BRIDGE PREVENTIVE MAINTENANCE STRATEGY

FOR ERIE-NIAGARA LOCAL BRIDGE OWNERS

GBNRTC

GREATER *BUFFALO-NIAGARA*
REGIONAL TRANSPORTATION COUNCIL





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Purpose

To maximize the non-deficient service life of local bridges in the Erie-Niagara region, members of the Greater Buffalo-Niagara Regional Transportation Council *(GBNRTC)* have cooperatively established a Bridge Preventive Maintenance Strategy *(BPMS)* to address the issue. Processes and procedures related to the program are described in this document.

Goal

Preservation of bridge infrastructure.

Proposed Objectives

To impede deterioration and maintain functionality of all local bridges in Erie and Niagara Counties by performing uniform preventive maintenance activities at fixed intervals and selective corrective repairs to bridge elements as deemed necessary.

Performance Measure

Increased condition ratings for bridges of the same type of construction at the same age when compared to ratings preceding the Bridge Preventive Maintenance Strategy.

Program Eligibility and Funding

- All publicly owned bridges are eligible with specific actions subject to criteria outlined herewithin.

- The element specific work types that are eligible for this program include:

  Cyclical Maintenance Activities: Includes recommended cyclical activities such as bridge washing, deck sealing, lubricating bearings and bridge painting.

  Corrective Maintenance Repair Program: Fundamentally these are repairs to damaged or deteriorated elements of bridges that are otherwise in good structural condition. Generally structural elements that have a rating less than 5 are eligible. A 'good bridge' is defined by a condition rating between 4.8 and 6. Potential repairs include joints, bearing replacement, pedestals, bridge seat/pier cap and columns/stems. Discretionary judgment of the local agency may be utilized to advance a preventive maintenance item as appropriate and necessary to prolong the service life of the structure in a cost effective manner.

- The federal funding source will be the Highway Bridge Replacement and Rehabilitation Program (HBRR). Local participation will require a minimum 20% match to participate in the bridge PM program.

- Local bridge owners are responsible for developing an annual program consistent with this document and Region 5 staff will assist to the extent possible. Initial Project Proposals may span multiple years to encompass a comprehensive span of cyclical activities.

- The flow chart on page 6 and the Bridge Maintenance Technical Guidance on pages 7 and 8**,** provide further details on identifying eligible candidates.

Cyclical Maintenance Activities

Bridge Washing

Strategy: Wash one-half (½) of all local bridges every year. Debris will be cleaned and removed from all bridge surfaces including, but not limited to, decks, sidewalks, approach slabs, shoulders, concrete paving, concrete beams, wing walls, back walls, around bridge railing posts, railings, parapets, light standards, signs, curbs, scuppers, downspouts, joints, steel members, diaphragms, bearings, seats, pedestal tops, piers, pier caps, columns, pier tops, drainage features, and other surfaces on the superstructure or top portions of the substructures.

Eligibility: All functional publicly owned structures.

Bearing Lubrication

Strategy: Lubricate steel bearings every 6 years. Includes the following steel type bearings:

- Steel Roller
- Steel Rocker
- Steel Sliding on Phosphor Bronze
- Steel sliding on Steel
- Steel Sliding on Lubrite
- Steel Sliding, Surface Unknown
- Steel, type Unknown
- Steel, Rotates on Rocker
- Steel, Rotates on Pin

Eligibility: All functional publicly owned structures.

Deck Sealing

Strategy: Seal the concrete decks of all local bridges every 6 years, including crack & substructure concrete.

Eligibility: All functional publicly owned structures with concrete wearing surfaces presently in place rated between 4.5 and 7. Includes:

- Portland Cement concrete overlay
- Precast Portland Cement Concrete Plank
- Integral or Monolithic Portland Cement Concrete
- Bonded Concrete
- Concrete with membrane
- High Density Concrete
- Latex Modified Concrete
- Micro-Silica Overlay
- Class “HP” Concrete

Bridge Painting

Strategy: Paint the load carrying steel members (but not weathering steel) of all local bridges every 12 years.

Eligibility: All functional publicly owned structures presently in place rated between 4.5 and 7. The following coating types are included:

- Painted, Lead-Based
- Painted, Not Lead-Based
- Painted, Unknown

AC Deck Treatment / Overlay

Strategy: Overlay wear surface on bridge deck every 12 years.

Eligibility: All functional publicly owned structures presently in place rated between 4.5 and 7. Includes the following wear surfaces presently in place:

- Asphalt Concrete
- Asphalt Concrete without Membrane
- Asphalt Concrete with Membrane
- Asphalt Concrete with Preformed Sheet Membrane
- Asphalt Concrete with Coal Tar Epoxy Membrane
- Asphalt Concrete with Membrane other than Coal Tar
- Asphalt Concrete with Mastic Membrane

Corrective Maintenance Repair Program

Bearing Replacement

Strategy: Replace bridge element identified in bridge inspection database as the worst bearing at an abutment. Structures identified as candidates for PM with a low rating for specific bearing type (fixed or expansion - sliding plate, roller, rocker, elastometric), and of certain materials (steel, neoprene, Teflon, bronze), will receive higher priority for inclusion in this PM activity to address the condition.

Eligibility: All functional publicly owned structures presently in place rated between 4.8 and 6, and an element rating <5. Includes the following steel type bearings:

- Steel Roller
- Steel Rocker
- Steel Sliding on Phosphor Bronze
- Steel sliding on Steel
- Steel Sliding on Lubrite
- Steel Sliding, Surface Unknown
- Steel, type Unknown
- Steel, Rotates on Rocker
- Steel, Rotates on Pin

Expansion Joints

Strategy: Repair deficient joints to prevent water and chlorides from falling onto substructure elements. Bridge inspection element is contained in the bridge database and indicates the ability of joints to function as designed - either watertight (closed) or allow water and debris to be diverted from bridge components (open). Structures identified as candidates for this PM activity will have a low rating for specific open (finger-plate, sliding-plate, formed) or closed (elastometric, poured seals, compression seals, cellular seals, modular) joint types and will be prioritized accordingly.

Eligibility: All functional publically owned structures presently in place rated between 4.8 and 6, and an element rating <5. Includes the following joint types:

- Elastometric (expansion, fixed)
- Armored Elastometric (expansion, fixed)
- Armored Compression Seal (expansion, fixed)
- Compression Seal (expansion, fixed)
- Strip Seal with Integral Armoring Angle (expansion, fixed)
- Strip Seal – Extrusion Anchored to Deck, No Elastometric Concrete (expansion, fixed)
- Strip Seal – Extrusion Embedded in Elastometric Concrete (expansion, fixed)
- Strip Seal – Type Unknown (expansion, fixed)
- Sawed and Filled (fixed)
- Filled, Elastic Material (fixed)

Channel Erosion

Strategy: Perform channel clearing/cleaning before bridges become endangered. Bridge inspection element contained in the bridge database identifies stream erosion and scour problems (where applicable). Structures identified as candidates for this PM activity will have a low rating for channel erosion and will be prioritized accordingly.

Eligibility: All functional publically owned structures.

Drainage

Strategy: Perform drainage inlet (DI) clearing when bridge inspection element contained in the bridge inspection database indicates the approach drainage system is not effective in preventing water from running onto the bridge or removing water from the approach surface.

Eligibility: All functional publically owned structures.

Flooding

Strategy: Identify structures routinely monitored for flood damage and implement measures to counter typical damage sustained by frequent flooding. Structures identified as candidates for this PM activity will have a data indicating bridge susceptibility to flooding and will be prioritized accordingly.

Eligibility: All functional publically owned structures.

Vertical Down

Strategy: Repair deficient substructures (i.e. bearing, pedestals, bridge seat/pier cap, columns/stems) where needed.

Eligibility: All functional publically owned structures presently in place rated between 4.8 and 6, and a substructure rating $\leq$5.

Vertical Clearances

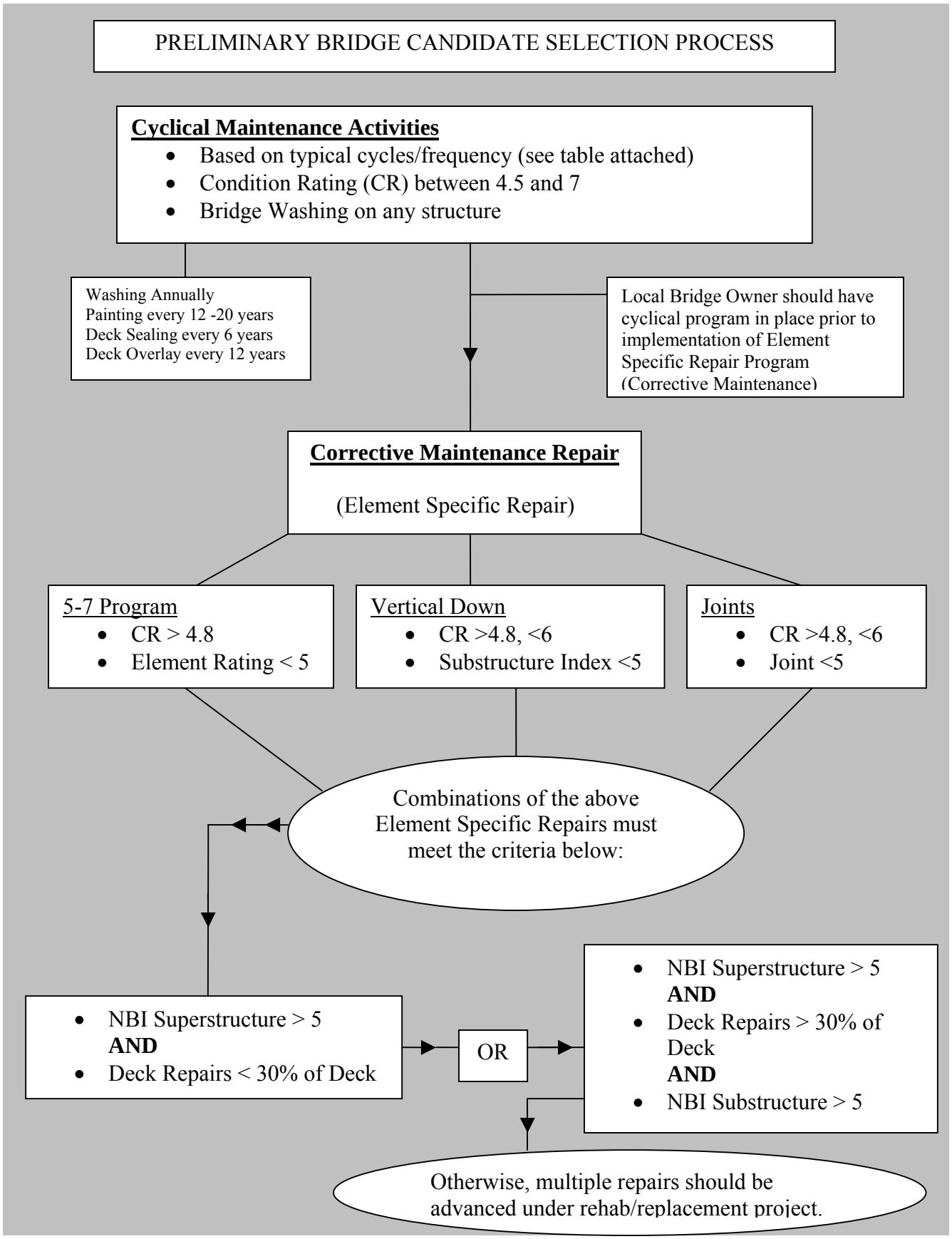
Strategy: Review locations where minor milling and resurfacing will improve or eliminate a clearance posting under a bridge.

Eligibility: All functional publically owned structures currently posted with a vertical clearance restriction.

Overload / Load Ratings

Strategy: Review locations where removal of excessive asphalt from a bridge will improve the load rating or remove a posting.

Eligibility: All functional publically owned structures, especially those with current load rating restrictions.


PRELIMINARY BRIDGE CANDIDATE SELECTION PROCESS
Cyclical Maintenance Activities
Based on typical cycles/frequency (see table attached)
Condition Rating (CR) between 4.5 and 7
Bridge Washing on any structure
Washing Annually
Painting every 12 -20 years
Deck Sealing every 6 years
Deck Overlay every 12 years
Local Bridge Owner should have cyclical program in place prior to implementation of Element Specific Repair Program (Corrective Maintenance)
Corrective Maintenance Repair
(Element Specific Repair)
5-7 Program
CR > 4.8
Element Rating < 5
Vertical Down
CR >4.8, <6
Substructure Index <5
Joints
CR >4.8, <6
Joint <5
Combinations of the above Element Specific Repairs must meet the criteria below:
NBI Superstructure > 5
AND
Deck Repairs < 30% of Deck
OR
NBI Superstructure > 5
AND
Deck Repairs > 30% of Deck
AND
NBI Substructure > 5
Otherwise, multiple repairs should be advanced under rehab/replacement project.

BRIDGE MAINTENANCE TECHNICAL GUIDANCE

Cyclical Activity	Selection Criteria	Cycle
Bridge Washing (including substructure concrete, deck & crack sealing)	All functional structures regardless of CR, priority to structures over highways.	2 years
Deck Sealing (including crack & substructure concrete, sealing)	Concrete wearing surfaces (present wearing surface codes 02, 03, 06, 12, 22, 32, 42, 45, 52 in RC 15 of BDMS) rated ≥ 5.0 on structures rated 4.5 to 7. • 02 - Portland Cement concrete overlay • 03 - Precast Portland Cement Concrete Plank • 06 - Integral or Monolithic Portland Cement Concrete • 12 - Bonded Concrete • 22 - Concrete with membrane • 32 - High Density Concrete • 42 - Latex Modified Concrete • 45 - Micro-Silica Overlay • 52 - Class "HP" Concrete	6 years
Bridge Painting	Painted structures (coating types 1, 2 or 3 in RC 15 of BDMS) on structures rated 4.5 to 7. • 1 - Painted, Lead-Based • 2 - Painted, Not Lead-Based • 3 - Painted, Unknown	12 years
Deck Overlay	Wearing surfaces (present wearing surface codes 04, 14, 24, 34, 44, 54, 64 in RC 15 of BDMS) on structures rated 4.5 to 7. • 04 - Asphalt Concrete • 14 - Asphalt Concrete without Membrane • 24 - Asphalt Concrete with Membrane • 34 - Asphalt Concrete with Preformed Sheet Membrane • 44 - Asphalt Concrete with Coal Tar Epoxy Membrane • 54 - Asphalt Concrete with Membrane other than Coal Tar • 64 - Asphalt Concrete with Mastic Membrane	12 years

Corrective Activity	Selection Criteria	Objective
"5 – 7" Program	Bridges in generally good condition (Condition Rating > 4.8) that have individual structural elements that are deficient (Element Ratings < 5).	Repair the deficient element and thus extend the non-deficient life of the bridge.
"Vertical Down"	Structures with average condition rating between 4.8 and 6 with a substructure condition index ≤ 5.0.	Repair deficient substructures (i.e. bearings, pedestals, bridge seat/pier cap, columns/stems) where needed
"Joints"	Structures with average condition rating between 4.8 and 6 with joints (Joint Type codes 07, 11, 12, 13, 15, 16, 17, 18, 21, 22, 27, 28, 29, 30, 31, 32, 33, 34 in RC02 and RC15 of BDMS) rated ≤ 5.0. • Elastometric 07 - expansion 27 - fixed • Armored Elastometric 11 - expansion 28 - fixed • Armored Compression Seal 12 - expansion 29 - fixed • Compression Seal 13 - expansion 30 - fixed • Strip Seal with Integral Armoring Angle 15 - expansion 31 - fixed • Strip Seal – Extrusion Anchored to Deck, No Elastometric Concrete 16 - expansion 32 - fixed • Strip Seal – Extrusion Embedded in Elastometric Concrete 17 - expansion 33 - fixed • Strip Seal – Type Unknown 18 - expansion 34 – fixed • Sawed and Filled 21 - fixed • Filled, Elastic Material 22 - fixed	Repair deficient joints to prevent water and chlorides from falling onto substructure elements.