Contents

1 Paints ........................................................................................................................................... 1
  1.1 General ..................................................................................................................................... 1
  1.2 Water-borne road marking paint .............................................................................................. 1
  1.3 Reflective glass beads ............................................................................................................... 1
  1.4 Skid resistance for transverse line marking .............................................................................. 2

2 Plastic materials ............................................................................................................................ 2
  2.1 General ..................................................................................................................................... 2
  2.2 Thermoplastics .......................................................................................................................... 2
    2.2.1 Sprayable thermoplastics ...................................................................................................... 3
    2.2.2 Extruded thermoplastics ....................................................................................................... 3
    2.2.3 Preformed thermoplastics .................................................................................................... 3
  2.3 Cold applied plastic markings ................................................................................................... 3

3 Line marking tape .......................................................................................................................... 4
  3.1 Temporary line marking tape ..................................................................................................... 4
  3.2 Permanent line marking tape ..................................................................................................... 4
    3.2.1 General ................................................................................................................................. 4
    3.2.2 Inlaying markings in new pavements .................................................................................... 5
    3.2.3 Overlaying markings on existing surfaces ............................................................................ 5
  3.3 Temporary linemarking covers .................................................................................................. 6

4 Raised pavement markers and pavement bars ............................................................................. 6
  4.1 Retroreflective Raised Pavement Markers (RRPMs) ................................................................. 6
  4.2 Non-Retroreflective Raised Pavement Markers (NRPMs) ........................................................ 6
  4.3 Temporary Raised Pavement Markers (TRPMs) ....................................................................... 7
  4.4 Pavement bars ........................................................................................................................... 7

5 Application equipment .................................................................................................................... 7
  5.1 General ..................................................................................................................................... 7
1  Paints

1.1  General

Currently, the majority of the regions in Queensland exclusively use premium water-borne paint for all type of markings, including their maintenance.

1.2  Water-borne road marking paint

Refer to MRTS45 Clause 6.1.2.

<table>
<thead>
<tr>
<th>Table 6.1.2 – Paint colour designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>Yellow</td>
</tr>
</tbody>
</table>

Paint used shall be water-borne road marking paint conforming to the requirements of AS4049.3 and having approval under the Australian Paint Approval Scheme – Specification 0041/5.

See Part 3 Section 1.10 of this guide for application rates.

Care should be taken when applying water-borne paint as the applied film is sensitive to water (rain) and traffic abrasion. Low road and air temperatures and humidity may have adverse effects on drying time and development of abrasion resistance.

See Part 3 Section 1.4 of this guide on setting out.

1.3  Reflective glass beads

Refer to MRTS45 Clause 6.1.3.

| 6.1.3 Reflective glass beads |

Reflective glass beads shall be Type B, B-HR, C, D or D-HR glass beads as described in AS2009. The type to be used shall be as stated in Clause 3 of Annexure MRTS45.1.

The glass beads shall comply with the requirements of AS2009 and the Australian Paint Approval Scheme – Specification AP-S0042.
1.4 **Skid resistance for transverse line marking**

Refer to MRTS45 Clause 6.1.4.

<table>
<thead>
<tr>
<th>Material type</th>
<th>Skid resistance level (BPN) (Under wet conditions)</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterborne paint</td>
<td>45</td>
<td>AS4049.4 Appendix J or APAS (Using Grip Tester)</td>
</tr>
<tr>
<td>Thermoplastic</td>
<td>45</td>
<td>AS4049.2 Appendix L or APAS (Using Grip Tester)</td>
</tr>
<tr>
<td>Cold applied plastic</td>
<td>45</td>
<td>AS4049.2 Appendix L or APAS (Using Grip Tester)</td>
</tr>
</tbody>
</table>

The testing frequency shall be in accordance with AS4049.4 and may be varied as stated in Clause 1 of Annexure MRTS45.1. The Contractor shall measure the level of retroreflectivity using the procedure set out in AS4049.4.

2 **Plastic materials**

2.1 **General**

Plastic markings usually fall into two categories: thermoplastics (applied hot) and cold applied plastics. They are relatively expensive and are usually installed by private contractors (except the screeded type), due to the specialised nature of the equipment that is needed.

2.2 **Thermoplastics**

Refer to MRTS45 Clause 6.1.5.

<table>
<thead>
<tr>
<th>6.1.5 Thermoplastic materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoplastic materials shall comply with the requirements of AS4049.2 and have approval under the Australian Paint Approval Scheme – Specification 0041/4.</td>
</tr>
</tbody>
</table>

Thermoplastic-based materials possess quick-dry properties. This desirable quality in road marking materials enables minimum disruptions to traffic, needing no lane closures or cones. They can be safely stored and transported and, because thermoplastics are composed of 100% solids, there are no volatile organic compounds (VOCs) to contend with and no disposal problems.

Four types of thermoplastic road marking material are:

a) spray  
b) extruded  
c) screed  
d) pre-formed.
2.2.1 Sprayable thermoplastics

A typical highly-durable, sprayable thermoplastic comprises a binder of hydrocarbon polymer and non-volatile mineral oil with a pigmented aggregate. Reflectorised grades usually contain glass beads at a rate not less than 0.18 kg/m$^2$. Thermoplastics are normally resistant to climatic extremes. Colour fastness is normally excellent, with a very low tendency to pick up dirt. Normal spraying temperatures are in the order of 200°C and, as a result, the material fuses to dry bituminous surfaces. While there is reasonable adhesion to concrete, it is advisable to use a bonding agent. Skid resistance is normally very good.

Sprayable thermoplastics are easily and quickly applied by machines designed for the purpose. Drying times are usually in the order of seconds and spraying machines can be operated at up to 20 km/h.

Coverage depends to a large extent on the texture of the road surface. As a guide, approximately one tonne of plastic would be sufficient to produce a line 1.5 mm thick, 100 mm wide and 3.5 km long on an average surface. Less material would normally be required on smooth surfaces and for covering worn existing lines.

2.2.2 Extruded thermoplastics

With extruded thermoplastic markings, the thermoplastic material is extruded onto the pavement using special equipment. Recommended thickness is of the order of 2 to 3 mm.

Extruded thermoplastic markings are usually only economical when larger quantities are involved. Preformed thermoplastics, cold screeded plastic material and permanent line marking tape may be more suitable for smaller quantities.

2.2.3 Preformed thermoplastics

Preformed thermoplastic pavement markings are also available in sheet form (commonly 600 mm x 900 mm) or as pre-cut symbols. The material is fixed to the pavement by applying heat. The flame of the blowtorch is played over the marking, which has a melting point of between 150°C and 180°C, according to the grade. The marking should be heated to melting point, but not beyond this if burning and distortion are to be avoided. The heated marking cools rapidly on removal of the flame and is ready for traffic within minutes.

2.3 Cold applied plastic markings

Refer to MRTS45 Clause 6.1.6.

### 6.1.6 Cold applied plastic materials

Cold Applied Plastic materials shall comply with the requirements of AS4049.4 and Clause 4 of Annexure MRTS45.1 and have approval under the Australian Paint Approval Scheme – Specification AP-S0041/3.

A typical cold applied plastic marking compound, such as Degadur®, comprises cold hardening methacrylate resins, being a mixture of esters of methacrylic and acrylic acids and their dissolved pigments. The product usually is supplied in two-pack form, comprising a catalyst and an accelerator. Because the compound has limited ‘pot’ life (about 10 minutes at 200°C), only small quantities should be mixed at one time. Typical minimum application rates are one litre per square metre. Recommended thickness is of the order of 2 to 3 mm. A sprayable form of cold applied plastic is now also available, which requires special application equipment.
Reusable templates may also be used. The road surface to be coated must be in good condition and free from dirt and grease and thick, old paint. The correct amount of compound should be poured over the area previously marked, then spread to the required thickness with a serrated smoother. The surface should then be trowelled to a smooth finish. Glass beads may be sprinkled on to the surface after trowelling. When the surface is ‘touch-dry’, templates (or tapes) should be removed. After about 30 minutes, the compound will have cured completely and the markings will be trafficable.

Most compounds are designed for use on bitumen roads. If concrete roads or steel surfaces are to be marked, then it is necessary to use a special primer before the compound is applied. They can be applied on old paint if oil residue is first removed with solvent of the right thickness.

All types of traffic markings and symbols (such as stop bars, letter symbols and pedestrian crossings) can be produced on the road surface by using prefabricated templates and smoothing battens or by bonding with adhesive strips and levelling with spacing strips.

3 Line marking tape

There are tapes available for both temporary and permanent markings.

3.1 Temporary line marking tape

The erasure of painted line markings by grinding, sand blasting or blackening out usually leaves a distinct scar or mark on the pavement. This scar or mark may have a similar appearance to a painted line in wet weather, at night or under some poor lighting conditions. This can be misleading to drivers. The problem can be overcome to some extent by using a temporary line marking tape. Such tape can be used wherever markings are to be changed frequently, such as during construction stages and, in particular, for all temporary pavement markings on final surfaces.

A typical temporary line marking tape has a durable, conformable aluminium core, coated with a tough vinyl layer on top and a self-adhesive underneath. The upper white pigmented surface is impregnated with ballotini (glass beads).

The tape is applied to the road surface using a special applicator. The tape adhesive is activated by a primer applied to the road surface. The tape may be removed later, using gentle heat, leaving only a thin coating of adhesive on the pavement. The adhesive residue soon wears away under traffic. For short duration and for ease of removal, use of the primer may be omitted.

Caution should be exercised when considering temporary line marking tape on rough chip seals. There is difficulty in application because the tape is easily ruptured by the tops of aggregate resulting in poor appearance.

3.2 Permanent line marking tape

3.2.1 General

This is generally a pliant polymer film, which is impregnated with glass beads for night-time visibility and to improve skid resistance. It is supplied in rolls of varying widths, usually about 1.5 mm thick and is available in sheeting form which may be cut into various words or symbols. It is also available in pre-cut pavement arrow and numeral forms.

These markings are pre-coated with a pressure-sensitive adhesive on the underside. For best results, they should be inlaid in new asphalt concrete surfaces, but they may also be overlaid on existing pavement surfaces.
These markings have very similar life characteristics to screeded thermoplastic materials. They are recommended for use instead of such materials where long life is desired and thermoplastic equipment is not available at the location or for quantity reasons.

3.2.2 Inlaying markings in new pavements

Lines, words and symbols may be positioned on the pavement surface manually. A tape applicator may also be used to apply tape. After application, the markings are embedded into the warm pavement surface with a finishing roller, using a minimum amount of water on the roller.

The new pavement should be soft enough to allow the markings to be inlaid, but firm enough to minimise shoving of the asphalt mat in front of the finishing roller.

Initial rolling of the markings, including transverse markings, such as crosswalks, should always be in the same direction as the markings were applied. A smaller roller (say one or two tonnes) may be used for transverse markings.

The inlay depth is dependent on applied pressure and the hardness of the asphalt mat. Additional passes of the roller may be required to achieve the desired amount of embedment. If the marking buckles or distorts severely in front of the roller, the mat may be too soft.

3.2.3 Overlaying markings on existing surfaces

Commonly, the markings are applied manually or with a tape applicator.

The minimum temperatures for application are 15°C for air and 20°C for road surface, with both temperatures rising. The markings should be applied during a season when daytime temperatures are above 20°C and night-time temperatures are above 15°C.

Pavements must be clean, dry and free of dust, dirt and other contaminants. For best results on existing surfaces, the pavement should be primed with special primer to consolidate dirt particles and seal against moisture. Using a solvent-resistant paint roller or primer spray applicator, a uniform coat of primer should be applied to the pavement at a rate of about 5 square metres per litre (or as specified), making sure that the primer extends at least 25 mm beyond a previously-outlined area.

Drying time of the primer is dependent upon ambient temperature, humidity and wind. The primer should be allowed to dry to a tacky state (approximately 5 to 15 minutes at 20°C) before applying the pavement marking. The primer will remain tacky for several hours, but the pavement marking should be applied to the tacky surface as soon as possible to avoid contamination of the primer by dirt.

Caution should be taken when applying the primer over old paint or other markings. For best results, old markings should be removed or primer applied adjacent to them.

When positioning markings on to primed surfaces, only butt splices should be used. There should be no overlaps.

All markings must be thoroughly tamped, preferably with a rubber-tyred roller. A normal tyre may be used by driving a vehicle slowly over the markings. All edges should be firmly stuck. The area should be opened to traffic as soon as possible.

The markings are not designed to be removed easily. Removal can best be accomplished by a scraping and jabbing action using a sharpened spade or similar tool. Burning or grinding are not recommended removal procedures.
3.3 Temporary linemarking covers

Some materials and systems available have been designed to respond to special circumstances. Tapes can be used in temporary situations such as roadworks. They are particularly convenient when small quantities are required as they are more expensive than liquid products.

Temporary markings need to retain their good quality over a short period of time and be easily removable without leaving traces on the road surface that could be confused with a permanent marking.

In roadwork situations, being generally more hazardous than normal traffic conditions, with accident rates being double the usual level, the use of high-quality, durable materials is essential.

Some tapes are reinforced to facilitate removal.

The removable black line mask is a preformed, patterned, skid-resistant black tape that features pressure-sensitive adhesive design to temporarily cover existing pavement markings.

The tapes are non-reflective matte black with a waffle pattern to reduce the glare resulting from tyres polishing flat markings and are usually used for masking lane lines, edge lines, tapers, crossovers and counter-flows common to work zone activities.

Temporary studs can also be used to supplement tapes and to improve wet / night visibility.

4 Raised pavement markers and pavement bars

4.1 Retroreflective Raised Pavement Markers (RRPMs)

Refer to MRTS45 Clause 6.2.

6.2 Raised retroreflective pavement markers

Raised retroreflective pavement markers shall comply with the requirements of AS1906.3 and shall be Type A1 either uni-directional or bi-directional.

Bi-directional raised retroreflective pavement markers shall be white or yellow as shown on the Drawings. Uni-directional raised retroreflective pavement markers shall be white, red, green or yellow as shown on the Drawings.

4.2 Non-Retroreflective Raised Pavement Markers (NRPMs)

Refer to MRTS45 Clause 6.3.

6.3 Non-retroreflective raised pavement markers

Non-retroreflective raised pavement markers shall comply with the requirements of AS1906.3 and shall be Type B.

Non-retroreflective raised pavement markers shall be circular, approximately 100 mm in diameter, and 15 mm high. The colour shall be white.
4.3 **Temporary Raised Pavement Markers (TRPMs)**

Refer to MRTS45 Clause 6.4.

### 6.4 Temporary raised pavement markers

Temporary raised pavement markers shall comply with the requirements of AS1906.3.

4.4 **Pavement bars**

Refer to MRTS45 Clause 6.5.

### 6.5 Pavement bars

Pavement bars shall be manufactured in accordance with details shown on the design documents. Where not otherwise shown, pavement bars shall be manufactured from concrete and painted white.

5 **Application equipment**

5.1 **General**

Mechanical means shall be used to apply painted pavement markings.

All equipment used in the application of pavement markings shall produce pavement markings of uniform quality which conform to the requirements of this Technical Standard.

The longitudinal line application machine shall be capable of accurately superimposing succeeding coats of paint upon the first coat and upon existing lines.

The longitudinal line application machine shall consist of a rubber-tyred vehicle which is manoeuvrable to the extent that straight lines can be followed, and normal curves can be painted in true arcs. The machine shall be capable of applying road marking paints and glass beads at the rates specified.

The longitudinal line application machine shall be equipped with the following:

a) a positive acting cut-off device to prevent depositing paint in gaps of broken lines, and

b) a glass bead dispenser located behind the paint applicator nozzle and which is controlled simultaneously with the paint applicator nozzle.

Where the configuration or location of a longitudinal line is such that the use of a longitudinal line application machine is unsuitable, road marking paint and glass beads may be applied by hand-sprayed means.

Stencils, boards and hand-spray equipment shall be used to paint transverse markings. Stencils shall conform to the dimensions shown on the design documents or in the *Manual of Uniform Traffic Control Devices*. 