

# **CHAPTER 6 REHABILITATION**

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## 6.2 Wearing Surface Replacement

### 6.2.1 Introduction

Wearing Surface Replacement projects involve removal and replacement of existing asphalt or concrete wearing surfaces and the rehabilitation of other bridge features such as deck slabs, joints, curbs/sidewalks, bridge rails, end posts and approach guardrail, as required. The items to be rehabilitated vary from project to project.

### 6.2.2 Typical Sheet Names and Contents

#### 6.2.2.1 Title Sheet

↳ Refer to Chapter 7 for more information.

#### 6.2.2.2 Estimated Quantities

↳ Refer to Chapter 7 for more information.

#### 6.2.2.3 General Plan

#### 6.2.2.4 Details

#### 6.2.2.5 Staged Construction

↳ Refer to Chapter 7 for more information.

#### 6.2.2.6 Reinforcing Steel Schedule (if applicable)

↳ Refer to Chapter 8 for more information

### 6.2.3 Detail List

Wearing Surface detailing may include the following:

- 1) General Construction Notes
- 2) Staged Construction Scheme
- 3) Plan
- 4) Transverse Section
- 5) Bridge Rail and Guardrail Modification Details
- 6) Aluminum Bridge Rail Splice Modification Details
- 7) Joint Rehab Details
- 8) Other Rehab Details (make sure to have geometry checked before designing any reinforcing steel req'd)

### 6.2.4 Prerequisites

- 1) Existing plans
- 2) Existing wearing surface thickness
- 3) Proposed Wearing Surface and Membrane Thicknesses
- 4) Scope of work listing the items to be rehabilitated. If answer to any of the following questions is yes, detailer must get a comprehensive rehab/replacement scheme from the designer.
  - a) End post to be replaced?
  - b) Approach Rail to be reset or replaced?
  - c) Bridge Rail to be reset or replaced?
  - d) Joint Armor to be rehabbed?
  - e) Seals to be replaced?
  - f) Aluminum Bridge Rail Splices to be modified?
  - g) Shoulders to be rehabilitated/widened?

### 6.2.5 Detailing

Include a legend for Existing Concrete to Remain, New Concrete, Existing Concrete to be removed and Existing Granite to remain.

### 6.2.6 Checklists

#### 6.2.6.1 Plan

**Intro:** Bare bones general plan showing bridge and abbreviated approaches.

**Sheet up:** Belongs in the upper left of the General Plan sheet.

**Scale:** 1"=25'

**Draw:**

- 1) Centerline of Construction
- 2) Centerline of Bearings Abutments and Piers
- 3) Limits of wearing surface removal and replacement
- 4) Curbs/sidewalks
- 5) Approach guardrail
- 6) Bridge drains

**Dimension:**

- 1) Deck width from CL of Construction
- 2) Skew angle between CL Abutment/Pier and line normal to CL Construction

- 3) Curbs/sidewalks widths
- 4) CL of bearings
- 5) Location of pavement transition at each approach

**Label:**

- 1) Detail Name (Plan)
- 2) North Arrow
- 3) Traffic flow arrows
- 4) Flow Arrow, if water crossing
- 5) CL Roadway or Railroad if grade crossing
- 6) Fixed or expansion bearings
- 7) Bar scale
- 8) Pavement transition
- 9) Label rehabilitation work (i.e. Remove, modify and reset 262.5 LF of existing guardrail; Retrofit and seal the deck joints at the piers; Modify sidewalk to provide ADA access...)
- 10) Bridge drains

**6.2.6.2 Transverse Section**

**Intro:** Transverse bridge section shows existing conditions on left side and proposed rehabilitations on right.

**Sheet up:** Belongs directly below the plan on the General Plan sheet.

**Scale:** 1/4" or larger if there is room

**Draw:**

- 1) CL Construction/Working Line
- 2) Superstructure, including deck, girders or box beams
- 3) Wearing surface
- 4) Curbs/sidewalks
- 5) Bridge rail
- 6) Bridge drains
- 7) Utilities on bridge

**Dimension:**

- 1) Deck width from CL of Construction

**Label:**

- 1) Detail Name (Transverse Section)
- 2) Existing and Proposed

- 3) Cross slope
- 4) Remove existing wearing surface and membrane waterproofing
- 5) Install 3" hot mix asphalt and 1/4" membrane waterproofing
- 6) Rehabilitate structural concrete slab as directed by Resident
- 7) Repairs to curbs/sidewalk, if required
- 8) Repairs to bridge rail, if required

### 6.2.6.3 Approach Pavement Transition Detail

**Intro:** Consists of two cross-sectional details showing the limits of pavement removal and replacement, respectively, at the roadway/bridge deck transition. The second detail shows how to accommodate the increased pavement thickness on the bridge.

**Sheet up:** If there is room, locate to the right of the transverse section on the general plan sheet. Otherwise it can go on a detail sheet.

**Scale:** 1 1/2"

**Draw:**

- 1) Removal Detail (Existing approach pavement, existing wearing surface on bridge, joint at end of bridge deck, hatch limits of pavement removal on approach)
- 2) Replacement Detail (Similar to removal detail except show limits of new pavement)

**Dimension:**

- 1) Removal Detail (Depth of pavement removal)
- 2) Replacement Detail (Depth of proposed pavement)

**Label:**

- 1) Detail Name
- 2) Removal Detail (Existing approach pavement, limits of approach pavement removal, end of bridge deck, top of existing wearing surface on bridge)
- 3) Replacement Detail (Existing approach pavement, limits of proposed pavement, end of bridge deck, top of proposed pavement on bridge, existing wearing surface on bridge, note to see joint modification detail)

## 6.3 Deck Replacement

### 6.3.1 Introduction

Deck Replacement projects involve removal and replacement of the concrete bridge deck, curbs/sidewalks and bridge rails and the rehabilitation of other features such as bridge joints, girder bearings and approach guardrail, as required. The items to be rehabilitated vary from project to project.

### 6.3.2 Typical Sheet Names and Contents

#### 6.3.2.1 Required

Title Sheet  
Estimated Quantities  
General Plan  
Staged Construction  
Structural Steel  
Superstructure  
Superstructure Details  
Reinforcing Steel

#### 6.3.2.2 Other sheets if required

Abutments  
Piers  
End Posts  
Bridge Bearings.  
Expansion Devices

### 6.3.3 Prerequisites

The following information needs to be gathered to detail plans:

- 1) Structural Steel Design
- 2) Transverse Section Design
- 3) Reinforcing Steel Design
- 4) Other rehab plan and details (make sure to have geometry checked before detailing any reinforcing steel)



- 5) Scope of work listing the items to be rehabilitated. If answer to any of the following questions is yes, detailer must get comprehensive rehab/replacement scheme from the designer.
  - A. Joints to be replaced?
  - B. Bridge bearings to be replaced?
  - C. Abutments or piers to be modified for new joints and bearings?
  - D. End posts to be replaced or added?
  - E. Approach rail to be reset or replaced?
  - F. Shoulder to be rehabbed/widened?
- 6) Staged Construction Scheme
- 7) Complete list of pay items to be estimated
- 8) Complete general construction notes
- 9) Existing plans
- 10) Existing slab and wearing surface thicknesses.
- 11) Proposed slab and wearing surface thicknesses
- 12) Proposed bridge rail

#### **6.3.4 Detailing**

Include a legend for New Concrete, Existing Concrete to be removed and Existing Concrete to remain.

#### **6.3.5 Checklists**

##### **6.3.5.1 General Plan**

Refer to plan checklist, Chapter 2.

##### **6.3.5.2 Superstructure Plan**

Refer to superstructure plan checklist, Chapter 4.

##### **6.3.5.3 Transverse Section**

Similar to bridge replacement project except steel girders are existing. Refer to Transverse Section checklist in Chapter 4.

##### **6.3.5.4 End of Slab Section**

Similar to bridge replacement project except abutment is existing. Refer to End of Slab Section checklist in Chapter 4. Differences may include modifications to the existing abutment for new joint armor or slab over backwall condition.

**6.3.5.5 Slab Haunch and Blocking Detail**

Refer to Slab Haunch and Blocking Detail Section checklist in Chapter 4.

**6.3.5.6 Bottom of Slab Elevation Layout Plan**

Refer to Bottom of Slab Elevation Layout Plan checklist, Chapter 4.

**6.3.5.7 Existing Framing Plan**

Similar to bridge replacement project except girders, diaphragms and bearing stiffeners are existing. Refer to Framing Plan checklist, Chapter 4.

**6.3.5.8 Beam Elevation and Stud Layout**

Required if adding or replacing shear studs, cover plates or bearing stiffeners. Refer to Beam Elevation and Stud Layout checklist in Chapter 4.

## 6.4 Invert Lining

### 6.4.1 Introduction

Invert lining projects are typically rehabilitations of the bottoms of pipes and pipe arches after they have corroded.

### 6.4.2 Prerequisites

You will need:

- 1) Size and length of existing structure
- 2) Relationship of structure to CL Road (length and skew)
- 3) Invert lining scheme, including:
  - a) Thickness
  - b) Height
  - c) End Conditions
- 4) Reinforcing scheme
- 5) Design/Modifications to facilitate fish passage
- 6) Notes

### 6.4.3 Detailing

Invert Linings require explicit rather than performance-based details. The Contractor is the main client to consider when detailing.

### 6.4.4 Typical Sheet Names and Contents

#### 6.4.4.1 Invert Lining, Pipe, etc.

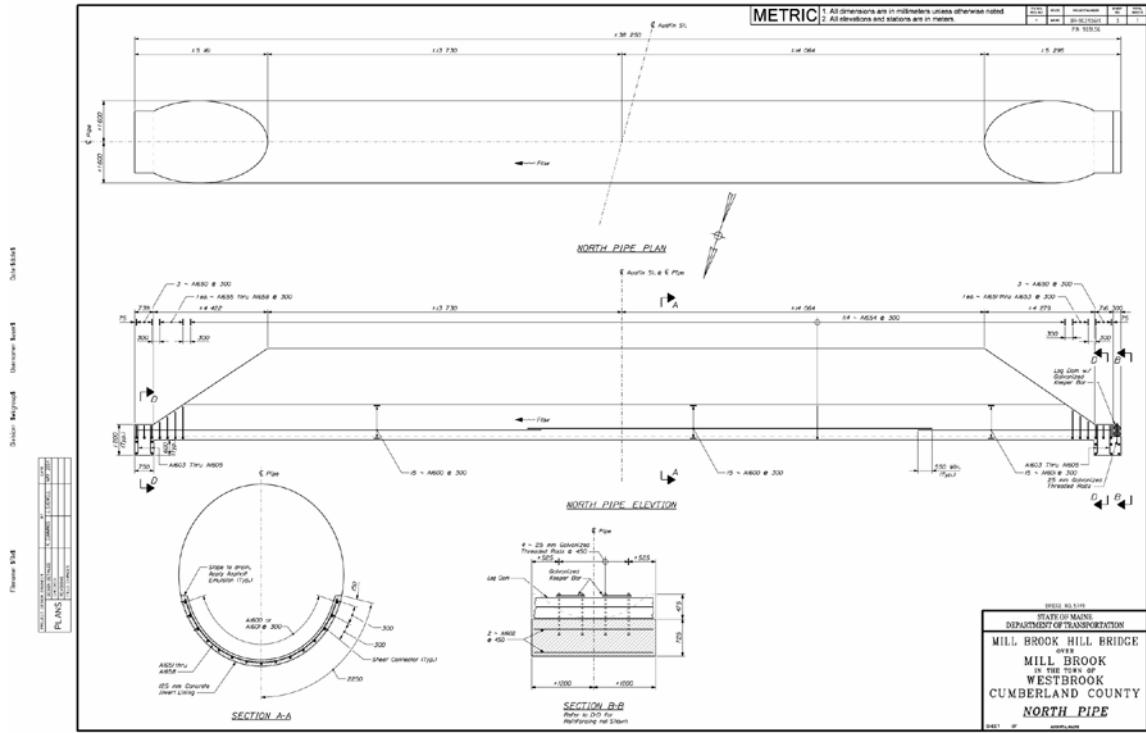


Figure 6-1 Invert Lining Sheet

**Will Contain:**

- 1) Invert lining Plan
- 2) Invert Lining Elevation
- 3) Invert Lining Section

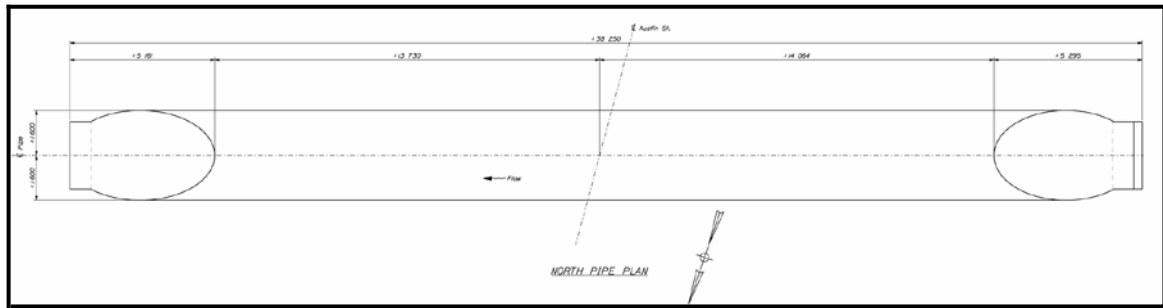
**May Contain:**

- 1) Other Details
- 2) Notes

### 6.4.5 Standard Notes

### 6.4.6 Checklists

#### 6.4.6.1 Invert Lining Plan



**Figure 6-2 Invert Lining Plan**

**Intro:** the invert lining plan shows the existing pipe and limits of the invert lining.

**Sheet up:** belongs on invert lining sheet, upper left, directly above elevation with working points aligned

**Scale:**  $\frac{1}{4}'' = 1'-0''$

**Draw:**

- 1) CL Road
- 2) CL Structure
- 3) Existing Structure
- 4) Invert lining as it impacts the plan

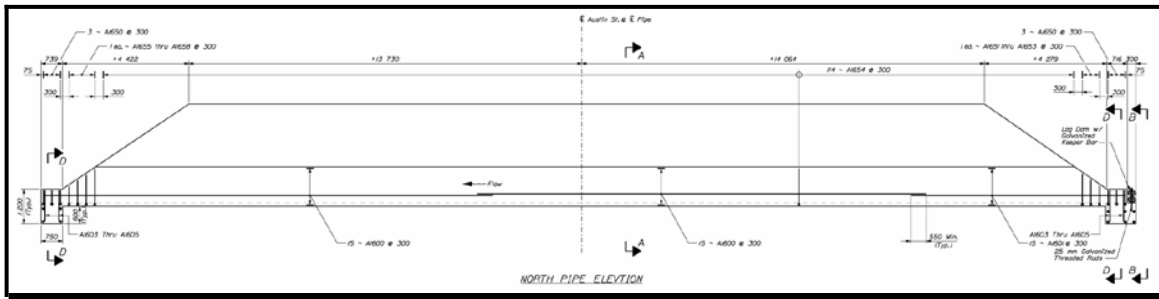
**Dimension:**

- 1) Approximate structure length and location
- 2) Approximate structure size
- 3) Approximate end bevel
- 4) Approximate skew

**Label:**

- 1) Detail Name
- 2) CL Road
- 3) CL Pipe
- 4) Flow
- 5) North

6.4.6.2 Invert Lining Elevation



**Figure 6-3 Invert Lining Elevation**

**Intro:** the invert lining elevation shows the vertical limits of the lining and the reinforcing steel

**Sheet up:** belongs on invert lining sheet, directly below plan with working points aligned

**Scale:** 1/4" = 1'-0"

**Draw:**

- 1) CL Road
- 2) Existing Structure
- 3) Proposed limits of invert lining
- 4) Reinforcing Steel

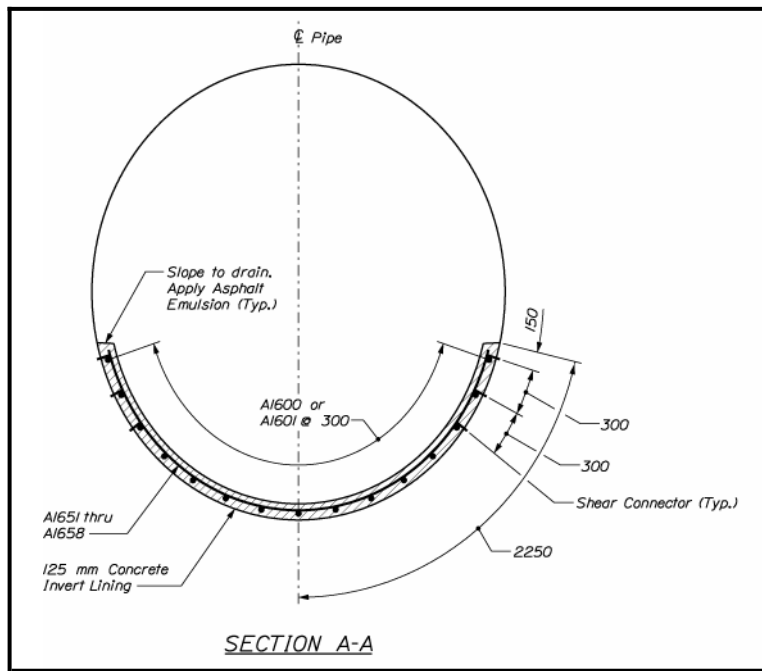
**Dimension:**

- 1) Approximate Length of pipe
- 2) Invert Lining
- 3) Reinforcing Steel

**Label:**

- 1) Detail Name
- 2) CL Road
- 3) Flow
- 4) Section Cuts

## 6.4.6.3 Invert Lining Section



**Figure 6-4 Invert Lining Section**

**Intro:** the section shows the thickness and limits of the invert lining, as well as the reinforcing steel.

**Sheet up:** Belongs on invert lining sheet

**Scale:**  $\frac{1}{2}'' = 1'-0''$

**Draw:**

- 1) CL Pipe
- 2) Existing Structure
- 3) Invert Lining
- 4) Reinforcing Steel
- 5) Shear Connector

**Dimension:**

- 1) Limits of Concrete. Usually given as a length along the curve of the existing structure, measured from the invert up to the top of the invert lining.
- 2) Reinforcing Steel, Shear Connectors

**Label:**

- 1) Detail Name
- 2) CL Pipe
- 3) Invert Lining

- 4) Shear Connectors
- 5) Reinforcing Steel
- 6) Slope to top of lining to drain