DEVELOPMENT CONSTRUCTION SPECIFICATION

C261

PAVEMENT MARKINGS

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
EXAMPLE 1	*Provision for acceptance of nonconformance with deduction in Payment*	*XYZ.00*	*AP*	*KP*	*2/6/97*
1	Measurement and Payment Pay Items	C261.28	O	JRM	17/10/00

SPECIFICATION C261 : PAVEMENT MARKINGS

GENERAL

C261.01 SCOPE

1. The work to be executed under this Specification consists of the setting out, supply and application of pavement marking paint, thermoplastic pavement marking material, pavement marking tape and raised pavement markers as shown on the Drawings and in accordance with this Specification.

C261.02 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated..

Documents Standards Test Methods

(a) Council Specifications

C201	-	Control of Traffic

(b) Australian Standards

AS 1580.107.3	-	Determination of wet film thickness by gauge.
AS 1742.2	-	Traffic control devices for general use.
AS 1906.3	-	Raised pavement markers (retroreflective and non-retroreflective).
AS 2009	-	Glass beads for road-marking materials.
AS 4049.1	-	Solvent-borne paint - For use with drop-on beads.
AS 4049.2	-	Thermoplastic road marking materials.
AS 4049.3	-	Waterborne paint - For use with drop-on beads.

C261.03 TYPE OF MARKINGS

1. Details of the various types of pavement markings and devices are generally in accordance with the requirements of as 1742.2.

Standard

C261.04 TYPES OF MATERIALS TO BE APPLIED

1. The materials shall be applied as follows:

Locations for Use

(a) Pavement Marking Paint

Permanent markings on all wearing surfaces. Temporary markings, other than on the final wearing surfaces. Traffic islands and kerbs where specified.

(b) Thermoplastic Pavement Marking Material

Permanent markings where explicitly indicated on the Drawings.

(c) Pavement Marking Tape

Temporary markings on final wearing surfaces.

(d) Reflective Glass Beads

To be applied to all painted and thermoplastic markings.

(e) Raised Pavement Markers

To be installed as permanent and temporary markings as shown on the Drawings.

C261.05 MATERIAL QUALITY

1. The Contractor shall submit to the Superintendent NATA Registered Laboratory Test Reports, at least seven days before work is scheduled to commence, on the quality of the materials, including paint, glass beads, raised pavement markers and thermoplastic material proposed for use. ***Contractor's Responsibility***

2. Only materials conforming to the requirements of the referenced Specifications/Standards shall be used. ***Quality Requirements***

C261.06 SETTING OUT

1. The Contractor shall set out the work to ensure that all markings are placed in accordance with the Drawings. ***Contractor's Responsibility***

2. The locations of pavement markings shall not vary by more than 20mm from the locations shown on the Drawings. ***Tolerance***

C261.07 SURFACE PREPARATION

1. Pavement markings shall only be applied to clean dry surfaces. The Contractor shall clean the surface to ensure a satisfactory bond between the markings and wearing surface of the pavement. ***Clean Dry Surface***

2. Pavement marking shall not be carried out during wet weather or, if in the opinion of the Superintendent, rain is likely to fall during the process. ***Wet Weather***

3. Where raised pavement markers are specified for pavements having a concrete wearing surface, the full area under each raised pavement marker shall be lightly scabbled to remove fine mortar material (laitance).. ***Scabbling***

C261.08 PROVISION FOR TRAFFIC AND PROTECTION OF WORK

1. The Contractor shall provide for traffic, in accordance with the Specification for CONTROL OF TRAFFIC – C201, while undertaking the work and shall protect the pavement markings until the material has hardened sufficiently so that traffic will not cause damage. ***Contractor's Responsibility***

C261.09 MAINTENANCE OF PAVEMENT MARKINGS

1. The Contractor shall be responsible for the maintenance, and replacement if necessary, of raised pavement markers and all pavement marking during the contract period and the contract defects liability period. ***Responsibility in Contract Period***

PAVEMENT MARKING PAINT

C261.10 MATERIALS

1. Paint shall comply with the requirements of AS 4049.1 or AS 4049.3 as directed by the Superintendent. In this Specification, the term 'paint' shall mean 'pavement marking paint'. ***Paint Quality***

2. Glass beads shall comply with the requirements of AS 2009 for drop-on beads.. ***Glass Beads Quality`***

C261.11 MIXING OF PAINT

1. All paint shall be thoroughly mixed in its original container before use to produce a smooth uniform product consistent with the freshly manufactured product. ***Uniform Product***

C261.12 APPLICATION OF PAINT AND BEADS

1. All longitudinal lines shall be sprayed by an approved self propelled machine. The two sets of lines forming a one-way or two-way barrier line pattern shall be sprayed concurrently. ***Longitudinal Lines***

2. Hand spraying with the use of templates to control the pattern and shape shall be permitted for transverse lines, symbols, legends, arrows and chevrons. ***Hand Spraying***

3. The paint shall be applied uniformly and the wet film thickness shall be neither less than 0.35 mm nor more than 0.40 mm. ***Paint Thickness***

4. Glass beads shall be applied by air propulsion to the surface of all longitudinal lines at a net application rate of 0.30 kilograms per square metre immediately after application of the paint. The actual application rate shall be set to overcome any loss of beads between the bead dispenser and the sprayed line. ***Beads for Longitudinal Lines***

5. Glass beads shall be similarly applied to all other paint markings at a net application rate of 0.30 kilograms per square metre immediately after application of the paint by a method approved by the Superintendent. ***Beads for other Markings***

6. Pavement markings shall be straight or with smooth, even curves where intended. All edges shall have a clean, sharp cut off. Any marking material applied beyond the defined edge of the marking shall be removed leaving a neat and smooth marking on the wearing surface of the pavement. ***Pavement Marking Finish***

7. The lengths of longitudinal lines shall not vary by more than 20mm from the lengths shown in AS 1742.2. The widths of longitudinal lines shall not vary by more than 10mm from the widths shown in AS 1742.2. ***Longitudinal Line Tolerances***

8. The lengths and widths of transverse lines shall not vary by more than 10mm from the lengths and widths shown in AS 1742.2. ***Transverse Line Tolerance***

9. The dimensions of arrows, chevrons, painted medians, painted left turn islands and speed markings shall not vary by more than 50mm from the dimensions shown on the Drawings or in AS 1742.2 as appropriate. Arrows and speed markings shall be placed square with the centreline of the traffic lane. ***Arrows, Chevrons Tolerance***

C261.13 FIELD TESTING

1. The thickness of the wet film applied to the road pavement shall be checked by the method described in AS 1580.107.3 Method B, comb gauge. ***Paint Application***

2. The application rate of glass beads applied to the surface of the markings shall be checked by the method described in Annexure C261A. ***Beads Application***

Road Speed km/h	Line Widths			
	75mm	100mm	125mm	150mm
8	371	495	619	742
13	603	804	1006	1207
16	742	990	1238	1484

1. Tolerance of +10% shall be permissible when measuring the above volume.
2. When two or more glass bead dispensers are to be used, each dispenser shall be checked separately to make up the totals shown.
3. Glass beads weigh approximately 1.53 grams per millilitre.

Table C261.1
Volume of glass beads (ml) required in 10 seconds of operation.

THERMOPLASTIC PAVEMENT MARKING MATERIAL

C261.14 MATERIALS

1. Thermoplastic pavement marking material shall comply with the requirements of AS 4049.2. ***Thermoplastic Quality***

2. In this Specification, the term 'thermoplastic material' shall mean 'thermoplastic pavement marking material'. ***Definition***

3. Glass beads shall be incorporated in thermoplastic material, in the proportion of 10 per cent of the total mass, as part of the aggregate constituent and shall comply with the requirements of AS 2009, Intermix type. ***Glass Bead Proportion***

4. Glass beads for surface application shall comply with the requirements of AS 2009, Drop-on beads.. ***Glass Bead Quality***

5. Tack coat material shall be to the manufacturer's specification as approved by the Superintendent. ***Tack Coat***

C261.15 PREPARATION OF THERMOPLASTIC MATERIAL ON SITE

Heating

1. Immediately before application, the thermoplastic material shall be uniformly heated in a suitable oil bath kettle to the temperature recommended by the manufacturer. The thermoplastic material shall not be heated above the temperature recommended by the manufacturer. The thermoplastic material shall not remain molten for more than six hours for hydrocarbon resins and four hours for wood and gum resins. Should over-heating occur and/or the time expire for molten materials, then the thermoplastic material shall be discarded.

C261.16 APPLICATION OF THERMOPLASTIC MATERIAL AND BEADS

Tack Coat Requirement

1. Where the wearing surface of the pavement is smooth or polished, a tack coat of material may be required by the Superintendent and shall be applied in accordance with the recommendations of the thermoplastic manufacturer. The tack coat shall be applied immediately before the application of the thermoplastic material in accordance with the directions of the manufacturer of the thermoplastic material and the manufacturer of the tack coat material.

Longitudinal Lines

2. All longitudinal lines shall be sprayed by a self propelled machine approved by the Superintendent. The two sets of lines forming a one-way or two-way barrier line shall be sprayed concurrently. The thermoplastic material shall be applied uniformly and the cold film thickness shall be 2.0mm with a tolerance of plus or minus 0.5mm.

Beads for Longitudinal Lines

3. Glass beads shall be applied by air propulsion to the surface of all longitudinal lines at a net application rate of 0.30 kilograms per square metre immediately after application of the thermoplastic material. The actual application rate shall be set to overcome any loss of beads between the bead dispenser and the sprayed line.

Screed

4. All transverse lines, symbols, legends and arrows shall be screeded. The screeded thermoplastic material shall be applied using a mobile applicator, approved by the Superintendent, and templates to control the pattern.

Tolerance

5. The thermoplastic material for transverse lines, symbols, legends and arrows shall be applied uniformly and the cold film thickness shall be 3.5mm with a tolerance of plus or minus 1.5mm. The surface finish shall be smooth.

Beads for Other Markings

6. Glass beads for other than longitudinal lines shall be uniformly applied to screeded markings at a net application rate of 0.30 kilograms per square metre immediately after application of the thermoplastic material by a method approved by the Superintendent.

Pavement Marking Finish

7. Pavement marking shall be straight or with smooth, even curves where intended. All edges shall have a clean, sharp cut off. Any marking material applied beyond the defined edge of the marking shall be removed leaving a neat and smooth marking on the wearing surface of the pavement.

Longitudinal Line Tolerances

8. The lengths of longitudinal lines shall not vary by more than 20mm from the lengths shown in AS 1742.2. The widths of longitudinal lines shall not vary by more than 10mm from the widths shown in AS 1742.2.

Transverse Line Tolerances

9. The lengths and widths of transverse lines shall not vary by more than 10mm from the lengths and widths shown in AS 1742.2.

Arrows, Chevrons, Tolerance

10. The dimensions of arrows, chevrons, painted medians, painted left turn islands and speed markings shall not vary by more than 50mm from the dimensions shown on the Drawings or in AS 1742.2 as appropriate. Arrows and speed markings shall be placed square with the centreline of the traffic lane.

C261.17 FIELD TESTING

1. The thickness of the cold film of thermoplastic material applied to the road pavement shall be checked by measurement, using a micrometer, of the thickness of thermoplastic material applied to a metal test plate. ***Thickness of Thermoplastic Material***

2. The application rate of glass beads applied to the surface of the markings shall be checked by the method described in Annexure C261A. ***Glass Beads Application Rate***

PAVEMENT MARKING TAPE

C261.18 MATERIALS

1. Pavement marking tape shall be a strippable type of tape, such as 'Staymark - Detour Grade', or equivalent tape approved by the Superintendent. ***Brands***

C261.19 APPLICATION OF PAVEMENT MARKING TAPE

1. The method of application of pavement marking tape, including surface preparation, shall be in accordance with the manufacturer's recommendations. ***Manufacturer's Recommen-dation***

C261.20 REMOVAL OF PAVEMENT MARKING TAPE

1. When directed by the Superintendent, the Contractor shall remove pavement marking tape in accordance with the manufacturer's recommendations. ***Manufacturer's Recommendation***

RAISED PAVEMENT MARKERS

C261.21 MATERIALS

1. Raised pavement markers, both reflective and non-reflective, shall comply with AS 1906.3 and shall have the dimensions shown on the Drawings. ***Standard***

2. The adhesive used for attaching the raised pavement markers to the wearing surface of the pavement shall be a hot melt bitumen adhesive or an equivalent product approved by the Superintendent. ***Bitumen Adhesive***

C261.22 INSTALLATION OF RAISED PAVEMENT MARKERS

1. Raised pavement markers shall be fixed to the wearing surface of the pavement using a hot melt bitumen adhesive or an equivalent product. The adhesive shall be freshly heated to the Manufacturer’s instructions and thoroughly mixed. The adhesive shall not be allowed to cool and be reheated prior to use. ***Adhesive Quality***

2. The adhesive shall be spread uniformly over the underside of the raised pavement marker to a depth of approximately 10 mm. The raised pavement marker shall be pressed down onto the pavement surface in its correct position and shall be rotated slightly until the adhesive is squeezed out around all edges of the marker. The raised pavement marker shall not be disturbed until the adhesive has set. ***Method***

3. On rough surfaces, such as newly laid coarse sprayed bituminous seals, and where directed by the Superintendent, an initial pad of adhesive of diameter 20mm larger than the diameter of the base of the raised pavement marker, shall be provided. The adhesive shall be applied to fill the irregularities in the pavement surface to produce a flat, smooth surface flush with the upper stone level. The adhesive pad shall be allowed to set. Additional adhesive shall be applied to the pavement, as described above, and then the raised pavement marker shall be pressed down onto the adhesive pad on the pavement surface to ensure good adhesion.

Rough Surfaces

REMOVAL OF PAVEMENT MARKINGS

C261.23 GENERAL

1. The Contractor shall remove pavement markings, no longer required, from the wearing surface of pavements without significant damage to the surface.

Undamaged Pavement

2. The method of removal shall be approved by the Superintendent before commencement of the work.

Removal Method

LIMITS AND TOLERANCES

C261.24 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses of this Specification are summarised in Table C261.2 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	**Location of Markings**	± 20mm from specified location	C261.06
2.	**Longitudinal Lines**		C261.12
	(a) Length	± 20mm from lengths shown in AS 1742.2	C261.16
	(b) Width	± 10mm from widths shown in AS 1742.2	C261.12 C261.16
3.	**Transverse Lines**		
	(a) Length) (b) Width)	± 10mm from lengths and widths shown in AS 1742.2	C261.12 C261.16
4.	**Arrows, Chevrons, Painted Medians, Speed Markings etc.**	± 50mm from the dimensions shown in AS 1742.2	C261.12 C261.16
5.	**Application of Paint**		
	(a) Film Thickness	>0.35mm <0.40mm	C261.12
6.	**Application of Thermoplastic**		
	(a) Longitudinal Lines - Cold Film Thickness	2.0mm ± 0.5mm	C261.16
	(b) Transverse Lines, Symbols, Arrows etc. Cold Film Thickness	3.5mm ± 1.5mm	C261.16
7.	**Glass Beads**		
	(a) Volume used in operation	0.30 kg/sq m + 10%	C261.12 C261.16

Table C261.2 - Summary of Limits and Tolerances

SPECIAL REQUIREMENTS

C261.25 RESERVED

C261.26 RESERVED

C261.27 RESERVED

MEASUREMENT AND PAYMENT

C261.28 RESERVED

ANNEXURE C261A

PROCEDURE FOR MEASUREMENT OF RATE OF APPLICATION OF SPHERICAL GLASS BEADS

1. **SCOPE**

The following procedure shall be adopted for field measurement of the rate of application of spherical glass beads on to wet paint or thermoplastic surfaces.

2. **SPHERICAL GLASS BEADS**

The glass beads shall comply with AS 2009.

3. **MEASUREMENT**

The method of field measurement shall be as follows:

(a) Turn off the paint or thermoplastic supply valves and operate the glass bead dispenser for exactly 10 seconds allowing glass beads to run into a plastic bag or tray.

(b) Pour the glass beads from the bag or tray into a suitable measuring cylinder calibrated in millilitres to measure the volume of glass beads collected. Level but do not compact the glass beads in the cylinder.

(c) Compare the volume of glass beads collected with the correct figure given in Table C261.1.

Table C261.1 shows the correct volumes of glass beads required to give a net application rate on the marked line of approximately 0.30 kilograms per square metre for different line widths and road speeds. The glass bead volume figures given in Table C261.1 are calculated for an actual application rate of 0.34 kilograms per square metre. These figures are used for calibrating the machine because there is a loss of beads between the bead dispenser and the marked line and the volume is measured with beads not compacted.

SPECIFICATION C261 - PAVEMENT MARKINGS

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