Chapter 4
Bridge Program Drawings

Section 4.22 – Preservation and Rehabilitation

Introduction

Preservation and rehabilitation is an ongoing task performed on structures during their lifetime.

The Bridge Management System, followed by on-site inspections provide the information that justifies the need for preservation and rehabilitation of structures.

Preservation will help maintain current conditions, prevent additional deterioration, and extend the service life of existing bridge elements. The most common type of preservation work are bridge railing modifications, bridge deck repair and resurfacing, expansion device modifications, approach slab installations/modifications, and concrete repairs.

Rehabilitation will evaluate existing bridge elements against values for Controlling Design Criteria as shown in the latest version of WYDOT's Design Guide. These consist of items such as structure roadway width, vertical clearance, and structure capacity. Rehabilitation will also evaluate bridges to determine elements in an advanced state of deterioration. Work needed to extend the functional life of the structure, including structure replacement, widening, or reconstruction of any element, may be addressed.

General Design and Detail Information

BRIDGE RAILING MODIFICATIONS are made when a bridge has curbs or railing that does not meet current standards. On bridges that have curbs within the proper size (4” to 9” high) and the railing does not meet the current standards, the old railing is removed and new railing is placed on the curbs. When both curb and railing on a bridge are substandard, the curbs and railing shall be removed and replaced with new curbs and railing or bridge barrier rail that meet current standards. A higher curb may be provided to maintain a 6" height measured from the top of the wearing surface. Some bridges have proper curbs and railing but do not have railing terminals to match the proposed approach and exit railings to the bridge. In this case, the bridge railing modification consists of removing and replacing the terminal

section. For all TL-3 and TL-4 railing modifications, top rail height above final wearing surface must meet the requirements shown in Section 4.10 - Bridge Railing. In all cases, a 10" radius on the ends of the curbs is required.

It is preferable to remove an entire section of railing as opposed to cutting the railing. The dimension and strength of the anchorage system shall be suitable for the situation at hand.

BRIDGE DECK RESURFACING is done when a bridge deck evaluation shows that the deck has spalls, cracks, delaminations, high electrical potential, and/or high chloride content that possibly will affect the strength of the reinforced concrete deck. The following resurfacing strategies will protect the layers of reinforcing steel and concrete from further deterioration:

Scarify the entire surface of the deck, removing any existing overlay, if present, plus ¼"of the original deck surface, sound the deck and perform additional repairs ranging from one-half to full depth thickness of the deck (Class II-A and Class II-B repairs respectively), and overlay with varying thicknesses, 1¼" minimum, with silica fume modified concrete.

Hydro-demolition the entire surface of the deck, removing ¼" and any unsound concrete up to one-half of the original deck thickness, perform additional repairs up to full thickness of the deck (Class II-B repairs), and overlay with varying thicknesses, 1¼" minimum, with silica fume modified concrete. If bridge deck has an existing overlay, scarify existing overlay in its entirety prior to hydro-demolition.

The expected service life of a silica fumed modified concrete overlay is 15 to 20 years.

BRIDGE DECK REPLACEMENT should be considered when a deck evaluation shows significant areas of cracking and delaminations with deteriorated concrete that correspond with large areas of map cracking with effloresence on the deck soffit. These typically indicate areas requiring full depth repair. Additional items such as cost, construction sequencing (i.e. crossover traffic or completed half at a time), age, previous maintenance, and load rating should also be considered when evaluating bridge deck resurfacing versus bridge deck replacement.

BRIDGE DECK MEMBRANES are a cost effective alternative to modified concrete overlays. They consist of a rubberized membrane covered with a protective sealer followed by a bituminous overlay. The membrane serves as a waterproof barrier between the concrete deck surface and the pavement overlay. This type of repair is normally taken care of with a Supplementary Specification and requires no details. It commonly occurs when an overlay is removed or a wearing course is added to the deck and should not be used when the approach roadway is concrete.

THIN BONDED EPOXY OVERLAYS are a ⅜" thick layer of pourable material combined with silica sand, basalt, or other similarly hard, durable, angular shaped aggregate. They are used when the deck has a smooth or reduced friction value, or has little or no spalls or delaminations, but has large amounts of cracking and/or high chloride content.

The expected service life of a thin bonded epoxy overlay is 7 to 10 years.

CRACK HEALER/PENETRATING SEALER systems are used when the deck has a good friction value, little or no spalls or delaminations, but has large amounts of cracking. These repairs typically do not require details, as the repair methods are covered by the general notes or special provisions.

The expected service life of a crack healer/penetrating sealer is 3 to 5 years.

EXPANSION DEVICE MODIFICATIONS are made when an existing bridge expansion system no longer functions properly, is loose, leaks excessively, or needs to be updated to current standards for maintenance considerations. The concrete around the existing device is saw cut and the device and concrete are removed. The new device and anchorage system is placed along with new reinforcing steel, as required, and concrete. The new device can be placed half at a time or for the full width of the deck, depending upon the type of traffic control. There are various types of expansion devices available for bridges depending on the amount of expansion. Most devices are installed prior to bridge deck overlays. The overlay is then placed to match the top surface of the expansion device modification.

Some existing expansion systems may be removed completely and replaced with reinforced concrete with no expansion at all. Examples of this are as follows:

- Expansion joints in a concrete bridge deck, located over an intermediate substructure, where the girders are continuous.
- Bridges with certain abutment foundations, structure lengths, and stiffness. These should be approved by Bridge Program Staff.

APPROACH SLAB INSTALLATIONS / MODIFICATIONS are constructed when the existing bridge has no approach slabs, the existing approach slabs have cracked or settled, or longer approach slabs are needed to level out the approach to the bridge. If the existing approach slab was constructed on reinforced backfill, and there are no signs of settlement, a new approach slab may be placed on top of the existing reinforced backfill. Although, in most cases, the material behind the abutment is excavated, a drain system is installed, and layers of geotextile and backfill material are placed as outlined in Section 4.14 - Approach Slabs. The reinforced concrete approach slab is then placed on the backfill.

Approach slab installations may be accomplished either half at a time or for the full width of the roadway, depending upon the type of traffic control. When constructing half at a time, sheet piling shall be designed to retain the existing or new reinforced backfill material. Additional bridge railing may be required if the existing railing terminates at rear face abutment, at end of the wingwall, or if a longer approach slab is installed. In this case, railing sheets will be required.
Curbs may be added to existing approach slabs that are in good condition if there is erosion occurring around the ends of the wingwalls. The curbs will direct flow to the end of the approach slab and away from the bridge abutment. The curb heights and widths will match that of those on the bridge, except if the curb width on the bridge is less than 1'-6", then the minimum curb width on the approach slab will be 1'-6". Additional bridge railing will be required, extending the existing bridge railing from the rear face abutment or wingwall to the end of the curb added to the approach slab.

CONCRETE REPAIR consists of replacing damaged or deteriorated concrete and reinforcing steel with new concrete or patching material and reinforcing steel.

BEARING DEVICE MODIFICATIONS are necessary when an existing bearing device no longer functions properly due to corrosion and/or deterioration, excessive movement, rotation, or

displacement. Typical bearing device modifications consist of elastomeric bearing pads that have "walked-out" from beneath the girders, or rocker bearings that are over inclined. These bearing devices modifications require jacking the existing girder(s), and repositioning the bearing device on a new masonry plate with anchor bolts.

SLOPE PAVING REPAIR/MODIFICATION is necessary when existing slope paving no longer functions properly due to excessive cracking, settlement, voids, or deterioration. Portions of existing slope paving are saw cut and removed, typically along scored lines, voids are backfilled with flowable fill, and new slope paving placed to match original construction.

PAINT REPAIR - STRUCTURAL STEEL and PAINT REPAIR - STEE PILING are necessary when the existing paint system on structural steel components (i.e. girders, diaphragms, cross-frames, stiffeners, bearing devices) and/or steel piling in bents has deteriorated, and is peeling or flaking with signs of corrosion. Typically an area requiring paint repair is estimated based on the bridge inspection report and a field inspection. The bid item CONTROLS FOR LEAD PAINT REMOVAL is typically included with the paint repair bid item for the monitoring, containment, and disposal of lead-based paint. The paint color of the repair areas should match the color of the existing girders.

BRIDGE WIDENINGS are constructed when an existing bridge does not meet current width standards and safety requirements, or to accommodate additional lanes of traffic. Widenings consist of removing the existing curb(s) and portions of the existing deck, widening the existing bent/pier caps and abutments to accommodate new girders, installing the new girders and new portions of the deck, and adding curbs and railing. The existing deck and new portions of the deck are often scarified and overlayed for the full width and length of the bridge. Approach slabs are then placed to match the new bridge width, completing the widening phase. Often, additional field information is required when completing bridge widenings. The Field shall be asked to provide any required elevations, dimensions, and any additional information required early in the design process.

Cells

Name	Description
BOLTRP	Rail Mod Repair Bolt
HATCH	Hatch Pattern
WBL1A	Railing Weld AWS B-L1a

Bridge Railing Modification (New Railing on Existing/New Curbs)

Plan

- ❑ The checklist for the PLAN will be similar to that of the standard railing sheet of Section 4.10 - BRIDGE RAILING.

Assembly Detail

- ❑ Swedge Bolt Call-out (length and epoxy)
- ❑ Curb Height/Width Dimension

View A-A

- ❑ Back of Curb to Base Plate Dimension
- ❑ Back of Curb to Centerline Bolt Dimension

Section B-B

- ❑ May not be required

End Terminal Modifications on Existing Railing

- ❑ Table of Dimensions

Bridge Deck Resurfacing

Plan (All Types)

- ❑ North Arrow
- ❑ Centerlines
- ❑ End of Slab/RF Abut Call-outs
- ❑ Dimensions
- ❑ Section Symbols
- ❑ Hatch/Delaminations
- ❑ Roadway Width

Miscellaneous

- ❑ Drain Taper Detail
- ❑ Sections at Abutments/Bents
- ❑ Taper Detail at Abutment/Bents

Notes

- ❑ Modification to Class II-A, Class-B Quantity
- ❑ Double Passes Class I
- ❑ Hydrodemolition
- ❑ Modification to Evaluation
- ❑ Half at a Time

Expansion Device Modification

Plan (All Types)

- ❑ Centerlines
- ❑ Width/Length Dimensions
- ❑ Approach Slab/RF Abutment/End of Slab/Corbel Call-outs
- ❑ Cut Line/Construction Joint Call-outs
- ❑ Removal/Reconstruction Stage Call-outs
- ❑ Section Symbols
- ❑ Skew Angle
- ❑ Hatching
- ❑ Anchor Spacing
- ❑ Snow Plow Plate Spacing
- ❑ Rail Splice Location

Existing Section

- ❑ Width/Height Dimensions
- ❑ Reinforcing Call-outs/To Stay in Place/To be Removed
- ❑ RF/FF Abutment Call-outs
- ❑ Patterning
- ❑ Cut-Lines
- ❑ Overlay

New Construction Section

- ❑ Width/Height Dimensions
- ❑ Reinforcing Size/Call-outs/Clearances/Epoxy Designations
- ❑ Tooled Edge
- ❑ Patterning
- ❑ RF/FF Autment Call-outs
- ❑ Expansion Device Call-out

Plan of Slab Support

- ❑ Length Dimensions
- ❑ End of Slab
- ❑ Reinforcing Size/ Spacing/Call-outs/Epoxy Designations
- ❑ Centerlines
- ❑ Construction Joints
- ❑ Slab Support Call-outs

Notes

- ❑ Hatched Area Removed
- ❑ Slab Opening
- ❑ Epoxy Coated Reinforcing
- ❑ Prefix Numbers
- ❑ Reinforcing Laps/Placement/Disposition/Field Cut
- ❑ Traffic Railing Anchorages Removed/Replaced
- ❑ Joint Across Deck/Curb/Sidewalks
- ❑ Compression Joint Ends Sealed

Miscellaneous

- ❑ Curb Radius at Abutments
- ❑ Section Thru Bents/Piers
- ❑ Bill of Reinforcements

Slope Paving Repair/ Modification

Plan

- ❑ North Arrow
- ❑ Centerlines
- ❑ End of Slab/RF Abut Call-outs
- ❑ Dimensions
- ❑ Section Symbols
- ❑ Hatch Damaged Sections
- ❑ Slope paving layout

Miscellaneous

- ❑ Section through slope paving

Paint Repair - Structural Steel & Paint Repair - Steel Piling

- ❑ Typically there are no details associated with Paint Repair and everything is covered in a General Note.

Approach Slab List

- ❑

  The appraoch slab check list is similar to teh check list for Section 4.14 - APPROACH SLABS, with the addition of sheet piling call-outs and notes, cut lines, and construction joint and stage call-outs. For location of call-outs and additional details see examples and jobs with similar features.

Concrete Repair

- ❑ Because of the great variance of possibilities, details from previous jobs with similar features should be referenced.

Bearing Device Modification

- ❑ Because of the great variance of possibilities, details from previous jobs with similar features should be referenced.

Bridge Widening

- ❑

The bridge widening check list will be similar to the check lists for Sections 4.2 through 4.15 of this chapter. Each bridge widening is unique, thus creating a different situation in ever case. The most efficient way to provide a check list is to review a referance file or sheet on a structure of similar features. As a rule, for each detail sheet on a bridge widening, phantom lines indicate existing structure and solid lines indicate limits of new construction.