

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

1. General
2. Paint
3. Quartz for "Non-Skid" Pavement Marking
4. Glass Beads
5. Crushed Glass Anti Skid Mix
6. High Performance Pavement Marking Materials
7. Coloured Pavement Surfacing
8. Raised Pavement Markers
9. Sheet Materials
10. Adhesives
11. Pavement Bars
12. Temporary Pavement Marking Materials
13. Quality Records
14. Hold Points
15. Verification Requirements and Records

Attachment R45A: Quartz Roundness Chart
Attachment R45B: Pavement Bar

1. GENERAL

This Part specifies the requirements for the supply of road pavement marking materials.

Documents referenced in this Part are listed below:

AS 1012	Methods of Testing Concrete
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1379	Specification and Supply of Concrete
AS 1580	Paints and related materials - Methods of test
AS1742.3	Traffic Control Devices for Works on Roads
AS 1906.3	Raised Pavement Markers (Retroreflective and Non-Retroreflective)
AS 2009	Glass Beads for Pavement-marking Materials
AS 2700	Colour Standards for General Purposes
AS 3600	Concrete Structures
AS 3610	Formwork for Concrete
AS 3972	Portland and Blended Cements
AS 4049.3	Paints and Related Materials - Road Marking Materials

Concrete Institute of Australia: Recommended Practice: Curing of Concrete
CIA, Appendix A, 1991

Australian Paint Approval Scheme (APAS): Specification 0042 "Glass Beads for Pavement Marking Paint",
available from: <http://www.apas.gov.au>.

DPTI Procedures:

PC108	Waterborne Pavement Marking Paint
PC109	Multi-Component Pavement Marking Materials
PC111	High Friction Surfacing
PC112	Pre-Form Thermoplastic
PC113	Thermoplastic Pavement Marking Material

DPTI procedures are available from: http://www.dpti.sa.gov.au/standards/materials_technology_documents.

2. **PAINT**

2.1 **General**

Pavement marking paint must be approved to DPTI procedure PC108.

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.

Provision of evidence demonstrating compliance with this Clause shall constitute a **HOLD POINT**.

2.2 **Colour**

The paint colour must comply with the following:

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 must 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

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**

3.1 **Description**

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

3.2 **Colour**

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 must be whiter than Y35 off white.

3.3 **Moisture Content**

All material supplied must 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.

3.4 **Size Distribution**

The particle size distribution as determined by TP 134 must be as follows:

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

3.5 **Shape**

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

3.6 **Packaging**

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

4. **GLASS BEADS**

All glass beads must 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:

Type B beads (drop-on) must 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:

- Section M4 Apparatus Clause a) Dry film thickness of paint will be 200 -250 µm
- Section M5 Procedure Clause b) Weigh 24 ± 0.5 grams of beads
- Section M5 Procedure Clause e) Wet Film thickness of paint will be 375 ± 25 µm

5. **CRUSHED GLASS ANTI SKID MIX**

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

6. **HIGH PERFORMANCE PAVEMENT MARKING MATERIALS**

6.1 **General**

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 must be approved to one or more of the following DPTI procedures: PC109, PC111, PC112 or PC113.

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>.

6.2 **Colour**

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

7. **COLOURED PAVEMENT SURFACINGS**

7.1 **General**

Coloured pavement surfacings such as that used for dedicated bus and cycle lanes must 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>.

7.2 Colour

Coloured pavement surfacings must 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

Raised pavement markers must comply with AS 1906.3. Non reflective raised pavement markers must not be ceramic.

9. SHEET MATERIALS

Road marking sheet material must be an approved pliant polymer.

10. ADHESIVES

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

11. PAVEMENT BARS

11.1 General

Size B Pavement Bars (for use where the 85th percentile speed is less than 75 km/h) must be 50 mm maximum height and comply with the dimensions shown on Attachment R45B. Size B Pavement Bars must 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

11.2 Concrete Pavement Bars

11.2.1 General

Concrete must be supplied in accordance with AS 1379 except where amended or added to by this Specification. Concrete must be strength Grade S32. Concrete must be placed and compacted in accordance with AS 3600 except where amended or added to by this Specification.

Any assessment of compressive strength must be undertaken without the addition of fibre reinforcement. Flexural strength tests must be undertaken with fibre reinforcement.

11.2.2 Sampling and Testing

Sampling and testing must comply with AS 1012.

Two standard specimens, made concurrently must form a sample for compressive strength testing. Three standard specimens made concurrently must form a sample for flexural strength testing.

Test specimens for flexural strength testing must be standard specimens and must be made and treated in accordance with AS 1012, Part 8.

11.2.3 Curing of Specimens

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

(a) Moist Curing Conditions

The surface must be maintained in a moist condition as required by AS 3600, Clause 19.1.5 for the following periods:

- (i) Concrete containing portland cement conforming to AS 3972 must be moist cured for 7 days.
- (ii) Concrete containing blended cements conforming to AS 3972 must be moist cured for 14 days.

(b) Steam Curing Conditions

Two additional compressive strength samples per 100 units must be prepared when steam curing is used. These specimens must be initially treated and steam cured as per Concrete Institute of Australia "Recommended Practice: Curing of Concrete CIA, Appendix A", 1991.

Subsequent to steam curing, the specimens must be subjected to the same curing procedures adopted for the unit(s) they represent and the Contractor must make provision for such curing of the specimens at the site.

Testing of these additional compressive strength test specimens will be carried out at the completion of the total curing cycle nominated by the Contractor.

11.2.4 Flexural Strength and Fibre Cohesive Capability of a Sample

The composite concrete flexural strength with fibre must comply with the requirements specified in Clause 12 "Verification Requirements".

After failure of the specimen, the upper rollers of the flexural test apparatus must be advanced a further 40 mm and released. For acceptance of the failure the fractured pieces of concrete must remain firmly held together by the fibre.

11.2.5 Fibre Reinforcement

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

11.2.6 Surface Finish

Concrete surfaces must be finished so as to achieve the specified dimensions, texture and surface finish. The surface finish must be Class 3 in accordance with AS 3610.

The bottom surface of the pavement bar must have an exposed aggregate finish free of laitance for bonding purposes.

11.2.7 Painting of Concrete Pavement Bars

Pavement bars must be painted with two coats of approved low gloss acrylic AS2700 Y14 "Golden Yellow" paint to a total dry film thickness of 60 μ m. A coating of glass beads must 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>

11.3 Recycled Pavement Bars

11.3.1 General

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.

The Contractor may request the approval of additional products by submitting:

- (a) 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;
- (b) disposal instruction for the recycled pavement bars; and
- (c) a guarantee/warranty statement of the life expectancy of the recycled pavement bars in relation to colour fastness and structural integrity of the material.

Approval will be subject to demonstrating satisfactory physical properties, proven durability and fixing method.

Provision of evidence demonstrating compliance with this Sub-clause must constitute a **HOLD POINT**.

11.3.2 Manufacturing

Recycled Pavement bars must 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 must not detach and create the possibility of damage to vehicles or other road users. Materials used must not be subject to becoming more brittle, or otherwise deteriorate structurally.

11.3.3 Compressive and Flexural Strength

Recycled pavement bars must have a minimum compressive strength of 32 MPa and a minimum flexural strength of 4.5 MPa.

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.

11.3.4 Colour

Recycled pavement bars must be manufactured either yellow in colour or capable of accepting and retaining paint. The yellow colour must be colour No. 14 Golden Yellow, as defined in AS2700. Each pavement bar must have a colour match rating of 3 when compared to the Y14 colour, as described in AS 1580.601.1.

Pavement bars not requiring painting must be capable of retaining their colour when exposed to weather conditions. The manufacturer must provide information on the likely service life of the recycled pavement bar prior to painting being required.

Recycled pavement bars are not required to be retroreflective if used on roads which have a level of road lighting.

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.

11.3.5 Performance Requirements

Recycled pavement bar surfaces must have a smooth surface and must not be capable of causing damage to vehicle tires. They must exhibit self-cleaning properties whereby it will retain its yellow colour and minimize discolouration due to wear or the accumulation of road grime.

Recycled pavement bars must be sufficiently rough enough to permit a good bond between it and the adhesive used. The bottom surface must be flat so that it can rest firmly on a hard flat surface without rocking when a load is alternately applied to each end.

11.3.6 Fixing Methods

Recycled pavement bars must 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

12.1 Temporary Retroreflective Raised Pavement Markers

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.

12.2 Temporary Linemarking Tape

Temporary Linemarking Tape must be subject to prior approval.

13. RECORDS

Further to Part G20 "Quality System Requirements", traceability is required for all Pavement Marking Materials. A record of consignments and associated documentation must be retained by the Contractor. The documentation must 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

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

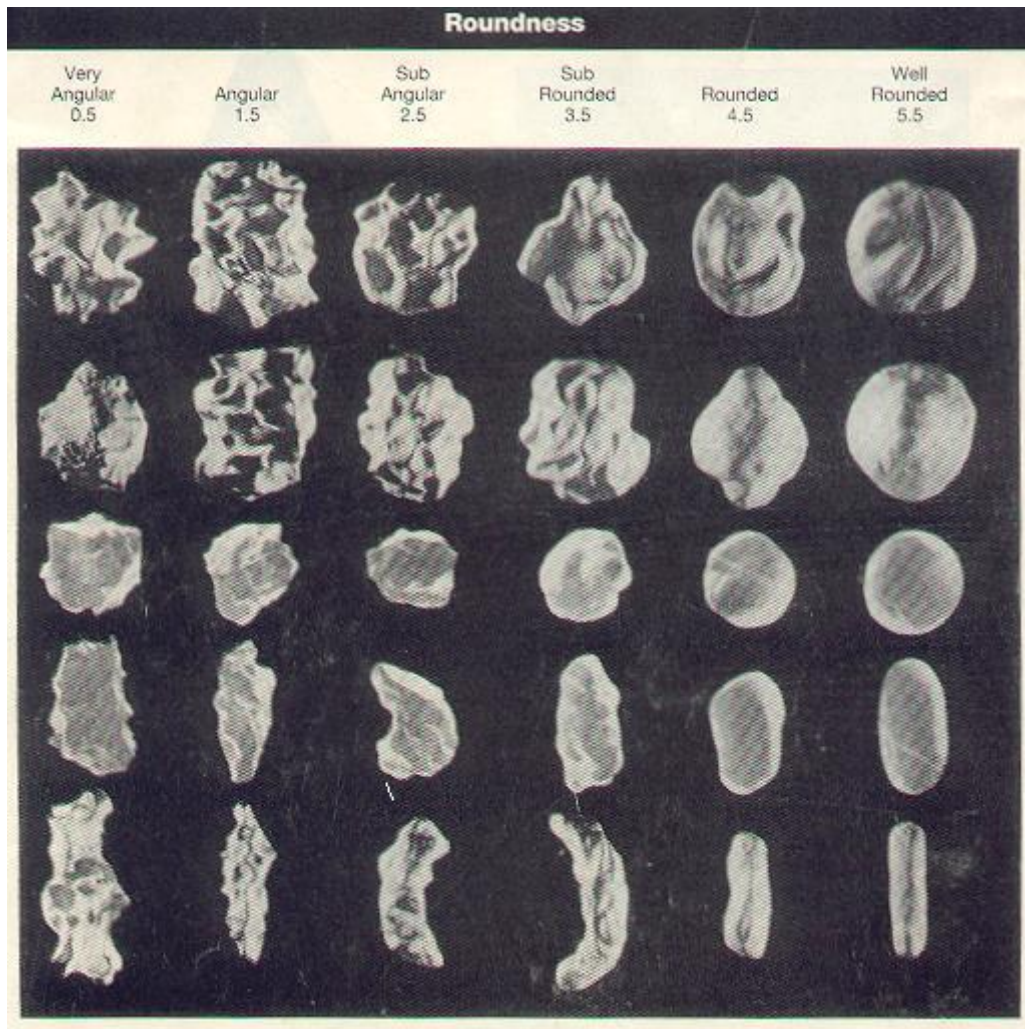
15. VERIFICATION REQUIREMENTS AND RECORDS

The Contractor must 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

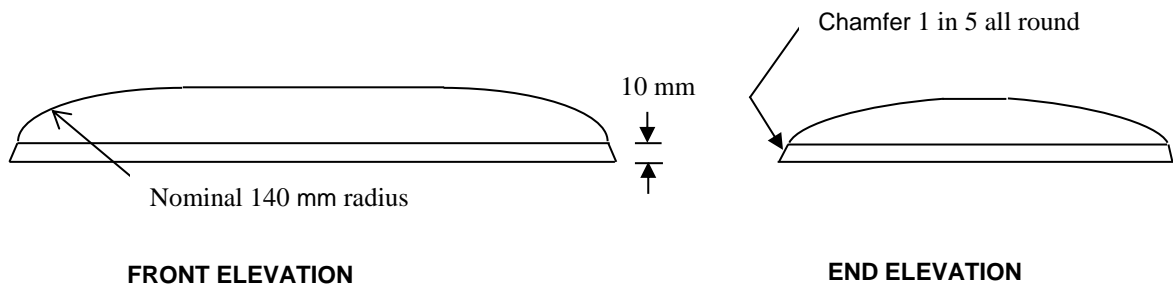
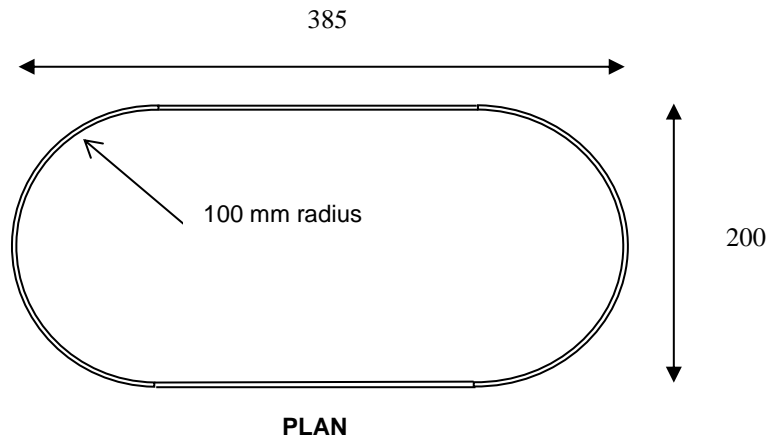
ATTACHMENT R45A

QUARTZ ROUNDNESS CHART



ATTACHMENT R45B

PAVEMENT BAR



NOTE:

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