Bridge/Culvert Servicing Manual

October 2008

Original October 2008 content, republished October 2014.

Copyright

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Contents

Tables

Figures

Part One – Introduction

1.1 General

Servicing, or routine maintenance, is the recurrent day-to-day, periodic, or scheduled work that is required to preserve or restore a bridge or culvert so that it can be effectively utilised as intended. It includes work to prevent damage or deterioration of a bridge or culvert that would otherwise be more costly to restore, and if left unchecked would eventually progress to structural damage. The concept of servicing involves the repair of small or potential problems in a timely manner so that they will not develop into expensive bridge replacements, and as such is an important aspect of bridge maintenance.

Servicing works fall into two categories:

- Preventative maintenance, and
- Reactive maintenance.

Preventative maintenance consists of the systematic servicing of a structure on a scheduled basis, the frequency of which varies depending on:

- the type of work or activity being undertaken
- environmental considerations (i.e. steel girders subject to saltwater)
- material type
- construction type
- age of the structure
- volume of general traffic/heavy vehicles using the structure.

Reactive maintenance is performed when the need for maintenance is deemed necessary to prevent further deterioration or development of defects. The need for this type of maintenance is normally identified during inspections or in the course of carrying out preventative maintenance.

Where issues are identified at the bridge site that were not scheduled for rectification, the process shown in Figure 1.1 should be followed to determine the appropriate action.

The main reason for servicing structures is to preserve the investment that has been made in the construction of this asset, as the cost of replacement is normally considerably higher than the initial construction cost. Similarly, the cost of programmed maintenance or rehabilitation is normally quite high, often many times the cost of carrying out normal servicing on a structure. This point is illustrated in the graph shown in Figure 1.2. Ensuring user safety is also an important requirement of regular servicing.

Figure 1.1 – Defect identified during servicing

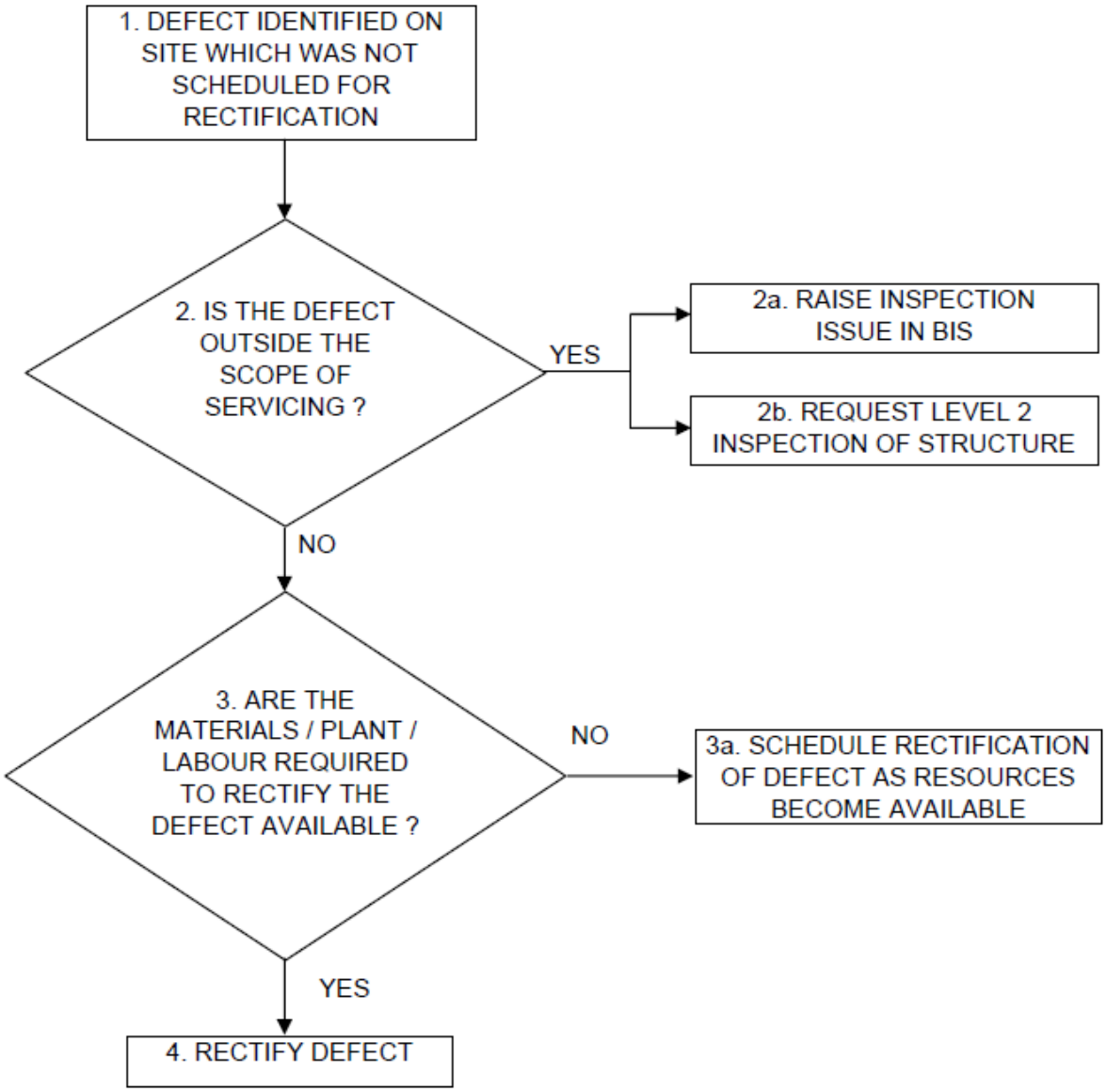
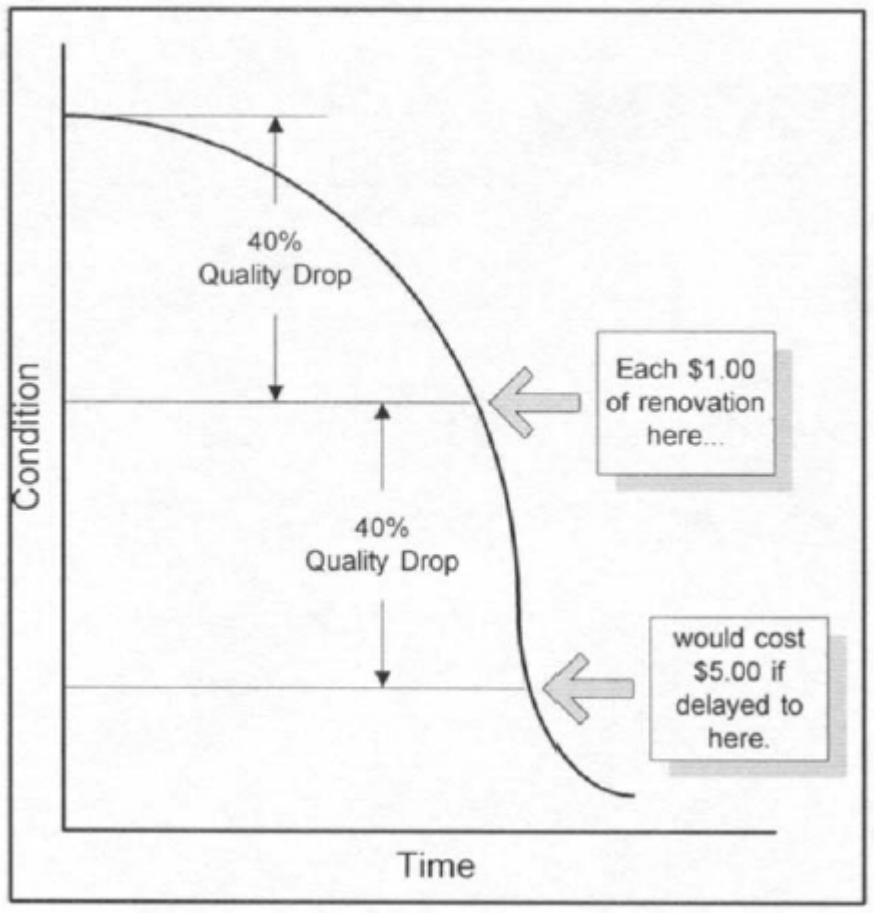


Figure 1.2: The cost of delaying servicing (figure taken from Federal Highway Administration (FHWA) Bridge Maintenance Manual)



1.2 Servicing requirements

The Department of Transport and Main Roads currently has a number of different types of structures on the road network constructed with a variety of materials, all of which require on-going maintenance. As these structures tend to have several common components, it is easier to describe servicing requirements in terms of these common groups rather than on the basis of a particular structure or material type. A set of standardised servicing requirements have been prepared for the following component groups:

- Deck surface
- Bridge substructure
- Bridge superstructure
- Timber bridges
- Culverts
- Guardrail and bridge rail
- Sign and delineation
- Waterway
- Approach embankment.

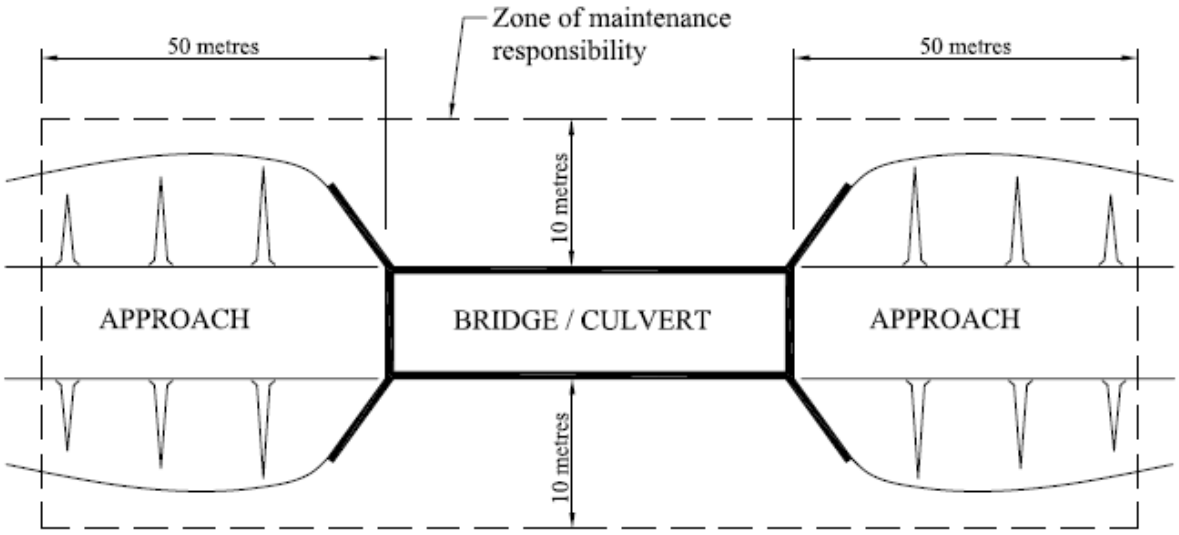
Appropriate activities have been listed for each of these groups, along with the specified frequency at which the activity should be carried out for the particular component group.

If it becomes apparent over time that the condition of individual components have not changed noticeably since the last maintenance works were conducted (i.e. scuppers or drainage gullies completely free of debris build up), then the Region/District may extend the relevant frequency for that particular activity for the structure in question. However, at least two cycles of routine maintenance shall be carried out at the specified frequencies before any such variation is made.

Should it become apparent that the specified frequency is not sufficient to maintain the components of a particular structure in a suitable state, the frequency for that structure should initially be halved (i.e. 12 months reduced to 6 months). If the frequency is still found to be insufficient, Bridge Asset Management section should be contacted to provide remedial advice.

Maintenance personnel are responsible for maintaining the area shown in Figure 2 at the standard described in the relevant activities.

Figure 2 – Extent of servicing/maintenance envelope



Where possible, servicing should be carried out prior to or in conjunction with scheduled inspections of the structure. This has the benefits of:

- ensuring that inspections may be conducted without unnecessary obstructions, and
- highlighting those defects which are beyond the scope of routine maintenance to resolve, and
- revealing those defects that may have been obscured by dirt or debris.

The timber servicing activities listed in this document were previously located in the Timber Bridge Maintenance Manual. However, upon the development of a dedicated servicing manual, it was decided that the timber servicing activities should be relocated so that servicing crews would only need to refer to a single document.

It is intended that these activities will be removed from the Timber Bridge Maintenance Manual at the next formal review, but in the interim personnel may wish to continue to refer to this document for additional background information on these activities.

1.3 Additional considerations

The following points should be considered when assessing servicing requirements for a structure;

- Where a DMR-owned structure passes over a road owned by others, and it appears that defects related to the condition or configuration of the road are having an adverse effect on the structure (i.e. inadequate road drainage resulting in scour of the abutment protection) then maintenance personnel should rectify the issue (if possible) in the course of normal maintenance works on the structure and notify the maintaining authority to inform them of the defect and request rectification as soon as possible.
- Where a DMR-owned structure passes over a rail line, and it appears that defects related to the line are having an adverse effect on the structure (i.e. inadequate track drainage resulting in scour of the abutment protection) then maintenance personnel should immediately notify the maintaining authority to inform them of the defect. Under no circumstances are maintenance personnel permitted to enter the rail reserve without permission from the owner and appropriate training and certification.
- Where services are found to be contributing to the deterioration of a structure (i.e. a leaking water main dripping onto steel components), then the service provider should be notified and asked to correct the defect as soon as possible. There is little to be gained in conducting maintenance on a component if the cause of the deterioration is not (where possible) also corrected.
- Due to ongoing water restrictions throughout Queensland, it is recognised that pressure washing of an entire structure with potable water may not be considered acceptable. In such cases alternate methods of cleaning (as specified in the activity description) should be used. Where this is not feasible, washing with potable water may be restricted to those items and areas specified in Activity No 815R2. Recycled water is generally not suitable for this purpose, due to the levels of impurities and soluble salts that it contains (for additional details, refer to Technical Note No 53 - The Use of Recycled Water in Road Construction and Maintenance)
- Where required, activity-specific 'approvals' have been listed in each activity description. Generic associated activities, such as traffic management, have not been listed under this heading, but approval for these activities must also be obtained prior to the commencement of works.
- Where alteration to the bed or banks of a stream (including vegetation) is required, the works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000), published by the Department of Natural Resources and Water. All information required by the guideline shall be recorded and stored appropriately.

1.4 Recording of bridge/culvert servicing in the maintenance module of the BIS

In order to maintain an on-going record of the works conducted on the structure, details of all servicing works shall be entered into the Maintenance Module of the BIS. As these works will not normally be conducted in response to a specific defect, it will be necessary to create a generic bridge-level defect through the Create Backlog screen to facilitate their entry. 'Routine Maintenance', 'Bridge Culvert Servicing' or similar are suggested descriptions.

Maintenance personnel should be instructed to collect sufficient information to allow operators to complete the necessary fields in the Maintenance Module. This will typically consist of the date of the works, the activities performed, the amount of work performed for each activity (reported in the relevant unit of measurement) and the cost of the works.

Future modifications to the BIS may alert personnel when preventative maintenance activities are due, in a similar fashion to the existing system for inspections. However, as the BIS is currently unable to perform this function, it is up to Region/District personnel to ensure that these activities are conducted at the required frequency. For information on the scope for varying the recommended activity frequencies, refer to Section 2.0.

Table 1 – Bridge and culvert servicing – Activity list

Activity No.	RMPC No.	Description	Related TBMM activity*	Unit	Frequency (months)	Relevance			
						Timber bridge	Steel bridge	Concrete bridge	Culvert
Preventative maintenance									
Timber preservation									
800R1	804	Apply chemical preservative to timber	100T1	Each	60	✓			
800R2	808	Apply preservative grease to member ends and contact surfaces	100T2	Each	12	✓			
800R3	814	Paint or repaint timber members	100T4	m^2	24	✓			
800R4	816	Apply end sealant to plywood decking	100T5	Lin m	12	✓			
Site maintenance									
805R1	Roads**	Maintain clean trafficked surface		m^2	12	✓	✓	✓	✓
805R2	Roads**	Vegetation control		m^2	12	✓	✓	✓	✓
805R3	Roads**	Herbicide spraying		m^2	12	✓	✓	✓	✓
805R4	Roads**	Litter removal		m^2	12	✓	✓	✓	✓
805R5	Roads**	Maintain delineation/ markers/signs		Each	12	✓	✓	✓	✓
Termite prevention treatment									
810R1	817	Drill and inject termite poison into timber	110T1	Each	24	✓			
Cleaning									
815R1	847	Clean, paint and maintain handrail/ barrier/guardrail furniture		m	12	✓	✓	✓	✓
815R2	857	Clean/maintain structure components		Provisional item	12	✓	✓	✓	✓
815R3	858	Pressure washing of structure		m^2	60	✓	✓	✓	✓
815R4	863	Clean/maintain drainage components		Provisional item	12	✓	✓	✓	✓
Maintain fastener tightness									
820R1	818	Tighten existing bolts – timber structures	120S1	Each	12	✓			
820R2	824	Tighten footpath fasteners (self-drilling screws)	120S6	Each	12	✓			
820R3	864	Tighten existing bolts – steel and concrete structures		Each	12		✓	✓	

Activity No.	RMPC No.	Description	Related TBMM activity*	Unit	Frequency (months)	Relevance			
						Timber bridge	Steel bridge	Concrete bridge	Culvert
Reactive maintenance									
Minor DWS repairs									
850R1	Roads**	Emergency temporary pavement repairs		m^2		✓	✓	✓	✓
850R2	Roads**	Sealing of pavement cracks		Litre		✓	✓	✓	✓
850R3	873	DWS/pavement repairs (manual)		Tonnes		✓	✓	✓	✓
850R4	874	DWS/pavement repairs (mechanical)		Tonnes		✓	✓	✓	✓
850R5	876	Footway DWS repairs (manual or mechanical)		Tonnes		✓	✓	✓	✓
850R6	825	Lay tingling	100M8	m		✓			
Miscellaneous treatments									
855R1	826	Reapply non-slip surfacing	100T6	m^2		✓			
855R2	827	Poison termite nests or trails	110T2	Each		✓			
855R3	Roads**	Graffiti treatment		m^2		✓	✓	✓	✓
855R4	828	Lay 3mm galvanised steel plate decking	100M7	m^2		✓			
855R5	840	Replace or provide metal caps to member ends	100T3	Each		✓			
Waterway maintenance									
860R1	877	Repair scouring/ deposition of waterway material		m^3		✓	✓	✓	✓
860R2	878	Remove flood debris from waterway		m^3		✓	✓	✓	✓
860R3	879	Maintain clear waterway		Provisional item		✓	✓	✓	✓
860R4	882	Maintain existing waterway protection		m^2		✓	✓	✓	✓
860R5	322	Clean culverts and pipes (major)/ pits/ gullies/ manholes		Provisional item					✓
860R6	883	Seal gaps between culvert elements/ wingwalls		m^2					✓
Barrier rectification									
865R1	884	Repair handrail/ barrier/guardrail furniture		Lin m		✓	✓	✓	✓
865R2	885	Make safe accident damage to handrail/ barrier/guardrail furniture		Provisional item		✓	✓	✓	✓

Activity No.	RMPC No.	Description	Related TBMM activity*	Unit	Frequency (months)	Relevance			
						Timber bridge	Steel bridge	Concrete bridge	Culvert
Replace fasteners									
870R1	841	Remove, replace or install damaged/ missing bolts	120S2	Each		✓			
870R2	842	Replace damaged/ missing anchor bolts	120S3	Each		✓			
870R3	843	Install large size washers at plywood fasteners	120S4	Each		✓			
870R4	844	Replace deteriorated footpath fasteners	120S7	Each		✓			
Cleaning									
875R1	886	Install/maintain bird control fencing		m^2		✓	✓	✓	✓
875R2	888	Clean aggressive contamination from steel girders and other componentry		m^2			✓		
875R3	848	Spot clean and paint steelwork		m^2			✓		
Emergency propping									
880R1	887	Place emergency propping	100M9	Provisional item		✓	✓	✓	✓
Maintain adequate load distribution									
885R1	845	Replace defective distributor (hardwood planks)	120T2	Lin m		✓			
885R2	846	Replace defective distributor (steel)	130S4	Lin m		✓			

* Additional information on these activities is at present located in the Timber Bridge Maintenance Manual. This information will eventually be removed, but in the interim it is suggested that personnel refer back to the TBMM for additional background information on these activities.

** These activities are to be performed under general RMPC contact as they are deemed to be more relevant to road and pavement maintenance.

Part Two – Servicing Requirements

2.1 Deck surface servicing

The main objective is the provision of clean, even and free-draining roadway and walkway, surfaces. In order to achieve this objective, the following criteria must be satisfied:

- The bridge surface must drain properly in order that casual water cannot accumulate on the surface. Debris on the surface and in gutters and drains prevents free drainage of the surface water and increases the risk of vehicles hydroplaning. Additionally, casual water can leak through the deck or joints and deteriorate the saturated superstructure and substructure components. Accordingly, drains must be kept clear by rodding or flushing with compressed air or water.
- Potholes in the surface will similarly initiate dynamic load effects up to three fold of the static axle mass resulting in accelerated deterioration of the bridge and the departure lane of the approach embankments with attendant accelerated deterioration of both. Additionally, surface water will saturate the deck and potentially generate a larger failure. Accordingly, pothole patches should be effected pending a pavement rehabilitation repair.
- Cracks in the wearing surface or over buried deck joints allows water to saturate the deck and underlying components with attendant accelerated deterioration. These defects should be filled with a hot-melt bitumen or other approved sealant pending a permanent repair.
- Uneven footways pose a risk to pedestrians and any discontinuities must be feathered with a cold asphalt correction course pending a permanent repair.
- Deck joint gaps must be free from obstructions that compromise the design movement capacity. The resulting "locked-in" stresses can damage joint, deck and substructure components. Debris in the joints can also puncture seals/glands and allow leakage on underlying superstructure and sub-structure components. Furthermore silt in the asphalt saw-cuts or ravelling joints can cause the asphalt to be pushed up in the untrafficked, carriageway shoulders.
- Larger pieces of debris must be removed as they pose a collision hazard or may be picked up by the wheels of a vehicle and thrown into the path of another vehicle.
- Vegetation may grow in the debris that has accumulated in the channels, drainage components or joints of poorly maintained bridges. This will compromise the drainage of surface water and will hold casual water on the structure. The roots of some plants or trees will damage drainage and structural components.
- Graffiti on the surface shall be removed, as it is unsightly and may reduce skid resistance. Additionally, lengthy exposure will encourage others to replicate this vandalism.

Table 2.1 - Associated activities – Deck surface servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R1	Maintain clean trafficked surface	m^2	12
805R4	Litter removal	m^2	12
815R3	Pressure washing of structure	m^2	60
815R4	Clean/maintain drainage components	Provisional sum	12
Reactive			
850R1	Emergency temporary pavement repairs	m^2	-
850R2	Sealing of pavement cracks	Litre	-
850R3	DWS/pavement repairs (manual)	Tonnes	-
850R4	DWS/pavement repairs (mechanical)	Tonnes	-
850R5	Footway DWS repairs (manual/mechanical)	Tonnes	-
855R1	Reapply non-slip surfacing	m^2	-
855R3	Graffiti treatment	m^2	-

2.2 Guardrail and bridge rail servicing

The main objective is to maintain vehicle containment and pedestrian barriers to the original design standard. In order to achieve this objective, the following criteria must be satisfied:

- Accident damage should be made safe until a permanent repair can be effected.
- Scheduling inspection and/or repairs to accident damaged or defective guardrail and bridge rail.
- Sounding barriers for any loose fasteners and tightening as required.
- When steel members corrode they will lose strength thus it is important that areas of spot rust are touched up routinely.
- Re-painting guardrail, kerbs and timber handrails.
- Graffiti and posters on concrete barriers and terminals shall be removed, as it is unsightly. Additionally, lengthy exposure will encourage others to replicate this vandalism.
- Pressure washing of barriers to remove salt or other contaminants and dirt.

Table 2.2 - Associated activities – Guardrail and bridge rail servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
815R1	Clean, paint and maintain handrail/ barrier/ guardrail furniture	Lin m	12
815R3	Pressure washing of structure	m^2	60
820R3	Tighten existing bolts – steel and concrete structures	Each	12
Reactive			
855R1	Graffiti treatment	m^2	-
865R3	Repair handrail/barrier/guardrail furniture	Lin m	-
865R2	Make safe accident damage to handrail/ barrier/ guardrail furniture	Provisional sum	-
875R2	Clean aggressive contamination from steel girders and other componentry	m^2	-
875R3	Spot clean and paint steelwork	m^2	-

2.3 Sign and delineation servicing

The main objective is the provision of clearly defined and signed structures in accordance with the MUTCD. Included is the structure and the portions of approach roadway within the maintenance envelope. In order to achieve this objective, the following criteria must be satisfied:

- Checking that signs, lines and delineators have been installed in accordance with the MUTCD.
- Scheduling supply of materials and works that are outside the scope of servicing.
- Cleaning signs and delineators.
- Repainting delineators where required.
- Installing/replacing delineators.
- Installing/replacing reflectors on guardrail and kerbs.
- Removing/trimming/poisoning vegetation that obscures or could obscure lines, signs or delineators.

Table 2.3 - Associated activities – Sign and delineation servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
805R5	Maintain delineation/markers/signs	Each	12
Reactive			
N/A			

2.4 Substructure servicing

The objective is to maintain serviceability and durability of primary support elements and ancillary components. In order to achieve this objective, the following criteria must be satisfied:

- Flood debris or surface water deposits associated with deck joint leakage will trap moisture on the bearing shelves and the accelerated deterioration of the substructure components will ensue. Joints must be made watertight, debris removed, substructure drainage cleared and all elements must be cleaned with low-pressure fresh water. If required, joint repairs will be conducted under the bridge rehabilitation programme.
- Larger pieces of flood debris may have damaged the structure or may have the potential to do so if it is dislodged. Furthermore, if the material is not removed it may result in scour damage to the bed or embankments and/or promote the collection of further debris creating a serious constriction of flow with consequential damage to structure or scour damage to the bed, banks and/or approaches.
- Vegetation is likely to germinate in poorly maintained bearing shelves and this could cause severe damage if trees are allowed to mature. All vegetation must be removed and roots poisoned. Similarly, vegetation around the foundations must be cut back and (where feasible) poisoned, as in addition to damaging substructure components this may promote the collection of flood debris and tree growth may result in damage to both substructure and superstructure elements. Cleared areas around substructures also facilitate unobstructed inspections.
- Blockages or leaks in drains can saturate components, resulting in accelerated deterioration. Accordingly, drains must be kept clear by rodding or flushing with compressed air or water. Any leaks should be repaired.
- Poorly maintained expansion and rotational bearings will seize and the resulting "locked-in" stresses will damage the components, fasteners and bearing shelves. Accordingly bearings must be cleaned and lubricated. If defective bearings are detected then a Level 2 or Level 3 inspection should be scheduled.
- Poorly designed and/or installed neoprene/elastomeric bearings have the tendency to "walk" off the bearing pedestals. If there is evidence of this occurring then details of the bearings movements should be noted and immediately reported to Structures Division for investigation and advice. In the interim a restraint plate should be bolted to the front of the pedestal/headstock and chocks installed under the ends of the girders/units as a precaution. Care should be taken to avoid compromising free movement of the girders/units under live load.
- Pressure washing of contaminants from superstructure components is necessary to prevent accelerated deterioration. This is particularly important in marine structures to remove salt and in structures where birds or bats roost to remove droppings.
- When steel members corrode they will lose strength thus it is important that areas of spot rust are touched up routinely.
- Material trapped between deck joints or the between the deck and the ballast walls at abutments will similarly compromise design movements and result in the transfer of loads to

members not designed to accommodate them. All foreign material must be removed. If gaps between members have closed then a Level 2 or Level 3 inspection should be scheduled.

- Weepholes are designed to relieve the hydraulic pressure behind retaining walls thus if discharge is compromised then the resulting increase in retained pressure could overstress the wall and/or increase forward movement of the wall. Excessive movements can bring adjacent surfaces into contact, such as ballast walls and decks, or open the joint between the abutment and wing walls allowing retained material to escape. Accordingly, weepholes must be cleared and flushed as required.
- Graffiti and posters on substructure elements shall be removed, as it is unsightly and may mask defects. Additionally, lengthy exposure will encourage others to replicate this vandalism.
- Scheduling supply of materials and works that are outside the scope of servicing.

Table 2.4 - Associated activities – Substructure servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
815R2	Clean/maintain structure components	Provisional sum	12
815R3	Pressure washing of structure	m^2	60
815R4	Clean/maintain drainage components	Provisional sum	12
820R3	Tighten existing bolts – steel and concrete structures	Each	12
Reactive			
855R3	Graffiti treatment	m^2	-
860R2	Remove flood debris from waterway	m^2	-
875R1	Install/maintain bird control fencing	m^2	-
875R2	Clean aggressive contamination from steel girders and other componentry	m^2	-
875R3	Spot clean and paint steelwork	m^2	-

2.5 Superstructure servicing

The objective is to maintain serviceability and durability of superstructure components. In order to achieve this objective, the following criteria must be satisfied:

- Flood debris or surface water deposits associated with deck joint leakage will trap moisture on girders and accelerated deterioration of these components will ensue. Joints must be made watertight, debris removed and all elements must be cleaned, with high-pressure fresh water or other suitable methods. If required, joint repairs will be conducted under the bridge rehabilitation programme.
- Pressure-relief vent holes are provided in cross girders to dissipate and equalise air pressure when the flood level passes the soffits of the girders. Any blockages to these vents must be cleared to avoid uplift being locally concentrated resulting in severe structural damage.

- Larger pieces of flood debris may have damaged the structure or may have the potential to do so if it is dislodged. Furthermore, if the material is not removed it may result in scour damage to the bed or embankments and/or promote the collection of further debris creating a serious constriction of flow with consequential damage to structure or scour damage to the bed, banks and/or approaches.
- Vegetation under the structure must be cut back and (where feasible) poisoned as in addition to damaging substructure components this may promote the collection of flood debris and tree growth may result in damage to both substructure and superstructure elements. Cleared areas around substructures also facilitate unobstructed inspections.
- Blockages or leaks in drains can saturate components resulting in accelerated deterioration. Accordingly, drains must be kept clear by rodding or flushing with compressed air or water. Any leaks should be repaired.
- Pressure washing of contaminants from superstructure components is necessary to prevent accelerated deterioration. This is particularly important in marine structures to remove salt and in structures where birds or bats roost to remove droppings. Any damage to bird screens should be repaired.
- When steel members corrode they will lose strength thus it is important that areas of spot rust are touched up routinely.
- Material trapped between deck joints or the between the deck and the ballast walls at abutments will similarly compromise design movements and result in the transfer of loads to members not designed to accommodate them. All foreign material must be removed. If gaps between members have closed then a Level 2 or Level 3 inspection should be scheduled.
- Graffiti and posters on superstructure elements shall be removed, as it is unsightly and may mask defects. Additionally, lengthy exposure will encourage others to replicate this vandalism.
- Scheduling supply of materials and works that are outside the scope of servicing.

Table 2.5 - Associated activities – Superstructure servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
815R2	Clean/maintain structure components	Provisional sum	12
815R3	Pressure washing of structure	m^2	60
815R4	Clean/maintain drainage components	Provisional sum	12
820R3	Tighten existing bolts – steel and concrete structures	Each	12
Reactive			
855R3	Graffiti treatment	m^2	-
860R2	Remove flood debris from waterway	m^2	-
875R1	Install/maintain bird control fencing	m^2	-
875R2	Clean aggressive contamination from steel girders and other componentry	m^2	-
875R3	Spot clean and paint steelwork	m^2	-

2.6 Waterway servicing

The objective is to maintain channel and approach embankment integrity and the designed waterway area. In order to achieve this objective, the following criteria must be satisfied:

- Larger pieces of flood debris upstream of the structure, such as logs or dead trees, may have damaged the structure or may have the potential to do so if it is dislodged. Furthermore, if the material is not removed it may result in scour damage to the bed or embankments and/or promote the collection of further debris creating a serious constriction of flow with consequential damage to structure or scour damage to the bed, banks and/or approaches. It is also a serious fire hazard and may become infested with vermin. Consequently, this material should be removed from the site and carted to a dump location clear of the channel.
- Fences should not be constructed across the bridge opening as these promote the accumulation of debris mats across the bridge. Generally, these should be removed however it will normally be necessary to negotiate a livestock retention solution with the landowner.
- Vegetation under and adjacent to the structure must be cut back and (where feasible) poisoned as it could potentially damage the structure and may promote the collection of flood debris. A cleared area around substructures also facilitates unobstructed inspections and provides a safe working environment for inspectors. Vegetation shall be cleared over the structure footprint and ten metres upstream and downstream over the projected length of the structure.
- Any trees with limbs overhanging the roadway should be removed or lopped to maintain the stated clearance area.

- Any trees in the channel within falling distance of the bridge that have been undermined by scour should be stabilised or felled. Any unstable or dying tree in the channel adjacent to the bridge should be removed to avoid the risk of future channel constrictions should it fall down.
- Scouring of bed material adjacent to or under substructures will compromise the stability and load capacity of the structure. Where this is found to be the case, measurements shall be taken and details forwarded to Structures Division for analysis and repair recommendations. The creek bed should be checked for a distance of 500m upstream of the bridge scours to determine if there is any fresh disturbance to the banks or channel that may have initiated the scour event. Any such disturbance should be photographed and measured and the advice forwarded to Structures Division with the scour details. In the interim, scour holes should be backfilled with stones with a minimum dimension in excess of 200mm.
- Conversely, deposition of bed material may occur (aggradation) and this can adversely affect the waterway area. Structures Division advice should generally be sought to investigate the issue if the accumulation is in excess of 10% of the waterway area of the bridge. In extreme cases, more than 20% of the waterway area reduced, then the accumulated material should be removed such that at least 90% of the design waterway is restored.
- Scour may occur at surface water outlets, compromising the stability of the structure, approach embankments or riverbanks. Outlets should be extended beyond the structural footprint or at least directed away from the structure, embankments or riverbanks. Erosion protection shall be provided and maintained at the outlet. In the interim any scour holes shall be backfilled with angular stones exceeding 200m in the minimum dimension.
- The integrity of existing bank or bed protection must be maintained thus slumped rip-rap must be supplemented and damaged gabions, revetment, mattresses, pitched rock or other structures repaired as required. Particular attention should be given to the margins of protection structures for undermining by scour action. If this has occurred then toe walls must be constructed in accordance with the standard details (Standard Drawing No. 1117). Construction of toe walls is deemed to be outside the scope of servicing.
- Blockages in table drains or batter chutes in approach embankments can cause catastrophic scour damage and the loss of the embankment and severe damage to the abutment and first span. Any debris or vegetation in these areas should be removed.
- Scheduling supply of materials and works that are outside the scope of servicing.

Table 2.6 - Associated activities – Waterway servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
Reactive			
860R1	Repair scouring/deposition of waterway material	m^2	-
860R2	Remove flood debris from waterway	m^2	-
860R3	Maintain clear waterway	Provisional sum	-
860R4	Maintain existing waterway protection	m^2	-

2.7 Approach roadway/embankment servicing

The objective is to maintain embankment integrity and carriageway continuity across the approach/bridge interface. At least 50 m of approach roadway and embankment should be included in the routine bridge servicing programme, with all approach roadway and walkway surfaces clean and free-draining. In order to achieve these objectives, the following criteria must be satisfied:

- Poorly designed and/or constructed approach embankments will consolidate and/or settle behind the bridge abutments resulting in a discontinuity at the embankment/bridge interface. This increases the dynamic load effects up to three fold of the static axle mass resulting in accelerated deterioration of the bridge and the departure lane of the embankments. An asphaltic correction course can be laid to rectify this defect but it is essential that the abutment joint be not overlaid. It may also be necessary to raise the relieving slab by pressure grouting (which is beyond the scope of servicing). Additionally, the approach guardrail will have to be raised by the same depth as the overlay to maintain the required standard.
- Potholes in the surface will similarly initiate dynamic load increases with attendant accelerated deterioration of the pavement and perhaps the bridge. Additionally, surface water will saturate the underlying pavement and embankment and potentially generate a larger failure. Accordingly, pothole patches should be effected pending a pavement rehabilitation repair.
- The road surface must drain properly in order that casual water cannot accumulate on the surface. Debris on the surface and in gutters and drains prevents free drainage of the surface water and increases the risk of vehicles hydroplaning. Additionally, casual water can leak through the wearing surface and saturate the pavement and underlying embankment resulting in pavement failures. Accordingly, the pavement surface should be cleared of debris and drains must be kept clear by rodding or flushing with compressed air or water.
- Shoulders at approaches should be sealed to the edge of the formation to prevent saturation of the embankment and to provide positive drainage to the offlets and the batter chutes. Any longitudinal cracks in the shoulder should be sealed with pourable bitumen.
- Larger pieces of debris must be removed as they pose a collision hazard or may be picked up by the wheels of a vehicle and thrown into the path of another vehicle.

- Vegetation may grow in the debris that has accumulated in the channels and drainage components of poorly maintained approaches. This will compromise the drainage of surface water and will hold casual water on the structure. The roots of some plants or trees will damage the pavement and drainage components.
- Any trees with limbs overhanging the roadway should be removed or lopped.
- Scour may occur at surface water outlets compromising the stability of the structure, approach embankments or riverbanks. Outlets should be extended beyond the structural footprint or at least directed away from the structure, embankments or riverbanks. Erosion protection shall be provided and maintained at the outlet. In the interim any scour holes shall be backfilled with stones exceeding 200 m in the minimum dimension.
- The integrity of existing embankment must be maintained thus slumped rip-rap must be supplemented and damaged gabions, revetment, mattresses, pitched rock or other structures repaired as required. Particular attention should be given to the margins of protection structures for undermining by scour action. If this has occurred then toe walls must be constructed in accordance with the standard details. (Drawing No. 1117)
- Blockages in table drains or batter chutes in approach embankments can cause catastrophic scour damage and the loss of the embankment and severe damage to the abutment and first span. Any debris or vegetation in these areas should be removed. Collected material should be carted and dumped clear of the channel.
- Service accesses, drainage pits and gullies should be checked for blockages or leakage and repairs effected or scheduled.
- Road drainage offlets, particularly adjacent to the abutments, should be cleared and any scour damage repaired.
- Guardrail, signs and delineation are covered elsewhere.
- Scheduling supply of materials and works that are outside the scope of servicing.

Table 2.7 - Associated activities – Approach roadway/embankment servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R1	Maintain clean trafficked surface	m^2	12
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
805R4	Litter removal	m^2	12
815R4	Clean/maintain drainage components	Provision sum	12
Reactive			
850R1	Emergency temporary pavement repairs	m^2	-
850R2	Sealing of pavement cracks	Litre	-
850R3	DWS/Pavement repairs (manual)	Tonne	-
850R4	DWS/Pavement repairs (mechanical)	Tonne	-
850R5	Footway DWS repairs (manual or mechanical)	Tonne	-
860R1	Repair scouring/deposition of waterway material	m^2	-
860R3	Maintain clear waterway	Provisional sum	-
860R4	Maintain existing waterway protection	m^2	-

2.8 Timber bridge servicing

The objective is to enhance the service life of the departments' timber bridge assets through regular servicing. In order to achieve this objective, the following criteria must be satisfied.

- Exposed end grain allows the timber to dry out and crack which will compromise the load capacity and durability of members. The ends of members (including the exposed ends of plywood decking) should be sealed by the application of hot petroleum jelly, lanolin, denso grease or copper napthenate and galvanised metal end caps should be fitted.
- Connection bolts will slacken as a consequence of shrinkage and embedment and must be tightened periodically. Particular attention should be given to snipe strengthening, girder/corbel connections, headstock/piles connections and pile splices. If the timber is sound and bolt heads or nuts are embedding in the surface or pulling through holes then larger and/or heavier washers should be fitted. Plywood decks are particularly prone to deforming around the fasteners.
- Nuts on bolts that are subjected to cyclical dynamic traffic loading may loosen between services unless locknuts or spring washers are fitted. Decking is particularly prone to flogging under traffic and it is essential that fasteners are kept tight.
- Bolted connections bearing on untreated sapwood will bed into the surface as the timber decays and softens and will lose tension. In these instances it may be necessary to locally remove the sapwood in order to make a sound and durable connection. Similarly, timber in contact with metal may blacken and soften as the result of the cellulose hydrolysis mechanism and again compromise the connection. This can be avoided by coating metal fittings with bitumen paint, lanolin grease or denso grease.

- If pile splice plates have been installed on untreated sapwood members, a gap may develop between the plate and the timber as the sapwood rots. The rotted material should be removed and the resulting gap/annulus sealed with a stiff grout mix. The upper ends of sound pile splice connection plates should be sealed with hot-melt bitumen that is sloped to shed moisture and dirt.
- Some preservatives will corrode the metal fittings and those that are severely corroded should be replaced. Metal fittings can be painted with bitumen or coated in lanolin grease or denso grease to preserve them in this environment.
- Every five years timber components should be pressure washed (or otherwise cleaned using a suitable method) and a preservative treatment should be applied. Care should be taken to ensure that holes in timber members are either plugged prior to washing or avoided.
- If rot is detected in members then fluorine/boron rods should be installed that will diffuse in the core in the presence of moisture and protect against further rot. These rods should installed at the ground line of piles and replaced every five years or so as a preventative measure.
- If termite presence is evident then the structure must be treated with an approved termiticide immediately. A number of treatments may be required over a three-month period to eradicate the colony. Termiticides should generally be applied every 2 years as a preventative measure. It is essential that the ground around piles and bedlogs be also treated to a depth of 300 mm.
- Paint to kerbs and barriers should be reapplied on a five-year cycle and any damaged areas spot painted in the intervening years.
- Surface water run-off should be directed away from the timber members but if this is unavoidable then the affected members must be protected with bitumastic paint or wraps.
- Joints and boltholes are particularly prone to the collection of moisture and dirt and the deterioration of members at the interface will be rapid unless they are treated. Typically the joints should be blown/washed clean, any rotted timber removed and a repair effected. If joints are re-made then a bitumen paint, membrane or heavy grease should be applied between surfaces and sloped to shed water and dirt. If the joints are only to be sealed then hot melt bitumen can be applied and the surface sloped to shed water. Boltholes should be treated with preservative and packed with grease.
- It is essential that any flood debris be removed and all other vegetation beneath a timber bridge is managed, as it is a serious fire hazard in addition to becoming a waterway obstruction.

Table 2.8 - Associated activities – Timber bridge servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
800R1	Apply chemical preservative to timber	Each	60
800R2	Apply preservative grease to member ends and contact surfaces	Each	12
800R3	Paint or repaint timber members	m^2	24
800R4	Apply end sealant to plywood decking	Lin m	12
810R1	Drill and inject termite poison into timber	Each	24
815R2	Clean/maintain structure components	Provisional sum	12
815R3	Pressure washing of structure	m^2	60
820R1	Tighten existing bolts – timber structures	Each	12
820R2	Tighten footpath fasteners (self-drilling screws)	Each	12
Reactive			
850R6	Lay tingling	m^2	-
885R1	Replace defective distributor (hardwood planks)	Lin m	-

2.9 Culvert servicing

The objective is to maintain the serviceability, durability and design waterway area of culvert components. In order to achieve this objective, the following criteria must be satisfied.

- Flood debris, silt or other material may accumulate in the culvert and will reduce the effective waterway area. All such blockages should be cleared so that flow through the culvert is not restricted and that all culvert components are visible and may be inspected. Collected material should be carted and dumped clear of the channel.
- Scour of the fill material will result in differential settlement and misalignment of the culvert cells. Loss of embankment fill material though gaps between the culvert and independent wingwalls may result in settlement of the approach roadway and subsequent deterioration of the culvert structure due to increased dynamic load effects. All gaps should be sealed with compressible filler or denso tape.
- Scouring of bed material adjacent to or under aprons or culvert base slabs may compromise the stability and the load carrying capacity of the structure. Rectification of this is covered under 'Waterway Servicing'
- Vegetation behind wingwalls, headwalls or immediately adjacent to apron slabs must be cut back and poisoned as in addition to damaging or overturning the wingwalls/headwalls, it may promote the collection of flood debris at the inlet and outlet. Cleared areas around culvert components also facilitate unobstructed inspections.
- When steel elements corrode they will lose strength, and full-depth corrosion of steel plate members may allow scour of the fill material, thus it is important that areas of spot rust are touched up routinely.

- Weepholes are designed to relieve the hydraulic pressure behind retaining walls thus if discharge is compromised then the resulting increase in retained pressure could overstress the wall and/or increase forward movement of the wall. Excessive movements can open the joint between the abutment and wing walls allowing retained material to escape. Accordingly, weepholes must be cleared and flushed as required.
- Pressure washing of contaminants from culvert cells is necessary to prevent accelerated deterioration. This is particularly important in marine structures to remove salt.
- Scheduling supply of materials and works that are outside the scope of servicing.

Table 2.9 - Associated activities – Culvert servicing

Activity number	Activity description	Unit	Frequency (months)
Preventative			
805R2	Vegetation control	m^2	12
805R3	Herbicide spraying	m^2	12
815R2	Clean/maintain structure components	Provisional sum	12
815R3	Pressure washing of structure	m^2	60
815R4	Clean/maintain drainage components	Provisional sum	12
Reactive			
860R1	Repair scouring/deposition of waterway material	m^2	-
860R5	Clean culverts and pipes (major)/ pits/ gullies/ manholes	Provisional sum	-
860R6	Seal gaps between culvert elements/wingwalls	m^2	-
875R2	Clean aggressive contamination from steel girders and other componentry	m^2	-
875R3	Spot clean and paint steelwork	m^2	-

Part Three – Servicing Activities

3.1 Activity 800R1 - Apply Chemical Preservative to Timber

Unit of measurement

Each

Category

Preventative maintenance

Description

All works associated with the application of a penetrating anti-fungal preservative to timber components.

Restoration standard

The following areas are to be treated with an approved anti-fungal preservative product:

- Deteriorated timber, showing signs of weathering, decay or splitting
- Ends of all members
- All timber surfaces in contact with other components.

Related activities

800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

800R4 - Apply End Sealant to Plywood Decking

855R5 - Replace or Provide Metal Caps to Member Ends

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required

Materials

- Timber drill (for insertion of boron rods)
- Cloths, brushes, and other specified application tools as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Generally approved preservatives are listed in Figure 17.7 of Part Two of the Timber Bridge Maintenance Manual. Where other products are to be used, approval must be sought from Bridge Asset Management.

Work procedures

1. Establish traffic control (if required).
2. All loose materials, including dirt and debris, shall be removed from the application area.
3. Where capping plates are present, they shall be removed.
4. The preservative shall be applied to the required areas in accordance with the product instructions.
5. Capping plates shall be reinstated to member ends. Where these plates were not present or were badly corroded, new capping plates shall be fabricated and attached in accordance with Activity No 855R5.
6. Remove traffic control (if established).

Planning points to consider

1. Preservative should be applied to contact surfaces when new members are placed, spliced or supported during the course of rehabilitation works.
2. The Material Safety Data Sheet associated with the preservative should be reviewed prior to arrival on site, to ensure that all necessary precautions are taken and that the specified PPE is available.

3.2 Activity 800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

Unit of measurement

Each

Category

Preventative maintenance

Description

All works associated with the application of preservative grease to component ends and contact surfaces.

Restoration standard

The following areas are to be treated with an approved preservative grease product:

- Ends of all members
- All timber surfaces in contact with other components.

Related activities

800R1 - Apply Chemical Preservative to Timber

800R4 - Apply End Sealant to Plywood Decking

855R5 - Replace or Provide Metal Caps to Member Ends

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required

Materials

- Cloths, brushes, and other specified application tools as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Generally approved preservatives are listed in Figure 17.7 of Part Two of the Timber Bridge Maintenance Manual. Where other products are to be used, approval must be sought from Bridge Asset Management.

Work procedures

1. Establish traffic control (if required).
2. All loose materials, including dirt and debris, shall be removed from the application area.
3. Where capping plates are present, they shall be removed.

4. The preservative shall be applied to the required areas in accordance with the product instructions.
5. Capping plates shall be reinstated to member ends. Where these plates were not present or were badly corroded, new capping plates shall be fabricated and attached in accordance with Activity No 855R5.
6. Remove traffic control (if established).

Planning points to consider

1. Preservative should be applied to contact surfaces when new members are placed, spliced or supported during the course of rehabilitation works.
2. The Material Safety Data Sheet associated with the preservative should be reviewed prior to arrival on site, to ensure that all necessary precautions are taken and that the specified PPE is available.

3.3 Activity 800R3 - Paint or Repaint Timber Members

Unit of measurement

Square metres (m^2)

Category

Preventative maintenance

Description

All works associated with the painting or repainting of timber components.

Restoration standard

The following areas shall be painted or repainted at the specified frequency, or where the paint system is observed to have broken down:

- Timber barriers
- Timber guideposts
- Timber kerbs.

Related activities

815R1 - Clean, Paint and Maintain Handrail/Barrier/Guardrail Furniture

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required
- Air compressor, with hoses and appropriate nozzles

Materials

- Paint products suitable for the existing system
- Wire brushes, dust brushes, scrapers, sandpaper, and other appropriate hand tools

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

- If working with lead-based paint systems, the necessary workplace health and safety requirements must be met. Environmental restrictions shall also apply to the works.
- The use of chemicals (such as paint solvent) must be conducted in accordance with Part 2, Sections 13 and 13A Chemical Usage (Agricultural and Veterinary) Control Act 1988. Where a permit for chemical usage is deemed necessary, operators shall comply with permit requirements.

Work procedures

1. Establish traffic control (if required).
2. All loose materials, including dirt and debris, shall be removed from the areas to be painted.
3. Check all components for loose or missing fasteners, and tighten/replace as required.
4. Prepare the surfaces requiring repainting using one of the following methods:
    - If paint coating thickness has worn thin or broken down, clean any adhering paint back to bare timber. Remove dust ready for painting.
    - If paint coating is in good condition remove any chipped or loose flaking paint. Strongly adhering paint can be left in place and overcoated. Remove dust ready for painting.
5. Apply paint in accordance with manufacturer's recommendations.
6. Remove traffic control (if established).

Planning points to consider

1. Any spot painting must be done with a matching colour in order to maintain a consistent appearance.
2. If unsure about the lead content of the existing paint system, a few areas should be selected at random and tested using lead check test kits prior to commencement of the works.
3. Ensure weather conditions are suitable for the application of the paint system. Paint should not be applied under the following conditions:
    - When the relative humidity is above 85%
    - Where wind speeds are 25 kph or greater.

3.4 Activity 800R4 - Apply End Sealants to Plywood Decking

Unit of measurement

Lineal metres (m)

Category

Preventative maintenance

Description

All works associated with the application of sealant to the exposed ends of plywood decking.

Restoration standard

All exposed ends of plywood decking sheets shall have an approved preservative/sealant applied to them at the specified frequency, or where severe weathering is observed.

Related activities

800R1 - Apply Chemical Preservative to Timber

800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

855R5 - Replace or Provide Metal Caps to Member Ends

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required
- Edge protection, as required.

Materials

- Cloths, brushes, and other specified application tools as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Generally approved preservatives are listed in Figure 17.7 of Part Two of the Timber Bridge Maintenance Manual. Where other products are to be used, approval must be sought from Bridge Asset Management.

Work procedures

1. Establish traffic control (if required).
2. All loose materials, including dirt and debris, shall be removed from the application areas.
3. The preservative shall be applied to the required areas in accordance with the product instructions.
4. Remove traffic control (if established).

Planning points to consider

1. Preservative should also be applied to ends of all new plywood decking sheets during the course of deck rehabilitation works.
2. Consideration should also be given to installing an aluminium damp course, consisting of thin aluminium sheeting fastened to the deck at the underside of the kerb and extending out over the edge of the plywood a distance of approximately 100 mm. This will act as an eave to shed water and will provide additional protection from the elements.

3.5 Activity 805R1 - Maintain Clean Trafficked Surface

Unit of measurement

Square metres (m^2)

Category

Preventative maintenance

Description

All works associated with maintaining a clean trafficked surface on structures and the approaches and verges within the maintenance envelope. Also includes cleaning out fixed joints and the seals/ membranes of deck expansion joints. This activity is often required in conjunction with other maintenance works, particularly overlays.

Restoration standard

Standard to be achieved is functionality of trafficked surface and verges, cleanliness (and therefore functionality) of fixed and expansion joints and safety for road users.

Related activities

Nil

Requirements

Plant

- Utility or light truck
- Broom tractor
- Vacuum sweeper truck

Materials

- Brooms, hand brushes, assorted hand tools (including podgy bar)

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Most debris falling from poorly loaded vehicles is quickly 'swept' by traffic clear of the running lanes although it will sometimes be necessary to remove this debris from the running lanes themselves.
3. Bulky debris items should be removed to a designated disposal area.
4. Small loose debris requires removal, and this could be carried out by either manual means or by vacuum sweeper truck.

5. Accumulations against and under the face of guardrails and bridge barriers should also be removed.
6. Silt or other debris within saw-cuts (which are typically located at fixed joints) should be removed by hand brushing.
7. Expansion joint seals/membranes should be cleared by loosening any material in the recess with a podgy bar, then sweeping the material out of the recess for collection by either manual means or by the vacuum sweeper truck. Care should be taken not to damage the seal/ membrane or the adjacent expansion joint components.
8. This activity also includes the removal of any obviously loose sections of DWS which appear to have the potential to quickly become missiles under the action of traffic – where disintegrating DWS is encountered it should be immediately remedied under the appropriate activity. In the event that the crew is not equipped to perform the repair straightaway, it should be reported as a matter of urgency and appropriate hazard signing erected in the interim.
9. Remove traffic control (if established).

Planning points to consider

1. From a road user safety and efficiency of operation perspective maintenance crews should be equipped to handle the range of conditions they are likely to encounter with a single visit.
2. Works involving asphalt on adjacent closed carriageways may cast debris or other loose material on to trafficked carriageways. Trafficable surfaces should be kept as clear as possible to reduce risk to road users.
3. For structures with a traffic count (AADT) in excess of 20000, there is a possibility that the volume of heavy metals present on the carriageway surface may have a negative impact on the waterway should debris be deposited into the waterway through scuppers or otherwise. In such cases, it is recommended that a vacuum sweeper truck should be used to collect debris from the road surface.

3.6 Activity 805R2 - Vegetation Control

Units of measurement

Square metres (m^2)

Category

Preventative maintenance

Description

All works associated with removal of excessive vegetation under the structure and within the area included in the maintenance envelope. 'Vegetation' comprises grass and small saplings to approximately 50 mm diameter (for larger trees use Activity 860R3). Typical plant may comprise tractor slasher but in some situations where terrain is an issue it may be necessary to use a brushcutter or chainsaw.

Restoration standard

Bushfire fuel levels reduced to manageable levels. Access for bridge inspection and maintenance equipment not impeded. Remove potential for debris mat formation, and eliminate the potential for damage occurring to the structure. All signage and delineation should be clearly visible and not obscured by vegetation.

Related activities

860R2 - Remove Flood Debris from Waterway

860R3 - Maintain Clear Waterway

860R4 - Maintain Existing Waterway Protection

805R3 - Herbicide Spraying

805R5 - Maintain Delineation/Markers/Signs

Requirements

Plant

- Utility or light truck
- Tractor with slasher or brushcutter

Materials

Nil

Manpower

- 1 Leading Hand
- 1-2 Labourers
- 1 Operator
- Traffic control, as required

Approvals

- Where alteration to the bed or banks of a stream (including vegetation) is required, the works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" - Water Act (2000).
- Trees of special significance (e.g. memorials) must not be removed without approval by the Principal. Protected plants (for example, rare and threatened plants) shall not be removed without approval from the Environmental Protection Agency.
- Where collected material is to be burnt on site, a fire permit may be required - refer Work Procedures, point 5.

Work procedures

1. Establish traffic control (if required).
2. Decide whether terrain is suitable for tractor/ slasher combination or whether manual methods may be necessary then undertake the work.
3. Smaller saplings should be cut off just above ground level and poisoned to prevent suckering.
4. Cut grass and other vegetation should be removed from beneath the structure to manageable levels.
5. It may be necessary to burn some of the material prior to leaving site in which case it a 'burn off' must be arranged - bushfire brigade authorities will need to give the appropriate approvals and may need to supply the men and equipment to contain the burn-off (contact your nearest Rural Fire Service for further information).
6. Remove traffic control (if established).

Planning points to consider

1. The aims of this activity are:
   - to ensure the volume of combustible material is reduced to manageable level
   - to improve accessibility for bridge inspection and other maintenance plant
   - to remove the potential for debris mat formation during a flood event
   - to eliminate the potential for structural damage occurring.

   It will be necessary to determine whether this activity or activity 805R3 – Herbicide Spraying are more appropriate for the required outcome.
2. Consultation with District environmental officers and Rural Fire Services will be necessary to ensure that any proposed 'burn-off' is conducted in a proper manner.
3. Consultation with District environmental officers will be necessary to ensure that any vegetation removal or herbicide spraying has minimal environmental impacts and is conducted in compliance with the relevant legislation.

3.7 Activity 805R3 - Herbicide Spraying

Unit of measurement

Square meters (m^2)

Category

Preventative maintenance

Description

All works associated with application of herbicide either by boom over larger areas or by use of smaller equipment in a spot spraying situation.

Restoration standard

Standard to be achieved is complete 'kill' of vegetation treated (check 'Planning Points to Consider' below for range of factors to consider in achieving this standard).

Related activities

805R2 - Vegetation Control

805R5 - Maintain Delineation/Markers/Signs

Requirements

Plant

- Utility or light truck
- Boom spray unit or spot spraying equipment

Materials

Herbicide (to be approved in consultation with local Environmental Officer).

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

- Permits are not required, but records must be kept on the chemical usage. See Part: 6, Section: 26 Agricultural Chemicals Distribution Control Act 1966.
- Operators should be appropriately trained, with the relevant tickets/qualifications.

Work procedures

1. Establish traffic control (if required).
2. Decide whether 'boom' or 'spot' spraying would be more appropriate.
3. Assess spraying conditions (wind speed, proximity to waterway, proximity to susceptible crops (particularly organically certified crops or stock), possibility of rain, growth stage of target plant/s and any other considerations nominated by the manufacturer) and make the decision to proceed or not.
4. Using manufacturer’s directions calculate spray mix volumes required then create the mix.

5. Apply as per manufacturer's guidelines for the method being used.
6. Clean up equipment.
7. Remove traffic control (if established).

Planning points to consider

The aims are to achieve a 'kill' of the target plant/s without causing damage to other plants (including crop plants) and without causing damage to waterway ecology or to downstream areas.

Some of the considerations already mentioned above are:

- Wind speed and/or direction (to minimise 'drift')
- Possibility of rain must be considered since different sprays have differing 'rain fast' periods
- Proximity to waterways may require a different activity for target plant control (perhaps 805R2 - Vegetation Control)
- Treatment of vigorously growing plants achieves best results - conversely, target plants in a dormant state respond poorly and it may even be better to postpone application to a more favourable growth stage.

A risk assessment should consider, among other things, possible effects on adjacent plants, livestock or ecosystems because:

- Some crops are extremely sensitive to herbicides, particularly organically certified crops or stock - even minor doses can have debilitating (or worse) effects
- It is difficult to minimize or localize pollution of waterways which are generally highly sensitive to start with. Waterways also tend to be high profile areas from a public attention point of view, and may contribute to the local water supply.

The following points should be adhered to by the applicator at all times:

- The use of particular application techniques for certain situations
- Wearing of specified PPE at differing stages of the process.

3.8 Activity 805R4 - Litter Removal

Unit of measurement

Square metres (m^2)

Category

Preventative maintenance

Description

All works required to remove litter from on and around structures. The works extend to the structure surface, the immediate approaches including approach embankments (within 50 m of structure) and the area under the structure and extending 10 metres upstream and downstream (refer to Maintenance Envelope in Part One). Pieces of plastic, paper, drink containers, cardboard, glass containers and other debris which have become loose from vehicles are all termed litter.

Restoration standard

Standard to be achieved is reasonable standard of cleanliness and tidiness. The area within the maintenance envelope is to be effectively litter-free.

Related activities

805R1 - Maintain Clean Trafficked Surface

Requirements

Plant

- Utility or light truck

Materials

Nil

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Remove all loose items defined as litter to an approved disposal point to leave the site in a generally tidy state (see Planning Points to Consider).
3. Remove traffic control (if established).

Planning points to consider

1. Given the definition above, litter is thought of as loose, light debris which gives an impression of general untidiness. The related activity 805R1 - Maintain Clean Trafficked Surface is to be used where debris is more substantial and creates a definite safety hazard.

2. Personnel should be aware of the possible presence of hazardous waste and must be prepared and equipped accordingly. This consists of:
   a) Being fully vaccinated against infectious diseases where possible, or being instructed on suitable control measures where vaccination is not available
   b) Having suitable PPE, such as heavy gloves
   c) Having access to a sharps/point collection bin for the disposal of needles.

3.9 Activity 805R5 - Maintain Delineation/Markers/Signs

Unit of measurement

Each

Category

Preventative maintenance

Description

All works associated with:

- Maintaining guide markers/reflectors (replacement or repair or cleaning)
- Maintaining structure delineation
- Maintaining signs (cleaning)

Restoration standard

Functionality of guide markers, delineation and/or signage. All signage and delineation must be in accordance with the MUTCD. Signage replacement requirements should be discussed and confirmed with the local Element Manager for 'Roadside Signage'.

Related activities

805R2 - Vegetation Control

805R3 - Herbicide Spraying

Requirements

Plant

- Utility or light truck
- Air compressor

Materials

- Paint products suitable for the existing system
- Solvent
- Wire brushes, dust brushes, scrapers, sandpaper, and other appropriate hand tools

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).

2. Decide if replacement, repair or cleaning is appropriate for the guide marker and carry out the appropriate works.
3. Identify and replace defective or missing delineators.
4. Check need for and undertake cleaning of sign faces.
5. Where the current configuration is not in accordance with the MUTCD, rectify nonconforming items where possible and schedule the rectification of all outstanding items.
6. Remove traffic control (if established).

Planning points to consider

Ensuring functionality is the single most important consideration for this activity.

3.10 Activity 810R1 - Drill and Inject Termite Poison into Timber

Unit of measurement

Each

Category

Preventative maintenance

Description

All works associated with the poisoning of timber members to protect against termites.

Restoration standard

All girder, corbels and piles to be treated with an approved poison at the specified frequencies, or where termite infestation has been discovered in or adjacent to the component.

Related activities

855R2 - Poison Termite Nests or Trails

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor, with hoses and appropriate nozzles

Materials

- Timber drill
- End caps/treated timber plugs
- Approved termicide

Manpower

- 1 Leading Hand (If applying termicide, must hold Pest Management Ticket)
- 1-2 Labourers (If applying termicide, must hold Pest Management Ticket)
- Traffic control, as required

Approvals

- Generally approved termicides are listed in Figure 17.8 of Part Two of the Timber Bridge Maintenance Manual. Where other products are to be used, approval must be sought from Bridge Asset Management.
- Personnel must have the necessary training and accreditations for handling and application of termicide poisons, in accordance with the appropriate legislation (i.e. Pest Management Ticket).

Work procedures

1. Establish traffic control (if required).

2. Locate existing poison insertion holes and remove the caps/plugs. Where such holes are required but are not present, they shall be inserted in accordance with Figure 7.1(a) in Part One of the Timber Bridge Maintenance Manual.
3. Insert poison into the holes in accordance with the manufacturer's specifications.
4. Insert caps/plugs back into the holes.
5. Remove traffic control (if established).

Planning points to consider

1. Records must be made of the particular chemical/poison used, the date of application, the locations at which the poison was applied and the name of the individual undertaking the works. A copy of these application records should be recorded in the BIS with a hard copy archived for future Audits, and application information stored on site - where necessary, a steel plate shall be attached to the outermost Abutment A headstock for this purpose.

3.11 Activity 815R1 - Clean, Paint and Maintain Handrail/Barrier/Guardrail Furniture

Unit of measurement

Lineal metres (m)

Category

Preventative maintenance

Description

All works associated with the cleaning, painting and general maintenance of handrail/barrier/guardrail furniture.

Restoration standard

There shall be no rusting present on painted or galvanised metallic surfaces. All painted delineation on barriers/guardrail furniture shall be maintained. There shall be no loose or missing fasteners along the full length of the handrail/barrier/guardrail.

Related activities

865R1 - Repair Handrail/Barrier/Guardrail

865R2 - Make Safe Accident Damage to Handrail/Barrier/Guardrail

800R3 - Paint or Repaint Timber Members

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor
- High pressure water blaster
- Sandblaster

Materials

- Paint products suitable for the existing system
- Solvent
- Wire brushes, dust brushes, scrapers, sandpaper, and other appropriate hand tools

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

- If working with lead-based paint systems, the necessary workplace health and safety requirements must be met. Environmental approvals shall also be required for the works.
- The use of chemicals (such as paint solvent) must be conducted in accordance with Part 2, Sections 13 and 13A Chemical Usage (Agricultural and Veterinary) Control Act 1988. Where a permit for chemical usage is deemed necessary, operators shall comply with permit requirements.
- Where a structure is Heritage-listed, The Queensland Heritage Council should be contacted to determine requirements.

Work procedures

1. Establish traffic control (if required).
2. Check all components for loose or missing fasteners, and tighten/replace as required.
3. Install containment/collection apparatus (if required).
4. Prepare the respective surface types requiring repainting using one of the following methods:
   - For galvanized materials
     - if zinc coating thickness has worn thin clean any rust and/or adhering paint back to bare zinc without unduly removing any of that material. Remove dust ready for painting.
     - if zinc coating is in good condition remove any chipped or loose flaking paint. Strongly adhering paint can be left in place and overcoated. Remove dust ready for painting.
   - For bare steel or concrete components:
     - For bare steel - remove all rust and loose flaking paint to the point where the paint is strongly adhering - finally remove dust ready for painting.
     - For concrete - remove loose flaking paint to the point where paint is strongly adhering - clean loose dust ready for painting.
   - Timber components shall be painted or repainted under Activity 800R3.
5. For application of coatings:
   - Where galvanized coating thickness is inadequate - re-build the coating thickness using a cold galvanizing product prior to application of other coatings. Alternatively, where damage is restricted to a small area and a result comparable to 'hot dipping' is required then an electric arc applied product is available for use with 'stick' welders.
   - For all other coating applications follow manufacturer's recommendations on paint application.
6. Clean down area, and remove containment/collection apparatus (if utilised).
7. Remove traffic control (if established).

Planning points to consider

1. What is causing the corrosion? Should other Activities be scheduled to correct the problem? If the corrosion is the result of exposure to moisture from a leaking pipe or joint, maintenance or repair of the source defect must be coordinated with the spot painting.
2. The existing paint system should be identified prior to application of new paint, so that a compatible system may be selected. Ideally, spot painting should be done with the same type of

paint already on the component. If this is not possible, contact Structures Division for advice on a suitable product. Where the existing paint system is identified as being leadbased, additional precautions must be taken in the removal and disposal of the paint system and the PPE requirements of staff.

3. Where possible, spot painting should be done with a matching colour to maintain a consistent appearance.
4. Ensure weather conditions are suitable for the application of the paint system. Paint should not be applied under the following conditions:
    - to surfaces with temperatures over 50° unless the paint is specifically formulated for high temperatures
    - when the relative humidity is above 85%
    - where wind speeds are 25 kph or greater.
5. Grease-like contaminants may be removed by wiping down with a solvent.
6. Newly galvanised surfaces may require etching locally around defects in order to allow overlap of the new coating.

3.12 Activity 815R2 - Clean/Maintain Structure Components

Unit of measurement

Provisional sum ($)

Category

Preventative maintenance

Description

All works associated with cleaning or maintaining the following components or parts of components:

- Pressure-equalising superstructure vent holes in girders and cross-girders
- Bearings/bearing shelves, and other flat surfaces beneath the bridge deck (such as girder flanges)
- Abutment and wingwall weepholes.

Flood debris which is trapped immediately beneath the deck shall also be removed under this activity. Cleaning shall be achieved by using one of the following methods:

- High pressure air blasting, or
- Hand tools (shovels, brooms, spatulas, pole saws, etc.)

The appropriate method shall be dictated by the structure type and recommended by the work procedures in this section.

Restoration standard

The various components or parts of components covered under this activity should be clean and free of dirt, animal droppings and other corrosive contaminants, silt and vegetation accumulations and should perform as intended.

Related activities

815R3 - Pressure Washing of Structure

Requirements

Plant

- Utility or light truck
- Elevated access equipment, if required
- Air compressor, with hoses and appropriate nozzles

Materials

- Bearing grease, grease gun, and degreaser
- Brooms, shovels, spatulas, brushes
- Pole saws and other suitable cutting implements

Manpower

- 1 Leading Hand
- 1-2 Labourers

- Operators, if required
- Traffic control, if required

Approvals

Nil

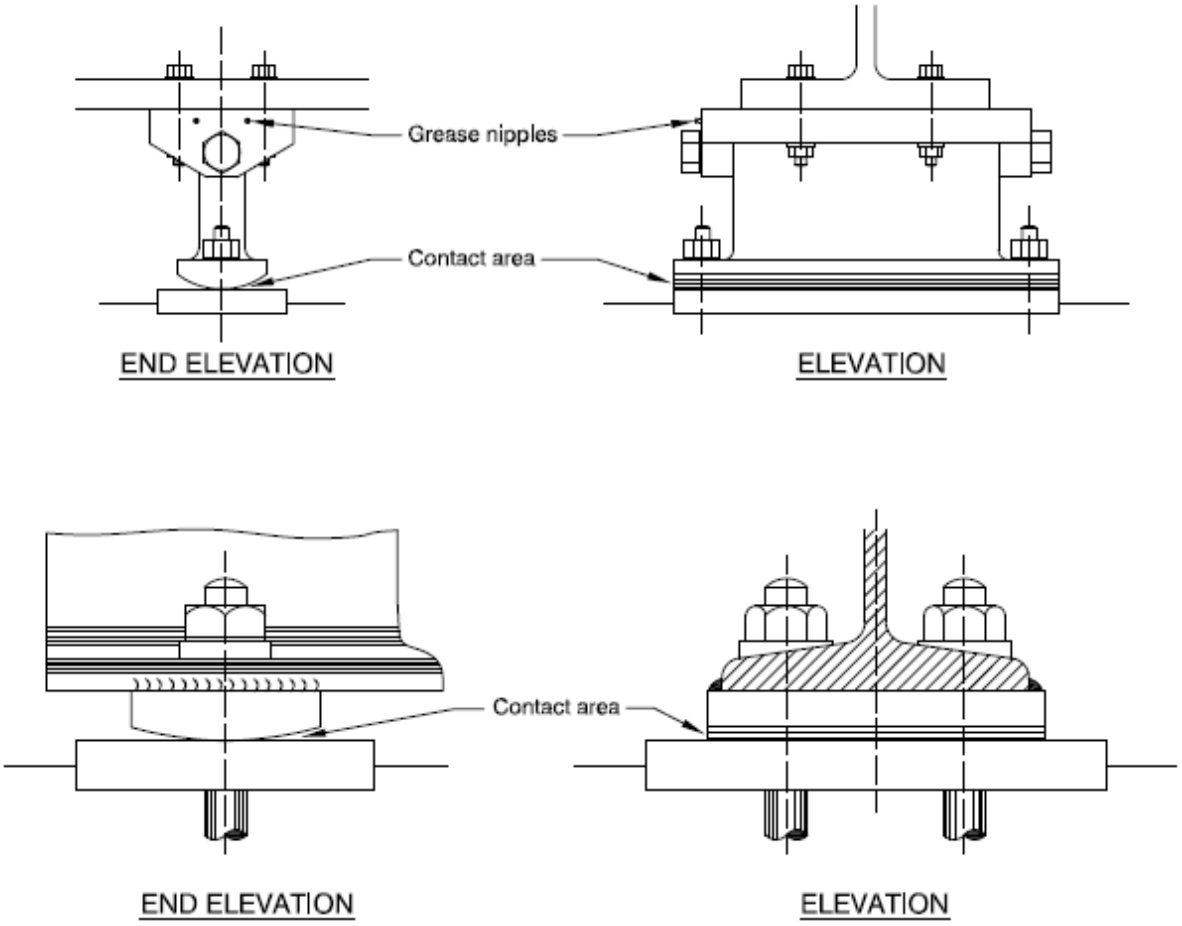
Work procedures

1. Establish traffic control (if required).
2. All surfaces should be dry-cleaned, as follows:
   a. Bearing shelves and other flat surfaces (such as girder flanges) should be cleared of large build-ups of dirt, droppings and other debris. Steel bearings should be greased appropriately (refer Figure 815R2-1 for typical details) and residual bearing grease should be removed with degreaser on absorbent material.
   b. Where bearings are 'walking' off a bearing pedestal or headstock, a steel restraint plate or angle should be fastened to the pedestal/headstock. Where there is sufficient clearance, hardwood packers should be installed under the ends of the deck members as a precaution (refer Figure 815R2-2 for details).
   c. Loose accumulations of flood debris beneath the structure shall be cut into manageable pieces (if required) and removed manually, not dropped into watercourse. Ensure that any material trapped between deck joints or between the deck and ballast wall is removed without damaging the joint.
   d. Superstructure vent holes shall be cleared of blockages using a screwdriver or other suitable probing implement.
   e. Weepholes shall be rodded out with a suitable probing implement or blasted with compressed air, ensuring that the holes are free of blockages. Care should be taken not to damage wingwall 'no-fines' blocks when cleaning weepholes.
3. Remove traffic control (if established).

Planning points to consider

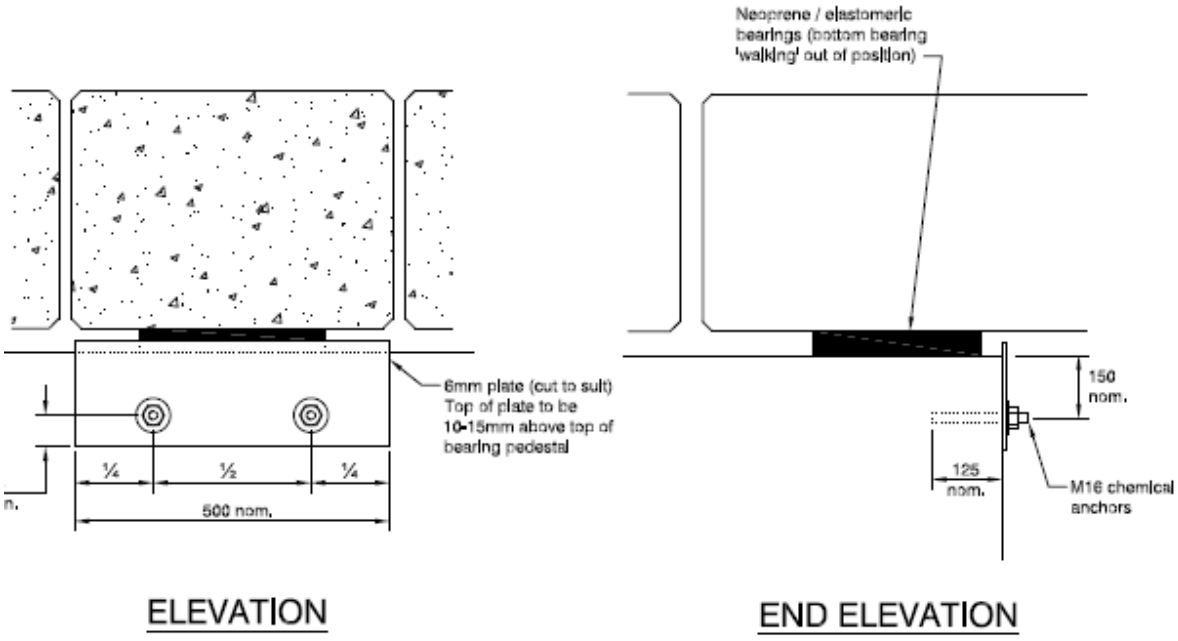
1. Method of disposal of waste from any of the processes requires consideration at planning stage.
2. Where bearing defects are observed (i.e. bearings are seized or 'walking' off the pedestal) they should immediately be referred to Structures Division for investigation and advice on rectification.

Figure 815R2-1 – Application of grease to bridge bearings

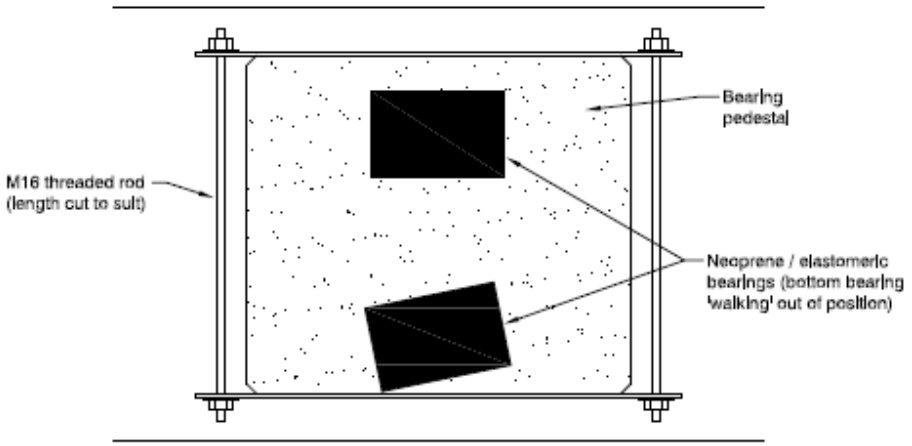


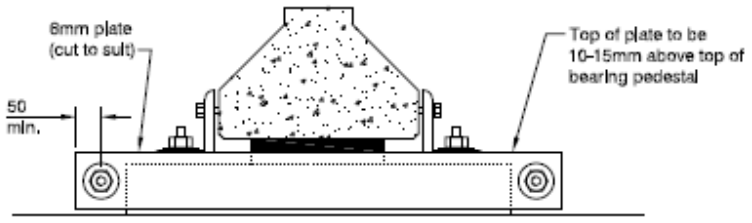
Where grease nipples are present, a suitable protective grease shall be applied at these locations with a grease gun. Grease shall also be applied to contact areas with a brush or piece of cloth.

Figure 815R2-2 – Temporary restraint of 'walking' bearings



TYPICAL DETAILS - DECK UNIT BRIDGES





TYPICAL DETAILS - PSC GIRDER BRIDGES

3.13 Activity 815R3 - Pressure Washing of Structure

Unit of measurement

Square meters (m^2)

Category

Preventative maintenance

All works associated with cleaning all component faces throughout the entire structure. Cleaning shall be achieved by using one of the following methods:

- Low pressure (20MPa) water washing
- High pressure air blasting, or
- Sandblasting.

The appropriate method shall be dictated by the structure type and recommended by the work procedures in this section.

Restoration standard

The structure should be clean and free of dirt and/ or loose rust, animal droppings and other corrosive contaminants, silt and vegetation accumulations.

Related activities

805R1 - Maintain Clean Trafficked Surface

805R4 - Litter Collection

855R3 - Graffiti Treatment

815R2 - Clean/Maintain Structure Components

Requirements

Plant

- Utility or light truck
- Trailer-mounted water tank
- Low pressure water cleaning unit, or, compressor with hoses and appropriate nozzles, or, sandblasting unit
- Elevated access equipment, if required

Materials

- Potable water
- Degreaser
- Brooms, shovels, spatulas, brushes

Manpower

- 1 Leading Hand
- 1-2 Labourers

- Operators, if required
- Traffic control, if required

Approvals

- Approval may be required for the use of potable water for this purpose, depending on the location of the works and the source of the water.
- Works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000).

Work procedures

1. Establish traffic control (if required).
2. All surfaces should be dry-cleaned prior to washing, under activity 815R2.
3. In those cases where water will be allowed to drain through the existing drainage systems, these systems shall be cleaned out prior to washing, under activity 815R4.
4. The following actions shall also be completed prior to washing the structure:
   a. Bridge decks should be swept and all loose dirt and debris removed. Care should be taken not to damage rubber joint diaphragms or joint sealants where present.
   b. All painted members (particularly steel) should be lightly scraped with a non-metallic implement to ensure that all loose and flaking paint is removed without being dropped into the watercourse.
5. Wash the structure with the minimum pressure that will clean the structure without damaging it (refer to Planning Points section below for additional information). Care should be taken when cleaning areas in which loose or flaking paint have been identified.
6. Remove traffic control (if established).

Planning points to consider

1. Ensure that the water pressure is low enough so as not to damage the structure. The goal is to remove surface contaminants and not damage the existing coating system or push bearings out of alignment. For water-based cleaning, this pressure will normally be no greater than 20MPa, however areas of concern should be tested at the intended pressure prior to widespread use.
2. For painted structures, the paint system should be identified so that suitable protective measures can be determined. Some loose paint and rust will be removed by most washing operations, and if the paint system is toxic (e.g. lead-based) then filtration of the water prior to discharge and suitable PPE for personnel will be required.
3. Method of disposal of waste from any of the processes requires consideration at planning stage.
4. Ensure drainage components will not be blocked with debris or otherwise adversely affected by these works. It may be necessary to install filters at drainage points to prevent dirt or debris entering the drainage system. Alternate drainage requirements may need to be considered.
5. Ensure that all cleaning activities are carried out in accordance with current water restrictions.

3.14 Activity 815R4 - Clean/Maintain Drainage Components

Unit of measurement

Provisional sum ($)

Category

Preventative maintenance

Description

All works associated with cleaning and clearing the following range of drainage components or parts of drainage components:

- Scuppers and associated drainage systems
- Deck joint drainage systems
- Bearing shelf drainage systems.

Cleaning/clearing shall be achieved by using one of the following methods:

- Low pressure (20MPa) water washing
- High pressure air blasting, or
- Manual rodding or dynamic rodding systems.

The appropriate method shall be dictated by the drainage configuration and recommended by the work procedures in this section.

Restoration standard

The various drainage systems should be clean and free of dirt, silt and vegetation accumulations and should perform as intended. All total or partial blockages shall be removed, and water should flow freely throughout the system.

Related activities

805R1 - Maintain Clean Trafficked Surface

815R2 - Clean/Maintain Structure Components

815R3 - Pressure Washing of Structure

Requirements

Plant

- Utility or light truck
- Trailer-mounted water tank
- Rodding equipment (dynamic rodding equipment, where required, shall be provided by Contractor)
- Low pressure water cleaning unit, or, compressor with hoses and appropriate nozzles
- Elevated access equipment, if required

Materials

- Potable water
- Brooms, shovels, spatulas

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, if required
- Traffic control, if required

Approvals

- Approval may be required for the use of potable water for this purpose, depending on the location of the works and the source of the water.
- Works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000).

Work procedures

1. Establish traffic control (if required).
2. Ensure deck area adjacent to scupper/drainage inlets is clear and free of debris (under Activity 805R1).
3. Scuppers and drainage pipes should be rodded with care to prevent damage to PVC or CI drainage components.
4. Flush scuppers/drainage pipes with low-pressure water wash or compressed air blast.
5. Where enclosed drainage systems are completely bound up with sand or the like it may be necessary to use a dynamic rodding technique working from the bottom end of the system (planning the discharge of removed material is crucial). If it is necessary to repair or dismantle the drainage system or associated components in order to restore full functionality, then this shall be raised as programmed maintenance.
6. Remove traffic control (if established).

Planning points to consider

1. Ensure that the water pressure is low enough so as not to damage the drainage components. The goal is to clear out residual material which was not removed by rodding, and to ensure water can flow freely through the system. Using a water pressure no greater than 20MPa should prevent damage, however areas of concern should be tested at the intended pressure prior to widespread use.
2. Method of disposal of waste from any of the processes requires consideration at planning stage.
3. Ensure that all cleaning activities are carried out in accordance with current water restrictions.

3.15 Activity 820R1 - Tighten Existing Bolts - Timber Structures

Unit of measurement

Each

Category

Preventative maintenance

Description

This activity covers all works necessary to tighten all bolts on timber structures.

Restoration standard

Restoration standard requires all bolts tightened to refusal. However, care should be taken to prevent over-tightening and subsequent crushing of the timber beneath the washers. All components shall be free of corrosion.

Related activities

Nil

Requirements

Plant

- Job truck
- Oxyacetylene kit
- Compressor and impact wrench with variable torque
- Elevated access equipment or scaffolding, as required

Materials

- Bolt/nut/washer components as required
- Wrench

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Refer to 'Planning Points to Consider' for details of the required approvals.

Work procedures

1. Establish traffic control (if required).
2. Identify the particular bolts requiring tightening.
3. Components showing signs of minor surface corrosion shall be cleaned back and treated with a protective coating of grease. Where washers are missing behind bolt heads or nuts, these shall be added prior to tightening.

4. Carry out the tightening process. Should any bolts require replacement Structures Division should be contacted for advice on whether there are any issues with the use of oxy in a particular application as an aid to bolt removal.
5. Check bolts are functioning as intended (for example - the bolts may be tightened to refusal but this could be as a result of threads being bound with corrosion).
6. Disestablish traffic control (if established).

Planning points to consider

1. It is essential that replacement bolts are of the correct grade and size - this may require consultation with Structures Division to confirm requirements (plans are not always available locally to enable confirmation of this requirement). Where applicable, bolts shall confirm to the details provided in Section 17.1 of Part Two of the Timber Bridge Maintenance Manual.
2. Consider the need to apply protective coatings to new and existing bolting hardware.
3. The cause of bolt looseness should be investigated to determine if decay or deterioration of the member has contributed to the looseness. If this is the case, the member may require replacement under programmed maintenance.
4. Before tightening takes place the deck should be inspected to determine if there is sufficient camber in the deck planks. If recambering is required, this should be scheduled under programmed maintenance.
5. Consider the effects of heavy rain or submergence on timber components. Tightening of bolts should be avoided when the timber is swollen with moisture absorption, as the timber will tend to shrink as it dries out and the bolts will be loose once again.

3.16 Activity 820R2 - Tighten Footpath Fasteners (Self-drilling Screws)

Unit of measurement

Each

Category

Preventative maintenance

Description

This activity covers all works necessary to tighten all fasteners for footpath sheeting.

Restoration standard

Restoration standard requires all fasteners to be tightened to refusal. However, care should be taken to prevent over-tightening and subsequent crushing of the timber. All fasteners shall be free of corrosion.

Related activities

Nil

Requirements

Plant

- Job truck

Materials

- Bolt/nut/washer components as required

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Refer to 'Planning Points to Consider' for details of the required approvals.

Work procedures

1. Establish traffic control (if required).
2. Identify the particular fasteners requiring tightening.
3. Components showing signs of minor surface corrosion shall be cleaned back and treated with a protective coating of grease. Where washers are missing behind bolt heads or nuts, these shall be added prior to tightening.
4. Carry out the tightening process.
5. Check fasteners are functioning as intended.
6. Disestablish traffic control (if established).

Planning points to consider

1. It is essential that replacement fasteners are of the correct grade and size - this may require consultation with Structures Division to confirm requirements (plans are not always available locally to enable confirmation of this requirement).
2. Consider the need to apply protective coatings to new and existing fasteners.
3. Where loosening of the fasteners and decking persists, it may be necessary to install lock nuts or spring washers.
4. Consider the effects of heavy rain or submergence on timber components. Tightening of fasteners should be avoided when the timber is swollen with moisture absorption, as the timber will tend to shrink as it dries out and the fasteners will be loose once again.

3.17 Activity 820R3 - Tighten Existing Bolts - Steel and Concrete Structures

Unit of measurement

Each

Category

Preventative maintenance

Description

This activity covers all works necessary to tighten all non-structural bolts on steel and concrete structures. Structural bolts may also be tightened under this activity, provided that such works are undertaken in accordance with an approved structure-specific process issued by Structures Division (refer to 'Planning Points to Consider' for further clarification).

Restoration standard

Restoration standard requires all bolts tightened to the required torque and functioning as intended. Where functionality is significantly reduced the affected component of the bolt/nut/washer combination should be replaced with the correct grade and size.

Related activities

Nil

Requirements

Plant

- Job truck
- Compressor and impact wrench with variable torque
- Oxyacetylene kit

Materials

- Bolt/nut/washer components as required

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Refer to 'Planning Points to Consider' for details of the required approvals.

Work procedures

1. Establish traffic control (if required)
2. Identify the particular bolts requiring tightening;

   2.1. Carry out the tightening process.
   2.2. Should any bolts require replacement Structures Division should be contacted for advice on:

   - The number of bolts in any one bolt group which can be removed at the one time

- Whether there are any issues with the use of oxy in a particular application as an aid to bolt removal

3. Check bolts are functioning as intended (for example - the required torque setting may be reached but could be as a result of threads being bound with paint).
4. Disestablish traffic control (if established).

Planning points to consider

1. The tightening of structural bolts (typically Grade TF or TB) may only be undertaken in accordance with an approved structure-specific process issued by Structures Division. Any observed performance issues pertaining to such bolts should be reported to Structures Division immediately.
2. Typically, the only bolts to be tightened as part of this activity will be:
   - Non-structural bolts (Grade S), such as bridge rail bolts and girder hold-down bolts. These bolts will be tightened to 'snug tight' unless otherwise specified.
   - Bolts which are contained within a non-structural pre-fabricated component, such as bolts/nuts within a deck expansion joints. These shall be tightened in accordance with manufacturer's specifications.
3. It is essential that replacement bolts are of the correct grade and size - this may require consultation with Structures Division to confirm requirements (plans are not always available locally to enable confirmation of this requirement).
4. Consider the need to apply protective coatings to new and existing bolting hardware.

3.18 Activity 850R1 - Emergency Temporary Pavement Repairs

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

This activity covers all works necessary to provide emergency repairs to structure DWS or to structure approach pavement within the maintenance envelope which has unexpectedly deteriorated, and has created or will quickly create a safety problem. The intention is to provide a temporary fix for the defect until more permanent works can be arranged.

Restoration standard

All repaired areas shall be filled with 'cold mix' flush with the surrounding levels.

Related activities

850R3 - DWS/Pavement Repairs (Manual)

850R4 - DWS/Pavement Repairs (Mechanical)

850R5 - Footway DWS Repairs (Manual or Mechanical)

Requirements

Plant

- Job truck
- Jet patcher
- Plate compactor
- Air compressor with appropriate hoses and nozzles (optional)

Materials

- Cold mix (as per AS 4283)
- Emulsion Tack Coat (as per MRS 11.12)

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Nil

Work procedures

1. Establish traffic control (if required).

2. Identify problem areas and clean the holes - usually a stiff brooming provides a sufficiently clean surface (if water is present in the hole, remove it using the same method, or dry the hole out with blasts of compressed air).
3. Apply tack coat.
4. Fill with cold mix to a level which takes compaction into account - aim to match the surrounding surface levels after compaction of the mix.
5. Use a plate compactor to compact the loose mix to the desired level.
6. Clean away loose material from the patch repair area/pavement surface.
7. Remove traffic control (if established).

Planning points to consider

1. Is this activity suitable for the scale of the operation (see related activities)?
2. This activity should only be used as a temporary measure, until such time as permanent repairs can be effected. The permanent repair should be planned and scheduled as soon as possible.
3. Consider the possibility of underlying deck problems requiring repair. With timber structures, potholes may be indicative of defective deck members. Rectification of such defects must be undertaken prior to or in conjunction with any repair works.
4. The trafficable surface must be kept safe throughout the duration of the repair works. This includes the removal of loose material, ensuring that markings are clear and hazard signage is in place, and that transitions are provided into and out of the treatment area.

3.19 Activity 850R2 - Sealing of Pavement Cracks

Unit of measurement

Litre (L)

Category

Reactive maintenance

Description

This activity covers all works necessary to seal cracks in either spray sealed or asphalt surfaces across structures or on approach pavements within the maintenance envelope of the structure (this includes longitudinal cracking in the carriageway shoulders). The aim is to prevent surface water from infiltrating to lower pavement or embankment levels or to underlying parts of the structure.

Restoration standard

All cracks in the pavement shall be sealed across their entire area, flush with the surrounding pavement surface.

Related activities

850R3 - DWS/ Pavement Repairs (Manual)

850R4 - DWS/ Pavement Repairs (Mechanical)

850R5 - Footway DWS Repairs (Manual or Mechanical)

Requirements

Plant

- Job truck
- Crack sealing unit
- Heater for use with sealing compound (if required - refer to manufacturer's specification)
- Air compressor with appropriate hoses and nozzles (optional)

Materials

- Rubberised crack sealing compound (Megaprene Hot Melt or similar approved product)

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify problem areas and ensure cracks are clean and dry. Any debris, dirt or moisture shall be removed with a broom or blasts of compressed air.

3. Where 'shoving', 'rutting' or other deformation has pushed the edges of a crack above the surrounding pavement surface, the protruding edges shall be corrected prior to sealing of the crack.
4. Once the crack sealing unit has heated the blocks to required temperature, proceed to fill the cracks, working backward away from the interface between 'hot' and 'cold' areas. Take care on large grades or crossfalls that hot material does not unduly migrate to the lowest point.
5. Remove traffic control (if established).

Planning points to consider

1. Crack sealing compound must not be overheated, otherwise it quickly oxidises, leading to it becoming brittle early in its service life - ensure crack sealing unit has good temperature control, and that the compound temperature is kept within the range recommended by the manufacturer.
2. Embrittlement can also occurs if the cold compound is heated too quickly - ensure heating/ sealing unit operates at slow rates of heating - in some instances, this can mean loading and heating a large hopper full of sealant material the afternoon before it is required.
3. A number of small jobs conducted over an extended time span requires repeated heating and cooling of the sealant material - this situation should be avoided wherever possible. Program the rectification of a number of problem structures to provide some continuity and volume throughput if the opportunity arises.
4. This process requires heating large quantities of rubberised compound to temperatures around 170° C. When compiling the risk assessment, the Project Manager should give special consideration to those safety procedures that are required in order to protect personnel working in close proximity to the molten repair material.
5. Avoid over-application of product, as this may result in areas of reduced skid resistance within segments of the carriageway (also known as 'tar snakes').

3.20 Activity 850R3 - DWS/Pavement Repairs (Manual)

Units of measurement

Tonnes (T)

Category

Reactive maintenance

Description

This activity covers all works necessary to excavate and permanently repair failed areas of deck wearing surface and/ or approach pavement within the maintenance envelope using principally manual means. Typically used where the amount of repair material required is less than or equal to 2 tonnes.

Restoration standard

Restoration requires failed areas of DWS or approach pavement to be excavated:

- to 150 mm depth in approach pavements
- to full depth in areas of DWS over concrete or timber.

Excavations shall be filled with asphalt compacted to the requirements of MRS 11.30 and finished to conform to surrounding levels.

Related activities

850R4 - DWS/Pavement Repairs (Mechanical)

850R5 - Footway DWS Repairs (Manual or Mechanical)

Requirements

Plant

- Job truck
- Tack coat application plant
- Compressor and jackhammers
- Compaction equipment (pedestrian roller or plate compactor)
- Jet patcher/flowcon truck

Materials

- Asphalt (as per MRS 11.30)
- Emulsion Tack Coat (as per MRS 11.12)

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Mark out the area to be excavated and carry out excavation:

    2.1 Sawcut the margins of the excavation where possible - (sawcutting the margins of the excavation prior to excavation helps to prolong the life of the repair).

    2.2 In the case of DWS over concrete, steel or timber deck (particularly plywood decking) observe extreme care not to damage the structural underlying decking with jackhammers or sawcuts. If the depth of the DWS is not known, it should be determined by localised testing (such as coring) or calculation based on height of the kerb above the surface.

    2.3. Care must also be taken to avoid damaging expansion joints or joint sealant adjacent to the DWS at the pier. Where entire or partial fixed joints are removed during the course of the works, they must be fully reinstated to their original standard. Expansion joint components are NOT to be removed or affected unless directed by an engineer from Structures Division.

    2.4. Take particular care in the area of relieving slabs - subsidence can create steeply sloping concrete surfaces over which it is difficult to maintain safety margins with excavating equipment. The cause of any such subsidence should be determined and rectified prior to carrying out the permanent repair (refer Planning Point 2).

    2.5. Remove all loose material from the excavation.

    2.6. Clean the repair area with blasts of compressed air to ensure all moisture and small material is removed from the repair area.

    2.7. Dispose of excavated material to designated spoil areas.

3. Apply tack coat.
4. Asphalt to be placed and compacted in layers as per specification - cooling time before trafficking can be a consideration particularly in hot weather.
5. Remove traffic control (if established).

Planning points to consider

1. Is this activity suitable for the scale of the operation (see Description and Related Activities).
2. Consider the possibility of underlying deck problems requiring repair. With timber structures, potholes may be indicative of defective deck members. Subsidence of relieving slabs may be the result of settlement or loss of the embankment material. Rectification of such defects must be undertaken prior to or in conjunction with any repair works.
3. Consider the need for re-marking linemarking on the running surface or temporary marking in the interim.
4. The trafficable surface must be kept safe throughout the duration of the repair works. This includes the removal of loose material, ensuring that markings are clear and hazard signage is in place, and that transitions are provided into and out of the treatment area.

3.21 Activity 850R4 - DWS/Pavement Repairs (Mechanical)

Units of measurement

Tonnes (T)

Category

Reactive maintenance

Description

This activity covers all works necessary to excavate and permanently repair failed areas of deck wearing surface and/or approach pavement within the maintenance envelope using mainly mechanical means. Typically used where the amount of repair material required is greater than 2 tonnes but is less than 10 tonnes. Where repair material in excess of 10 tonnes is required, the works should be conducted under programmed maintenance.

Restoration standard

Restoration requires failed areas of DWS or approach pavement to be excavated:

- to 150 mm depth in approach pavements
- to full depth in areas of DWS over concrete or timber.

Excavations shall be filled with asphalt compacted to the requirements of MRS 11.30 and finished to conform to surrounding levels.

Related activities

850R3 - DWS/Pavement Repairs (Manual)

850R5 - Footway DWS Repairs (Manual or Mechanical)

Requirements

Plant

- Heavy truck
- Job truck
- Bobcat/backhoe/loader/excavator
- Bobcat Profiler (larger if the job warrants)
- Compaction Plant (CC10 roller or plate compactor)
- Tack coat application plant
- Jet patcher/flowcon truck

Materials

- Asphalt (as per MRS 11.30)
- Emulsion Tack Coat (as per MRS 11.12)

Manpower

- 1 Leading Hand
- 2 Labourers

- Plant Operators as required
- 2 Traffic Controllers (if required)

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Mark out the area to be excavated and carry out excavation using the plant chosen for that application.

    2.1. Sawcut the margins of the excavation where possible - (sawcutting the margins of the excavation prior to excavation helps to prolong the life of the repair).

    2.2. In the case of DWS over concrete, steel or timber deck (particularly plywood decking) observe extreme care when excavating with some of the larger profilers to ensure underlying deck surface is not damaged, particularly as mechanical means are to be used.

    2.3. Care must also be taken to avoid damaging expansion joints or joint sealant adjacent to the DWS at the pier. Where entire or partial fixed joints are removed during the course of the works, they must be fully reinstated to their original standard. Expansion joint components are NOT to be removed or affected unless directed by an engineer from Structures Division.

    2.4. Take particular care in the area of relieving slabs - subsidence can create steeply sloping concrete surfaces over which it is a more difficult to maintain safety margins on cutting head separation from those underlying surfaces. The cause of any such subsidence should be determined and rectified prior to carrying out the permanent repair (refer Planning Point 2).

    2.5. Remove all loose material from the excavation.

    2.6. Clean the repair area with blasts of compressed air to ensure all moisture and small material is removed from the repair area.

    2.7. Dispose of excavated material to designated spoil area.

3. Apply tack coat.
4. Asphalt to be placed and compacted in layers as per specification - cooling time before trafficking can be a consideration particularly in hot weather.
5. Remove traffic control (if established).

Planning points to consider

1. Is this activity suitable for the scale of the operation (see Description and Related Activities).
2. Consider the possibility of underlying deck problems requiring repair. With timber structures, potholes may be indicative of defective deck members. Subsidence of relieving slabs may be the result of settlement or loss of the embankment material. Rectification of such defects must be undertaken prior to or in conjunction with any repair works.
3. Consider the need for re-marking the linemarking on the running surface or temporary marking in the interim.

4. The trafficable surface must be kept safe throughout the duration of the repair works. This includes the removal of loose material, ensuring that markings are clear and hazard signage is in place, and that transitions are provided into and out of the treatment area.

3.22 Activity 850R5 - Footway DWS Repairs (Manual or Mechanical)

Unit of measurement

Tonnes (T)

Category

Reactive maintenance

Description

This activity covers all works necessary to excavate and repair failed areas of footway deck wearing surface and/ or footway approach pavement within the maintenance envelope.

Restoration standard

Restoration requires failed areas of DWS or approach pavement to be excavated:

- to 75 mm depth in approach pavements
- to full depth in areas of DWS over concrete or timber.

Excavations shall be filled with asphalt compacted to the requirements of MRS 11.30 and finished to conform to surrounding levels.

Related activities

850R3 - DWS/Pavement Repairs (Manual)

850R4 - DWS/Pavement Repairs (Mechanical)

Requirements

Plant

- Job truck
- Tack coat application plant
- Compressor and jackhammers
- Bobcat profiler
- Concrete saw
- Compaction equipment (pedestrian roller or plate compactor)
- Jet patcher/flowcon truck

Materials

- Asphalt (as per MRS 11.30)
- Emulsion Tack Coat (as per MRS 11.12)

Manpower

- 1 Leading Hand
- 2 Labourers
- 2 Traffic Controllers (if required)

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Mark out the area to be excavated and carry out excavation:

    2.1. Sawcut the margins of the excavation where possible - (sawcutting the margins of the excavation helps to prolong the life of the repair).

    2.2. In the case of DWS over concrete, steel or timber deck (particularly plywood decking) observe extreme care not to damage the structural underlying decking with jackhammers or sawcuts.

    2.3. Care must also be taken to avoid damaging expansion joints or joint sealant adjacent to the DWS at the pier. Where entire or partial fixed joints are removed during the course of the works, they must be fully reinstated to their original standard. Expansion joint components are NOT to be removed or affected unless directed by an engineer from Structures Division.

    2.4. Take particular care in the area of relieving slabs - subsidence can create steeply sloping concrete surfaces over which it is a more difficult to maintain safety margins with excavating equipment. The cause of any such subsidence should be determined and rectified prior to carrying out the permanent repair (refer Planning Point 2).

    2.5. Remove all loose material from the excavation.

    2.6. Clean the repair area with blasts of compressed air to ensure all moisture and small material is removed from the repair area.

    2.7. Dispose of excavated material to designated spoil areas.

3. Apply tack coat.
4. Asphalt to be placed and compacted in layers as per specification - cooling time before trafficking can be a consideration particularly in hot weather.
5. Remove traffic control (if established).

Planning points to consider

1. Is this activity suitable for the scale of the operation (see Description and Related Activities).
2. Consider the possibility of underlying deck problems requiring repair. With timber structures, potholes may be indicative of defective deck members. Subsidence of relieving slabs may be the result of settlement or loss of the embankment material. Rectification of such defects must be undertaken prior to or in conjunction with any repair works.
3. Consider the need for re-marking linemarking on the running surface or temporary marking in the interim.
4. The trafficable surface must be kept safe throughout the duration of the repair works. This includes the removal of loose material, ensuring that markings are clear and hazard signage is in place, and that transitions are provided into and out of the treatment area.

3.23 Activity 850R6 - Lay Tingling

Units of measurement

Lineal metres (m)

Category

Reactive maintenance

Description

All works required to lay tingling over excessive gaps between hardwood deck planks prior to the placement of deck wearing surface (DWS).

Restoration standard

All excessive gaps in the timber deck (i.e. those gaps which are wide enough to allow DWS to pass through them) to be covered with tingling prior to the application of DWS

Related activities

850R1 - Emergency Temporary Pavement Repairs

850R3 - DWS/Pavement Repairs (Manual)

850R4 - DWS/Pavement Repairs (Mechanical)

850R5 - Footway DWS Repairs (Manual or Mechanical)

Requirements

Plant

- Utility or light truck

Materials

- Metal strips
- Coach screws, clouts or other suitable fasteners
- Tools sufficient for forming holes in metal strips and inserting fasteners

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify locations requiring tingling, and cut metal strips to required lengths.
3. Attach metal strips to deck with fasteners. Only one edge of the metal strip should be fastened to the deck, as this will allow for minor movement without placing strain on the fasteners or deck planks.

4. Undertake DWS repair in accordance with relevant activity.
5. Disestablish traffic control.

Planning points to consider

Make sure that the deck planks to which the tingling is fastened are in good condition. Tingling which is connected to rotten or defective planks will tend to vibrate loose. Where necessary, deck planks may need to be repaired or replaced under scheduled rehabilitation works prior to installation of DWS.

3.24 Activity 855R1 - Reapply Non-slip Surfacing

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works required for the repair of existing non-slip surfacing on plywood footpath sheeting. The surfacing will normally consist of a thin layer (20 mm) of asphalt, but other suitable approved products may be used.

Restoration standard

The non-slip surfacing shall be fully intact across the entire length and width of the footway. There shall be no delaminations or missing patches of surfacing.

Related activities

Nil

Requirements

Requirements shown below are for asphalt surfacing only. Other surfacing types will most likely have different requirements. These should be discussed with the manufacturer of the surfacing product and determined prior to commencement of the work.

Plant

- Job truck
- Jet patcher/flowcon truck
- Plate compactor
- Air compressor with appropriate hoses and nozzles (optional)

Materials

- Asphalt (as per MRS 11.30)
- Emulsion Tack Coat (as per MRS 11.12)

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control (if required)

Approvals

Nil

Work procedures

Establish traffic control (if required).

For asphalt surfacing:

1. Where delamination or deterioration has occurred, mark out the area of surfacing to be removed and sawcut the margins (sawcutting the margins of the repair area will provide straight, level edges to work against, and will help to prolong the life of the repair).
2. Observe extreme care not to damage the structural underlying decking with the sawcuts. If the depth of the DWS is not known, it should be determined by localised testing (such as probing at deck joints) or calculation based on height of the kerb above the surface.
3. Care must also be taken to avoid damaging expansion joints or joint sealant adjacent to the asphalt at the pier. Where entire or partial fixed joints are removed during the course of the works, they must be fully reinstated to their original standard. Expansion joint components are NOT to be removed or affected unless directed by an engineer from Structures Division.
4. Remove all loose material from the repair area.
5. Clean the repair area with blasts of compressed air to ensure all moisture and small material is removed from the repair area.
6. Dispose of excavated material to designated spoil areas.
7. Apply tack coat and place and compact asphalt. Allow sufficient cooling time before permitting pedestrians to use the footway.

For other surfacing types

Advice should be sought from the surfacing manufacturer as to the most suitable process for undertaking repairs to individual defects.

Remove traffic control (if established).

Planning points to consider

1. Consider the possibility of underlying deck problems requiring repair. Ineffective or missing distributors may result in cracking at the deck joints and damage to adjacent areas. Rectification of such defects must be undertaken prior to or in conjunction with any repair works.

3.25 Activity 855R2 - Poison Termite Nests or Trails

Unit of measurement

Each

Category

Reactive maintenance

Description

All works associated with the poisoning of termite nests or trails on timber components.

Restoration standard

All known termite nests or trails to be treated with an approved termicide.

Related activities

810R1 - Drill and Inject Termite Poison into Timber

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor, with hoses and appropriate nozzles

Materials

- Timber drill
- End caps/treated timber plugs
- Approved termicide

Manpower

- 1 Leading Hand (If applying termicide, must hold Pest Management Ticket)
- 1-2 Labourers (If applying termicide, must hold Pest Management Ticket)
- Traffic control, as required

Approvals

- Generally approved termicides are listed in Figure 17.8 of Part Two of the Timber Bridge Maintenance Manual. Where other products are to be used, approval must be sought from Bridge Asset Management.
- Personnel must have the necessary training and accreditations for handling and application of termicide poisons, in accordance with the appropriate legislation (i.e. Pest Management Ticket).

Work procedures

Establish traffic control (if required).

For insertion of poison into drilled holes:

1. Locate existing poison insertion holes and remove the caps/plugs. Where such holes are required but are not present, they shall be inserted in accordance with Figure 7.1(a) in Part One of the Timber Bridge Maintenance Manual.
2. Insert poison into the holes in accordance with the manufacturer's specifications.
3. Insert caps/plugs back into the holes.

For application of termicide dust:

1. Where required, drill access holes into the component to be treated.
2. Apply the dust to the trails or within the chamber with an approved blower.
3. Where holes were drilled for application, seal the holes with caps/plugs.

Remove traffic control (if established).

Planning points to consider

1. Records must be made of the particular chemical/poison used, the date of application, the locations at which the poison was applied and the name of the individual undertaking the works. A copy of these application records should be recorded in the BIS with a hard copy archived for future Audits, and application information stored on site - where necessary, a steel plate shall be attached to the outermost Abutment A headstock for this purpose.
2. Where the treatment is carried out by external (i.e. non-Departmental) personnel, the completion of the necessary records (as described above) shall be included in the works. A copy of the records shall be recorded in the BIS upon completion of the works.

3.26 Activity 855R3 - Graffiti Treatment

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works required to:

- Remove graffiti using methods such as water-blasting, sandblasting and manual effort, either in association with, or independent of the use of, commercially available graffiti cleaners.
- Mask graffiti by methods such as over-painting.

Restoration standard

Standard to be achieved is either:

- Effective removal of graffiti without damage to underlying surfaces or 'shadowing' of the original problem through the contrasting of newly cleaned surfaces against surrounding weathered surfaces.
- Effective masking of problem areas by over-painting with acrylic paint to match the colour of the surrounding surface.

Related activities

815R2 - Clean/Maintain Structure Components

Requirements

Plant

- Utility or light truck
- High pressure water blaster/'wet' sand blaster

Materials

Commercially available graffiti remover/acrylic paint

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

The use of chemicals (such as graffiti cleaner) must be conducted in accordance with Part 2, Sections 13 and 13A Chemical Usage (Agricultural and Veterinary) Control Act 1988. Where a permit for chemical usage is deemed necessary, operators shall comply with permit requirements.

Work procedures

1. Establish traffic control (if required).

2. Carry out the appropriate process (see planning points).

3. Disestablish traffic control.

Planning points to consider

Decide which process may be more applicable for the circumstances:

- Graffiti which has weathered for some time is generally more difficult to remove and thus 'masking' may be more appropriate
- Graffiti applied with enamel based paint generally resists removal - once again 'masking' may prove more effective than removal
- Where graffiti is applied to sign faces the chemicals or the removal process itself could affect the sign's reflectivity - use of the process on a trial area may be appropriate.

Damage to concrete surfaces is to be avoided from a durability point of view. Roughening of the surface and removal of the mortar rich outer layer significantly affect long term durability.

When using the masking process consider the difficulty of matching colours (paint - existing) and the patchwork affect that small areas of masking could create. The solution may be to apply masking to slightly larger areas than the minimum required to cover the particular problem – try to achieve more regular shapes.

3.27 Activity 855R4 - Lay 3mm Galvanised Steel Plate Decking

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works involved with the supply and placement of thin galvanised steel plates over isolated areas of deteriorated hardwood planks.

Restoration standard

All areas of deteriorated decking planks to be covered with galvanised plate. However, if more than two adjacent planks or three individual planks are identified as being defective within a single metre length of the repair area, then new deck planks will be required.

Related activities

Nil

Requirements

Plant

- Utility or light truck
- Timber drill and other tools appropriate for inserting fasteners
- Compressor

Materials

- 3 mm thick galvanised steel plates of appropriate sizes
- Coach screws or other appropriate fasteners
- Densotape or equivalent

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Remove loose dirt and debris from the surface of the deck.
3. Cover the area to be plated with a layer of Densotape.

4. Drill holes for screws/fasteners at opposite corners of the plate area. Attach the steel plates to the deck at these locations, and drill the remainder of the required holes using the plate as a template.
5. Insert the remaining screws/fasteners.
6. Disestablish traffic control.

Planning points to consider

- The spacing of the grid should be determined and the steel plates cut to size and drilled prior to the commencement of the works.
- If more than two adjacent planks or three individual planks are identified as being defective within a single metre length of the proposed repair area, then this method of repair is not suitable, and new deck planks will be required.
- Consideration must be given to the proposed location of the repair. Where defects in the deck planks are located directly within the wheelpath, then new deck planks will be required. If there are any concerns about the suitability of this repair technique for a particular situation, advice should be sought from Structures Division.

3.28 Activity 855R5 - Replace or Provide Metal Caps to Member Ends

Unit of measurement

Each

Category

Reactive maintenance

Description

All works involved with the supply of metal caps to the ends of headstocks, wales and pile tops. Where existing caps are badly corroded or damaged, they shall also be replaced under this activity

Restoration standard

The ends of all headstocks, walers and pile tops shall be covered with a metal cap.

Related activities

800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required

Materials

- 24 gauge galvanised iron sheets of appropriate sizes
- Galvanised nails

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Where corroded or damaged metal caps are present, remove them from member ends.
3. Clean loose dirt and debris from member ends.
4. Treat member ends with an approved preservative under Activity No 800R2.
5. Nail the metal caps into place.
6. Disestablish traffic control.

Planning points to consider

An estimate of the number of metal caps required should be made prior to conducting the works, to ensure that sufficient materials are available on site to complete the works while the traffic control is in place

3.29 Activity 860R1 - Repair Scouring/Deposition of Waterway Material

Unit of measurement

Cubic metres (m^3)

Category

Reactive maintenance

Description

This activity covers all works necessary to repair the following defects, generally with rip-rap:

- Scouring of batter protection, or
- Scouring of embankment material caused by batter protection, or
- Formation of localised scour holes within bed or embankment material (possibly encompassing piled foundations) in excess of 2 metres deep, or
- Scouring at either inlets or outlets of culverts and other drainage structures.

It also covers the removal of deposited material, where such deposits have reduced the waterway area by more than 20% or have changed the direction of flow to so as to cause scouring of the banks.

Restoration standard

In each case restoration of original surface levels and surface shape is required unless specified elsewhere.

Related activities

860R2 - Remove Flood Debris from Waterway

860R3 - Maintain Clear Waterway

860R4 - Maintain Existing Waterway Protection

Requirements

Plant

- Heavy truck
- Job truck
- Bobcat/backhoe/loader/excavator

Materials

- Rock (as per MRS 11.03)
- Geotextiles (as per MRS 11.03)

Manpower

- 1 Leading Hand
- 2 Labourers
- 1 Plant Operator
- 2 Traffic Controllers (if required)

Approvals

- Where alteration to the bed or banks of a stream (including vegetation) is required, the works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000).
- In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds' declarations) have been obtained prior to commencement of works.

Work procedures

Establish traffic control (if required).

For placing fill material (refer to Figure 860R1-1 for some typical details):

1. Insert a layer of geotextile material in the hole, ensuring that sufficient material is present to accommodate movement once the riprap is placed.
2. Piles or other structural components shall be covered with a layer of compressible material.
3. Place the riprap in the scour hole, taking care to ensure that the geotextile material is not damaged or moved significantly in the process. Riprap may be dumped, placed by hand or placed mechanically. Care must be taken not to damage the structure in the process.
4. Riprap should not extend significantly above the original profile of the streambed, as this may act as an obstruction.
5. Upon completion of the works, remove all excess material from the waterway and revegetate as required.

For excavating material:

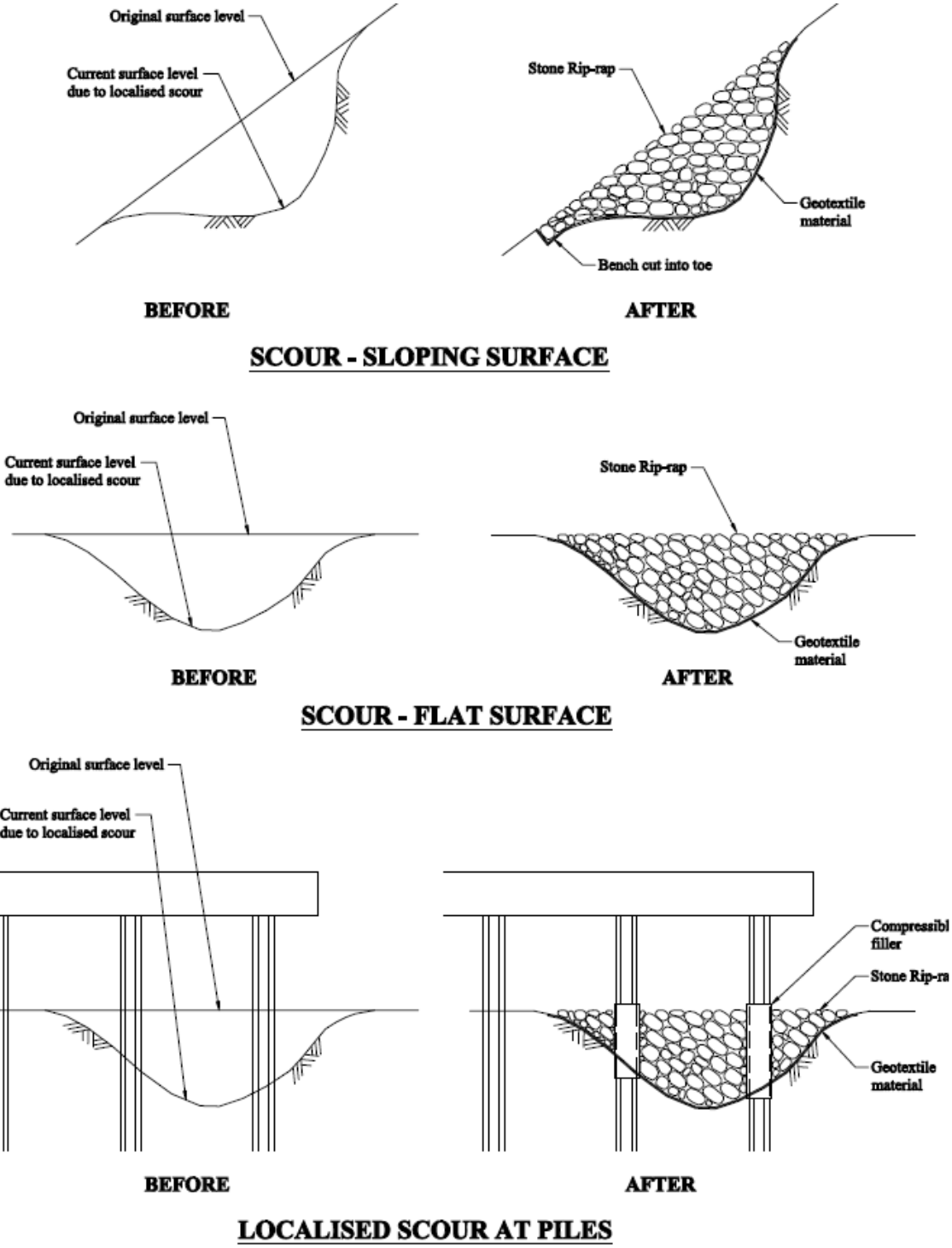
1. Remove excessive fill material, taking care not to damage the structure with the excavating equipment. Care must be taken to ensure that removal of material does not de-stabilise adjacent structures, embankments, embankment protection or trees.
2. Ideally the original surface profile shall be restored through these works. However, restoration of at least 90% of the design waterway shall be deemed sufficient.

Remove traffic control (if established).

Planning points to consider

1. If possible, the cause of the scour or deposition should be identified and rectified. Schedule additional Activities to correct this, if necessary.
2. Ensure no other maintenance is scheduled for the area in which the defect is present (such as Vegetation Control) prior to rectification of the defect.
3. Is programmed maintenance/rehabilitation more appropriate? If the scour has undercut structural components (such as footings or sill logs) or is in excess of 4 metres deep at piled foundations or other localised areas, advice shall be sought from Structures Division prior to rectification. Where deposited material is in excess of 10% of the waterway area, advice from Structures Division shall also be sought.
4. Works should be conducted in such a way as to minimise the risk of damaging the structure. The appropriate plant should be selected with this aim in mind.
5. Advice should be sought from the local Environmental Officer prior to commencement of the works.

Figure 860R1-1 – Rectification of typical scour defects



3.30 Activity 860R2 - Remove Flood Debris from Waterway

Unit of measurement

Cubic metres (m^3)

Category

Reactive maintenance

Description

All works associated with removal of flood debris from beneath the structure (excluding material trapped within the deck superstructure, which shall be removed under Activity 815R2) and from the adjacent waterway. Use related activities for other than removal of flood debris, such as grass or waterway restoration works.

Restoration standard

No flood debris shall be left beneath the structure, within the embankment spillthrough or approach embankments, or within the waterway area extending 10 metres beyond the outer kerb face on both sides of the bridge.

Related activities

860R3 - Maintain Clear Waterway

805R2 - Vegetation Control

805R3 - Herbicide Application

815R2 - Clean/Maintain Structure Components

Requirements

Plant

- Utility with heavy trailer or light truck
- Excavator
- Franna crane
- Bogie tipper
- Mulcher/chipper

Materials

- Nil

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators as required

Approvals

- A permit is not required, however in accordance with the Environmental Protection Act 1994, personnel must minimise any environmental harm caused as a result of the works.

- In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds' declarations) have been obtained prior to commencement of works.

Work procedures

1. Setup traffic control (if required).
2. Remove flood debris within the envelope specified in the Restoration Standard.
3. Dependent on situation differing approaches to disposal may be used - debris may be removed to stockpile for chipping or removed in bulk off-site.
4. Remove traffic control (if established).

Planning points to consider

1. Pre-inspection of the site is recommended to enable specification of larger plant for removal of heavy flood debris where this problem exists.
2. If any structural damage is revealed during the course of the works, an Inspection Issue should be raised on the BIS and details should be forwarded to Structures Division.
3. A risk assessment should be conducted prior to commencement of the works, to ensure safe removal of flood debris. In some cases, a specific works procedure may need to be developed to ensure that the works are conducted in a safe manner.
4. Advice should be sought from the local Environmental Officer prior to commencement of the works.

3.31 Activity 860R3 - Maintain Clear Waterway

Unit of measurement

Provisional sum ($)

Category

Reactive maintenance

Description

All works associated with any or all of the following:

- Removal of fences within the waterway that run across the structure opening
- Stabilization, trimming or removal of trees within the maintenance envelope.

Restoration standard

In every case restoration is to be carried out in accordance with the specific plan for the works. Any trees inside the maintenance envelope found immediately under the structure or within 3 metres either side of the roadway shall be cleared. In addition, all tree limbs overhanging the road shall be cut back at least 3 metres beyond the edge of the roadway.

Related activities

860R2 - Remove Flood Debris from Waterway

805R2 - Vegetation Control

Requirements

Plant

- Heavy truck, job truck and water truck
- Bobcat/backhoe/loader/excavator
- Pole saws, chainsaws, mulching equipment

Materials

- Geotextiles (as per MRS 11.03)
- Plant materials (e.g. turf, hydromulch, tufting plants)
- Weed mats, hessian etc.
- Fencing material (steel or timber posts, fencing wire, etc.)

Manpower

- 1 Leading Hand
- 2 Labourers
- 1 Plant Operator
- 2 Traffic Controllers (if required)

Approvals

- Where alteration to the bed or banks of a stream (including vegetation) is required, the works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000).
- All mature trees will be cleared only where there is no reasonable alternative (refer to Restoration Standard for clearing requirements). Where trees or other vegetation are removed, personnel must mitigate any potential erosion or loss of bank stability.
- Additionally, trees of special significance (e.g. memorials) must not be removed without approval by the Principal. Protected plants (for example, rare and threatened plants) shall not be removed without approval from the Environmental Protection Agency.
- In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds' declarations) have been obtained prior to commencement of works.

Work procedures

Establish traffic control (if required).

For tree stabilisation/removal:

1. Initial treatment may involve reinstatement of fill material as per the works plan.
2. Secondary treatment may involve any or all of the following:
    - Installation of turf or turf sprigs
    - Application of hydromulch
    - Placement of weed matting or hessian to protect newly disturbed areas and slopes
    - Planting of tufting type grasses suitable to the waterway situation.
3. Tertiary treatment may consist of:
    - Short term monitoring and maintenance to disturbed areas
    - Watering of plant materials until established.
4. Where stabilisation is not possible an undermined tree may need to be removed – where possible the stump should be cut low and left in place. If this process would create undue downstream turbulence it may be better to remove the stump with the tree and use one of the restoration processes described above.

For branch lopping/trimming:

1. All overhanging branches shall be lopped or removed in accordance with the Restoration Standard.
2. Lopped materials may be removed from site, or mulched and placed as part of an adjacent Tree Stabilisation/Removal procedure.

For fence removal:

1. All fencing material is to be removed back to the edges of the waterway area. Posts shall be removed entirely, or where this is not possible, cut off at ground level.

2. Where required, a suitable livestock retention system shall be installed.

Remove traffic control (if established).

Planning points to consider

1. Ensure no other maintenance is scheduled for the area in which the defect is present (such as Vegetation Control) prior to rectification of the defect.
2. Removal of fencing requires consultation with landowners and development of a satisfactory solution for the retention of livestock.
3. Advice should be sought from the local Environmental Officer prior to commencement of the works.

3.32 Activity 860R4 - Maintain Existing Waterway Protection

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works associated with the stabilization and/or restoration of bank protection, including related drainage systems such as table drains and batter chutes.

Restoration standard

In the case of bank protection, restoration of original surface levels and surface shape is required unless specified elsewhere. All drainage systems should be free of blockages and operating as intended.

Related activities

860R1 - Repair Scouring/Deposition of Waterway Material

Requirements

Plant

- Heavy truck
- Job truck
- Bobcat/backhoe/loader/excavator
- Water truck

Materials

- Rock (as per MRS 11.03)
- Geotextiles (as per MRS 11.03)
- Plant materials (e.g. turf, hydromulch, tufting plants)
- Weed mats, hessian etc.

Manpower

- 1 Leading Hand
- 2 Labourers
- 1 Plant Operator
- 2 Traffic Controllers (if required)

Approvals

- Where alteration to the bed or banks of a stream (including vegetation) is required, the works shall be undertaken in accordance with the "Guideline for Activities in a Watercourse, Lake or Spring carried out by an Entity" (Water Act 2000).

- In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds' declarations) have been obtained prior to commencement of works.

Work procedures

Establish traffic control (if required).

For bank stabilisation/scour rectification:

1. Initial treatment may involve some shaping, levelling and/or filling as per plan.
2. Secondary treatment may involve any or all of the following:
    - Installation of turf or turf sprigs
    - Application of hydromulch
    - Placement of weed matting or hessian to protect newly disturbed areas and slopes
    - Planting of tufting type grasses suitable to the waterway situation.
3. Tertiary treatment may consist of:
    - Short term monitoring and maintenance to damaged areas
    - Watering of plant materials until established.

For drainage systems:

1. All table drains and batter chutes should be cleared of blockages.
2. Damaged areas should be reinstated to original condition.
3. Scouring or erosion along the edges of drainage channels should be reinstated with mass concrete or compacted fill.
4. Vegetation in the vicinity of the drainage system should be cut back or removed.

Remove traffic control (if established).

Planning points to consider:

1. If possible, the cause of any bank degradation needs to be identified and rectified. Advice from Hydraulics Section should be obtained prior to conducting any works. Schedule additional Activities to correct this, if necessary.
2. Ensure no other maintenance is scheduled for the area in which the defect is present (such as Vegetation Control) prior to rectification of the defect.
3. Is programmed maintenance/rehabilitation more appropriate? If the banks show degradation to the point where there is significant undercutting of structural components, advice shall be sought from Structures Division prior to rectification.

3.33 Activity 860R5 - Clean Culverts and Pipes (major)/Pits/Gullies/Manholes

Units of measurement

Provisional sum ($)

Category

Reactive maintenance

Description

All works associated with cleaning silt and other heavier deposits such as gravel or sand and including the removal of other loose debris from culverts, pipes, pits, gullies and manholes. Choice of cleaning equipment depends on the situation but could include any of the following:

- Manual (i.e. by hand)
- Bobcat or small excavator and truck
- Suction cleaning unit
- Jetting and suction unit.

Restoration standard

The various structures should be clean and free of silt and heavier deposits such as gravel or sand and free from other loose debris. The structure's on-going ability to function as intended (e.g. to pass silt through the drainage system) also forms part of the restoration standard and may require works beyond the structure itself.

Related activities

Nil

Requirements

Plant

- Utility or light truck
- Bobcat
- Tandem tipper
- Mini-excavator
- Suction cleaning plant
- Suction and jetting plant
- Water truck
- Low pressure water cleaning unit
- Compressor
- Submersible pumps

Materials

Nil

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, if required
- Traffic control, if required

Approvals

- Environmental approval must be obtained in those areas where any water will be discharged directly into the watercourse without filtration.
- Where possible, efforts shall be made to minimise environmental harm in accordance with the Environmental Protection Act 1994.
- In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds') have been obtained prior to commencement of works.

Work procedures

1. Establish traffic control (if required).
2. Establish the site, the processes to be used, the disposal points and the extent of works then carry out the works:
    a. For culverts and pipes - large quantities requiring 'truck and loader' technique:
        i) Start works at the 'bottom end' so groundwater drains away from the working face
        ii) Setup site de-watering equipment early in the process
        iii) Setup water filtration devices before allowing discharge to watercourses
        iv) Closely monitor the removal offsite of silt and other materials
            (1) Loading trucks to even normal levels can result in major spills of materials due to breakages caused by high hydrostatic pressure loadings on truck tailgates
            (2) Even minor spills can cause a major traffic hazard due to the slippery nature of some materials.
    b. For all structure types - smaller quantities using manual means or vacuum type equipment
        i) 'Linear structures' - (i.e. culverts and pipes)
            (1) Start works at the 'bottom' end so drainage is away from working face
            (2) Use bunding in conjunction with jetting and suction plant to contain slurry as it is removed
        ii) For pits, gullies and manholes
            (1) where suction type plant is used monitor the disposal of material removed
            (2) where a pit, gully or manhole is partially or fully silted check the downstream structures for siltation and assess the need for additional works
            (3) Remove traffic control (if established).

Planning points to consider

1. Where deposited material requires excavation beyond the end of either the 'upstream' or 'downstream' culvert or pipe aprons the possibility that underground services may have been installed subsequent to culvert construction should not be discounted. This could be the case

even where excavation will only take place down to invert levels at the time the culvert was constructed.

2. The efficiency of the suctioning process decreases with height of 'lift'.
3. Where a number of drainage lines are silted, installation of low bunds in gullies and manholes prior to de-silting works can assist in containing the migration of heavier suspended particles further along the system and collects that material where it is most easily removed.
4. The efficient functioning of culverts and pipes is dependent on velocity of flow through the system - where flow velocity falls below some minimum value deposition of heavier suspended particles begins to occur. Downstream vegetation growth (and other factors) at culvert outlets slows stormwater speed which promotes siltation. Removal of these obstacles to effective flow velocity is essential to continued proper operation for all upstream structures.

3.34 Activity 860R6 - Seal Gaps Between Culvert Elements/Wingwalls

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works associated with the sealing of all minor gaps between culvert units and between wingwalls and abutments, in order to prevent the loss of fill material and ensure that moisture is directed to escape through the appropriate locations (such as weepholes).

Restoration standard

There shall be no visible gaps present at any point in the culvert structure through which fill material might pass.

Related activities

815R2 - Clean/Maintain Structure Components

Requirements

Plant

Nil

Materials

- Compressible foam material
- 'Denso' tape
- Brushes, hand tools

Manpower

- 1 Leading Hand
- 1 Labourer

Approvals

Nil

Work procedures

1. All loose soil and material shall be cleared out of the gap by hand brushing.
2. The gap shall be sealed using either packing it with 'denso' tape, or by packing the gap with compressible foam (i.e. backing rods) and applying a layer of 'denso' tape to keep the foam in place.

Planning points to consider

1. Is Programmed maintenance/rehabilitation more appropriate? Advice shall be sought from Structures Division prior to determining maintenance requirements if any of the following are observed:

- A significant amount of fill material is lost from behind culvert units or wingwalls
- Loss of horizontal of vertical alignment within the culvert cells
- Forward rotation of wingwalls in excess of 50 mm.

2. When selecting the size of the backing rod to be used for a repair, as a guide the diameter of the rod should be approximately 30% greater than the width of the gap.

3.35 Activity 865R1 - Repair Handrail/Barrier/Guardrail Furniture

Unit of measurement

Lineal metres (m)

Category

Reactive maintenance

Description

All works associated with the repair of damaged or defective handrail/barrier/guardrail furniture.

Restoration standard

The barrier shall be restored as follows:

- Where the original barrier was designed to a substandard containment class, it shall be repaired or replaced to the current standard.
- Where the original barrier was designed to the current containment class, it shall be repaired or replaced to its original condition.
- Where asphalt overlays have reduced the effective height of the barrier, it shall be raised to the height required in the current standard.

Requirements should be discussed and confirmed with the local Element Manager for 'Roadside Barrier Management'.

Related activities

815R1 - Clean Paint Handrail/Barrier/Guardrail furniture

865R2 - Make Safe Accident Damage to Handrail/Barrier/Guardrail.

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor

Materials

- Varies

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Determine what repair method will be required.
3. Carry out the repairs - repairs may require the use of new materials or repairs of existing materials may be appropriate.
4. Remove traffic control (if established).

Planning points to consider

1. Be aware of changing standards - damaged components installed to the standard applying at the time may now need to be repaired to a new standard. If you are unsure about the suitability of the current barrier, contact Structures Division for guidance.
2. Damaged components incorporated into a repair should be carefully checked for damage not so easily detected by quick examination (for example, weld cracks).

3.36 Activity 865R2 - Make Safe Accident Damage to Handrail/Barrier/Guardrail Furniture

Unit of measurement

Provisional sum ($)

Category

Reactive maintenance

Description

All works associated with the emergency temporary works required to make safe traffic accident damage to handrail/barrier/guardrail furniture. This activity shall be used to cover the first response to a reported traffic accident when the extent of damage to containment furniture is generally unknown - the aim is to make the site safe on a temporary basis, until such time as permanent repairs can be effected.

Restoration standard

The works shall be sufficient to leave any traffic damage to handrail/barrier/guardrail in a safe condition on a temporary basis. This may involve a combination of temporary repairs, erection of suitable signage or installation of temporary traffic control measures.

Related activities

Nil

Requirements

Plant

- Utility or light truck
- Oxy acetylene kit

Materials

Safety barrier fencing.

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Determine the temporary repairs required and undertake those repairs. In many cases this will involve the erection of safety mesh around the damaged area or perhaps the removal of damaged sections of barrier which present a traffic hazard.
3. Remove traffic control (if established).

Planning points to consider

1. Since the works are only temporary, begin programming the permanent repairs.
2. Crews should be equipped with sufficient equipment to respond to most situations.

3.37 Activity 870R1 - Remove, Replace or Install Damaged/Missing Bolts

Unit of measurement

Each

Category

Reactive maintenance

Description

All works associated with the removal and re-use of existing corbel, girder, headstock, running plank, distributor and kerb bolts or coach screws which are found to be very loose, badly corroded or otherwise defective. It also includes the installation of new bolts or coach screws where required. It also covers the installation, replacement or re-use of nuts and washers as required.

This applies only to bolts or coach screws that can be removed and replaced without the need for extensive propping - those fasteners requiring significant associated works shall be dealt with under programmed maintenance.

Restoration standard

All bolts and coach screws to be in good condition, performing as intended, with a loss of section due to corrosion of less than 10% of the cross-sectional area of the bolt/screw. All bolts/coach screws exhibiting signs of corrosion shall be treated with a protective coating of a suitable material. Suitable nuts and washers shall be present and performing as required.

Related activities

820R1 - Tighten Existing Bolts - Timber Structures

870R2 - Replace Damaged/Missing Anchor Bolts

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required
- Hydraulic or electric impact wrench, as required

Materials

- Protective grease
- New bolts, nuts, washers and coach screws of appropriate sizes, as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required.

Approvals

Nil

Work Procedures

1. Establish traffic control (if required).
2. Identify bolts that are missing or requiring attention.
3. Where required, withdraw the bolt from the hole and determine if it requires replacement on the basis of its condition.
4. Inject the bolt hole and/or coat the bolt with an approved preservative grease.
5. Insert the bolt, attach appropriate nuts and washers and retighten to refusal.
6. Disestablish traffic control (if established).

Planning points to consider

1. It is essential that replacement bolts are of the correct grade and size - this may require consultation with Structures Division to confirm requirements (plans are not always available locally to enable confirmation of this requirement). Where applicable, bolts shall confirm to the details provided in Section 17.1 of Part Two of the Timber Bridge Maintenance Manual.
2. Structures Division should be contacted for advice on whether there are any issues with the use of oxy in a particular application as an aid to bolt removal.
3. Consider the need to apply protective coatings to new and existing bolting hardware.
4. The cause of bolt looseness should be investigated to determine if decay or deterioration of the member has contributed to the looseness. If this is the case, the member may require replacement under programmed maintenance.

3.38 Activity 870R2 - Replace Damaged/Missing Anchor Bolts

Unit of measurement

Each

Category

Reactive maintenance

Description

All works associated with the replacement of anchor bolts used in bridge barriers

Restoration standard

All bolts to be in good condition, performing as intended, with a loss of section due to corrosion of less than 10% of the cross-sectional area of the bolt. All bolts exhibiting signs of corrosion shall be treated with a protective coating of a suitable material.

Related activities

820R1 - Tighten Existing Bolts - Timber Structures

870R1 - Remove, Replace or Install Damaged/Missing Bolts

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required
- Hydraulic or electric impact wrench, as required

Materials

- Protective grease
- New bolts, nuts and washers of appropriate sizes, as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify bolts that are missing or requiring attention.
3. Where required, withdraw the bolt from the hole and determine if it requires replacement on the basis of its condition.
4. Inject the bolt hole and/or coat the bolt with an approved preservative grease.

5. Insert the bolt, attach appropriate nuts and washers and retighten.
6. Disestablish traffic control (if established).

Planning points to consider

1. It is essential that replacement bolts are of the correct grade and size - this may require consultation with Structures Division to confirm requirements (plans are not always available locally to enable confirmation of this requirement). Where applicable, bolts shall confirm to the details provided in Section 17.1 of Part Two of the Timber Bridge Maintenance Manual.
2. Structures Division should be contacted for advice on whether there are any issues with the use of oxy in a particular application as an aid to bolt removal.
3. Consider the need to apply protective coatings to new and existing bolting hardware
4. The cause of bolt looseness should be investigated to determine if decay or deterioration of the member has contributed to the looseness. If this is the case, the member may require replacement under programmed maintenance.

3.39 Activity 870R3 - Install Large Size Washers at Plywood Fasteners

Unit of measurement

Each

Category

Reactive maintenance

Description

All works associated with the installation of large size washers for bolted connections in plywood sheeting

Restoration standard

All bolt washers are to be sitting proud of the surface of the plywood decking or kerb.

Related activities

820R1 - Tighten Existing Bolts - Timber Structures

870R1 - Remove, Replace or Install Damaged/Missing Bolts

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required

Materials

- Protective grease
- New washers of appropriate sizes, as required

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify washers that are requiring attention.
3. Withdraw the bolt from the hole and determine if it requires replacement on the basis of its condition (bolt replacement to be performed under Activity No 870R1).
4. Apply large washers, re-insert the bolt, attach appropriate nuts and retighten.
5. Disestablish traffic control (if established).

Planning points to consider

1. Consider the need to apply protective coatings to new and existing bolting hardware.
2. For details of appropriate washer dimensions, refer to Figures 4.1, 5.2(a) and 17.1(b) in Part Two of the Timber Bridge Maintenance Manual.

3.40 Activity 870R4 - Replace Deteriorated Footpath Fasteners

Unit of measurement

Each

Category

Reactive maintenance

Description

All works associated with the replacement of corroded or deteriorated footway fasteners

Restoration standard

All fasteners to be in good condition, exhibiting minimal corrosion and no signs of distress

Related activities

820R2 - Tighten Footpath Fasteners (Self-drilling Screws)

Requirements

Plant

- Utility or light truck

Materials

- Protective grease
- New fasteners

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify fasteners that are requiring replacement.
3. Remove damaged fastener.
4. Apply a coat of protective grease to the new fastener and install.
5. Disestablish traffic control (if established).

Planning points to consider

Where possible, replacement fasteners should be of a similar type to those fasteners being replaced.

3.41 Activity 875R1 - Install/Maintain Bird Control Fencing

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works associated with the installation of bird control fencing used to preclude birds from roosting or nesting on superstructure or substructure elements thus minimizing the corrosive effects of bird droppings on these parts of the structure.

Restoration standard

Bird control fencing shall effectively preclude the nesting or roosting of birds on parts of the substructure or superstructure.

Related activities

815R2 - Clean/Maintain Structure Components

875R2 - Clean Aggressive Contamination from Steel Girders and Other Componentry

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Explosive powered tools
- Electric drilling gear

Materials

- Bird wire
- Fasteners
- Steel battens, etc.

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control (if required).
2. Identify the areas to be treated.
3. Actual procedure will vary dependent on fixing method specified, fastener type, structure type involved and the particular problem on that structure however it will generally consist of:
   a. Marking position for the screen
   b. Drilling holes as required
   c. Placing the mesh
   d. Holding mesh in place with a covering batten either bolted or explosive nailed in place.
4. Remove traffic control (if established).

Planning points to consider

1. The system may require monitoring and modification as birds find the weak spots in the design.
2. Bird droppings, particularly in combination with moisture are highly corrosive - all existing deposits should be removed prior to installation using the appropriate activity.
3. The system should be erected with provisions made to allow access for future inspections.

3.42 Activity 875R2 - Clean Aggressive Contamination from Steel Girders and other Componentry

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works associated with the cleaning of:

- Aggressive contamination or corrosion on steel girders or steel componentry
- Deteriorated galvanized steel surfaces on girders or other components in preparation for recoating.

Restoration standard

Cleaned surfaces shall be clean of contaminants and/or corrosion and be dust-free in preparation for painting.

Related activities

875R1 - Install/Maintain Bird Control Fencing

875R3 - Spot Clean and Paint Steelwork

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor and scabbling tools
- Sand blaster
- High pressure water blaster
- Vacuum extraction system

Materials

- Wire brushes, dust brushes, scrapers, sandpaper, and other appropriate hand tools

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

If working with lead-based paint systems, the necessary workplace health and safety requirements must be met. Environmental restrictions shall also apply to the works.

Work procedures

1. Establish traffic control (if required).
2. Install containment/collection apparatus (if required).
3. Prepare the surface by cleaning back to bare metal the area to be treated, using the following guidelines:
    - Remove all loose, scaly or flaky paint with a wire brush.
    - Corroded materials shall be removed using one or more of a number of methods, from wire brushing to abrasive blasting. Care should be taken to ensure that the surrounding intact paint system is not damaged during the process.
    - Water and dirt may be removed by air-blasting and wiping.
    - Grease-like contaminants may be removed by wiping down with a solvent.
    - Newly galvanised surfaces may require etching locally around defects in order to allow overlap of the new coating.
4. Clean down area, and remove containment/collection apparatus (if utilised).
5. Remove traffic control (if established).

Planning points to consider

1. What is causing the corrosion? Should other activities be scheduled to correct the problem? If the corrosion is the result of exposure to moisture from a leaking pipe or joint, maintenance or repair of the source defect must be coordinated with the spot painting. If the corrosion is the result of bird or bat droppings, the area should be protected with suitable barriers under Activity 875R1.
2. If unsure about the lead content of the existing paint system, a few areas should be selected at random and tested using lead check test kits prior to commencement of the works.
3. Disposal of water and other waste materials must be considered prior to commencement of works
4. Advice should be sought from the local Environmental Officer prior to commencement of the works.

3.43 Activity 875R3 - Spot Clean and Paint Steelwork

Unit of measurement

Square metres (m^2)

Category

Reactive maintenance

Description

All works associated with the preparation and spot-painting of deteriorated painted or galvanised surfaces, in order to minimise or prevent deterioration of the underlying steelwork. This includes the exposed ends of transverse stressing bars.

Restoration standard

There shall be no spot rusting present on painted or galvanised metallic surfaces.

Related activities

Nil

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Air compressor

Materials

- Paint products compatible with the existing system
- Solvent
- Wire brushes, dust brushes, scrapers, sandpaper, and other appropriate hand tools

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

If working with lead-based paint systems, the necessary workplace health and safety requirements must be met. Environmental restrictions shall also apply to the works.

Work procedures

1. Establish traffic control (if required).
2. Install containment/collection apparatus (if required).
3. Prepare the surface by cleaning back to bare metal the area to be treated, using the following guidelines:

- Remove all loose, scaly or flaky paint with a wire brush.
- Corroded materials shall be removed using one or more of a number of methods, from wire brushing to abrasive blasting. Care should be taken to ensure that the surrounding intact paint system is not damaged during the process.
- Water and dirt may be removed by air-blasting and wiping.
- Grease-like contaminants may be removed by wiping down with a solvent.
- Newly galvanised surfaces may require etching locally around defects in order to allow overlap of the new coating.

4. Apply the appropriate paint system to the affected area. This should be done on the same day as the completion of the surface preparation.
5. Clean down area, and remove containment/collection apparatus (if utilised).
6. Remove traffic control (if established).

Planning points to consider

1. What is causing the corrosion? Should other activities be scheduled to correct the problem? If the corrosion is the result of exposure to moisture from a leaking pipe or joint, maintenance or repair of the source defect must be coordinated with the spot painting. If the corrosion is the result of bird or bat droppings, the area should be protected with suitable barriers under Activity 875R1.
2. The existing paint system should be identified prior to application of new paint, so that a compatible system may be selected. Ideally, spot painting should be done with the same type of paint already on the structure. If this is not possible, contact Structures Division for advice on a suitable product. For galvanised members, a cold galvanising product should be used.
3. If unsure about the lead content of the existing paint system, a few areas should be selected at random and tested using lead check test kits prior to commencement of the works.
4. Where possible, spot painting should be done with a matching colour to maintain a consistent appearance.
5. Disposal of water and other waste materials must be considered prior to commencement of works.
6. Advice should be sought from the local Environmental Officer prior to commencement of the works.
7. Ensure weather conditions are suitable for the application of the paint system. Paint should not be applied under the following conditions:
   - to surfaces with temperatures over 50° unless the paint is specifically formulated for high temperatures
   - when the relative humidity is above 85%
   - where wind speeds are 25 kph or greater.

3.44 Activity 880R1 - Place Emergency Propping

Unit of measurement

Provision sum ($)

Category

Reactive maintenance

Description

All works associated with the placement of temporary propping to support failing elements in timber structures such as decking, girders or headstocks, until such time as the defective component can be repaired.

Restoration standard

All defective components of structural significance are propped in a suitable manner, allowing the bridge to remain open to traffic until such time as repairs can be undertaken. Typical examples of defective components requiring propping include:

- Steel trough decking which is sagging and buckling
- Girders or headstocks with large moment cracks
- Headstocks in which splices have failed or broken apart.

Related activities

Nil

Requirements

Plant

- Heavy truck and job truck
- Bobcat/backhoe/loader/excavator

Materials

- Timber or steel members of suitable dimensions for use as propping/bracing members
- Fasteners suitable for use with timber/steel members
- Concrete for use as a base material

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Where installing propping beneath structures showing signs of distress, the necessary workplace health and safety requirements must be met.

In accordance with Destroying up to 0.25Ha of Vegetation, Excavating up to 500m³ and Placing up to 500m³ of Fill in a Watercourse or Lake 2003 (Water Regulation 2002 s.49 ,a works permit is required where the volume of proposed fill material exceeds 500m³. If this is the case, refer to Section 6.1 and 6.2 of the document mentioned above.

In order to prevent the spread of noxious vegetation, it is necessary to ensure that, where heavy equipment is being used within or adjacent to the waterway, the appropriate cleaning certificates ('weeds and seeds') have been obtained prior to commencement of works.

Work procedures

1. Establish traffic control.
2. Locate the components to be propped.
3. Install the required propping in accordance with the following guidelines:
    - Excavate material beneath the structure as required, in order to obtain base material with a reasonable bearing capacity (i.e. firm material).
    - The support base of the props may consist of either timber or concrete of suitable dimensions. Support base area requirements are described in Figure 17.11(a) and (b) in Part Two of the Timber Bridge Maintenance Manual.
    - All components of the props must be securely attached to each other and the member being supported. Props should be connected to adjacent props or permanent components (such as timber piles) with bracing, to improve their overall stability.
4. Remove traffic control.

Planning points to consider

1. All works should be conducted in accordance with the relevant Australian Standard for falsework.
2. When determining the prop arrangements, some consideration of the effects of flooding need to be made, such as:
    - Softening of the bearing material beneath the prop
    - Scour impact
    - Increased debris entrapment due to the presence of the prop.
3. Approval of the proposed prop configuration (including height of the props and bracing requirements) shall be obtained from Structures Division prior to installation.
4. Bridge Asset Management should be advised of the propping arrangements so that appropriate load limits can be determined and the District advised accordingly.

3.45 Activity 885R1 - Replace Defective Distributor (Hardwood Planks)

Unit of measurement

Lineal metres (m)

Category

Reactive maintenance

Description

All works associated with the replacement of defective hardwood distributor planks

Restoration standard

All distributor planks shall be free of significant defects, and shall distribute load as intended

Related activities

800R1 - Apply Chemical Preservative to Timber

800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

Requirements

Plant

- Utility or light truck
- Elevated access equipment or scaffolding, as required
- Timber drill

Materials

- Hardwood timber planks of suitable dimensions
- Anti-fungal preservatives and preservative grease

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work procedures

1. Establish traffic control.
2. Locate the defective distributors to be replaced.
3. Loosen the nuts and remove the defective planks. Examine the protruding portion of the bolt and determine if it requires replacement on the basis of its condition.
4. Apply a layer of preservative grease to the exposed bolts and the contact surfaces of the distributor planks and the deck planks.

5. Install the new distributor planks and retighten the bolts.
6. Remove traffic control.

Planning points to consider

1. Replacement planks shall be equal in size or greater than the planks to be replaced. Supply of hardwood distributor planks shall be to the requirements of MRS 11.87.
2. Details of fastener spacings, typical distributor sizes and configurations are shown in Figures 5.2(b) and 17.3(a) of Part Two of the Timber Bridge Maintenance Manual.
3. Ensure that the proper combination of lock washer/nuts are used, so that where possible, routine tightening can be carried out without the need for elevated access beneath the bridge.

3.46 Activity 885R2 - Replace Defective Distributor (Steel)

Unit of measurement

Lineal metres (m)

Category

Reactive maintenance

Description

All works associated with the replacement of defective steel distributor members

Restoration standard

All distributor members shall be free of significant defects, and shall distribute load as intended

Related activities

800R1 - Apply Chemical Preservative to Timber

800R2 - Apply Preservative Grease to Member Ends and Contact Surfaces

870R3 - Install Large Size Washers at Plywood Fasteners

Requirements

Plant

- Utility or light truck
- Elevated access equipment, as required
- Electric drilling gear
- Compressor

Materials

- Steel beams of suitable dimensions
- Anti-fungal preservatives and preservative grease

Manpower

- 1 Leading Hand
- 1-2 Labourers
- Operators, as required
- Traffic control, as required

Approvals

Nil

Work Procedures

1. Establish traffic control.
2. Locate the defective distributors to be replaced.
3. Loosen the nuts and remove the defective members. Examine the protruding portion of the bolt and determine if it requires replacement on the basis of its condition.

4. Apply a layer of preservative grease to the exposed bolts and the contact surfaces of the steel members and the deck planks.
5. Install the new distributor members and retighten the bolts.
6. Remove traffic control.

Planning points to consider

1. Replacement members shall be equal in size or greater than the members to be replaced.
2. Details of fastener spacings, typical distributor sizes and configurations are shown in Figures 5.2(b) and 17.3(a) of Part Two of the Timber Bridge Maintenance Manual.