

Roads

Master Specification

RD-LM-S2 Supply of Signs

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RD-LM-S2 Supply of Signs

1 General

- 1.1 This Part sets out the requirements for the manufacture and delivery of all regulatory, warning, guide, information, freeway guide, direction and hazard marker signs. This Part does not cover electronic signs.
- 1.2 The Contractor shall supply signs in accordance with the following (in order of precedence):
 - a) any contract specific drawings or specified by the Principal;
 - b) the requirements of this Part; and
 - c) standard drawings.
- 1.3 "Standard Sign" means a sign in accordance with AS 1743 or a sign detailed on the DPTI Sign Index.
- 1.4 Documents referenced in this Part are listed below:
 - a) AS 1163 Cold-formed Structural Steel Hollow Sections.
 - b) AS 1170 SAA Loading Code – Wind Loads.
 - c) AS 1214 Hot-Dip Galvanized Coatings on Threaded Fasteners.
 - d) AS 1450 Steel Tubes for Mechanical Purposes.
 - e) AS 1397 Continuous Hot-Dip Metallic Coated Steel Sheet and Strip - Coatings of Zinc and Zinc Alloyed with Aluminium and Magnesium.
 - f) AS 1580 Paints and Related Materials - Methods of Test.
 - g) AS 1627 Metal Finishing - Preparation and Pre-treatment of Surfaces.
 - h) AS 1627.1 Metal finishing - Preparation and Pretreatment of Surfaces - Removal of Oil, Grease and related Contamination.
 - i) AS 1627.4 Metal Finishing - Preparation and Pretreatment of Surfaces - Abrasive Blast Cleaning.
 - j) AS 1734 Aluminium and Aluminium Alloys - Flat Sheet, Coiled Sheet and Plate.
 - k) AS 1742.1-15 Manual of Uniform Traffic Control Devices.
 - l) AS 1743 Road Signs – Specifications.
 - m) AS 1744 Standard Alphabets for Road Signs.
 - n) AS 1866 Aluminium and Aluminium Alloys - Extruded Rod, Bar, Solid and Hollow Shapes.
 - o) AS 1906.1 Retroreflective Materials and Devices for Road Traffic Control Purposes – Retroreflective Sheeting.
 - p) AS 2700 Colour Standards for General Purposes.
 - q) DPTI Standard Road Sign - Specification South Australia. Refer to online index at <http://www.dteiapps.com.au/signindx/>.

2 Prequalification

- 2.1 Signs shall be manufactured by a company prequalified with DPTI – refer https://www.dpti.sa.gov.au/contractor_documents/prequalification.

3 Design

- 3.1 The design of a sign shall be in the format of either a DPTI Traffic Engineering Specification (TES) drawing or a standard drawing prefixed similar to the Australian Standard series, e.g. R1-2.
- 3.2 The dimensions, legend and background for each sign shall be in accordance with:
- a) Specific Road Signs – Specifications, South Australia (TES drawing);
 - b) AS 1743;
 - c) AS 1744; and
 - d) Standard Road Sign – Specification South Australia.

4 Materials of Signs

Sign Blanks

Metallic Sign Blanks

- 4.1 Metallic sign blanks shall be manufactured from an aluminium alloy with a thickness of either 1.6 mm or 2.0 mm. The aluminium alloy shall be grade 5052 or 5251, temper H36 or H38 as specified in AS 1734. Sign blanks shall be free of cracks, tears and other surface blemishes and the edges shall be true and smooth.

Non-Metallic Substrate Sign Blanks

- 4.2 The Principal is trialling the use of non-metallic substrates for a limited range of signs and may permit, at its sole and unfettered discretion, the use of a non-metallic substrate. Any such sign blanks shall:
- a) be no larger than 600 mm x 900 mm for signs from the Australian Standard series, as defined in the DPTI Standard Road Sign Index;
 - b) be 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 DPTI Standard Road Sign Index;
 - c) comply with the provisions of AS1743 Clause 11.1;
 - d) be compatible with the material with which they will be covered;
 - e) be constructed of Polycarbonate or other approved UV stable product to guarantee an outdoor service life of at least 15 years;
 - f) be flexible, non-shattering and not subjected to fatigue cracking;
 - g) have a nominal thickness of 3 mm;
 - h) be smooth, free of cracks, surface blemishes, and all edges shall be true and smooth for the life of the product; and
 - i) not void the warranty given by the manufacturer of any sheeting or coating applied to the substrate.
- 4.3 Non-metallic substrates shall only be used in areas where there is a high probability of vehicle impact and the Principal's written approval is obtained beforehand.

Stiffeners

- 4.4 Stiffeners shall be continuous horizontal lengths of galvanized cold rolled steel channel with cross-sectional dimensions of 41.3 x 21.0 mm or aluminium extruded section with cross-sectional dimensions of 28.5 x 25.5 mm.

- 4.5 Each stiffener section shall have 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.

Rivets

- 4.6 Rivets shall be from a self-piercing riveting system or conform to the following requirements:
- a) 1 320 N minimum shear load;
 - b) 1 910 N minimum tensile load;
 - c) aluminium alloy with a steel stem and domed head;
 - d) 4.8 to 5 mm shank diameter; and
 - e) 8.5 to 9.5 mm head diameter.
- 4.7 The riveting process shall not project above the surface of the sign blank in a manner which will result in damage of the sign face material. The heads of rivets shall be coloured to match the surrounding material.

Backing Strips

- 4.8 Backing strips shall be the same material and condition as required in Clause 4.1 "Sign Blanks".

Double Sided Acrylic Foam Tapes

- 4.9 Foam tapes shall be double sided, medium firm, acrylic pressure sensitive adhesives that have high initial adhesion, good shear holding power and a demonstrated long-term holding strength. The tape shall also be capable of withstanding extremely high or low temperatures and have characteristics similar to 3M VHB 4952 double sided acrylic foam tape.

Hinges

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

Retroreflective Material for Background and Legend

- 4.11 Class 1A, Class 1100, Class 900, Class 400, Class 300 and Class 100 retroreflective sheeting shall conform to the requirements defined in AS 1906.1.
- 4.12 Details of the class of material to be used on Standard Signs are listed in Appendix 1: Sign Materials - Legends and Backgrounds.
- 4.13 Details of the class of material to be used on specific road signs designated by a TES number are noted on the DPTI "Specific Road Signs-Specifications, South Australia" drawing. The Contractor shall demonstrate that the luminance contrast ratios between legends and backgrounds is not less than that set out in Table B1, Appendix B, AS 1906.1.

Non-Retroreflective Material for Background and Legend

Paint

- 4.14 Paint shall be compatible with the legend and background material, both in application and durability, and shall meet the warranty requirement of the sign as set out in Table 8.3 "Warranty Performance Schedule".
- 4.15 Colours shall approximate to that defined in AS 1743. Matt colours, when measured in accordance with method 602.2 detailed in AS 1580, shall have specular gloss value of:
- a) 12 – 20 for an 85° head; or

- b) 8 – 12 for a 60° head.

Sheet Material

- 4.16 The material shall be of uniform density and compatible with the material used for the legend and background both in application and durability. All sheeting shall 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

- 5.1 The sign manufacturer shall provide the following details to support the sign performance warranty underwritten by the retroreflective sheeting manufacturer:
 - a) Report of the last audit of the manufacturing facility conducted by the retroreflective sheeting manufacturer to assess the Contractor's manufacturing performance.
 - b) Certification issued by the retroreflective sheeting manufacturer that the Contractor is currently eligible to offer a Sign Performance Warranty arrangement that is underwritten by the retroreflective sheeting manufacturer.
- 5.2 The Contractor shall have procedures in place to satisfy the requirements of the retroreflective sheeting manufacturer for storage and handling of signs.

6 Manufacture of Signs

Sign Blanks

- 6.1 Sign blanks shall be free of cracks, tears and other surface blemishes and the edges shall be true and smooth. The face of each sign blank shall be chemically cleaned and etched or mechanically abraded in accordance with AS 1627. The back of each sign blank shall be rendered dull and non-reflective either by mechanical or chemical means.
- 6.2 Sign blanks shall be fabricated from a single sheet of aluminium unless the sign is larger than the standard sheet size. Fingerblade signs shall be manufactured from extruded aluminium with an extruded rib, top and bottom of the blade.

Multi-Piece Signs

- 6.3 Where the sign is of such a size as to require more than one full standard sheet of aluminium, a multi-piece sign shall be made using the minimum number of sheets practicable.
- 6.4 A sign with more joins than necessary will not be accepted. All joints shall be covered by a backing strip except for horizontal joints in sectioned signs. This backing strip shall be fixed to the sign using double sided acrylic foam tapes or riveted to each sheet.
- 6.5 Double sided acrylic foam tapes shall be applied in accordance with the manufacturer's recommended application procedure.

Sectioned Signs

- 6.6 Where the sign is of such a size that it is necessary for the sign to be manufactured, transported or installed in sections, it shall be manufactured in accordance with Appendix 3: Stiffener Joining Detail (for vertical joints) and Appendix 4: Sectioned Sign Joining (for horizontal joints). Joins should not be made through legends or symbols wherever possible. Sectioned signs shall be clearly marked for ease of assembly in the field.

Hinge Signs

- 6.7 Hinged signs shall be manufactured with the hinge running the full length of the hinged section of the sign. The hinge shall 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.
- 6.8 Holes on the top and bottom or both sides of the sign shall be positioned to accommodate a 38 mm wide padlock (supplied by others) when the sign is in the closed position.

Dimensions and Tolerances

- 6.9 The dimensions of the sign blank shall be within 2.5 mm of those specified. The finished sign shall be flat within a maximum allowable warp or twist of 5 mm/metre in any direction.
- 6.10 Backing strips shall:
- a) be of uniform width of at least 50 mm wide over full length; and
 - b) extend to within 25 mm of edge of sign.
- 6.11 Vertical backing strips shall stop at each horizontal stiffener or horizontal backing strip and shall butt against it with a gap of 1 mm.
- 6.12 Riveted backing strips, stiffeners and hinges shall be according to the following:
- a) secured by regularly spaced rivets to each side of the joint;
 - b) rivet spacing shall not exceed 200 mm;
 - c) the end rivets shall be a maximum distance of 25 mm from each end; and
 - d) a minimum of 2 rivets shall be installed on each side of the joint.
- 6.13 Sections of multi-piece signs shall be butted together with a maximum gap of 1 mm at any point along the joint.
- 6.14 Hinged sign plates shall have sufficient clearance between the plates when the sign is in the closed position to clear the rivet heads. On sectioned signs, stiffeners shall be placed along the edge of the butted join and there shall be a maximum gap of 1 mm at any point along the joint.
- 6.15 Stiffeners shall comply with the following:
- a) butt joints shall be 5 mm;
 - b) each end of the stiffener shall be 50 to 150 mm from the edge of the sign unless specified in Appendix 2: Schedule of Hole and Stiffener Centre Locations; and
 - c) maximum panel overhang at the top and bottom of the sign shall be an equal distance from the stiffener centres and shall be in the range of between 50 to 150 mm.
- 6.16 Where "High Wind Signs" are specified on the Drawings, rivet spacing shall not exceed 150 mm and at least 3 rivets shall be installed on each side of the joint.

Provision for Mounting of Signs

Non-Reinforced Signs

- 6.17 Non-reinforced signs shall be manufactured with square holes for mounting purposes. The holes shall be cleanly punched 11 mm square (0.5 mm) to accept a 10 mm diameter cup head square neck bolt. The hole spacing shall be in accordance with Appendix 2: Schedule of Hole and Stiffener Centre Locations.

Reinforced Signs

- 6.18 All signs with the following thicknesses shall have stiffeners fixed to the rear of the sign in accordance with Appendix 2: Schedule of Hole and Stiffener Centre Locations:
- a) with a plate thickness $t = 1.6$ mm and overall width > 1200 mm; or

- b) with a plate thickness $t = 2.0$ mm and overall width > 1400 mm.
- 6.19 Where the length of the stiffener exceeds 6.0 m, joining of stiffening sections is permitted. Joined stiffening sections shall be staggered so that the structural integrity of the sign is not compromised. Spacing shall be in accordance with the stiffener centre guide in Appendix 2: Schedule of Hole and Stiffener Centre Locations.
- 6.20 Where specified reinforcing for High Wind Category signs shall be as shown on the drawings. Stiffeners shall be attached to the sign blanks by rivets or double sided acrylic foam tapes.

Sectioned Signs

- 6.21 In addition to the requirements set out in Clause 6.6.19 "Reinforced Signs", sectioned signs shall have stiffeners fixed along the horizontal join of the two joining pieces in accordance Appendix 4: Sectioned Sign Joining.

Temporary Signs

- 6.22 No provision for attachment is required for temporary signs.

Fingerblade Signs

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

Sign Overlays

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

Form of Letters and Numerals

- 6.25 All individual letters shall have neat, clearly defined edges with smooth curves on round letters conforming to AS 1744.

Retroreflective Sign Background and Legend

Retroreflective Material

- 6.26 Retroreflective material shall be applied to the sign blank in accordance with the Retroreflective Sheeting Manufacturer's recommendations. The material shall be applied in one continuous piece. Retroreflective materials used as background and legends of signs shall conform in colour and grade to the requirements of AS 1906.1.
- 6.27 Where sign dimensions exceed the standard retroreflective material width, joining of the material shall be in accordance with Clause 6.9 "Material Joins".

Screening Ink and Electronic Cuttable Films

- 6.28 Coloured legends or backgrounds may be provided by using either:
- a) transparent screen process colours;
 - b) opaque screen process colours;
 - c) electronic cuttable films; or
 - d) digital printing.
- 6.29 Legends shall be manufactured by the retroreflective sheeting manufacturer to ensure compatibility and durability with the reflective sheeting.
- 6.30 The screen process colours or electronic cuttable films shall be applied using materials and techniques recommended by the retroreflective sheeting manufacturer.
- 6.31 For digital printing only:

- a) matched component inks and printer devices recommended by the retro-reflective sheeting manufacturer shall be used; and
- b) the ink and any protective coating shall be compatible with the background material, both in application and durability.

Material Joins

6.32 Joins of the material shall be in accordance with the Reflective Sheet Manufacturer's recommendations.

Non-Reflectorised Sign Background, Legend, Symbols and Borders

Background Paint

- 6.33 Where specified, the front of signs (background) shall be painted using a 2-pack polyurethane paint as approved to APAS-2911. Surface preparation of the sign substrate and the primer to be used shall be as specified by the finish coat manufacturer. All paints shall be from the one manufacturer.
- 6.34 The colour of the background paint shall be an approximate match to the appropriate colour as specified in AS 1743, Clause 10.1, when assessed in accordance with AS 1580.601.1. The specular gloss of the background paint shall be less than 20%, when assessed in accordance with AS 1580.602.2.
- 6.35 Where required, the backs of signs shall be painted as follows:
 - a) degrease all surfaces in accordance with AS 1627.1;
 - b) apply one coat of waterborne galvanized iron primer, as approved to APAS-0134; and
 - c) apply two coats of flat or low gloss latex paint, as approved to APAS-0280/3.
- 6.36 The colour of the paint shall be an approximate match to AS 2700, G61 Dark Green, unless otherwise specified, when assessed in accordance with AS 1580.601.1. All paints shall be from the one manufacturer.
- 6.37 Where paint is used it shall be applied with a minimum dry film thickness of 38 microns. Touching up of small areas by brush to fully match the spray painted surface shall be permissible using the colour base and hardener mixture without reducer.

Sheet Material Application

- 6.38 All sheeting and films shall 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.

Screening Ink and Electronic Cuttable Films

- 6.39 Legends may be manufactured using either opaque screen process colours or electronic cuttable films and the sign manufacturer shall ensure compatibility and durability with the retroreflective sheeting. The screen process colours or electronic cuttable films shall be applied using materials and techniques recommended by the manufacturer of the retroreflective sheeting. Where joins in the cuttable films are required, they shall be of the "butt-join" type and shall overlap. Background material of the legend shall be compatible in application and durability.

Reference Markings

- 6.40 Identification coding shall be clearly and permanently stamped, engraved or printed on all signs. The coding shall appear in characters 6 mm to 10 mm high. The coding may be made by stamping or engraving the rear of the sign, or by attaching a stamped or engraved 1.6 mm thick aluminium plate with rivets or double sided acrylic foam tape. Stamping and engraving shall be carried out in such a manner that the front face of the sign is not damaged.
- 6.41 For rectangular signs, the coding shall appear as near as practicable to the bottom rear left hand corner. For other shaped signs it shall be positioned on or below the horizontal centre line and as near to the left rear edge as practicable.

- 6.42 For printed signs the code may be printed on the sign face within the outer border strip as near as practicable to the bottom left hand corner – refer Appendix 5: Sign identification”. Identification codes printed on the front of a sign shall be encased under protective film to ensure the code remains legible for the life of the sign.
- 6.43 The format of the information shall include:
- TES number or Sign Code;
 - sign manufacturer's name;
 - month and year of manufacture; and
 - manufacturer and class of retroreflective material.
- 6.44 For example:

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

- 7.1 All finished signs shall be handled, transported and stored to prevent damage to the sign face or other components. Large guide and information signs shall be adequately braced during transport to avoid buckling and rivet popping. Packaged signs shall not be stored wet.
- 7.2 Signs may only be stored outdoors if no practical indoor alternative exists. If the signs are stored in outdoor facilities, the signs shall be:
- stored off the ground in an upright position;
 - supported to prevent damage to the face or sign blank;
 - free of transport packaging; and
 - well ventilated to prevent moisture build up on the face of the sign.
- 7.3 Moisture or condensation shall not come into contact with the face of the sign. Signs with wet packages shall immediately be removed and allowed to dry completely.
- 7.4 Signs shall not be stored in a high temperature or high humidity environment and shall be appropriately protected for the storage conditions.

8 Sign Performance Warranties

General

- 8.1 The Contractor shall establish, in conjunction with the manufacturer, procedures for storage, delivery and erection to ensure continuity of the retroreflective sheeting manufacturer's warranty.
- 8.2 The Contractor shall provide certification from the retroreflective sheeting manufacturer that in the event of a failure to the sign during the warranty period, the retroreflective sheeting manufacturer shall repair or replace the faulty sign.
- 8.3 In the event of a defect in a sign which has been installed, the Contractor shall either:
- remove, replace and reinstall the defective sign at its own expense without additional payment;
 - or

- b) if agreed between the parties, compensate the Principal for all additional costs necessary incurred by the Principal (including removal and reinstallation) as a consequence of the defective sign.
- 8.4 This warranty shall not apply to signs that have failed in service as a result of vandalism, accidental damage or abnormal environmental conditions.

Sign Panel

- 8.5 The complete sign panel including all components thereon or attached except for the sign face or sheeting, shall be guaranteed against any defects caused by failure of the components for a period of at least 36 months from the date of manufacture.
- 8.6 This warranty does not apply to signs that have failed in service as a result of vandalism, accidental damage or abnormal environmental conditions.

Sign Face or Sheeting

- 8.7 The Contractor shall provide a manufacturer's guarantee the signs for the warranty period shown in the following table "Warranty Performance Schedule". 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/m ² 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 | 80% ⁽²⁾ |
| | Electronic Cuttable Films | 14 years | |
| | Screen printed colours | 10 years | |
| | 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 | |

(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 AS1906.1.

Non-metallic Substrate Sign Blank and Sheeting

- 8.8 The combined manufacture of non-metallic substrate sign blank and sheeting as one item by the sign manufacturer shall guarantee the warranty period shown in the Table 8.3 "Warranty Performance Schedule" for the combination sign.

9 Hold Points

- 9.1 There are no Hold Points referenced in this Part.

10 Verification Requirements and Records

10.1 The Contractor shall supply the following records:

Table RD-LM-S2 10-1 Verification requirements

| Document Ref. | Subject | Record To Be Provided |
|---------------|------------------------------|---------------------------|
| 8. | Sign manufacturer's warranty | Retro reflective warranty |

11 Appendix 1: Sign Materials - Legends and Backgrounds

Table RD-LM-S2 11-1 Sign Materials - Legends and Backgrounds

| Sign Situation | | Sign Background Reflective Sheeting Class And Colour | |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------|
| Regulatory Signs | | | |
| 1.1.1 | Movement Series (R1) | Class 400 Legend & Background | |
| 1.1.2 | Direction Series (R2) | Class 400 Legend & Background | |
| 1.1.3 | Pedestrian Series (R3) | Class 400 Legend & Background | |
| 1.1.4 | Speed Series (R4) | Class 400 Legend & Background | |
| 1.1.5 | Parking Series (R5) Except R5-50, R5-51, R5-57 & R5-58 | Non-reflective Legend & Background Class 400 Legend & Background | |
| 1.1.6 | Miscellaneous Series (R6) Except R6-11 & R6-12 | Class 400 Legend & Background Class 900 Legend & Background | |
| 1.1.7 | Exclusive-use Lane Series (R7) | Class 400 Legend & Background | |
| 1.1.8 | Bicycle/Pedestrian Series (R8) | Class 400 Legend & Background | |
| 1.1.9 | Supplementary Plates for General Use (R9) | Class 400 Legend & Background | |
| Warning Signs | | | |
| 1.2.1 | Alignment Series (W1) | Class 400 Yellow | |
| 1.2.2 | Intersection & 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 & Narrow Clearance Series (W4) | Class 400 Yellow | |
| 1.2.5 | Road Obstacle Series (W5) | Class 400 Yellow | |
| 1.2.6 | Pedestrian, School & Bicycle Series (W6) Except W6-1, W6-2, W6-3 & W6-SA106, | Class 400 Yellow Class 400 Fluorescent Yellow/Green | |
| 1.2.7 | Railway Level Crossing Series (W7) Except W7-2 & W7-14 | Class 400 Yellow 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 |

| Sign Situation | | Sign Background Reflective Sheeting Class And Colour | |
|-----------------|------------------------------------------------|------------------------------------------------------|------------------------------------------|
| 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 |
| Temporary Signs | | | |
| 1.5.1 | Worker Protection Signs | Class 1A Orange Fluorescent | |
| 1.5.2 | Other Temporary Signs | Class 400 Legend & 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 | | |

13 Appendix 2: Schedule of Hole and Stiffener Centre Locations

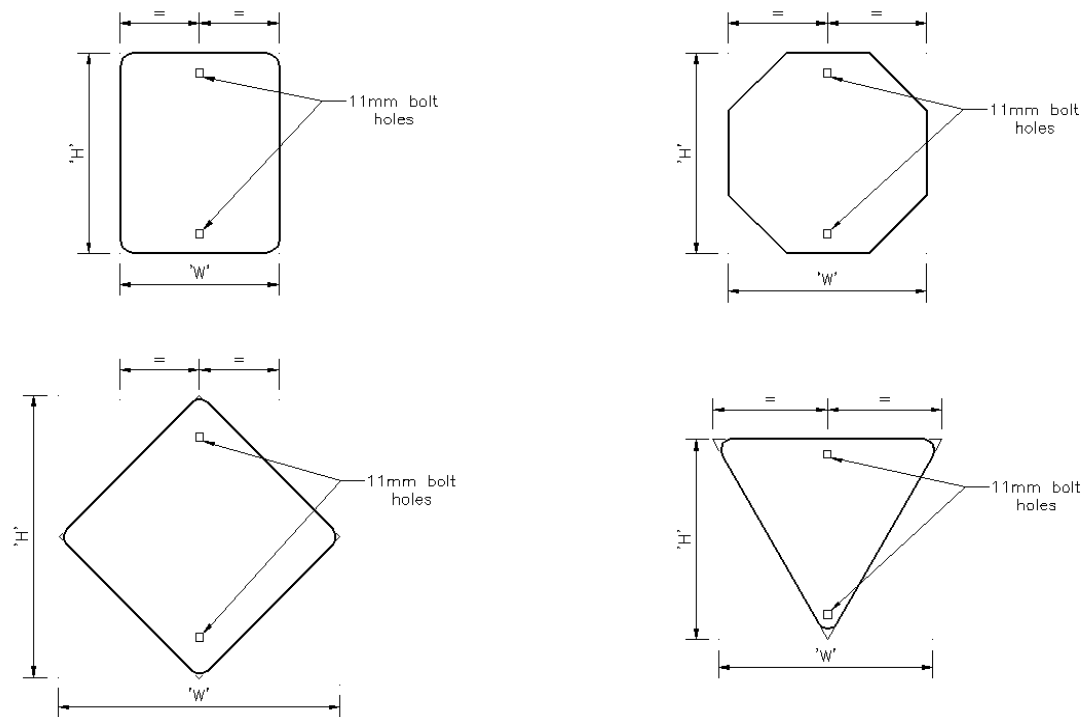


Table RD-LM-S2 13-1 Hole and Stiffener Centre Locations

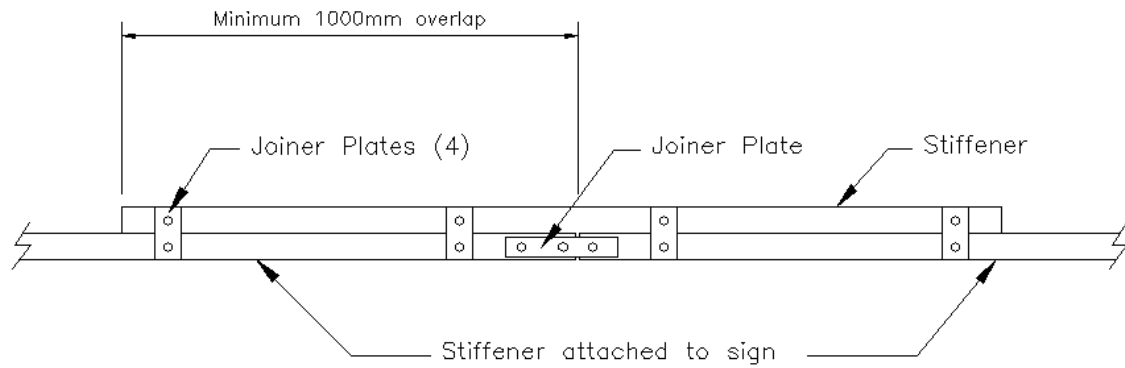
| Overall Sign Size | Sign Height 'H' | Sign Width 'W' | | | | | | | | Bolt Hole Spacing | No. of Holes | Stiffener Spacing | No. of Stiffeners |
|-------------------|-----------------|-----------------------------------------|-----|-----------|-----|-------|-----|-----------|-----|-------------------|--------------|-------------------|-------------------|
| | | < 1200 | | 1201-1400 | | | | > 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 | | | | | | | | | | | |
| | 200 | Y | Y | Y | Y | N/A | Y | Y | Y | 150 | 2 | 150 | 2 |
| | 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 |
| | 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 |
| 600 x 600 | 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 |
| 750 x 750 | 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 |

| Overall Sign Size | Sign Height 'H' | Sign Width 'W' | | | | | | | | Bolt Hole Spacing | No. of Holes | Stiffener Spacing | No. of Stiffeners | | |
|-------------------|-----------------|-----------------|-----|-----------|-----|-----------|-----|-----------|-----|-------------------|--------------|-------------------|-------------------|--------|--|
| | | < 1200 | | | | 1201-1400 | | | | | | | | > 1401 | |
| | | Holes | | Stiffener | | Holes | | Stiffener | | | | | | | |
| | | Plate Thickness | | | | | | | | | | | | | |
| | | 1.6 | 2.0 | 1.6 | 2.0 | 1.6 | 2.0 | 1.6 | 2.0 | | | | | | |
| | 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 | | |
| | 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 | N/A | N/A | Y | Y | N/A | N/A | Y | Y | N/A | N/A | TBD | 7 | | |
| | 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 | | |

Notes:

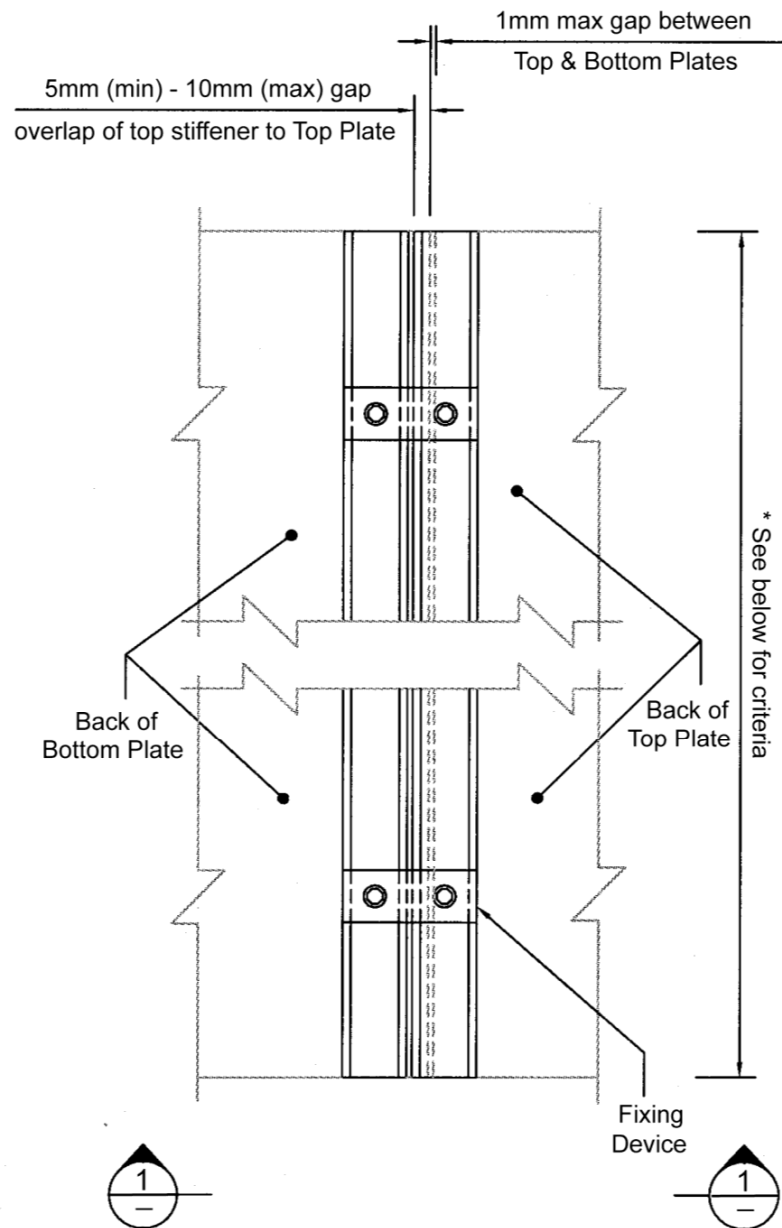
- Dimensions to the centre of stiffener or bolt holes.
- Stiffener spacing to be equidistant using required number of stiffeners for sign heights marked 'TBD' (To Be Determined).
- Refer to TES 12186 for additional stiffener requirements needed for gantry and overhead mounted signs.

14 Appendix 3: Stiffener Joining Detail



A minimum overhanging length of 1000 mm is required for the stiffeners at vertical joins

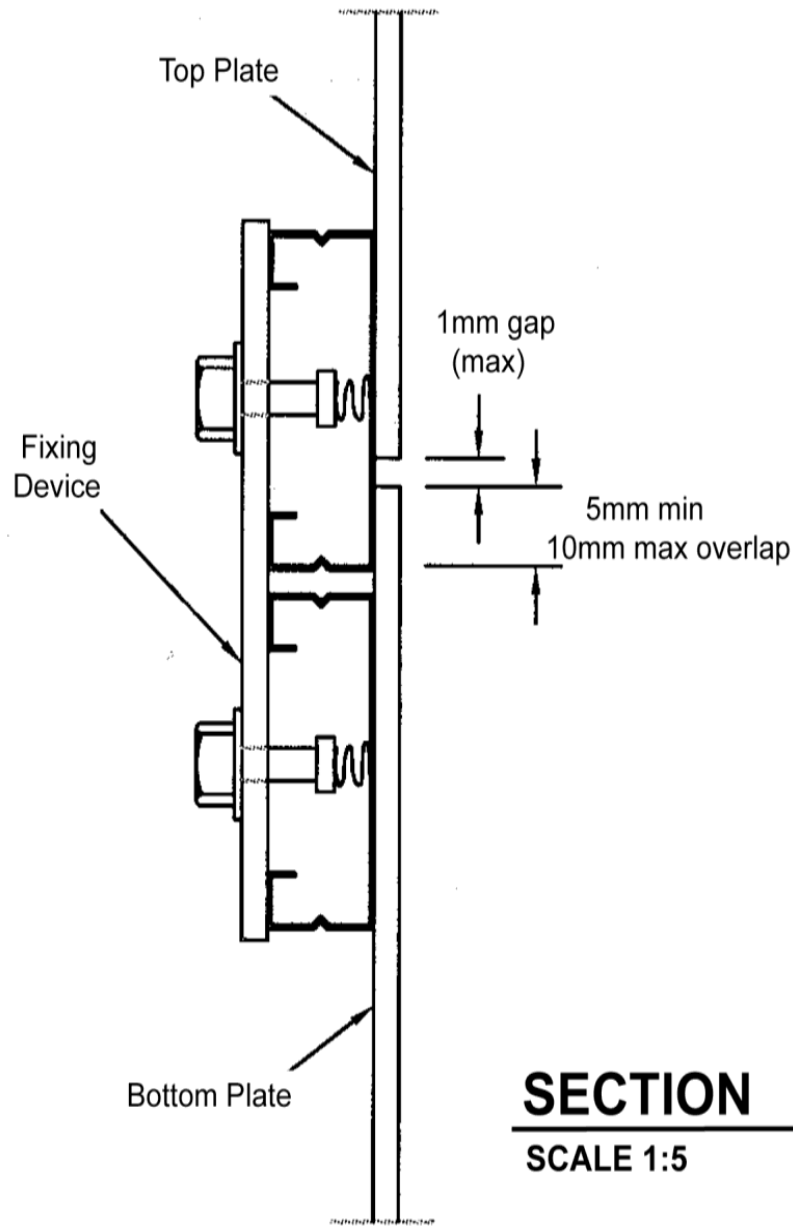
15 Appendix 4: Sectioned Sign Joining



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

PLAN

SCALE 1:15



16 Appendix 5: Sign identification

