Technical Specification

Transport and Main Roads Specifications
MRTS84A Removal of Bridge Deck Wearing Surface

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Queensland Government

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1 Introduction

This Technical Specification applies to the removal of asphalt Deck Wearing Surface (DWS) using cold milling operation or approved alternative methods on bridge decks the subsequent removal of loose material, and cleaning and preparation of milled asphalt surface or concrete surface to allow resurfacing.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Further definitions are as defined in Table 2.

Table 2 – Definition of terms

Term	Definition
DWS	Deck Wearing Surface, including waterproof membrane
GPR	Ground Penetrating Radar method to determine the existing DWS thickness
Prequalified BD2	BD2 Level Transport and Main Roads prequalified Engineering Consultants for bridge designs
RPEQ	Registered Professional Engineer Queensland

3 Referenced documents

Table 3 – Referenced documents

Reference	Title
MRTS01	*Introduction to Technical Specifications*
MRTS50	*Specific Quality System Requirements*
MRTS84	*Deck Wearing Surface*

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications.*

The Hold Points and Witness Points applicable to this Technical Specification are summarised in Table 4.1. There are no Milestones defined.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5	1. Submission of DWS Investigation Plan	1. DWS investigation survey results	
6.1		2. Notification of the DWS removal	
6.2 & 6.3.1	2. Acceptance of 'Equipment Operational Plan' and 'Work Method Statement'		
6.3.2	3. Acceptance of no damage		
6.3.4	4. Approval of remedial action procedure		
6.3.6	5. Acceptance of completion of DWS removal and cleaning of milled asphalt surface or concrete deck.	3. Completion of DWS removal and cleaning operation	

5 DWS thickness survey and investigation

The approximate thickness of existing DWS is shown in the project drawings and / or scheme documents.

The Contractor shall set out the DWS area to be removed as shown in the project drawings. Prior to commencing removal work, the Contractor shall undertake an investigation into the exact thickness and the variation in thickness of DWS on the bridge deck. This investigation shall be supervised by a Contractor's experienced road pavement engineer.

Asphalt coring and / or asphalt cutting investigation methods may be used to determine the exact thickness of the existing DWS. Asphalt coring shall be in accordance with Test Method Q302A. Coring or cutting of asphalt methods shall not damage the bridge deck. The Contractor shall use a sufficient number of drilled holes using a hand held power drill to determine the thickness of the existing DWS, prior to coring or cutting to avoid damage to the bridge deck. Ground Penetrating Radar (GPR) survey can also be used to determine the exact DWS thickness. However, the GPR survey result shall be calibrated by limited asphalt coring or asphalt slab cutting. The Contractor shall submit a DWS Investigation Plan, including minimum number of asphalt coring require and the locations for the investigation and agreed with the Administrator prior to the investigation commences. **Hold Point 1** The calibrated GPR results shall provide details of existing DWS thickness for full length and width of the investigated area rather than a depth information at isolated spots.

DWS thickness at each location determined by this investigation shall be located using survey. The Contractor shall complete a sufficient number of tests to determine the exact thickness of existing asphalt over the area of DWS removal.

The Contractor shall report the test results of survey and existing DWS asphalt thickness to the Administrator. **Witness Point 1**

The existing DWS investigation survey results shall contain the following information:

a) exact DWS thickness information to cover the entire investigation area

b) type of existing deck waterproofing membrane, as required

c) Condition of Bond / adhesion between DWS and the concrete deck, and

d) results of concrete deck texture depth test in accordance with Test Method Q705 (full depth removal only).

Bridge decks with deck units without concrete slab can have DWS thickness variation between adjoin deck units due to hog variations. The DWS investigation shall verify this variation. This information is important to determine the minimum and maximum DWS thicknesses and their locations on the bridge deck.

6 DWS removal operation

6.1 General

The Contractor shall prepare documented procedures for all construction processes for DWS removal in accordance with the quality system requirements of the Contract.

The Contractor shall inform the Administrator at least three business days prior to the planned commencement of any DWS removal operations. **Witness Point 2** The Contractor shall arrange with the relevant road authority for any traffic detector loops to be located and disconnected as necessary.

6.2 Vehicle equipment and plant induced loads on bridge

For each bridge, the Contractor shall prepare and submit an Equipment Operational Plan that details the proposed vehicles, plant and equipment that will be used on the bridge. The Equipment Operational Plan shall include:

a) a list of all vehicles, plant and equipment that will load the bridge

b) gross mass of all individual vehicles, plant and equipment in tonnes, including any incidental mass, fuel and any attachments on vehicles, plant and equipment

c) vibrating frequency (Hz) and nominal amplitude (mm) of vibrating rollers. Preference shall be given to oscillating drum rollers

d) rotational speed (rpm) and milling depth range and number of teeth on the cutter drum of cold milling machine drum

e) combinations of vehicles, plant and equipment for the purpose of evaluating the load distribution on the bridge during bridge work

f) any additional details requested by the Administrator

g) RPEQ Certification by a Transport and Main Roads BD2 minimum prequalified Engineering Consultant that the existing bridge is structurally adequate to support the operational equipment and plant, including dynamic effects, and

h) the sequence and staging of construction considering loads and dynamic effects of the equipment and plant shall be specified by the RPEQ.

The Contractor shall submit the Equipment Operational Plan along with the Work Method Statement as specified in Clause 6.3.1 to the Administrator at least 20 business days prior to the commencement of DWS removal work. The Administrator will confirm the suitability of the Equipment Operational Plan and Work Method Statement. The removal operation shall not be commenced until the Administrator

has accepted the Equipment Operational Plan and Work Method Statement. **Hold Point 2** The Administrator may contact the Project Bridge Designer and / or Transport and Main Road's Director (Bridge Construction Maintenance and Management) to review the Equipment Operational Plan and assess the existing bridge to ensure that the DWS removal operation will not compromise the structural integrity of the bridge.

6.3 DWS removal procedure

6.3.1 General

The Contractor shall submit the Work Method Statement for the DWS removal operation to the Administrator at least 20 business days before the commencement of the work along with Equipment Operational Plan as specified in Clause 6.2 (**Hold Point 2** in Clause 6.2 applies). This Work Method Statement shall include, as a minimum, the following details:

a) sequence of equipment to be used (equipment as listed in Equipment Operational Plan) for DWS removal operation

b) the width of single run cut, the position of the loading conveyor, and the proposed method of handling and transporting the milled material

c) the method of level control proposed

d) the proposed method of carrying out the work, including sequencing of milling runs and planned daily outputs

e) the haulage fleet required to optimise the milling output and minimise public inconvenience

f) steps proposed to minimise dust nuisance, excessive noise, excessive windrows, loose material or excessive roughness of the cold milled surface

g) methods and equipment to be used to identify hidden metal objects (tramlines, grating, candybar brackets, loop detectors, etc.) and hidden public utilities

h) method of cleaning milled DWS surface (partial DWS removal)

i) when full depth removal is specified, method of cleaning the bridge deck and achieving the deck texture if specified on the project drawings

j) process of drying wet / moisture deck prior to placing water proof membrane for new DWS, as required, and

k) any other factors affecting performance of the work, public safety and public convenience.

Utilisation / disposal of excavated materials shall be in accordance with the requirements in Clause 11 of MRTS01 *Introduction to Technical Specifications*.

During DWS removal operations, the Contractor shall have an experienced staff member solely responsible for monitoring the operations to ensure that the bridge structure is not damaged (refer Clause 6.3.4) as a result of the work operations, including, but not limited to, excessive milling depth or excessive vibrations on the bridge deck.

To mitigate the dust hazard during removal operation, vacuum trucks shall be utilised, as required.

Only waterless DWS removal operation shall be undertaken. Introduction of water / moisture to the milled asphalt surface or concrete deck shall not be allowed.

DWS removal shall be undertaken in a dry weather condition. The Contractor shall be responsible for maintaining dry concrete deck condition until the construction of the new DWS. If the deck is wet, the Contractor shall dry deck before placing DWS.

If the weather forecast suggests wet weather ahead, DWS removal operation shall not proceed if rainfall appears to be imminent.

6.3.2 Partial depth milling of DWS to profile

Partial DWS removal shall be carried out using cold milling operation to a depth specified on the project drawings.

The existing DWS on a bridge shall be cold milled to the depth and area shown on the project drawings and the resultant rubble removed from the work Site.

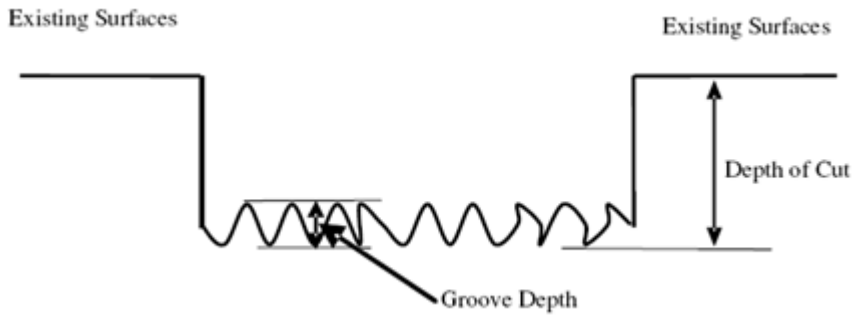
The Contractor shall verify to the Administrator that cold milling to the depth specified plus the groove depth plus tolerance have not damaged the bridge structure. The Administrator's acceptance is required prior to completion of removal operations and before commencing of new DWS. **Hold Point 3**

The partial milling operation shall not leave residual thin asphalt layers (less than 40 mm) on the bridge deck. In case a thin residual layer of asphalt is identified during DWS removal, the Contractor shall notify the Administrator and submit the remedial procedure for approval by the Administrator.

A waterproofing membrane in accordance with project drawings and MRTS84 *Deck Wearing Surface* shall be installed over the milled and cleaned DWS surface, prior to overlay.

When milling to specified depth, the depth at any point shall not vary from the specified depth by more than 5 mm. For this purpose, the depth shall be measured from adjacent surfaces to the top of the milled surface as shown in Figure 6.3.2.

Figure 6.3.2 – Partial depth cold milling to profile



When milling to a depth specified shown in the project drawings, the top of the milled surface shall not vary by more than ± 5 mm from the depths shown on the drawing.

The difference in vertical surface profiles between adjacent runs, measured under a straight edge shall not exceed 5 mm.

6.3.3 Full depth removal of DWS

Where a full thickness of the DWS is to be removed, it is imperative that the removal operation shall not damage the existing concrete deck. Contractor shall prepare DWS removal Work Method

Statement and Equipment Operational Plan and submit to Administrator in accordance with Clause 6.2 and 6.3.1.

The following DWS removal options may be considered:

a) Full depth removal using cold milling machine: Where DWS investigation survey identified that the existing DWS thickness has no large variation, use of milling machine has low risk of damaging the bridge deck and adhesion between DWS and the deck is weak, cold milling to full depth may be considered. Where the milling depth is less than 20 mm, fine milling machines shall be used for more accuracy and producing a finely textured surface.

b) Full depth removal in two stages. The first stage, partial removal using a cold milling machine. The final stage is using an alternative method, such as excavator with suitable attachments or other an acceptable means, and

c) Full depth using alternative methods. In situations where the DWS thickness varies across the investigated section, the use of a cold milling machine has a high risk to damage the concrete deck. Therefore, the Contractor may propose an alternative DWS removal method using excavator with suitable attachment or other acceptable means.

Existing DWS thickness on the bridge deck may vary due to the overlay during the previous deck rehabilitations, deck crossfall and so on. Also, deck unit bridge decks without concrete slabs can have DWS thickness variation even between adjoining deck units due to hog variations. The Contractor's Work Method Statement and Equipment Operational Plan shall clearly demonstrate how the Contractor plans to ensure that the existing concrete deck is not damaged during the removal operation.

6.3.4 Damage of bridge deck

The Contractor shall not cause damage to concrete medians or kerbs, manholes, gully grates, utility covers or similar structures.

The asphalt shall be cold milled in a manner which shall not cause damage to the remaining pavement, bridge relieving slabs, kerb, or kerb and channel. Where the edge of the remaining existing surface adjacent to the area to be cold milled remains exposed, that edge is to be saw cut to a minimum depth of 40 mm prior to cold milling. Care shall be taken not to damage the bridge deck during saw cutting.

If the bridge is damaged during the DWS removal operation, the Contractor shall notify the Administrator immediately and work shall stop immediately and it shall be repaired at the Contractor's expense. The Contractor shall undertake an investigation, including assessment of the structural integrity of the bridge, and prepare and submit to the Administrator a remedial action procedure in respect to the repair of the damage and further DWS removal operations. This remedial action procedure, including structural integrity report, shall be certified by a Transport and Main Roads prequalified BD2 minimum, Engineering Consultant. The Contractor shall not re-commence DWS removal operations until the remedial action procedure has been submitted to the Administrator and approval (which shall not be unreasonably withheld) has been given by the Administrator.
Hold Point 4

6.3.5 Barriers and expansion joints within the milling area

The Contractor shall cold mill to between 50 mm and 150 mm from longitudinal objects, such as kerbs and parapets. Removal of remaining asphalt shall be by other means.

The Contractor shall not longitudinally cold mill asphalt surfacing closer than 1000 mm from transverse obstacles, such as expansion joints. Removal of asphalt within 1000 mm of transverse obstacles may be by a combination of transverse cold milling, where applicable, and by other means.

6.3.6 Cleaning of the milled asphalt surface or bridge deck

After DWS removal operation is complete, the milled asphalt surface or concrete bridge deck shall be clean free of all loose material and the resultant rubble shall be removed from the Site of the works. Where full depth removal is specified, the existing bridge deck shall be cleaned to the surface texture depth as specified in the project drawings and / or accepted by the Administrator.

The Contractor shall use a vacuum truck for dust removal on the bridge deck in conjunction with a sweeper truck.

Notice in writing, regarding the completion time of the milling and cleaning operation, shall be given by the Contractor to the Administrator at least 24 hours in advance. **Witness Point 3**

The DWS removal equipment and cleaning plant shall not be removed from Site until the Administrator provides acceptance to the completion of the DWS removal and cleaning of milled asphalt surface or concrete deck. This Hold Point is released by the Administrator. **Hold Point 5**

6.3.7 Unsuitable material

Any weakened planes of asphalt, concrete or any unsuitable material existing below the specified milling depth, which is not removed by the milling operation, shall be removed.

6.4 Trafficking milled surfaces

In order to open a milled surface to traffic, the transverse edges of the milled surface shall be ramped to tie into the existing road levels. The ramp shall have a minimum taper length of 2.5 m for each 50 mm variation in levels or part thereof. Where the permanent speed limit prior to commencing road works on the Site is 60 km per hour or less a minimum taper length of 1.5 m for each 50 mm variation in levels or part thereof shall apply. The ramp can be formed by either bevelling with the cold milling machine or by using asphalt. When bevelling is used, the lip between the milled run and the unmilled run shall not exceed 10 mm.

Where traffic is required to travel on a longitudinal edge, it is to be ramped as required for transverse edges except that the taper shall be a minimum length of 1.0 m for each 50 mm variation in levels or part thereof. Work shall be arranged so that longitudinal edges of milled work which have not been ramped are not open to traffic.

Asphalt ramps shall be formed and compacted around manholes, gully grates, utility covers or other similar structures. The ramp shall have a minimum taper length of 1.5 m for each 50 mm or part thereof, of material removed.

Ramps may be formed with cold mix provided that:

a) an emulsion tack coast is applied to the milled surface prior to the placement of cold mix

b) the maximum thickness of the cold mix does not exceed 40 mm

c) the cold mix ramp is not to be left in place longer than one week, and

d) the Contractor maintains the line and level of the ramp while it is under traffic.

Where work under the Contract includes the replacement of the milled material with the new materials, any ramps shall be removed before the new material is placed. The ramp material shall be disposed in accordance with Clause 6.5.

6.5 Clean up and disposal of DWS material

All loose material from DWS removal operation shall be removed from the Site.