

PART R45**SUPPLY OF MATERIALS FOR PAVEMENT MARKING****CONTENTS**

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1. GENERAL

- .1 This Part specifies the requirements for the supply of road pavement marking materials.
- .2 Documents referenced in this Part are listed below:

(a)	AS 1012	Methods of Testing Concrete
(b)	AS 1289	Methods of Testing Soils for Engineering Purposes
(c)	AS 1379	Specification and Supply of Concrete
(d)	AS 1580	Paints and related materials - Methods of test
(e)	AS1742.3	Traffic Control Devices for Works on Roads
(f)	AS 1906.3	Raised Pavement Markers (Retroreflective and Non-Retroreflective)
(g)	AS 2009	Glass Beads for Pavement-marking Materials
(h)	AS 2700	Colour Standards for General Purposes
(i)	AS 3600	Concrete Structures
(j)	AS 3610	Formwork for Concrete
(k)	AS 3972	Portland and Blended Cements
(l)	AS 4049.3	Paints and Related Materials - Road Marking Materials
(m)	Concrete Institute of Australia: Recommended Practice: Curing of Concrete CIA, Appendix A, 1991	
(n)	Australian Paint Approval Scheme (APAS): Specification 0042 "Glass Beads for Pavement Marking Paint", available from: http://www.apas.gov.au .	
- .3 DPTI Procedures:

(a)	PC108	Waterborne Pavement Marking Paint
(b)	PC109	Multi-Component Pavement Marking Materials
(c)	PC111	High Friction Surfacing
(d)	PC112	Pre-Form Thermoplastic
(e)	PC113	Thermoplastic Pavement Marking Material
- .4 DPTI procedures are available from:
http://www.dpti.sa.gov.au/standards/materials_technology_documents.

2. PAINT

General

- .1 Pavement marking paint shall be approved to DPTI procedure PC108.
- .2 A list of approved pavement marking paints is included in the DPTI Approved Products List, available from : <http://www.dpti.sa.gov.au/documents/contractsandtenders/specifications/general>. The Contractor may submit a request for the approval of additional products.
- .3 Provision of evidence demonstrating compliance with this Clause shall constitute a **HOLD POINT**.

Colour

- .4 The paint colour shall comply with the following:

Table 2.4.1 Paint colour	
White:	luminance factor of >80%, when measured in accordance with AS 4049.3
Black:	luminance factor of <5%, when measured in accordance with AS 4049.3
Yellow:	luminance factor of 45 - 50%, when measured in accordance with AS 4049.3. The chromaticity coordinates shall lie within the colour space defined by the coordinates shown in Table 2.2.
Blue:	luminance factor of 12 -15%, when measured in accordance with AS 4049.3

Table 2.4.2 – Yellow Colour Space*		
Point	X	y
1	0.531	0.468
2	0.477	0.433
3	0.427	0.483
4	0.465	0.534

* Chromaticity coordinates CEI Illuminant D₆₅, instrument configuration 45/0, 2° observer.

3. QUARTZ FOR "NON-SKID" PAVEMENT MARKINGS

Description

- .1 All material shall be clean, sound, hard, durable, non-plastic and free from adherent coatings and any foreign matter.

Colour

- .2 When a cylindrical container of minimum diameter 50 mm and minimum depth 20 mm, is filled with quartz, the surface screeded off and compared with an AS 2700 colour swatch, the quartz shall be whiter than Y35 off white.

Moisture Content

- .3 All material supplied shall have a moisture content of less than 5% when tested in accordance with AS 1289.2.1.4. One moisture content sample randomly selected from each delivery will be taken.

Size Distribution

- .4 The particle size distribution as determined by TP 134 shall be as follows:

SIEVE MESH SIZE (µm)	% PASSING
500	100
300	50-90
150	25-55
75	0-30

Shape

- .5 The quartz shall be very angular, angular or sub angular when viewed under magnification of 10X, and compared with Attachment R45A: "Quartz Roundness Chart".

Packaging

- .6 Quartz shall be packaged so as to prevent damage during transportation and handling, and to ensure that contamination does not occur.

4. GLASS BEADS

- .1 All glass beads shall comply with AS 2009 and APAS 0042 "Glass Beads for Pavement Marking Paint" with an additional requirement for Type B beads (drop-on) as modified below:
- .2 Type B beads (drop-on) shall comply with the properties defined in AS 2009 with an additional high performance retroreflectivity requirement requiring the delivery of a minimum 450 mcd/m²/lx when tested in accordance with a modified Appendix M of AS2009 as described below:
- (a) Section M4 Apparatus Clause a) Dry film thickness of paint will be 200 -250 µm
 - (b) Section M5 Procedure Clause b) Weigh 24 ± 0.5 grams of beads
 - (c) Section M5 Procedure Clause e) Wet Film thickness of paint will be 375 ± 25 µm

5. CRUSHED GLASS ANTI SKID MIX

- .1 Anti skid mixtures shall consist of glass beads and crushed glass in the ratio of 70:30. Glass used in anti skid mixtures shall be crushed to a cubic shape and contain no sign of glass shards. The particle size of the glass shall be 1 mm – 2 mm.

6. HIGH PERFORMANCE PAVEMENT MARKING MATERIALS**General**

- .1 High performance pavement marking materials are used where greater durability than that provided by waterborne paint is required. Examples include intersection marking and messages. Products shall be approved to one or more of the following DPTI procedures: PC109, PC111, PC112 or PC113.
- .2 Current approved products are listed in included in the DPTI Approved Products List, available from : <http://www.dpti.sa.gov.au/documents/contractsandtenders/specifications/general>.

Colour

- .3 Markings will be white or yellow to the requirements specified in the relevant PC as listed above.

7. COLOURED PAVEMENT SURFACINGS**General**

- .1 Coloured pavement surfacings such as that used for dedicated bus and cycle lanes shall be approved to DPTI procedure PC111. Current approved products are listed in included in the DPTI Approved Products List, available from : <http://www.dpti.sa.gov.au/documents/contractsandtenders/specifications/general>.

Colour

- .2 Coloured pavement surfacings shall be a commercial match to the following AS 2700 colours:
- (a) Bus lanes: Signal Red, R13
 - (b) Cycle lanes: Emerald, G13
 - (c) Pedestrian crossings: Golden Yellow, Y14
 - (d) Accessible boarding indicator patch (station platforms): Ultramarine, B21
 - (e) Dedicated parking patch for people with disabilities: Ultramarine, B21

8. RAISED PAVEMENT MARKERS

- .1 Raised pavement markers shall comply with AS 1906.3. Non reflective raised pavement markers shall not be ceramic.

9. SHEET MATERIALS

- .1 Road marking sheet material shall be an approved pliant polymer.

10. ADHESIVES

- .1 Adhesives for fixing of raised pavement markers and pavement bars shall be as approved in writing by the raised pavement marker or pavement bar manufacturer.

11. PAVEMENT BARS

General

- .1 Size B Pavement Bars (for use where the 85th percentile speed is less than 75 km/h) shall be 50 mm maximum height and comply with the dimensions shown on Attachment R45B. Size B Pavement Bars shall be either:
 - (a) manufactured from fibre reinforced concrete and comply with clause 11.2, or
 - (b) an approved recycled bar complying with clause 11.3

Concrete Pavement Bars

General

- .2 Concrete shall be supplied in accordance with AS 1379 except where amended or added to by this Specification. Concrete shall be strength Grade S32. Concrete shall be placed and compacted in accordance with AS 3600 except where amended or added to by this Specification.
- .3 Any assessment of compressive strength shall be undertaken without the addition of fibre reinforcement. Flexural strength tests shall be undertaken with fibre reinforcement.

Sampling and Testing

- .4 Sampling and testing shall comply with AS 1012.
- .5 Two standard specimens, made concurrently shall form a sample for compressive strength testing. Three standard specimens made concurrently shall form a sample for flexural strength testing.
- .6 Test specimens for flexural strength testing shall be standard specimens and shall be made and treated in accordance with AS 1012, Part 8.

Curing of Specimens

- .7 The concrete shall be cured in accordance with AS 3600, except where amended or added to by this Specification.

Moist Curing Conditions

- .8 The surface shall be maintained in a moist condition as required by AS 3600, Clause 19.1.5 for the following periods:
 - (a) Concrete containing portland cement conforming to AS 3972 shall be moist cured for 7 days.
 - (b) Concrete containing blended cements conforming to AS 3972 shall be moist cured for 14 days.

Steam Curing Conditions

- .9 Two additional compressive strength samples per 100 units shall be prepared when steam curing is used. These specimens shall be initially treated and steam cured as per Concrete Institute of Australia "Recommended Practice: Curing of Concrete CIA, Appendix A", 1991.
- .10 Subsequent to steam curing, the specimens shall be subjected to the same curing procedures adopted for the unit(s) they represent and the Contractor shall make provision for such curing of the specimens at the site.
- .11 Testing of these additional compressive strength test specimens will be carried out at the completion of the total curing cycle nominated by the Contractor.

Flexural Strength and Fibre Cohesive Capability of a Sample

- .12 The composite concrete flexural strength with fibre shall comply with the requirements specified in Clause 12 "Verification Requirements".
- .13 After failure of the specimen, the upper rollers of the flexural test apparatus shall be advanced a further 40 mm and released. For acceptance of the failure the fractured pieces of concrete shall remain firmly held together by the fibre.

Fibre Reinforcement

- .14 Reinforcing fibre shall be Caricrete, fibre size various tex, fibre length 75 mm (Order Code KU10100) or an approved alternative. The amount of fibre in the mix shall be a minimum of 0.3% by mass.

Surface Finish

- .15 Concrete surfaces shall be finished so as to achieve the specified dimensions, texture and surface finish. The surface finish shall be Class 3 in accordance with AS 3610.
- .16 The bottom surface of the pavement bar shall have an exposed aggregate finish free of laitance for bonding purposes.

Painting of Concrete Pavement Bars

- .17 Pavement bars shall be painted with two coats of approved low gloss acrylic AS2700 Y14 "Golden Yellow" paint to a total dry film thickness of 60 mm. A coating of glass beads shall be added to each coat of paint whilst it is still wet to ensure embedment. 27/3 . Current approved products are listed in included in the DPTI Approved Products List, available from :
<http://www.dpti.sa.gov.au/documents/contractsandtenders/specifications/general>

Recycled Pavement Bars**General**

- .18 The Recycled Pavement Bars listed in the DPTI Approved Products List, available from:
<http://www.dpti.sa.gov.au/documents/contractsandtenders/specifications/general> are approved for use on DPTI roads.
- .19 The Contractor may request the approval of additional products by submitting:
- results of recognised tests or other suitable documentation (to be evaluated on submission) in order to support the requirements of this Sub-clause 11.3;
 - disposal instruction for the recycled pavement bars; and
 - a guarantee/warranty statement of the life expectancy of the recycled pavement bars in relation to colour fastness and structural integrity of the material.
- .20 Approval will be subject to demonstrating satisfactory physical properties, proven durability and fixing method.
- .21 Provision of evidence demonstrating compliance with this Sub-clause shall constitute a **HOLD POINT**.

Manufacturing

- .22 Recycled Pavement bars shall be manufactured from recyclable materials and materials that resist permanent deformation. Recycled pavement bars are to be manufactured so that they resist breaking under impact from traffic, or if breaks do occur, sections of the bar shall not detach and create the possibility of damage to vehicles or other road users. Materials used shall not be subject to becoming more brittle, or otherwise deteriorate structurally.

Compressive and Flexural Strength

- .23 Recycled pavement bars shall have a minimum compressive strength of 32 MPa and a minimum flexural strength of 4.5 MPa.
- .24 Some materials may not meet these strength requirements but possess a memory characteristic allowing the materials to regain its shape after deformation. These types of materials will be considered.

Colour

- .25 Recycled pavement bars shall be manufactured either yellow in colour or capable of accepting and retaining paint. The yellow colour shall be colour No. 14 Golden Yellow, as defined in AS2700. Each pavement bar shall have a colour match rating of 3 when compared to the Y14 colour, as described in AS 1580.601.1.
- .26 Pavement bars not requiring painting shall be capable of retaining their colour when exposed to weather conditions. The manufacturer shall provide information on the likely service life of the recycled pavement bar prior to painting being required.
- .27 Recycled pavement bars are not required to be retroreflective if used on roads which have a level of road lighting.
- .28 The manufacturer may nominate a preferred paint product which is compatible with the recycled pavement bar surface and will minimize discolouration due to wear or the accumulation of road grime.

Performance Requirements

- .29 Recycled pavement bar surfaces shall have a smooth surface and shall not be capable of causing damage to vehicle tires. They shall exhibit self-cleaning properties whereby it will retain its yellow colour and minimize discolouration due to wear or the accumulation of road grime.
- .30 Recycled pavement bars shall be sufficiently rough enough to permit a good bond between it and the adhesive used. The bottom surface shall be flat so that it can rest firmly on a hard flat surface without rocking when a load is alternately applied to each end.

Fixing Methods

- .31 Recycled pavement bars shall be capable of being fixed to the road surface by the use of adhesives. Mechanical fixings are not acceptable. The manufacturer may nominate a preferred adhesive agent.

12. TEMPORARY PAVEMENT MARKING MATERIALS**Temporary Retroreflective Raised Pavement Markers**

- .1 In accordance with AS 1742.3 Clause 3.9.5, temporary retroreflective raised pavement markers should be sufficiently robust to survive under traffic until permanent markings are installed.

Temporary Linemarking Tape

- .2 Temporary Linemarking Tape shall be subject to prior approval.

13. RECORDS

- .1 Further to Part G20 Quality System Requirements, traceability is required for all Pavement Marking Materials. A record of consignments and associated documentation shall be retained by the Contractor. The documentation shall include the following details:
 - (a) Product Name
 - (b) Product Description
 - (c) Batch No.
 - (d) Date of manufacture
 - (e) Evidence that the material complies with the requirements of the Specification.

14. HOLD POINTS

- .1 The following is a summary of Hold Points referenced in this Part:

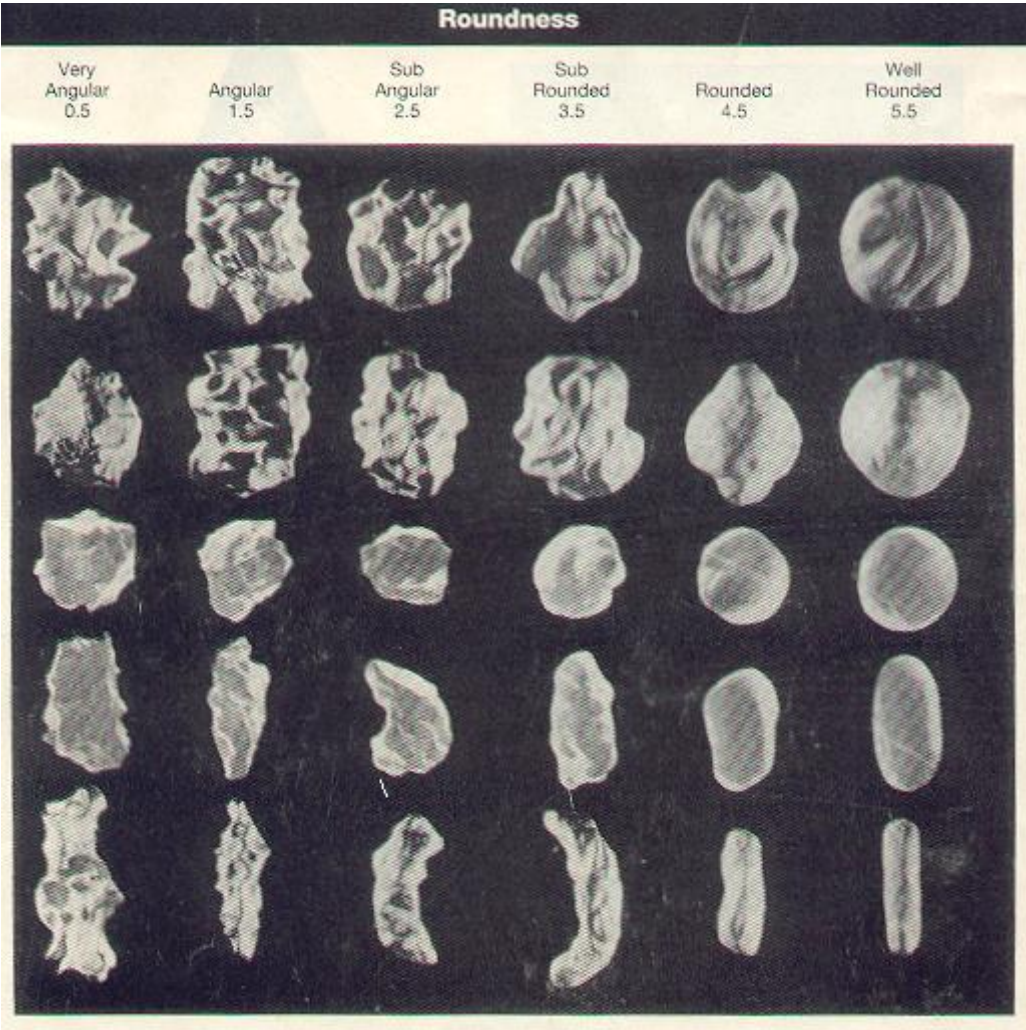
CLAUSE REF	HOLD POINT	RESPONSE TIME
2.1	Submission of evidence of compliance	7 days

15. VERIFICATION REQUIREMENTS AND RECORDS

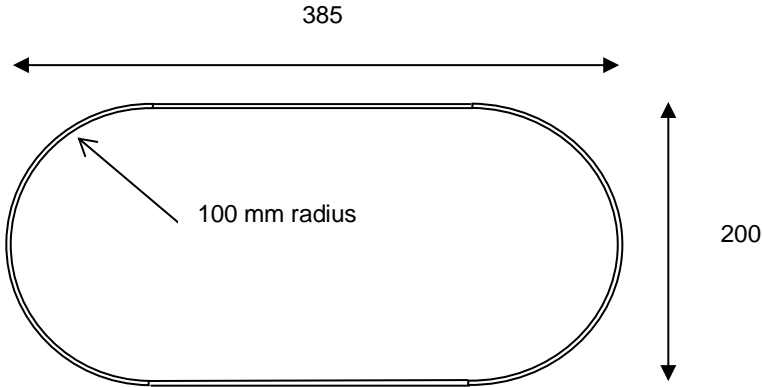
- .1 The Contractor shall supply the following records:

CLAUSE REF.	SUBJECT	PROCEDURE	FREQUENCY	RECORD TO BE PROVIDED
4.	Quartz for non-skid paint	TP 946	Each consignment	Record of supply stating compliance to Specification
5.	Glass beads	AS 2009 and APAS 0042	Each consignment	Record of supply stating compliance to AS 2009 and APAS 0042 for Type D-HR, Type C or Type B High Performance Retroreflectivity glass beads
8.	Raised pavement markers	AS 1906.3	Each batch	Record of supply stating compliance to AS 1906.3
10.	Adhesives			Written approval of raised pavement marker or pavement bar manufacturer
11.	Pavement bars		Each batch	Record of supply stating compliance to Specification

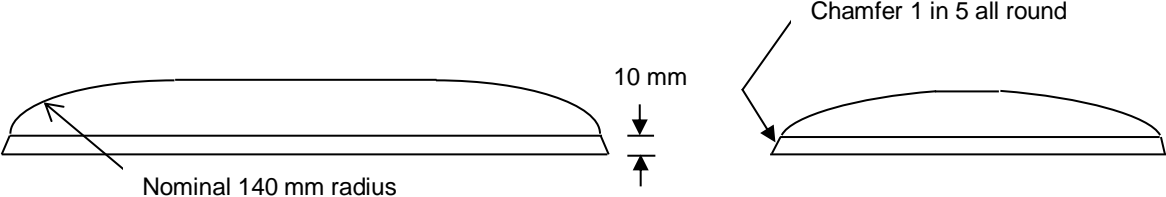
16. ATTACHMENT R45A QUARTZ ROUNDNESS CHART



17. ATTACHMENT R45B PAVEMENT BAR



PLAN



FRONT ELEVATION

END ELEVATION

NOTE:

- 1. Not to scale
- 2. All dimensions in millimetres
- 3. Size B Bars 50 mm nominal height.