Technical Specification

Transport and Main Roads Specifications MRTS111 High Friction Surface Treatments

July 2021

Queensland Government

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Contents

1 Introduction

This Technical Specification details the requirements for construction of high friction surface treatments for road surfaces. High Friction Surface Treatments (HFST) are used to provide very high skid resistance on the road.

HFST is typically used in the following applications:

a) intersections

b) tight curves

c) steep gradients and curves.

Figure 1 – Typical HFST on a tight curve

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 are defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Further definitions are defined in Table 2.

Table 2 – Definition of terms

Term	Definition
accelerant	Any material used to reduce the curing time of the binder.
aggregate	Any natural or synthetic particles used as a material applied to the binder, to provide a high friction and textured surface treatment.
binder	Any thermosetting resin used to bond the aggregate to the road surface.
cleaning agents	All materials used to remove dirt, grime, fuel, oil and other materials from the road surface.
delamination	Failure of the HFST to adhere to the road surface.
pavement markings	Longitudinal lines, transverse lines and pavement messages.
pavement temperature	The temperature measured at the surface of the pavement.

Term	Definition
priming material	Any substance used to prepare the road surface for the application of binder and improve the adhesion of the binder to the road surface.
ravelling	A HFST defect involving the progressive disintegration of the HFST though loss of both binder and aggregates.
road surface	The surface onto which the HFST is applied.
road surface delineation	Pavement markings, raised pavement markers and audiotactile linemarking.
stripping	The loss of aggregate from a HFST, caused by the action of traffic, usually in the presence of water.
TIPES *Certified*	The process by which the suitability of products are assessed for inclusion on Transport and Main Road's registered products list.
TIPES Product Evaluation Panel	The TIPES Product Evaluation Panel will be comprised of one ARRB technical staff member, and one TMR Engineering and Technology technical staff member. A Transport and Main Roads District representative may also be nominated. The panel assess the suitability of a product to be TIPES *Certified* and included on Transport and Main Road's registered products list.

3 Referenced documents

Table 3 lists the documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
AGTP/T250	*Modified Surface Texture Depth (Pestle Method)*
AS 4663	*Slip resistance measurement of existing pedestrian surfaces*
MRTS01	*Introduction to Technical Specifications*
MRTS45	*Road Surface Delineation*
MRTS50	*Specific Quality System Requirements*
MRTS51	*Environmental Management*
-	*Registration of Products used for Surface Treatments*

4 Standard test methods

The standard test methods given in Table 4 shall be used in this Technical Specification. Further details of test numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

Table 4 – Standard test methods

Property to be Tested	Method No.
Skid resistance (wet method)	AS 4663[1]
Selection of sampling or test locations	Q050
Surface texture depth	AGPT/T250

Notes:

[1] Use of equivalent alternative test methods require Administrator approval prior to use.

5 Quality system requirements

5.1 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, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 5.1. There are no Witness Points defined.

Table 5.1 –Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
6			Submission of product details, and construction procedure
9.1	1. Inspection of road surface condition		
9.2.1	2. Readiness of the road surface for application of HFST		
12	3. Proposed treatment for defects		

5.2 Minimum testing frequencies

The minimum testing frequencies for HFST are given in Table 5.2.

Table 5.2 – Testing frequencies

Property	Test Method	Minimum Testing Frequency
Skid resistance (British pendulum number)	AS 4663 (wet method)	Immediately after installation and curing[1]: a) First lot: 3 tests. b) Other lots: Testing is only required if ordered by the Administrator. During the defect liability period[2]: If testing only required if it is ordered by the Administrator
Surface texture	AGPT/T250	Immediately after installation and curing[1]: a) First lot: 3 tests. b) Other lots: Testing is only required if ordered by the Administrator. During the defect liability period[2]: If testing only required if it is ordered by the Administrator

Notes:

[1] For lots tested immediately after installation and curing, test locations shall be determined in accordance with Q050.

[2] For lots tested during the defect liability period, test locations shall be determined by the Administrator.

For lots, other than the first lot incorporated into the works, skid resistance and surface texture testing may be ordered by the Administrator and is paid for separately under Work Items 44602P and 44606P. The cost of testing the first lot incorporated into the works is deemed to be included under Work Item 44601. Testing during the defect lability period would typically be completed in the wheel paths so that the effect of traffic on the conformity of the HFST can be assessed.

5.3 Maximum lot size

A lot shall consist of an area of work that is constructed during a single work shift using a single batch of binder.

6 Registration of products used for high friction surface treatments

Transport and Main Roads maintains a list of registered products used for HFST. The criteria for registration is detailed in the department's *Registration of Products used for Surface Treatments*.

Only registered products shall be used and any conditions of registration listed on the register (including usage limitations) must be complied with.

The Department of Transport and Main Roads maintains a list of registered HFST products on its website (www.tmr.qld.gov.au). Administrator can check the registration status of a product using this register. Further details about the suitability of various HFST products can be found on this register. The information contained on the register is based on information submitted by the supplier to Transport and Main Roads.

At least 14 days before placement of a HFST, the Contractor shall submit to the Administrator:

- details of the registered product, and
- construction procedure to be used. **Milestone**

The construction procedure to be used for the Works shall be consistent with:

- the procedure included in the supplier's submission for the product to be TIPES *Certified* and
- the manufacturer's current recommendations.

Any variations to the construction procedure must be discussed with the Administrator and agreed prior to use.

The construction procedure provided by the contractor must be, as detailed as the procedure provided by the product supplier and preferably more detailed.

7 High Friction Surface Treatments system and materials

7.1 General

The HFST (and its components) shall be:

a) able to withstand the action of traffic (e.g. acceleration, braking, turning and scrubbing forces) without damage

b) resistant to fuel and oil spills from traffic

c) non-flammable after placement and curing

d) free from offensive odours after placement and curing

e) able to be swept using a mechanical broom and cleaned with high pressure water without damage

f) free from any environmental contaminants such as lead and other heavy metals, and

g) chemically stable when subjected to prolonged ultraviolet radiation exposure.

7.2 Constituent materials

7.2.1 General

The materials used in the HFST shall be consistent with those nominated for the registered product. No substitution of materials is allowed.

7.2.2 Binder

The binder shall:

- be a two or more component thermosetting resin (or alternative binder type) that has been certified by the TIPES Product Evaluation Panel, and
- provide adhesion to the aggregate and substrate.

The following binders are not acceptable:

- thermoplastic materials, and/or
- waterborne paints.

7.2.3 Aggregate

Aggregate shall be hard, tough, durable, moderately sharp grains of natural stone or synthetic material of uniform quality and grading, free of dust, dirt and other deleterious matter.

The aggregate shall be from the same source, quality, particle size distribution and resistance to polishing as that nominated by the supplier in their submission for the product to be TIPES *Certified*.

7.3 Colour

The HFST shall be a grey, black or buff colour, unless otherwise shown on the Drawings or approved by the Administrator.

8 Scope of Works

The extent and location for the application of the HFST shall be as specified on the Drawings and/or Clause 1 of Annexure MRTS111.1.

Unless otherwise specified in Clause 2 of Annexure MRTS111.1, the default Transport and Main Roads Registration Level for the HFST product used in the Works shall be Level 2.

9 Construction

9.1 Assessment of existing surface

At least 14 days before application of HFST, the Contractor and Administrator shall jointly inspect the site to confirm the suitability of the road surface. **Hold Point 1**

The Contractor and Administrator should discuss the condition of the existing surface before Hold Point 1 is released. A joint inspection is suggested as part of this process. Any decision(s) related to Hold Point 1 should be documented in writing and the hold point formally released when / if appropriate.

HFST is a rigid layer of material that provides a high friction surface. HFST does not correct defects such as shape loss or cracking. Where the road surface is already cracked, the HFST will also crack within a short time.

HFST may extend the life of an existing road surface but should not be applied to very old road surfaces that are in poor condition.

New asphalt surfaces (including patches) should be trafficked for some time (typically 4 to 6 weeks) prior to application of HFST. The bond between new asphalt and HFST may be compromised if the layer of binder covering the aggregates in the asphalt surface is not removed / polished prior to application of the HFST. The minimum period for trafficking prior to application varies between HFST products and will be stated in the construction procedure for the registered product.

9.2 Road surface preparation

9.2.1 Cleaning

Immediately prior to installation of the HFST, the Contractor shall clean and prepare the road surface in accordance with the construction procedure for the registered product to ensure the HFST adheres to the road surface. This cleaning process shall remove all oil, grease, dirt and any foreign material from the road surface.

Cleaning and preparation shall not cause damage to the road surface or structural damage to the pavement. All cleaning agents and collected material shall be removed from site and disposed in accordance with MRTS51 *Environmental Management*.

The HFST shall not be applied until the Administrator agrees the prepared road surface is ready. **Hold Point 2**

The success of HFST application depends on the preparation of the road surface and the application process. The road surface preparation should be observed by the Administrator.

Oil and other deleterious materials on the road surface are likely to reduce bond. These materials should be removed prior to application.

Cleaning the road surface usually involves:

- removing all loose material, grit, stones, vegetative matter, rubbish and other deleterious material from the road surface, and
- water blasting the road surface to remove oil, grease, dirt and hydrocarbons from the road surface.

Use of a cleaning agent may be required.

9.2.2 Protection of road surface delineation

Unless otherwise approved by the Administrator, the HFST shall not be applied over existing road surface delineation. The road surface delineations shall be masked to ensure protection of the road surface delineation.

This Technical Specification is written to retain existing road surface delineation.

Where road surface delineations are altered, the Principal should include these alterations as supplementary requirements in the Annexure. Removal and replacement of road surface delineations are covered under the standard work items in MRS45 *Road Surface Delineation*.

9.2.3 Protection of pavement saw cuts

Saw cuts that exist due to the installation of traffic detector loops shall not be masked with tape. The HFST shall be placed over the saw cuts.

Saw cuts are not normally masked to ensure a consistent high friction surface.

HFST may fret or chip over the saw cuts and is not considered a defect of the HFST.

9.2.4 Service pits, covers, and drainages

Unless otherwise approved by the Administrator, large pits and valve covers shall be covered with the HFST. All lifting mechanisms and joins between the lid and frame shall be masked and protected such that the HFST does not impede lifting and replacing lids. Service pits and valve covers less than 0.03 m², and drainage grates and frames shall be masked to ensure the HFST is not applied to them.

Small pits and covers are fully masked from the application (not only masking the lifting mechanisms and joints) for the ease of construction. Large pits and covers (except the lifting mechanisms and joints) are treated with HFST to achieve a consistent and uniform friction surface.

9.3 Application

The Contractor shall apply the HFST to achieve:

a) an effective bond between the binder and the road surface

b) an effective bond between the binder and aggregate, and

c) a visually uniform, high friction and textured surface. The edges of the work shall provide a neat and clean line onto the adjacent surface.

9.3.1 Pavement surface temperature and weather conditions

The Contractor shall comply with any weather or pavement temperature restrictions nominated in the construction procedure and manufacturer's recommendations for the registered product.

In addition to these requirements, the following shall apply:

a) the surface on which the HFST is to be placed shall be dry, and

b) the application of the HFST shall not commence or take place during rain or when rain is likely to fall during construction.

The Contractor shall measure and record, as a minimum, air temperature, humidity, dew point and pavement temperature at the following times:

- one hour before application of the binder, and
- hourly thereafter until the binder is cured and the HFST is ready for trafficking.

A suitable thermometer shall be used to measure the temperature. A wet / dry bulb hygrometer shall be used to measure the dew-point and relative humidity. The weather conditions throughout the construction process and curing shall be recorded and included in the construction lot record for each lot.

HFST is sensitive to dew point and temperatures during application and curing. The presence of moisture during application and/or curing can cause the HFST to delaminate from the existing surface and/or aggregate to strip from the binder. A decrease in the temperature will usually result in an increase in the curing time of the binder.

9.3.2 Materials

Priming material (where applicable), binder and aggregate shall be uniformly applied over the area to be treated in accordance with the construction procedures for the registered product. The actual application rate of each constituent material shall be recorded and included in the construction lot record for each lot.

9.3.3 Protection of structures

The Contractor shall take all necessary precautions to prevent unintended overspray of the binder onto features / structures.

9.3.4 Protection of work

The Contractor shall take all necessary precautions to protect the work from damage and/or contamination, until such time that the new HFST has developed sufficient strength to carry normal traffic without damage.

9.3.5 Clean up of work

All excess material shall be removed from the site.

Prior to opening the site to traffic:

- all masking shall be removed, and
- excess aggregate shall be removed from the roadway, kerb and channel, driveways and any adjacent trafficked and un trafficked areas.

All material which becomes loose after the initial clean-up shall be removed at 24 hours, 3 days and 14 days after placement, unless otherwise directed by the Administrator.

HFST uses a small size aggregate. Excess and loose aggregates need to be removed from site for safety reasons (i.e. maintain sufficient road surface friction).

10 Maintenance after completion

The Contractor shall be responsible for monitoring and maintaining the HFST from the time of placement to the end of the defect liability period.

11 Finished Surface Properties

HFST shall have a visually uniform appearance and comply with the requirements in Table 11 from the time of placement until the end of the defect liability period.

Table 11 – Finished surface properties

Property	Requirement
Skid resistance (British pendulum number)	≥ 65 when tested in accordance with AS 4663 (wet method)
Surface texture	≥ 1.0 mm when tested in accordance with AGPT/T250
Delamination	Area of HFST that has delaminated from underlying road surface: a) ≤ 1% in any square metre, and b) ≤ 0.1% of the total area of work.
Stripping or ravelling	Area of HFST that has stripped (i.e. loss of aggregate and/or binder): a) ≤ 1% in any square metre, and b) ≤ 0.1% of the total area of work.

12 Rectification of nonconformances

Work that fails to meet the requirements of Clause 11 at any time during the Defect Liability Period shall be rectified.

The Contractor shall carry out any works necessary to protect and maintain the condition of the road surface and repair all surface failures, including stripping and/or ravelling (loss of aggregate), bleeding, fatty areas, flushing, loss of skid resistance, and delamination from the existing surface.

Repairs shall be undertaken within four weeks of notification by the Administrator. Urgent repairs, as determined by the Administrator, shall be started onsite within 24 hours of notice by the Administrator.

> Urgent repairs are normally required for defects which impact road safety such as a large area (> 1 m²) of stripping and/or ravelling where the aggregate has been removed from the HFST and the binder remains.

The Contractor shall advise the Administrator in writing of the proposed treatment for repair of defects before undertaking the work. **Hold Point 3**

13 Supplementary Requirements

The requirements of Technical Specifications are varied by the supplementary requirements given in Clause 3 of Annexure MRTS111.1