goal(s)



Implementation Strategies – Work Plan

- **Select and Rank Projects**
- **Classify Projects Based on Work Groups as Discussed Earlier (PM, Rehab, Improvement)**
- **Group Projects Based on Type and Location (Site Specific, Multiple Sites, Corridor, Region-wide, etc.)**



Implementation Strategies – Work Plan

Considerations:

- Identify key factors to be considered in the ranking and prioritization process. Factors such as: ADT, Condition, Age, Detour length, Safety, Criticality, Risk, etc.)
- Available Funding
- Resources (in house vs. outsourcing)
- Environmental Restrictions
- Work Zone Traffic Restrictions
- Past Plan Delivery Performance



Summary

- Building an effective bridge management program entails a proactive and balanced approach
 - Preventative; Rehabilitation; Replacement
- Implementing an effective bridge preservation program calls for appropriate tools and resources
- Achieving optimum results is accomplished by applying the appropriate treatments/strategies at the right time

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Thank You

