Master Specification
Part RD-LM-S2

Supply of Signs

September 2024

Government of South Australia
Department for Infrastructure and Transport

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Document Information

Document Information	
K Net Number:	13623475
Document Version:	1
Document Date:	30/09/2024

Document Amendment Record

Version	Change Description	Date
0	Initial issue	31/08/2023
1	Updated cover page	30/09/2024

Document Management

Contents

RD-LM-S2 Supply of Signs

1 General

a) This Master Specification Part sets out the requirements for the manufacture and delivery of all road signs including regulatory, warning, guide, information, freeway guide, direction and hazard marker signs including:

i) the document requirements, as set out in section 2;

ii) the design requirements, as set out in section 3;

iii) the requirements for the materials of signs, as set out in section 4;

iv) the requirements for retroreflective sheeting manufacturer certification, as set out in section 5;

v) the requirements for manufacture of signs, as set out in section 6;

vi) the requirements for handling of signs, as set out in section 7;

vii) the sign performance warranty requirements, as set out in section 8; and

viii) the verification requirements and records, as set out in section 9.

b) This Master Specification Part does not apply to electronic signs (refer to RD-ITS-S4 “Supply of Electronic Signs”).

c) The manufacture and delivery of road signs must comply with the Reference Documents, including:

i) AS/NZS 1163 Cold formed structural steel hollow sections;

ii) AS/NZS 1170 Structural design actions, Part 2: Wind actions;

iii) AS/NZS 1214 Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series);

iv) AS 1397 Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium;

v) AS 1450 Steel tubes for mechanical purposes;

vi) AS/NZS 1580.601.1 Paints and related materials — Methods of test, Method 601.1: Colour — Visual comparison;

vii) AS/NZS 1580.602.2 Paints and related materials — Methods of test, Method 602.2: Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°;

viii) AS 1627 Metal finishing - Preparation and pretreatment of surfaces;

ix) AS 1627.1 Metal finishing - Preparation and pretreatment of surfaces, Part 1: Removal of oil, grease and related contamination;

x) AS 1627.4 Metal finishing - Preparation and pretreatment of surfaces, Part 4: Abrasive blast cleaning of steel;

xi) AS/NZS 1734 Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate;

xii) AS 1742.1 Manual of uniform traffic control devices;

xiii) AS 1743 Road signs - Specifications;

xiv) AS 1744 Standard alphabets for road signs;

xv) AS/NZS 1866 Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes;

xvi) AS 1906.1 Retroreflective materials and devices for road traffic control purposes, Part 1: Retroreflective sheeting;

xvii) AS 2700 Colour standards for general purposes;

xviii) APAS Specification AP-S0134 Latex Primer for Glavanised Steel and Zincalume (Buildings) (available from: https://vs.csiro.au/apas/specifications/);

xix) APAS Specification AP-S0280/3 Exterior Water Based Paints for Buildings - Low gloss or matt finish (available from: https://vs.csiro.au/apas/specifications/);

xx) APAS Specification AP-S2911 Polyurethane Coating for the Protection of Steel in Atmosphere (available from: https://vs.csiro.au/apas/specifications/);

xxi) Department Standard Road Sign Index (available from: http://www.dteiapps.com.au/signindx/); and

xxii) Department Traffic Engineering Specification (TES) Specific Road Signs - Specifications, South Australia (TES drawings).

d) The Contractor must ensure that signs which are included in AS 1743 Road signs - Specifications or which are otherwise detailed on the Department Standard Road Sign Index and which are to be supplied pursuant to this Master Specification Part are:

i) supplied in accordance with AS 1743 Road signs - Specifications; or

ii) supplied as detailed on the Department Standard Road Sign Index.

e) The Contractor must ensure that all signs supplied pursuant to this Master Specification Part have been manufactured by an entity prequalified with the Department under the Manufacture of Road Signs category (Refer to: https://www.dit.sa.gov.au/contractor_documents/prequalification).

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

a) details of the proposed location and use of non-metallic substates, as required by section 4.1.2c); and

b) audit report and certification as required by section 5.

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include the verification requirements and records as required by section 9.

3 Design

a) The Contractor must ensure that the design of all signs to be supplied pursuant to this Master Specification Part are in the format of either a Department Traffic Engineering Specification (TES) drawing or a standard drawing prefixed similar to the Australian Standard series, e.g. R1-2.

b) Where applicable, the Principal will supply the TES design to the Contractor. The Contractor must ensure that it satisfies the Principal’s requirements in relation to the Principal’s required timing for procurement, programming and provision of TES design as specified in Contract Documents, or if not specified, a minimum period of 10 weeks.

c) The Contractor must ensure that the dimensions, legend and background for each sign is in accordance with all relevant requirements of the following:

i) Department Traffic Engineering Specification (TES) Specific Road Signs - Specifications, South Australia (TES drawing);

ii) AS 1743 Road signs - Specifications;

iii) AS 1744 Standard alphabets for road signs; and

iv) Department Standard Road Sign Index.

4 Materials of signs

4.1 Sign blanks

4.1.1 Metallic sign blanks

a) The Contractor must ensure that metallic sign blanks are manufactured from an aluminium alloy with a thickness of either 1.6 mm or 2.0 mm.

b) The aluminium alloy required by section 4.1.1a) must be grade 5052 or 5251, temper H36 or H38 as specified in AS/NZS 1734 Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate.

c) The Contractor must ensure that metallic sign blanks are free of cracks, tears and other surface blemishes and the edges must be true and smooth.

4.1.2 Non-metallic substrate sign blanks

a) If the Contractor proposes to supply non-metallic substrates for signs, the Contractor must provide details as part of the Construction Documentation, including evidence that the sign blanks:

i) are no larger than 600 mm x 900 mm for signs from the Australian Standard series, as defined in the Department Standard Road Sign Index;

ii) are no larger than 1200 mm x 900 mm for flat panel temporary warning signs or 1800 mm x 600 mm for temporary warning signs having a polycarbonate extruded edge, i.e. box edge signs, as defined in the Department Standard Road Sign Index;

iii) comply with the provisions of AS 1743 Road signs - Specifications;

iv) are compatible with the material with which they will be covered;

v) are constructed of polycarbonate or other approved ultraviolet stable product to guarantee an outdoor Design Life of at least 15 years;

vi) are flexible, non-shattering and not subjected to fatigue cracking;

vii) are smooth, free of cracks, surface blemishes, and all edges are true and smooth for the life of the product; and

viii) will not void the warranty given by the manufacturer of any sheeting or coating applied to the substrate.

b) Non-metallic substrates must only be proposed by the Contractor for use in areas where there is a high probability of vehicle impact.

c) The Contractor must provide details of the proposed location and use of non-metallic substates in the Construction Documentation.

4.2 Stiffeners

a) The Contractor must ensure that stiffeners are continuous horizontal lengths of:

i) galvanized cold rolled steel channel with cross-sectional dimensions of 41.3 mm x 21.0 mm; or

ii) aluminium extruded section with cross-sectional dimensions of 28.5 mm x 25.5 mm.

b) The Contractor must ensure that each stiffener section has internal clamping ridges compatible with the Unistrut pipe and tubing clamping system. A minimum overlap length of 1000 mm is required when joining stiffeners on a multi-piece sign, as shown in Appendix 3: Stiffener joining detail.

4.3 Rivets

a) The Contractor must ensure that rivets are from a self-piercing riveting system or have a:

i) 1320 N minimum shear load;

ii) 1910 N minimum tensile load;

iii) aluminium alloy with a steel stem and domed head;

iv) 4.8 mm to 5 mm shank diameter; and

v) 8.5 mm to 9.5 mm head diameter.

b) The Contractor must ensure that the riveting process does not project above the surface of the sign blank in a manner which will result in damage of the sign face material.

c) The Contractor must ensure that the heads of rivets are coloured to match the surrounding material.

4.4 Backing strips

The Contractor must ensure that backing strips are the same material and condition as required in section 4.1.

4.5 Double sided acrylic foam tapes

a) The Contractor must ensure that foam tapes are double sided, medium firm, acrylic pressure sensitive adhesives that have high initial adhesion, good shear holding power and a demonstrated holding strength to meet the Design Life.

b) The foam tapes contemplated by section 4.5a) must also be capable of withstanding extremely high or low temperatures and have characteristics similar to 3M VHB 4952 double sided acrylic foam tape.

4.6 Hinges

The Contractor must ensure that hinges comprise a continuous brass, galvanized steel or stainless steel piano type hinge approximately 40 mm to 60 mm wide when in the open position with a 1 mm to 2 mm blade thickness and a 3mm to 5 mm diameter stainless steel or brass hinge pin that is securely locked in position.

4.7 Retroreflective material for background and legend

a) Class 1A, class 1100, class 900, class 400, class 300 and class 100 retroreflective sheeting must conform to the requirements defined in AS 1906.1 Retroreflective materials and devices for road traffic control purposes, Part 1: Retroreflective sheeting.

b) The Contractor must ensure that it uses the class of material for standard signs as set out in Appendix 1: Sign materials - legends and backgrounds.

c) The Contractor must ensure that it uses the class of material on specific road signs designated by a TES number as noted on the Department Traffic Engineering Specification (TES) Specific Road Signs - Specifications, South Australia drawing which accompany the TES sign design.

d) The Contractor must ensure that the luminance contrast ratios between legends and backgrounds is not less than that set out in AS 1906.1 Retroreflective materials and devices for road traffic control purposes, Part 1: Retroreflective sheeting.

4.8 Non-retroreflective material for background and legend

4.8.1 Paint

a) Paint must be compatible with the legend and background material, both in application and durability, and must meet the warranty requirement of the sign as set out in Table RD-LM-S2 8-1.

b) Colours must be approximate to that defined in AS 1743 Road signs - Specifications.

c) When measured in accordance with AS/NZS 1580.602.2 Paints and related materials — Methods of test, Method 602.2: Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°, matt colours must have specular gloss value of:

i) 12 to 20 for an 85° head; or

ii) 8 to 12 for a 60° head.

4.8.2 Sheet material

a) The sheet material must be of uniform density and compatible with the material used for the legend and background both in application and durability.

b) All sheeting must be applied with pressure sensitive adhesive or tack-free heat activated adhesive. Adhesive cast vinyl legend and background material or equivalent product may be used.

5 Certification from retroreflective sheeting manufacturer

a) The Contractor must submit as part of the Construction Documentation:

i) the report of the last audit of the manufacturing facility conducted by the retroreflective sheeting manufacturer to assess the manufacturing performance; and

ii) the certification issued by the retroreflective sheeting manufacturer that the manufacturer is currently eligible to offer a sign performance warranty arrangement that is underwritten by the retroreflective sheeting manufacturer.

b) The Contractor must have and adhere to procedures to satisfy the requirements of the retroreflective sheeting manufacturer for storage and handling of signs.

6 Manufacture of signs

6.1 Sign blanks

a) Sign blanks must be free of cracks, tears and other surface blemishes and the edges must be true and smooth.

b) The face of each sign blank must be chemically cleaned and etched or mechanically abraded in accordance with AS 1627 Metal finishing - Preparation and pretreatment of surfaces.

c) The back of each sign blank must be rendered dull and non-reflective either by mechanical or chemical means.

d) Sign blanks must be fabricated from a single sheet of aluminium unless the sign is larger than the standard sheet size.

e) Fingerblade signs must be manufactured from extruded aluminium with an extruded rib, top and bottom of the blade.

6.2 Multi-piece signs

a) Where the sign is of such a size as to require more than one full standard sheet of aluminium, a multi-piece sign must be made using the minimum number of sheets practicable.

b) The Contractor must minimise the number of joints in a multi-piece sign to ensure the minimum number of joints practicable.

c) All joints must be covered by a backing strip except for horizontal joins in sectioned signs. This backing strip must be fixed to the sign using double sided acrylic foam tapes or riveted to each sheet.

d) Double sided acrylic foam tapes must be applied in accordance with the foam tape manufacturer's recommended application procedure.

6.3 Sectioned signs

a) Where the sign is of such a size that it is necessary for the sign to be manufactured, transported or installed in sections, it must be manufactured in accordance with:

   i) Appendix 3: Stiffener joining detail (for vertical joints); and

   ii) Appendix 4: Sectioned sign joining (for horizontal joints).

b) Joins should not be made through legends or symbols wherever possible.

c) Sectioned signs must be clearly marked for ease of assembly in the field.

6.4 Hinge signs

a) Hinged signs must be manufactured with the hinge running the full length of the hinged section of the sign. The hinge must be attached to the back of the sign such that when the sign is in the open position, only the pin roll is visible from the front of the sign.

b) Holes on the top and bottom or both sides of the sign must be positioned to accommodate a 38 mm wide padlock (the supply of which is not the subject of this Master Specification Part) when the sign is in the closed position.

6.5 Dimensions and tolerances

a) The dimensions of the sign blank must be ±2.5 mm of the specified dimensions.

b) The finished sign must be flat within a maximum allowable warp or twist of 5 mm/metre in any direction.

c) Backing strips must:

   i) be of uniform width of at least 50 mm wide over full length; and

   ii) extend to within 25 mm of edge of sign.

d) Vertical backing strips must stop at each horizontal stiffener or horizontal backing strip and must butt against it with a gap of 1 mm.

e) Riveted backing strips, stiffeners and hinges must have:

   i) regularly spaced rivets to each side of the joint securing it;

   ii) rivet spacing not exceeding 200 mm;

   iii) the end rivets a maximum distance of 25 mm from each end; and

   iv) a minimum of 2 rivets installed on each side of the joint.

f) Sections of multi-piece signs must be butted together with a maximum gap of 1 mm at any point along the joint.

g) Hinged sign plates must have sufficient clearance between the plates when the sign is in the closed position to clear the rivet heads. On sectioned signs, stiffeners must be placed along the edge of the butted join and there must be a maximum gap of 1 mm at any point along the joint.

h) Stiffeners must be manufactured with:

i) 5mm butt joins;

ii) each end of the stiffener to be 50 to 150 mm from the edge of the sign unless specified in Appendix 2: Schedule of hole and stiffener centre locations; and

iii) maximum panel overhang at the top and bottom of the sign must be an equal distance from the stiffener centres and must be in the range of between 50 to 150 mm.

i) Where high wind signs are specified in the Contract Documents, rivet spacing must not exceed 150 mm and at least 3 rivets must be installed on each side of the joint.

6.6 Provision for mounting of signs

6.6.1 Non-reinforced signs

a) Non-reinforced signs must be manufactured with square holes for mounting purposes.

b) The holes must be cleanly punched 11 mm square (±0.5 mm) to accept a 10 mm diameter cup head square neck bolt.

c) The hole spacing must be in accordance with Appendix 2: Schedule of hole and stiffener centre locations.

6.6.2 Reinforced signs

a) All signs with the following thicknesses must have stiffeners fixed to the rear of the sign in accordance with Appendix 2: Schedule of hole and stiffener centre locations:

i) with a plate thickness of 1.6 mm and overall width >1200 mm; or

ii) with a plate thickness of 2.0 mm and overall width >1400 mm.

b) Where the length of the stiffener exceeds 6.0 m, joining of stiffening sections is permitted. Joined stiffening sections must be staggered so that the structural integrity of the sign is not compromised. Spacing must be in accordance with the stiffener centre locations in Appendix 2: Schedule of hole and stiffener centre locations.

c) Where specified, reinforcing for high wind category signs must be as shown in the Design Documentation. Stiffeners must be attached to the sign blanks by rivets or double sided acrylic foam tapes.

6.6.3 Sectioned signs

In addition to the requirements in section 6.6.2, sectioned signs must have stiffeners fixed along the horizontal join of the 2 joining pieces in accordance with Appendix 4: Sectioned sign joining.

6.6.4 Temporary signs

No provision for attachment is required for temporary signs.

6.6.5 Fingerblade signs

Spacers equal to the width of extrusion must be used when mounting fingerblade signs on 80 mm x 40 mm rectangular hollow section posts.

6.6.6 Sign overlays

Sign overlays used to modify or amend a sign legend will be made from 1.6 mm thick aluminium sheet unless noted otherwise on the TES drawing.

6.7 Form of letters and numerals

All individual letters must have neat, clearly defined edges with smooth curves on round letters conforming to AS 1744 Standard alphabets for road signs.

6.8 Retroreflective sign background and legend

6.8.1 Retroreflective material

a) Retroreflective material must be applied to the sign blank in accordance with the retroreflective sheeting manufacturer's recommendations.

b) The retroreflective material must be applied in one continuous piece.

c) Retroreflective materials used as background and legends of signs must conform in colour and grade to the requirements of AS 1906.1 Retroreflective materials and devices for road traffic control purposes, Part 1: Retroreflective sheeting.

d) Where sign dimensions exceed the standard retroreflective material width, joining of the retroreflective material must be in accordance with section 6.9.

6.8.2 Screening ink and electronic cuttable films

a) Coloured legends or backgrounds may be provided by using either:

   i) transparent screen process colours;

   ii) opaque screen process colours;

   iii) electronic cuttable films; or

   iv) digital printing.

b) Legends must be manufactured by the retroreflective sheeting manufacturer to ensure compatibility and durability with the reflective sheeting.

c) The screen process colours required by section 6.8.2a)i) or electronic cuttable films required by section 6.8.2a)iii) must be applied using materials and techniques recommended by the retroreflective sheeting manufacturer.

d) For digital printing contemplated by section 6.8.2a)iv) only:

   i) matched component inks and printer devices recommended by the retroreflective sheeting manufacturer must be used; and

   ii) the ink and any protective coating must be compatible with the background material, both in application and durability.

6.9 Material joins

Joins of the material must be in accordance with the retroreflective sheet manufacturer's recommendations.

6.10 Non-reflectorised sign background, legend, symbols and borders

6.10.1 Background paint

a) Where specified in the Contract Documents, the front of signs (background) must be painted using a 2-pack polyurethane paint as approved to APAS Specification AP-S2911 Polyurethane Coating for the Protection of Steel in Atmosphere.

b) Surface preparation of the sign substrate and the primer to be used must be as specified by the finish coat manufacturer. All paints must be from the one manufacturer.

c) The colour of the background paint must be an approximate match to the appropriate colour as specified in AS 1743 Road signs - Specifications, when assessed in accordance with AS

1580.601.1 Paints and related materials — Methods of test, Method 601.1: Colour — Visual comparison.

d) The specular gloss of the background paint must be less than 20%, when assessed in accordance with AS/NZS 1580.602.2 Paints and related materials — Methods of test, Method 602.2: Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°.

e) Where required, the backs of signs must be painted by:

i) degreasing all surfaces in accordance with AS 1627.1 Metal finishing - Preparation and pretreatment of surfaces, Part 1: Removal of oil, grease and related contamination;

ii) applying one coat of waterborne galvanized iron primer, as approved to APAS Specification AP-S0134 Latex Primer for Glavanised Steel and Zincalume (Buildings); and

iii) applying 2 coats of flat or low gloss latex paint, as approved to APAS Specification AP-S0280/3 Exterior Water Based Paints for Buildings - Low gloss or matt finish.

f) The colour of the paint must be an approximate match to AS 2700 Colour standards for general purposes, G61 Dark Green, unless otherwise specified, when assessed in accordance with AS 1580.601.1 Paints and related materials — Methods of test, Method 601.1: Colour — Visual comparison. All paints must be from the one manufacturer.

g) Where paint is used it must be applied with a minimum dry film thickness of 38 µm. Touching up of small areas by brush to fully match the spray painted surface will be permissible using the colour base and hardener mixture without reducer.

6.10.2 Sheet material application

All sheeting and films must be applied in accordance with the manufacturer's instructions so that it is securely fixed to the sign and the surface is free of bubbles, wrinkles and blemishes.

6.10.3 Screening ink and electronic cuttable films

a) Legends may be manufactured using either opaque screen process colours or electronic cuttable films and the sign manufacturer must ensure compatibility and durability with the retroreflective sheeting.

b) The screen process colours or electronic cuttable films must be applied using materials and techniques recommended by the manufacturer of the retroreflective sheeting.

c) Where joins in the cuttable films are required, they must be of the "butt-join" type and must overlap. Background material of the legend must be compatible in application and durability.

6.11 Reference markings

a) For aluminium signs, identification coding must be clearly and permanently stamped or engraved on all signs produced. The coding must appear in characters 6 mm to 10 mm high. Stamping and engraving must be carried out in such a manner that the front face of the sign is not damaged.

b) For rectangular signs, the identification coding required by section 6.11a) must appear as near as practicable to the bottom rear left hand corner. For other shaped signs, the identification coding required by section 6.11a) must be positioned on or below the horizontal centre line and as near to the left rear edge as practicable.

c) For printed signs, the identification code required by section 6.11a) must be printed on the sign face within the outer border strip as near as practicable to the bottom left hand corner in accordance with Appendix 5: Sign identification". Identification codes printed on the front of a sign must be encased under protective film to ensure the code remains legible for the Design Life of the sign.

d) The format of the identification code must include:

i) TES number or sign code;

ii) sign manufacturer's name;

iii) month and year of manufacture; and

iv) manufacturer and class of retroreflective material.

e) An example of the identification code for reference purposes only is included in Table RD-LM-S2 6-1.

Table RD-LM-S2 6-1 Sign reference marking

XYZ	11	17	3M1
Abbreviated to signify manufacturer	Month of manufacturer	Year of manufacture	Abbreviated to signify retroreflective sheeting manufacturer and grade of retroreflective sheeting

7 Handling of signs

a) All finished signs must be handled, transported and stored to prevent damage to the sign face or other components.

b) Large guide and information signs must be adequately braced during transport to avoid buckling and rivet popping. Packaged signs must not be stored wet.

c) Signs may only be stored outdoors if no practical indoor alternative exists. If the signs are stored in outdoor facilities, the signs must be:

i) stored off the ground in an upright position;

ii) supported to prevent damage to the face or sign blank;

iii) free of transport packaging; and

iv) well ventilated to prevent moisture build up on the face of the sign.

d) Moisture or condensation must not come into contact with the face of the sign. Signs with wet packages must immediately be removed and allowed to dry completely.

e) Signs must not be stored in a high temperature or high humidity environment and must be appropriately protected for the storage conditions.

8 Sign performance warranties

8.1 General

a) The Contractor must provide a manufacturer's warranty for the supply of all signs in accordance with the requirements of PC-CN3 "Construction Management".

b) The Contractor must establish and comply with, in conjunction with the manufacturer of the retroreflective sheeting, procedures for storage, delivery and erection to ensure continuity of the retroreflective sheeting manufacturer's warranty.

c) This warranty will not apply to signs that have failed in service as a result of vandalism, accidental damage or abnormal environmental conditions.

8.2 Sign panel

a) The complete sign panel including all components thereon or attached except for the sign face or sheeting, must be guaranteed against any Defects caused by failure of the components for a period of at least 36 months from the date of manufacture.

b) This warranty does not apply to signs that have failed in service as a result of vandalism, accidental damage or abnormal environmental conditions.

8.3 Sign face or sheeting

a) In addition to the warranty requirements set out in section 8.1a), the Contractor must provide a manufacturer's warranty for the performance of all signs supplied, for period shown in Table RD-LM-S2 8-1, in accordance with PC-CN3 "Construction Management".

b) Where materials with different performance characteristics are combined, such as a guide sign, the warranty period applicable is determined by the warranted performance of the material with the minimum durability ranking of the combination.

Table RD-LM-S2 8-1 Warranty performance schedule

Background sheeting class	Used in combination with	Warranted outdoor exposure	Warranted retained CIL/m² percentile(1)
Class 900	Class 1A	10 years	80%(2)
	Class 900	10 years	-
	Class 400	12 years	-
	Electronic cuttable films	14 years	-
	Screen printed colours	10 years	-
	Fluorescent yellow, yellow / green	10 years	-
	Fluorescent red / orange	3 years	-
Class 400	Class 400	12 years	-
	Electronic cuttable films	14 years	-
	Screen printed colours	10 years	80%(2)
	Fluorescent yellow, yellow / green	5 years	-
	Fluorescent red / orange	3 years	-
Class 100	Class 1A	7 years	50%(2)
	Class 900	10 years	-
	Class 400	12 years	-
	Electronic cuttable films	14 years	-
	Fluorescent yellow, yellow / green	10 years	-
	Fluorescent Red / Orange	3 years	-

Table notes:

(1) Warranted retained brightness levels apply to reflective sheeting used for sign backgrounds, borders and legends.

(2) Retained CIL percentile is based on minimum CIL values for new reflective sheeting by Class for all of the combinations of observation and entrance angles defined in relevant tables included in AS 1906.1 Retroreflective materials and devices for road traffic control purposes, Part 1: Retroreflective sheeting.

8.4 Non-metallic substrate sign blank and sheeting

Where the manufacture of non-metallic substrate sign blank and sheeting is combined as one item, in addition to the warranty requirements set out in section 8.1a), the Contractor must provide a manufacturer's warranty for performance of the combined sign for the period shown in Table RD-LM-S2 8-1, in accordance with PC-CN3 "Construction Management".

9 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-BP-S2 9-1 have been complied with.

Table RD-BP-S2 9-1 Verification requirements

Subject	Property	Frequency	Acceptable limits
Sign manufacturer's warranty	Retroreflective warranty	Refer section 8	Refer section 8

10 Appendix 1: Sign materials - legends and backgrounds

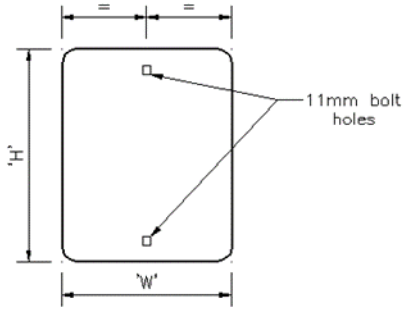
Table RD-LM-S2 10-1 Sign materials - legends and backgrounds

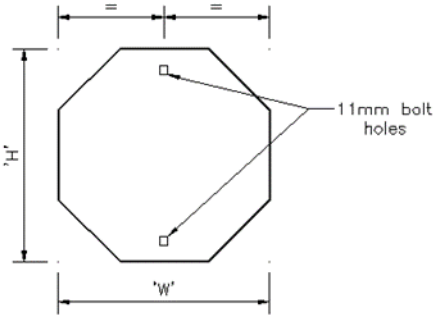
Sign situation		Sign background reflective sheeting class and colour	
Regulatory signs		Class 400 legend and background	
1.1.1	Movement series (R1)	Class 400 legend and background	
1.1.2	Direction series (R2)	Pedestrian series (R3) Class 400 legend and background	
1.1.3	Pedestrian series (R3)	Class 400 legend and background	
1.1.4	Speed series (R4)	Class 400 legend and background	
1.1.5	Parking series (R5) Except R5-50, R5-51, R5-57 and R5-58	Non-reflective legend and background Class 400 legend and background	
1.1.6	Miscellaneous series (R6) Except R6-11 and R6-12	Class 400 legend and background Class 900 legend and background	
1.1.7	Exclusive-use lane series (R7)	Class 400 legend and background	
1.1.8	Bicycle/pedestrian series (R8)	Class 400 legend and background	
1.1.9	Supplementary plates for general use (R9)	Class 400 legend and background	
Warning signs			
1.2.1	Alignment series (W1)	Class 400 yellow	
1.2.2	Intersection and junction series (W2)	Class 400 yellow	
1.2.3	Advance warning of traffic control device series (W3)	Class 400 yellow	
1.2.4	Road width, low and narrow clearance Series (W4)	Class 400 yellow	
1.2.5	Road obstacle series (W5)	Class 400 yellow	
1.2.6	Pedestrian, school and bicycle series (W6) Except W6-1, W6-2, W6-3 and W6-SA106,	Class 400 yellow Class 400 fluorescent yellow/green	
1.2.7	Railway level crossing series (W7)	Class 400 yellow	
	Except W7-2 and W7-14	Black on class 400 white	
1.2.8	Auxiliary series (W8) Except W8-13, W14, W8-18, W8-19, W8-20, W8-22, W8-24, W8-25, W8-SA3, W8-SA5, W8-SA17, W8-SA23, W8-SA56, W8-SA104	Class 400 yellow Fluorescent yellow/green	
1.2.9	Other warning signs	Class 400 yellow	
Guide signs (excluding TES drawings)			
1.3.1	Direction series (G6)	Black	Class 400 white
1.3.2	Service series (G7)	Class 1 white	Class 400 background
	Except G7-SA122		
1.3.3	Route marker series (G8)	Class 1 white	Class 400 brown
1.3.4	Traffic instruction series (G9)	Class 1 legend	Class 400 background
1.3.5	Kilometre posts (G10)	Class 1 white	Class 400 green
1.3.6	Tourist series (G11)	Class 1 white	Class 400 brown
Freeway guide series (excluding TES drawings)			
1.4.1	Exit direction series (GE2)	Class 1 white	Class 400 green
1.4.2	Information series (GE6)	Class 1 white	Class 400 green
1.4.3	Service series (GE7)	Class 1 white	Class 400 blue
1.4.4	Traffic instruction series (GE9)	Class 1 legend	Class 400 background

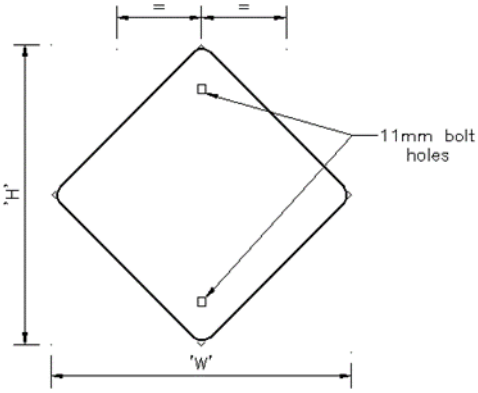
Sign situation		Sign background reflective sheeting class and colour
Temporary signs		
1.5.1	Worker protection signs	Class 1A orange fluorescent
1.5.2	Other temporary signs	Class 400 legend and background fluorescent yellow/green where specified
Hazard markers		
1.6.1	Hazard markers (D4) Except D4-6 and D4-SA50	Class 100 white Class 400 yellow
Other		
1.7.1	Guide post marker	Class 1A red/white
TES signs		
1.8.1	As detailed on individual TES drawings	

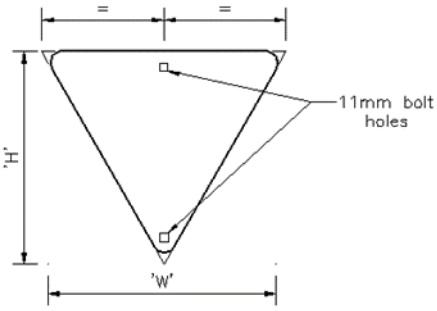
11 Appendix 2: Schedule of hole and stiffener centre locations

Table RD-LM-S2 11-1 Supply of Signs









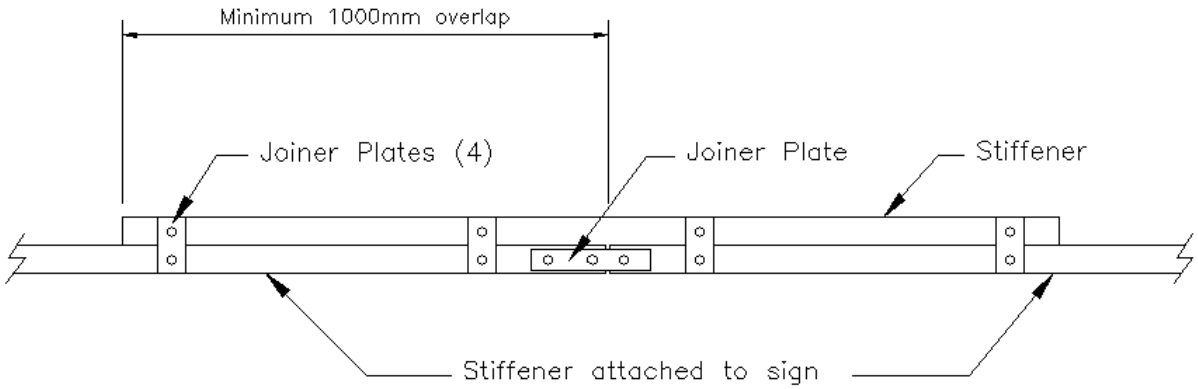
Overall sign size	Sign height 'H'	Sign width 'W'								Bolt hole spacing (1)	No. of holes	Stiffener spacing (1)(2)(1)	No. of stiffeners (3)
		< 1200				1201-1401		>1401					
		Holes	Stiffener			Holes	Stiffener						
		Plate Thickness											
		1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0				
	100	Holes or stiffeners to suit as required											
	150	Holes or stiffeners to suit as required											
	180	Holes or stiffeners to suit as required											
	210	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	215	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	225	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	230	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	240	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	250	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	300	Y	Y	Y	Y	N/A	Y	Y	Y	150	2	150	2
	350	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	360	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	370	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	375	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	390	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	400	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	420	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
300 x 300	425	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	450	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	500	Y	Y	Y	Y	N/A	Y	Y	Y	300	2	300	2
	550	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2

Overall sign size	Sign height 'H'	Sign width 'W'								Bolt hole spacing (1)	No. of holes	Stiffener spacing (1)(2)(1)	No. of stiffeners (3)
		< 1200				1201-1401		>1401					
		Holes	Stiffener			Holes	Stiffener						
		Plate Thickness											
		1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0				
	560	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2
	600	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2
450 x 450	635	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2
	675	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2
	700	Y	Y	Y	Y	N/A	Y	Y	Y	450	2	450	2
	750	Y	Y	Y	Y	N/A	Y	Y	Y	600	2	600	2
	800	Y	Y	Y	Y	N/A	Y	Y	Y	600	2	600	2
	820	Y	Y	Y	Y	N/A	Y	Y	Y	600	2	600	2
	850	Y	Y	Y	Y	N/A	Y	Y	Y	600	2	600	2
	900	Y	Y	Y	Y	N/A	Y	Y	Y	600	2	600	2
	990	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1000	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1050	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1060	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1065	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1067	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1100	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1125	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1150	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1170	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
	1200	Y	Y	Y	Y	N/A	Y	Y	Y	450	3	450	3
900 x 900	1270	Y	Y	Y	Y	N/A	Y	Y	Y	600	3	600	3
	1300	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1334	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1350	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1400	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1420	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1440	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1485	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1500	Y	Y	Y	Y	N/A	N/A	Y	Y	600	3	600	3
	1600	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	3
	1650	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
1200 x 1200	1695	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	1720	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	1800	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	1867	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	1950	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	2000	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	2015	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	2020	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	2100	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	4
	2250	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	5
	2350	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	5
	2400	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	5
	2550	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	5
	2700	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	5
	2850	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	6
	2950	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	6
	3000	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	6

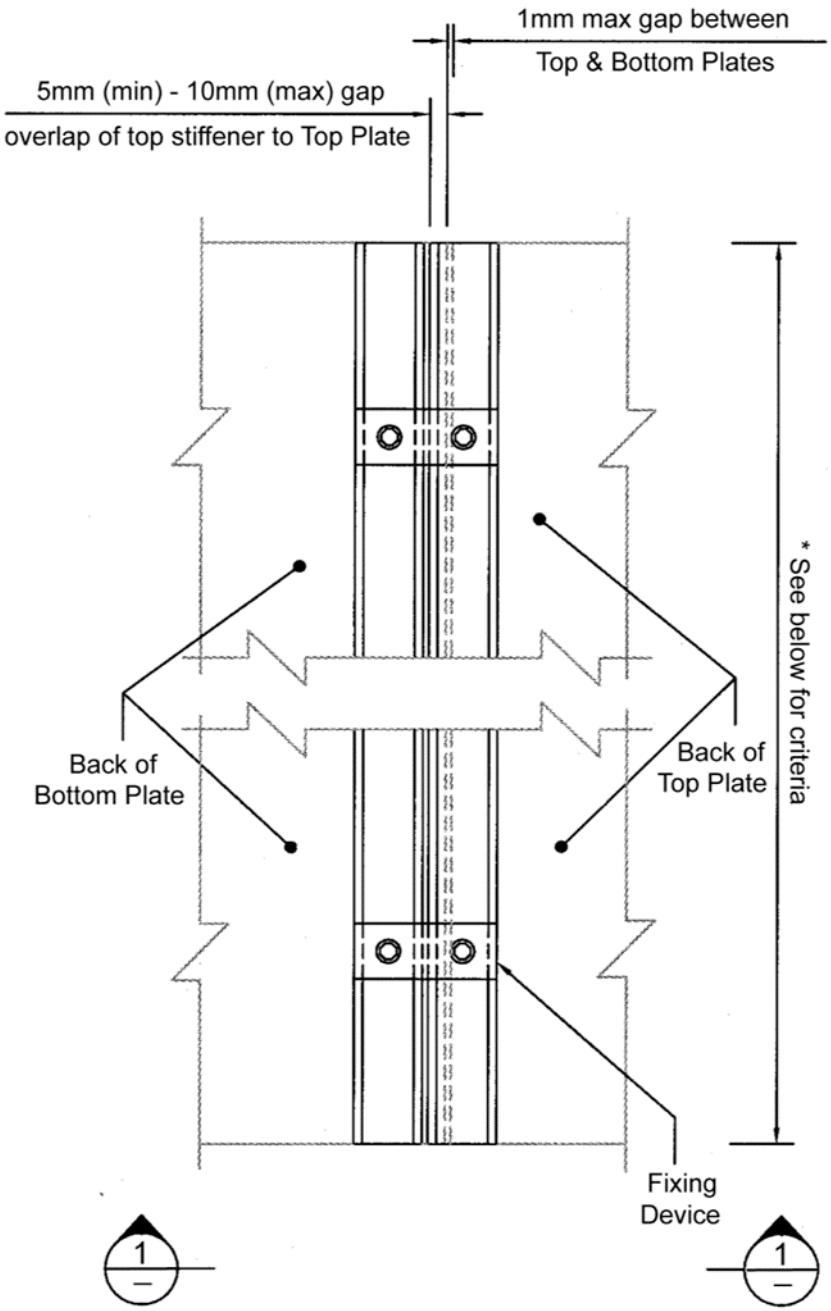
Overall sign size	Sign height 'H'	Sign width 'W'								Bolt hole spacing (1)	No. of holes	Stiffener spacing (1)(2)(1)	No. of stiffeners (3)
		< 1200				1201-1401		>1401					
		Holes	Stiffener			Holes	Stiffener						
		Plate Thickness											
		1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0				
	3150	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	6
	3300	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	6
	3450	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	7
	3600												
	3750	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	7
	3900	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	7
	4050	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	7
	4200	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	8
	4350	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	8
	4500	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	8
	4650	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	9
	4800	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	9
	4950	N/A	N/A	Y	Y	N/A	N/A	Y	Y	N/A	N/A	TBD	9

Table notes:
(1) Dimensions to the centre of stiffener or bolt holes.
(2) Stiffener spacing to be equidistant using required number of stiffeners for sign heights marked TBD.
(3) Refer to TES 12186 for additional stiffener requirements needed for gantry and overhead mounted signs.

12 Appendix 3: Stiffener joining detail



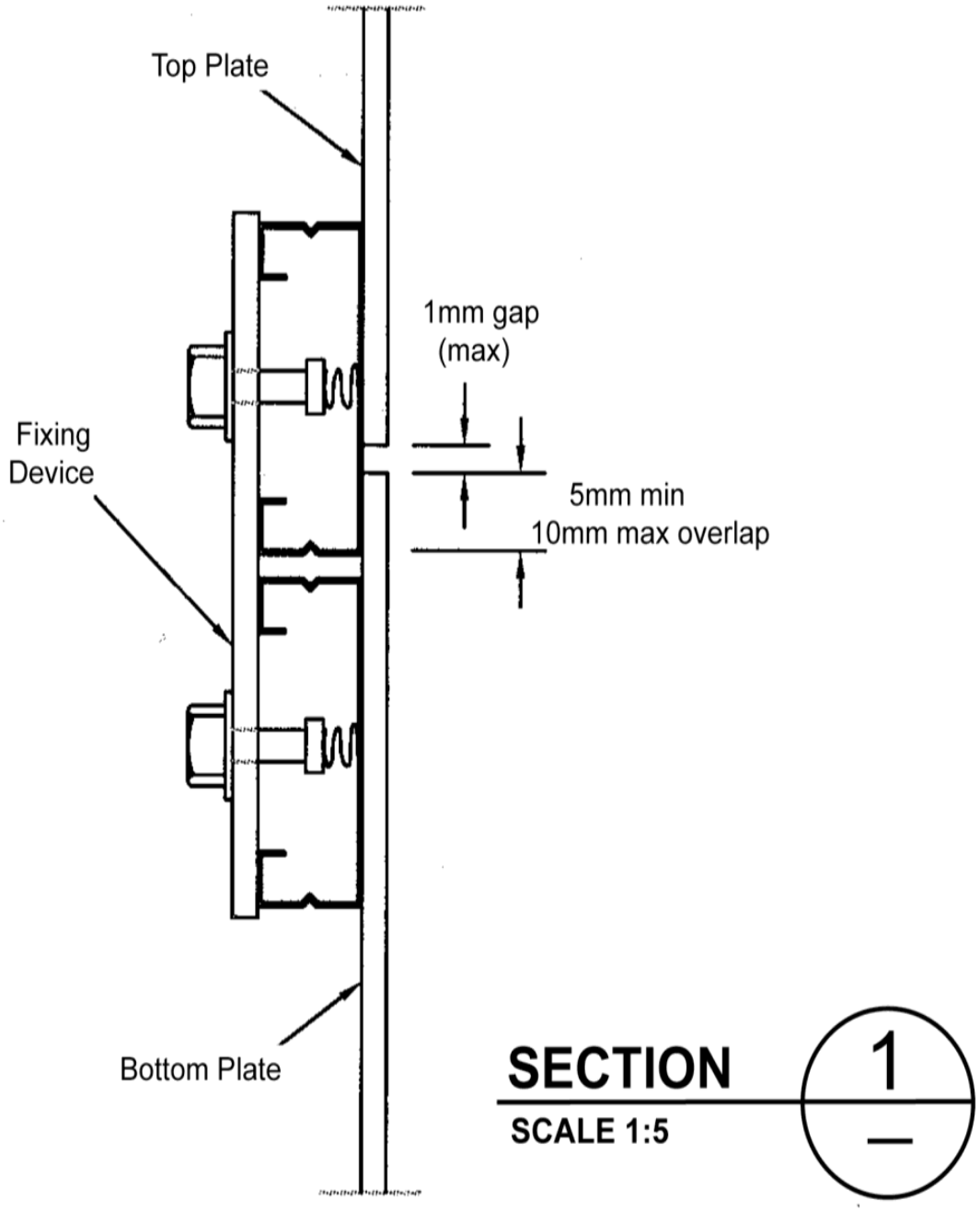
13 Appendix 4: Sectioned sign joining



NOTE : * = > 2000 use a minimum of 3 Fixing Devices
< 2000 use 2 Fixing Devices

PLAN

SCALE 1:15


Top Plate
1mm gap
(max)
Fixing
Device
5mm min
10mm max overlap
Bottom Plate
SECTION
1
SCALE 1:5

14 Appendix 5: Sign identification