ROADWORKS SPECIFICATION

R64 PAVEMENT MARKING

Date JULY 2013

Edition 1 / Revision 0

Department *of* Infrastructure, Energy *and* Resources

Tasmania
Explore the possibilities

REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1 / Rev 0	R64.5.12 R64.9 R64.10 Removed	Replace reference to "R64 Appendix B" with "DIER Standard Drawing SD-81.001" Change "Payment" Clause Number from R64.10 to R64.9 Change "Hold Points and Deliverables" Clause Number from R64.11 to R64.10 Remove "Pavement Marking Code" drawing from Appendix B, to be replaced by Standard Drawing SD-81.001	RB (MTE)	24.07.13

Index **Page**

R64.1 SCOPE

This Specification sets out the requirements for the supply, application and removal of pavement marking materials, glass beads, aggregate, Reflective Raised Pavement Markers (RRPM's) and temporary pavement tape.

R64.2 REFERENCES

All pavement marking shall be in accordance with all DIER Standards and Specifications, in particular:

- G1 – General Provision
- G2 – Contract Management Plan
- G3 – Traffic Management
- T10 – Traffic Signs and Pavement Marking
- AS 1742 Manual of uniform traffic control devices
- AS 1906 Retroreflective materials and devices for road traffic control purposes
- AS 2009 Glass beads for road-marking materials
- AS 1580 Paints and related materials - Methods of test
- AS 3554 Adhesives-Epoxy - For Retroreflective Raised Pavement marker installation
- AS 4049 Paints and related materials - Road Marking paints
- APAS - Australian Paint Approval Scheme
- PCCP - Paint Contractors Certification Program

R64.3 CONTRACT MANAGEMENT

R64.3.1 Contract Management Plan

The Contractor shall provide a Contract Management Plan that is consistent with *Specification G2 Contract Management Plan*. The Contract Management Plan shall also cover procedures defined by, but not limited to, the following:

- Type of material and glass beads with product label information and the product data sheet.
- Estimation of material, glass beads and aggregate application rates including methods of verification of the application rates.
- Calibration of application equipment including calibration of measuring devices used for inspection and testing
- Inspection and testing regimes for dry retro reflectivity and skid resistance tests
- Pavement cleaning method prior to painting.
- Method of protection of newly painted markings.
- Method of removal of existing markings including occupational health measures.
- Traffic Management plans with reference to *Standard Specification G3 Traffic Management*
- Control of a non-conforming product

The Contract Management Plan shall be submitted at least 10 working days prior to commencement of pavement marking work or as required by the General Conditions of Contract.

R64.3.2 Evidence of Compliance

R64.3.2.1 General

Further to the requirements of *Standard Specification G1.7 Records*, evidence of compliance shall include the record (available on request from Documents.RandT@dier.tas.gov.au) of all line marking undertaken as well as initial dry retro reflectivity and skid resistance readings.

Note:
From 1st January 2013 DIER may require registered pavement marking contractors to be have the appropriate PCCP level accreditation.

R64.3.2.2 Performance Measures

Initial dry retro reflectivity readings shall be recorded by the Contractor for all markings except audio tactile markings between 14 – 30 days after marking as per *Appendix A*. Records of retro reflectivity shall be submitted to the Superintendent within 28 days of testing.

Provision of initial dry retro reflectivity records shall constitute a HOLD POINT.

A marking shall be deemed non compliant if the initial reading is less than the values in *Table 64.1 Minimum Retro Reflectivity*.

For each test location a subsequent dry retro reflectivity reading shall be recorded by the Contractor between 160 – 180 days of marking and submitted to the Superintendent within 28 days of testing.

A marking shall be deemed non compliant if the reading is less than the values in *Table 64.1 Minimum Retro Reflectivity*.

Where the initial retro reflectivity are below the minimum but above the re-mark values a penalty shall be applied as detailed in *Clause R64.9*.

Where the subsequent retro reflectivity measurements are below minimum levels at 160 – 180 days, the relevant marking shall be subject to a remark at no cost to the Principal. The timing of the remarking shall be at the discretion of the Superintendent.

Table 64.1 - Minimum Retro Reflectivity

Marking Material	**Marking Type**	**Days**		
		20 – 30		**160 - 180**
		Minimum retro reflectivity (*mcd/lux/m²)*	**Re-mark if less (*mcd/lux/m²)***	**Minimum retro reflectivity (*mcd/lux/m²)***
Water Borne Paint	Short Term	200	180	150
	Standard	250	230	200
Thermoplastic	Extruded	250	230	200
	Preformed	250	230	200
Cold Applied Plastic	Painted	250	230	200

R64.4 MATERIALS

R64.4.1 General

Road marking materials shall conform to the following Australian Standard, Australian Paint Approval Scheme Specifications and shall be on the current APAS List of Approved Products:

- (a) AS 4049.2 Thermoplastic material approval system
- (b) APAS 0041/5, Road Marking Paint, water borne.

The drying (no pickup) time for water borne (0041/5) paints shall be less than 5 minutes when tested at 25^0C in accordance with *AS 1580.401.8*.

Thinners shall be in accordance with the Manufacturer's specification.

R64.4.2 Definitions

Pavement marking types are defined in terms of their design life as listed in *Table R64.3 Definitions*.

Table R64.3 Definitions

Marking Type	Expected Life
Short Term Waterborne Paint	1 years
Standard Waterborne Paint	2 years
Extruded Thermoplastic	7 years
Preformed Thermoplastic	4 years
Cold Applied Plastic	7 years

R64.4.3 Glass Beads

The glass beads shall comply with the requirements of *AS 2009* Classes B, C or D.

R64.4.4 Thermoplastic

Thermoplastic road marking paint shall be in accordance with *AS4049.2 - Appendix F*. The proportion of glass beads shall be a minimum of 20% to a maximum of 30% by mass of the total mixed material and shall be minimum size Class C.

The allowable softening point shall be in the range 75 - 105^{o}C for Tasmania.

Preformed thermoplastic sheet material placed with localised heat shall be acceptable.

R64.4.5 Cold Applied Plastic

Methyl methacrylate based proprietary products may only be used as a long-term marking product on compliance with *Clause R64.4.10*.

R64.4.6 Reflective Raised Pavement Markers

Reflective raised pavement markers shall comply with the requirements of *AS1906* and be Type A unless otherwise specified.

Adhesives shall comply with the requirements of *AS3554*.

R64.4.7 Temporary Pavement Tape

Temporary pavement tape shall be removable pressure sensitive material and its use shall require prior approval by the Superintendent. It shall be of minimum width 100 mm $\pm$5 mm.

R64.4.8 Aggregate

Quartz shall be white, clean, sound grained angular to semi angular, free from deleterious matter with 100% passing a 1 mm sieve and less than 1% passing 0.15 mm sieve. Bauxite or garnet shall be clean sound grained angular material sized between 1 and 3 mm.

R64.4.9 Drying

Where required drying additive may be applied in accordance with the paint Manufacturer's guidelines.

R64.4.10 Proprietary Products

The contractor shall provide evidence that all proprietary products such as epoxy or plastic products have demonstrated satisfactory field performance for a period of at least three (3) years.

Such products shall be applied in accordance with the Manufacturer's Specification. Where a proprietary product is used, evidence that it has been applied in accordance with the Manufacturer's instructions shall be provided.

R64.5 APPLICATION

R64.5.1 Surface Treatment

The area to be marked shall be dry and free of dirt, gravel, oil and other loose or foreign material to ensure the best possible adhesion of new material. Where the existing paint or other material is flaking or chipping, this shall be removed. Cleaning may be carried out by brooming, blowing or washing.

Where the thermoplastic material specifies the use of a tack coat or primer material for certain surface or conditions, such use shall be in accordance with the Manufacturer's Specification.

R64.5.2 Setting Out

The location of all pavement markings on new surfaces, including reflective raised pavement markers, shall be set out by spotting with paint or other approved method prior to application of the markings.

The location of all pavement markings over existing markings shall match the existing except where directed otherwise.

R64.5.3 Water Borne Paint

The paint shall be thoroughly mixed before use. Dry film thickness shall be calculated from the solids content of the paint.

If thinners are used the Contractor shall adjust the application rate to ensure the specified thickness is achieved.

Water borne paint shall not be applied when the pavement temperature is below 12^{o}C or when the humidity is above 85%.

Water borne painted pavement markings shall have the following minimum dry film thickness, glass bead class and design life as in *Table 64.4 Specifications*.

Table R64.4 Specifications

Marking Type	Minimum Dry Film Thickness	Glass Beads Class
Short Term Waterborne Paint	0.2 mm	B
Standard Waterborne Paint	0.3 mm	D

Standard Waterborne paint markings may incorporate a drying additive to reduce the film dry through time unless ideal drying conditions give the specified dry through time.

R64.5.4 Thermoplastic

The thermoplastic material shall be applied in accordance with the Manufacturer's Specification.

The marking produced shall be uniform in texture, width and thickness and the surface substantially free from blisters, streaks, lumps and other defects. Any occurrence of overspray and gun dribble shall be removed by the Contractor before leaving the site.

Thermoplastic pavement marking shall have the minimum dry film thickness and glass bead class as listed in *Table 64.5 Thermoplastic Specifications*.

Table R64.5 Thermoplastic Specifications

Marking Type	Minimum Dry Film Thickness	Glass Beads Class
Extruded thermoplastic	2.5 mm	C (intermix 20 – 30% by mass) and D
Preformed thermoplastic	2.5 mm	C (intermix 20 – 30% by mass) and D

The thickness of thermoplastic shall not vary from the specified thickness by more than 0.5 mm, when the application rate from the machine is measured on a sheet of flat metal.

For continuous thermoplastic pavement marking, 50 mm drainage gaps shall be provided, at a maximum spacing of 6m $\pm$1m, to allow adequate drainage of the pavement surface. The Contractor shall nominate in his Contract Management Plan his method of identifying the location and spacing for these gaps.

R64.5.5 Cold Applied Plastic

Cold applied plastic shall be applied in accordance with the Manufacturer's Specification that may include a primer coat. It may be applied by spray, roller, extruded, screeded or trowelled depending on the subject being marked. Glass beads and skid resistance material shall be included, as specified for each site, at rates set out in *Clauses R64.5.6 and R64.5.7*.

R64.5.6 Glass Beads

Glass beads shall be uniformly applied to the surfaces of all painted markings as part of the application process and before it skins at a rate of 0.30 kg/m^2 for Class B beads and 0.4 kg/m^2 for Class D beads.

As well as the "mixed in" glass beads additional Class D beads shall be uniformly applied to the surface of thermoplastic at the rate of 0.40 kg/m^2 as part of the application process and before the material has commenced to set.

R64.5.7 Skid Resistance

All markings shall have angular aggregate applied at a rate of 0.2 kg/m^2 before the marking material skins.

The aggregate shall be placed immediately prior to the glass beads.

The quantity of aggregate shall be at the rate of one (1) part aggregate to two (2) parts glass beads (by mass).

R64.5.8 Reflective Raised Pavement Markers

Reflective raised pavement markers shall be set out and coloured as specified in *AS1742.2* except where directed.

On separation lines they shall be located on the centre of the line.

On barrier lines they shall be located adjacent to the line.

On edge lines they shall be located on the shoulder side of the edge line.

Reflective raised pavement markers shall be fixed by adhesive in accordance with the Manufacturer's Specification. The reflective raised pavement markers shall be fixed to unpainted surfaces with the reflective element set at right angles to the line and shall not be painted over.

R64.5.9 Temporary Pavement Markings

Removable pressure sensitive material shall be applied according to the Manufacturer's specifications.

R64.5.10 Chevrons

Generally chevrons shall be marked with standard water borne paint, glass beads and skid resistance material. Where chevrons are located in high wear areas, cold applied plastic with glass beads and skid resistance material shall be applied as directed.

R64.5.11 Arrows

Pavement arrows may be marked with waterborne paint, thermoplastic or cold applied plastic materials. In temporary situations, short term pavement marking paint shall be applied.

R64.5.12 Audio Tactile Markings

Audio tactile markings shall be type A or B as shown on DIER Standard Drawing SD-81.001.

For Type B, 50 mm drainage gaps shall be provided at a maximum spacing of 6m.

R64.5.13 Removal of Existing Markings

Existing thermoplastic markings shall be removed flush with the surrounding surface.

For sprayed bituminous resurfacing sites removal by grinding or milling will not be accepted.

For asphalt resurfacing sites grinding or milling may be accepted.

In both these instances all surface defects cause by the removal process shall be repaired by the contractor at no additional cost to the principal.

Evidence of compliance shall be provided to the Superintendent prior to the application of new markings.

R64.6 TOLERANCES

Permanent markings shall comply with the following tolerances:

General

- The Contractor shall ensure that the new pavement markings match the existing pavement markings at the limits of the works.

Lines

- Lines shall not deviate from the longitudinal alignment by more than 25 mm, measured from centre of applied line to specified location.
- The width of lines, and the width of the space between parallel lines, shall not vary from the specified widths by more than 5 mm.
- For separation lines, lane lines, continuity lines, intermittent edge lines, two way intermittent barrier lines and the broken segments of one way barrier lines, the average lengths of line segments and the space between over a distance of 100 metres shall be as specified, however individual segments and spaces shall not vary from the specified lengths by more than 50 mm and 100 mm respectively.
- For junction continuity lines and holding lines, individual segments and spaces shall not vary from the specified length by more than 25 mm.

Arrows and Chevrons

- For arrows and chevrons, the painted area shall be within 25 mm of the specified template dimensions.

Reflective Raised Pavement Markers

- Generally, unless otherwise specified, Reflective Raised Pavement markers shall be located in accordance with *AS 1742.2, Section 4.6*.

- For broken lines, markers shall be laterally located to within 5 mm of the centre of the line.

Short Term Markings

- Short term markings in solvent or water borne paint or temporary pressure sensitive material shall be located to the tolerances given above.

Pavement Markings over Existing Markings

- For pavement markings over existing markings, the tolerance for all works shall be $\pm$5 mm.

R64.7 WORKMANSHIP

All pavement markings shall be uniformly and neatly applied and finished with sharp edges. Longitudinal markings shall have a smooth and even appearance located within the tolerances specified. New markings shall be smoothly transitioned to match existing markings at the limits of the works.

Any pavement markings, which do not comply with this Specification, shall be removed at the Contractor's expense to the satisfaction of the Superintendent.

R64.8 PROTECTION OF WORKS

The Contractor shall protect all markings until the material has dried and hardened sufficiently to resist being damaged by traffic.

The Contractor shall be responsible for the protection of all roadside facilities and traffic from overspray and wet paint.

The Contractor shall, at his own cost:

- Remove and replace all paint spilled or applied and subsequently damaged or spread by the action of traffic or other road users prior to hardening.
- Remove any paint which adhered to roadside facilities due to his operations.

R64.9 PAYMENT

Payment for the supply and application of pavement marking material shall be based on the rate quoted in the *Schedule of Rates*. The unit of measurement for all line markings shall be linear metres. The unit of measurement for chevrons shall be square metres of total area inside the barrier line including the unpainted parts. The unit of measurement for pavement arrows and reflective raised pavement markers shall be by number.

Payment for Audio Tactile markings Types A and B shall be per linear metre and shall include the strips and the continuous marking (waterborne or thermoplastic as appropriate).

The rate for supply and application of pavement markings shall include all associated costs such as any surface preparation, priming, setting out, supply and application of all materials, and the protection of the finished product from damage by traffic. The rate shall exclude the cost of traffic management and all retro reflectivity testing as these shall be payed for under separate items.

Payment for the removal of pavement marking material shall be per m^2 of top surface area.

The rate for the removal of pavement markings shall include the supply of all plant and labour required.

The rate for the supply and application of temporary pavement tape shall include the cost of its subsequent removal and disposal.

Payment for each scheduled item will be made following satisfactory results from the retro reflectivity and skid resistance measurements reading records (20 - 30 days).

Initial retro reflectivity measurements below the minimum values in *Table 64.1 Minimum Retro Reflectivity* but above re-mark levels shall be subject to a 10% reduction in the Scheduled Rate for the relevant marking type.

Subsequent retro reflectivity markings below the minimum values in *Table 64.1 Minimum Retro Reflectivity* at 160 – 180 days shall be subject to a remark at no cost to the Principal. The timing of the remarking shall be at the discretion of the Superintendent.

The rate for the retro reflectivity measurement of all pavement markings shall include the supply of all equipment and labour required.

The unit of measurement for longitudinal markings shall be by the number of test sites along each line as specified in Appendix A. The unit of measurement for other markings including transverse lines, chevrons and arrows shall be by the number of test sites as specified in Appendix A.

Payment for traffic management shall be in accordance with *Standard Specification G3 Traffic Management*.

R64.10 HOLD POINTS AND DELIVERABLES

Hold points and related evidence of compliance in this specification are listed in *Table R64.6 Hold Points*.

Table R64.6 Hold Points

Ref	Description of Hold Point	Nominated Work not to proceed	Evidence of Compliance
R64.3.2.2	Provision of initial dry retro reflectivity records at 20 - 30 days after marking	Payment for the quantity of each relevant item claimed	Test Results
R64.3.2.2	Provision of subsequent dry retro reflectivity records at 160 – 180 days after marking	Payment for the test measurements	Test Results
R64.5.2	Set out of markings	Application of markings	Location details
R64.5.13	Removal of Existing Markings	Application of markings	Evidence of compliance

APPENDIX R64.A - DRY RETRO REFLECTIVITY

Dry Retro Reflectivity Test

General

Two dry retro reflectivity tests shall be carried out at the same spot/location in accordance with Evidence of Compliance at the following intervals:

a) 20 – 30 days after marking
b) 160 – 180 days after marking

The precise location of the test shall be recorded and marked on site.

The retro reflectivity measurement shall be taken using a 30 metre geometry reflectometer.

Test procedures shall be in accordance with *AS4049.4 Appendix K*.

Testing instruments shall be calibrated in the field prior to testing at each test site in accordance to manufacturer's instructions. Evidence of a third party full calibration compliance test completed within the previous twelve (12) months prior to retro reflectivity testing shall be provided prior to testing.

Sampling Plan

A) Longitudinal Markings

The number of test sites for longitudinal markings shall be in accordance with *Table A1 – Longitudinal Marking Test Sites* or as directed by the Superintendent.

Table A1 – Longitudinal Marking Test Sites

Length of Marking	Minimum no. of test sites
Less than 150m	Nil
Between 150m and 500m	1
Sections up to 2 km	One every 1 km
Sections up to 20 km	One every 2 km
Sections >20 km	One every 4 km

The Superintendent reserves the right to nominate the precise location of sampling point on each line. Subsequent retro reflectivity test shall be carried out between **160 – 180 days** on the same spot as the initial retro reflectivity test.

At each test site, the indicative reading shall be the average of 3 readings in each direction over a metre length of line. Readings shall be taken in both directions on centre-lines.

B) Other Markings

The Superintendent will nominate the precise location of the test sites for markings other than longitudinal markings.

The indicative reading shall be the average of a minimum of 3 readings within the perimeter of marking unless stated otherwise.

Readings in transverse markings shall be taken in both wheel-path and between wheel-path areas.

TRANSPORT INFRASTRUCTURE SERVICES DIVISION
Department *of* Infrastructure, Energy *and* Resources

GPO Box 936, Hobart 7001
Ph: 1300 135 513
Email: webmaster@dier.tas.gov.au
Visit: www.dier.tas.gov.au