



BUREAU BRIDGE PRESERVATION GUIDE

A guide to the applicable practices used to prevent or delay the deterioration of bureau bridges & bridge elements - using these preservation measures, tribal agencies can extend the service life of their bridge infrastructure



BUREAU OF INDIAN AFFAIRS
Division of Transportation

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Table 2. Condition State Descriptions & Preservation Practices

Table 3. Common Structural Repairs

REFERENCES

Bureau of Indian Affairs Inspection Handbook (Handbook)

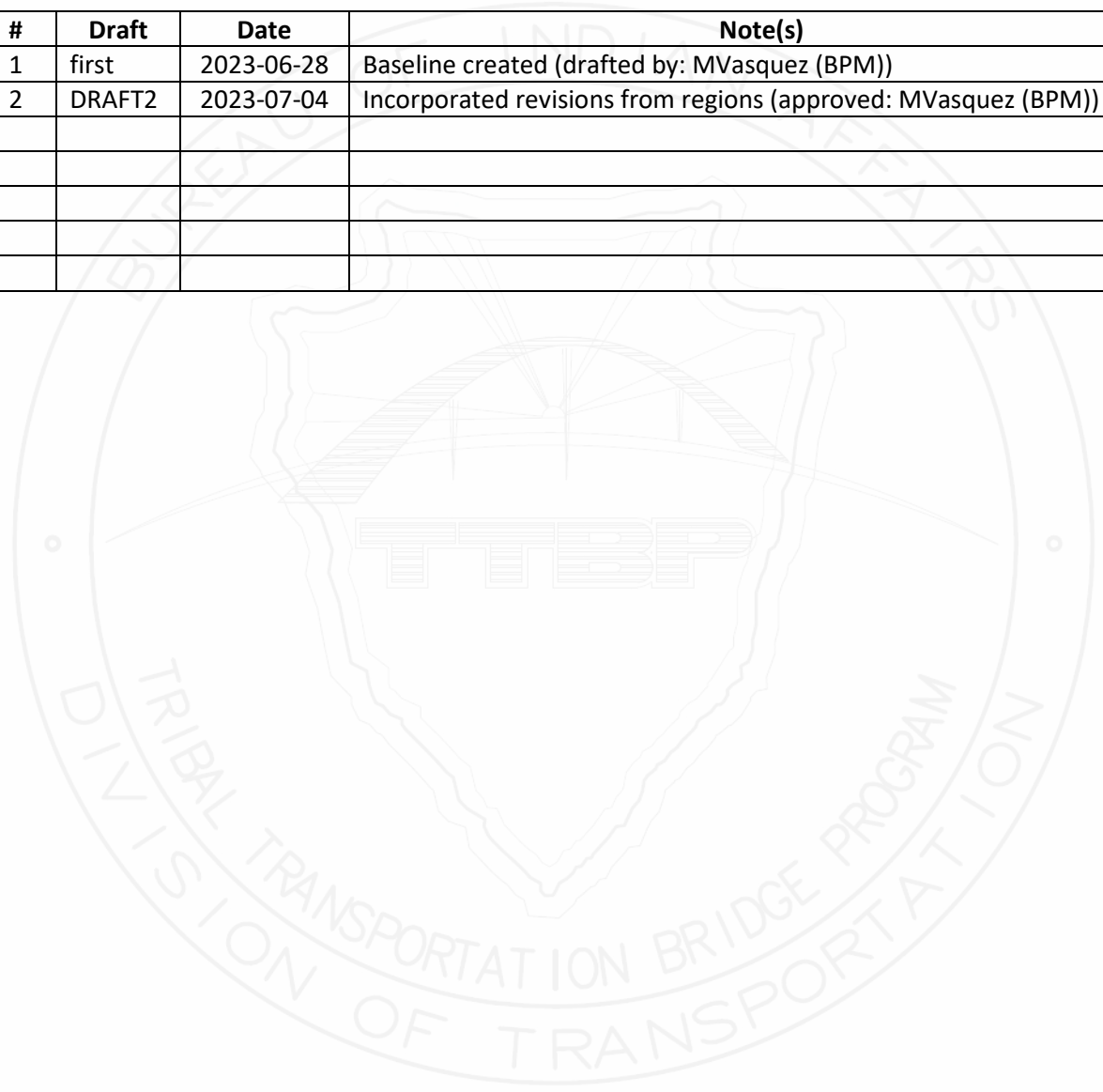
Bridge Preservation Guide, FHWA – Spring 2018

Service Life Design Reference Guide – November 2022

Revisions

This guide is a dynamic document that is updated periodically to incorporate revisions based on new requirements from the Federal Highway Administration (FHWA), as well as newly adopted practices by either federal or local agencies within the regions. We encourage the user to submit to the Bridge Program Office any proposed revisions or new material that, after review, can be incorporated into this guide to increase the knowledge base and its transfer.

#	Draft	Date	Note(s)
1	first	2023-06-28	Baseline created (drafted by: M Vasquez (BPM))
2	DRAFT2	2023-07-04	Incorporated revisions from regions (approved: M Vasquez (BPM))



Forward & Purpose

Bridge preservation i.e., bridge preventive maintenance, is vitally important in extending the serviceable life of structures throughout Indian Country as well as the rest of the nation. Several factors can accelerate the deterioration of bridge elements; among them are increased volume of truck traffic and heavier truck weights, local hydrologic and-or population changes, and the decreasing frequency of bridge preventive maintenance efforts. Preventive maintenance can, and should, be used consistently to arrest or delay deterioration of bureau bridge elements.

The purpose of the Bureau Bridge Preservation Program (BBPP) is to assist both regional and tribal agencies with extending the life of their bridges by performing the prescribed bridge maintenance activities contained herein. The Bureau Bridge Preservation Program Goals are to:

- Maintain the existing inventory of bureau bridges in a structurally safe and serviceable condition;
- Correct minor structural defects;
- Correct minor structural deficiencies early in a bridge's life, rather than wait until a bridge has major problems requiring costly rehabilitation, reconstruction or replacement;
- Extend the service life of existing bureau bridges ([hif22052.pdf \(dot.gov\)](#)); and,
- Make efficient use of limited resources.

1 INTRODUCTION

1.1 BACKGROUND

Aging bridges require repairs, rehabilitation, or replacement. Until recently, funding levels remained insufficient to replace bridges on a large scale. Fiscal constraints will continue to pose a challenge to infrastructure managers charged with mitigating the effects of aging and deteriorating bridges. To improve the condition of the bureau's aging and deteriorating bridge infrastructure, the BIA Bridge Program Office has developed this guide to assist the agencies with extending the service life of bureau-owned and tribal-owned bridges with practicable solutions that are both safe and cost-effective.

1.2 SCOPE OF GUIDE

To address the declining condition of aging bridge inventories, the FHWA and many transportation organizations have developed a coherent approach termed **bridge preservation** - this includes,

"...actions or strategies that prevent, delay or reduce the deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life. Bridge preservation actions may be preventive, or condition driven."¹

This provides a practicable approach to dealing with the issue of aging bridges; one that does not apply only to "fixing broken stuff" or employing a "worst-first" strategy for bridge maintenance. Most importantly, preservation actions allow bridge managers to seek cost-effective maintenance options and to pursue problems by addressing root-level causes. This strategy is preferred over correcting problems as they arise on a piecemeal basis - and often in a superficial, symptomatic manner. Aggressively pursuing **bridge preservation** may resolve the nation's aging/deteriorating bridge infrastructure problem in the most cost-effective manner.

1.3 POLICY

Preventive maintenance is a fundamental set of activities incorporated into all **bridge preservation** programs. Preventative maintenance has been defined as, "a planned strategy of cost-effective treatments to an existing roadway 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". When used as part of a bridge preservation staged workflow, preventive maintenance offers an economical way to preserve and extend the service life of bridges already in satisfactory condition. The Bureau Bridge Program Office shall adapt those bridge preservation methodologies that represent the current need of its expansive bridge inventory.

¹ **Bridge Preservation Guide** – Maintaining a Resilient Infrastructure to Preserve Mobility, FHWA, 2018

2 BRIDGE PRESERVATION PRACTICES

2.1 DEFINITIONS

The definitions are offered as a means of establishing clear and consistent terminology for bridge owners and preservation practitioners.

Maintenance describes work that is performed to maintain the condition of the transportation system or respond to specific conditions or events that restore the highway system to a functional state of operations. Maintenance is a critical component of an agency's asset management plan that includes both routine and preventive maintenance.

Man-hour (MH) describes an hour regarded in terms of the amount of work that can be done by one person within this period.

Routine maintenance encompasses work that is performed in reaction to an event, season, or activities that are done for short-term operational need that do not have preservation value. This work requires regular reoccurring attention.

Preventive maintenance (PM) is a cost-effective means of extending the service life of highway bridges.

Cyclical maintenance activities are performed on pre-determined intervals that aim to preserve and delay deterioration of bridge elements or component conditions.

Condition-based maintenance activities are performed on bridge components or elements in response to known defects. Condition-based maintenance improves the condition of that portion of the element but may or may not result in an increase in the component condition rating.

Rehabilitation involves major work required to restore the structural integrity of a bridge, as well as work necessary to correct major safety defects. Examples of bridge rehabilitation include but are not limited to: partial or complete deck replacement, superstructure replacement, and substructure/culvert strengthening or partial/full replacement. Incidental widening is often associated with some of these activities.

Replacement means the total replacement of an existing bridge with a new facility constructed in the same general traffic corridor. Like bridge rehabilitation, bridge replacement projects require engineering resources for design, a substantial and complex completion schedule, and considerable costs. Life-cycle costs and other economic factors are usually considered when weighing rehabilitation versus replacement costs.

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 or fair condition; and extend their service life. Preservation actions may be cyclical, or condition based.

Bridge Program Manager (BPM) manages all sections covered under 23 CFR Part 650 Subpart C; for more information, see, [eCFR :: 23 CFR Part 650 Subpart C -- National Bridge Inspection Standards \(NBIS\)](#)

2.2 SCOPE

This section provides guidance for scoping of bridge projects that have been selected for both cyclic and condition-based interventions. This section does not address specific, detailed actions required for bridge components or elements, but rather provides direction on whether a bridge should be preserved, rehabilitated or replaced. For each coded bridge condition, both regions and agencies shall refer to Table 1 and Table 2 for a cyclic and-or condition-based course of action.

Table 1. Condition Descriptions & Agency Actions

Code	Condition	Condition Description	Inventory Status	Preservation Activity	Agency Action
0	FAILED	Out of service - beyond corrective action	Bridge closed	Program for replacement	See BPM for guidance
1	IMMINENT FAILURE	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	Bridge closed	Program for replacement	See BPM for guidance
2	CRITICAL	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 it may be necessary to close the bridge until corrective action is taken	Bridge closed	Program for replacement	See BPM for guidance
3	SERIOUS	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	Under review for closure	Program for replacement	See BPM for guidance
4	POOR	Advanced section loss, deterioration, spalling or scour	Under review for closure	Program for replacement	See BPM for guidance
5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour	Open to traffic	Possible replacement of structure; cyclic & routine maintenance performed	See inspector notes for detailed guidance
6	SATISFACTORY	Structural elements show some minor deterioration	Open to traffic	Possible rehabilitation of structure; cyclic & routine maintenance performed	See inspector notes for detailed guidance
7	GOOD	Some minor problems	Open to traffic	Cyclic & routine maintenance performed	See inspector notes for detailed guidance
8	VERY GOOD	No problems noted	Open to traffic	Cyclic & routine maintenance performed	See inspector notes for detailed guidance
9	EXCELLENT		Open to traffic	Cyclic & routine maintenance performed	See inspector notes for detailed guidance
N	NOT APPLICABLE		Open to traffic		

Table 2. Condition State Descriptions & Preservation Practices

Code	Condition	Condition State (CS)	CS Description	Preservation Activity
0	FAILED	CS 4	Varies depending on element - Severe	Program for replacement
1	IMMINENT FAILURE			
2	CRITICAL			
3	SERIOUS			
4	POOR	CS 3	Varies depending on element - Poor	Condition-Based Maintenance, or Rehabilitation or Replacement
5	FAIR			
6	SATISFACTORY	CS 2	Varies depending on element - Fair	Cyclic or Condition-Based Maintenance when cost effective
7	GOOD	CS 1	Varies depending on element - Good	Preservation/Cyclic Maintenance
8	VERY GOOD			
9	EXCELLENT			

Table 2 (Condition State Descriptions & Preservation Practices) aligns the bridge condition descriptions in Table 1 (Condition Descriptions & Preservation Practices) with **condition state** language for purposes of providing consistent bridge preservation direction.

2.3 REPLACEMENT & REHABILITATION

Replacement is the preferred option only if the cost of rehabilitation or repair/preservation exceeds sixty-five percent (65%) of the replacement or unless there are strong mitigating factors indicating replacement is required. Cost estimates for both bureau bridge rehabilitation or replacement projects should include all highway and project costs necessary to develop the complete cost estimate. The following mitigating factors may be used to justify a bridge replacement if the rehabilitation or repair/preservation cost is less than 65% of the replacement:

- Scour susceptibility
- Hydraulic inadequacy
- Fracture critical superstructure elements
- Alkali-silica or alkali-carbonate reactive aggregate
- Accident history or potential
- Inadequate horizontal or vertical clearances
- Unsafe site distance or roadway alignment (vertical or horizontal)
- Inadequate deck geometry
- Requirements to accommodate bicycle and/or pedestrian access
- Overloads/effects on permit vehicles
- Loading capacity below legal loads
- Extraordinary environmental constraints
- Life Cycle Cost Analysis indicates that replacement is the most cost-effective alternative over a 75-year service life

Similarly, mitigating factors may justify repair/preservation or rehabilitation, even when the cost of doing so exceeds 65% of replacement. Rehabilitation projects can include component replacement (deck and-or superstructure), repair or some combination thereof. Rehabilitation can *also* include significant repairs that do *not* involve replacement of a bridge component. Examples include but are not limited to hydro-milling with concrete overlay, structural beam end repair or strengthening or other significant improvements to bridge components. Rehabilitation must be conducted in conjunction with preservation practices that mitigate and slow the causes of the damage being repaired.

2.4 CONDITION-BASED MAINTENANCE

Condition-based maintenance is a maintenance strategy used to actively manage the condition of the structure to perform maintenance only when it is needed and at the most opportune times. Condition-based maintenance is accomplished by integrating all available data to predict impending failures of bureau bridge assets as well as to avoid costly maintenance activities. This action depends, largely, on the quality of the inspection data collected and the most current bureau-developed deterioration model to recognize undesirable operating conditions as measured by the inspection teams. The bridge inspector's observations are directly incorporated into the condition-based maintenance activities of each bureau bridge, when applicable. This preservation activity also allows a bridge to continue operating in an undesirable, yet safe, condition while it is being monitored until maintenance can be scheduled and performed. Condition-based maintenance can also reduce future rehabilitation costs, improve resiliency and asset availability, as well as enhance the service life of the bureau's structures.

2.4.1 CONDITION-BASED MAINTENANCE - DECK

Deck	New Wearing Surface Joint Seal Replacement Header Installation Joint Replacement Install or Replace Cathodic Protection (CP) Electrochemical Chloride Extraction (ECE) Repair Deck Replace Deck
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2.4.2 CONDITION-BASED MAINTENANCE – SUPERSTRUCTURE

Superstructure	Replace Bearing Spot Paint Repair Superstructure Replace Superstructure
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2.4.3 CONDITION-BASED MAINTENANCE – SUBSTRUCTURE

Substructure	Install Grout Bags Point Masonry Abutments and Piers Electrochemical Chloride Extraction (ECE) Install or Repair Scour Countermeasures Install or Replace Pier Protection Repair Substructure Replace Substructure
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2.4.4 CONDITION-BASED MAINTENANCE - CULVERT

Culvert	Replace Lost Streambed Material Repair Concrete Culvert Repair Metal Culvert Repair Culvert Scour Replace Culvert
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2.4.5 CONDITION-BASED MAINTENANCE - STREAMBANK

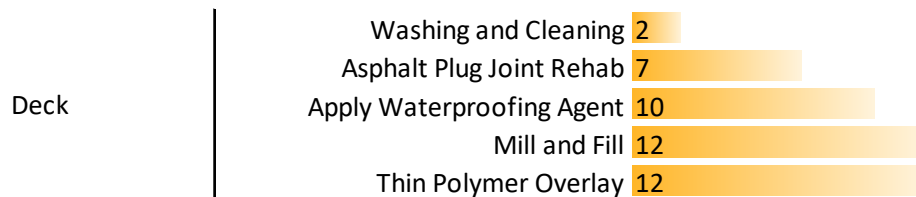
Streambank	Install Riprap Install Streambank Stabilization Measures Install Erosion Control Measures
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2.5 CYCLIC MAINTENANCE (ROUTINE)

Cyclic maintenance activities are routinely performed on a pre-determined interval and meant to preserve existing bridge element or component conditions. Bridge element or component conditions are not always directly improved because of these activities, but the deterioration of the element is projected to be delayed. It is encouraged that any cyclical routine bridge maintenance be scheduled in such a way that it will maximize economies of scale i.e., work that is similar should be applied to as many locations as possible or advantage should be taken of similar work efforts. In addition, response-type efforts should be performed when work of a scheduled nature is underway, such as: when the deck and scuppers on a bridge are being cleaned, the crew should clean the expansion joints and troughs as applicable.

These activities generally depend on a top-down approach, with the overall goal of keeping water away from sensitive elements of the bridge, thus enhancing its long-term performance. Although the deck is designed to carry traffic loads, it also protects the components below from water, like the roof on a house. Decks must be kept watertight and clean to perform this protective function. When decks have separate wearing surfaces, those surfaces must be kept watertight to protect and preserve the underlying deck. Proper maintenance of bridge decks is very critical, not only from a structural preservation viewpoint but also from one of public perception. Decks littered with antiskid materials contribute to the chloride contamination of concrete and corrosion of reinforcing steel which, in turn, accelerates the formation of potholes and the ultimate deterioration of highway structures. A quality deck routine maintenance regimen will go a long way in minimizing present and future repair costs.

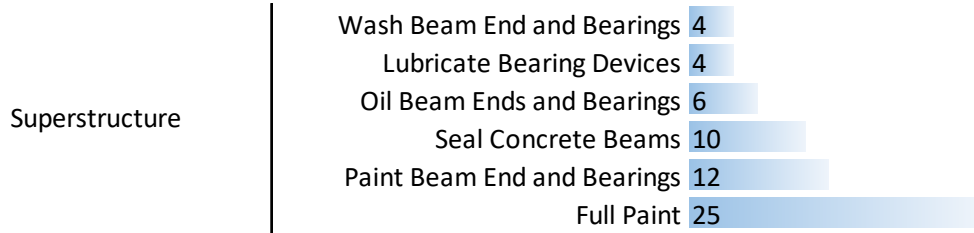
2.5.1 CYCLIC MAINTENANCE - DECK



Preservation Activity	Scope of Activity
Washing and Cleaning -	Remove sand and other debris from the deck surface. Flush deck surface with water.
Asphalt Plug Joint Rehab -	Remove and replace mastic material. Replacement of plate may be required.
Apply Waterproofing Agent -	Apply silane or equivalent waterproofing agent to concrete bridge rail, curb, and fascia down to drip notch.
Mill and Fill -	Remove pavement 1" – 1.5" from curb to curb and replace in-kind.
Thin Polymer Overlay -	Add 3/8" polymer-based overlay to a concrete wearing surface.

The driving forces behind the deterioration of bridge decks is thought to be a combination of three conditions: break-out of penetrating cracks caused by faulty construction and drying shrinkage, infiltration and leakage of rainwater, and abrasion due to wheel loading.

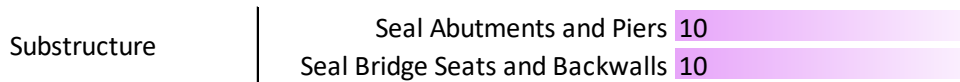
2.5.2 CYCLIC MAINTENANCE - SUPERSTRUCTURE



Preservation Activity	Scope of Activity
Wash Beam End and Bearings -	Remove sand and other debris from the bridge seats. Flush bridge seat with water.
Lubricate Bearing Devices -	Apply lubricant to bearings. Restore proper movement if needed.
Oil Beam Ends and Bearings -	Apply Fluid Film™, NH Oil™, or equivalent to steel beam ends and bearings.
Seal Concrete Beams -	Apply silane or equivalent waterproofing agent to precast prestressed concrete superstructure elements.
Paint Beam End and Bearings -	Apply paint to steel beam ends and bearings.
Full Paint -	Apply paint to steel bridge elements.

Substructure problems include deterioration (particularly at the water line), cracking (usually related to settlement), impact damage (associated with traffic under the bridge), and shear damage (associated with movement or approach pavement pressure). Since most substructure units are concrete, repairs are often concrete related. If the concrete substructure is exposed to salt water, either from the deck or from below, there are likely to be the same rebar corrosion and spalling problems associated with the deck. In addition to the problems listed above, timber substructures are damaged by decay and other environmental factors. Substructure repairs are often very costly involving temporary bents to support the superstructure.

2.5.3 CYCLIC MAINTENANCE - SUBSTRUCTURE



Preservation Activity	Scope of Activity
Seal Abutments and Piers -	Apply silane or equivalent waterproofing agent to abutments and piers within splash zones.
Seal Bridge Seats and Backwalls -	Apply silane or equivalent waterproofing agent to bridge seats and backwalls.

Similarly, joints allowing each deck span to move independently must be kept watertight, or water will reach the beams, bearings, or substructure concrete below, causing deterioration. Drainage systems, designed to carry surface water safely off the deck and away from the bridge, must be kept clean to ensure water flow. Plugged drainage systems allow water to pond on the deck, where it will eventually attack other critical bridge substructural elements.

2.6 COMMON STRUCTURAL REPAIRS

This section provides an overview of the top structural repairs that are commonly performed on bridges on or near tribal lands. (See Table 3. Common Structural Repairs)

Table 3. Common Structural Repairs

Activity	Reason for Activity
Steel: Stringer or Floorbeam or Girder (Repair-Replace)	Leaking deck joints of steel stringer bridges often result in rusting of the ends of the beams below the joints. When the results of the bridge inspection indicate that significant section loss to the beam webs has occurred, the load carrying capacity of the beams could be compromised. Repairing of the beam webs then becomes necessary. Reducing the water that reaches the beam ends should also be addressed when completing this beam repair.
Galvanized channel repair (damaged web)	Leaking deck joints of steel stringer bridges often result in rusting of the ends of the beams below the joints. When the results of the bridge inspection indicate that significant section loss to the beam webs has occurred, the load carrying capacity of the beams could be compromised. Repairing of the beam webs then becomes necessary. Reducing the water that reaches the beam ends should also be addressed when completing this beam repair.
Doubler Beam (for damaged stringers)	Leaking deck joints of steel stringer bridges often result in rusting of the ends of the beams below the joints. When the results of the bridge inspection indicate that significant section loss to the beam webs has occurred, the load carrying capacity of the beams could be compromised. Adding a supplemental beam is an option to increase the capacity of the member.
Reinforced-Prestressed Concrete: Stringer or Diaphragm or other Members (Repair-Replace)	Leaking deck joints of reinforced concrete and prestressed concrete beam bridges often lead to concrete spalling at the ends of the beams below the joints. When the bridge inspection or other report indicates that significant spalling has occurred that exposes the reinforcement bars or prestressing strands, repairing of the beam webs then becomes necessary. Reducing the water that reaches the beam ends should also be addressed when completing this beam repair.
Bearing Pedestal Repair	Cracking or spalling of the bearing pedestal will result in the need to perform a spall repair. Spalls are caused by reinforcement bars that have expanded due to rusting and water freezing in cracks.
Resetting Bearings	Bearings become frozen as a result of lack of regular lubrication in addition to rusting from water intrusion thru the joints, as well as debris from the deck. A frozen bearing cannot rotate in response to the expansion and contraction of the structure. In the worst case, the bearing will be pushed or pulled over, ratcheting the bearing and allowing movement in only one direction as a result of the expansion/contraction forces.
Concrete Deck (Repair)	Deterioration of the top surface of a cement concrete deck will result in the need to perform a concrete deck repair. Rusting of the top layer of reinforcement bars, accelerated by the penetration of chlorides to the reinforcement bars, could lead to the formation of concrete spalls, due to rusting reinforcement bars expanding and water freezing.
Abutments (Spall Repair) and Bearing Seats (Repair)	Spalling of the exposed surface of a concrete abutment backwall, cheekwall, stem, or wingwall will result in the need to perform a spall repair. Rusting of the top layer of reinforcement bars, possibly accelerated by the penetration of chlorides to the reinforcement bars due to water leaking through deck expansion joints could lead to the formation of concrete spalls. Spalls are caused by reinforcement bars that have expanded due to rusting and water freezing in cracks.

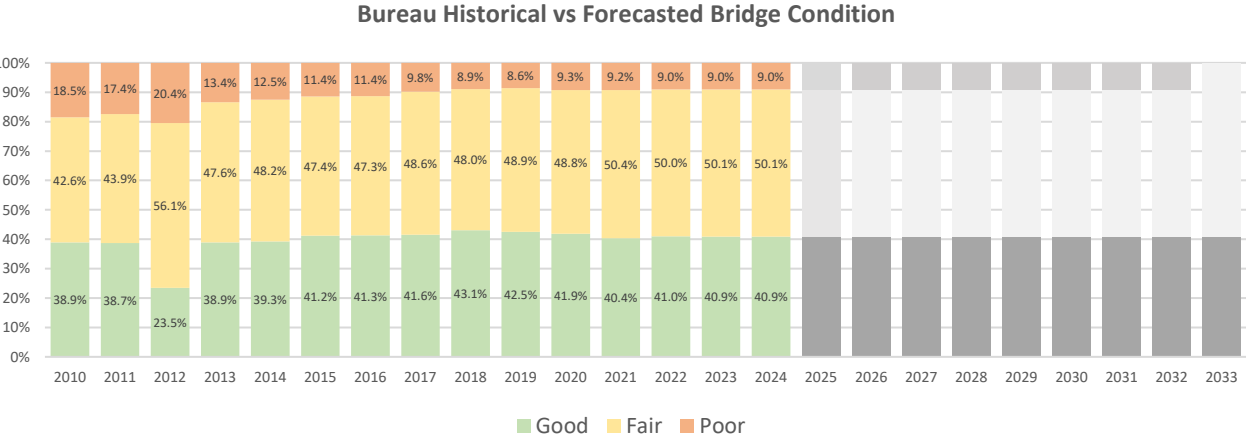
Table 3. Common Structural Repairs (continued)

Activity	Reason for Activity
Pier Repairs	Spalling of the exposed surface of a concrete pier will result in the need to perform a spall repair. Rusting of the top layer of reinforcement bars, possibly accelerated by the penetration of chlorides to the reinforcement bars due to water leaking through deck expansion joints could lead to the formation of concrete spalls. Spalls are caused by reinforcement bars that have expanded due to rusting and water freezing in cracks.
Abutments (Crack Repair)	Settlement of an abutment can lead to a crack. Concrete shrinkage due to curing, or movement due to temperature change, can also cause cracking. The cause of the crack should be determined first. A crack could be a symptom of a larger structural problem that should be addressed. It is important to determine if the crack is static or is active. If the crack is static, then performing only the crack repair will be sufficient. However, if the crack is changing in width over time, the cause for the movement, such as abutment settlement, needs to be addressed or the crack will reappear.
Masonry (Repoint)	Stone masonry mortar pointing can deteriorate over time due to water penetration and freeze/thaw, resulting in a need for repointing. The mortar bonds the stones together into a solid unit and protects the wall from water penetration. Because a stone masonry abutment also serves as a retaining wall there is often saturated backfill behind the wall. Therefore, in some instances it is advantageous to have some open joints without mortar in the wall to act as weep holes to allow water to drain from behind the wall, in which case repointing all the joints can be detrimental to the wall unless weep holes are provided.
Footing (Underpin)	High velocity stream flow during a high-water event, an undersized bridge hydraulic opening, and/or an unstable stream bed can result in scour of the stream bed. If the scour depth extends below the bottom of footing elevation, a void could form in the soil or erodible rock on which the footing is founded.
Scour Hole	High velocity stream flow during a high-water event, an undersized bridge hydraulic opening, and/or an unstable stream bed can result in scour of the stream bed. If the scour depth extends below the bottom of footing elevation, a void could form in the soil or erodible rock on which the footing is founded.
Repair-Reseal Deck Joints & Compression Seal Deck Joints (Repair-Rehabilitate)	Leaking deck joints often lead to deterioration to beam ends, bearings, and substructure units. Therefore, minimizing water penetration is a very important cost-effective maintenance repair goal.
Structure Mounted Railing (Repair-Replace)	Many older bridges were constructed with structure mounted metal railings or other styles of railings such as open rail concrete barriers. These railings can be damaged from vehicle collision damage or have section loss due to steel corrosion or concrete spalling. Bridge inspection reports may also recommend railing replacement to improve safety features.

Bridge expansion joints allow traffic to continue seamlessly across a bridge structure. They also help to accommodate movement of the bridge, shrinkage, and variations in temperature that cause the bridge to naturally expand and contract. However, as a bridge expands and contracts, the movement can result in concrete cracking and spalling, leading to leaks and the eventual failure of the expansion joint. Any evidence of cracking and spalling along expansion joints should warrant repair or replacement.

3 BUREAU BRIDGE PERFORMANCE MEASURES

In developing bridge preservation strategies, an agency can start by familiarizing its staff with preservation as a commonsense approach to maintenance of bridges. The agency may consider a set of steps that begin with direct actions in preservation with shifts in policies that lead to promotion of bridge preservation through employable and practicable performance measures and funding the cyclic and condition-based activities supporting those measures. (See Figure 1. Historical vs Forecasted)



Developing and maintaining a plan for completing bridge maintenance is a vital step to ensuring continued serviceability of bureau bridges. As managers of bureau bridge inventory, agencies must continue their efforts to adapt and implement systematic processes for bridge preservation by expanding maintenance practices to include bridge preservation activities. Bridge preservation must be an integral component of our overall bridge asset management plan; opportunities to address bridge preservation activities cannot be overlooked.

A successful bridge program seeks a balanced approach to preventive maintenance, preservation, and bridge replacement. Focusing on replacing deficient bridges, while discounting preservation needs will be inefficient and cost-prohibitive in the long term. The objective of good bridge preservation is to employ cost effective strategies and actions to maximize the useful life of bridges. Applying the appropriate bridge preservation treatments and preventive maintenance activities at the appropriate time can extend the useful life of our bridges at a lower lifecycle cost.

3.1 PRESERVATION PERFORMANCE STANDARDS

This guide describes the procedures and standards for a multitude of activities related to element-level bridge repair and maintenance. It is organized into sections related to the inspector’s evaluation of the bridge structural element items i.e., Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), Item 61 (Channel) and Item 62 (Culverts); each section considers a different structure element and the repair and-or maintenance activities associated with it.

The following appendices contain information that the agencies will find useful in their bridge preservation efforts e.g., layout(s) for estimating resource needs, maintenance forms, workflows, and alternative maintenance approaches. Contact the Bureau Bridge Program Manager (BPM) or the Bureau Bridge Maintenance Engineer (BME) if more assistance is needed.

APPENDICES

APPENDIX A

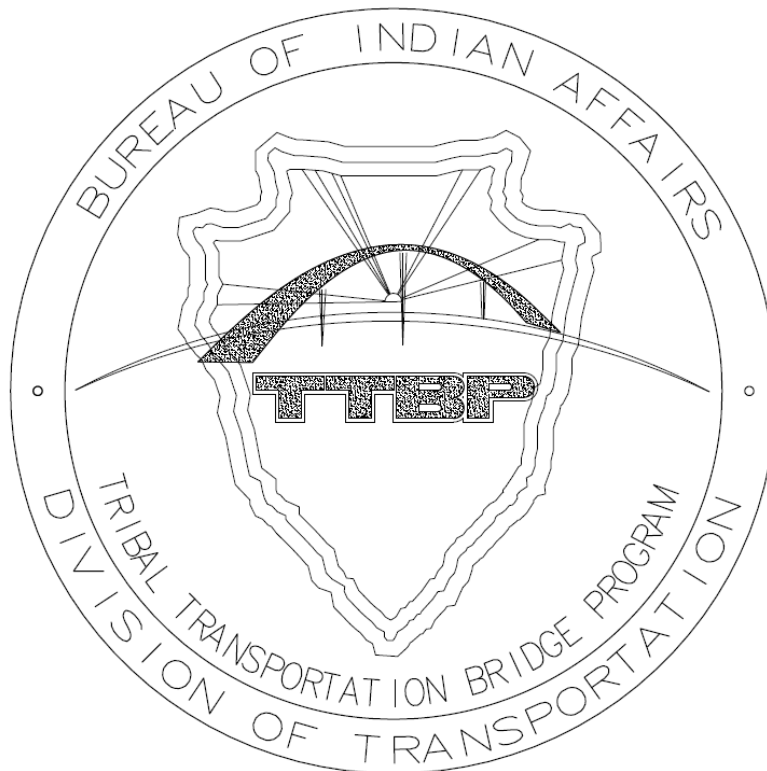
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ITEM 59 – SUPERSTRUCTURE
ITEM 60 – SUBSTRUCTURE
ITEM 61 – CHANNEL
ITEM 62 – CULVERTS

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MAINTENANCE FORMS

APPENDIX C

CHANNEL PRESERVATION OPTIONS & MATERIAL ESTIMATION



APPENDIX A

ITEM 58 – DECK

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CLEAN & FLUSH DECK

PRESERVATION ACTIVITY:	CLEAN & FLUSH DECK
<i>UNIT OF MEASUREMENT:</i> EACH BRIDGE	
<i>PROCEDURE:</i> GENERAL PROCEDURE	
<i>MAINTENANCE:</i> CONDITION-BASED & CYCLIC & PREVENTATIVE	

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Should be performed at least once annually, after winter maintenance operations have been completed. Additional times based on need. In areas where salt and anti-skid applications are particularly heavy, additional cleanings as weather permits during the winter should be considered.

Coordinate deck cleaning scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire deck between backs of the abutment backwalls including joints, gutters, curbs, sidewalks, parapets, railings, concrete median strips, and the portions of appurtenances, such as light and sign standards, that can be reached without special lift equipment. Deck joints include both the upper exposed surface attached to the concrete as well as the area beneath the joint that is intended to remove water from the deck, and the top and upper edge of the compression seals joints.

ACTIVITY DESCRIPTION

Removing all salt, anti-skid, dirt, debris, and other deleterious material from the work area by brooming, shoveling, or mechanical means. Removing any residual material by flushing, as appropriate for maximum efficiency.

PROCEDURE DESCRIPTION

1. Sweep loose material from parapets, railings, and sidewalks onto bridge deck by manual or mechanical means. Utilize mechanical removal devices (i.e., street sweepers) in areas where the equipment is available.
2. Sweep and collect material from the deck. Do not deposit material in drainage facilities or joints. Minimize discharge of loose material, grit and debris into the water.
3. Remove remaining dirt and debris from deck joints and drains. Use high pressure air, or, when necessary, high-pressure water, to remove dirt and gravel from strip seal glands and tooth dam troughs and compression joints to ensure water flows freely and that the seals don't get broken. Clean debris and dirt from top and edge of compression joints. Do not touch the seal with the wand nozzle. If using deicing truck tankers, make sure the tanks have been cleaned and are free of salt before using to flush bridge decks.
4. Dispose of collected cleanings at a proper disposal or fill site.
5. Use clean water when flushing the deck. Water should be obtained from the same water body that the bridge being cleaned spans. For small streams, where a significant decrease in stream

CLEAN & FLUSH SCUPPERS AND DOWNSPOUTS

PRESERVATION ACTIVITY:	CLEAN & FLUSH SCUPPERS & DOWNSPOUTS
<i>UNIT OF MEASUREMENT:</i>	EACH BRIDGE
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Should be performed at least once annually, after winter maintenance operations have been completed, and is normally accomplished concurrently with cleaning of the deck. Additional cleanings, as necessary, to keep scuppers and downspouts clear and drainage water flowing freely. In areas where salt and antiskid applications are particularly heavy, additional cleanings as weather permits during the winter months should be considered.

Coordinate deck cleaning scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All scuppers and downspouts.

ACTIVITY DESCRIPTION

Removing all salt, anti-skid, dirt debris and other deleterious material from scuppers and drains by hand or mechanical means. Removing any residual material by flushing, air blasting or mechanical devices, as appropriate for maximum efficiency.

PROCEDURE DESCRIPTION

1. Remove debris from grating and lift grating from scupper.
2. Remove debris and sediment from scupper box and pipe.
3. Flush pipe and downspouts with water. Do not use high-pressure water that may damage joints or anchors. Minimize discharge of loose material, grit and debris into the water.
4. If debris has accumulated in downspouts, remove cleanout plugs as necessary and dislodge with water, snakes, or "roto rooter" type devices.
5. Replace grating and cleanout plugs.
6. Dispose of collected cleanings at a proper disposal or fill site.
7. Use clean water when flushing scuppers and downspouts. Water should be obtained from the same water body that the bridge being cleaned spans. For small streams, where a significant decrease in stream flow is likely, water may be brought to the site providing it is of equal or better quality than the background stream quality.

Minimize the amount of debris entering the water body. Utilize best management practices (BMPs) when cleaning bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Water Tank		Water
2	Crew Members	1	Snakes or roto-rooter		
1	Operator				
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
two (2) scuppers/hour		three (3) units/day		two (2) MH/unit	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

(assuming four (4) scuppers (downspouts) per bridge)

CLEAN & FLUSH BEARING AND BEARING SEAT

PRESERVATION ACTIVITY:	CLEAN & FLUSH BEARING AND BEARING SEAT
<i>UNIT OF MEASUREMENT:</i>	EACH BRIDGE
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Should be performed at least once annually, after winter maintenance operations have been completed, on work areas underneath open joints, finger joints and other floor expansion joints which permit the passage of water carrying salt, anti-skid and other debris. Additional times, as necessary, under open floor joints and under sealed joints to keep bearings and areas around them free of deleterious materials.

Coordinate deck cleaning scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All bearings and bearing seats at all piers and abutments.

ACTIVITY DESCRIPTION

Removing all salt, anti-skid, dirt, debris and other deleterious material from the work area by scraping, brushing, or by other hand or mechanical means. Removing any residual material by flushing, as appropriate for maximum efficiency.

PROCEDURE DESCRIPTION

1. Set up scaffolding or ladders, or position manlift or snooper truck as required.
2. Manually dry clean the bearing and bearing seats, by scraping, brushing, or chipping all accumulated debris. Material should be collected and disposed of at a proper disposal or fill site.
3. Remove loose paint by dry brushing. Collect and dispose of at an approved disposal site. Avoid paint chips from entering water bodies.
4. Thoroughly flush all bearings and bearing seats at piers and abutments with pressurized water to remove salt, dirt and debris, that could not be removed by manual cleaning methods.
5. Limit wet cleaning to (5) feet on either side of the joint at the pier unless debris in other areas require further cleaning. Clean (5) five feet from each abutment.
6. Use clean water when flushing the bearings and bearing seat. Water should be obtained from the same water body that the bridge being cleaned spans. For small streams, where a significant decrease in stream flow is likely, water may be brought to the site providing it is of equal or better quality than the background stream quality.
7. Minimize the amount of debris entering the water body. Exercise special care when cleaning bridges over environmentally sensitive waterways.

8. Use hay bales, temporary silt fencing, and other erosion control measures where necessary to prevent stream bank sediments from entering the stream.
9. Perform at regular intervals. The work area is all contacted metal surfaces that are not permanently lubricated. Clean contact surfaces, surrounding area of rust, and old lubricant. Place new penetrating spray grease.

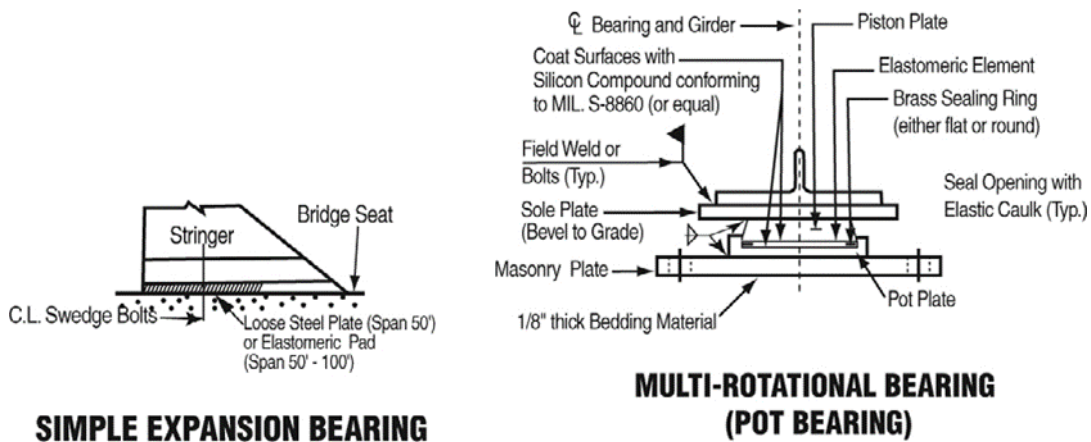
ACTIVITY REQUIREMENTS*

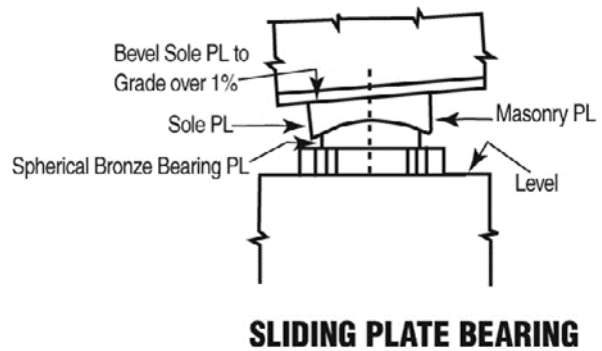
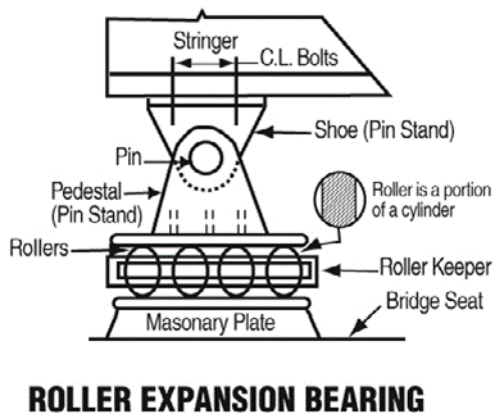
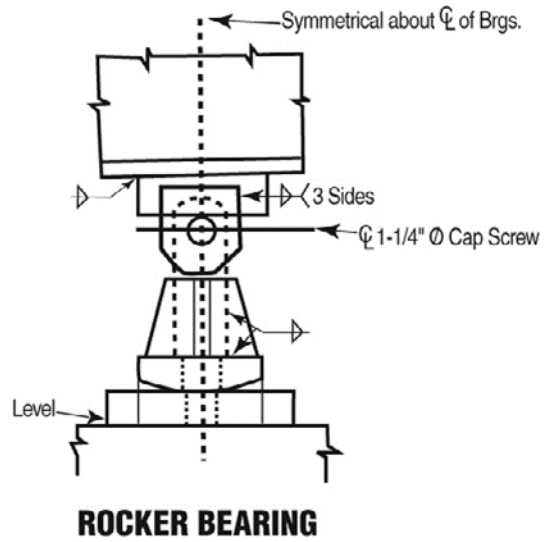
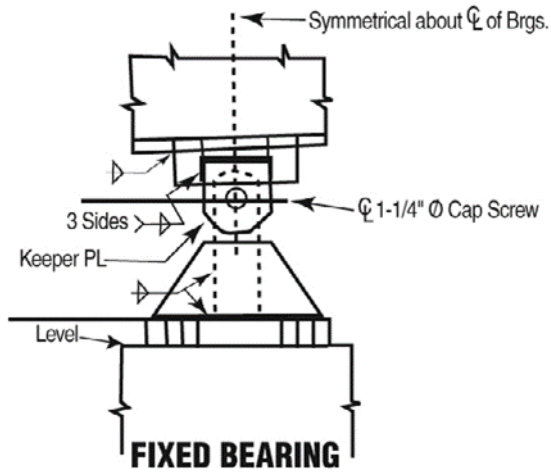
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Water Tank		Water
2	Crew Members	1	Compressor (or pressure hoses)		
1	Operator				
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
~1125 SF**/hour		three (3) units/day		eight (8) MH/unit	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Deck Dimensions: Bureau bridges:

Average Width, ft = 25
 Average Length, ft = 90
 **(0.5)*Average Area, SF = 1125





CLEAN & FLUSH STEEL HORIZONTAL SURFACES

PRESERVATION ACTIVITY:	CLEAN & FLUSH STEEL HORIZONTAL SURFACES
<i>UNIT OF MEASUREMENT:</i>	EACH BRIDGE
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Should be performed at least once annually, after winter maintenance operations have been completed, on surfaces exposed to water contaminated by deicing chemical, and in places where anti-skid collects. As required on other surfaces to remove dirt, debris, bird droppings, and other deleterious materials which can reduce paint longevity and/or promote corrosion.

Coordinate cleaning scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All horizontal surfaces of structural steel members except the top surfaces of beams and stringers to which open grid flooring is directly attached. The cleaning of these surfaces shall be included with Clean & Flush Deck.

ACTIVITY DESCRIPTION

Removing all salt, anti-skid, dirt, debris and other deleterious materials from the work area by scraping, brushing or by other hand or mechanical means. Removing any residual material by flushing, as appropriate for maximum efficiency.

PROCEDURE DESCRIPTION

1. Set up scaffolding or ladders or position manlift or snooper truck as required.
2. Manually dry clean the horizontal surfaces, by scraping, brushing or by other hand or mechanical means all accumulated debris. Material should be collected and disposed of at an approved disposal site.
3. Remove loose paint by dry brushing. Collect and dispose of at an approved disposal site. Avoid paint chips from entering water bodies.
4. Thoroughly flush all horizontal surfaces of structural steel members, with pressurized water to remove salt, dirt and debris, that could not be removed by manual cleaning methods.
5. Limit wet cleaning of steel horizontal surfaces to five (5) feet on either side of the joint at the pier and five (5) feet out from the abutment unless debris in other areas require further cleaning. Fascia beams may be flushed their entire length.
6. Use clean water when flushing steel horizontal surfaces. Water should be obtained from the same water body that the bridge being cleaned spans. For small streams, where a significant decrease in stream flow is likely, water may be brought to the site providing it is of equal or better quality than the background stream quality.

CLEAN & FLUSH OPEN GRID DECKS AND THEIR SUPPORTING STRUCTURES

PRESERVATION ACTIVITY:	CLEAN & FLUSH OPEN GRID DECKS & THEIR SUPPORTING STRUCTURES
<i>UNIT OF MEASUREMENT:</i>	EACH BRIDGE
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Should be performed at least once annually, after winter maintenance operations have been completed. Additional times based on need. In areas where salt and anti-skid applications are particularly heavy, additional cleanings as weather permits during the winter should be considered.

Coordinate cleaning scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire deck between the backs of the abutment backwalls including gutters, curbs, sidewalks, parapets, railings, and the portions of appurtenances, such as light and sign standards, that can be reached without special lift equipment.

ACTIVITY DESCRIPTION

Removing all salt, anti-skid, dirt, debris, and other deleterious material from the work area by brooming, shoveling, or mechanical means.

Removing any residual material by flushing, as appropriate for maximum efficiency.

PROCEDURE DESCRIPTION

1. Remove loose material from horizontal steel surfaces, parapets, railings, and devices (i.e., vacuum) in areas where the equipment is available.
2. Minimize discharge of loose material, grit and debris into the water.
3. Remove remaining dirt and debris from deck joints and drains.
4. Dispose of collected cleanings at a proper disposal or fill site.
5. Use clean water when flushing the deck and supporting structure. Water should be obtained from the same water body that the bridge is being cleaned spans. For small streams, where a significant decrease in stream flow is likely, water may be brought to the site providing it is of equal or better quality than the background stream quality.
6. Minimize the amount of debris entering the water body. Use best management practices (BMPs). Exercise special care when cleaning bridges over environmentally sensitive waterways.
7. When cleaning open grid decks flush supporting structural members also.
8. Use hay bales, temporary silt fencing, and other erosion control measures where necessary to prevent stream bank sediments from entering the stream.

RESEAL DECK JOINTS (LIQUID ONLY)

MAINTENANCE ACTIVITY:	RESEAL DECK JOINTS (LIQUID ONLY)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF DECK JOINT (LF)
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Joint must be dry and temperature at or above 40 degrees Fahrenheit (°F).

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All joints of less than one inch between Portland Cement Concrete (PCC) deck elements including construction joints and joints between precast slab elements having limited movement that can be accommodated by poured sealing material. The joints can be located anywhere within the entire width of the superstructure for the entire length of the bridge between the backs of the backwalls.

ACTIVITY DESCRIPTION

Resealing joints using poured material at any location within the work area. The work includes removing damaged, deteriorated, or nonadherent existing sealing material; cleaning and preparing the surfaces of the concrete against which the sealing material will be poured, placing a backer rod or bond breaker, if appropriate; and pouring new joint sealing material.

PROCEDURE DESCRIPTION

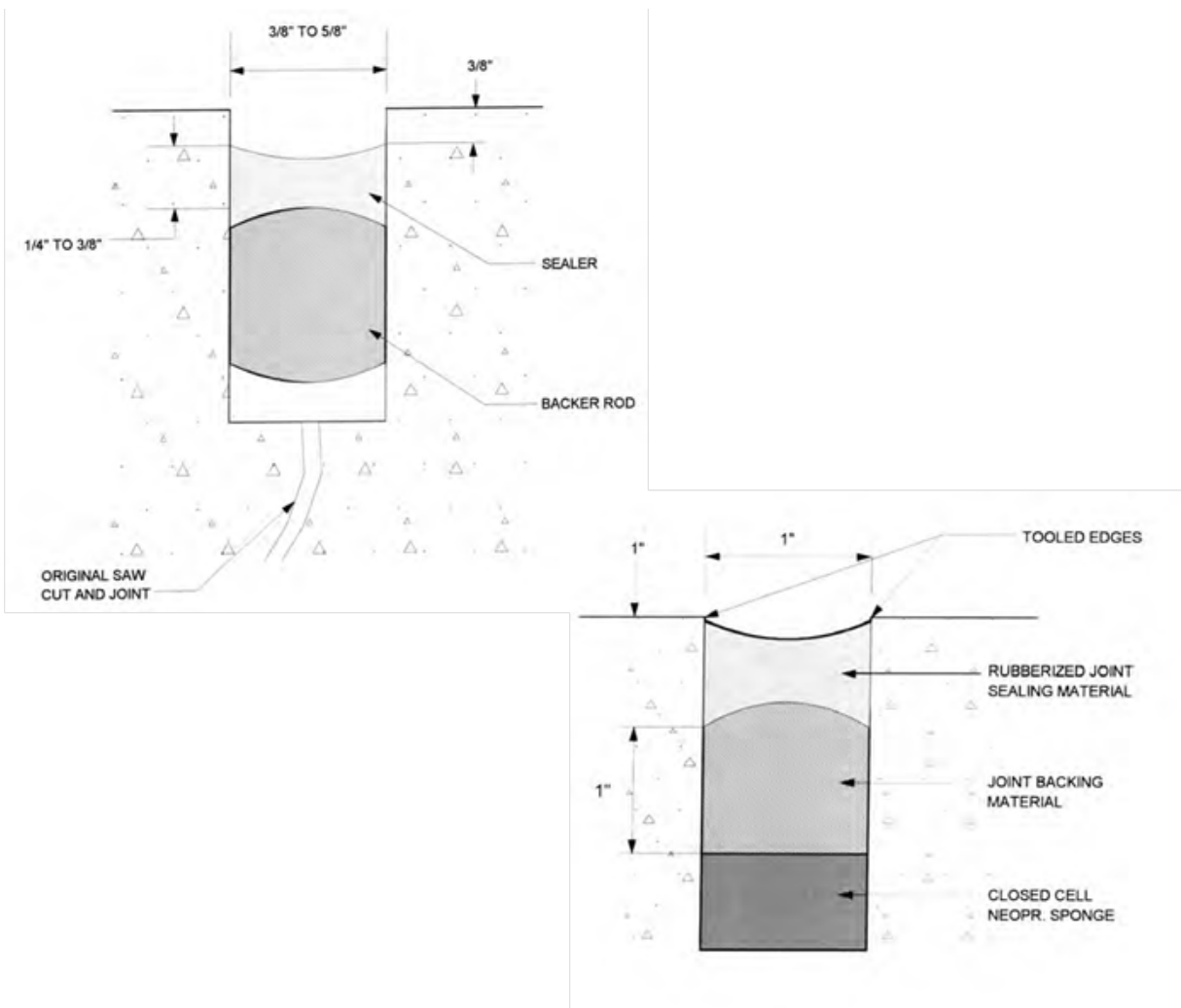
1. Clean joint of all existing sealer and backer rod using a plow. Do not remove joint filler unless it is deteriorated. If necessary, resaw joint to between 3/8" and 5/8".
2. Remove all sealer material from the joint faces by using wire brushes and remove all loose material from the joint by blowing with an air compressor.
3. Place foam joint backer rod into joint and push down approximately 3/4" below the surface of the deck. The backer rod should be approximately 1/8" wider than the joint.
4. Pour sealant into joint to within 3/8" of surface of deck surface.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Compressor	A/N	Backer Rod
3	Crew Members	1	Concrete Saw	A/N	Rubber (Silicone)
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
one (1) LF/hour		one (1) LF/hour		one (1) LF/hour	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



REPAIR/RESEAL DECK JOINTS

MAINTENANCE ACTIVITY:	REPAIR/RESEAL DECK JOINTS
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF DECK JOINT (LF)
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Joint must be dry and temperature at or above 40 degrees Fahrenheit (°F) for placing joint sealing material.

After concrete joint has started to deteriorate, the affected area tends to increase rapidly if exposed to traffic. The resulting high live load impact can damage other parts of the structure, so work should not be delayed unnecessarily.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All joints of less than one inch between Portland Cement Concrete (PCC) deck elements having limited movement that can be accommodated by poured sealing material. The work area includes both the joint and the adjacent concrete which must be removed and replaced to repair the joint.

ACTIVITY DESCRIPTION

Repairing and resealing joints using poured material at any location within the work area. The work can include, but is not limited to, removing damaged, deteriorated, or nonadherent existing sealing material; removing deteriorated concrete; retying or replacing reinforcing steel; constructing forms; placing concrete; placing a backer rod or bond breaker, when appropriate; and pouring new joint sealing material.

PROCEDURE DESCRIPTION

1. Remove all old joint material and backer rod.
2. Mark all areas of damaged concrete to be removed.
3. Remove concrete by saw cutting and jack hammering.
4. Put temporary form in joint and place concrete.
5. After concrete cures, remove temporary form and clean joint of any loose material.
6. Place foam joint backer rod into joint and push down so top of filler is approximately 3/4" below the surface of the deck. The filler should be approximately 1/8" wider than the joint.
7. Pour sealant into joint to within 3/8" of surface of deck surface.

REPAIR OTHER DAM TYPES

MAINTENANCE ACTIVITY:	REPAIR OTHER DAM TYPES
<i>UNIT OF MEASUREMENT:</i>	LINEAL FEET OF JOINT REPAIRED (LF)
<i>PROCEDURE:</i>	OTHER
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All expansion joints, regardless of movement classification, using a joint system other than compression seals, strip seals, modular dams, or steel dams.

ACTIVITY DESCRIPTION

Repairing or replacing the existing joint system, either partially or totally, with a joint system not covered under another activity. The work can include but is not limited to the removal of the existing joint repair of the concrete adjacent to the joint if needed, and placement of the new joint system - new joint systems include Dow Corning XJS, Silcoflex, Jennie Joint, asphalt plugs, and other proprietary or experimental joint systems.

The joint system to be used should be approved by the Bridge Maintenance Engineer (BME) or the Bridge Program Manager (BPM).

PROCEDURE DESCRIPTION

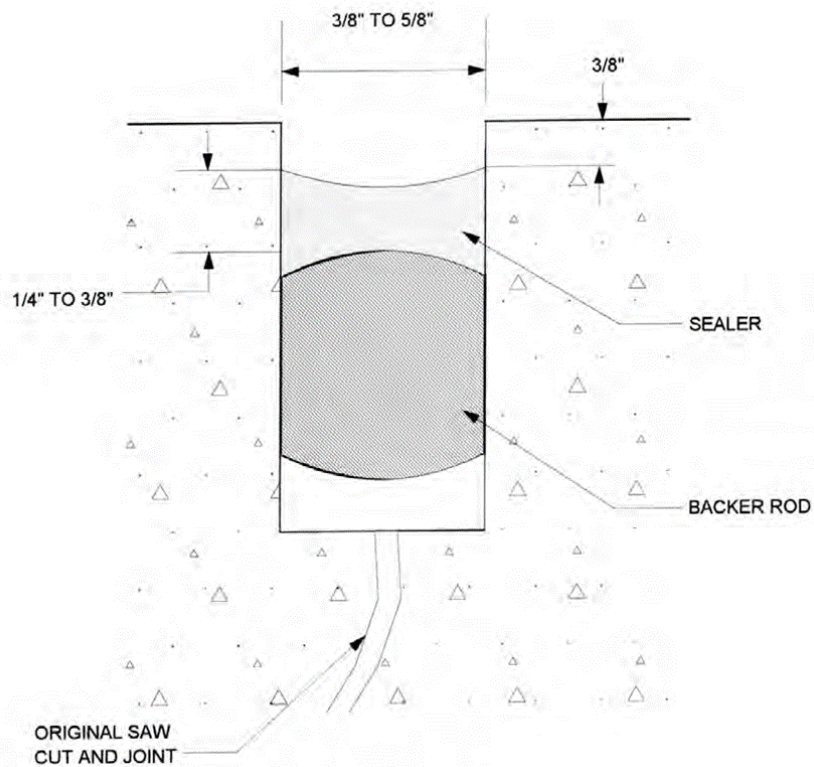
The installation procedure will vary with the type of joint system to be used. The manufacturer should furnish specific installation instructions for the joint system. A manufacturer's representative should be on the job during initial installation of demonstration or experimental joint systems.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Joint Backing Material
3	Crew Members	1	Jack Hammer	A/N	Silicone (or)
		1	Concrete Saw	A/N	Rubberized Concrete
		1	Concrete Mixer		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
three (3) LF/hour		eighteen (18) LF/day		1.3 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



SAW CUT JOINT

COMPRESSION SEAL DECK JOINTS (REPLACE EXISTING SEAL)

MAINTENANCE ACTIVITY:	COMPRESSION SEAL DECK JOINTS (REPLACE EXISTING SEAL)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF COMPRESSION SEAL DECK JOINT (LF)
<i>PROCEDURE:</i>	REPLACE EXISTING COMPRESSION SEAL
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Preformed compression seals can be installed more efficiently during cooler, but not below freezing, temperatures. Surfaces against which seals are placed must be dry, although concrete surfaces may be "damp dry".

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All armored and unarmored joints in the deck in which preformed compression seals have been or will be placed. The work area includes both the joint and deteriorated or damaged concrete adjacent to unarmored joints which must be removed and replaced to repair the joint.

ACTIVITY DESCRIPTION

Repairing or rehabilitating existing preformed compression seal deck joints or replacing poured seals with preformed compression seals at any location within the work area. The work can include, but is not limited to, removing all or portions of an existing preformed seal that has deteriorated, has been damaged, or is no longer providing a watertight seal; removing all of the existing poured seal and modifying the joint to accept a preformed seal; removing deteriorated concrete; retying or replacing reinforcing steel; constructing forms; placing concrete; sawing seal grooves; and installing preformed compression seals.

PROCEDURE DESCRIPTION

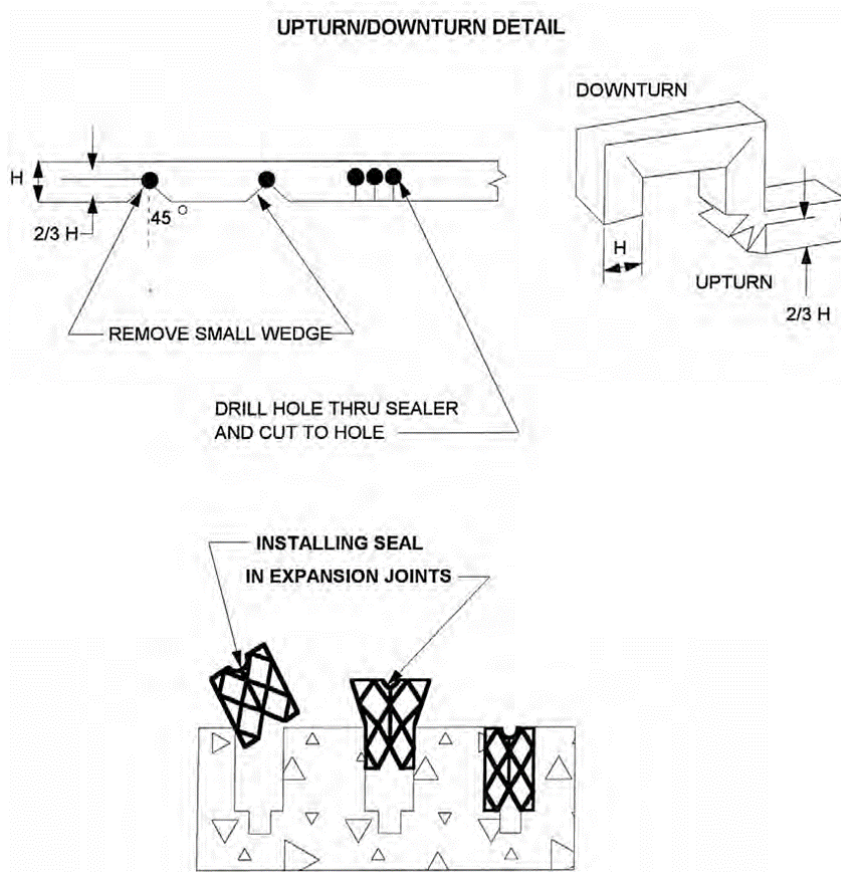
1. Remove existing compressible joint material from joint.
2. Clean joint of any foreign material using compressed air.
3. Remove and replace any deteriorated concrete.
4. Cut new compressible material to fit the joint. If joint extends beyond deck to curbs or medians, then cut according to sketch.
5. Apply lubricant adhesive to the faces of the joint.
6. Position seal over joint opening, compress and insert into joint while the adhesive is still wet. Install seal within the joint to the required depth of application, usually 1/4 to 1/2 inch below the deck surface.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Pre-formed Neoprene
3	Crew Members	1	Concrete Mixer		Compression Seal
				A/N	Lubricant Adhesive
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
five (5) LF/hour		thirty (30) LF/day		0.6 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



COMPRESSION SEAL DECK JOINTS (MODIFIED POURED SEAL JOINT)

MAINTENANCE ACTIVITY:	COMPRESSION SEAL DECK JOINTS (MODIFIED POURED SEAL JOINT)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF COMPRESSION SEAL DECK JOINT (LF)
<i>PROCEDURE:</i>	MODIFY POURED SEAL JOINT AND RESEAL WITH COMPRESSION SEAL
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Prefomed compression seals can be installed more efficiently during cooler, but not below freezing, temperatures. Surfaces against which seals are placed must be dry, although concrete surfaces may be "damp dry".

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All armored and unarmored joints in the deck in which preformed compression seals have been or will be placed. The work area includes both the joint and deteriorated or damaged concrete adjacent to unarmored joints which must be removed and replaced to repair the joint.

ACTIVITY DESCRIPTION

Repairing or rehabilitating existing preformed compression seal deck joints or replacing poured seals with preformed compression seals at any location within the work area. The work can include, but is not limited to, removing all or portions of an existing preformed seal that has deteriorated, has been damaged, or is no longer providing a watertight seal; removing all of the existing poured seal and modifying the joint to accept a preformed seal; removing deteriorated concrete; retying or replacing reinforcing steel; constructing forms; placing concrete; sawing seal grooves; and installing preformed compression seals.

PROCEDURE DESCRIPTION

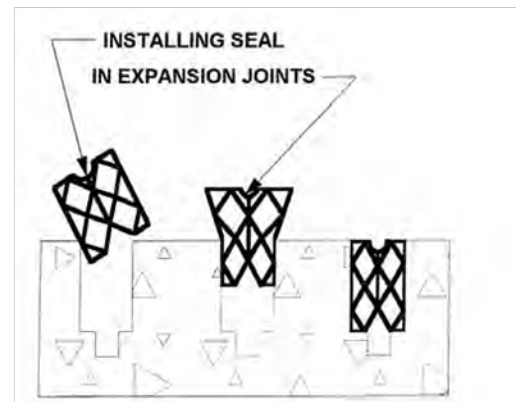
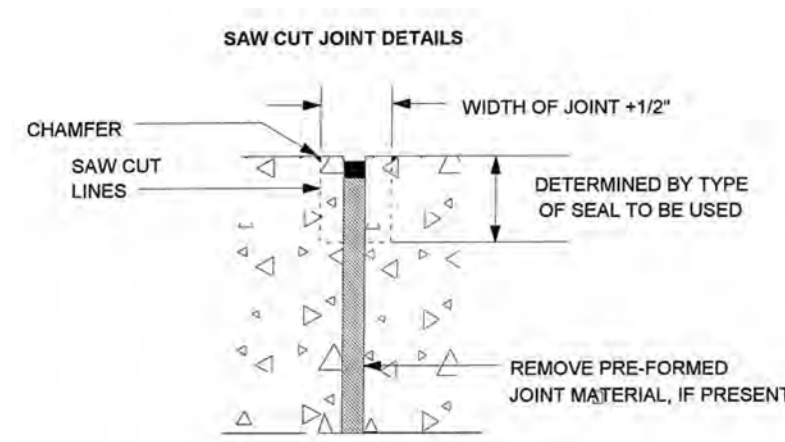
1. Remove existing poured joint material and debris from joint.
2. Saw - cut the joint to a uniform dimension across the bridge deck to the prescribed width and depth for the anticipated deck movement.
3. Grind chamfer on edges of joint from curb to curb.
4. Clean dirt and debris from the joint using compressed air.
5. Apply lubricant adhesive to the faces of the joint.
6. Position seal over joint opening, compress the bottom of the seal and insert into the joint while the adhesive is still wet.
7. Complete the installation by positioning the seal within the joint to the depth required, usually 1/4 to 1/2 inch below the deck surface.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Pre-formed Neoprene
3	Crew Members	1	Concrete Saw (double-bladed)		Compression Seal
				A/N	Lubricant Adhesive
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
five (5) LF/hour		thirty (30) LF/day		0.6 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



MODULAR DAM DECK JOINTS (REPAIR/REHABILITATE)

MAINTENANCE ACTIVITY:	MODULAR DAM DECK JOINTS (REPAIR/REHABILITATE)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF MODULAR DAM DECK JOINT (LF)
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to modular dam deck joints are often only possible when the repairs are initiated while the defective or damaged portion of the dam is relatively small.

Repairs may be facilitated when temperatures are moderate. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All modular dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the joint. Report repairs to concrete outside of this work area to appropriate activities.

ACTIVITY DESCRIPTION

Repairing or rehabilitating modular dam deck joints within the work area. The work can include, but is not limited to, removing all or portions of an existing modular dam deck joint; disassembling portions of an existing joint; removing concrete adjacent to the joint to replace deteriorated concrete and/or to gain access to the dam connections; retying or placing reinforcing steel; replacing deficient parts of an existing joint; modifying an existing joint; constructing forms; reinstalling the repaired or modified joint; and placing concrete.

PROCEDURE DESCRIPTION

1. Remove defective component or section of modular dam from joint.
2. Mark all areas of defective concrete at joint to be removed including around anchors to be replaced or reset.
3. Remove all unsound concrete.
4. Set forms for concrete or position armored edges or anchors as necessary.
5. Place concrete.
6. Repair salvageable dam components by welding, strengthening, grinding, etc.
7. Replace modular dam sections or components in joint.

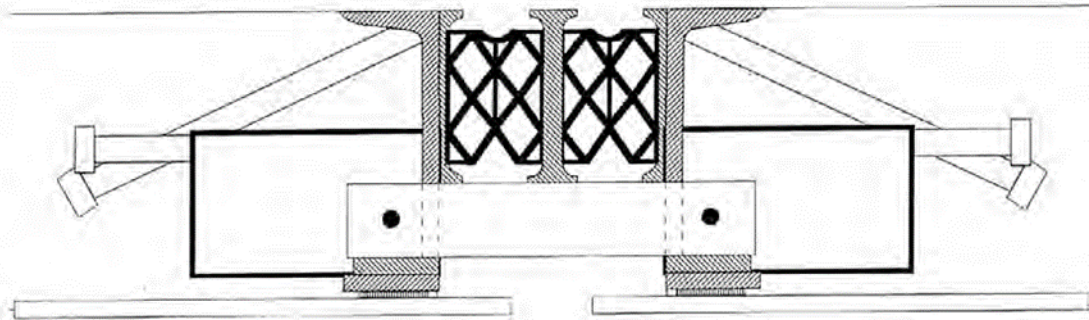
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Modular Dam (or)
2	Crew Members	1	Concrete Mixer		Component
1	Certified Welder	1	Concrete Saw		
		1	Welding equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
three (3) LF/hour		eighteen (18) LF/day		1.3 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



MODULAR DAM DECK JOINTS (ELASTOMERIC OR BELL-TYPE)

MAINTENANCE ACTIVITY:	MODULAR DAM DECK JOINTS (ELASTOMERIC OR BELL-TYPE)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF MODULAR DAM DECK JOINT (LF)
<i>PROCEDURE:</i>	ELASTOMETRIC OR BELL TYPE EXPANSION DAMS
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to modular dam deck joints are often only possible when the repairs are initiated while the defective or damaged portion of the dam is relatively small.

Repairs may be facilitated when temperatures are moderate. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All modular dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the joint. Report repairs to concrete outside of this work area to appropriate activities.

ACTIVITY DESCRIPTION

Repairing or rehabilitating modular dam deck joints within the work area. The work can include, but is not limited to, removing all or portions of an existing modular dam deck joint; disassembling portions of an existing joint; removing concrete adjacent to the joint to replace deteriorated concrete and/or to gain access to the dam connections; retying or placing reinforcing steel; replacing deficient parts of an existing joint; modifying an existing joint; constructing forms; reinstalling the repaired or modified joint; and placing concrete.

PROCEDURE DESCRIPTION

1. Remove existing poured joint material and debris from joint.
2. Saw - cut the joint to a uniform dimension across the bridge deck to the prescribed width and depth for the anticipated deck movement.
3. Grind chamfer on edges of joint from curb to curb.
4. Clean dirt and debris from the joint using compressed air.
5. Apply lubricant adhesive to the faces of the joint.
6. Position seal over joint opening, compress the bottom of the seal and insert into the joint while the adhesive is still wet.
7. Complete the installation by positioning the seal within the joint to the depth required, usually 1/4 to 2 inch below the deck surface.

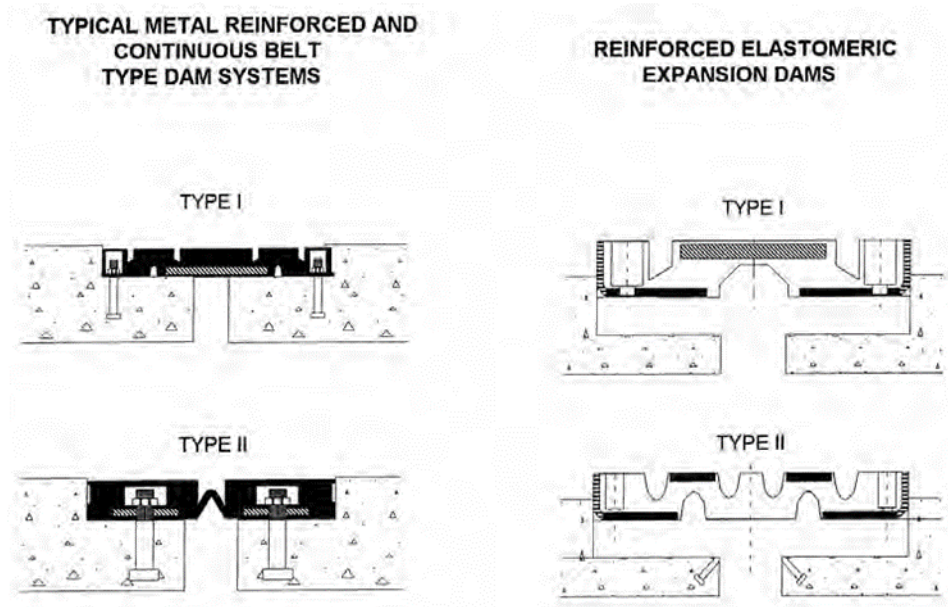
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Modular Dam (or)
2	Crew Members	1	Concrete Mixer		Component
1	Certified Welder	1	Concrete Saw		
		1	Welding equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
three (3) LF/hour		eighteen (18) LF/day		1.3 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



MODULAR DAM DECK JOINTS (REPLACE W/STRIP SEAL)

MAINTENANCE ACTIVITY:	MODULAR DAM DECK JOINTS (REPLACE W/STRIP SEAL)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF MODULAR DAM DECK JOINT (LF)
<i>PROCEDURE:</i>	REPLACE EXISTING JOINT WITH STRIP SEAL (REHABILITATE/OVERLAY)
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to modular dam deck joints are often only possible when the repairs are initiated while the defective or damaged portion of the dam is relatively small.

Repairs may be facilitated when temperatures are moderate. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All modular dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the joint. Report repairs to concrete outside of this work area to appropriate activities.

ACTIVITY DESCRIPTION

Repairing or rehabilitating modular dam deck joints within the work area. The work can include, but is not limited to, removing all or portions of an existing modular dam deck joint; disassembling portions of an existing joint; removing concrete adjacent to the joint to replace deteriorated concrete and/or to gain access to the dam connections; retying or placing reinforcing steel; replacing deficient parts of an existing joint; modifying an existing joint; constructing forms; reinstalling the repaired or modified joint; and placing concrete.

PROCEDURE DESCRIPTION

1. Remove existing expansion dam and adjacent concrete or fingers of steel finger dam.
2. Attach armored edge extrusions to concrete and reinforcing steel or weld to modified plate of finger dam.
3. Place concrete behind joint.
4. Place overlay.
5. Place strip seal gland using adhesive and special tools as recommended by the manufacturer.

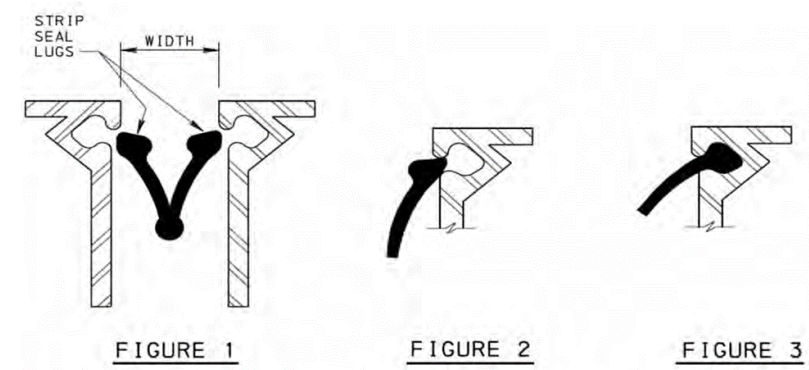
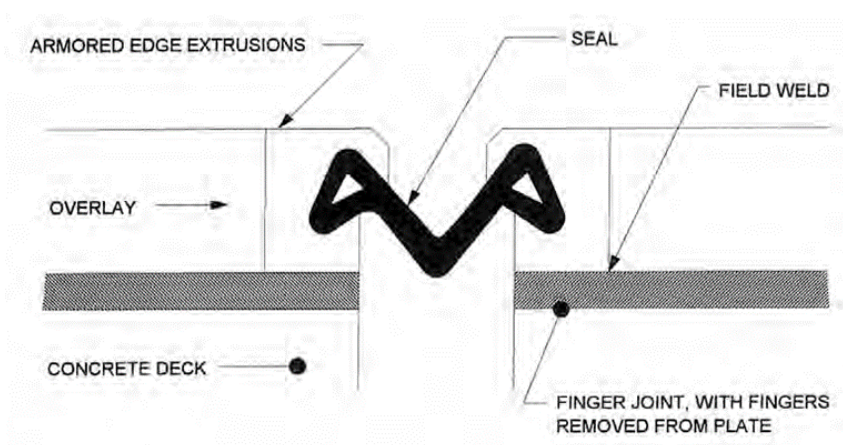
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Strip Seal System
2	Crew Members	1	Concrete Mixer	A/N	Welding materials
1	Certified Welder	1	Concrete Saw	A/N	Concrete Rebar
		1	Welding equipment	A/N	Studs
				A/N	Anchor bolts
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
three (3) LF/hour		eighteen (18) LF/day		1.3 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



STRIP SEAL INSTALLATION PROCEDURE

MODULAR DAM DECK JOINTS (REPAIR STRIP SEAL SYSTEM)

MAINTENANCE ACTIVITY:	MODULAR DAM DECK JOINTS (REPAIR STRIP SEAL SYSTEM)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF MODULAR DAM DECK JOINT (LF)
<i>PROCEDURE:</i>	REPAIR STRIP SEAL SYSTEMS
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to modular dam deck joints are often only possible when the repairs are initiated while the defective or damaged portion of the dam is relatively small.

Repairs may be facilitated when temperatures are moderate. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All modular dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the joint. Report repairs to concrete outside of this work area to appropriate activities.

ACTIVITY DESCRIPTION

Repairing or rehabilitating modular dam deck joints within the work area. The work can include, but is not limited to, removing all or portions of an existing modular dam deck joint; disassembling portions of an existing joint; removing concrete adjacent to the joint to replace deteriorated concrete and/or to gain access to the dam connections; retying or placing reinforcing steel; replacing deficient parts of an existing joint; modifying an existing joint; constructing forms; reinstalling the repaired or modified joint; and placing concrete.

PROCEDURE DESCRIPTION

1. Remove deteriorated sections of gland. Heating the seal may be necessary to melt adhesives. Special tools from the seal manufacturer may facilitate seal removal and replacement.
2. Re-anchor or replace as necessary any loose sections of the extrusion by removing and replacing deteriorated concrete and extrusion.
3. Replace gland using adhesive and special tools as recommended by the manufacturer.

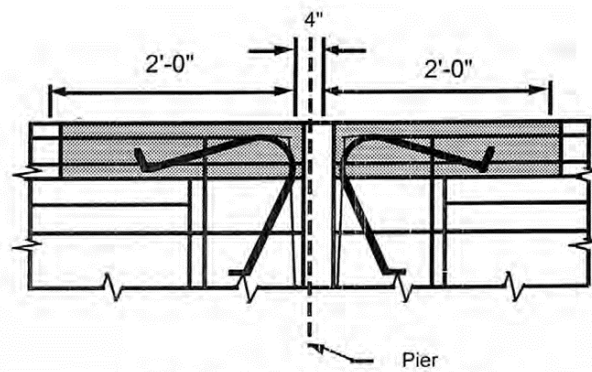
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

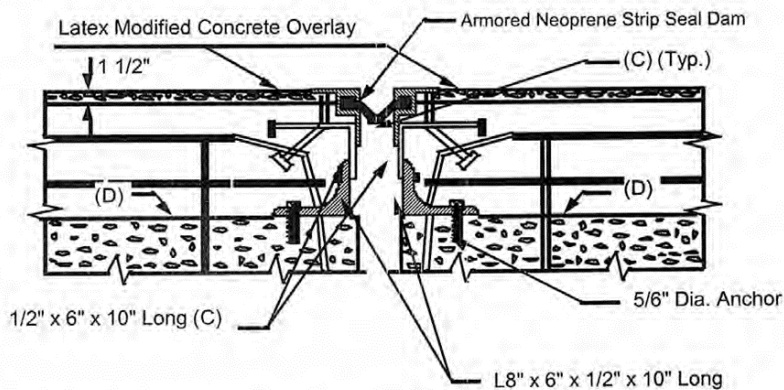
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Modular Dam (or)
2	Crew Members	1	Concrete Mixer		Component
1	Certified Welder	1	Concrete Saw		
		1	Welding equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
three (3) LF/hour		eighteen (18) LF/day		1.3 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



REPLACEMENT OF EXPECTED DAM



(C) Shall be welded to steel extrusion and stud shall be welded to steel by the exp. dam manufacturer.

(D) Existing concrete chipped and smoothed to a sound surface and sufficient depth to install entire assembly.

STEEL DAM DECK JOINTS (REPAIR/REHABILITATE)

MAINTENANCE ACTIVITY:	STEEL DAM DECK JOINTS (REPAIR/REHABILITATE)
<i>UNIT OF MEASUREMENT:</i>	**LINEAR FEET OF STEEL DAM (LF)
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to steel dams are often only possible if the repairs are initiated while relatively small portions of the dam are deficient.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All steel dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the dam.

****Special Measurement Note:**

Work on each dam or each side of a joint shall be measured for reporting work on this activity.

ACTIVITY DESCRIPTION

Repairing or rehabilitating or installing steel dams within the work area. The work can include, but is not limited to, removing concrete adjacent to the dam to permit removal of the dam or to gain access to the connections used to secure the dam to concrete or steel; repairing or replacing a portion of the dam or its structural connections; straightening and aligning the dam; retying or placing reinforcing steel; securing the dam to proper line and grade; constructing forms; and placing concrete.

PROCEDURE DESCRIPTION

1. Remove steel dam and supports as necessary by cutting anchors or dam with cutting torch.
2. Remove unsound concrete by saw cutting and jack hammering.
3. Place forms for concrete and anchor system for dam.
4. Set dam in place.
5. Place and finish concrete.
6. Complete assembly of dam or remove temporary shipping and erection braces as necessary.
7. Place new neoprene compression seal, drainage trough or water collector as necessary.

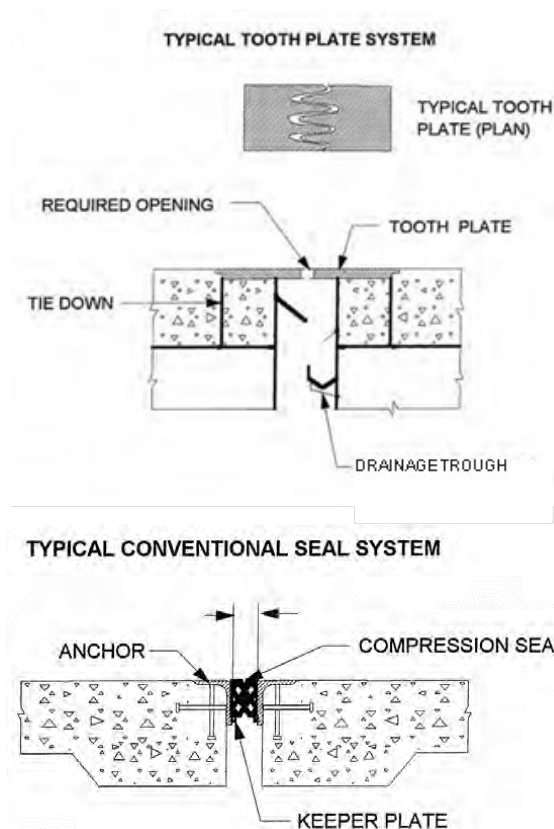
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Steel Dam assembly
2	Crew Members	1	Concrete Mixer		
1	Certified Welder	1	Jack Hammer		
		1	Welding equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
1.5 LF/hour		nine (9) LF/day		2.7 MH/**LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



STEEL DAM DECK JOINTS (REPLACE W/ARMORED COMPRESSION SEAL)

MAINTENANCE ACTIVITY:	STEEL DAM DECK JOINTS (REPLACE W/ARMORED SEAL)
<i>UNIT OF MEASUREMENT:</i>	LINEAR FEET OF STEEL DAM (LF)
<i>PROCEDURE:</i>	REPLACE EXISTING JOINT WITH ARMORED COMPRESSION SEAL
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. Effective and economical repairs to steel dams are often only possible if the repairs are initiated while relatively small portions of the dam are deficient.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

All steel dams, their connections to adjacent concrete or structural steel members, and concrete adjacent to the dam which must be removed and replaced to repair or rehabilitate the dam.

ACTIVITY DESCRIPTION

Repairing or rehabilitating or installing steel dams within the work area. The work can include, but is not limited to, removing concrete adjacent to the dam to permit removal of the dam or to gain access to the connections used to secure the dam to concrete or steel; repairing or replacing a portion of the dam or its structural connections; straightening and aligning the dam; retying or placing reinforcing steel; securing the dam to proper line and grade; constructing forms; and placing concrete.

PROCEDURE DESCRIPTION

1. Cut or remove sliding plate or other joint as shown.
2. Place new armored joint reinforcing.
3. Place concrete around joint or overlay deck as required.
4. Place preformed neoprene compression seal.

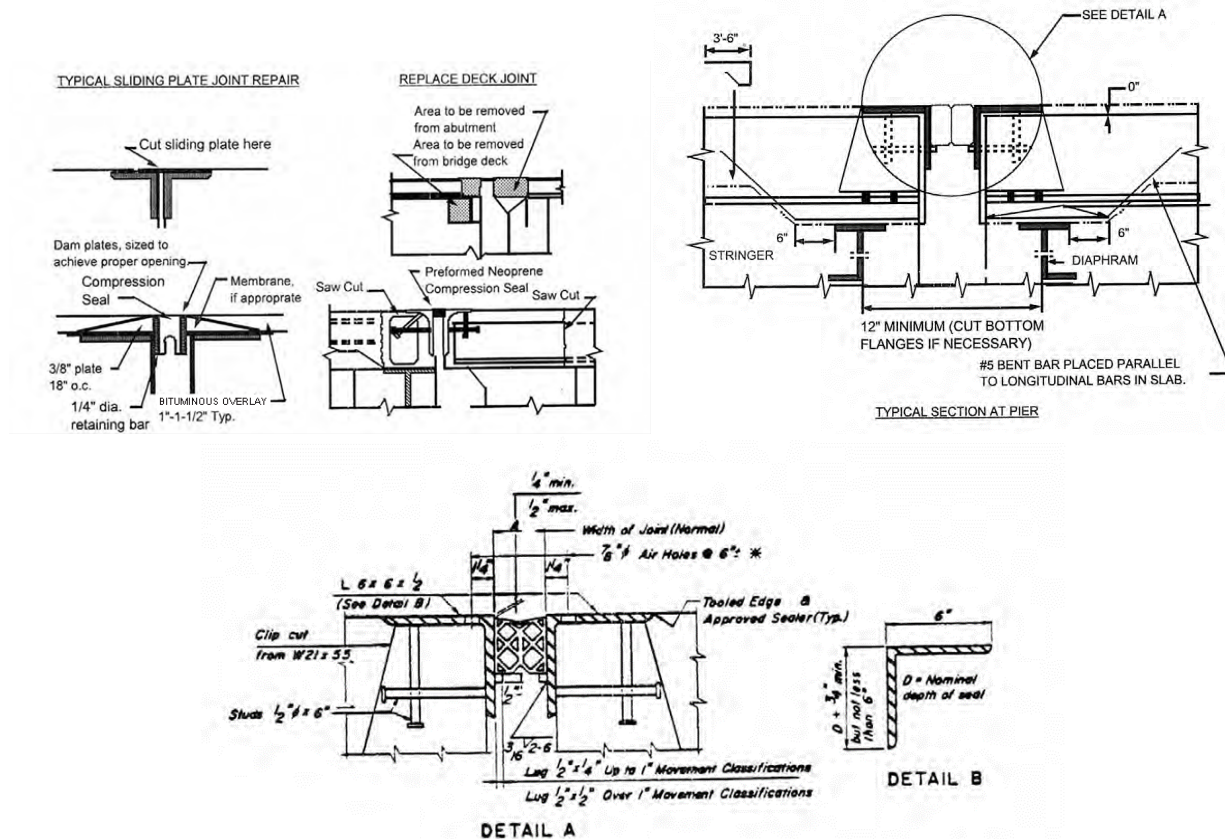
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Preformed Neoprene
2	Crew Members	1	Concrete Mixer		Compression Seal
1	Certified Welder	1	Cutting Torch	A/N	Lubricant Adhesive
		1	Welding equipment	A/N	Steel - 8" X 6" Angle
		1	Light Air Hammer	A/N	Anchor Studs
				A/N	Concrete
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
1.5 LF/hour		nine (9) LF/day		2.7 MH/LF	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



BITUMINOUS DECK WEARING SURFACE (REPAIR/REPLACE)

MAINTENANCE ACTIVITY:	BITUMINOUS DECK WEARING SURFACE (REPAIR/REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQ. YARDS OF BITUMINOUS CONCRETE WEARING SURFACE (SY)
<i>PROCEDURE:</i>	GENERAL PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Permanent repairs should not normally be attempted when the air or surface temperature is at or below 40°F or when the surface is wet.

Permanent replacement of wearing course is not to occur from approximately October 1 to March 31, depending on local seasonal construction norms. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire bituminous concrete wearing surface on bridge between curbs and the backs of abutment backwalls. Concrete or timber decks below the wearing surface are not included in this work area so report the repair of any defects in decks revealed by the removal of the wearing surface to the appropriate deck repair activity. End dams and scuppers against which the bituminous concrete wearing surface is to be placed are included within the work area for the purposes of cleaning contact surfaces, applying tack coat, or making minor adjustments.

ACTIVITY DESCRIPTION

Repairing or replacing all or portions of a bituminous concrete wearing surface. The work can include, but is not limited to, excavating deteriorated or defective material, and preparing surfaces against which new material is to be placed; placing new bituminous concrete in prepared excavations; placing new bituminous concrete overlay to improve skid resistance; repairing or replacing of waterproofing membrane; crack filling; and caulking or sealing the joint between the bituminous concrete wearing surface and curb faces.

PROCEDURE DESCRIPTION

1. Remove existing deck wearing surface by milling or pneumatic hammering to concrete or timber deck or desired depth of existing bituminous surface.
2. Patch spalled or cracked areas.
3. Raise end dams and scuppers as necessary. Clean contact surfaces of end dams and scuppers.
4. Apply bituminous tack coat to the deck surface and contact surfaces of end dams and scuppers.
5. Place heavy duty membrane as required.
6. Place and compact bituminous wearing course to the required thickness.

7. Apply paint traffic lines and markings after the wearing course has cured in accordance with the paint manufacturer's recommendation.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Paver	A/N	Bituminous Concrete (SY)
3	Crew Members	1	Rollers (or other compaction equipment)	A/N	Tack Coat (0.5 gal/SY)
3	Operators	1	Milling Machine	A/N	Membrane, heavy gauge (SY)
		1	Asphalt Distributor		
		1	Jack Hammer		
		A/N	Dump Trucks		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
18 SY/hour		110 SY/day		0.4 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

TIMBER DECK (REPAIR/REPLACE)

MAINTENANCE ACTIVITY:	TIMBER DECK (REPAIR/REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF TIMBER DECK (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Work can be performed during any season and at any temperature which is reasonable for outdoor work. Scope of work can increase substantially as work progresses, so time allotted should not be too restrictive.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire timber deck between the backs of abutment backwalls, including deck; timber curbs; timber sidewalks; timber railings or timber portions of composite railings; or nailing strips, or bolsters, on top of steel stringers.

ACTIVITY DESCRIPTION

Repairing or replacing all or any portion of a timber element within the work area. Work can also include replacing or supplementing the connections between existing members by spiking or bolting.

PROCEDURE DESCRIPTION

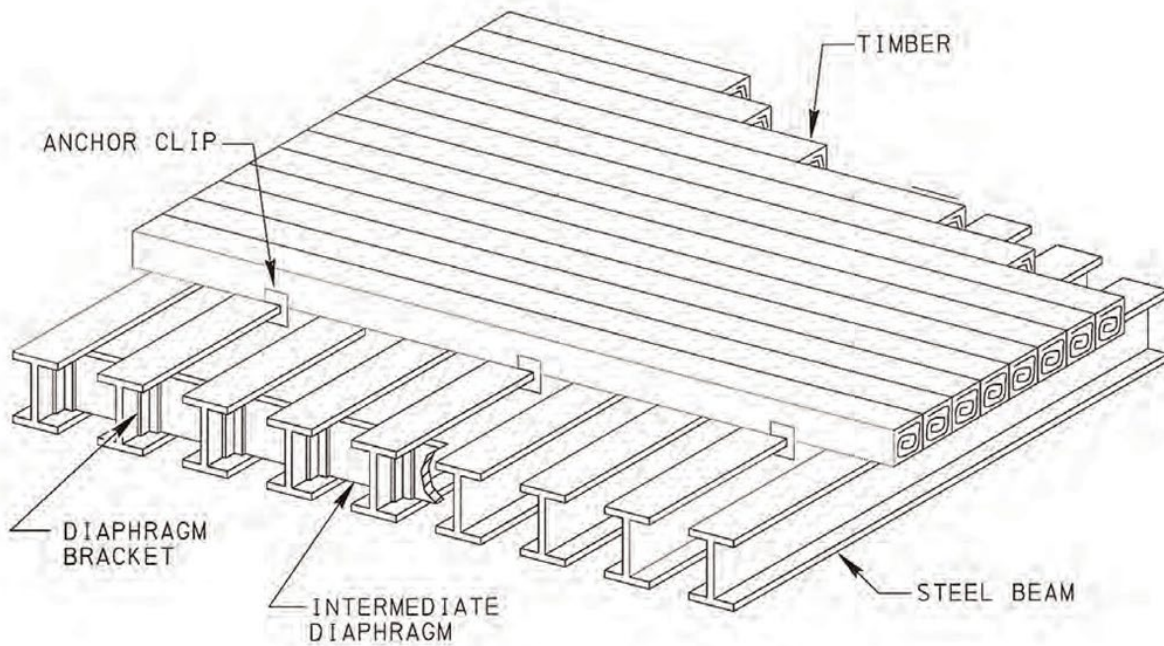
1. Remove and store deck mounted curbs, parapets, wheel guards and railing.
2. Remove existing deteriorated decking that can be repaired or replaced in the same day.
3. Clean and paint top flanges of stringers.
4. Place pressure treated lumber on the stringers parallel to the abutment. Lumber should be placed with the smallest dimension on the stringer. No stick shall bear on fewer than three stringers and joints should be staggered.
5. Spike each stick in place with spikes spaced as specified by the District Bridge Engineer.
6. Place Anchor plates spaced as specified by the District Bridge Engineer along every stringer, alternating sides of the stringer flange with every stringer.
7. Apply wood preservative to the ends of any stick that is field cut.
8. Place preformed membrane waterproofing if authorized by the District Bridge Engineer and place the bituminous wearing surface if authorized.
9. Replace deck mounted appurtenances (after wearing surface applied if applicable).

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman			A/N	Pressure-treated
3	Crew Members				Timber Spikes
				A/N	Anchor Plates
				A/N	Treated Timber
					(in accordance with design & conditions)
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
1.8 SY/hour		eleven (11) SY/day		2.2 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



NOTE: THIS IS A SCHEMATIC DRAWING, CONSULT THE DISTRICT BRIDGE ENGINEER FOR STANDARDS OF SPIKING, SPLICING, AND ANCHOR PLATE ATTACHMENTS.

OPEN STEEL GRID DECK (REPAIR/REPLACE)

MAINTENANCE ACTIVITY:	OPEN STEEL GRID DECK (REPAIR/REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF OPEN STEEL GRID DECK (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. For maximum effectiveness, deficiencies in steel grid floors and their connections to stringers should be corrected promptly to limit the area of the deck which is affected.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire steel grid deck between the backs of abutment backwalls, including curbs and sidewalks, and connections to steel stringers, to include fasteners and shim-plates.

ACTIVITY DESCRIPTION

Repairing or replacing portions of an existing open steel grid deck. The work can include, but is not limited to, removing deteriorated or damaged sections and replacing them; rewelding elements of a deck; rewelding a deck to steel stringers; installing shims to reduce extraneous tension loads on welded connections; increasing skid resistance by serrating or adding studs to the top of the grid; and repairing or replacing structural elements of curbs and sidewalks. Do not replace entire decks with open steel grid decking.

PROCEDURE DESCRIPTION

1. Locate damaged sections of grid, broken welds between grid and stringers and other areas requiring repair.
2. Cut and remove damaged steel as required. Repairs should be continuous over at least three stringers.
3. Weld replacement steel and/or reweld deck to stringers. Ensure splice joints are over a supporting stringer.

NOTE: Welding detail for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

OPEN STEEL GRID DECK (REPLACE)

MAINTENANCE ACTIVITY:	OPEN STEEL GRID DECK (REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF OPEN STEEL GRID DECK (SY)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and deficiencies observed and reported by other personnel. For maximum effectiveness, deficiencies in steel grid floors and their connections to stringers should be corrected promptly to limit the area of the deck which is affected.

Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire steel grid deck between the backs of abutment backwalls, including curbs and sidewalks, and connections to steel stringers, to include fasteners and shim-plates.

ACTIVITY DESCRIPTION

Repairing or replacing portions of an existing open steel grid deck. The work can include, but is not limited to, removing deteriorated or damaged sections, and replacing them; rewelding elements of a deck; rewelding a deck to steel stringers; installing shims to reduce extraneous tension loads on welded connections; increasing skid resistance by serrating or adding studs to the top of the grid; and repairing or replacing structural elements of curbs and sidewalks. Do not replace entire decks with open steel grid decking.

PROCEDURE DESCRIPTION

1. Ensure replacement grid deck sections are on hand prior to beginning work.
2. Remove existing deck sections as required.
3. Erect steel grid and weld to steel beams. Follow any recommendations of the grid manufacturer.
4. If the grid system includes a wearing surface, place concrete.

NOTE: Welding detail for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

CONCRETE DECK REPAIR

MAINTENANCE ACTIVITY:	CONCRETE DECK REPAIR
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CONCRETE DECK (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or by work order issued on an emergency basis.

Deterioration is often more extensive than is apparent from observation alone, so allotted time should not be too restrictive. Coordinate maintenance scheduling with the local road maintenance departments that may be affected by these activities during anticipated periods of increased roadway usage.

WORK AREA

Entire structural concrete slab out-to-out of the superstructure between the backs of abutment backwalls. Portland cement concrete (PCC) wearing surfaces are also included.

ACTIVITY DESCRIPTION

Repairing or replacing all or any portions of a structural deck or wearing surface. The work can include, but is not limited to, removing deteriorated or damaged concrete; removing deteriorated or damaged reinforcing steel; constructing forms; retying existing reinforcing steel; supporting and tying new reinforcing steel; and placing new concrete.

PROCEDURE DESCRIPTION

Type 1 Repair - Deteriorated concrete extends to ½ inch above the top mat of the reinforcement bars:

(If reinforcement bar is exposed, this is considered a Type 2 condition. Type 1 repairs are used, but rarely; Type 2 repairs are used in most situations.)

See diagrams for

Type 2 Repair - Deteriorated concrete extends 1 inch below the top mat of reinforcement bars:

1. Outline the perimeter of the deteriorated concrete to be patched with a ¾ inch deep saw cut.
2. Remove deteriorated or damaged concrete with jack hammer (30 lb. maximum class size). Cut and remove deteriorated reinforcing steel. Provide a minimum ¾ inch clearance around all reinforcing bars in the top mat, regardless of concrete deterioration.
3. Place replacement reinforcing steel by tying into existing sound steel at a minimum of 18-inch overlap.
4. Place concrete patch in one continuous operation when possible.
5. Finish and texture the deck and cure the concrete.

Type 3 Repair - Deteriorated concrete extends to a depth more than half of the deck thickness:

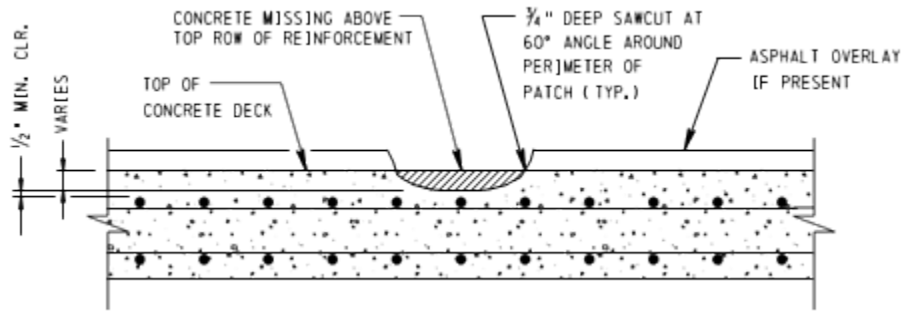
1. Outline the perimeter of the deteriorated or damaged concrete to be replaced with a ¾ inch deep saw cut.
2. Provide shielding to prevent debris from falling below the deck. Prevent damage to the underlying beam.
3. Remove deteriorated concrete with jack hammer (30 lb. maximum class size).
4. Full depth deck repairs over stringers should be performed for a width from centerline to centerline of the stringers.
5. Use removable formwork of sufficient strength to prevent vertical deflection. For deck overhang areas, provide side formwork with drip strip and chamfering as appropriate.
6. Place replacement reinforcing steel by tying into existing sound steel at a minimum of 18-inch overlap.
7. Place concrete patch in one continuous operation when possible.
8. Finish and texture the deck and cure the concrete.
9. Remove formwork.

ACTIVITY REQUIREMENTS*

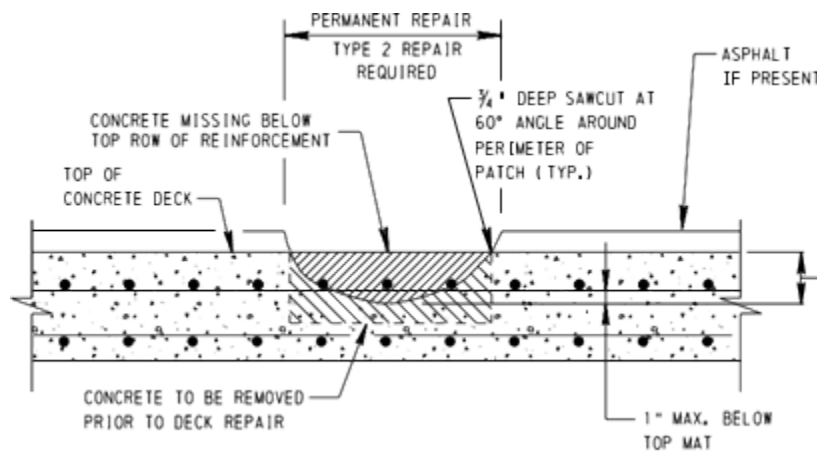
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Welding equipment	A/N	Concrete (SY)
3	Crew Members	1	Concrete Mixer	A/N	Rebar (LF)
1	Operator	1	Air Compressor (w/Jack Hammer)		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
2.3 SY/hour		fourteen (14) SY/day		2.2 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

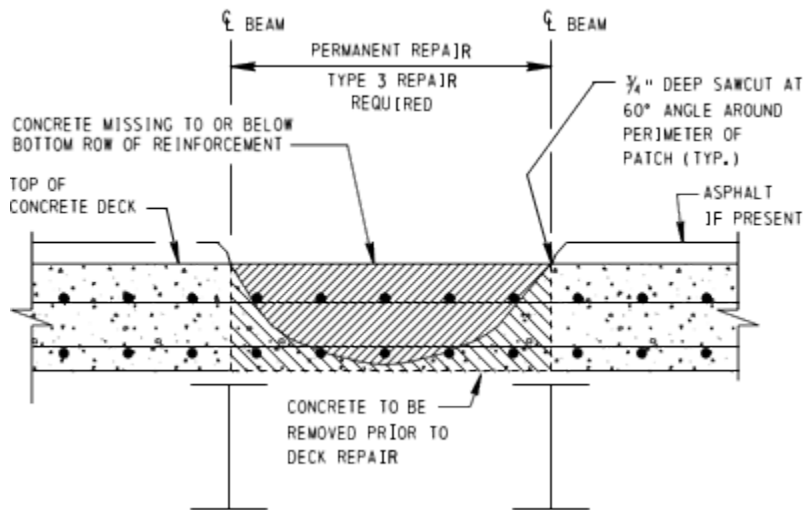
Note: A/N - as needed



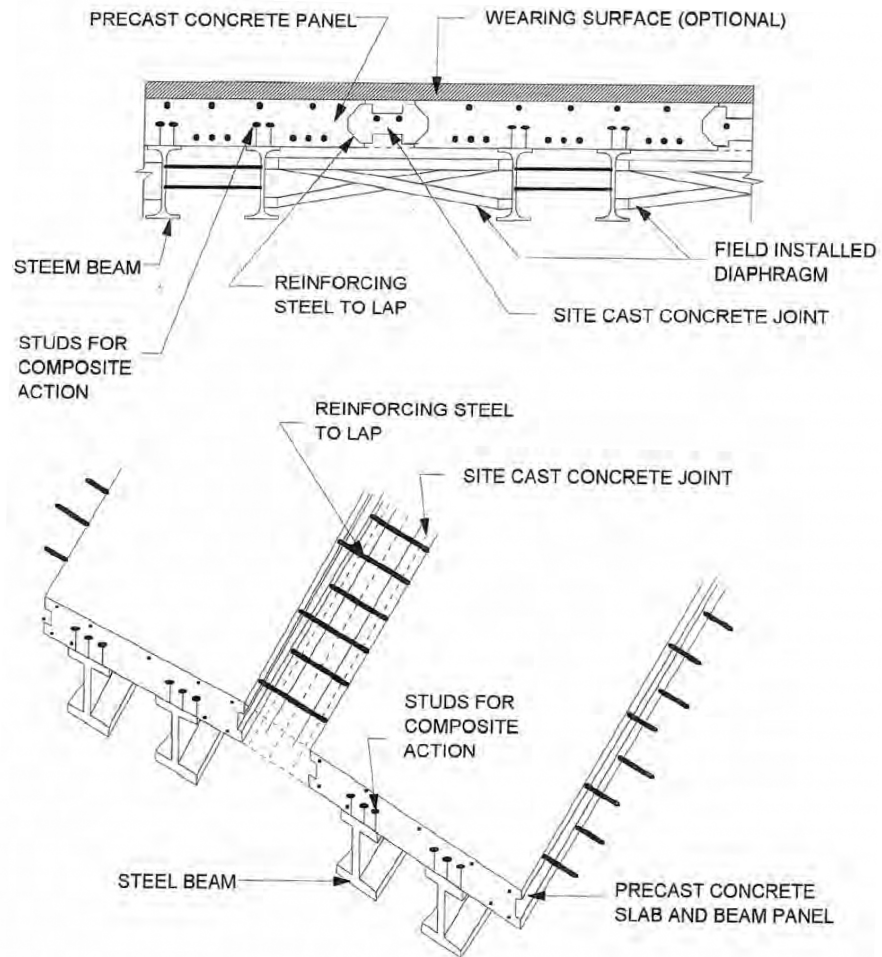
TYPE 1 CONDITION
(USE TYPE 2 REPAIR FOR TYPE 1 CONDITION)



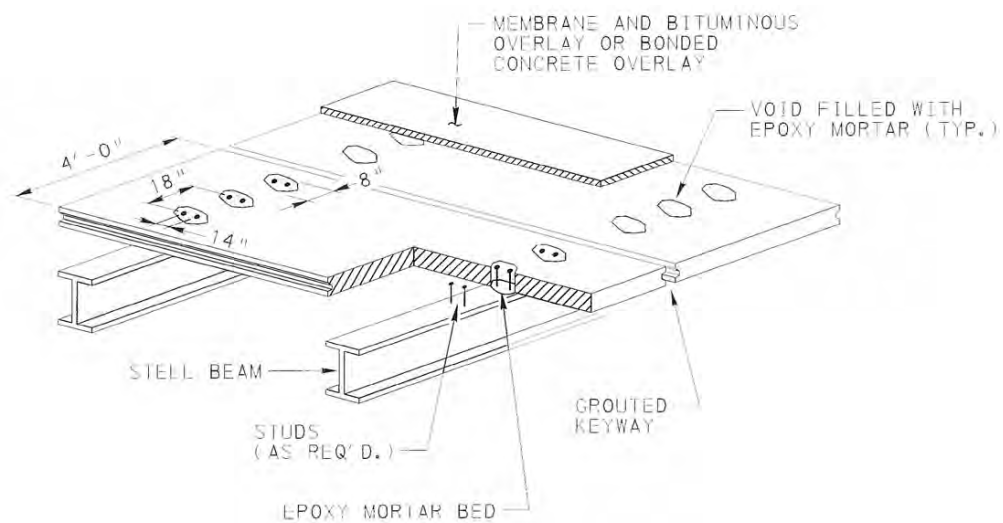
TYPE 2 CONDITION AND REPAIR



TYPE 3 CONDITION AND REPAIR



LONGITUDINALLY PLACED – PRECAST CONCRETE PANELS



TRANSVERSELY PLACED – PRECAST CONCRETE PANELS

DRAIN-SCUPPER (REPLACE)

MAINTENANCE ACTIVITY:	DRAIN-SCUPPER (REPLACE)
<i>UNIT OF MEASUREMENT:</i>	DRAIN-SCUPPER (EA)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All locations at curbs or parapets selected for installation of a scupper between backs of abutment backwalls. Included in the work area is a sufficient portion of the deck so that the installation can be accomplished. Also, be sure to include a few of the superstructure members so that any connection required by the design of the drain can be attached. Installing grates and down spouting incidental to installation of a new or replacement scupper are included in this activity.

ACTIVITY DESCRIPTION

Installing scuppers and drains. The work can include, but is not limited to, removing sufficient wearing surface if present, to permit drilling a hole in the deck and shaping the surface to facilitate the flow of drainage water; drilling a hole of the correct size in the concrete deck to accommodate the drain pipe; grouting the pipe into position; connecting the pipe to the concrete or steel superstructure elements; replacing the wearing surface; and placing grate bars if they are not part of the prefabricated scupper.

PROCEDURE DESCRIPTION

1. Drill hole or holes through the deck to act as drain or to remove sufficient material to place grate, drain, or scupper assembly. Carefully cut and bend any reinforcing bars encountered to permit placement of the drain or scupper.
2. Place grate, drain or scupper.
3. Recast deck around grate, drain or scupper shaping the deck to facilitate drainage.
4. Attach any down spouting supports to beam as necessary.
5. Install down spouting as necessary.
6. Place riprap or splash blocks under drains or down spouting.
7. Plug any old existing drain holes with epoxy or rapid-set concrete patching material.

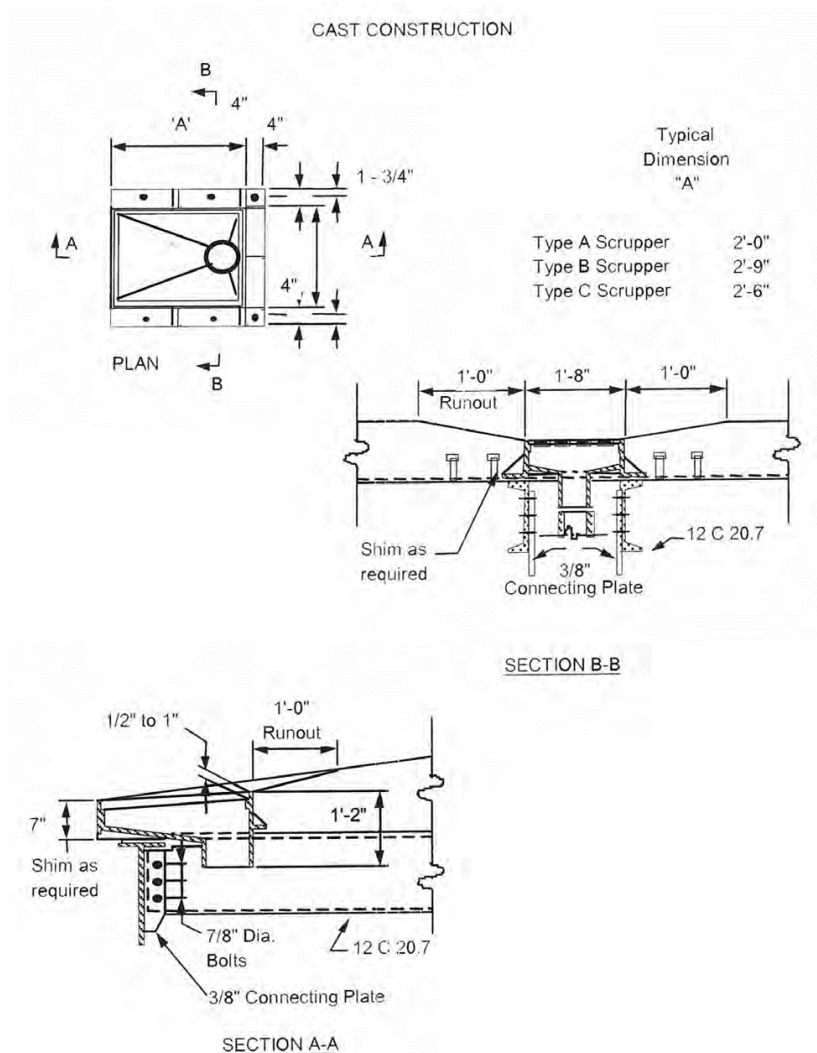
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Welding equipment	A/N	Grate Assembly (EA)
2	Crew Members				
3	Welder, Certified				
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
one (1) EA/hour		six (6) EA/day		4 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



PVC DECK DRAIN (INSTALL)

MAINTENANCE ACTIVITY:	PVC DECK DRAIN (INSTALL)
<i>UNIT OF MEASUREMENT:</i>	DRAIN-SCUPPER (EA)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All locations at curbs or parapets selected for installation of a scupper between backs of abutment backwalls. Included in the work area is a sufficient portion of the deck so that the installation can be accomplished. Also, be sure to include a few of the superstructure members so that any connection required by the design of the drain can be attached. Installing grates and down spouting incidental to installation of a new or replacement scupper are included in this activity.

ACTIVITY DESCRIPTION

Installing scuppers and drains. The work can include, but is not limited to, removing sufficient wearing surface if present, to permit drilling a hole in the deck and shaping the surface to facilitate the flow of drainage water; drilling a hole of the correct size in the concrete deck to accommodate the drain pipe; grouting the pipe into position; connecting the pipe to the concrete or steel superstructure elements; replacing the wearing surface; and placing grate bars if they are not part of the prefabricated scupper.

PROCEDURE DESCRIPTION

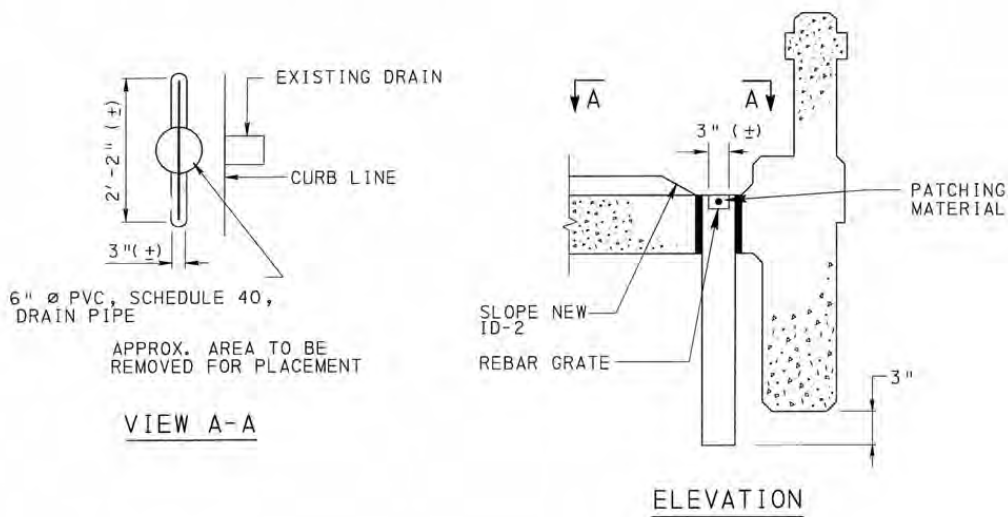
1. Drill holes through deck and remove sufficient concrete to set grate of epoxy coated No. 6 reinforcing bar.
2. Set drain pipe and grate bar with epoxy or rapid set concrete patching material.
3. Plug any old existing drain holes with epoxy or rapid-set concrete patching material.
4. Place riprap or splash blocks as required under drains.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	6-in dia. PVC Sched. 40 pipe
3	Crew Members	1	Pneumatic Drill	A/N	No. 6 Epoxy-coated rebar
		1	Concrete Mixer	A/N	Concrete Patching material
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.5 EA/hour		three (3) EA/day		8 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



METAL DRAINS THROUGH PARAPETS (INSTALL)

MAINTENANCE ACTIVITY:	METAL DRAINS THROUGH PARAPETS (INSTALL)
<i>UNIT OF MEASUREMENT:</i>	DRAIN-SCUPPER (EA)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All locations at curbs or parapets selected for installation of a scupper between backs of abutment backwalls. Included in the work area is a sufficient portion of the deck so that the installation can be accomplished. Also, be sure to include a few of the superstructure members so that any connection required by the design of the drain can be attached. Installing grates and down spouting incidental to installation of a new or replacement scupper are included in this activity.

ACTIVITY DESCRIPTION

Installing scuppers and drains. The work can include, but is not limited to, removing sufficient wearing surface if present, to permit drilling a hole in the deck and shaping the surface to facilitate the flow of drainage water; drilling a hole of the correct size in the concrete deck to accommodate the drain pipe; grouting the pipe into position; connecting the pipe to the concrete or steel superstructure elements; replacing the wearing surface; and placing grate bars if they are not part of the prefabricated scupper.

PROCEDURE DESCRIPTION

1. Remove existing concrete parapet and deck as required.
2. Cut metal drain section to proper length (typically 2'-3') and butt weld together.
3. Place metal drain in proper position.
4. Place concrete around drain and replace concrete in parapet deck as required.

NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

DECK DRAIN USING ECCENTRIC REDUCERS (INSTALL)

MAINTENANCE ACTIVITY:	DECK DRAINS USING ECCENTRIC REDUCERS (INSTALL)
<i>UNIT OF MEASUREMENT:</i>	DRAIN-SCUPPER (EA)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & CYCLIC & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All locations at curbs or parapets selected for installation of a scupper between backs of abutment backwalls. Included in the work area is a sufficient portion of the deck so that the installation can be accomplished. Also, be sure to include a few of the superstructure members so that any connection required by the design of the drain can be attached. Installing grates and down spouting incidental to installation of a new or replacement scupper are included in this activity.

ACTIVITY DESCRIPTION

Installing scuppers and drains. The work can include, but is not limited to, removing sufficient wearing surface if present, to permit drilling a hole in the deck and shaping the surface to facilitate the flow of drainage water; drilling a hole of the correct size in the concrete deck to accommodate the drain pipe; grouting the pipe into position; connecting the pipe to the concrete or steel superstructure elements; replacing the wearing surface; and placing grate bars if they are not part of the prefabricated scupper.

PROCEDURE DESCRIPTION

1. Drill holes through the deck and remove sufficient material to place the drain assembly. Carefully cut and bend any reinforcing bars encountered to permit placement of the drain.
2. Place drain assembly and weld support to beam web.
3. Recast deck around drain shaping the top of the deck to facilitate drainage.
4. Replace wearing surface around drain as necessary.
5. Plug any old existing drain holes with epoxy or rapid-set concrete patching material.
6. Place riprap or splash blocks under drains as required.

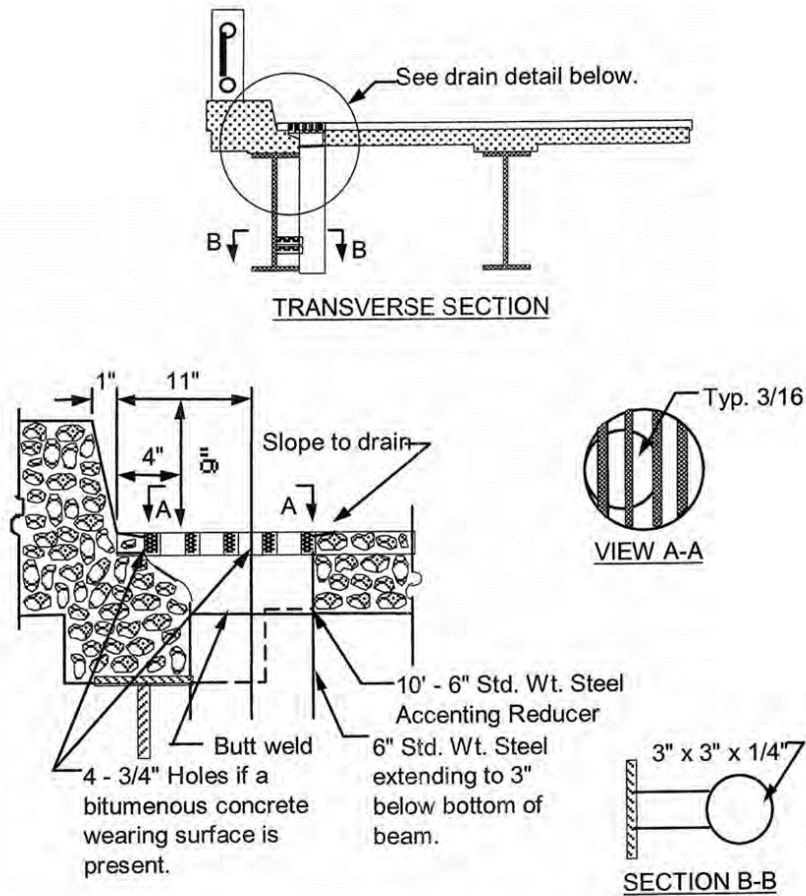
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	1	Eccentric reducer assembly w/grate
2	Crew Members	1	Welding Equipment	A/N	6-in dia. Steel pipe
1	Certified Welder	A/N	Access Equipment	A/N	Splash block or Riprap
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.5 EA/hour		three (3) EA/day		8 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



STANDARD SCUPPER (INSTALL)

MAINTENANCE ACTIVITY:	STANDARD SCUPPER (INSTALL)
<i>UNIT OF MEASUREMENT:</i>	DRAIN-SCUPPER (EA)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All locations at curbs or parapets selected for installation of a scupper between backs of abutment backwalls. Included in the work area is a sufficient portion of the deck so that the installation can be accomplished. Also, be sure to include a few of the superstructure members so that any connection required by the design of the drain can be attached. Installing grates and down spouting incidental to installation of a new or replacement scupper are included in this activity.

ACTIVITY DESCRIPTION

Installing scuppers and drains. The work can include, but is not limited to, removing sufficient wearing surface if present, to permit drilling a hole in the deck and shaping the surface to facilitate the flow of drainage water; drilling a hole of the correct size in the concrete deck to accommodate the drain pipe; grouting the pipe into position; connecting the pipe to the concrete or steel superstructure elements; replacing the wearing surface; and placing grate bars if they are not part of the prefabricated scupper.

PROCEDURE DESCRIPTION

1. Drill holes through the deck and remove sufficient material to place the standard scupper. Carefully cut and bend any reinforcing bars encountered to permit placement of the scupper.
2. Place scupper assembly and weld or bolt support to beam web.
3. Recast deck around scupper. Shape deck to facilitate drainage.
4. Plug any old existing drain holes with epoxy or rapid-set concrete patching material.
5. Install down spouting as necessary.
6. Place riprap or splash blocks under drains as necessary.

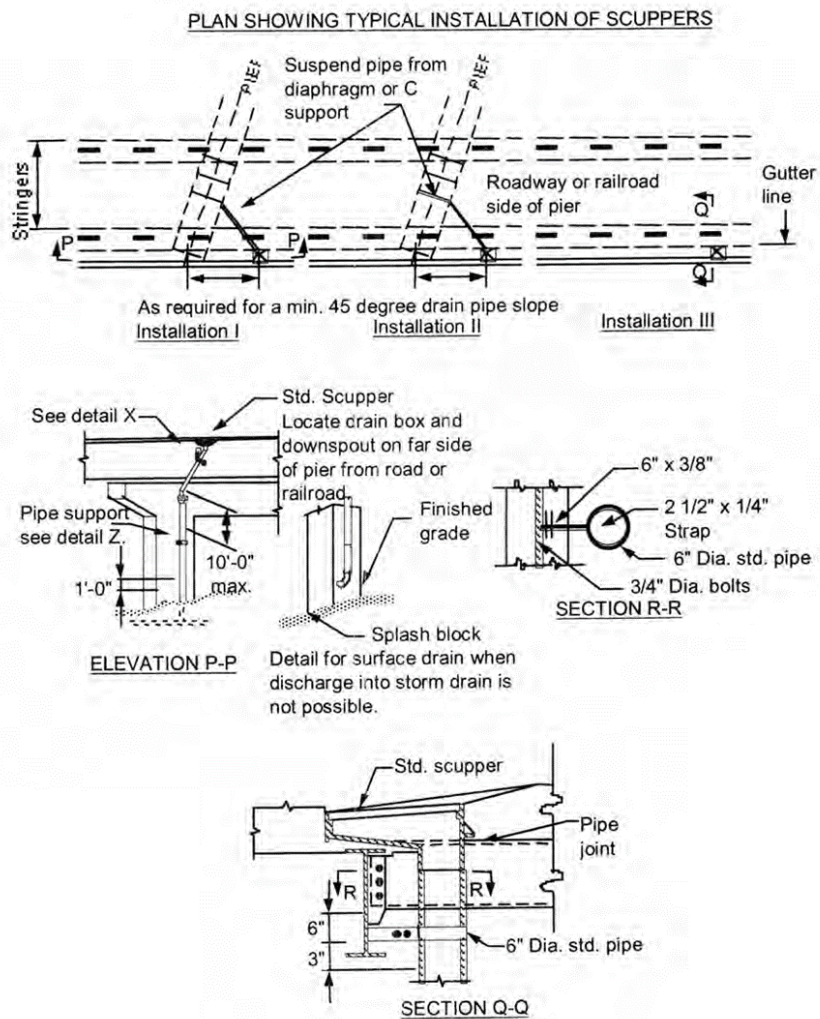
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	1	Standard Scupper assembly
2	Crew Members	1	Welding Equipment	A/N	Concrete
1	Certified Welder	A/N	Access Equipment	A/N	6-in dia. Steel pipe
				A/N	Splash block or Riprap
				A/N	Pipe supports, straps, etc.
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.5 EA/hour		three (3) EA/day		8 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



DOWNSPOUTING (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	DOWNSPOUTING (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	DOWNSPOUT (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All down spouting and connections of down spouting to superstructure and substructure elements. The work area also includes sufficient areas of the superstructure and substructure elements to make minor repairs to them when necessary and-or to remove existing down spouting anchorages and install new ones.

ACTIVITY DESCRIPTION

Repairing or replacing portions or all of bridge down spouting. The work can include, but is not limited to, removing deteriorated or damaged and anchorages to superstructure or substructure elements; repairing portions of superstructure or substructure elements damaged at the down spouting anchorage points using standard concrete or structural steel repair methods, as appropriate; prefabricating all or portions of the down spouting as required; drilling and installing anchorages to the bridge superstructure and substructure; and installing repaired or replacement down spouting.

PROCEDURE DESCRIPTION

1. Remove pipe supports, hangers, drain boxes and pipe sections as necessary.
2. Drill new anchor holes in concrete or steel surfaces.
3. Fasten supports to concrete surfaces with expansion anchor bolts or other approved fastener. Fasten supports to steel surfaces with bolts or by welding.
4. Install new pipe sections and attach to supports and hangers.

NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

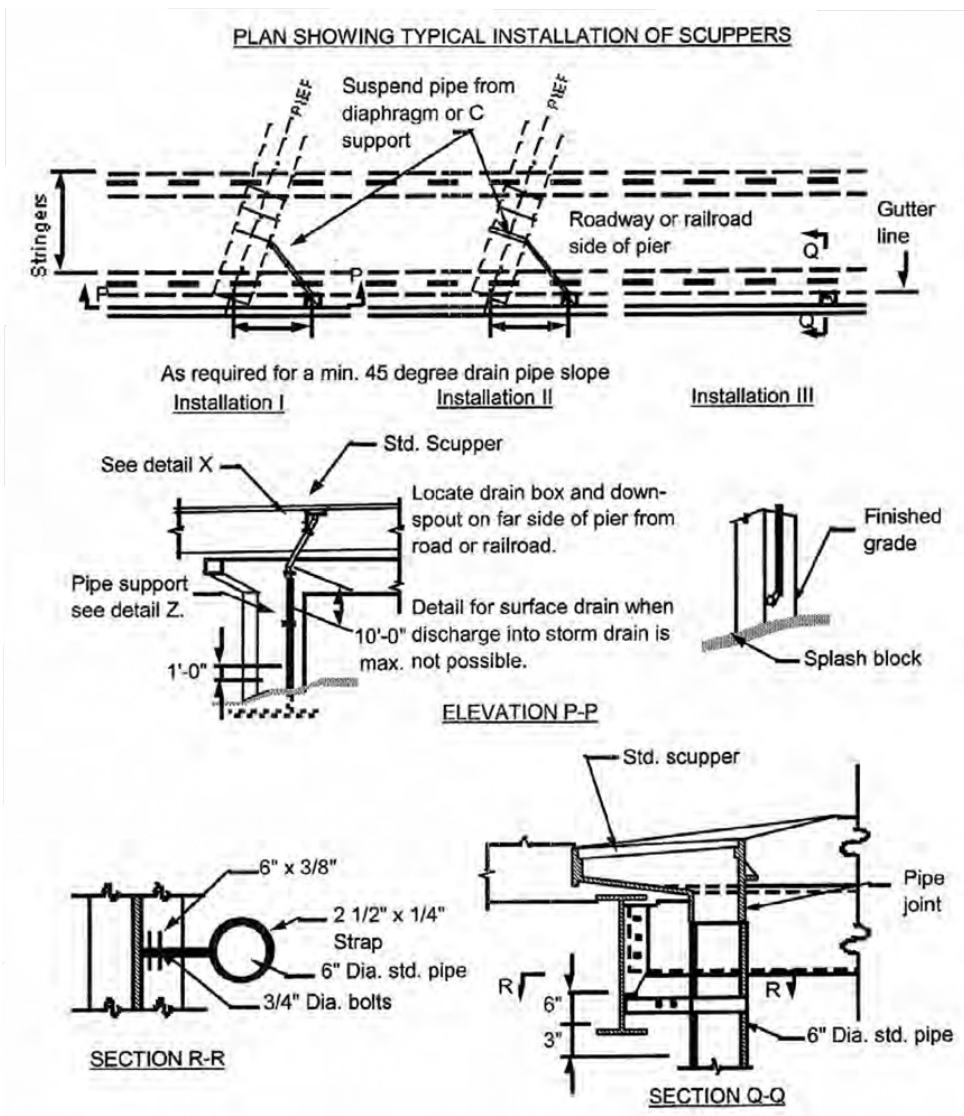
ACTIVITY REQUIREMENTS*

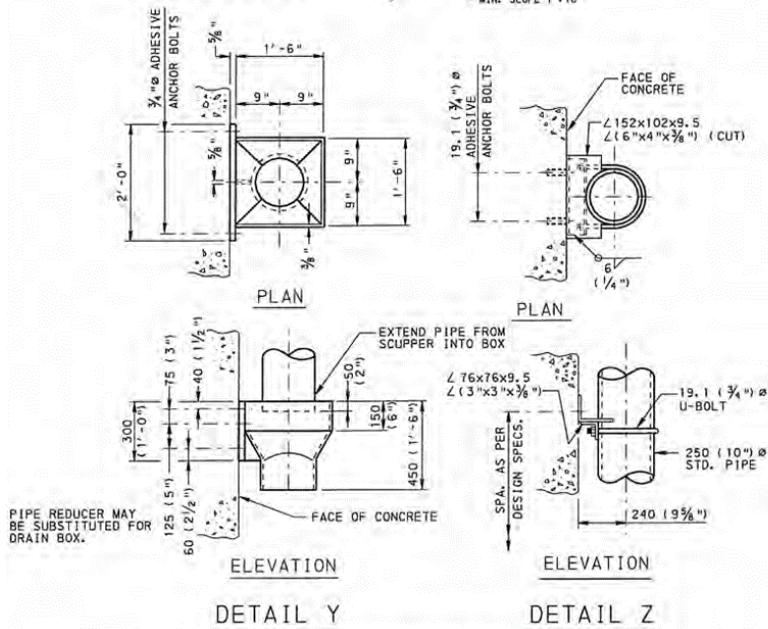
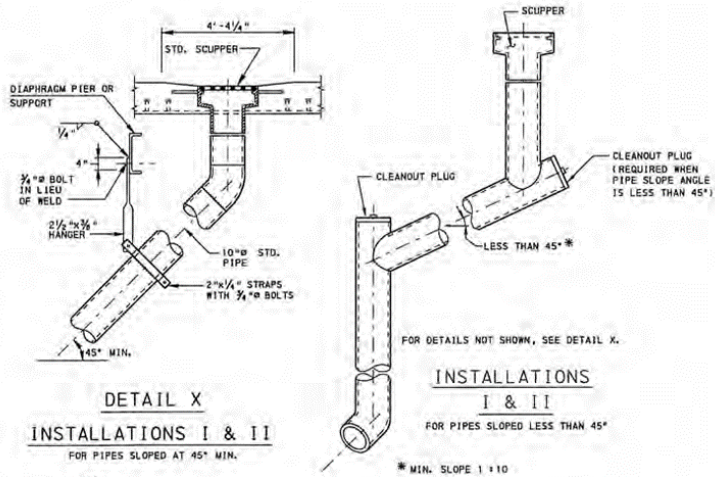
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	6-in dia. Standard pipe
2	Crew Members	1	Welding Equipment	A/N	Anchor fittings
1	Certified Welder	A/N	Access Equipment	A/N	Concrete

PRESERVATION UNIT/HOURS	PLANNING UNITS	PERFORMANCE STANDARD
0.5 EA/hour	three (3) EA/day	8 MH/EA

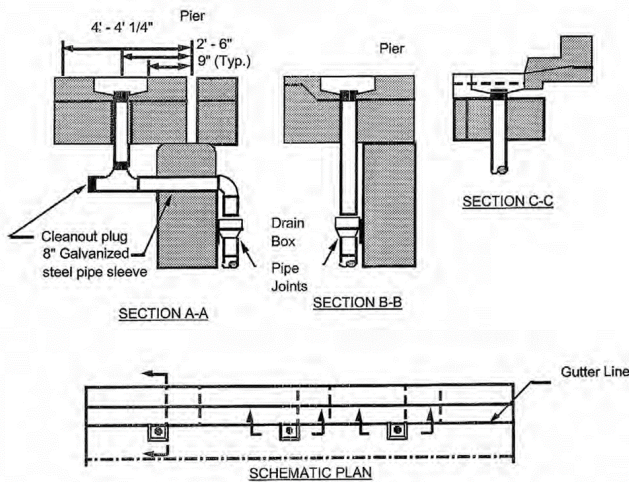
*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed





TYPICAL DOWNSPOUTING DETAILS FOR PRESTRESSED CONCRETE BOX BEAR BRIDGES.



ITEM 59 – SUPERSTRUCTURE

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<u>REPAIR CONCRETE MEMBERS (REPAIR-REPLACE)</u>	109

TIMBER STRINGERS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	TIMBER STRINGERS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	TIMBER STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

Timber stringers, cross bracing attached to stringers being repaired or replaced, and fasteners to decks.

ACTIVITY DESCRIPTION

Repairing or replacing timber stringers. The work can include, but is not limited to, providing temporary supports for jacking; jacking stringers and/or portions of the deck; removing fasteners between stringers and the deck and cross bracing; removing existing stringers; fabricating and installing new stringers; treating cuts and holes with wood preservative; replacing existing cross bracing, if necessary, and fastening cross bracing to stringers; and fastening new stringers to the deck. The work can also include all work necessary for installing sister beams which does not involve removing existing stringers.

PROCEDURE DESCRIPTION

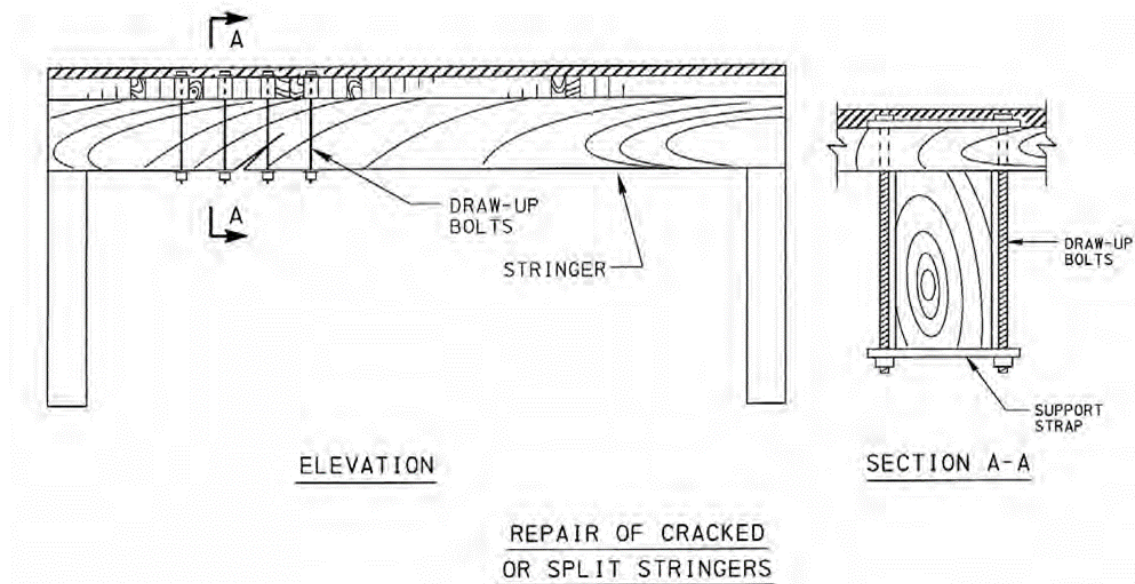
1. Use template to locate holes on cap and scab
2. Drill holes and treat holes
3. Insert rings in cap
4. Install scab.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Saw	A/N	Prefabricated Straps
3	Crew Members	1	15--lb Hammer	A/N	3/4" dia. Plates
		1	Concrete-Asphalt Saw	A/N	3/4" dia. Bolts, nuts and washers
				A/N	Bituminous Patching material
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 EA/hour		four (4) EA/day		6 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



REPAIR OF DECAYED TIMBER STRINGER ENDS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	REPAIR DECAYED STRINGER ENDS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	TIMBER STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

Timber stringers, cross bracing attached to stringers being repaired or replaced, and fasteners to decks.

ACTIVITY DESCRIPTION

Repairing or replacing timber stringers. The work can include, but is not limited to, providing temporary supports for jacking; jacking stringers and/or portions of the deck; removing fasteners between stringers and the deck and cross bracing; removing existing stringers; fabricating and installing new stringers; treating cuts and holes with wood preservative; replacing existing cross bracing, if necessary, and fastening cross bracing to stringers; and fastening new stringers to the deck. The work can also include all work necessary for installing sister beams which does not involve removing existing stringers.

PROCEDURE DESCRIPTION

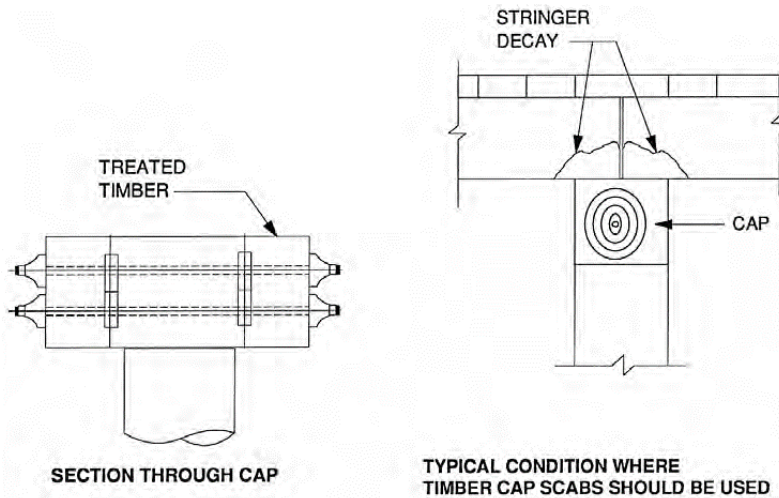
1. Use a template to locate holes on cap and scab.
2. Drill holes for draw-up bolts and treat.
3. Insert rings in the cap.
4. Install scab.
5. Install plates and tighten bolts.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Power Drill	A/N	Scabs
3	Crew Members			A/N	Bolts
				A/N	Rings
				A/N	OG Washers
				A/N	Wood Preservative
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 EA/hour		four (4) EA/day		6 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



UNDER THE DECK STRINGER REPLACEMENT (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	UNDER THE DECK STRINGER (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	TIMBER STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

Timber stringers, cross bracing attached to stringers being repaired or replaced, and fasteners to decks.

ACTIVITY DESCRIPTION

Repairing or replacing timber stringers. The work can include, but is not limited to, providing temporary supports for jacking; jacking stringers and/or portions of the deck; removing fasteners between stringers and the deck and cross bracing; removing existing stringers; fabricating and installing new stringers; treating cuts and holes with wood preservative; replacing existing cross bracing, if necessary, and fastening cross bracing to stringers; and fastening new stringers to the deck. The work can also include all work necessary for installing sister beams which does not involve removing existing stringers.

PROCEDURE DESCRIPTION

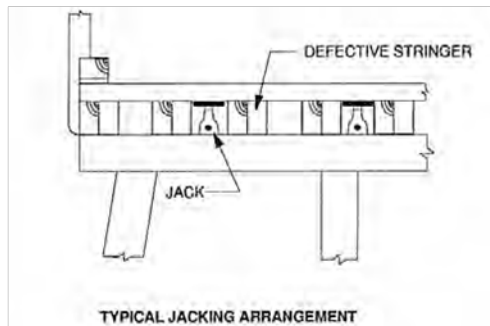
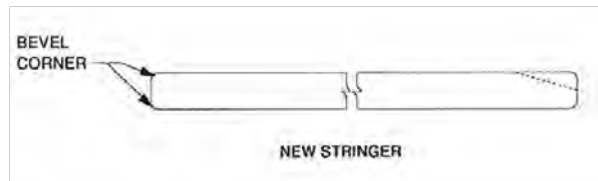
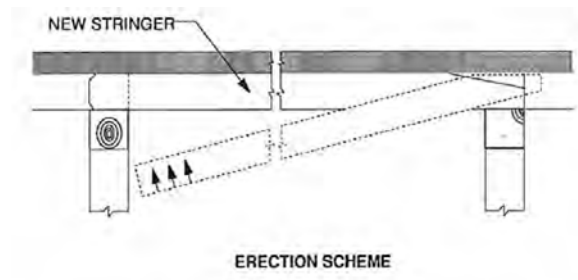
1. Construct temporary bent for jacking.
2. Lift superstructure jacking against steel plate.
3. Remove cross bracing between stringers.
4. Remove existing timber stringer.
5. Cut new stringer as shown.
6. Treat cut and any holes with wood preservative.
7. Install new stringer using a 'come-along' assembly.
8. Nail cut section to stringer.
9. Fasten cross bracing to new stringer.
10. Fasten deck to new stringers.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	no special equipment required		A/N	Replacement Stringer
2	Crew Members			A/N	Wood Preservative
				A/N	Cross-bracing
				A/N	Temporary Bent
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 EA/hour		four (4) EA/day		6 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



ABOVE THE DECK STRINGER REPLACEMENT (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	ABOVE THE DECK STRINGER (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	TIMBER STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

Timber stringers, cross bracing attached to stringers being repaired or replaced, and fasteners to decks.

ACTIVITY DESCRIPTION

Repairing or replacing timber stringers. The work can include, but is not limited to, providing temporary supports for jacking; jacking stringers and/or portions of the deck; removing fasteners between stringers and the deck and cross bracing; removing existing stringers; fabricating and installing new stringers; treating cuts and holes with wood preservative; replacing existing cross bracing, if necessary, and fastening cross bracing to stringers; and fastening new stringers to the deck. The work can also include all work necessary for installing sister beams which does not involve removing existing stringers.

PROCEDURE DESCRIPTION

1. Remove cross bracing between stringers.
2. Cut deck along center lines of stringers adjacent to stringer to be removed.
3. Remove stringer and continuous deck.
4. Install new stringer.
5. Replace deck and nail decking in the same manner as existing.
6. Fasten cross bracing to new stringers in the same manner as existing.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	no special equipment required		A/N	Replacement Stringer
2	Crew Members			A/N	Cross-bracing
				A/N	Decking
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 EA/hour		four (4) EA/day		6 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

STEEL STRINGERS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	STEEL STRINGERS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	STEEL STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL SECTION REPAIR-REPLACEMENT PROCEDURE (BEAM END)
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage. When damage or deterioration is so severe that the structural capacity of a stringer is impaired, special traffic controls may be required on an emergency basis.

WORK AREA

All rolled beam steel stringers; their connections to bearings and floor beams which support them; areas of the deck directly adjacent to stringers requiring repair or replacement; and incidental items supported by and connected to stringers, such as diaphragms, cross-frames and utility brackets.

ACTIVITY DESCRIPTION

Repairing and replacing all or portions of steel stringers. The work can include, but is not limited to, providing temporary supports for jacking; temporarily supporting or reducing loads carried by stringers either by jacking from below or using needle beams from above; disconnecting stringers from their supports or disconnecting incidental items supported by stringers by removing bolts or rivets or using oxyacetylene cutting torches; prefabricating replacement members or elements; drilling and reaming holes; grinding to provide the required finish or tolerances on steel surfaces; making minor repairs to decks within the work area; repairing or replacing incidental items within the work area; erecting replacement or repaired elements and incidental items, including installation of shear connectors, by welding or high tensile strength bolting; and preparing surfaces which have been damaged or left bare by the work, and applying a prime coat of paint.

PROCEDURE DESCRIPTION

1. Modify superstructure to accept jacking loads, if necessary.
2. Construct temporary bent or install needle beam under sound portion of superstructure.
3. Lift superstructure.
4. Remove damaged or deteriorated section.
5. Weld new section into place using full penetration groove welds.
6. Lower member and check for distress.
7. Remove lifting devices.
8. Sandblast and apply prime coat paint.

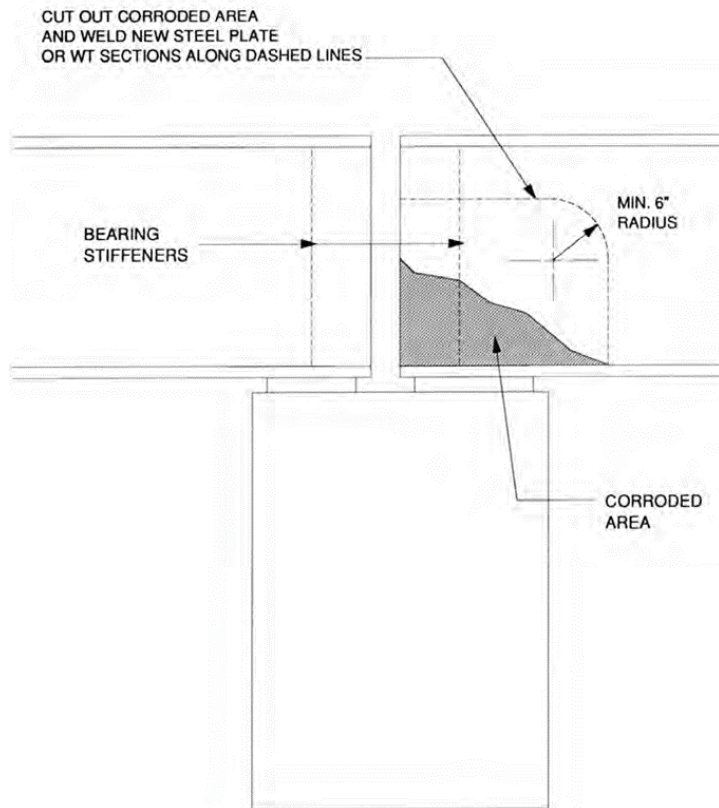
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	A/N	Jacks or Carrier Beams	A/N	Temporary Bent
3	Crew Members	1	Sand Blaster	A/N	New Section
1	Certified Welder	1	Cutting torch	A/N	Prime Coat Paint
		1	Welding Equipment	A/N	Sand
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		18 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



STEEL FLOORBEAM (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	STEEL FLOORBEAM (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	STEEL FLOORBEAM (EA)
<i>PROCEDURE:</i>	GENERAL SECTION REPAIR-REPLACEMENT PROCEDURE (BEAM END)
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. When deterioration is so severe that the structural capacity of a floorbeam is impaired, special traffic controls may be required.

WORK AREA

All rolled beam and built-up, riveted or welded floorbeams, their connections to girders, chords or bearings; stringer connections to floorbeams; and areas of the deck directly adjacent to floorbeams requiring repair or replacement.

ACTIVITY DESCRIPTION

Repairing or replacing all or portions of steel floorbeams. The work can include; but is not limited to, providing temporary supports for jacking; temporarily supporting the ends of floorbeams or the loads from stringers supported by floorbeams either by jacking from below or using needle beams from above; disconnecting floorbeams from their supports, or stringers from their beams by removing bolts or rivets or using oxy-acetylene cutting torches; prefabricating replacement members or elements; drilling and reaming holes; grinding to provide the required finish or tolerances on steel surfaces; making minor repairs to decks within the work area; erecting replacement or repaired elements and incidental items in the work area by welding or high tensile strength bolting; and preparing surfaces which have been damaged or left bare by the work, and applying a prime coat of paint.

PROCEDURE DESCRIPTION

1. Modify superstructure to accept jacking loads, if necessary.
2. Construct temporary bent or install needle beam under sound portion of superstructure.
3. Lift superstructure.
4. Remove damaged or deteriorated section.
5. Weld new section into place using full penetration groove welds.
6. Lower member and check for distress.
7. Remove lifting devices.
8. Clean and apply prime coat paint.

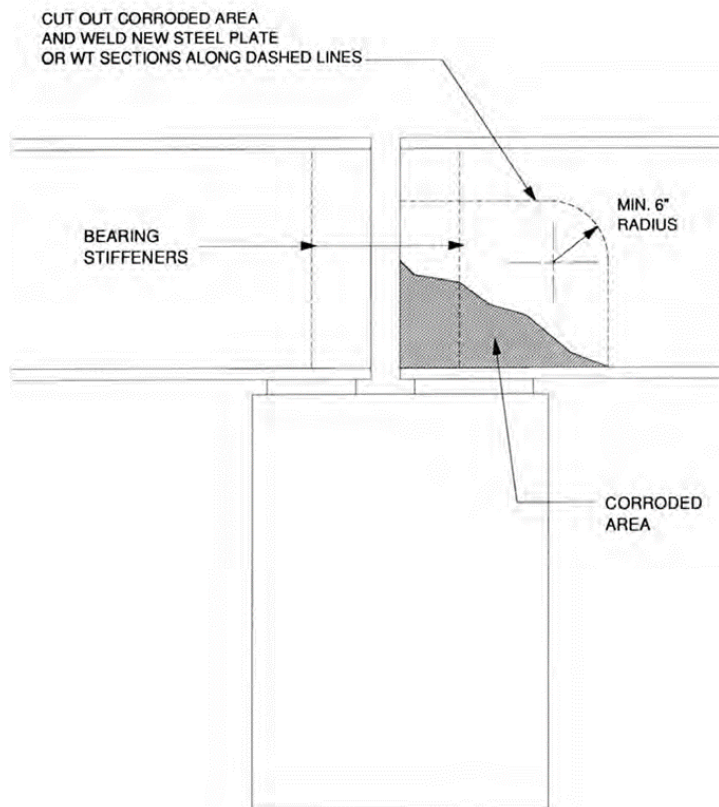
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	A/N	Jacks or Carrier Beams	A/N	Floorbeam sections
3	Crew Members	1	Sand Blaster	A/N	Prime Coat Paint
1	Certified Welder	1	Cutting torch		
		1	Welding Equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		18 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



STEEL GIRDER (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	STEEL GIRDER (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	STEEL GIRDER (EA)
<i>PROCEDURE:</i>	GENERAL SECTION REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage. If damage or deterioration is sufficiently severe so that the structural capacity of a girder is impaired special traffic controls may be required on an emergency basis.

WORK AREA

All built-up girders, riveted or welded; their connections to floor beams, incidental items such as cross frames and bearings; and areas of the deck directly adjacent to girders requiring repair.

ACTIVITY DESCRIPTION

Repairing built-up steel girders by restoring or replacing damaged or deteriorated elements. The work can include, but is not limited to, providing temporary supports for jacking; modifying girders to accept jacking loads; temporarily supporting or reducing loads carried by girders by either jacking from below or using needle beams from above; disconnecting or removing elements from girders by removing bolts or rivets or using oxy-acetylene torches; repairing or prefabricating replacement elements; drilling and reaming holes; grinding to provide required finish or tolerances on steel surfaces; making minor repairs to decks within the work area; erecting repaired or replaced elements and incidental items by welding or high tensile strength bolting; and preparing surfaces damaged or left bare by the work and applying a prime coat of paint.

PROCEDURE DESCRIPTION

1. Modify superstructure to accept jacking loads, if necessary.
2. Construct temporary bent or install needle beam under sound portion of superstructure.
3. Lift superstructure.
4. Remove damaged or deteriorated section.
5. Weld new section into place using full penetration groove welds.
6. Lower member and check for distress.
7. Remove lifting devices.
8. Clean and apply prime coat paint.

NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	A/N	Jacks or Carrier Beams	A/N	Temporary Bent
3	Crew Members	1	Sand Blaster	A/N	New Section
1	Certified Welder	1	Cutting torch	A/N	Prime Coat Paint
		1	Welding Equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 EA/hour		one (1) EA/day		24 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

STEEL DIAPHRAGM-LATERAL BRACING (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	STEEL LATERAL BRACING (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	STEEL DIAPHRAGM-LATERAL BRACING (EA)
<i>PROCEDURE:</i>	GENERAL SECTION REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All steel diaphragms, cross frames, lateral bracing, and their connections to beams and girders.

***Special Measurement Note:** Diaphragms are usually composed of a single member such as a channel. In these cases, the single member is considered as "one - each item" for measurement purposes. Cross frames are usually composed of at least four elements consisting of upper and lower members and cross members. All these members together are considered as "one each item" for measurement purposes. Lateral systems may be composed of one or two members, and these may be discontinuous on multi-beam or girder bridges. One element, or two elements fastened together, spanning between connections without a break is considered "one each item" for measurement purposes.

ACTIVITY DESCRIPTION

Repairing or replacing all or part of the elements in structural steel diaphragms, cross-frames or lateral bracing. The work can include, but is not limited to, disconnecting or removing elements by removing bolts or rivets or using oxy-acetylene cutting torches; straightening members by the application of heat and mechanical means; prefabricating replacement elements; repairing elements; drilling and reaming holes; erecting repaired or replaced elements by welding or high tensile strength bolting; and preparing surfaces damaged or left bare by the work and applying a prime coat of paint. Cross-frames and diaphragms are often connected to beam and girder stiffeners.

PROCEDURE DESCRIPTION

1. Modify superstructure to accept jacking loads, if necessary.
2. Construct temporary bent or install needle beam under sound portion of superstructure.
3. Lift superstructure.
4. Remove damaged or deteriorated section.
5. Weld new section into place using full penetration groove welds.
6. Lower member and check for distress.
7. Remove lifting devices.
8. Clean and apply prime coat paint.

NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position of the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	A/N	Jacks or Carrier Beams	A/N	Temporary Bent
3	Crew Members	1	Blocking	A/N	Steel shapes
1	Certified Welder	1	Cutting torch	A/N	Prime Coat Paint
		1	Welding Equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		18 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

REPAIR IMPACT DAMAGE TO STEEL GIRDER (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	REPAIR IMPACT TO STEEL GIRDER (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	STEEL GIRDER (EA)
<i>PROCEDURE:</i>	GENERAL SECTION REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on the need as indicated by inspection reports or reports of accidental damage. If fracture will occur due to subsequent impact, then this corrective action will be done immediately.

WORK AREA

The impact area should be flared back to the material edge not less than a slope of 1 to 10.

ACTIVITY DESCRIPTION

Repairing impact damage to steel girders requires very careful attention. Unless corrective measures are taken, fracture of the beam can occur due to impact at the original damage location or at any other point on the beam. The corrective measure to prevent fracture is to grind the impact damage to a smooth surface to eliminate stress riser and must be done prior to heat straightening.

PROCEDURE DESCRIPTION

1. Grind impact area to bright metal to remove any irregularities and surface defects. Using a sanding disc, smooth area and round over edges. Finish grinding should be done parallel to the stress, so this ensures that transverse grind marks are not present.
2. If the impact is within the proximity of a welded detail, the weld toes should be smoothed with a die grinder to ensure that no microcracks were introduced during the impact. Using a sanding disc, smooth the area and round over edges. Finish grinding should be done parallel to the stress, so this ensures that transverse grind marks are not present.
3. The impact area should be flared back to the material edge at not less than a 1 to 10 slope.
4. The area should be thoroughly inspected, including any weld toes of details within the vicinity of the impact using ultrasonic or magnetic particle testing as appropriate for the detail.

REINFORCED-PRESTRESSED CONCRETE STRINGER (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	CONCRETE STRINGER (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CONCRETE STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All reinforced concrete stringers; all prestressed concrete stringers; areas of deck directly adjacent to reinforced concrete or prestressed concrete stringers requiring repair or replacement; and diaphragms framed into reinforced concrete or prestressed concrete stringers requiring repair or replacement.

ACTIVITY DESCRIPTION

Repairing or replacing reinforced concrete or prestressed concrete stringers. The work can include, but is not limited to, providing temporary supports for jacking; temporarily supporting the loads carried by the stringer either by jacking from below or using needle beams from above; temporarily applying loads to prestressed stringers; removing damaged or deteriorated concrete and reinforcing steel; drilling and grouting dowels of threaded inserts; constructing false work to support forms; constructing forms; installing reinforcing bars; placing concrete; and replacing prefabricated, prestressed stringers. Report the work of making minor repairs to the deck directly adjacent to a stringer being repaired or replaced, or the work of repairing or replacing diaphragms that frame into a stringer being repaired or replaced to this activity.

PROCEDURE DESCRIPTION

1. Remove all loose concrete from the damaged area and clean all areas where new concrete will be bonded.
2. Chip all cracks to a 2-inch-deep V-shaped groove.
3. Clean and repair any exposed reinforcing steel or prestress tendons.
4. Install forms to repair stringer to its original cross section.
5. Seal cracks in the stringer with epoxy and coat the contact surfaces of the existing concrete to be patched with an epoxy resin.
6. Place the new concrete while the epoxy resin is still wet.
7. Remove forms and finish surfaces.

REPAIR PRESTRESSED CONCRETE STRINGER (POST-TENSIONING)

MAINTENANCE ACTIVITY:	PRESTRESSED CONCRETE STRINGER (POST-TENSIONING)
<i>UNIT OF MEASUREMENT:</i>	CONCRETE STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All reinforced concrete stringers; all prestressed concrete stringers; areas of deck directly adjacent to reinforced concrete or prestressed concrete stringers requiring repair or replacement; and diaphragms framed into reinforced concrete or prestressed concrete stringers requiring repair or replacement.

ACTIVITY DESCRIPTION

Repairing or replacing reinforced concrete or prestressed concrete stringers. The work can include, but is not limited to, providing temporary supports for jacking; temporarily supporting the loads carried by the stringer either by jacking from below or using needle beams from above; temporarily applying loads to prestressed stringers; removing damaged or deteriorated concrete and reinforcing steel; drilling and grouting dowels of threaded inserts; constructing false work to support forms; constructing forms; installing reinforcing bars; placing concrete; and replacing prefabricated, prestressed stringers. Report the work of making minor repairs to the deck directly adjacent to a stringer being repaired or replaced, or the work of repairing or replacing diaphragms that frame into a stringer being repaired or replaced to this activity.

PROCEDURE DESCRIPTION

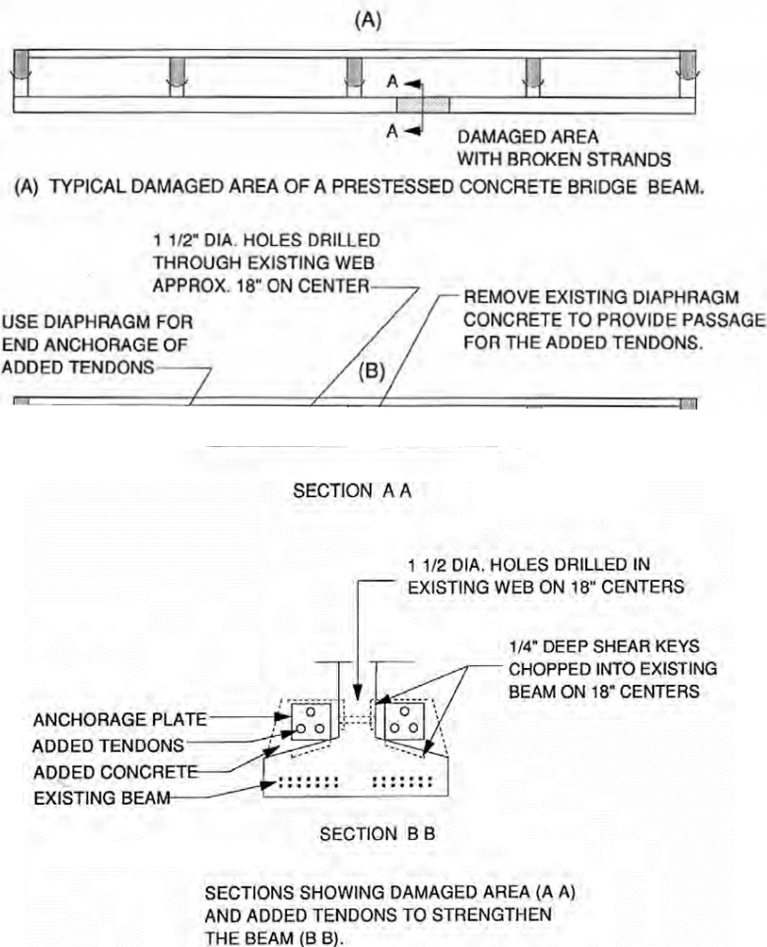
1. Drill 1-1/2 in. diameter holes through the web as shown to accommodate reinforcing steel to tie the new concrete together. These reinforcing bars are to be placed and grouted into the holes. Care must be exercised to avoid drilling through tendons or reinforcing bars.
2. Roughen and clean the surface of the concrete beams where the new concrete is to be bonded.
3. Install the post-tensioning ducts, reinforcing steel and the forming for the new concrete.
4. Cast the contact surfaces with an epoxy resin and place the new concrete while the epoxy is still tacky.
5. After the concrete has attained design strength, tension the strands to the specified load. The strands should be tensioned in a sequence to balance the load on each side of the flange.
6. Fill the post-tensioning ducts with grout.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
3	Crew Members	1	Post-tensioning Jacks	A/N	Epoxy Bonding material
		A/N	Access Equipment	A/N	Post-tensioning ducts
				A/N	Tendons
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 EA/hour		one (1) EA/day		24 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



REPAIR DISTRESSED CONCRETE BEAM ENDS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	REPAIR DISTRESSED CONCRETE BEAM ENDS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CONCRETE STRINGER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All reinforced concrete stringers; all prestressed concrete stringers; areas of deck directly adjacent to reinforced concrete or prestressed concrete stringers requiring repair or replacement; and diaphragms framed into reinforced concrete or prestressed concrete stringers requiring repair or replacement.

ACTIVITY DESCRIPTION

Repairing or replacing reinforced concrete or prestressed concrete stringers. The work can include, but is not limited to, providing temporary supports for jacking; temporarily supporting the loads carried by the stringer either by jacking from below or using needle beams from above; temporarily applying loads to prestressed stringers; removing damaged or deteriorated concrete and reinforcing steel; drilling and grouting dowels of threaded inserts; constructing false work to support forms; constructing forms; installing reinforcing bars; placing concrete; and replacing prefabricated, prestressed stringers. Report the work of making minor repairs to the deck directly adjacent to a stringer being repaired or replaced, or the work of repairing or replacing diaphragms that frame into a stringer being repaired or replaced to this activity.

PROCEDURE DESCRIPTION

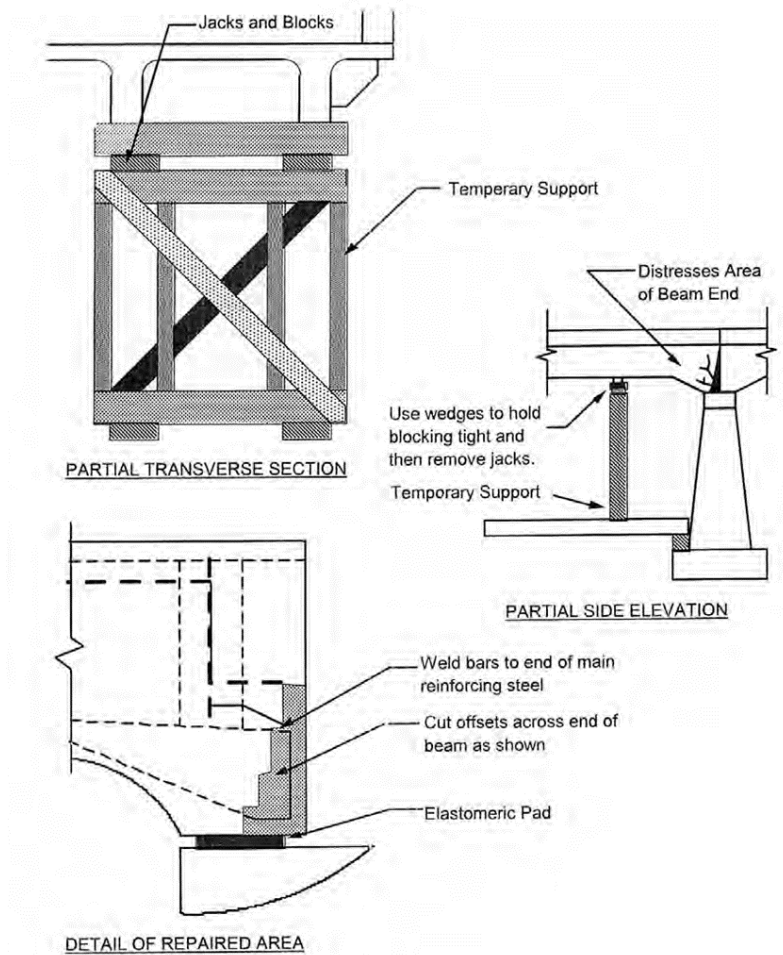
1. Where required, construct temporary bent for supporting jacks and blocking.
2. Place jacks and raise entire end of bridge a fraction of an inch. The lift should be only that required to insert a piece of sheet metal or other thin material used as a bond breaker for the new concrete.
3. Place the sheet metal bond breaker on the beam seat at the pier or abutment.
4. Above the deteriorated concrete to provide horizontal bearing surfaces between the new and old concrete.
5. Place new reinforcing steel and secure to the old reinforcing steel by welding. If weldability of the two steels is questionable, use low hydrogen electrodes and preheat the reinforcing bars. As an alternate to welding, the new reinforcement can be lapped with the old steel the amount of the development length.
6. Apply epoxy bonding compound to prepare the surfaces of sheared beam end, place the new concrete. A non-shrink additive should be used in the new concrete.
7. After concrete has reached sufficient strength, jack all beams simultaneously to the height needed to allow placement of elastomeric bearing pads.
8. Uniformly lower the entire end of the bridge. Check for possible distress in the repaired area.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
3	Crew Members	A/N	Jacks	A/N	Epoxy Bonding material
		1	Welding Equipment	A/N	Reinforcing Steel
		1	Air Compressor w/ chipping hammer	A/N	Temporary Bents
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 EA/hour		one (1) EA/day		24 MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



REPAIR CONCRETE DIAPHRAGMS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	REPAIR CONCRETE DIAPHRAGMS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CONCRETE DIAPHRAGM (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All concrete diaphragms framed into reinforced concrete or prestressed concrete beams or girders; areas of the deck directly adjacent to concrete diaphragms requiring repair or replacement; areas of reinforced concrete at prestressed concrete beams or girders at and adjacent to diaphragms requiring repair or replacement.

ACTIVITY DESCRIPTION

Repairing or replacing concrete diaphragms framed into reinforced concrete or prestressed concrete beams or girders. The work can include, but is not limited to, removing damaged or deteriorated concrete, and reinforcing steel; drilling, installing adhesive anchors or grouted dowels or threaded inserts; constructing false work or installing temporary hang-ers to support forms; constructing forms; installing reinforcing bars; and placing concrete. Report the work of making minor repairs to decks directly adjacent to diaphragms being repaired or replaced, or minor repairs and connections to stringers at and directly adjacent to diaphragms being repaired or replaced to this activity unless the diaphragms are framed into stringers undergoing major repair or replacement.

PROCEDURE DESCRIPTION

1. Remove damaged concrete using 15 lb. hammer.
2. Remove any damaged reinforcing steel.
3. If remaining steel reinforcement is too short (less than 18' embedded), adhesive anchors threaded inserts or grouted dowels must be used.
4. Drill holes appropriate for either adhesive anchors, threaded inserts or dowels and grout.
5. Install reinforcing steel.
6. Construct form work. Form work must be supported either by false work or temporary hangers.
7. Place concrete. If possible, a 1.5-inch diameter vent hole vertically through the deck will facilitate concrete placement.
8. Remove formwork.

REPAIR CONCRETE MEMBERS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	REPAIR CONCRETE MEMBERS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CONCRETE MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or reports of accidental damage.

WORK AREA

All reinforced concrete or prestressed concrete superstructure members such as girders or floor beams, which are not included in the definitions of stringers or diaphragms; areas of the deck directly adjacent to such members; and connections of such members to stringers or diaphragms.

ACTIVITY DESCRIPTION

Repairing or replacing reinforced concrete or prestressed concrete superstructure members that are neither stringers nor diaphragms. The work can include, but is not limited to, removing damaged or deteriorated concrete, and reinforcing steel; drilling and installing adhesive anchors, grouted dowels or threaded inserts; constructing false work; constructing forms; installing reinforcing steel; and placing concrete. Report the work of making minor repairs to decks in the work area and connecting to other members to this activity.

PROCEDURE DESCRIPTION

1. Remove damaged concrete using a 15 lb. hammer.
2. Remove any damaged reinforcing steel.
3. If remaining steel reinforcement is too short, laps cannot be used. Either threaded inserts or grouted dowels must be used.
4. Drill holes, as appropriate, for the adhesive anchors, threaded inserts or dowels and grout.
5. Form work support must be provided either by false work or temporary hangers.
6. Install reinforcing steel.
7. Construct form work. Brace form work.
8. Place concrete.
9. Remove form work.

ITEM 60 – SUBSTRUCTURE

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ABUTMENT BACKWALLS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	ABUTMENT BACKWALLS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

Abutment backwalls for the full width of the structure between abutment parapets, and to a depth sufficiently below the bridge seat elevation to permit the installation of dowels and/or the proper lapping of reinforcement bars.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing or replacing all or portions of concrete masonry backwalls. The work can include, but is not limited to, installing sheeting, if necessary, and excavating pavement and other roadway material behind backwalls to gain access to them, removing deteriorated or damaged concrete; reinforcing steel; or masonry; drilling and installing adhesive anchored or grouted dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and restoring all pavement and other roadway material behind the backwalls. In some instances, removal of concrete in a backwall is primarily for the purpose of gaining access to anchorages for armored or modular dams or making minor repairs to concrete associated with deck joints and is within the defined work area for an activity involving deck joints.

PROCEDURE DESCRIPTION

1. Temporarily tack weld the abutment side of steel armored joints, plate expansion dams, or toothed expansion dams to the deck side of the joint assembly.
2. Cut and excavate the approach slab or pavement to allow access to the backwall.
3. Remove deteriorated concrete or masonry and/or reinforcing bars from the backwall.
4. Place replacement reinforcing bars by tying them into existing bars in the abutment or by grouting dowel bars into the abutment.
5. Place forms for concrete.
6. Place and cure concrete. Ensure concrete is placed beneath existing joints.
7. Remove forms and temporary tack welds on joints or dams.
8. Backfill and compact subgrade under the approach slab or pavement.
9. Patch the approach slab or pavement.

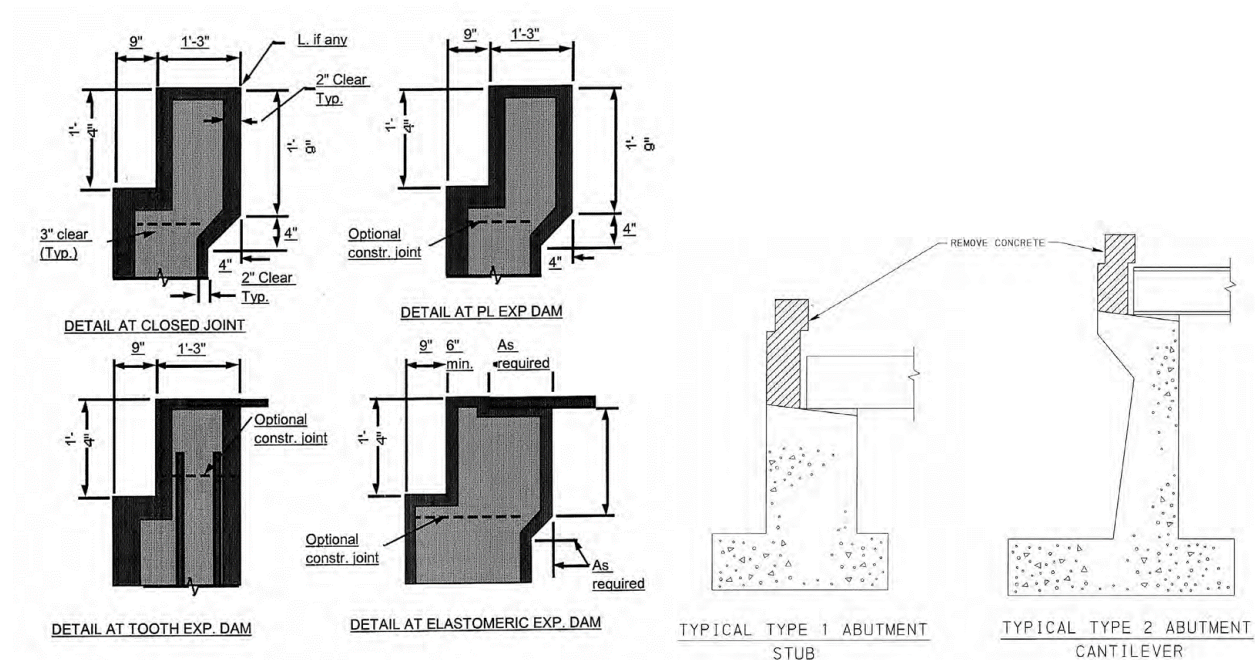
NOTE: Welding details for this repair should be furnished by the manufacturer and the welding should be accomplished by personnel certified for the type and position the weld required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Welding Equipment	A/N	Steel Reinforcement
3	Crew Members	1	Concrete Mixer	A/N	Concrete
1	Certified Welder	1	Backhoe		
1	Operator	1	Roller or Tamper		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 CY/hour		one (1) CY/day		36 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



ABUTMENTS (REPAIR)

MAINTENANCE ACTIVITY:	ABUTMENTS (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The breastwall and other portions of bridge abutments, except for wingwalls when only the wingwalls are involved. The wingwalls are included in the work area when both breastwalls and wings are being repaired at the same time.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the abutment; temporarily modifying superstructures to accept jacking loads; providing temporary supports for jacking; removing loads from abutments either by jacking from below or using needle beams from above; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the backwall or bridge pedestal/seats are involved, the work should not be reported under this activity. It should be reported under appropriate activities for the work. When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Remove backfill or materials protecting or being retained by the abutment to gain access to the repair area.
2. Provide temporary supports for jacking or set up needle beams to remove loads from the abutment as required.
3. Remove loads from the abutment by jacking or using needle beams or removing portions or the entire span as necessary.
4. Remove deteriorated concrete or masonry and additional material as required to establish vertical and horizontal surfaces.

5. Place dowel bars, reinforcing steel and forms.
6. Apply bonding agent, place and cure concrete and remove forms.
7. Reload the abutment by removing jacks or needle beam or replacing the span.
8. Place and compact backfill and rock protection as required.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Excavator	A/N	Steel Reinforcement
3	Crew Members	1	Concrete Mixer	A/N	Concrete
1	Certified Welder	1	Welding Equipment		
1	Operator	1	Roller or Tamper		
		A/N	Load Removal Equipment		
		A/N	Jacks, Needle Beams		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.087 CY/hour		five (5) CY/day		60 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

ABUTMENTS (REPAIR) – JACKET CONCRETE

MAINTENANCE ACTIVITY:	ABUTMENTS (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – JACKET CONCRETE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The breastwall and other portions of bridge abutments, except for wingwalls when only the wingwalls are involved. The wingwalls are included in the work area when both breastwalls and wings are being repaired at the same time.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the abutment; temporarily modifying superstructures to accept jacking loads; providing temporary supports for jacking; removing loads from abutments either by jacking from below or using needle beams from above; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the backwall or bridge pedestal/seats are involved, the work should not be reported under this activity. It should be reported under appropriate activities for the work. When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

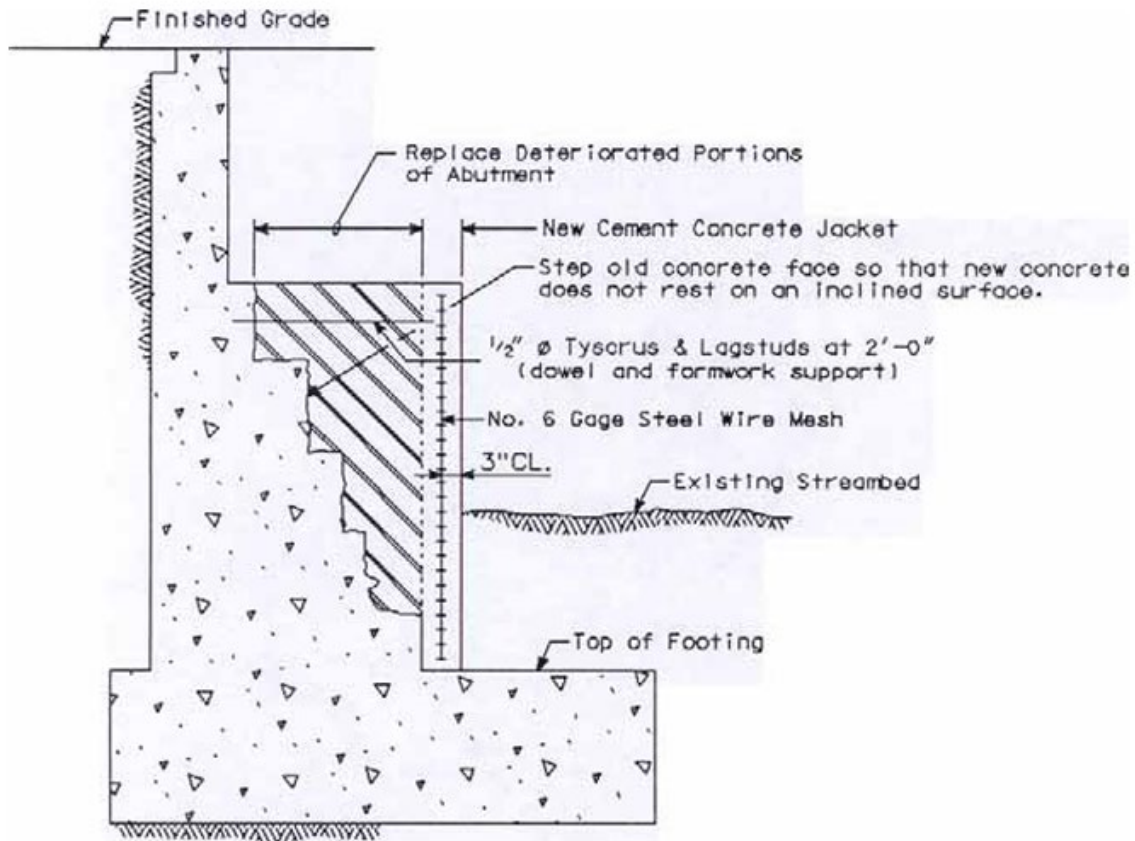
1. Remove deteriorated concrete and laitance by chipping and blast cleaning.
2. Drill and set TYSCRUs and Lagstuds.
3. Set reinforcing steel and forms.
4. Just prior to placing concrete, apply epoxy bonding agent.
5. Place cement concrete, cure, remove forms, and provide erosion control.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Air Compressor	A/N	Steel Reinforcement
3	Crew Members	1	Concrete Mixer	A/N	Concrete
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.08 CY/hour		0.5 CY/day		60 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



ABUTMENTS (REPAIR) – L-SHAPED ABUTMENT JACKET

MAINTENANCE ACTIVITY:	ABUTMENTS (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – L-SHAPED JACKET
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The breastwall and other portions of bridge abutments, except for wingwalls when only the wingwalls are involved. The wingwalls are included in the work area when both breastwalls and wings are being repaired at the same time.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the abutment; temporarily modifying superstructures to accept jacking loads; providing temporary supports for jacking; removing loads from abutments either by jacking from below or using needle beams from above; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the backwall or bridge pedestal/seats are involved, the work should not be reported under this activity. It should be reported under appropriate activities for the work. When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Construct sandbag cofferdam and excavate for footing to sound material.
2. Clean existing stone that will come into contact with new concrete.
3. Set dowels with non-shrink grout or approved adhesive in existing open stone joint at 24 in. horizontally and vertically with 1 ft-3 in. embedment length.
4. Set concrete forms and place concrete as required against existing stone abutment. Prior to placing concrete, apply epoxy bonding compound to stone that will come into contact with new concrete.

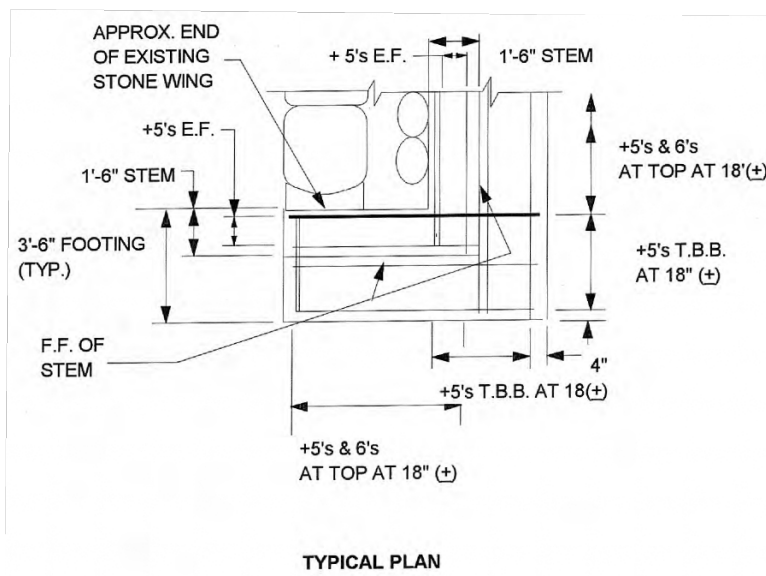
5. Place forms, reinforcing steel, and concrete for new abutment footing.
6. Place forms, reinforcing steel, and concrete for new abutment wall.
7. Remove loads from the existing abutment by jacking or using needle beams as necessary.
8. Install new bearings or move old bearings as necessary. Reload the newly jacketed abutment.
9. Remove formwork and the cofferdam.

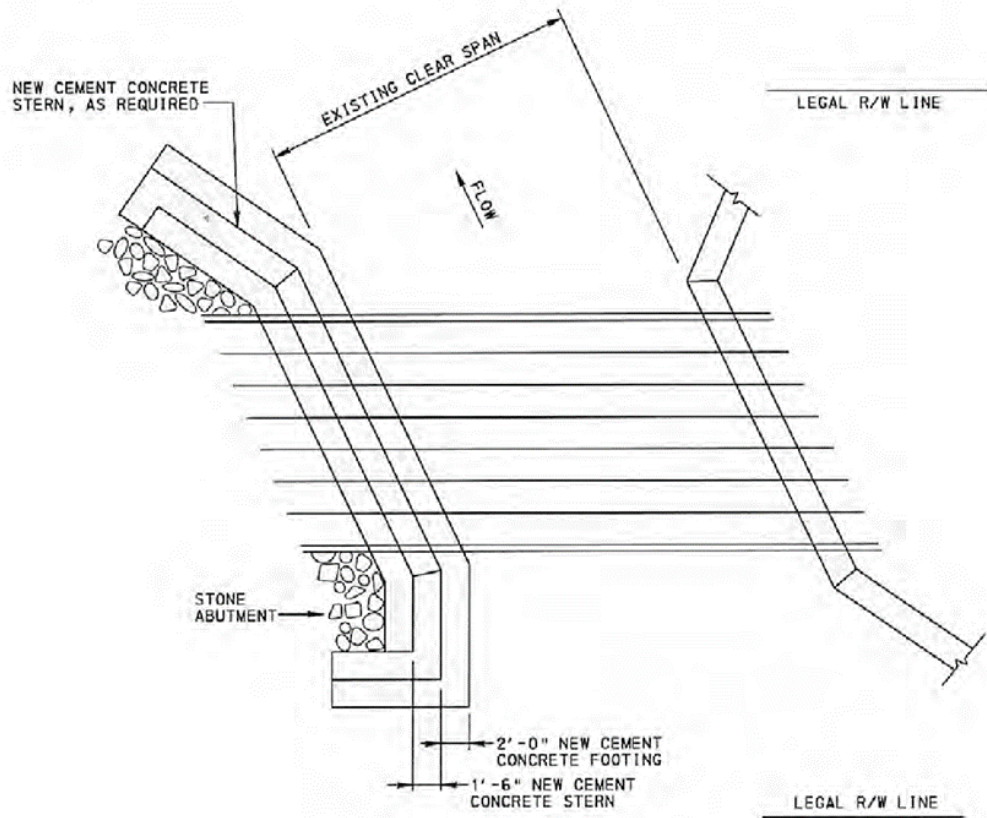
ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Steel Reinforcement
3	Crew Members			A/N	Concrete
				A/N	Sandbags
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.08 CY/hour		0.5 CY/day		60 MH/CY	

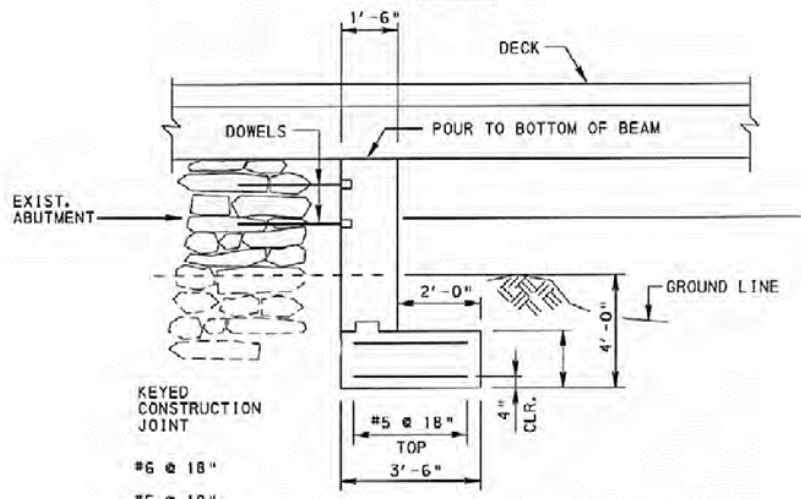
*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed





PLAN



SECTION

ABUTMENT WINGWALLS (REPAIR-REPLACE) – GABION EXTENSION

MAINTENANCE ACTIVITY:	ABUTMENT WINGWALLS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – GABION EXTENSION
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of abutment wingwalls from, and including, the abutments parapets to the end of the wingwalls.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the wingwall; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity. When wingwalls are being repaired at the same time as breastwalls, a separate report under this activity is not required, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Excavate and remove all unsuitable material below the wingwall extension.
2. As required, replace unsuitable material with acceptable granular material and thoroughly compact the entire foundation to a firm, even surface.
3. Place specified geotextile fabric or place cement concrete pad.
4. Assemble, bind, join, and place gabions.
5. Fill gabions by hand or small power equipment, with specified aggregate.
6. As specified, secure lid to sides, ends, and diaphragms using connecting wire.

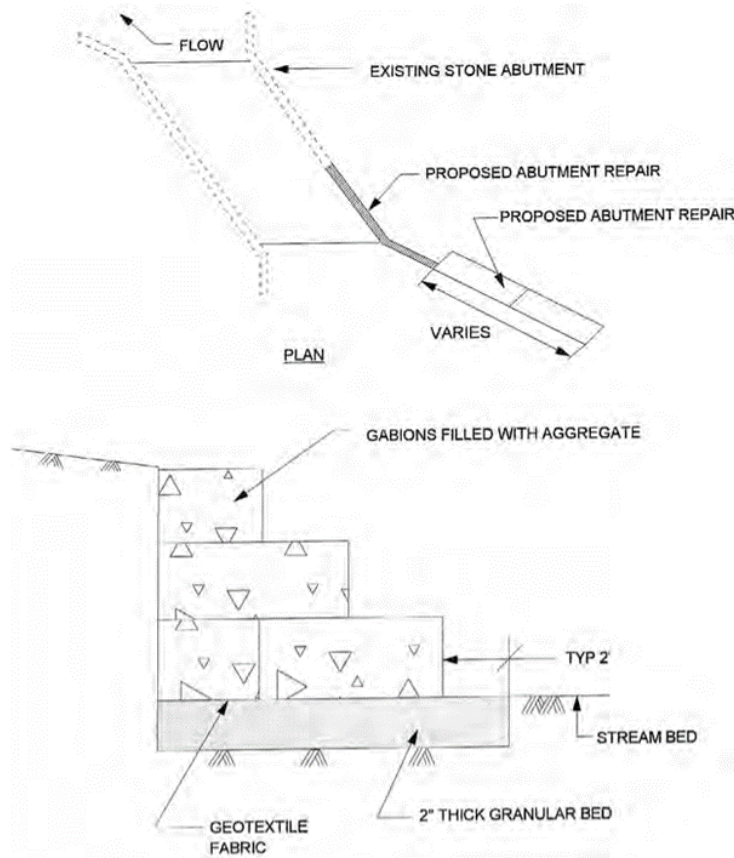
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when maintaining bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

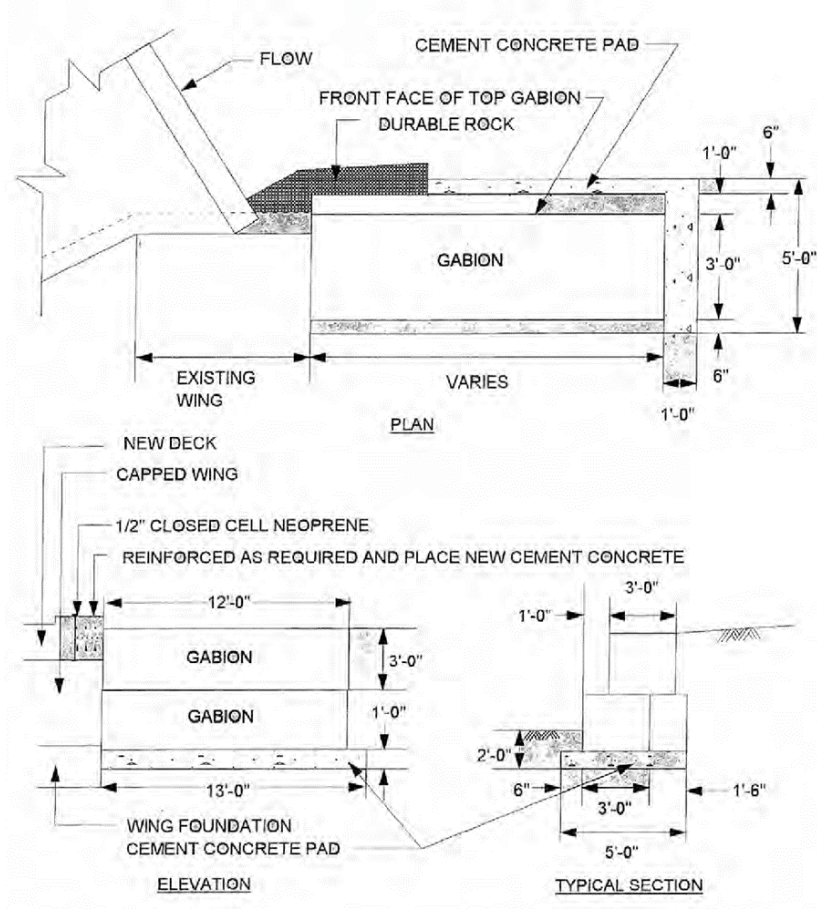
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Stone, gabions
3	Crew Members	1	Backhoe	A/N	Geotextile fabric
1	Operator	1	Tamper or Roller	A/N	Gabions & ties
		1	Sweeper	A/N	Granular bed material
				A/N	Aggregate, base
				A/N	Concrete (for base)
				A/N	water
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 CY/hour		four (4) CY/day		6 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



TYPICAL GABIONS WITH CONCRETE PAD



ABUTMENT WINGWALLS (REPAIR-REPLACE) – REPLACE CONCRETE WINGWALLS

MAINTENANCE ACTIVITY:	ABUTMENT WINGWALLS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – REPLACE WINGWALLS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of abutment wingwalls from, and including, the abutments parapets to the end of the wingwalls.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the wingwall; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity. When wingwalls are being repaired at the same time as breastwalls, a separate report under this activity is not required, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

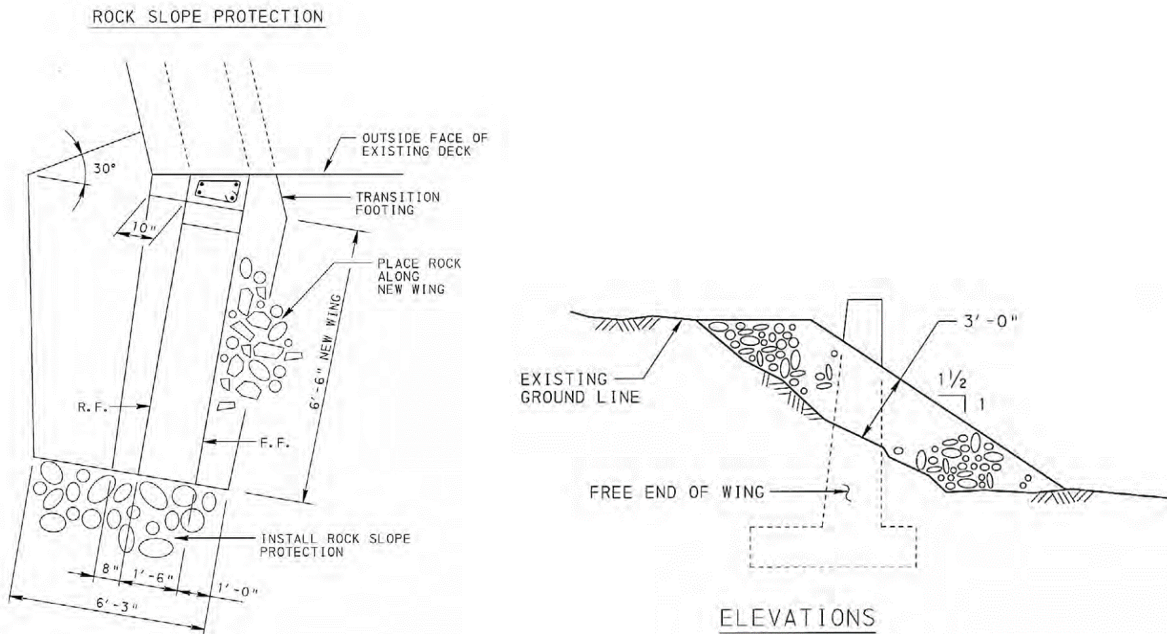
1. Remove existing wingwalls and excavate to sound material.
2. Clean all concrete that is to come in contact with new concrete. Chip and clean existing concrete to remove any unsound material and laitances.
3. Drill and set dowels.
4. Set forms, reinforcing steel and place concrete. Just prior to placing concrete, apply epoxy bonding compound to all existing cleaned concrete that is to come in contact with fresh new concrete.
5. Prior to placing concrete, provide for adequately reinforced weep holes.
6. Backfill adequately cured concrete wing- walls. Suitable filter shall be provided for weep holes.
7. Provide scour protection.

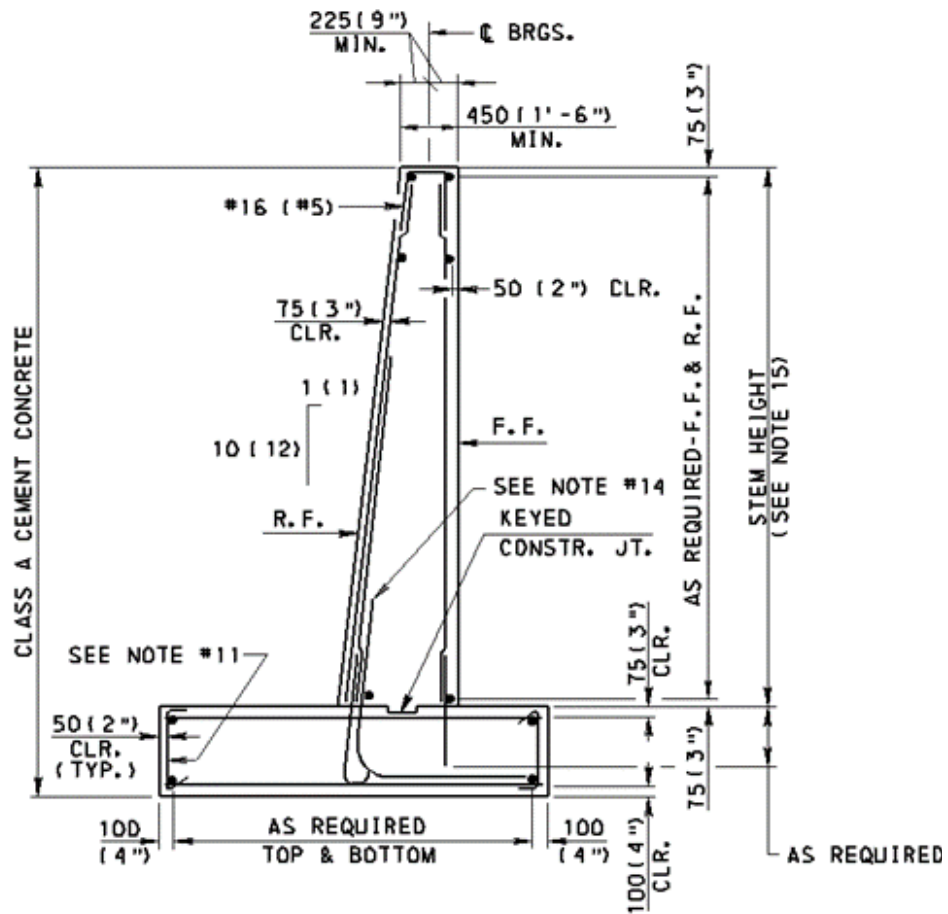
ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
3	Crew Members	1	Backhoe	A/N	Reinforcing Steel
1	Operator			A/N	Riprap for scour protection
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 CY/hour		four (4) CY/day		6 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed





TYPICAL SECTION WITHOUT BACKWALL
(WITH OR WITHOUT BATTER)

ABUTMENT WINGWALLS (REPAIR-REPLACE) – REPAIR BROKEN-DETERIORATED CONCRETE WINGWALLS

MAINTENANCE ACTIVITY:	ABUTMENT WINGWALLS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – REPAIR WINGWALLS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of abutment wingwalls from, and including, the abutments parapets to the end of the wingwalls.

* **Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the wingwall; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity. When wingwalls are being repaired at the same time as breastwalls, a separate report under this activity is not required, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

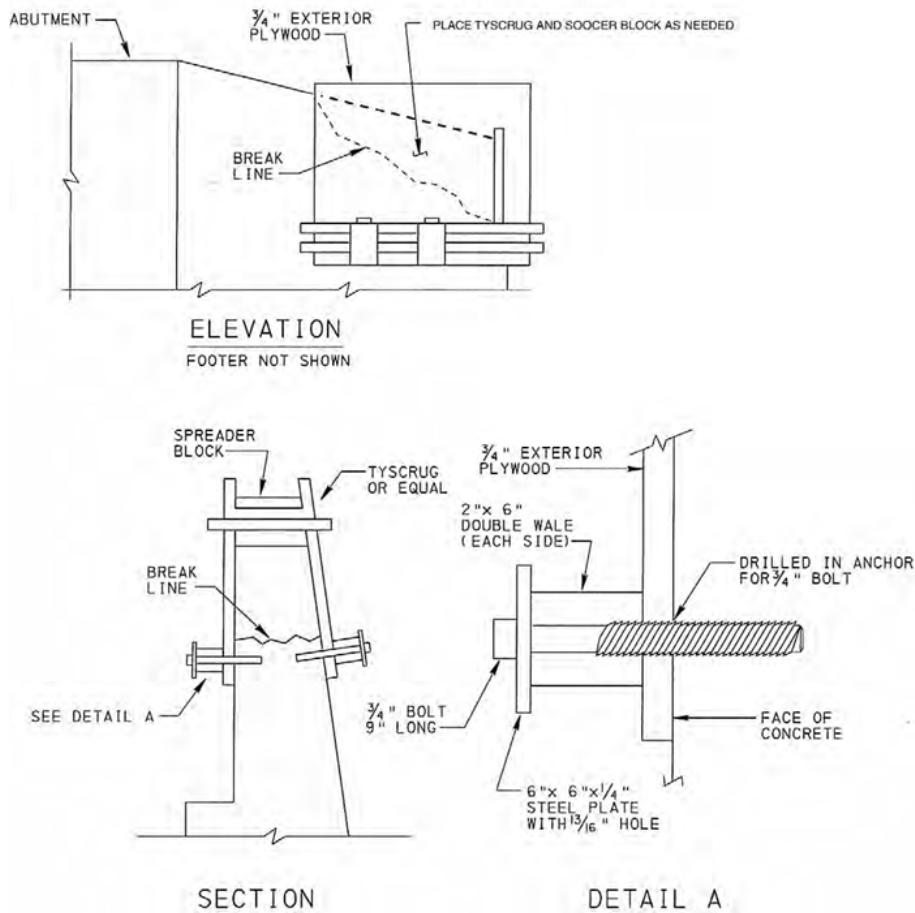
1. Excavate as required to set dowels and forms.
2. Remove all fractured or deteriorated concrete to sound concrete by chipping, and blast to remove laitances.
3. Drill and set form anchor bolts and dowels. Dowels are to be placed a minimum of 9 in. into sound concrete and set with no shrink grout or approved adhesive, 18 in. on center, front and back.
4. Cross-lace reinforcing bars as shown and set forms.
5. Just prior to placing concrete, apply epoxy bonding agent to all existing concrete that is to come into contact with new concrete.
6. Cure concrete until concrete has developed sufficient strength to resist the imposed lateral pressures before backfilling with granular material.
7. Backfill and provide erosion protection as necessary.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
3	Crew Members	1	Backhoe	A/N	Reinforcing Steel
1	Operator			A/N	Riprap for scour protection
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 CY/hour		four (4) CY/day		6 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



ABUTMENT WINGWALLS (REPAIR-REPLACE) – STABILIZE WINGWALLS W/GABIONS OR PRECAST BLOCK

MAINTENANCE ACTIVITY:	ABUTMENT WINGWALLS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR-REPLACEMENT PROCEDURE – STABILIZE WINGWALLS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of abutment wingwalls from, and including, the abutments parapets to the end of the wingwalls.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry abutments. The work can include, but is not limited to, installing sheeting when necessary and excavating material retained by or protecting the wingwall; removing deteriorated or damaged concrete, reinforcing steel or masonry; drilling and installing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, such as Rock Protection. However, a separate report is not required, and the work should be reported under this activity. When wingwalls are being repaired at the same time as breastwalls, a separate report under this activity is not required, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Excavate and remove all unsuitable material below the face of wingwall to be retained or stabilized.
2. As required, replace unsuitable material with acceptable granular material and thoroughly compact the entire foundation to a firm, even surface.
3. Place specified geotextile fabric or place cement concrete pad.
4. Assemble, bind, join, and place gabions.
5. Fill Type A gabions by hand, and Type B gabions by hand or small power equipment, with specified aggregate.
6. As specified, secure lid to sides, ends, and diaphragms using connecting wire.
7. Place specified large rock buttress at a one-to-one slope.

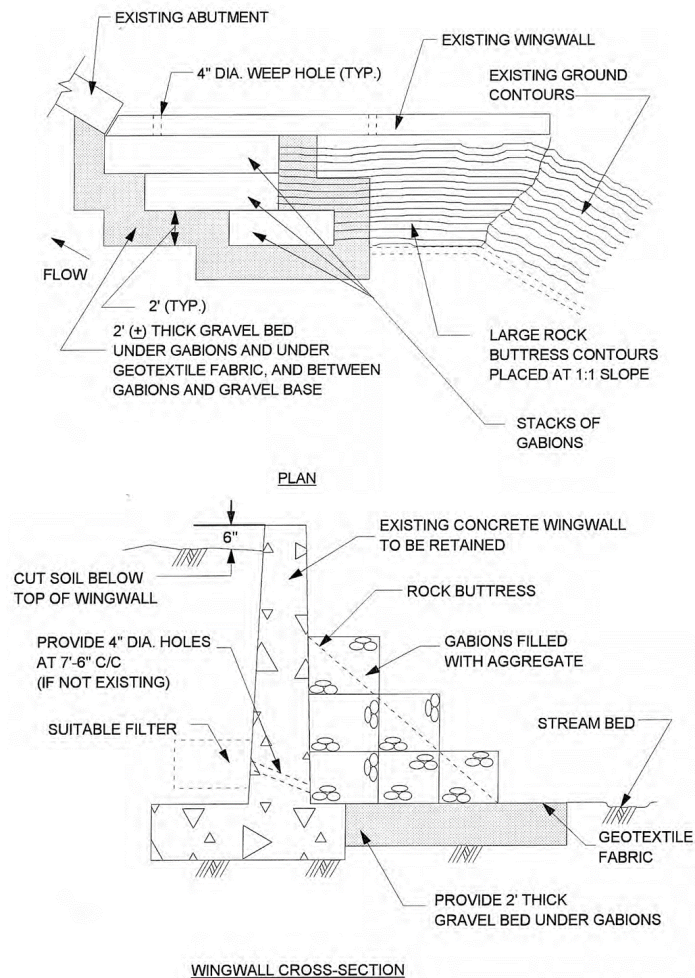
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Stone for Gabions
3	Crew Members	1	Backhoe	A/N	Gabion Baskets & ties
1	Operator			A/N	Geotextile fabric
				A/N	Aggregate (for base)
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.67 CY/hour		four (4) CY/day		6 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



PIERS (REPAIR) – GENERAL REPAIR

MAINTENANCE ACTIVITY:	PIERS (REPAIR)
<i>UNIT OF MEASUREMENT:</i> CUBIC YARDS OF CONCRETE-MASONRY (CY)	
<i>PROCEDURE:</i> GENERAL REPAIR PROCEDURE	
<i>MAINTENANCE:</i> CONDITION-BASED & PREVENTATIVE	

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All portions of all types of concrete or masonry piers.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry piers. The work can include, but is not limited to, installing sheeting when necessary and excavating material temporarily modifying superstructures to accept jacking loads, providing temporary supports for jacking; removing loads from piers either by jacking from below or using needle beams from above; removing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the bridge pedestals/seats are involved, the work should not be reported under this activity, but should be reported under Bearing Pedestal/Seat (Reconstruct). When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Saw cut the boundaries of the deteriorated concrete to be removed to a depth of 3/4".
2. Remove deteriorated concrete by chipping with light power tools.
3. Blast clean exposed reinforcing bars of all rust and foreign materials. Replace deteriorated bar sections as necessary.
4. Place reinforcing mesh as necessary.
5. Blast clean the existing concrete to be patched to remove loose concrete chips and laitances.
6. Place forms, coat existing concrete surfaced with epoxy bonding agent, and place concrete.
7. Remove forms and finish surfaces after concrete has cured.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
3	Crew Members	1	Welding equipment	A/N	Reinforcing Steel
1	Certified Welder	1	Scaffolding or lifting equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 CY/hour		one (1) CY/day		30 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

PIERS (REPAIR) – REPAIR DETERIORATED CONCRETE PILE

MAINTENANCE ACTIVITY:	PIERS (REPAIR) – REPAIR DETERIORATED CONCRETE PILE
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPAIR CONCRETE PILE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All portions of all types of concrete or masonry piers.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry piers. The work can include, but is not limited to, installing sheeting when necessary and excavating material temporarily modifying superstructures to accept jacking loads, providing temporary supports for jacking; removing loads from piers either by jacking from below or using needle beams from above; removing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the bridge pedestals/seats are involved, the work should not be reported under this activity, but should be reported under Bearing Pedestal/Seat (Reconstruct). When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Remove deteriorated concrete from existing piles.
2. Clean existing reinforcing steel and replace any steel as required.
3. Install new mesh reinforcing cage around pile. Use spacers to keep the form in the proper position.
4. Place forming jacket around pile and seal the bottom of form against pile surface.
5. Pump concrete into the form through the opening at the top. Finish the concrete at the top of the form.

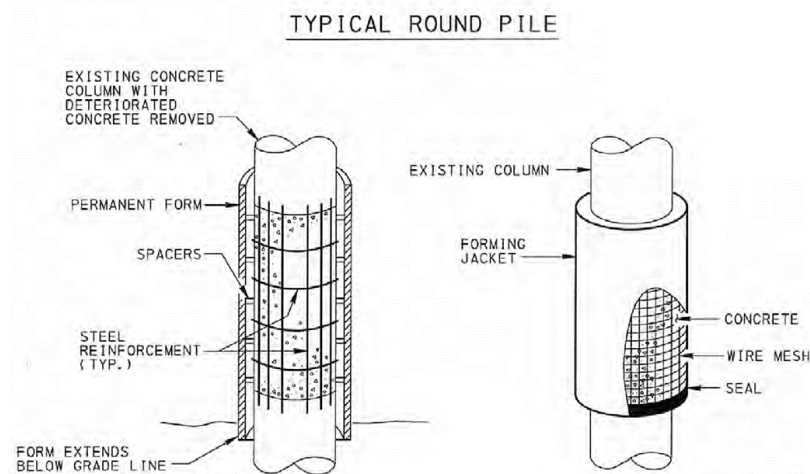
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

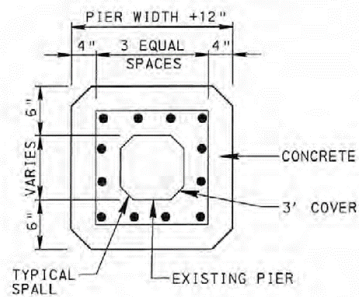
LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
2	Crew Members	1	Welding equipment	A/N	Reinforcing Steel or Mesh
1	Certified Welder	1	Access equipment	A/N	Forming Jacket
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 CY/hour		one (1) CY/day		30 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



TYPICAL SQUARE PILE



PLAN

PIERS (REPAIR) – REPAIR CRACKED HAMMER HEAD PIERS

MAINTENANCE ACTIVITY:	PIERS (REPAIR) – REPAIR CRACKED HAMMER HEAD PIERS
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – EPOXY GROUTED REINFORCEMENT
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All portions of all types of concrete or masonry piers.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry piers. The work can include, but is not limited to, installing sheeting when necessary and excavating material temporarily modifying superstructures to accept jacking loads, providing temporary supports for jacking; removing loads from piers either by jacking from below or using needle beams from above; removing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the bridge pedestals/seats are involved, the work should not be reported under this activity, but should be reported under Bearing Pedestal/Seat (Reconstruct). When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Clean crack of all loose concrete and laitances.
2. Seal crack with epoxy grout.
3. Drill holes perpendicular to the crack place.
4. Inject epoxy grout into the drill holes under low pressure.
5. Place the rebars into the drill holes.
6. Clean any excess grout.

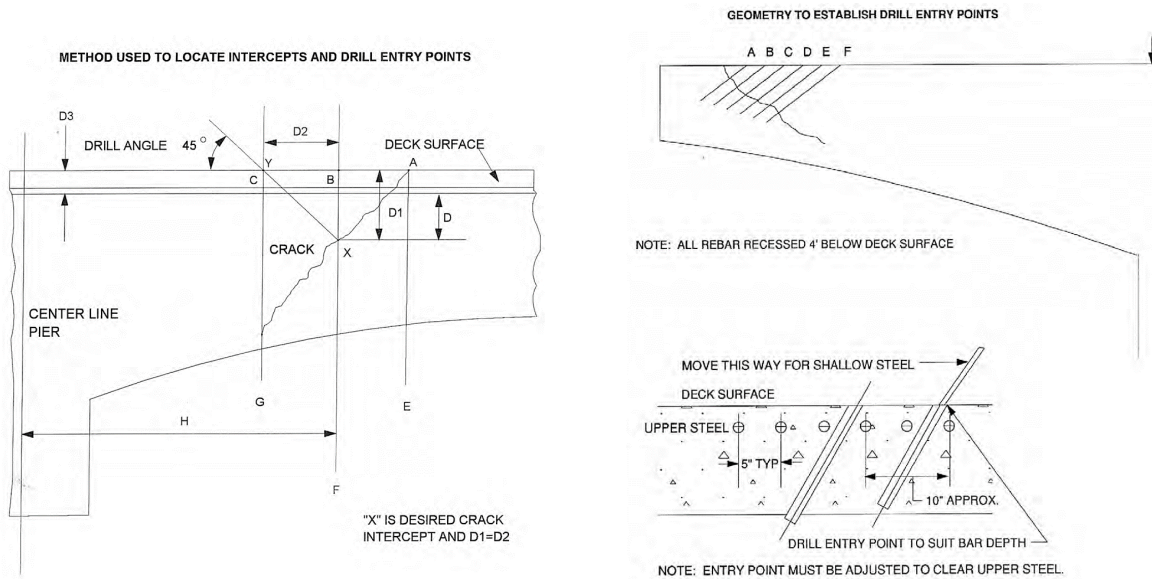
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Injection equipment	A/N	Epoxy Grout
3	Crew Members	1	Concrete drill	A/N	Reinforcing Steel, No. 4
		A/N	Access equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 CY/hour		one (1) CY/day		30 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



PIERS (REPAIR) – POST TENSIONING OF CRACKED HAMMER HEAD PIERS

MAINTENANCE ACTIVITY:	PIERS (REPAIR) – POST TENSIONING HAMMER HEAD PIERS
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – POST TENSIONING CRACKED PIERS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All portions of all types of concrete or masonry piers.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry piers. The work can include, but is not limited to, installing sheeting when necessary and excavating material temporarily modifying superstructures to accept jacking loads, providing temporary supports for jacking; removing loads from piers either by jacking from below or using needle beams from above; removing dowels; installing reinforcing steel; constructing forms; placing concrete; replacing and pointing masonry elements; pressure grouting masonry; epoxy pressure grouting; and replacing excavated material.

When only the bridge pedestals/seats are involved, the work should not be reported under this activity, but should be reported under Bearing Pedestal/Seat (Reconstruct). When protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with work descriptions in appropriate activities, the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Erect all intermediate supports and anchorage assembly at one end of pier cap. Locate existing stirrups and horizontal steel in pier cap prior to installing expansion bolts for the supports.
2. Insert corrugated pipes with pre-grouted, thread-bars inside to the intermediate supports or the pier cap. Erect the smooth PVC pipes with thread-bars inside to the intermediate supports or the pier cap.
3. Erect anchorage assembly at other end of pier cap.
4. Add anchor plates with steel tubes to both assemblies, pack tubes with plastic corrosion inhibitor and add anchor units on both ends.
5. Initially post-tension all thread-bars to 10 kips in order to seat the post-tensioning system on the pier cap.
6. Epoxy inject all cracks in the pier cap.
7. After the injected epoxy has hardened, post-tension the system to the required load per bar. Install sealing caps with plastic corrosion inhibitor and plastic nuts.

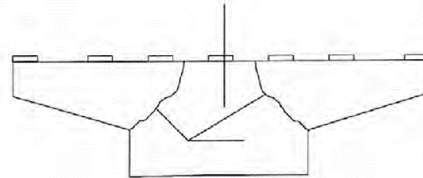
ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Injection equipment	A/N	Epoxy Grout
3	Crew Members	1	Jack	A/N	Post Tensioning Bars (as fittings)
		A/N	Access equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 CY/hour		one (1) CY/day		30 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

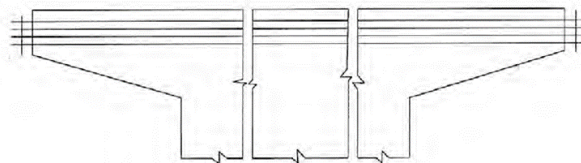
CRACK LOCATION DETAIL



ENTRY PORTS TO BE PLACED AT 6" CENTERS FOR INJECTION OF EPOXY BONDING MATERIAL.



PLAN



ELEVATION

FOOTINGS (UNDERPIN)

MAINTENANCE ACTIVITY:	FOOTINGS (UNDERPIN)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – FOOTINGS (UNDERPIN)
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or special inspections conducted because of rapid run-off resulting from unusually high water.

WORK AREA

All footings on all substructure’s units; abutments, wingwalls, piers, and sufficient area adjacent to them to allow for any necessary excavation and the placing of water control devices.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

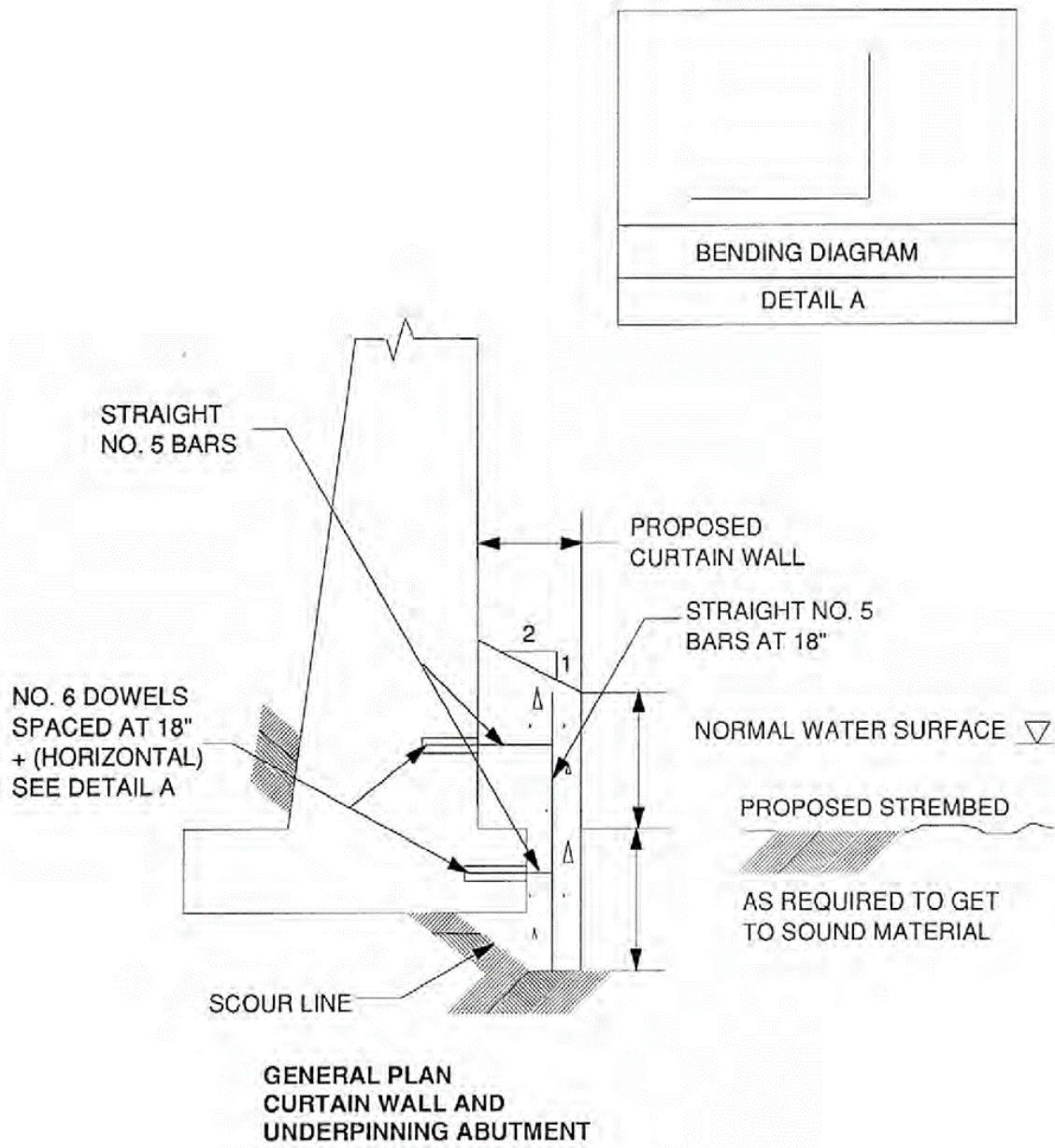
ACTIVITY DESCRIPTION

Underpinning concrete or masonry footing with concrete or pumped grout. The work can include, but it’s not limited to, excavating material; installing sheeting or other water control devices such as bagged concrete riprap or nylon tubes filled with pumped grout; erecting temporary supports to permit the removal of unsatisfactory material; constructing forms; drilling and grouting dowels; placing reinforcing steel; placing concrete or pumping grout; and replacing excavated material. When protective material such as riprap is excavated to gain access to the work area, it should be replaced in conformance with work description in appropriate activities, such as Rock protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Construct sandbag cofferdam to an elevation above the water level or divert stream using temporary pipes.
2. Clean all exposed concrete of marine growth and remove loose or deteriorated concrete.
3. Excavate as required to sound material.
4. Drill required dowel holes, set and install dowels, set additional reinforcing, and place forms.
5. Place form work 6” higher than the bottom of the foundation to ensure the cement concrete fills the scour area and supports the foundations properly.
6. Remove forms and protect against continued stream bed erosion with gabions or stone riprap.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.



FOOTINGS (UNDERPIN) – REPAIR USING TREMIE CONCRETE

MAINTENANCE ACTIVITY:	FOOTINGS (UNDERPIN) – USING TREMIE CONCRETE
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – FOOTINGS (UNDERPIN)
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or special inspections conducted because of rapid run-off resulting from unusually high water.

WORK AREA

All footings on all substructure’s units; abutments, wingwalls, piers, and sufficient area adjacent to them to allow for any necessary excavation and the placing of water control devices.

*** Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Underpinning concrete or masonry footing with concrete or pumped grout. The work can include, but it’s not limited to, excavating material; installing sheeting or other water control devices such as bagged concrete riprap or nylon tubes filled with pumped grout; erecting temporary supports to permit the removal of unsatisfactory material; constructing forms; drilling and grouting dowels; placing reinforcing steel; placing concrete or pumping grout; and replacing excavated material. When protective material such as riprap is excavated to gain access to the work area, it should be replaced in conformance with work description in appropriate activities, such as Rock protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Clean all exposed concrete of marine growth and remove loose or deteriorated concrete.
2. Excavate as required to sound material.
3. Place concrete riprap bags around scour area. Where the scoured-out material is fine-grained, a filter should be placed prior to placing the riprap.
4. Pump or tremie concrete into damaged area.
5. Protect against continued stream bed erosion as required by rebuilding stream bed with properly designed riprap or by paving the stream bed.

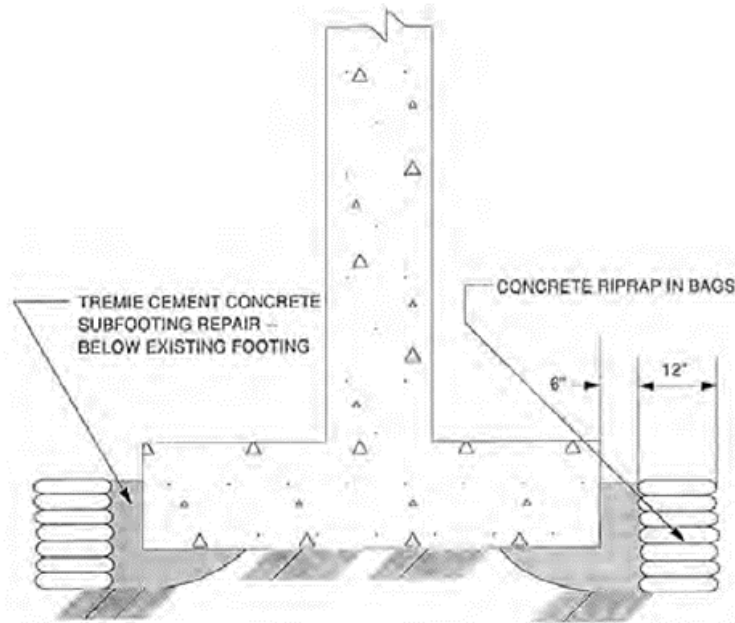
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete
2	Crew Members	1	Backhoe		
1	Operator				
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.13 CY/hour		two (2) CY/day		12 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



MASONRY (REPOINT)

MAINTENANCE ACTIVITY:	MASONRY (REPOINT)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF CONCRETE-MASONRY (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPOINT MASONRY
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Work should not be scheduled when there is any possibility of freezing temperatures.

WORK AREA

All masonry substructure units; abutments, wingwalls and piers, and sufficient area adjacent to them to allow for any necessary excavation and the placing of water control devices.

* **Special Measurement Note:** Cubic yards of concrete or masonry placed, not the deteriorated material removed.

ACTIVITY DESCRIPTION

Pointing and repointing masonry elements is substructure units with mortar. The work can include, but is not limited to, excavating materials; installing sheeting or other water control devices such as bagged concrete riprap; removal of deteriorated concrete with hand or power tools; cleaning surfaces to be mortared with high pressure water, air-blasting or sand-blasting, as appropriate and necessary; mixing mortar and mortaring prepared joints. When protective material such as riprap is excavated to gain access to the work area, it should be replaced in conformance with work description in appropriate activities, such as Rock protection. However, a separate report is not required, and the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Thoroughly clean masonry joints of all loose and unsound mortar and foreign material.
2. Saturate the joint surfaces with clean water before applying mortar.
3. Fill all the voids with mortar, making the surface flush with the adjacent face of the structure.
4. Cure all new mortar with wet burlap or clear curing compound.
5. Clean the face of the masonry.

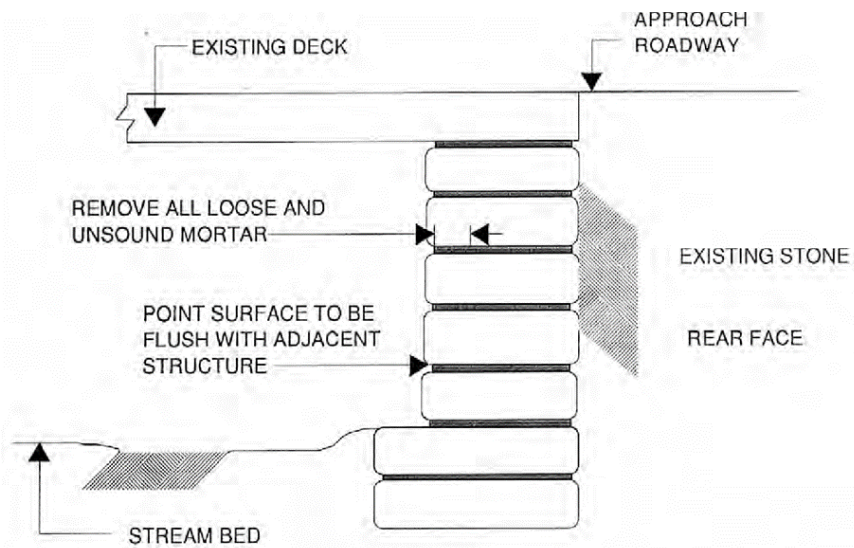
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Pressure Grouting equipment	A/N	Mortar
3	Crew Members				
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.13 CY/hour		two (2) CY/day		12 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



NOTE: IF WEEPHOLES ARE NOT PRESENT THEN DRILL OPENINGS FOR PLACEMENT OF WEEPHOLE PIPES OR LEAVE SEVERAL OPENINGS TO RELIEVE HYDRAULIC PRESSURE.

ABUTMENT SLOPEWALL (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	ABUTMENT SLOPEWALL (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF ABUTMENT SLOPEWALL (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – ABUTMENT SLOPEWALL
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. If the bridge is a water crossing, the work can usually be done most conveniently during the middle to late summer season when water levels are normally low.

WORK AREA

The entire area of existing slopewalls and sufficient additional area to permit any necessary excavation and installation of cutoff or toe walls.

***Special Measurement Note:** Square yards of slopewall surface repaired or replaced, not removed.

ACTIVITY DESCRIPTION

Repairing or replacing portions of an existing slopewall, composed of the same materials. The work can include, but is not limited to, installing sheeting or other water control devices; excavating material; removing deteriorated or damaged concrete masonry units; constructing forms; grading surfaces and installing aggregate and/or geotextiles; placing reinforcing steel; placing concrete; laying concrete blocks or stones; and mortaring joints. If an entire slopewall is removed and replaced with a slopewall composed of a different material, all work should be reported under Activity Abutment Slopewall (Construct New).

PROCEDURE DESCRIPTION

1. Excavate for a new end wall around toe of slope to extend to below scour line or to solid rock.
2. Set up forms for end wall and place concrete.
3. Fill voids in existing sound slope protection by removing sections of protection and filling voids with crushed stone.
4. Grade and place bedding for slope wall extension.
5. Replace damaged sections, sections removed to fill voids with concrete, and place extension.
6. Fill voids in embankment and protect slopes adjacent to stone protection with large stone riprap.

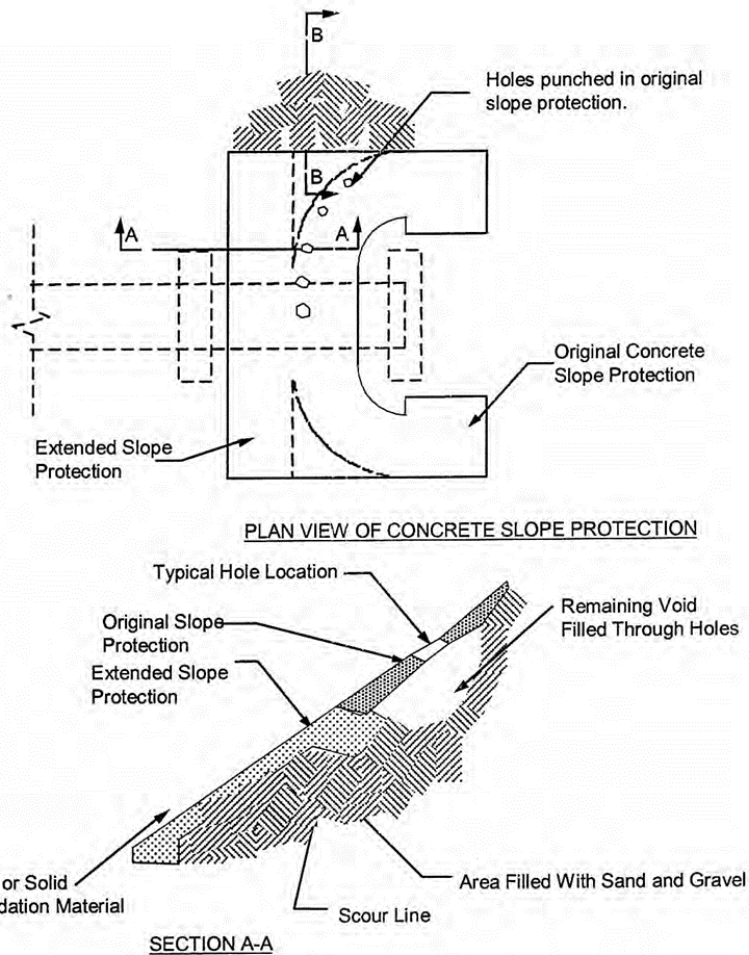
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

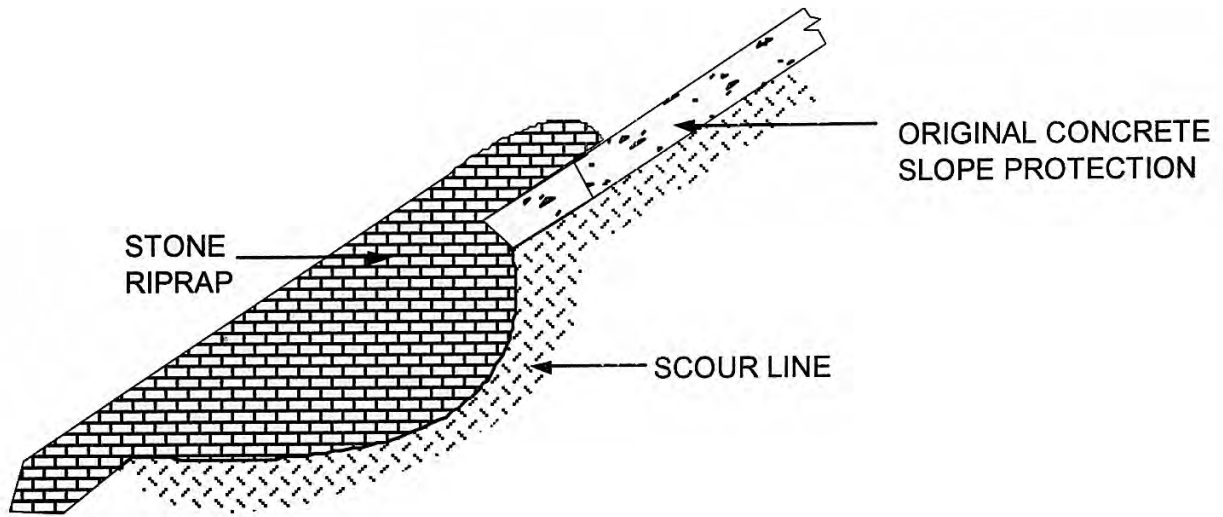
ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete or Blocks
2	Crew Members	1	Backhoe	A/N	Joint Sealing material
1	Operator	1	Air Compressor w/Jack Hammer	A/N	Sand & Fine Aggregate
				A/N	Riprap
				A/N	Reinforcing Steel
				A/N	Geotextile
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.4 SY/hour		25 SY/day		one (1) MH/SY	

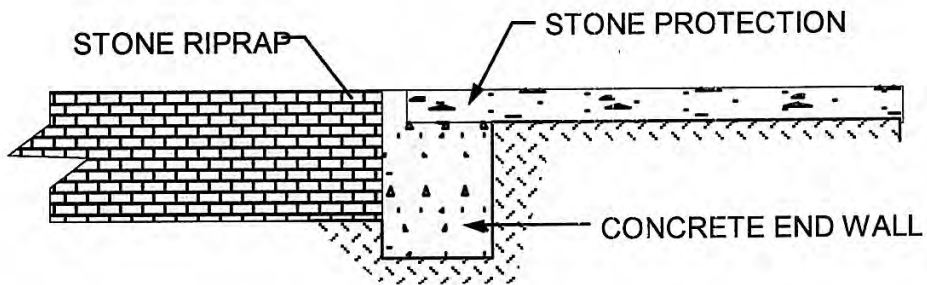
*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed





PROFILE



SECTION B-B

ABUTMENT SLOPEWALL (CONSTRUCT NEW)

MAINTENANCE ACTIVITY:	ABUTMENT SLOPEWALL (CONSTRUCT NEW)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF ABUTMENT SLOPEWALL (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPLACE ABUTMENT SLOPEWALL
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. If the bridge is a water crossing, the work can usually be done most conveniently during the middle to late summer season when water levels are normally low.

WORK AREA

The filled area in front of a stub or semi-stub abutment extending from a line drawn perpendicular to the centerline of the bridge from the end of one wing to a similar line drawn from the other wing between the abutment structure at the top and the stream bed or shoulder depending upon whether the structure is a water crossing or an overpass at the bottom.

***Special Measurement Note:** Square yards of slopewall surface repaired or replaced, not removed.

ACTIVITY DESCRIPTION

Constructing new precast cement concrete block, cast-in-place cement concrete slab, stone or random stone abutment slope walls within the work area. The work can include, but is not limited to, installing sheeting or other water control devices; excavating material; removing deteriorated or damaged concrete masonry units; constructing forms; grading surfaces and installing aggregate and/or geotextiles; placing reinforcing steel; placing concrete; laying concrete blocks or stones; and mortaring joints.

Similar work on the bridge approaches back of the described work area should not be reported under this activity but should be reported to appropriate highway maintenance activities.

PROCEDURE DESCRIPTION

1. Remove existing deteriorated abutment slopewall.
2. Regrade slope and place sand and geotextiles as required for precast cement concrete blocks or stone.
3. Place forms and concrete, precast concrete blocks, or stones.
4. Construct cut-off and toe walls.
5. Seal joints as required.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Concrete Mixer	A/N	Concrete or Blocks
2	Crew Members	1	Backhoe	A/N	Joint Sealing material
1	Operator	1	Air Compressor w/Jack Hammer	A/N	Sand & Fine Aggregate
				A/N	Riprap
				A/N	Reinforcing Steel
				A/N	Geotextile
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.4 SY/hour		25 SY/day		one (1) MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

TIMBER SUBSTRUCTURE (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	TIMBER SUBSTRUCTURE (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	EACH TIMBER MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – TIMBER SUBSTRUCTURE MEMBER
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All timber elements of bridges and their fasteners between the backs of abutment backwalls, including pile caps and bracing bents.

ACTIVITY DESCRIPTION

Repairing or replacing timber elements at any location within the work area. The work can include, but is not limited to, providing temporary supports for jacking; jacking all or a portion of the structure to gain access to the timber elements being repaired or replaced; removing or cutting fasteners, as required, to facilitate work; removing all or a portion of a deteriorated or damaged member; prefabricating a replacement element; treating cuts or holes with wood preservative; and refastening repaired or replaced element.

PROCEDURE DESCRIPTION

1. Install U-Clamps and jacks, as shown.
2. Lift span approximately 1/2" higher than final elevation.
3. Cut shims 1/4" less than pile-cap gap and install. Use wood preservative.
4. Lower cap.
5. Toe nail shims.
6. Remove U-Clamps and jack.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

TIMBER SUBSTRUCTURE (REPAIR-REPLACE) – STRENGTHEN EXISTING CAP

MAINTENANCE ACTIVITY:	TIMBER SUBSTRUCTURE (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	EACH TIMBER MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – STRENGTHEN EXISTING CAP
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All timber elements of bridges and their fasteners between the backs of abutment backwalls, including pile caps and bracing bents.

ACTIVITY DESCRIPTION

Repairing or replacing timber elements at any location within the work area. The work can include, but is not limited to, providing temporary supports for jacking; jacking all or a portion of the structure to gain access to the timber elements being repaired or replaced; removing or cutting fasteners, as required, to facilitate work; removing all or a portion of a deteriorated or damaged member; prefabricating a replacement element; treating cuts or holes with wood preservative; and refastening repaired or replaced element.

PROCEDURE DESCRIPTION

1. Notch existing pile if necessary.
2. Clamp new members as shown.
3. Drill bolt holes and treat with preservative.
4. Place bolts and tighten.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

TIMBER SUBSTRUCTURE (REPAIR-REPLACE) – REPLACE PILE

MAINTENANCE ACTIVITY:	TIMBER SUBSTRUCTURE (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	EACH TIMBER MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPLACE PILE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All timber elements of bridges and their fasteners between the backs of abutment backwalls, including pile caps and bracing bents.

ACTIVITY DESCRIPTION

Repairing or replacing timber elements at any location within the work area. The work can include, but is not limited to, providing temporary supports for jacking; jacking all or a portion of the structure to gain access to the timber elements being repaired or replaced; removing or cutting fasteners, as required, to facilitate work; removing all or a portion of a deteriorated or damaged member; prefabricating a replacement element; treating cuts or holes with wood preservative; and refastening repaired or replaced element.

PROCEDURE DESCRIPTION

1. Cut through overlay and deck along center lines of adjacent stringers near pile to be replaced. Remove sufficient area of deck to permit pile to be driven.
2. Remove cross-bracing as necessary.
3. Drive pile at slight batter so it will be plumb when in final position.
4. Install U-Clamps and blocking on pile to be replaced as shown. Lift cap.
5. Cut new pile and pull into position under cap.
6. Install flashing and lower cap.
7. Remove existing pile and jack.
8. Install cross-bracing, deck, and overlay if appropriate.

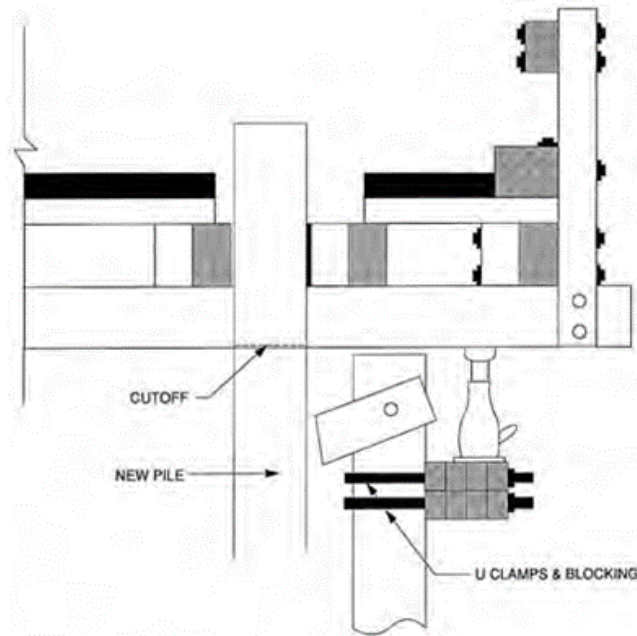
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	power saw	A/N	Timber Pile
3	Crew Members	1	Pile Driver	A/N	Flashing
1	Operator	1	Come-Along winch	A/N	Cross-bracing
		A/N	Jack	A/N	Decking
		A/N	U-Clamps	A/N	Overlay material
		A/N	Blocking	A/N	Wood Preservative
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		twelve (12) MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



TIMBER SUBSTRUCTURE (REPAIR-REPLACE) – REPLACE PILE SECTION

MAINTENANCE ACTIVITY:	TIMBER SUBSTRUCTURE (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	EACH TIMBER MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPLACE PILE SECTION
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All timber elements of bridges and their fasteners between the backs of abutment backwalls, including pile caps and bracing bents.

ACTIVITY DESCRIPTION

Repairing or replacing timber elements at any location within the work area. The work can include, but is not limited to, providing temporary supports for jacking; jacking all or a portion of the structure to gain access to the timber elements being repaired or replaced; removing or cutting fasteners, as required, to facilitate work; removing all or a portion of a deteriorated or damaged member; prefabricating a replacement element; treating cuts or holes with wood preservative; and refastening repaired or replaced element.

PROCEDURE DESCRIPTION

1. Install temporary crutch bent near pile to be partially replaced.
2. Install U-Clamps and jack on pile to be partially replaced. Lift cap.
3. Shim crutch bent to remove load from, and lift span from pile to be partially replaced.
4. Treat cut area with wood preservative.
5. Install replacement pile section and toe nail or use scabs if appropriate.
6. Remove crutch bent.

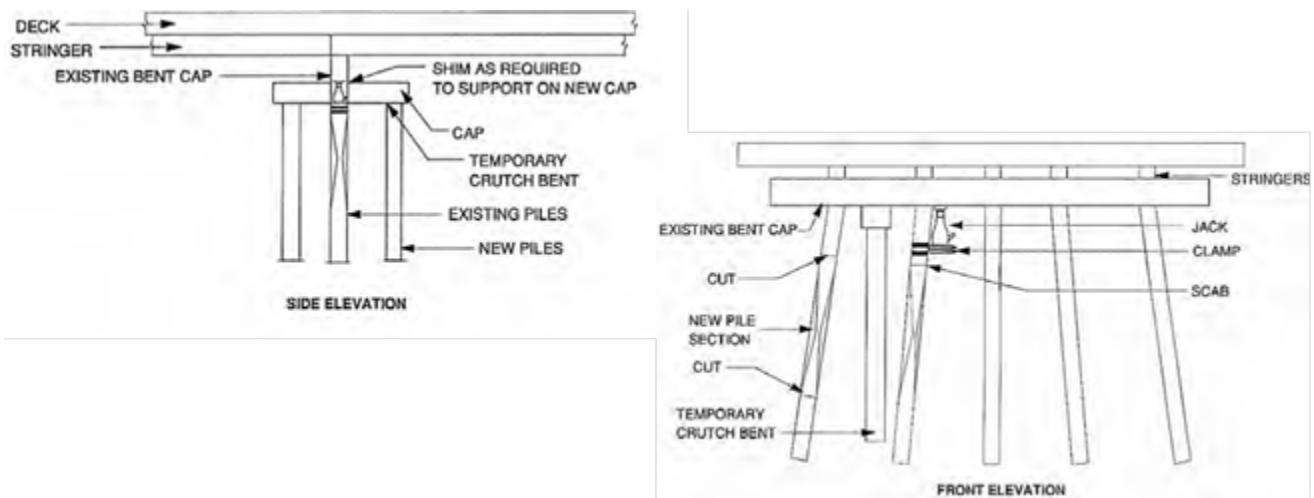
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	power saw	A/N	Bent, temporary
3	Crew Members	A/N	Jack	A/N	Shims
		A/N	U-Clamps	A/N	Wood Preservative
				A/N	Pile Section, replacement
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		twelve (12) MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



TIMBER SUBSTRUCTURE (REPAIR-REPLACE) – REPLACE CROSS-BRACING

MAINTENANCE ACTIVITY:	TIMBER SUBSTRUCTURE (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	EACH TIMBER MEMBER (EA)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – REPLACE CROSS-BRACING
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

All timber elements of bridges and their fasteners between the backs of abutment backwalls, including pile caps and bracing bents.

ACTIVITY DESCRIPTION

Repairing or replacing timber elements at any location within the work area. The work can include, but is not limited to, providing temporary supports for jacking; jacking all or a portion of the structure to gain access to the timber elements being repaired or replaced; removing or cutting fasteners, as required, to facilitate work; removing all or a portion of a deteriorated or damaged member; prefabricating a replacement element; treating cuts or holes with wood preservative; and refastening repaired or replaced element.

PROCEDURE DESCRIPTION

1. Remove deteriorated cross-bracing. Plug old bolt holes with caulk/grout.
2. Temporarily attach bracing to piles with galvanized nails. Nails should not interfere with bolt installation.
3. Drill and treat holes with wood preservative.
4. Place bolts, washers, and nuts. Tighten.

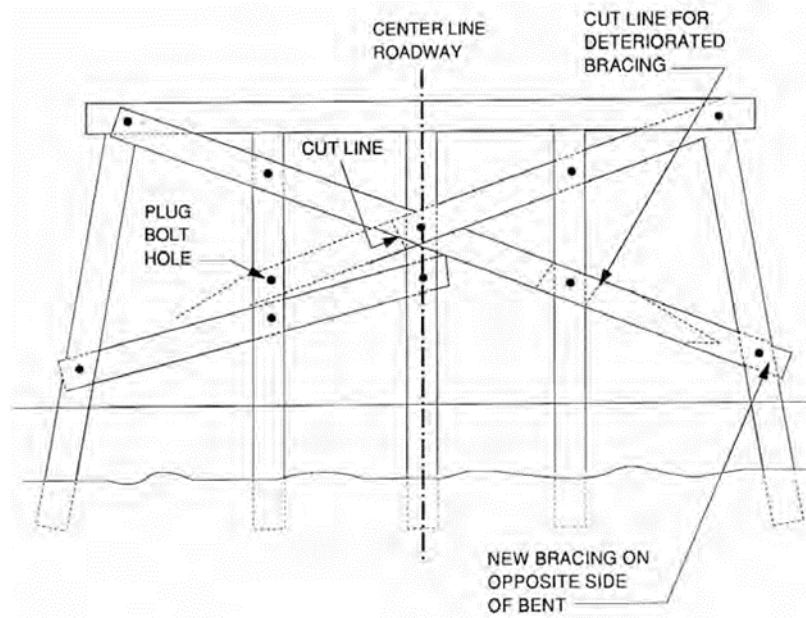
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	power drill	A/N	Cross-bracing
3	Crew Members			A/N	Nails, galvanized
				A/N	Bolts, Washers, Nuts
				A/N	Wood Preservative
				A/N	Caulk-Grout
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.33 EA/hour		two (2) EA/day		twelve (12) MH/EA	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



ITEM 61 - CHANNEL

<u>CHANNEL PROTECTION (REPAIR-REPLACE) – ROCK PROTECTION</u>	162
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<u>CHANNEL PROTECTION (REPAIR) – VEGETATION-DEBRIS REMOVAL</u>	171
<u>CHANNEL PROTECTION (REPAIR) – SEDIMENTATION-DEPOSITION (REMOVE)</u>	173

Other channel preservation activities can be found in Appendix C.

CHANNEL PROTECTION (REPAIR-REPLACE) – ROCK PROTECTION

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF ROCK PROTECTION (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – ROCK PROTECTION
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and-or changes in stream flow or conditions that increase the potential for scour problems. Be aware of any seasonal environmental restrictions.

WORK AREA

All areas at and adjacent to bridge substructure units that are subject to scour and require rock protection.

ACTIVITY DESCRIPTION

Restoring existing rock protection by relocating existing rock and placing additional rock as required or placing new rock protection at and adjacent to bridge substructure units. The work can include, but is not limited to, removing dislocated existing rock; preparing surface by excavating unsuitable material, backfilling, placing material, and grading surface; placing geotextiles; placing gabion baskets; and placing rock either directly on geotextiles and prepared; choking the tops of riprap placed in a streambed with streambed material.

The minimum size of stone in rock protection should be based on a maximum anticipated velocity of water per existing rock sizing specifications.

PROCEDURE DESCRIPTION

1. Obtain necessary permits-clearances from environmental agencies.
2. Install siltation devices.
3. Prepare foundation by removing unsuitable base material if required.
4. Backfill with suitable base material if required.
5. Place geotextiles if appropriate.
6. Place riprap of the size specified by dumping to depth specified.
7. Choke with streambed material if required.
8. Remove siltation devices.

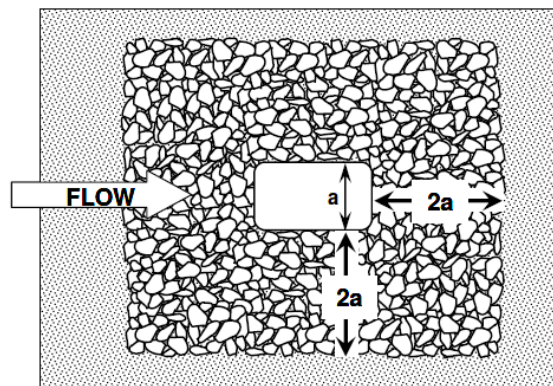
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Excavation equipment	A/N	Riprap
3	Crew Members	2	Rock Stick	A/N	Geotextile
1	Operator	1	tools, miscellaneous	A/N	Siltation devices
				A/N	Base material
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
one (1) CY/hour		six (6) CY/day		five (5) MH/CY	

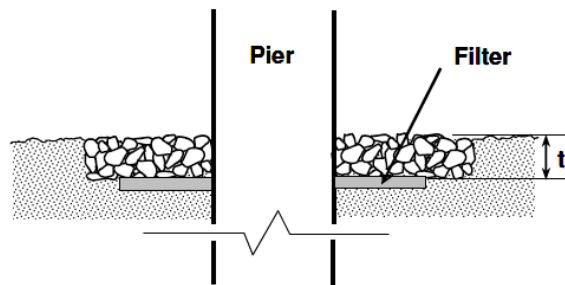
*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



Pier width = "a" (normal to flow)
Riprap placement = 2(a) from pier (all around)

a. Plan View



Minimum riprap thickness $t = 3d_{50}$, depth of contraction scour and long-term degradation, or depth of bedform trough, whichever is greatest

Filter placement = $4/3(a)$ from pier (all around)

b. Profile

CHANNEL PROTECTION (REPAIR-REPLACE) – GABION BASKETS

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF ROCK PROTECTION (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – GABION BASKETS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and/or changes in stream flow or conditions that increase the potential for scour problems. Be aware of any seasonal environmental restrictions.

WORK AREA

All areas at and adjacent to bridge substructure units that are subject to scour and require rock protection.

ACTIVITY DESCRIPTION

Restoring existing rock protection by relocating existing rock and placing additional rock as required or placing new rock protection at and adjacent to bridge substructure units. The work can include, but is not limited to, removing dislocated existing rock; preparing surface by excavating unsuitable material, backfilling, placing material, and grading surface; placing geotextiles; placing gabion baskets; and placing rock either directly on geotextiles and prepared; choking the tops of riprap placed in a streambed with streambed material.

The minimum size of stone in rock protection should be based on a maximum anticipated velocity of water per existing rock sizing specifications i.e., Isbash Curve, Far West States (FWS)-Lane Method.

PROCEDURE DESCRIPTION

1. Obtain necessary permits-clearances from environmental agencies.
2. Install siltation devices.
3. Excavate and remove all unsuitable material below the face of the wingwall to be retained or stabilized.
4. As required, replace unsuitable material with an acceptable granular material and thoroughly compact the entire foundation to a firm, even surface.
5. Place specified geotextile fabric or place cement concrete pad.
6. Assemble, bind, join, and place gabions.
7. Fill Type A gabions by hand, or with small power equipment, using specified aggregate.
8. As specified, secure lid to sides, ends, and diaphragms using connecting wire.
9. Place the specified large rock buttress at a one-to-one (1:1) to one-to-two (1:2) slope.
10. Remove siltation devices.

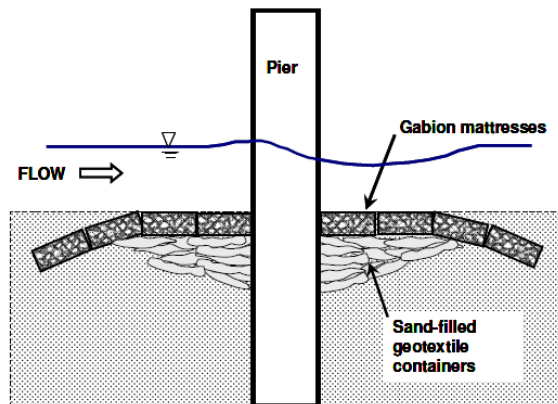
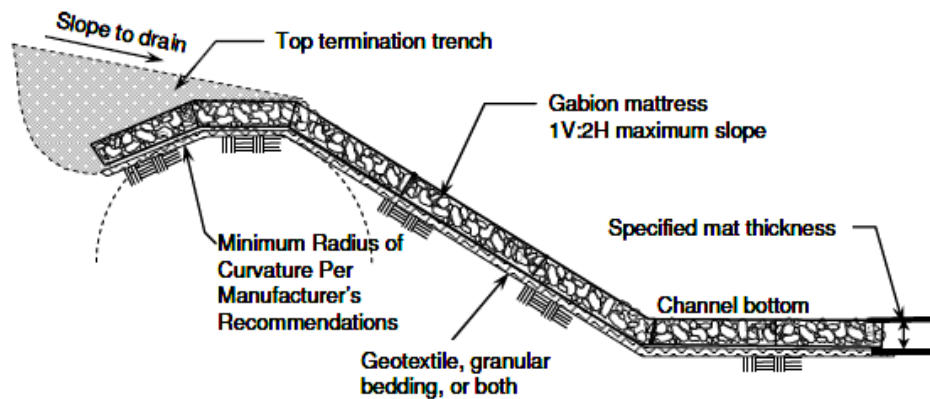
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Excavation equipment	A/N	Rock for Gabions
3	Crew Members	2	tools, miscellaneous	A/N	Geotextile fabric
1	Operator			A/N	Siltation devices
				A/N	Backfill
				A/N	Gabion Baskets
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
one (1) CY/hour		six (6) CY/day		five (5) MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



CHANNEL PROTECTION (REPAIR-REPLACE) – STREAM BARBS

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF ROCK PROTECTION (CY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE – STREAM BARBS
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable) and USACE-approved design

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections and/or hydraulic evaluations. Work can be most efficiently performed during periods of low water which are most likely to occur during later summer or early fall. Be aware of any seasonal environmental restrictions.

WORK AREA

Areas of stream banks adjacent to bridges at existing stream deflectors or as shown on the plan for new stream barbs.

ACTIVITY DESCRIPTION

Repairing existing or constructing new stream barbs. The work can include, but is not limited to, removing displaced existing embankment protection material; excavating unsuitable material; driving sheet piling; and placing embankment protection materials. For more information on this activity, see <https://www.fhwa.dot.gov/engineering/hydraulics/pubs/09111/09111.pdf>

When appropriate portions of the work shall be performed in accordance with other pertinent activities such as Rock Protection, or Deposition (Remove), but separate activity reports are not required, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Obtain necessary permits-clearances from environmental agencies.
2. Install siltation devices.
3. Remove displaced existing embankment protection material and dispose of properly.
4. Excavate unsuitable material and dispose of properly.
5. Drive piling as shown on plans.
6. Place and compact suitable material.
7. Place geotechnical fabric.
8. Place embankment protection material.
9. Remove siltation devices.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

CHANNEL PROTECTION (REPAIR) – SCOUR HOLE

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR)
<i>UNIT OF MEASUREMENT:</i> CUBIC YARDS OF BACKFILL (CY)	
<i>PROCEDURE:</i> EXCAVATE AND FILL – SCOUR HOLE	
<i>MAINTENANCE:</i> CONDITION-BASED & PREVENTATIVE	

REFERENCES

State DOT Specifications (if applicable) and USACE-approved design

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Inspections in addition to regularly scheduled inspections may be appropriate following unusually high water, particularly in areas where scourable bed material is present and where scour holes previously occurred. Be aware of any seasonal environmental restrictions.

WORK AREA

All areas of stream beds at and adjacent to substructure units where scour holes are present and cause potential hazard to a bridge.

***SPECIAL MEASUREMENT NOTE:** Cubic yards of material placed, not excavated.

ACTIVITY DESCRIPTION

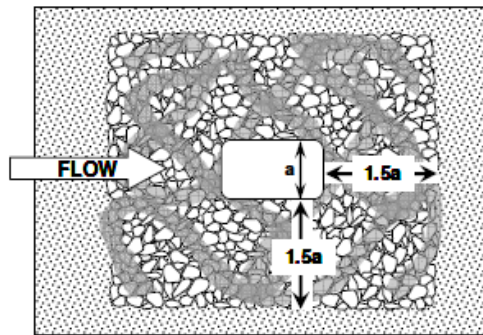
Filling scour holes at and adjacent to substructure units with scour resistant material, typically large riprap. The work can include, but is not limited to, excavation of silt or other highly scourable bed material naturally deposited in scour holes.

Ancillary work such as the removal of debris that is a contributing cause to the formation of a scour hole and the placing of heavy rock around a pier to prevent a scour hole from becoming a hazard to a pier should be reported under appropriate activities such as Rock Protection, and Vegetation-Debris Removal.

PROCEDURE DESCRIPTION

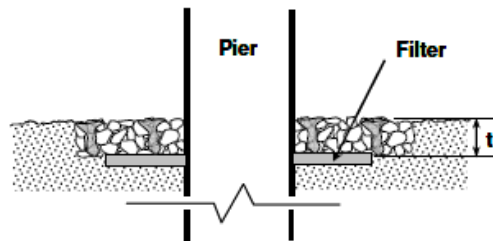
1. Obtain necessary permits-clearances from environmental agencies.
2. Install siltation devices.
3. Excavate highly scourable bed material and dispose of properly.
4. Place scour resistant material, choke with streambed material if required.
5. Remove siltation devices.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.



Pier width = "a" (normal to flow)
 Extend partially grouted riprap a distance of 1.5(a)
 from pier (all around)

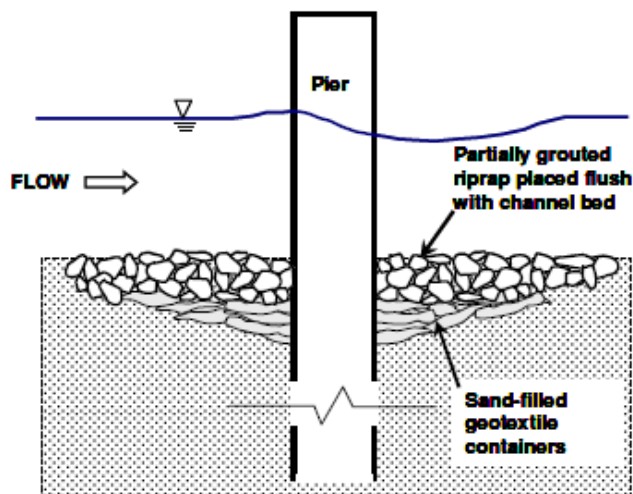
a. Plan View



Minimum riprap thickness $t = 2d_{50}$, depth of contraction scour and long-term degradation, or depth of bedform trough, whichever is greatest

Filter placement = 1.0(a) from pier (all around)

b. Profile



Minimum armor thickness $t = 2d_{50}$, depth of contraction scour and long-term degradation, or depth of bedform trough, whichever is greatest

Filter placement = 1.0(a) from pier (all around)

CHANNEL PROTECTION (REPAIR) – VEGETATION-DEBRIS REMOVAL

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR)
<i>UNIT OF MEASUREMENT:</i> CUBIC YARDS OF VEGETATION-DEBRIS (CY)	
<i>PROCEDURE:</i> GENERAL PROCEDURE – VEGETATION-DEBRIS REMOVAL	
<i>MAINTENANCE:</i> CONDITION-BASED & PREVENTATIVE	

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or as reported by bridge maintenance personnel. Debris is likely to collect at substructure units during a period of high water to help reduce scour problems. Be aware of any seasonal environmental restrictions.

WORK AREA

Areas around substructure units where debris has collected, and areas of stream beds and banks adjacent to the structure under State control where standing vegetation impedes stream flow or might become dislodged and cause hazardous conditions in the future.

ACTIVITY DESCRIPTION

Removing and disposing of vegetation and debris which is growing or has collected in the work area. The work can include, but is not limited to, removing debris collected around substructure units by manual and/or mechanically assisted means; cutting down and removing growing vegetation; loading material in truck; and disposing of material at an approved dumping location.

PROCEDURE DESCRIPTION

1. Obtain necessary permits-clearances from environmental agencies.
2. Remove debris collected around substructure.
3. Remove vegetation from stream banks and the streambed as permitted.
4. Dispose of debris and vegetation properly.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when maintaining bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Excavation equipment		none
3	Crew Members	1	Chainsaw		
1	Operator	A/N	Bush Axe		
		1	Winch-Pulling equipment		
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
3.3 CY/hour		twenty (20) CY/day		1.5 MH/CY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

CHANNEL PROTECTION (REPAIR) – SEDIMENTATION-DEPOSITION (REMOVE)

MAINTENANCE ACTIVITY:	CHANNEL PROTECTION (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	CUBIC YARDS OF DEPOSITED MATERIAL REMOVED (CY)
<i>PROCEDURE:</i>	GENERAL PROCEDURE – SEDIMENTATION REMOVAL
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections or as reported by bridge maintenance personnel. Removal of material deposited during periods of high water is important especially if the material is deposited in a manner that will change the direction or velocity of the flow increasing the possibility of scour. Be aware of any seasonal environmental restrictions.

WORK AREA

Streambeds and banks at and adjacent to bridge substructure units where excess material has been deposited that reduces the hydraulic efficiency of the structure.

ACTIVITY DESCRIPTION

Excavating and disposing of soil, clay silt, sand, gravel, or rock that has been deposited in streambeds and on streambanks at and adjacent to bridge substructure units. The work can include, but is not limited to, excavating deposited material; grading streambeds and banks; loading material in trucks; and disposing of material at approved dumping locations.

If the deposition of material has been initiated because of a collection of debris or vegetation, the debris and vegetation should be removed in accordance with Vegetation-Debris Removal, but separate activity reports are not necessary. All required work is to be reported under this activity.

PROCEDURE DESCRIPTION

1. Obtain necessary permits-clearances from environmental agencies.
2. Install siltation devices.
3. Excavate deposition as permitted and dispose of properly.
4. Grade streambed and banks, if required.
5. Remove siltation devices.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when maintaining bridges over environmentally sensitive waterways.

ITEM 62 – CULVERTS

<u>CULVERT HEADWALL-WINGS (REPAIR-REPLACE)</u>	176
<u>CULVERT HEADWALL-WINGS (REPLACE)</u>	178
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CULVERT HEADWALL-WINGS (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	CULVERT HEADWALL-WINGS (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CULVERT HEADWALL-WINGS (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of masonry and concrete headwalls and wingwalls of culverts identified by the Department as having the minimum dimensions to qualify as being considered a bridge as per the Bridge Management System.

* **Work Measurement Note:** Square yards of either the front face or back face repaired or replaced, or both in those cases where a single replacement or repair involves both faces.

ACTIVITY DESCRIPTION

Repairing or replacing all or portions of concrete or masonry headwalls or wingwalls. The work can include, but is not limited to, installing sheeting, when necessary, and excavating material retained by or protecting the headwall or wingwall, removing deteriorated or damaged concrete, reinforcing steel, constructing forms, placing concrete, replacing and pointing masonry elements, pressure grouting masonry, epoxy pressure grouting, and replacing excavated material.

When roadway embankment or protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with standard highway maintenance procedures or with work descriptions in appropriate activities, such as Rock Protection, as applicable. However, separate reports are not required, and all the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Install siltation devices.
2. Excavate as required to set dowels and forms.
3. Remove all fractured or deteriorated concrete to sound concrete by chipping, and blast clean to remove laitances.
4. Drill and set form anchor bolts and dowels. Dowels are to be placed a minimum of 9 inches. Into sound concrete and set with no shrink grout, or approved adhesive, 18 in. on center, front and back.
5. Cross-lace bars and set forms.
6. Just prior to placing concrete, apply epoxy bonding agent to all existing concrete that is to come into contact with new concrete.
7. Cure concrete until concrete has developed sufficient strength to resist the imposed lateral pressures before backfilling with granular material.
8. Remove siltation devices.

CULVERT HEADWALL-WINGS (REPLACE)

MAINTENANCE ACTIVITY:	CULVERT HEADWALL-WINGS (REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CULVERT HEADWALL-WINGS (SY)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections.

WORK AREA

The full length and depth of masonry and concrete headwalls and wingwalls of culverts identified by the Department as having the minimum dimensions to qualify as being considered a bridge as per the Bridge Management System.

*** Work Measurement Note:** Square yards of either the front face or back face repaired or replaced, or both in those cases where a single replacement or repair involves both faces.

ACTIVITY DESCRIPTION

Repairing or replacing all or portions of concrete or masonry headwalls or wingwalls. The work can include, but is not limited to, installing sheeting, when necessary, and excavating material retained by or protecting the headwall or wingwall, removing deteriorated or damaged concrete, reinforcing steel, constructing forms, placing concrete, replacing and pointing masonry elements, pressure grouting masonry, epoxy pressure grouting, and replacing excavated material.

When roadway embankment or protective material such as riprap is excavated to gain access to the work, it should be replaced in conformance with standard highway maintenance procedures or with work descriptions in appropriate activities, such as Rock Protection, as applicable. However, separate reports are not required, and all the work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Install siltation devices.
2. Install sluices or other water diversion devices.
3. Remove existing wingwalls and/or headwall and excavate to sound material.
4. Clean all concrete that will be in contact with new concrete. Chip and blast-clean existing concrete to remove any unsound material and laitance.
5. Drill holes and set dowels with no shrink grout or approved adhesive.
6. Prior to placing concrete, provide for adequately reinforced weep holes.
7. Set forms and reinforcing steel and place concrete. Just prior to placing concrete, apply epoxy bonding compound to all existing cleaned concrete that will come into contact with fresh new concrete.
8. Backfill adequately cured concrete, wingwalls. Suitable filter shall be provided for weep holes.
9. Provide scour protection for wings.
10. Remove siltation devices.

CULVERT APRON-CUTOFF WALL (REPAIR-REPLACE)

MAINTENANCE ACTIVITY:	CULVERT APRON-CUTOFF WALL (REPAIR-REPLACE)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CULVERT APRON-CUTOFF WALL (SY)
<i>PROCEDURE:</i>	GENERAL REPLACEMENT PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Work can be most efficiently performed during periods of low water which are most likely to occur during late summer or early fall.

WORK AREA

The entire width and length of existing masonry and concrete aprons and cutoff walls of culverts identified by the Department as having the minimum dimensions to qualify as being considered a bridge identified in the Bridge Management System.

*** Special Measurement Note:** Square yards measured horizontally for aprons and vertically for cutoff walls.

ACTIVITY DESCRIPTION

Repairing and replacing all or portions of existing culvert cement concrete or masonry aprons and cutoff walls. The work can include, but is not limited to, constructing sluices or providing other means to conduct water through the structure and to protect the work and freshly placed concrete from flowing water; driving sheeting; removing deteriorated masonry units, mortar concrete, and reinforcing steel; excavating material to the required dimensions; placing and compacting suitable base material; drilling and install-ing dowels; constructing forms; placing and tying reinforcing steel; placing concrete; placing and pointing masonry units; and backfilling.

PROCEDURE DESCRIPTION

1. Install siltation devices.
2. Construct sluices or other devices to divert stream.
3. Remove deteriorated masonry.
4. Excavate unsuitable material.
5. Place and compact base material.
6. Drill holes and set dowels with no shrink grout or approved adhesive.
7. Construct formwork.
8. Place reinforcing steel.
9. Place concrete. Just prior to placing concrete, apply epoxy bonding agent to all existing concrete that will come into contact with new concrete.
10. Remove formwork.
11. Remove sluices and siltation devices.
12. Grade Streambed.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Drill	A/N	Concrete Mix
3	Crew Members	1	Backhoe	A/N	Reinforcing Steel
1	Operator			A/N	Epoxy & Dowels
				A/N	Base material
				A/N	Backfill
				A/N	Sluice material
				A/N	Siltation devices
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
1.3 SY/hour		eight (8) SY/day		3.75 MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

CULVERT BARREL (REPAIR)

MAINTENANCE ACTIVITY:	CULVERT BARREL (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CULVERT BARREL (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Work can be most efficiently performed during periods of low water which are most likely to occur during late summer or early fall.

WORK AREA

The full length and width of masonry and concrete culvert barrels of culverts identified by the Department as having the minimum dimensions to qualify as being considered a bridge identified in the Bridge Management System.

*** Work Measurement Note:** Square yards of either the inside face or outside face repaired, or both in those cases where a single repair involves both faces.

ACTIVITY DESCRIPTION

Repairing all or portions of concrete or masonry culvert barrel. The work can include, but is not limited to, constructing sluices, or providing other means to control water flow through the culvert so the work can be accomplished; driving sheeting; excavating material; removing deteriorated concrete, reinforcing steel or masonry; epoxy pressure grouting; and replacing excavated material.

When roadway embankment or pavement is excavated to gain access to the work, it should be replaced in conformance with standard highway maintenance procedures. Separate reports are not required, however, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Install siltation devices.
2. Construct sluices or other devices to divert stream.
3. Remove deteriorated masonry.
4. Drill holes and set dowels with no shrink grout or approved adhesive.
5. Construct formwork.
6. Place reinforcing steel.
7. Place concrete. Just prior to placing concrete, apply epoxy bonding agent to all existing concrete that will come into contact with new concrete.
8. Replace, repair and point masonry elements.
9. Pressure inject any cracks with epoxy cement.
10. Remove sluices.
11. Remove siltation devices.
12. Backfill, if necessary.

NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Backhoe	A/N	Concrete Mix & Grout
3	Crew Members	1	Drill	A/N	Reinforcing Steel
1	Operator	1	Pressure Injection equipment	A/N	Epoxy & Dowels
				A/N	Base material
				A/N	Backfill
				A/N	Sluice material
				A/N	Siltation devices
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 SY/hour		one (1) SY/day		thirty (30) MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed

METAL ARCH CULVERT BARREL STRUCTURAL SHOTCRETE (REPAIR)

MAINTENANCE ACTIVITY:	METAL ARCH CULVERT BARREL STRUCTURAL SHOTCRETE (REPAIR)
<i>UNIT OF MEASUREMENT:</i>	SQUARE YARDS OF CULVERT BARREL (SY)
<i>PROCEDURE:</i>	GENERAL REPAIR PROCEDURE
<i>MAINTENANCE:</i>	CONDITION-BASED & PREVENTATIVE

REFERENCES

State DOT Specifications (if applicable)

SCHEDULING CONSIDERATIONS

Based on need as indicated by bridge inspections. Work can be most efficiently performed during periods of low water which are most likely to occur during late summer or early fall.

WORK AREA

The full length and width of metal arch culvert barrels identified by the Department as having the minimum dimensions to qualify as being considered a bridge identified in the Bridge Management System - in addition to any area required to install flow control devices which are needed to facilitate the work.

*** Work Measurement Note:** Square yards of the inside face of the corrugated metal arch culvert.

ACTIVITY DESCRIPTION

Repairing all or portions of corrugated metal arch culvert barrel. The work can include, but is not limited to, constructing sluices or providing other means to control water flow through the culvert so the work can be accomplished; removing all foreign matter from all metal surfaces receiving welded connections; arc gun welding steel studs to the existing arch, installing steel reinforcement bars and welded wire mesh fabric reinforcement, and applying shotcrete facing to the inside of the metal arch culvert barrel.

When roadway embankment or pavement is excavated to gain access to the work, it should be replaced in conformance with standard highway maintenance procedures. Separate reports are not required, however, and all work should be reported under this activity.

PROCEDURE DESCRIPTION

1. Install siltation and all erosion and sedimentation devices.
2. Construct sluices or other devices to divert stream. Always maintain dewatering operations.
3. Remove and dispose of any loose scale rust from the inside of the existing metal arch culvert.
4. Install steel studs by arc welding gun process to the culvert on a 24" x 24" maximum square grid pattern. Attach the No. 4 reinforcing bars to the steel studs.
5. Attach doubled 4"x 4" 8-gauge welded wire mesh reinforcement mats (to form a maximum 2" x 2" opening).
6. Spray a 4" thickness of shotcrete facing to the inside of the metal arch culvert. Hand finish to a uniform smooth finish. Dewatering operations will have to be maintained for a minimum of 24 hours to ensure the shotcrete has sufficient time to harden; before allowing stream to return through the arch.

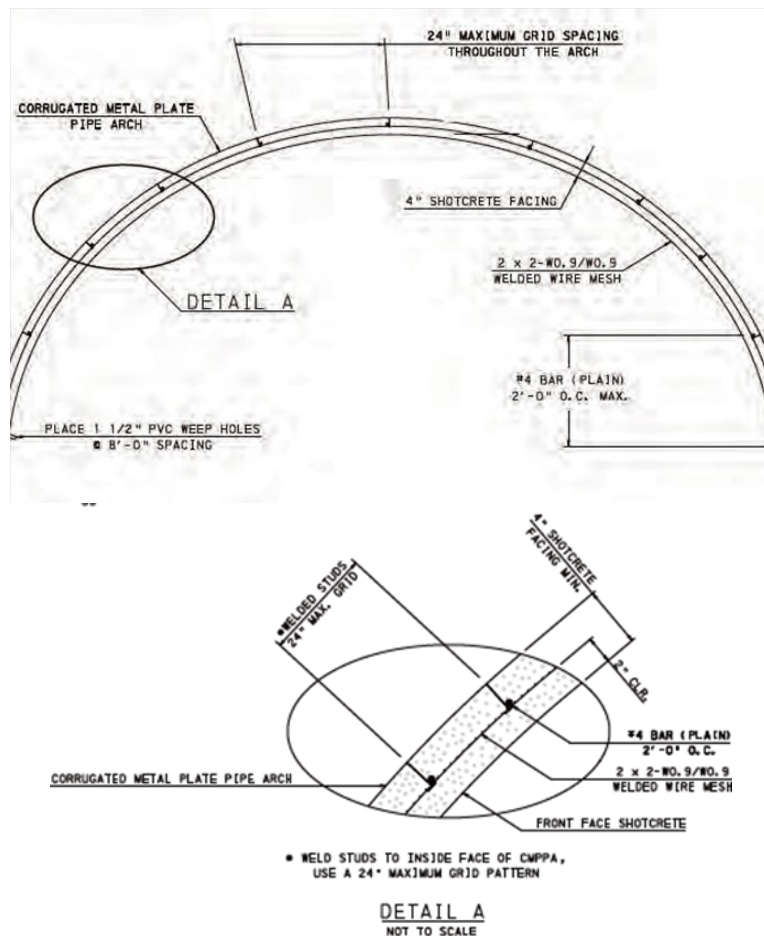
NOTE: Minimize the quantity of debris entering the water body. Utilize best management practices (BMPs) when repairing bridges over environmentally sensitive waterways.

ACTIVITY REQUIREMENTS*

LABOR		EQUIPMENT		MATERIALS	
@	DESCRIPTION	@	DESCRIPTION	@	DESCRIPTION
1	Foreman	1	Metal Arc Welder	A/N	Shotcrete
5	Crew Members	1	Shotcrete equipment	A/N	Reinforcing Steel
1	Operator	1	tools, miscellaneous	A/N	Wire Mesh Reinforcement
				A/N	Sluice material
				A/N	Siltation devices
PRESERVATION UNIT/HOURS		PLANNING UNITS		PERFORMANCE STANDARD	
0.17 SY/hour		one (1) SY/day		thirty (30) MH/SY	

*These are conservative estimates based on past similar bureau bridge maintenance actions - these estimations may differ based on agency resource abundance or need.

Note: A/N - as needed



APPENDIX B

MAINTENANCE FORMS

Page 1 – Cover Sheet: Select Maintenance Type and input each task associated with the maintenance project; attach specifications (if applicable) and order the activities associated with the project. The remainder of the form is for your team to use to estimate and summarize the resources necessary to successfully complete the project. Gather all the associated activity sheets (page 4) and tally all the resource needs of all associated activities of the project.

Page 2 – Maintenance Activity Summary Sheet: This sheet connects the activities with the estimated resources necessary to successfully complete the project and the costs associated with the resource need.

Page 3 – Safety Checklist for the Maintenance Project: Use the dropdowns, comment space and insert-attach functionality to support the safety measures taken to successfully complete the project.

Page 4 – Activity Description Sheet: This sheet is used to breakdown the resources connected to each activity - these activities & resource needs are described in Appendix A. Use the data connected to each activity, in Appendix A, to estimate the project's resource needs. Use as many of these pages necessary to accurately convey what's needed to successfully complete this activity for this maintenance project - this project may have many activities (and resource needs) associated with its successful completion.

APPENDIX C

CHANNEL PRESERVATION OPTIONS & MATERIAL ESTIMATION

