



mainroads
WESTERN AUSTRALIA

SPECIFICATION 601

SIGNS

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REVISION REGISTER			
Clause Number	Description of Revision	Authorised By	Issue Date
Clause 601.33	Reference to Drawings 1830-0013 and 1830-0015 removed. Reference to Drawings 2430-0601 and 2630-1948 added.	TESM	07/09/2026
Clause 601.43.03	Clarified that the 50 mm washer area threshold applies specifically to the sign panel.		
Clause 601.45.03	Reference to Drawings 1830-0013 and 1830-0015 removed. Requirement for 20 mm × 20 mm chamfers on all concrete edges revised.		
Clause 601.45.04	N20 concrete updated to N40.		
Annexure 601D	Amended the total sign area threshold from 0.81 m ² to 1.00 m ² and clarified that the post selection threshold is based on the total sign area.		
Annexure 601F	Reference to Drawings 1830-0013 and 1830-0015 removed. Reference to Drawing 2630-1948 added.		
Annexure 601I	Signhere Signs Pty Ltd added as a sign maker for Avery Dennison. Aus Safesigns & Products added as a sign maker for ORAFOL. Hartac Sales & Distribution Pty Ltd, Jason Signmakers, Sunny Sign Company, Safety Signs Service (Brady Corporation) and Ascot Sign Company removed as sign makers for MNTECH Global.		
Annexure 601K	Stiffener requirement for UB post larger than 200UB30 removed as no longer used since publication of drawing 1830-0011. Breakaway direction updated to unidirectional in direction of traffic.	TESM	23/10/2025
Clause 601.43.03	M8 bolt size removed. Reference to bolt detail amended from 9648-0176 to 8720-0657. Warrant for 50 mm diameter washer changed from C size or larger signs to 0.81 metres squared or larger signs.		
Clause 601.45.02	Reference to post hole excavations amended from 1830-0014 to 2430-0601.		
Clause 601.45.03	Reference to post footing dimensions amended from 1830-0014 to 2430-0601. Requirement for 20 mm x 20 mm chamfer for all concrete edges added. Reference to 1830-0013 added.		
Clause 601.45.05	Reference to drawings 9531-1007 and 9748-0438 removed.		
Annexure 601D	Sign area threshold amended from 1.00 m ² to 0.81m ² . Reference to Regional Manager amended to Regional Director.		

REVISION REGISTER			
Clause Number	Description of Revision	Authorised By	Issue Date
Annexure 601F	Drawings 9531-1007 and 9748-0438 removed. Description for drawings 8720-0657, 9548-0106 and 9648-0176 amended.		
Annexure 601I	Sign maker accreditation updated for Retroreflective Sheeting Manufacturers Kiwalite, 3M and Avery Dennison. Jason Signmakers and Sunny Sign Company removed as a sign maker for Kiwalite. Uniform Safety Signs Pty Ltd added as a sign maker for 3M. Sunny Sign Company removed as a sign maker for Avery Dennison.		
Clause 601.81	Item (i) 1. Reference to Drawings 200331-0048, 200331-0049 and 200331-0050 removed. Reference to Drawings 201831-0025, 201831-0026, 201831-0027 and 201831-0028 added. Item (ii) 1. Reference to Drawing 200331-0050 added.	TESM	19/02/2025
Annexure 601F	Drawings 200331-0048, 200331-0049, 2430-0602, 2430-0603 and 2430-0604 removed. Drawing 1830-0016, 201831-0025, 201831-0026, 201831-0027 and 201831-0028 added.		
Annexure 601I	SignBiz Group added as a sign maker for Sheeting Manufacturer 3M. Tradesman Technologies Pty Ltd renamed to Civil Products WA. Wheatbelt Services removed as a sign maker for Sheeting Manufacturer ORAFOL.		
Clause 601.26.05	Height requirements for bracket and sleeve options for removable posts added	TESM	03/07/2024
Clause 601.26.09	Fibreglass post installation requirement to be behind a barrier added		
Clause 601.27.01	Low carbon electronic resistance welded (ERW) steel tube requirement of grade C350 specified		
Clause 601.33, Annexure 601F	Existing fluted aluminium frangible poles updated to Signfix LEGACY with drawings 201131-0010 and 201331-0071 updated. Signfix MASH drawings 202331-000117 and 202331-000118, and Optimast drawings 202331-000119 and 202331-000120 added		
Annexure 601F	Drawings 1830-0004, 1830-0005, 1830-0014 and 1830-0016 removed. Drawings 2330-2234, 2330-2235, 2430-0601, 2430-0602, 2430-0603 and 2430-0604 added		
Annexure 601G	Optimast included		

REVISION REGISTER			
Clause Number	Description of Revision	Authorised By	Issue Date
Annexure 601H	Interim approval for retroreflective sheeting ORALITE 5910 and 9910 with the ORALITE Traffic Printing System Roland TrueVIS VG3-540 and ORALITE 5017 inks for Class 400 and Class 1100 added for Orafol		
Annexure 601I	Sign Maker accreditation updated for Retroreflective Sheeting Manufacturers Kiwalite, 3M Australia, Avery Dennison, Orafol and MNTECH Global		
Annexure 601I	Jaybro WA added as a sign maker for Sheeting Manufacturer Orafol	TESM	19/05/2023
Annexure 601D	Street name blades corrected from 60.3 mm CHS to 76.1 mm CHS 3.2 mm post to match drawing 9531-2303	TESM	20/06/2022
Annexure 601H	The list of revised approved retroreflective material for 3M as requested by the manufacturer Included 400T retroreflective material for Avery Denison		
Annexure 601I	Added RS-7000 for MNTG Sign makers accreditation list updated		
Clause 601.12.02	Item (iii) 2. and Annexure 601C is referred to for list of approved bonding tapes	TESM	07/07/2021
Clause 601.43.03	Item 1 amended and item 2 added for large washers for large signs		
Clause 604.43.05	Item 4 removed		
Clause 601.43.06	Item 2, Drawing No.202031-0091 added		
Table 601.3	Performance criteria added for Red Regulatory Signs and Yellow Warning Signs		
Annexure 601C	Orafol UHB tapes added		
Annexure 601F	Post design drawings 1830-0007, 1830-0008, 1830-0009, 1830-0010 removed and 2130-0654, 202031-0091 added		
Annexure 601G	Composite RHS post renamed Zack Post and supplier changed from Calpro to Jason Signmakers		
Annexure 601H	Screen printing inks added for Avery Dennison		
Clause 601.41.01	Additional advice provided for sign visibility	TESM	15/02/2021
Annexure 601H	Retroreflective sheeting materials updated for Kiwalite and MNTG		
Annexure 601I	Manufacturer Global Spill & Safety is added to the list and accreditation validity period is updated for sign manufacturers		

REVISION REGISTER			
Clause Number	Description of Revision	Authorised By	Issue Date
Whole Document	Inclusion: Retroreflective sheeting class of material updated. Manufacturer's links added in Annexure 601B & 601G. Drawings updated in Annexure 601F. New sheeting material and printer details added in Annexure 601H. Manufacturer's cleaning guideline for reflective sheeting material is included Annexure 601J. As-Built information added in Clause 601.81. Requirement of certification from reflective sheeting manufacturer is included in Clause 601.06.02	TESM	17/06/2020
Annexure 601I	Updated the list of accredited sign makers	TESM	14/02/2020
Whole Document	Reformatted as per Corporate Guidelines	SCO	01/06/2018
Annexure 601H	Class 1(WZ) & Class 1W(WZ) sheeting material added to ORAFOL	TESM	08/05/2015
Whole document	Format changes	TESM	14/11/2014
Whole document	Inclusion: Annexure 601H for approved retroreflective sheeting materials, Annexure 601I for accredited sign manufacturers, Annexure 601J for installation of multi-post signs checklist. Added Signfix aluminium fluted posts in Annexure 601G and Signfix post selection chart drawing in Annexure 601F. Note 2, in Table 601.2 – Warranty Performance Schedule is altered to entrance angle 4° and observation angle 0.2° instead of all angles. Taper lock base added for circular sign post in Clauses 601.43.04, 601.43.07 & 601.26.3(b). Requirement for vertical joints in large gantry sign assembled in pieces, included in Clause 601.12.02 and Clause.601.46.01. Clause 601.26.5 modified to include relevant drawings	TESM	10/09/2014

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SPECIFICATION 601

SIGNS

GENERAL

601.01 SCOPE

1. The work under this specification consists of the requirements for the manufacture, delivery, installation and maintenance of all regulatory, warning, guide, direction, reassurance, temporary, temporary works, hazard marker, service and tourist signs, sign supports and associated fixings.
2. Where the signs to be manufactured are not included in the Main Roads Signs Indexes, AS 1742 or AS 1743, detailed sign drawings will be provided to enable manufacture.
3. A checklist for the manufacture and installation of multi-post signs is provided in Annexure 601K.

601.02 REFERENCES

1. Australian Standards, MAIN ROADS Western Australia Standards and MAIN ROADS Western Australia Test Methods are referred to in abbreviated form (e.g. AS 1234, MRS 67-08-43 or WA 123). For convenience, the full titles are given below:

Australian Standards

AS 1397	Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium
AS 1450	Steel tubes for mechanical purposes
AS 1627.4	Metal finishing – Preparation and pretreatment of surfaces – Abrasive blast cleaning of steel
AS 1627.5	Metal finishing – Preparation and pretreatment of surfaces – Pickling
AS 1627.6	Metal finishing – Preparation and pretreatment of surfaces – Chemical conversion treatment of metals
AS 1742	Manual of uniform traffic control devices (Parts 1-7 and 9-15)
AS 1743	Road signs – Specifications
AS 1744	Standard alphabets for road signs
AS 2700	Colour standards for general purposes

Australian/New Zealand Standards

AS/NZS 1734	Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate
AS/NZS 1866	Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes
AS/NZS 1906.1	Retroreflective materials and devices for road traffic control purposes – Retroreflective sheeting
AS/NZS 3678	Structural steel – Hot-rolled plates, floorplates and slabs
AS/NZS 3679.1	Structural steel – Hot-rolled bars and sections
AS/NZS 3750.9	Paints for steel structures – Organic zinc-rich primer
AS/NZS 4680	Hot-dip galvanised (zinc) coatings on fabricated ferrous articles

MAIN ROADS Standards & Guidelines

Main Roads Signs Indexes

Main Roads Sign Standards

Main Roads Sign Structural Design Guidelines

Main Roads Multi-Message Signs (for Road Works) Guidelines

Main Roads Drawings as per Annexure 601F

Main Roads Directional Sign Guidelines

MAIN ROADS Specifications

Specification 407 KERBING

Specification 505 SEGMENTAL PAVING

Specification 901 CONCRETE – GENERAL WORKS

601.03 – 601.05 NOT USED

RETROREFLECTIVE TRAFFIC SIGNS

601.06 MANUFACTURER'S CERTIFICATION AND WARRANTY

601.06.01 GENERAL

1. Retroreflectorised traffic signs shall be manufactured and supplied in accordance with the Main Roads Signs Indexes, AS 1742, AS 1743, AS 1744 and this specification.

2. Where the signs to be manufactured are not included in the Main Roads Signs Indexes, AS 1742 or AS 1743, detailed sign drawings approved by Main Roads shall be provided to enable manufacture.

601.06.02 CERTIFICATION FROM SHEETING MANUFACTURER

1. The retroreflective sheeting manufacturer shall provide the Main Roads Traffic Engineering Standards Manager with the following details related to support for Sign Performance Warranty Programs:
 - (a) report of the last audit of the manufacturing facility conducted by the retroreflective sheeting manufacturer to assess the sign manufacturer's manufacturing performance; and
 - (b) certification issued by the retroreflective sheeting manufacturer that the sign manufacturer is currently eligible to offer a Sign Performance Warranty arrangement that is underwritten by the retroreflective sheeting manufacturer.

601.06.03 CERTIFICATION FROM SIGN MANUFACTURER

1. The Contractor shall provide the Principal with the following details related to support for Sign Performance Warranty programs 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;
 - (c) sign storage areas meeting the specified conditions so that Sign Performance Warranty Statements are not adversely impacted or jeopardised; and
 - (d) an assurance in writing that the guideline to storage, cleaning and field maintenance of signs published by the retroreflective sheeting manufacturer as per Annexure 601J shall be followed while in Contractor's responsibility.

Note 1: The Contractor shall provide copies of the guidelines described in (d) for distribution to work sites and other locations where signs may be stored, installed or maintained.

Note 2: The current list of sign makers accredited by retroreflective sheeting manufacturers is given in Annexure 601I.

2. Before commencement of sign manufacture, the Contractor shall provide the Principal with technical literature describing the materials intended for use. Specifically related to the retroreflective material intended for use, the Contractor shall provide a Certificate of Conformance showing total compliance with the requirements of AS/NZS 1906.1 for each class, supported with test results from independent test facilities, unless the conditions of Clause 601.06.03(3) are met. The Contractor is advised that results from testing complying with AS/NZS 1906.1 Clause 2.6.2 Outdoor accelerated weathering test is considered to be of special importance.
3. The Certificate of conformance in the previous clause is not required for those retroreflective sheeting materials approved by Main Roads and given in Annexure 601H.
4. **Manufacture of signs shall not proceed until the Principal has acknowledged receipt of the certification and guidelines referred to in sub-clauses 601.06.03(1) and 601.06.03(2) in writing.**

HOLD POINT

601.06.04 RETROREFLECTIVE SHEETING

1. The retroreflective materials used in the background or legend of the signs shall conform in all respects with the requirements defined for each of Class 1100, Class 900, Class 400 and Class 100 retroreflective sheeting as defined in AS/NZS 1906.1.
2. The “optimum wide angle” retroreflective sheeting designated as Class 1100 has higher luminous intensity than Class 900. Class 1100 sheeting material may be used as an alternative to Class 900 provided there is agreement and no cost implication to the Principal.

However, Class 1100 material shall be used as specified by Main Roads, where better visibility potential provided by the product can be used to make those signs more visible.

3. The retroreflective materials Class 1100T, Class 900T and Class 400T used in work zone signs and devices shall conform to the requirements defined in AS/NZS 1906.1 for Class 1100, Class 900 and Class 400 respectively except for limited service durability requirement in Clause 2.6, AS/NZS 1906.1.
4. The use of Class 900 material is mandatory for the following signs:
 - (a) R1-1 (STOP)
 - (b) R1-2 (GIVEWAY)
 - (c) R1-3 (ROUNDAABOUT)
5. Class 1100 material shall be used in the following circumstances:
 - (a) Signs on cantilever, overhead gantries and bridges.
 - (b) Where sign observation angle is greater than 15° from the road alignment.
 - (c) Signs mounted in medians or with larger offsets on high wide load routes.

601.06.05 SIGN WARRANTIES

(i) General

1. The complete sign panel including all components and fittings thereon or attached, except for any aspects covered in Clause 601.06.05(ii) for the sign face, shall be guaranteed against any defects caused by failure of the components for a period of at least 36 months from the date of installation.
2. Responsibility for failure shall be limited to the following:
 - (a) poor workmanship;
 - (b) use of unapproved materials;
 - (c) inappropriate use of approved materials;
 - (d) incorrect installation by the Contractor including fastenings;
 - (e) poor or incorrect design;
 - (f) damage during transporting, handling and installation.
3. In the event of defects, the Contractor shall be responsible for the total costs of any replacement or repair of signs, including removal and erection.

(ii) Sign Sheeting Material

1. During the warranty period, while maintaining a photometric performance of retroreflectivity of at least the percentage shown in Table 601.1 – Warranty Performance Schedule, the sign manufacturer shall guarantee that the signs are free of defect in:
 - (a) material;
 - (b) workmanship;
 - (c) structure;
 - (d) sign face performance.
2. Where materials with differing performance characteristics are combined, such as a guide sign using Class 1100 for the legend and Class 400 for the background, the warranty period applicable is ten (10) years together with 50% retained photometric.
3. In the event of defects, the manufacturer shall undertake any replacement or repair of signs, including all labour and material involved at the time of replacement, at a pro-rata cost related to the length of service of the sign.

4. If a sign needs to be replaced, and the sign manufacturer is no longer in business, the manufacturer of the retroreflective sheeting used in producing the failed sign shall undertake the replacement or repair. This shall include all costs for labour, material and installation and be calculated on a pro-rata basis related to the provided service life of the sign. The sheeting manufacturer shall provide certification confirming acceptance of this condition signed by an authorised corporate officer of the retroreflective sheeting manufacturer.
5. This warranty shall not apply to signs that have failed in service as a result of improper fabrication, failure to substrate, damage during installation, improper storage and handling, improper maintenance and cleaning practices, vandalism, negligence, inadequate storage conditions, accidental damage caused by vehicle accidents, or abnormal environmental conditions.
6. To qualify for warranty entitlement, signs must be packaged, labelled, transported and stored in accordance with the recommendations of the manufacturer of the retroreflective sheeting, together with the substrate being stamped, engraved or marked as per Clause 601.19.

TABLE 601.1 WARRANTY PERFORMANCE SCHEDULE

Background Sheeting Class	Used in combination with	Warranted Outdoor Exposure	Warranted Retained CIL/m ² Percentile ¹
Class 1100	Class 1100 Class 900 Class 400 Electronic Cuttable Films Screen Printed Colours Digital Printing	10 years	50% ²
Class 900	Class 1100 Class 900 Class 400 Electronic Cuttable Films Screen Printed Colours Digital Printing	10 years	50% ²
Class 400	Class 400 Electronic Cuttable Films	12 years	80% ²
Class 400	Screen Printed Colours Digital Printing	10 years	80% ²

Background Sheeting Class	Used in combination with	Warranted Outdoor Exposure	Warranted Retained CIL/m ² Percentile ¹
Class 100	Class 1100 Class 900 Class 400 Electronic Cuttable Films Screen Printed Colours Digital Printing	7 years	50% ²

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

Note 2: Retained CIL percentile is based on minimum CIL values for new reflective sheeting by class for observation angle 0.2° and entrance angle 4° defined in relevant tables included in AS/NZS 1906.1.

601.07 SIGN CATEGORIES

601.07.01 FLAT SIGNS – UNBRACED

1. This category comprises flat aluminium sheet signs of the following maximum dimensions:
 - (a) Material Rectangular signs not exceeding 900 mm nominal width and 1200 mm nominal length.
 - (b) Triangular signs not exceeding 1200 mm nominal vertical depth.
 - (c) Diamond signs not exceeding 900 mm x 900 mm square.
 - (d) Other shaped signs including circular, octagonal and trapezoidal, etc. not exceeding 900 mm depth.
2. Unbraced flat steel or non-metallic substrate signs may be used for those signs specified in Clause 601.26(4) only, which are vulnerable to damage by vehicles or vandalism. The signs shall be in accordance with the approved items given in Annexure 601B, and are generally used with alternative sign posts given in Annexure 601G.
3. Chevroflex, flexible chevron alignment marker comprised of polymer panels, may be used as an alternative to the unbraced flat aluminium sheet sign D4-6. The complete system including the base shall be installed in accordance with the manufacturer's instructions. Chevroflex chevron alignment markers are included in the list of approved items in Annexure 601B.

**Aluminium
Signs**

Steel Signs

601.07.02 FLAT ALUMINIUM SHEET SIGNS – BRACED

1. This category comprises flat aluminium sheet signs of the following dimensions:
 - (a) Rectangular signs exceeding 900 mm nominal width and 1200 mm nominal length.

- (b) Triangular signs exceeding 1200 mm nominal vertical depth.
- (c) Diamond signs exceeding 900 mm x 900 mm square.
- (d) Other shaped signs including circular, octagonal and trapezoidal, etc. exceeding 900 mm depth.

601.07.03 EXTRUDED ALUMINIUM SECTION SIGNS

1. This category comprises extruded aluminium section signs such as street and road name signs attached directly to sign supports.

601.07.04 TEMPORARY INFORMATION SIGNS

1. This category comprises flat aluminium or steel sheet signs as specified in Clause 601.07.01 to be used for short-term purposes.

601.07.05 BOX EDGE SECTION SIGNS

1. This category comprises hot dip zinc coated or powder coated steel signs used at construction work zone sites, or unbraced flat aluminium sheet signs fastened to a frame consisting of 25 mm x 25 mm SHS welded tubes to be used for short-term purposes only.

601.07.06 SIGN OVERLAYS

1. Sign overlays are used for the modification or amendment to a sign legend.
2. Overlays less than 1000 mm x 300 mm shall be of the decal type and greater than 1000 mm x 300 mm shall be made from 1.6 mm thick flat aluminium sheet. However all overlays requiring a protective overlay film shall be made from 1.6 mm thick flat aluminium sheet, regardless of size.

601.07.07 MULTI-MESSAGE SIGNS

1. Multi-message signs may be used as an alternative or in conjunction with standalone signs for traffic management in road works.
2. Multi-message signs shall be used and installed in accordance with Main Roads guidelines for multi-message signs.
3. Multi-message signs shall be mounted in a frame complying with AS 1742.3. The typical Main Roads frame details are given in Drawing No. 201031-0155.
4. Multi-message signs may be manufactured using the substrates detailed in Table 601.2.

601.08 SIGN MATERIALS

1. Multi-message signs may be used as an alternative or in conjunction with standalone signs for traffic management in road works.

TABLE 601.2 SIGN MATERIALS

Sign Category	Material Description	Material Compliance
Flat aluminium sheet signs – unbraced (Clause 601.07.01)	Aluminium sheet 2.0 mm thick	AS/NZS 1734 in the following grades and tempers: ALLOY TEMPER 5052 H36 or H38 5251 H36 or H38
Flat aluminium sheet signs – braced (Clause 601.07.02)	Aluminium sheet 1.6 mm thick	AS/NZS 1734 in the following grades and tempers: ALLOY TEMPER 5052 H36 or H38 5251 H36 or H38
Extruded aluminium section signs (Clause 601.07.03)	Extruded aluminium section	AS/NZS 1734 in the following grades and tempers: ALLOY TEMPER 6063 T5 or T6 6061 T6
Temporary information signs (Clause 601.07.04)	Hot dip zinc coated or powder coated steel 1.2 mm thick	AS 1397 in the following grades and coating class: ALLOY CLASS G2 ZF100 G300 AZ150
Flat steel sheet signs – unbraced (Clause 601.07.01)	Hot dip zinc coated or powder coated flexible steel 1.2 mm thick	AS 1397 in the following grades and coating class: ALLOY CLASS G350 AZ150
Box edge section signs (Clause 601.07.05)	Hot dip zinc coated or yellow or off-white powder coated steel 0.8 - 1.0 mm thick with folded edge. Alternatively, in place of a folded edge, the sheet is fastened to a welded 25 mm x 25 mm SHS galvanised or yellow or off-white powder coated steel tube, see Drawing No. 9548-0090.	AS 1397 in the following grades and coating class: ALLOY CLASS G2 ZF100 G300 AZ150
Sign overlays (Clause 601.07.06)	Aluminium sheet 1.6 mm thick	AS/NZS 1734 in the following grades and tempers: ALLOY TEMPER 5052 H36 or H38 5251 H36 or H38
Multi-Message Signs (Clause 601.07.07)	Different materials can be used for substrates including: 5 mm core flute Aluminium UV stabilised plastic	The thickness and rigidity should be sufficient to prevent the signs being blown out of the frame

2. Extruded aluminium sections shall have a track along the top and the bottom of the blade.
3. Flat aluminium sheet shall be smooth and free from cracks, sharp edges and other blemishes, and shall not be swaged, have the edges rolled or be treated in any form to provide additional stiffness.

601.09 TOLERANCES

1. Signs shall be manufactured to the following tolerances:

(a) Length and Width	± 5.0 mm
(b) Hole Diameters	± 1.0 mm
(c) Hole Centre Position Tolerances (Laterally)	± 1.0 mm
(d) Hole Centre Position Tolerances (Vertically)	± 1.0 mm
(e) Maximum allowable twist, warp, or departure from flatness	± 5.0 mm/m

601.10 SHEET METAL WORKS

1. Holes in unbraced signs shall be drilled or punched in the locations specified on Drawing No. 9220-0180.
2. Burrs and rough and sharp edges shall be removed after cutting, drilling and punching of holes.

601.11 SUBSTRATE PREPARATION

1. After the completion of sheet metal works and prior to the application of paint or sheeting, aluminium material shall be etched on both sides by acid etching in a 6 - 8% phosphoric acid bath at a temperature in the range 35° - 40°C followed by thorough rinsing in clean water. As an alternative to acid etching, the substrate shall be cleaned, degreased and mechanically abraded in accordance with the reflective sheeting manufacturer's recommendation.
2. The sign face shall be treated in accordance with the paint or sheeting manufacturer's published instructions as appropriate and in a manner to validate the manufacturer's product warranty.
3. Steel material used for temporary information signs, construction work zones and any other special purposes shall be prepared in accordance with the sheeting manufacturer's published recommendations and in a manner to validate the manufacturer's warranty, as applicable.

601.12 FLAT ALUMINIUM AND STEEL SHEET SIGNS – BRACED

601.12.01 SHEET SIZE AND JOINT LIMITATIONS

1. Flat sheet signs that cannot be manufactured from a single sheet of material and which exceed 2400 mm in length, but do not exceed 1200 mm in height, shall be manufactured from the least number of sheets possible.
2. Flat sheet signs that cannot be manufactured from a single sheet of material and which are greater than 2400 mm in length may be fabricated as single multi-piece signs using vertical joining of either 600 mm or 900 mm or 1200 mm wide sheets and least number of sheets possible.
3. Flat sheet signs that cannot be manufactured from a single sheet of material and which are greater than 1200 mm in height may be fabricated in horizontal modules with each module using the least number of sheets possible. All horizontal joints shall be by using an approved interlocking stiffener system equivalent to types specified in Clause 601.12.03.

601.12.02 JOINTS

(i) General

1. Joints shall be located so as to minimise the amount of legend directly over the joint.
2. Legend and background on either side of a joint shall be colour matched.

(ii) Horizontal Joints

1. The top edge of a module that is to join the bottom edge of another module shall have a type A1, B1 or C1 aluminium stiffener attached, as specified in Clause 601.12.03. The bottom edge of a module that is to join the top edge of another module shall have a “Z” section stiffener attached, as specified in Clause 601.12.03. The aluminium stiffeners shall be attached to the aluminium or steel sheet by a single row of evenly spaced rivets, or other fixings as specified in Clause 601.12.05.
2. As an alternative to the horizontal joint constructed in accordance with the above clause, horizontal joints may be constructed using Type A, Type B or Type C stiffeners together with a sign alignment bracket as detailed on Drawing No. 200831-0017, provided the maximum spacing of the stiffeners is less than 450 mm. The maximum spacing of the alignment bracket should be 450 mm.

(iii) Vertical Joints

1. Before vertical joints are constructed, the adjoining sheets shall be painted or covered with reflective sheeting. Joints shall be covered with a backing strip of the same metal type as the sign, 60 ± 5 mm wide, terminating 5 ± 5 mm short of the edge of the sign and discontinued at each horizontal stiffening section with a gap not exceeding 5 mm. The backing strip for a joint may be omitted if the calculated length of the strip is less than 120 mm. The backing strip shall be attached to each aluminium sheet by a single row of evenly spaced rivets, or by other approved fixings as

**Workshop
assembly**

specified in Clause 601.12.05. The resultant gap between two sheets so butted shall not at any point exceed 1.5 mm.

2. An approved joining tape may be used as an alternative method of constructing a joint: the backing strip is to be fixed to the sign by 12 mm wide approved high bond joining strips on both sides of the joint. A list of approved high bond tapes, given in Annexure 601C and shall be used in accordance with the manufacturer's instructions.
3. For large gantry single sign spanning across more than one lane, or other very large signs, sign panels may be assembled on site in pieces to reduce the difficulty of handling and erecting. The vertical joints along the full height of the sign shall be formed using pre-installed aluminium angles (25 mm x 25 mm x 3 mm) in accordance with Drawing No. 201431-0032. The angles shall be bolted together with a galvanised M6 bolt and nut at 500 mm spacing with equal distances from sign edges on both sides.

**On-site
assembly**

601.12.03 EXTRUDED ALUMINIUM STIFFENERS

1. Type A, Type B, Type C, Type A1, Type B1, Type C1 and Type Z stiffeners are detailed on Drawing No. 8820-0354. They shall be affixed to the rear of a sign. Type A, Type B, Type C, Type A1, Type B1 and Type C1 stiffeners shall be affixed at interval specified on the sign drawings and "Z" stiffeners shall be used to brace the signs. Where horizontal alignment brackets are used to brace the signs instead of "Z" stiffeners in terms of Clause 601.12.02(ii) 2, maximum spacing shall be 450 mm.
2. Type A, Type B, Type C, Type A1, Type B1, Type C1 and Type Z stiffeners shall be extruded from aluminium type 6063-T5 in accordance with AS/NZS 1866.
3. Stiffeners attached to signs less than or equal to 6,500 mm in length shall be a continuous length of extrusion not joined in any way. Where stiffeners longer than 6,500 mm are required and the sign is to be manufactured as a single continuous horizontal unit and continuous lengths of extrusion are not available, lengths of stiffener extrusion may be joined.
4. The ends of the extrusions to be joined shall be machined to facilitate a general-purpose full penetration butt weld and the extrusions shall be butt welded together. Extended stiffeners shall be attached with the connections staggered, so that the join in two adjacent stiffeners is separated by a distance exceeding 2 m.
5. Stiffeners shall be attached to the aluminium or steel sheet by a single row of evenly spaced rivets, or other fixings as specified in Clause 601.12.05.

601.12.04 ROUTE NAME TAGS, DISTANCE TAGS AND DROP TAGS

1. Route name tags, distance tags and drop tags shall be manufactured and fixed to signs using the methods shown on Drawing Nos 9334-4051, 9334-4052 and 9334-4383. Where a sign is fabricated using modules, then the tag shall only be fixed to the module immediately adjacent to the tag.

2. The stiffeners and braces attached to the tag(s) shall be the same type of stiffener section as used on the sign. Braces shall be fixed to the stiffeners using a bolted connection as specified in Clause 601.12.05.
3. Signs to be delivered outside the Perth Metropolitan Area shall have their tags and braces removed, after trial assembly, to simplify packaging.

601.12.05 RIVETS AND OTHER FIXINGS

1. Rivets for attaching stiffener sections and backing strips shall be 4 mm in diameter and colour matched to the legend and background of the sign. For signs other than temporary information signs, rivets shall be monel or stainless steel pop rivets or self-piercing riveting system. For temporary information signs, rivets may be manufactured from other suitable materials. The distance between each rivet shall not exceed 250 mm, with the first and last rivets, positioned at a distance not exceeding 30 mm from the end of each backing strip or stiffener. A minimum of two (2) rivets shall be used on each side of a joint to fix a backing strip.
2. The acceptance of fixings other than rivets for attaching stiffener sections and backing strips shall be by type approval in individual cases.
3. Bolted connections, used to fix vertical braces to stiffener sections for route name and drop tag attachment, shall use the components and the method shown on Drawing Nos. 9334-4051, 9334-4052 and 9334-4383.

601.13 BOX EDGE SECTION SIGNS

1. Box edge section signs shall be:
 - (a) formed from a single steel sheet and incorporate a formed 25 mm box edge on all sides in accordance with Drawing No. 9548-0090, or
 - (b) constructed by fastening a single steel or aluminium sheet to a frame consisting of welded 25 mm x 25 mm SHS tubing in accordance with Drawing No. 9548-0090.

601.14 SIGN OVERLAYS

1. Sign overlays shall have the reflective sheeting of the same colour and reflective class as stated on the sign drawings.
2. Aluminium sheet panel overlays shall be fastened to sign panels using monel or stainless steel pop rivets of size 4 mm in diameter and colour matched to the legend and background of the sign. The distance between each rivet shall not exceed 250 mm, with the first and last rivet positioned at a distance not exceeding 30 mm from the edge of the overlay.
3. If required, protective overlay film, compatible with and approved by the sheeting manufacturer shall be applied to the sign overlay prior to installation.

601.15 BACKGROUND SURFACES

601.15.01 PAINTED SURFACES

1. An undercoat that is suitable for aluminium surfaces and which is compatible with the finishing coat paint shall be applied to the prepared substrate in accordance with the manufacturer's published recommendations.
2. A suitable exterior long life industrial quality matt finish acrylic paint shall be applied to the prepared surface in accordance with the manufacturer's published recommendations. The paint shall be pigmented to give finished colours and specular gloss values in accordance with AS 2700.

601.15.02 RETROREFLECTIVE SHEETING

1. Retroreflective sheeting shall be applied to the prepared substrate in accordance with the manufacturer's recommendations. The sheeting shall be applied in one continuous piece without joints, as far as possible, and shall be in accordance with AS/NZS 1906.1 and AS 1743. The retroreflective sheeting for box edge signs shall have the photometric performance of Class 400T, Class 900T or Class 1100T as defined in AS/NZS 1906.1 and as specified on the Drawings.

601.16 SIGN BACKGROUND, LEGEND, SYMBOLS AND BORDERS

601.16.01 REFLECTORISED

(i) Colour

1. The colour of retroreflective sheeting to be used for the sign background, legend, symbols and borders shall be as specified in AS 1743 or as shown on the Drawings for signs not included in AS 1743. These colours shall fall within the respective, designated colour box defined in AS/NZS 1906.1.

(ii) Class

1. The class of retroreflective sheeting to be used shall be as follows:
 - (a) for Main Roads signs – as per the drawings contained in the Main Roads Signs Indexes, or
 - (b) for project related signs – as per the project sign drawings. For all other signs, including Australian Standards signs – as per Main Roads Sign Standards on the website.
2. Retroreflective sheeting shall be applied to the prepared substrate in accordance with the manufacturer's published recommendations. Typically, the sheeting shall be applied in one continuous piece without joints and shall conform in all respects with the requirements of AS/NZS 1906.1 and AS 1743.

3. Coloured legend or background may be provided by using either transparent or opaque screen process colour or electronic cut film manufactured by the manufacturer of the retroreflective sheeting to ensure compatibility and durability with the retroreflective sheeting. The screen process colour or electronic cut film shall be applied using materials and techniques recommended by the manufacturer of the retroreflective sheeting. Where joins in the cut films are required, they shall be of the “butt-join” type and must not be overlapped.

Digital printing on reflective sheeting for signs shall be in accordance with manufacturer’s requirement and shall be overlaid with approved film material for durability.

4. Where joins are required for retroreflective sheeting, they shall be of the “butt-join” type and must not be overlapped.

601.16.02 NON-REFLECTORISED

1. The colours of the non-reflectorised sign legend, symbols and borders shall be in accordance with AS 1743 or as shown on the sign drawings.
2. The non-reflectorised sign legend, symbols and borders of flat aluminium unbraced signs may be applied by the silk screening process. Silk screening inks shall be applied to the background surface in accordance with the manufacturer’s published recommendations.
3. Non-reflective sheeting shall be applied in accordance with AS 1743, AS/NZS 1906.1 and the manufacturer's published recommendation. Typically, the sheeting shall be applied in one continuous piece without joins. Where joins in the sheeting are required, they shall be of the “overlap” type and shall not allow the ingress of moisture after the sign is installed. The non-reflective sheeting for temporary signs shall be similar in appearance and have similar qualities as specified in AS 1743 and AS/NZS 1906.1.

601.17 PROTECTIVE OVERLAY FILM OR COATING

1. For all signs apart from temporary information signs, a protective overlay film (POF) shall be provided to prevent against environmental contaminants and graffiti. When digital printing is used, there is a requirement to install an approved UV protective overlay film. This overlay film can also be suitable as POF for protection against graffiti. In case the UV protection film does not provide protection against graffiti, a separate overlay of anti-graffiti film is required on top.
2. The protective overlay film or coating shall be compatible with the sheeting material and approved by the sheeting manufacturer and shall not affect the warranty of the retroreflective or non-reflective sheeting.
3. Along the top of every individual sign or interlocking sign segment, the overlay film or coating shall be extended over to the back of the sign for a distance of 15 mm from the top of the sign to prevent ingress of moisture under the overlay film or coating.

601.18 REAR OF SIGNS

1. The rear surface of all multi-post guide, service and tourist traffic signs and all poles, brackets and other fixings located in the “Green Zone” as shown in Drawing No. 9448-0144 and national parks shall be painted Bottle Green – G11 (AS 2700) in accordance with Clause 601.15.01.

601.19 MARKING OF REFLECTORISED TRAFFIC SIGNS

601.19.01 FLAT ALUMINIUM SHEET SIGNS – UNBRACED

1. Unbraced flat aluminium sheet signs shall be metal stamped or neatly engraved using an engraving tool and stencils on the rear face of the sign in capital block letters and numerals 10 mm in height with the following details:
 - (a) the letters MRWA;
 - (b) the manufacturer’s initials or trademark or assigned identification code and State of manufacture, e.g. BSC WA for Burns Sign Company, Western Australia;
 - (c) the month and year of manufacture, e.g. 10/19 for October 2019;
 - (d) a coding to identify the manufacturer and class of the retroreflective sheeting, e.g. ORA CL400 or 3M CL400;
 - (e) the sheet thickness, the relevant international registered designation of the alloy and the temper, e.g. 2/5052-H36 or 2/5251-H38; and
 - (f) AS 1743 Sign Number or MRWA Sign Number e.g. G1-4 or MR-GE-14.

601.19.02 FLAT ALUMINIUM SHEET SIGNS – BRACED

1. Braced flat aluminium sheet signs shall have the aluminium identification plate attached by rivets or other fixings as specified in Annexure 601C. This includes all braced signs such as hazard markers. The plate shall be attached to the rear bottom corner of the sign nearest to the road (normally the bottom left hand corner on the back of the sign) 80 mm above the lowest stiffener to allow the identification plate to be read after the sign is installed. The identification plate shall be of the same 1.6 mm thick aluminium plate as the main sign panel except that the identification plate for signs with protective overlay film shall be anodised bronze colour with an additional capital letter G on the lower right hand corner of the plate. The identification plate shall be stamped or neatly engraved using an engraving machine tool and stencils in capital block letters and numerals 10 mm in height with the following details:
 - (a) the letters MRWA;
 - (b) the manufacturer’s initials or trademark or assigned identification code and State of manufacture, e.g. BSC WA for Burns Sign Company, Western Australia;
 - (c) the month and year of manufacture, e.g. 10/19 for October 2019;

- (d) a coding to identify the manufacturer and class of the retroreflective sheeting, e.g. AVY CL400 or MNT CL400;
- (e) the sheet thickness, the relevant international registered designation of the alloy and the temper, e.g. 1.6/5052-H36 or 1.6/5251-H38;
- (f) the MRWA sign drawing number or AS 1743 Sign Number or MRWA Sign Number, e.g. Drg.201731-0005 or G2-1 or MR-GE-10; and
- (g) the sign location number as specified on the sign Drawing, if available, e.g. 07-132-2 or 07-132-5.

601.19.03 EXTRUDED ALUMINIUM SECTION SIGNS

1. Single-sided extruded aluminium signs shall be metal stamped or engraved on the rear of the sign using capital block letters and numerals 10 mm in height. On doubled sided signs an adhesive identification label with letters and numerals of 10 mm in height shall be attached to the bottom corner nearest to the post. The identification label shall be designed to last the life of the sign. The following details shall be shown on the sign or label:
 - (a) the letters MRWA;
 - (b) the manufacturer's initials or trademark or assigned identification code and State of manufacture, e.g. BSC WA for Burns Sign Company Western Australia; and
 - (c) the month and year of manufacture, e.g. 10/19 for October 2019.

601.19.04 TEMPORARY INFORMATION SIGNS

1. Temporary information signs shall have an adhesive identification label with capital block letters and numerals 10 mm in height. The label shall be attached to the bottom left corner of the rear of the sign. The identification label shall be designed to last the life of the sign. The following details shall be shown on the signs:
 - (a) the letters MRWA;
 - (b) the manufacturer's initials or trademark or assigned identification code and State of manufacture, e.g. BSC WA for Burns Sign Company, Western Australia;
 - (c) the month and year of manufacture, e.g. 10/19 for October 2019; and
 - (d) the sign location number as specified on the sign drawing, e.g. 07-132-1 or 07-131-7B.

601.19.05 BOX EDGE SECTION SIGNS

1. Box edge section signs shall have an adhesive identification label with capital block letters and numerals 10 mm in height. The label shall be attached to the bottom right corner of the front face of the sign. The identification label shall be designed to last the life of the sign. The following details shall be shown on the signs:

- (a) the letters MRWA;
- (b) the manufacturer's initials or trademark or assigned identification code and State of manufacture, e.g. BSC WA for Burns Sign Company Western Australia; and
- (c) the month and year of manufacture, e.g. 10/19 for October 2019.

601.20 PACKAGING FOR DELIVERY

1. Signs shall be packaged and handled in accordance with the sign sheeting manufacturer's recommendations to ensure delivery in an undamaged condition.
2. Signs manufactured with Class 400, 900 & 1100 sheeting shall be packaged in accordance with the retroreflective sheeting manufacturer's recommendations incorporating interleaves of thin foam sheeting. Signs manufactured with Class 100 retroreflective sheeting shall be packaged for delivery interleaved with the backing sheet of the retroreflective sheeting used.
3. Unbraced signs as specified in Clause 601.07.01 shall be packaged in groups not exceeding 10 signs. Each package of signs shall contain signs of the same type with the quantity and description of the signs marked on each package.
4. Braced signs shall be packed face to face in packs of two. The two-sign packs shall be packed in groups not exceeding 10 packs supported by timber framing for protection during transportation.
5. The packaged signs shall contain a label with the sheeting manufacturer's recommendations for handling and storage and shall be marked "KEEP DRY" on both faces with letters exceeding 100 mm in height.
6. Signs shall be transported and stored in accordance with Clause 601.61.

601.21 – 601.25 NOT USED

SIGN SUPPORTS

601.26 GENERAL

1. Sign support dimensions shall be in accordance with Drawing Nos. 8720-0657, 1830-0011, 1830-0012 and the post schedules shown on the sign drawings.
2. The gauge of rectangular hollow section (RHS) and circular hollow section (CHS) sign posts for single post signs shall be as specified in Annexure 601D. Alternative posts and mounting devices are given in Annexure 601G.
3. Circular Hollow Section (CHS) signposts must be secured using an approved fixing device and / or sign-mounting bracket as specified in Annexure 601E

4. Flexible sign posts and / or mounting bases may be used for single post signs vulnerable to impact. Normally, the post, mounting base and sign substrate would be designed to be flexible. Approved fixing devices are specified in Annexure 601G.

Flexible Sign Posts are defined as sign posts which deflect when impacted by a vehicle and then returns to a vertical position, without maintenance intervention. Flexible sign posts may only be used for the installation of signs that are mounted near the nose of a traffic island. The height from the ground to the top of the sign shall not exceed 1.2 m. This application may typically be applied to the following signs:

***Flexible Sign
Post***

- (a) R2-3 (L or R) Keep Left/Keep Right
- (b) R2-5 (No U-Turn)
- (c) R2-15 (U-Turn Permitted)
- (d) D4-1-2 (Unidirectional Hazard Marker)
- (e) MR-GT-15 (L or R) Cars Only
- (f) MR-HM-12 (Divisional Marker) or D4-2-2 (Bidirectional Hazard Marker)

The types of flexible posts and bases used shall be as specified in Annexure 601G.

5. Removable Sign Posts are defined as sign posts which enables the posts to be removed and reinstated from their base with specially designed tools or a lock and key arrangement without damaging either the base or post. Removable sign posts shall be used, where specified, for all removable signs on High-Wide Load corridor routes. A PVC casing arrangement and footing details for a removable sign post located in a concrete or paved area is shown in Drawing No. 9548-0106. Removable sign posts may also be used in locations where signs are frequently hit and the removable post design enables the post to be replaced using the existing footing. Alternative types of removable sign posts used shall be as specified in Annexure 601G.

***Removable Sign
Posts***

On OSOM routes where removable posts are to be installed, the following shall apply:

- (a) A bracket or sleeve shall be used where the post length is ≤ 1.5 m. Post length measured from top of foundation to top of post.
 - (b) A sleeve shall be used for all post > 1.5 m. Post length measured top of foundation to top of post.
6. Frangible aluminium posts as specified in Annexure 601G and installed in accordance with the manufacturers requirements are also approved for use in WA.
7. Break-Safe Omni-Directional Breakaway sign support system as specified in Annexure 601G is also approved for use in WA.

8. Lattice Type Sign Mast as specified in Annexure 601G is also approved for use in WA.
9. Fibreglass Reinforced Polymer Pultrusion Profile, RHS composite post as specified in Annexure 601G is also approved for use in WA and shall only be installed where protected from vehicle impact by a road safety barrier.

601.27 MATERIALS

601.27.01 NORMAL (NON-FLEXIBLE) POSTS

1. Materials used for the fabrication of the posts shall be of the following:
 - (a) Low carbon electric resistance welded (ERW) steel tubes shall be Grade C350 in accordance with AS 1450.
 - (b) Galvanised steel strip in accordance with AS 1397.
 - (c) Universal beams shall be BHP Grade 300+ in accordance with AS/NZS 3679.1.
 - (d) Base plates for breakaway posts shall be Grade 350 in accordance with AS/NZS 3678.
 - (e) Fuse plates for breakaway posts shall be Bisalloy 80.
 - (f) Ground support stands for box edge section signs shall be 350 MPa mild steel box section and rod.
 - (g) Fluted aluminium poles and sleeves shall be aluminium grade 6061-T6 in accordance with AS/NZS 1866.
 - (h) Lattice type sign mast shall be aluminium grade 6063-T6 in accordance with AS/NZS 1866.
2. The posts shall be saw cut not sheared. Holes may be drilled or punched. No deformation to posts shall result from cutting, drilling or punching.
3. Drilling holes in the field on galvanised or powder coated posts shall be kept to a minimum. If it is required to drill any holes in the field, the drilled holes shall be coated with suitable galvanising paint, prior to attaching the sign.

601.27.02 FLEXIBLE POSTS

1. Flexible signposts shall be made with material, which provide the properties of strength, flexibility, impact resistance and durability required. The material used shall not shatter into multiple parts on impact and after being struck signposts shall not project a dangerous impaling section.
2. The material shall be resistant to combustion if located in areas subjected to fire of intensity typical of roadside bush and grass fires. The material shall not be affected by hydrocarbon solvents (such as mineral turpentine, kerosene and diesel) which may be used for cleaning purposes. Any metal component should be anti-corrosive.

3. The signposts shall be capable of retaining its colour, appearance and physical properties for at least three years when exposed to weather conditions existing in Western Australia.
4. The flexible post shall be capable of self-erecting and remaining serviceable after being subjected to a series of direct impacts by a typical passenger vehicle at temperatures between 15°C and 30°C. The posts to be tested shall be installed in accordance with the manufacturer's published recommendations. The sign post shall be capable of withstanding a series of five (5) bumper bar impacts at a speed of 60 km/h directed at 90° to the front face of the post. The impacting vehicle shall suffer little or no damage during the impact tests. The sign post shall return to within 5° of vertical within 30 seconds of impact.

601.28 HOLES

1. The following tolerances for holes shall apply:

- | | |
|-----------------------------------|----------|
| (a) Diameter | ± 1.0 mm |
| (b) Lateral hole centre position | ± 1.0 mm |
| (c) Vertical hole centre position | ± 1.0 mm |

601.29 POST LENGTH

1. CHS and RHS post lengths shall have a tolerance of ± 5 mm. Ground support stands for box edge section signs shall have a tolerance of ± 10 mm.
2. Dimensions and tolerances of universal beams shall be in accordance with AS 3679.1.

601.30 SURFACE FINISHING

601.30.01 POWDER COATED SIGN CHS AND RHS POSTS

1. Posts fabricated from electric resistance welded (ERW) steel tube shall be either zinc coated mill finished or hot-dip galvanised after cutting and drilling. The galvanised coating mass requirement shall be as specified in AS/NZS 4680, Table 1 for articles that are not centrifuged. Holes and ends of posts shall have burrs removed prior to galvanising and powder coating.

601.30.02 GALVANISED SIGN CHS AND RHS POSTS AND COMPONENTS

1. Steel components shall be galvanised to the requirements as specified in AS/NZS 4680, Table 1 for articles that are not centrifuged. All galvanising runs and beads shall be removed without exposing the underlying steel surface.
2. Posts and components shall be hot-dip galvanised as follows:
 - (a) Posts and components shall be grit blasted to achieve a Class 2 standard of surface preparation as specified in AS 1627.4. After grit blasting, posts and components shall be pickled in dilute sulphuric or

hydrochloric acid in accordance with AS 1627.5 and then washed in water to remove all traces of acid.

(b) Galvanising of posts and components shall occur within 4 hours of pickling and washing. Posts and components shall be dipped in a bath of molten zinc not exceeding 1.5% by weight of impurities to produce a minimum coating thickness specified in AS/NZS 4680, Table 1 for articles that are not centrifuged.

3. Posts shall be galvanised inside and outside. Areas of steel exposed during machining (including holes and edges) shall be touched up with a zinc enriched primer in accordance with AS/NZS 3750.9.

601.30.03 BREAKAWAY SIGN POSTS

1. Steel components shall be hot-dip galvanised in accordance with AS/NZS 4680 and the requirements of Clause 601.30.02.
2. Areas of steel exposed during machining (including holes and edges) shall be touched up with a zinc enriched primer in accordance with AS/NZS 3750.9.
3. Where required in terms of Clause 601.18, breakaway sign posts shall be painted with a suitable exterior long life industrial quality matt finish acrylic paint in accordance with the manufacturer's published recommendations. The paint shall be pigmented to give finished colours and specular gloss values in accordance with AS 2700.
4. Where posts are painted in terms of the above clause, an undercoat that is suitable for galvanised surfaces and compatible with the finishing coat paint shall be applied to the prepared substrate in accordance with the manufacturer's published recommendations.

601.30.04 OTHER APPROVED SIGN POSTS

1. The finished surface of all approved sign posts as specified in Annexure 601G, shall be to the manufacturer's requirements.

601.31 POWDER COATING

601.31.01 GENERAL

1. Where specified in Annexure 601D or on the sign drawings, posts shall be covered with exterior grade lead free polyester powder coat. The finished colour and specular gloss value shall be equivalent to Golden Yellow Y14 colour or Bottle Green G11 as specified in AS 2700, and as required in Clause 601.18.

601.31.02 PREPARATION

1. Zinc coated mill finished and hot-dip galvanised surfaces shall be degreased using an Alkaline cleaning dip. The Alkaline cleaning dip shall be removed with water prior to powder coating.
2. A zinc phosphate conversion coating in accordance with AS 1627.6 shall then be applied to zinc coated mill finishes or hot-dip galvanised surfaces.

3. After completion of etching, the posts shall be thoroughly rinsed with water and allowed to dry.

601.31.03 APPLICATION

1. The powder coat shall be applied by an electrostatic powder spray and to the coating manufacturer's specification to give a finished colour in accordance with Clause 601.31.01. Coated surfaces shall be cured for a period exceeding 10 minutes at a metal temperature exceeding 200°C.

601.32 PACKAGING FOR DELIVERY

1. Sign posts shall be packaged and handled to ensure delivery in an undamaged condition.
2. Each bundle of posts shall contain a label with recommendations for handling and storage, and a description of the posts.

601.33 DESIGN OF POSTS

1. Design of sign supports shall be in accordance with the Main Roads Sign Structural Design Guidelines and the following drawings:
 - (a) Post design – Drawing Nos. 1830-0001 to 1830-0010
 - (b) Sign stiffeners – Drawing No. 1830-0016
 - (c) Sign footings – Drawing Nos. 1830-0011, 1830-0012, 2430-0601 and 2630-1948
 - (d) Post design for fluted aluminium frangible poles (Signfix LEGACY, Signfix MASH and Optimast) – Drawing Nos. 201131-0010, 201331-0071, 202331-000117, 202331-000118, 202331-000119 and 202331-000120.
 - (e) Post design for lattice type frangible poles (Lattix) – Drawing Nos. 201731-0004, 201731-0005 and 201331-0007

601.34 – 601.35 NOT USED

ASSOCIATED FIXINGS

601.36 MANUFACTURE

1. Clamps, saddle extrusions, security washers, lock washers, T bolts, knuckles and sign brackets shall be manufactured in accordance with Drawing Nos. 8820-0257, 9020-0693 and 9320-0316 unless other fixings have been approved as given in Annexure 601E.
2. Any fixings associated with mounting of removable posts and flexi-posts shall be in accordance with Drawing No. 9548-0106 or the recommendation of manufacturers for approved products given in Annexure 601G.

601.37 PACKAGING FOR DELIVERY

1. All fixings shall be properly packaged, stored and handled during transit and upon delivery.
2. Packages of fixings shall be labelled such that the type and size of fixings can be identified.

601.38 – 601.40 NOT USED

INSTALLATION

601.41 SIGN LOCATION

601.41.01 LONGITUDINAL PLACEMENT

1. The longitudinal placement of signs will be specified in the sign drawings (signs and line marking plan). However, there may be instances such locations are not appropriate on the ground and in which case the final location of the signs, shall be decided in consultation with the Project Manager.
2. The signs shall be located to ensure that they have visibility and minimum sight distances for road users. The minimum sight distances and allowable minimum distance between adjacent signs are given in AS 1742.2, Appendix D. For sight distance to direction signs, refer to Main Roads [“Guideline for Determination of Sight Distance for Direction Signs”](#).
3. The Contractor must ensure adequate visibility for signs on site at all times.

601.41.02 LATERAL PLACEMENT AND HEIGHT

1. The lateral placement and height of signs supported by one post shall be in accordance with Drawing No. 9548-0106.
2. The lateral placement and height of signs supported by two or three posts shall be in accordance with Drawing No. 8720-0762.
3. The lateral placement of signs supported on overhead gantry or bridge structures will be specified in the sign drawings. Where multiple signs are fixed to a gantry or bridge structure the signs shall be fixed such that the lowest edges of the signs are at the same level.
4. Signs shall not be erected on any other infrastructure other than mentioned in this document, except that street name blades installed by Local Government Authorities may be installed on street lighting poles with the asset owner's approval.
5. In addition, there are instances where directional or width markers will be installed on culverts, bridge and barrier approaches, where the pavement width narrows or driver line of approach sight changes abruptly.

601.42 SIGN ORIENTATION

1. Post-mounted signs shall be orientated in the direction of oncoming traffic in accordance with Drawing No. 8720-0762 (specular reflection angle).

601.43 FLAT ALUMINIUM AND STEEL SHEET SIGNS – UNBRACED

601.43.01 SIGN SUPPORT

1. Unbraced flat aluminium and steel sheet signs shall be supported by one post.
2. The type and gauge of the sign post to be used shall be as specified in Annexure 601D.
3. The length of post required shall be in accordance with Drawing No. 8720-0657, or as indicated on the post schedule drawings for the specific project.

601.43.02 POST HOLE EXCAVATION

1. A square or circular hole as shown on Drawing No. 9548-0106 or manufacturer's drawing for flexible and removable posts, shall be excavated to accommodate the sign post, footing and any attachments. The excavated soil shall be stockpiled adjacent to the hole for use as backfill, or disposed of in an acceptable manner.

601.43.03 SIGN FIXING

1. Signs shall be fixed to the sign post prior to installation using an M10 galvanised bolt, a nylon washer between bolt head and the sign face and nut with a security washer (refer: MRWA Drg.No.8720-0657), manufactured in accordance with Clause 601.36 or as specified otherwise in the contract.
2. For sign panels 0.81 metres squared or larger, a large 50 mm diameter zinc plated mild steel flat washer shall be used in place of the nylon washer. The washer is to be covered with retroreflective sheeting to match the class and the background sheeting material colour of the sign (refer: MRWA Drg.No.8720-0657).

601.43.04 INSTALLATION

1. The sign post with the sign(s) fixed in place shall be positioned in the centre of the post hole.
2. Compacted earth and concrete shall be used to backfill the hole in accordance with Drawing No. 9548-0106. The top 50 mm shall be filled using a similar material to the surrounding ground.
3. The sign post shall be vertical as measured by a spirit level and the sign shall be orientated towards oncoming traffic in accordance with Clause 601.42.
4. Each layer of backfill shall be compacted with six blows of a 10 kg hand tamper. The level of the completed backfill shall be within +5 mm and

0 mm of the surface level of the surrounding ground. Excess material shall be disposed of at an authorised disposal site.

5. Flexible and removable signs posts shall be installed in accordance with the Drawing No. 9548-0106 or manufacturer's recommendation for approved products given in Annexure 601G.
6. A plastic or aluminium end cap shall be fitted to the top of the post to prevent the ingress of water.
7. If an approved self-locking taper is used for installing the sign post, the footing, sleeves and bases for the installation of the sign post shall be in accordance with the manufacturer's recommendation.

601.43.05 ERECTION

1. Once signs have been transported to the road site, they should not be laid flat on the ground. Laying signs flat can result in damage to the reflective face through direct contact with the ground.
2. When attaching signs to posts, all connecting bolts should be tightened using offset spanners, not socket wrenches. The use of offset spanners minimise tool and hand contact with the sign face and avoids scratching of the surface, as well as allowing the extent of tightening to be observed. Only one end of the nut and bolt should be tightened, preferably tightened from the rear of the sign.
3. Tightening from both sides can transfer stress into the top film of reflective sheeting resulting in permanent pinwheel style wrinkles. Avoid over tightening the connecting bolts as this can cause specular glare from dimples on the sign face.
4. A circle of diameter slightly larger than the bolt head may be scored in the reflective sign face around the bolt hole to minimise any fine cracking that may inadvertently occur during bolt tightening.
5. When erecting large guide and information signs, care must be taken to prevent lifting ropes, cables and chains from contacting the sign surface. These can cause permanent visible damage.
6. After installation and before leaving the road site, inspect all signs to see that they have not been damaged during erection and are free of oil and dirt residue from fingers and tools.

601.43.06 TRAFFIC ISLANDS

1. Rigid and Non-removable Sign posts
 - (a) During construction of concrete filled islands, a circular hole 150 mm $\pm$ 50 mm in diameter or 150 mm $\pm$ 50 mm square hole and 600 mm $\pm$ 50 mm in depth shall be excavated to accommodate a 120 mm long section of 150 mm diameter PVC bore casing as shown in Drawing No. 9548-0106.

- (b) The PVC bore casing shall be positioned centrally in the hole such that the top of the bore casing is within +5 mm and 0 mm of the proposed finished surface level of the concrete infill.
- (c) The PVC bore casing shall be filled with clean sand up to a depth 20 mm below the top of the bore casing within +5 mm and 0 mm limit.
- (d) When installing the sign any damage to brick paving or concrete infill shall be repaired with materials of the same type, size and colour in accordance with Specification 407 KERBING, Specification 901 CONCRETE – GENERAL WORKS, and Specification 505 SEGMENTAL PAVING.
- (e) Excess material shall be disposed of at an authorised disposal site.

2. Flexible and removable Sign posts

- (a) Footings, sleeves and bases for flexible and removable posts shall be constructed in accordance with Drawing Nos. 9548-0106, 202031-0091 or the manufacturer's drawings.

601.43.07 ALTERNATIVE SIGN POST FIXING DEVICES

1. For signs to be installed where a concrete surface cannot readily be removed to excavate the post hole, an approved galvanised post mounting bracket may be bolted to the surface. Main Roads approved mounting brackets are listed at Annexure 601E.

The taper-lock method for fixing the sign post may be used as an alternative by core drilling the surface (or removing the pavers to install the socket in the case of a paved area). The method of installation shall be as recommended by the manufacturer.

601.43.08 ATTACHMENT OF SIGNS TO TRAFFIC SIGNAL POLES

1. Mounting brackets for signs attached to traffic signal poles shall be as shown on Drawing No. 9320-0316 or an equivalent stainless steel banding strap. Under no circumstances shall mounting brackets or any other fixing be used which necessitates drilling holes into the traffic signal pole.

601.44 EXTRUDED ALUMINIUM SECTION SIGNS

601.44.01 GENERAL

1. Extruded aluminium section signs are supported by one or two posts.
2. Street name signs mounted below an intersection warning sign shall be installed as part of the warning sign as specified in Clause 601.41 for its lateral placement and height.
3. Other extruded aluminium section signs including street name blades shall be installed as specified in Clause 601.41 for its longitudinal, lateral placements and height.
4. Standard fingerboard signs brackets are shown in Drawing No. 9531-2303.

601.45 FLAT ALUMINIUM SHEET SIGNS – BRACED (POST MOUNTED)

601.45.01 SIGN SUPPORTS

1. Braced aluminium (post mounted) are generally supported by two or three posts.
2. The number, type, size and length of the posts required will be specified on the sign drawings. In special circumstances, braced signs may be installed on a single post provided that:
 - (a) the post is designed to withstand the bending moment caused by wind loading;
 - (b) the post meets frangibility requirements;
 - (c) the post is restrained from rotating in the ground;
 - (d) the sign is restrained from rotating around the post;
 - (e) the stiffeners shall be designed in accordance with Drawing No. 1830-0016; and
 - (f) the post is restrained from becoming a projectile in the event of it shearing off or becoming dislodged from its footing after a vehicle impact.

601.45.02 POST HOLE EXCAVATIONS

1. The dimensions of post hole excavations shall be designed in accordance with Drawing No. 2430-0601 and specified on the sign drawings. The excavated soil shall be stockpiled adjacent to the excavations for use as backfill, or disposed of in an acceptable manner.

601.45.03 POST FOOTINGS

1. The post footing dimensions shall be designed in accordance with Drawing No. 2430-0601 and specified on the sign drawings. All exposed concrete edges and edges to crack control joints shall have 20 mm x 20 mm chamfers unless noted otherwise. The 20 mm x 20 mm chamfer may be omitted where the top surface of the footing is sloped away from the post. Where specified on the project drawings, the associated steel reinforcing details shall be provided in accordance with those drawings.

601.45.04 INSTALLATION

1. The sign posts shall be positioned vertically in the centre of the post holes.
2. The concrete post footings shall be poured with Class N40 concrete in accordance with Specification 901 CONCRETE – GENERAL WORKS.
3. The sign posts shall be vertical as measured by a spirit level and the sign/s shall be orientated towards oncoming traffic in accordance with Clause 601.42.

4. Excess material shall be disposed of at an authorised disposal site.
5. Where applicable, a plastic or aluminium end cap shall be fitted to the top of the post to prevent the ingress of water.

601.45.05 SIGN FIXING

1. The sign post footings shall be allowed to cure for a minimum of 24 hours prior to fixing the sign(s), unless rapid hardening concrete is used, in which case the cement manufacturer's requirements shall be complied with.
2. The sign(s) shall be attached to the posts using fixings manufactured in accordance with Clause 601.36 and be level as measured by a spirit level.
3. Fixing and installation details for hazard markers are shown on Drawing No. 9648-0176.

601.46 FLAT ALUMINIUM SHEET SIGNS – BRACED (CANTILEVER, GANTRY OR BRIDGE MOUNTED)

601.46.01 SIGN SUPPORTS

1. The structure and support details for mounting overhead signs will be detailed on the sign drawings. For large cantilever or gantry signs assembled at the site with vertical joints constructed in accordance with Clause 601.12.02(iii) 2, the spacing of supports shall provide any additional support required for the joints and shall avoid coinciding directly with the vertical joints.
2. **The final approval for the gantry design for large signs mentioned above shall not proceed until the Principal acknowledges in writing that the supports are positioned appropriately to support the sign assembly.**
3. Signs fixed directly to bridge structures shall be designed and approved by Main Roads Structures Engineering Branch. Drawing No. 9730-1027 provides a typical example.

HOLD POINT

601.46.02 INSTALLATION

1. The sign support structure and/or supports shall be installed in accordance with the details shown on the sign drawings and be level as measured by a spirit level.

601.46.03 SIGN FIXING

1. The sign(s) shall be attached to the sign supports using fixings manufactured in accordance with Clause 601.36.

601.47 SIGN OVERLAYS

1. Sign overlays shall be fixed to the sign panels in accordance with Clause 601.14.

601.48 – 601.50 NOT USED

SIGN REMOVAL

601.51 SIGN REMOVAL

1. Signs shall be detached from the sign supports and either reused or disposed of at an authorised disposal site.
2. Traffic signs that are to be reused shall be transported and stored in accordance with Clauses 601.61 – 601.63.

601.52 SIGN SUPPORT REMOVAL

1. Sign supports, fittings and footings shall be removed and disposed of.
2. Sign support holes shall be backfilled, watered and compacted in layers not exceeding 75 mm to within +25 mm and 0 mm of the surface level of the surrounding ground.
3. The backfill shall be compacted until the final passes or blows of the compaction equipment leave no impressions on the backfilled surface.
4. Excess material shall be disposed of at an authorised disposal site.

601.53 SURFACE REINSTATEMENT

1. Damaged brick paving or concrete infill shall be repaired with materials of the same type, size and colour in accordance with Specification 407 KERBING and Specification 505 SEGMENTAL PAVING.
2. Grass verges shall be backfilled and reinstated to the same standard as the surrounds.
3. Excess material shall be disposed of at an authorised disposal site.

601.54 – 601.60 NOT USED

TRANSPORTATION AND STORAGE OF SIGNS

601.61 TRANSPORTATION

1. Traffic signs are intended to communicate information to the road user in a clear and concise manner.
2. This can only be accomplished if the surface of the sign is free of damage, abrasion, dirt, oil or other markings causing loss of legibility. These problems are especially severe when dealing with reflective material since night-time legibility is directly related to the quality and clarity of the reflective surface.
3. This specification serves to highlight the important aspects of correct reflective sign storage and handling and is designed to be used by sign manufacturers, sign users and erectors.
4. All finished signs should be handled, transported and stored to prevent damage to the sign face or other components. Signs should be stored vertically with their edges clear of the ground and in such a manner that

the sign faces are not scuffed or marked, making use of protruding stiffening members where possible.

5. Back to back storage of signs is permitted, but pressure must not be transferred onto a sign face by any other sign or sign support.
6. When transporting signs by truck or trailer, it is imperative that signs be securely braced vertically and adequately supported and secured to avoid damage due to scuffing, abrasion and load shifting.
7. Large guide and information signs should be braced using wooden stiffeners attached to the extensions at the back of the sign and transported with the stiffeners in place to avoid buckling and rivet popping.

601.62 INDOOR STORAGE

1. Signs should be preferably stored indoors. Signs required to be stored outdoors must have the packaging removed and be stored so as to permit free air circulation and normal moisture evaporation. Moisture must be prevented from remaining in contact with the face of the sign at all times. Packaging that has become wet or damp must be removed immediately and the signs permitted to dry completely. Steps need to be taken to ensure that high temperature and high humidity conditions do not occur in either indoor or outdoor storage.

601.63 OUTDOOR STORAGE

1. Signs stored outdoors shall be unwrapped from their transport packaging and stored upright on edge using wooden battens on the floor or as vertical supports, or both.
2. Signs stored outdoors, especially large guide or information signs should be stored using a racking system that will provide vertical support for the stored signs that will avoid pressure points on sign faces and allow adequate air circulation between sign faces to prevent a build-up of moisture.

601.64 SIGN COVERING

1. Covering signs is not good general practice due to the damage that can be caused to the sign face through the interaction of environmental conditions.
2. If it is necessary to cover a sign face temporarily after erection, caution must be exercised as some coverings may cause permanent damage to the sign face following exposure to moisture and sunlight. Some porous materials have been used successfully for limited periods by folding the material over the sign and securing it at the back of the sign. At the same time, the material needs to have sufficient opacity to prevent the reflective face of the sign showing through at night.
3. Covering signs with paper or plastic materials, especially black, is forbidden, as it is known that these materials are responsible for severe and permanent damage within 24 hours as a consequence of the high temperatures and humidity conditions that can be generated during entrapment.

4. Avoid the use of ropes, wire fasteners or strapping that may abrade the sign surface. Do not apply tape to the sign face because sunlight will cause it to bond permanently. Masking or application tape must be removed prior to exposure to sunlight.
5. Some specially formulated low tack pressure sensitive films are available that are suitable to mask signs. For specific details on use, refer to technical literature available from the manufacturer of the retroreflective sheeting.
6. It is important that suitable materials be selected for covering signs in order not to jeopardise Sign Performance Warranties provided by the manufacturer of the retroreflective sheeting.

601.65 – 601.70 NOT USED

SIGN MAINTENANCE

601.71 SIGN MAINTENANCE

601.71.01 GENERAL

1. All materials and application processes used for the maintenance of signs shall comply with this Specification.
2. The level of service of all signs shall not fall below the minimum performance criteria as specified in Clause 601.71.06.

601.71.02 SIGN REPLACEMENT

1. Signs to be replaced shall be removed in accordance with Clause 601.51.
2. Replacement signs shall be attached to the post using fixings manufactured in accordance with Clause 601.36 and be level as measured by a spirit level.
3. The replacement of signs shall be carried out in a single operation to ensure a minimum length of time during which the signs are not in use.

601.71.03 SIGN REMOVAL

1. Sign removal, sign post removal and surface reinstatement shall be in accordance with Clauses 601.51 to 601.53.

601.71.04 SIGN CLEANING

1. Signs should be cleaned in accordance with sheeting manufacturer's instructions (Refer Annexure 601J).
2. Traffic signs shall be cleaned without damage to the sign face and legend.
3. Traffic signs shall be cleaned to remove all dust, grime and other loose or foreign material from the sign face, legend and rear of sign panel.

4. Typical cleaning methods may include washing using a mild detergent agent mixed in water with soft bristle brooms or brushes and rinsing with potable water. The sign surface shall be free from streaks after washing.
5. Graffiti shall be removed in accordance with the paint, sheeting or protective overlay sheeting manufacturer's instructions.
6. The Contractor shall be responsible for ensuring the compatibility of the proposed cleaning method and medium without injurious effect to the sign, sign face and legend. Traffic signs damaged by the Contractor's cleaning works shall be rectified at no cost to the Principal.
7. For maximum performance, signs should be kept clean and free from dirt, road tar, oil, bituminous material and mulch. Primarily this means cleaning the surface of the reflective sheeting, the essential characteristic of a sign.
8. A wet, detergent type, non-abrasive cleaner suitable for high quality paint surfaces is recommended. The cleaner must also be free of strong aromatic solvents or alcohols and be chemically neutral (i.e. pH of around 7.0). Following use of any cleaning agent, the sign surface must be immediately and thoroughly rinsed with clean water. In all cleaning operations, care should be taken not to abrade the sign by use of stiff-bristle brushes or by unnecessary scrubbing.

601.71.05 NORMAL CLEANING PROCEDURE

1. Flush the surface with clean water to remove loose, dirt particles. A squeeze (or triggered) hose nozzle is convenient for this purpose.
2. Wash the sign face with a clean rag or sponge using detergent or any of several suitable commercial cleaners. Wash thoroughly from the top down. Once suds have been applied, keep a steady stream of water flowing on the sign face to wash away dirt particles.
3. Rinse the entire sign face with clean water, and allow the sign to drain dry.
4. Take extreme care in cleaning screened sign faces since some cleaning solvents may damage the screen-printed area. Use a mild solvent such as mineral spirits. Follow with detergent and water, and then rinse with clean water. Do not use high-pressure sprayers. Do not direct sprays at sign face edges.

601.71.06 PERFORMANCE CRITERIA

(i) Colour Fade or Change

1. When blue, brown or green signs are viewed under either daytime or night time conditions, the perceived colour shall be that commonly associated with that designated colour, that is, there shall be no degradation of appearance that would allow a sign using one of these colours to be confused with either of the other colours.

(ii) Retroreflectivity and Luminance

1. The retroreflectivity shall be measured in accordance with AS/NZS 1906.1 Appendix A at an observation angle 0.2° and at an entrance angle 4°. The value must be an average of five readings equally spaced across the width

of larger signs or within the area of smaller signs and shall be greater than the minimum value specified in Table 601.3.

2. The luminance factor is measured in accordance with AS/NZS 1906.1 Appendix C using the Y function of the CIE 1964 colour system and shall be less than the maximum value specified in Table 601.3.

TABLE 601.3 PERFORMANCE CRITERIA

Sign Type	Red Regulatory Signs	White Regulatory Signs	Yellow Warning Signs	Hazard Signs	Guide, Service & Tourist Signs
Description					
Legend Colour	White	Black, Red	Black	Black	White, Black
Background Colour	Red	White	Yellow, Orange	White, Yellow	Green, Blue, Brown, White
Minimum Retroreflectivity					
Class 400, 900 & 1100 Legend (White)	40cd/lx.m ²	n/a	n/a	n/a	100cd/lx.m ²
Class 400, 900 & 1100 Background (Red)	5cd/lx.m ²	n/a	n/a	n/a	n/a
Class 400, 900 & 1100 Background (White)	n/a	50cd/lx.m ²	n/a	50cd/lx.m ²	50cd/lx.m ²
Class 400, 900 & 1100 Background (Yellow)	n/a	n/a	40cd/lx.m ²	40cd/lx.m ²	n/a
Class 400, 900 & 1100 Background (Orange)	n/a	n/a	20cd/lx.m ²	n/a	n/a
Class 100 Legend (White)	40cd/lx.m ²	n/a	n/a	n/a	40cd/lx.m ²
Class 100 Background (White)	n/a	40cd/lx.m ²	n/a	40cd/lx.m ²	40cd/lx.m ²
Class 100 Background (Yellow)	n/a	n/a	35cd/lx.m ²	35cd/lx.m ²	n/a
Maximum Luminance Factor					
Red Colour	0.20	0.20	n/a	n/a	n/a
Orange Colour	n/a	n/a	0.60	n/a	n/a
Minimum Internal Contrast Ratio	3:1	3:1	n/a	n/a	3:1

601.72 – 601.80 NOT USED

AS BUILT AND HANDOVER REQUIREMENTS

601.81 AS-BUILT INFORMATION

(i) Major Signs

1. The Contractor shall provide the Principal full set of “As Built Drawings” as indicated in example Main Roads Drawing Nos. 200331-0047, 201831-0025, 201831-0026, 201831-0027 and 201831-0028.
2. Final documentation is to consist of electronic and hardcopy sets including:
 - (a) Major sign location drawing for project area.
 - (b) Sign panel details and dimensions.
 - (c) Sign installation details.
 - (d) Stiffener and post design criteria.
 - (e) Material types and colours.
 - (f) Sign Post schedule drawing.
3. As Built Drawings shall include the following information, including, but not limited to:
 - (a) MRWA drawing number.
 - (b) Location reference number.
 - (c) Sign reference number.
 - (d) Chainage and position.

(ii) Minor Signs

1. The Contractor shall provide the Principal “As Built Information” as indicated in example Main Roads Drawing No. 200931-0083 and 200331-0050.
2. Final documentation is to consist of electronic and hardcopy sets including:
 - (a) Sign location chainage.
 - (b) Sign number.
 - (c) Sign description.
 - (d) Signage actions (existing / install / remove / replace and/or relocate).

601.82 – 601.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

601.91 – 601.99 NOT USED

ANNEXURE 601A

SPECIFICATION REQUIREMENTS

THIS SECTION MUST BE COMPLETED BY THE CONTRACT ORIGINATOR

1. HOLD POINTS

The following HOLD POINTS shall apply to this Sign Specification:

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(A possible HOLD POINT could be applied on completion of signs prior to installation)

2. PROTECTIVE OVERLAY FILM

Protective Overlay Film shall be applied to the following signs: ALL SIGNS
TO NO SIGNS
TO SIGNS AS SHOWN ON CONTRACT DRAWINGS
OTHER – Specify (ex; UV protective overlay for signs with digital printing)

(Delete those, which are not applicable)

3. SIGN DRAWINGS

Are all sign drawings supplied?	
YES	NO

ANNEXURE 601B

MAIN ROADS APPROVED ALTERNATIVE SIGN MATERIALS

UNBRACED FLAT STEEL SHEET SIGNS

1. “Keep Left” Sign, R2-3 (L, R) – Dura-Post (Aust) Pty Ltd

<https://www.durapost.com.au>

UNBRACED FLAT NON-METALLIC SUBSTRATE MATERIAL

1. Sign – Flex (small signs on islands and medians) – Delnorth International Pty Ltd

<https://www.delnorth.com/>

2. Chevreflex, flexible chevron alignment marker (D4-6) – RUD Pty Ltd

<http://www.wasteandrecyclingbins.com.au/chevreflex-chevron-boards>

3. Retroreflective Decals – Material as specified on approved drawing provided.

4. Non-retroreflective Decals – UV stabilised vinyl with a minimum 5 year life.

ANNEXURE 601C

MAIN ROADS APPROVED FIXINGS FOR METAL SHEETING

1. 3M VHB (Very High Bond) Tape 4941.
2. ORABOND UHB (Ultra High Bond) Tapes UHB03110W (White) and UHB03110G (Grey).

ANNEXURE 601D**SINGLE TRAFFIC SIGN POSTS****1. ALL AREAS**

Kilometre plates (Focal point markers)	60.3 mm CHS 2.3 mm
Parking restriction signs (MR-RPK & R5 series)	60.3 mm CHS 2.3 mm
Street name blades	76.1 mm CHS 3.2 mm post with welded brackets (refer to Drawing No. 9531-2303) or approved reusable brackets.
Bicycle directional Signs	75 mm x 50 mm x 2.5 mm hot-dip galvanised and powder coated Bottle Green - G11 (AS 2700)

2. METROPOLITAN AND BUILT-UP AREAS

Total Sign Area	< 1.00 m ² -	76 mm x 38 mm x 2.0 mm RHS ¹ or 60.3 mm CHS 2.3 ² mm where additional strength is required ³ .
	≥ 1.00 m ² -	75 mm x 50 mm x 2.5 mm RHS
Surface finish		Yellow powder coating

3. RURAL AREAS**(a) Areas subject to tropical cyclones (Regions C and D on Drawing No. 1830-0002)**

Size	75 mm x 50 mm x 2.5 mm RHS
Surface finish	Hot-dip galvanised or with yellow powder coating for town sites as required by Main Roads Regional Director.

(b) Other rural areas

Total Sign Area	< 1.00 m ² -	76 mm x 38 mm x 2.0 mm RHS ¹ or 60.3 mm CHS 2.3 ² mm where additional strength is required ³ .
	≥ 1.00 m ² -	75 mm x 50 mm x 2.5 mm RHS
Surface Finish		Hot-dip galvanised or with yellow powder coating for town sites as required by Main Roads Regional Director.

Notes:

1. The larger 75 mm x 50 mm x 2.5 mm RHS post may be used where the total sign area is < 1.00 m² to protect against vandalism.
2. For signs facing oncoming traffic, 60.3 mm CHS 2.3 mm posts are to be used in conjunction with a fixing bracket that provides a flat surface of approximate 75 mm x 20 mm around the bolt fixing area to secure the sign to the post. The fixing bracket shall also restrain the sign from rotating around the post.
3. The CHS posts may be also used in situations where the use of a removable post system can have a significant cost benefit in replacing the damaged sign post by reusing the existing footing. Approved systems are given in Annexure 601G.
4. Approved single sign posts for use as alternative are given in Annexure 601G.

ANNEXURE 601E

MAIN ROADS APPROVED SIGN FIXINGS

1. Catsby Sign Fixing Bracket.
2. “SIGNFIX ARC” series Stainless Steel Saddle Brackets.
3. LX2 Sign Security Washers - Patent Application No. 2007900327.
 - (a) SW001 – 50 mm clear polycarbonate sign security washer for 8 mm bolt.
 - (b) SW002 – 26 mm clear polycarbonate sign security washer for 8 mm bolt.
 - (c) SW003 – 26.5 mm clear polycarbonate sign security washer for 10 mm bolt.
 - (d) SW004 – 65 mm clear polycarbonate sign security washer for 10 mm bolt.
4. “SIGNFIX” Wicks Security Washers for M8 and M10 galvanised bolts.
5. SIGNFIX RSJ M10 Toe Clamp Unit.
6. Smart Urban re-usable Sign Bracket.
7. SIGNFIX Stainless Steel Channel Clips –
 - (a) Double Bolt Saddle Brackets – HDTB series.
 - (b) RHS Brackets – HRH and LRH series.
 - (c) Back-to-Back Clips – BBC series.
 - (d) M10 Channel Bolts and Nuts.
 - (e) UCC002 M10 Universal Channel Clamp.
8. SIGNFIX Aluminium Brackets –
 - (a) TD1 SGNFX 50 mm NB Single Sided Brackets.
 - (b) TD2 SGNFX 50 mm NB Double Sided Brackets.
 - (c) TD1 UNI 060 50 mm NB and TD1 UNI 076 65 mm NB Single Bolt Uni-Clamp Brackets.
 - (d) Heavy Duty Double Bolt Uni-Clamp Bracket – 50 mm NB AU060MCH-02.
 - (e) Heavy Duty Double Bolt Uni-Clamp Bracket - 65 mm NB AU076MCH-02.
9. SIGNFIX Stainless Steel Banding and Buckles –
 - (a) 210 Grade Band and Buckles – STR and BUC series
10. SIGNFIX Banding Brackets –
 - (a) MR 135-9.
 - (b) UR 302 – 29 mm.
 - (c) UR 251 – 29 mm.
 - (d) UR 251 CH – 29 mm.
 - (e) UR 151 – 19 mm.

11. SIGNFIX Buckle Straps –

- (a) BS 192
- (b) BS 193.

12. CALPRO Traffic Products –

Brackets

- (a) CP-TD1A – TD-1 Aluminium Bracket with Bolt.
- (b) CP-TD2A – TD-2 Aluminium Bracket with Bolt.
- (c) CP-BRARC60 – ARC 60 mm Stainless Steel Bracket with Bolt.
- (d) CP-BRARC76 – ARC 76 mm Stainless Steel Bracket with Bolt.
- (e) CP-BRARC89 – ARC 89 mm Stainless Steel Bracket with Bolt.
- (f) CP-BRARC102 – ARC 102 mm Stainless Steel Bracket with Bolt.
- (g) CP-BRARC114 – ARC 114 mm Stainless Steel Bracket with Bolt.
- (h) CP-BRALL – Aluminium L Bracket with Bolts.
- (i) CP-BRALB – Aluminium Type B, L Bracket.
- (j) CP-BRCAT – Galvanised Base Catsby Bracket with Bolt.
- (k) CP-BR7638RHS – 76 mm x 38 mm Stainless Steel Bracket (for RHS post).
- (l) CP-KNUCKLE – Aluminium Knuckle Bracket (for UB post).
- (m) CP-BRBO251 – UR-251 Stainless Steel UR-251 Bracket and Bolt.
- (n) CP-BRBSL – BSL Bracket with Bolt.

Bolts

- (a) CP-BOLTCT1021 – Bolt Cone Tip M10 x 21 mm to suit TD1 and TD2.
- (b) CP-BoltCT1025 – Bolt Cone Tip M10 x 25mm to suit TD1 and TD2.
- (c) CP-BOLTCT1021 – Bolt Tribular Cone Tip M10 x 21 mm with Set Screw.
- (d) CP-BOLTCT1025 – Bolt Tribular Cone Tip M10 x 25mm Bolt with Set Screw.
- (e) CP-BOASM8 – 65 mm Long M8 Bolt Assembly with Security Washers.
- (f) CP-BOASM10 – 65 mm Long M10 Bolt Assembly with Security Washers.

Buckles

- (a) CP-BUCK13 – 13 mm Stainless Steel Buckle.
- (b) CP-BUCK19 – 19 mm Stainless Steel Buckle.

Caps

- (a) CP-CAPSPPG – 50 mm NB Galvanised Cap.

Washers

- (a) CP-SEW8 – Security Washer Size M8.
- (b) CP-SEW10 – Security Washer Size M10.

Wedges

- (a) CP-WELSSMZ – Galvanised Road Side Wedge.
- (b) CP-WELSSM – Galvanised Wedge Small (for Grab Rails).
- (c) CP-WELSLG – Galvanised Wedge Large (for Grab Rails).

ANNEXURE 601F**MAIN ROADS STANDARD SIGN DRAWINGS**

The following Main Roads standard sign drawings are available on the Main Roads web site. Users are responsible for ensuring that the latest revision is sourced.

Drawing No.	Description
8720-0657	Road Traffic Signs – Installation – Sign Fixing Details
8720-0762	Location details for two & three post signs
8820-0257	Typical mounting for single sided back to back signs
8820-0354	Aluminium extrusion for the rear of road signs
9020-0693	Typical mounting detail single side and back to back signs
9220-0180	Unbraced sign blanks – Bolt hole locations
9320-0316	Traffic sign brackets
9334-4051	Attachment of route name tag to sheet aluminium intersection direction sign
9334-4052	Attachment of distance tag to sheet aluminium intersection direction sign
9334-4383	Attachment of drop tag to sheet aluminium intersection direction sign
9448-0144	Green zone advanced direction signs – Perth Metropolitan Area
9531-2303	Standard fingerboard sign brackets
9548-0090	Temporary signs – Construction work zone series
9548-0106	Road Traffic Signs – Installation – Installation Details for Single Post and Footing
9648-0176	Road Traffic Signs – Installation – Installation Details for Hazard Markers
9730-1027	Sign support details on bridges (typical example drawing)
200831-0017	Horizontal joint for braced signs
200331-0047	Major Signing (example drawing)
200331-0050	Sign Post Schedule (example drawing)
200931-0083	Minor Signs and Pavement Marking (example drawing)
201031-0155	Frame for multi message signs
201131-0010	Signfix LEGACY – Post Selection Chart
201331-0071	Signfix LEGACY – Footing and Installation Details
201431-0032	Typical assembly of multi piece sign on-site vertical joints

Drawing No.	Description
201731-0004	Lattix sign post selection chart 1 – Force 0 -15 kN
201731-0005	Lattix sign post selection chart 2 – Force 15 -100 kN
201731-0007	Lattix sign post footing details
1830-0002	Wind speed region chart and terrain category selection photographs
1830-0003	Sign area, moment lever arm & post spacing chart
1830-0006	CHS post selection chart force 0 to 20 kN
1830-0011	Breakaway UB sign post fabrication details
1830-0012	Breakaway UB sign post fuse plates, sign post assembly and site erection procedure
1830-0016	Sign Stiffener Types A, B & C – Stiffener Spacing Charts
201831-0025	Presentation Drawing – Signs and Pavement Markings – UB Post Example
201831-0026	Presentation Drawing – Signs and Pavement Markings – CHS Post Example
201831-0027	Presentation Drawing – Signs and Pavement Markings – Lattix Post Example
201831-0028	Presentation Drawing – Signs and Pavement Markings – Signfix Post Example
202031-0091	Sleeve for 76 mm x 38 mm RHS sign post
2130-0654	UB Post Selection Chart – Force 5 to 100 kN
2330-2234	Force Acting on Sign Charts – Sign Area 0 to 10 m ²
2330-2235	Force Acting on Sign Charts – Sign Area 10 to 60 m ²
202331-000117	Signfix MASH – Post Selection Chart
202331-000118	Signfix MASH – Footing and Installation Details
202331-000119	Optimast – Post Selection Chart
202331-000120	Optimast – Footing and Installation Detail
2430-0601	Footing Dimensions for Ground Mounted Signs
2630-1948	Post Footing Details and Post Fabrication Details

ANNEXURE 601G

MAIN ROADS APPROVED ALTERNATIVE SIGN POSTS AND POST FIXING DEVICES

1. Flexible Sign Post – Dura-Post (Aust) Pty Ltd
<https://www.durapost.com.au>
2. Flexible Sign Post (Springy Post) – JMB Manufacturing Pty Ltd
<https://www.jmbsignposts.com/>
3. Smart Taper (post fixing device) – Smart Urban Pty Ltd
<https://smarturban.com.au/>
4. Dynaflex Sign Base – Mulford Plastics Pty Ltd
<https://www.mulfordplastics.com.au/>
5. Poly-Flex Sign Base – Delnorth International Pty Ltd
<https://www.delnorth.com/>
6. Signfix and Optimast Aluminium Fluted (frangible) Sign Posts – Delnorth International Pty Ltd
<https://www.signfix.com.au/>
7. Retro Post (Flexible Rubber Sign Post) – RPS Industries (Distributor: Traffic Systems West)
<https://www.rpstraffic.com.au/>
8. Lattix Sign Mast Types 4412, 4420, 4425 and 4438 – Artcraft Pty Ltd
<https://www.artcraft.com.au/>
9. Break-Safe Omni-Directional Breakaway Sign Support System (subject to conditions in letter of approval, ref: No. 11/61 dated 04/02/2011, trim document D11#28644) – Transpo Industries
<https://www.transpo.com/>
10. Zack Post – RHS Composite Post 76mmx38mm, Fibreglass Reinforced Polymer Pultrusion Profile – Jason Signmakers
<https://www.jasonsigns.com.au/>

ANNEXURE 601H**MAIN ROADS APPROVED RETROREFLECTIVE SHEETING MATERIALS, DIGITAL PRINTERS AND INKS**

1. Retroreflective Sheeting Manufacturer – Kiwalite

CLASS	PRODUCT
AS/NZS 1906.1 Class 100	Engineering Grade 2613 – White 2643 – Yellow 2653 – Orange 2663 – Red 2683 – Blue
AS/NZS 1906.1 Class 400	Prismatic Grade 55013 – White 55043 – Yellow 55063 – Red 55083 – Blue 55033 – Fluorescent Yellow Green 55153 – Fluorescent Orange
Overlay Film	Kiwacal Transparent Film AF-204 – Yellow AF-206 – Red AF-208 – Blue AF-219 – Brown FF-117 – Moss Green (Standard Green)

2. Retroreflective Sheeting Manufacturer – 3M Australia Pty Ltd

CLASS	PRODUCT
AS/NZS 1906.1-2017 Class 100	Engineering Grade * EGB 3290 – White
AS/NZS 1906.1-2017 Class 100	* EGB 3290 White with Overlay 1170C * Digital ink 3M 8800UV series ink * Yellow * Dark Green * Blue
AS/NZS 1906.1-2017 Class 100	* EGB 3290 White * Screen print ink 3M 880 * Red
AS/NZS 1906.1-2017 Class 400T	High Intensity Prismatic Grade * HIP 3824 – Fluorescent Orange * HIP 3830 – White * HIP 3831 – Yellow
AS/NZS 1906.1-2017 Class 400T	* HIP 3830 White * Screen print ink 3M 880 * Red
AS/NZS 1906.1-2017 Class 400T	* HIP 3830 White with Overlay 1170C * Digital ink – 3M 8800UV series ink * Yellow * Red
AS/NZS 1906.1-2017 Class 400T	3340 White Cone Sheeting
AS/NZS 1906.1-2017 Class 400	High Intensity Prismatic Grade * HIP 3930 – White * HIP 3931 – Yellow
AS/NZS 1906.1-2017 Class 400	* HIP 3930 White with Overlay 1170C * Digital ink – 3M 8800UV series ink * Red * Yellow * Dark Green * Blue * Brown
AS/NZS 1906.1-2017 Class 400	* 3930DS White with Overlay 1170C * Digital ink – 3M 8900UV series ink * Blue * Red * Brown * Yellow

CLASS	PRODUCT
AS/NZS 1906.1-2017 Class 400	* HIP 3930 White with Overlay 1170C * 831 HP Latex ink * Blue * Red * Black * Dark Green * Brown
AS/NZS 1906.1-2017 Class 400	* HIP 3930 White * HIP 3931 Yellow * Screen print ink 3M 880 * Red
AS/NZS 1906.1-2017 Class 900	Diamond Grade * VIP 3990 – White * VIP 3991 – Yellow
AS/NZS 1906.1-2017 Class 900	* VIP 3990 White * 3M Screen print ink * 882I Red * 883I Blue
AS/NZS 1906.1-2017 Class 900	* VIP 3990 White with Overlay 1170C * Digital ink – 3M 8800UV series ink * Red * Yellow * Blue
AS/NZS 1906.1-2017 Class 900	* VIP 3990DS White with Overlay 1170C * Digital ink – 3M 8900UV series ink * Blue * Red * Brown
AS/NZS 1906.1-2017 Class 1100T	DG ³ Diamond Grade * 4084 – Fluorescent Orange
AS/NZS 1906.1-2017 Class 1100	DG ³ Diamond Grade * 4081 – Fluorescent Yellow * 4083 – Fluorescent Yellow Green * 4090 – White * 4091 – Yellow
AS/NZS 1906.1-2017 Class 1100	* DG³ 4083 Fluorescent Yellow Green with Overlay 1170C * 831 HP Latex ink * Black

CLASS	PRODUCT
AS/NZS 1906.1-2017 Class 1100	* DG³ 4090 White with Overlay 1170C * Digital ink – 3M 8800UV series ink * Red * Yellow * Dark Green * Blue * Brown
AS/NZS 1906.1-2017 Class 1100	* DG³ 4090DS White with Overlay 1170C * Digital ink – 3M 8900UV series ink * Blue * Red * Yellow * Dark Green * Brown
AS/NZS 1906.1-2017 Class 1100	* DG³ 4090 White with Overlay 1170C * 831 HP Latex ink * Blue * Red * Black * Dark Green * Brown
AS/NZS 1906.1-2017 Class 1100	* DG³ 4091 Yellow with Overlay 1170C * 831 HP Latex ink * Black
Overlay Film	Transparent Film * 1170C – Clear * 1171 ECF– Yellow * 1172 ECF– Red * 1175 ECF – Blue * 1176 ECF – Dark Green * 1179 ECF – Brown
AS/NZS 1906.1-2017 Printers:	Digital Inks
* Durst 161,162	* 3M 8800UV – Traffic Yellow, Traffic Red, Traffic Blue, Dark Green, Traffic Orange, Traffic Brown
* Durst163, EFI H1625-RS	* 3M 8900UV – Traffic Yellow, Traffic Red, Traffic Blue, Dark Green, Traffic Orange, Traffic Brown
HP360, HP365	831 HP Latex – Traffic Red, Traffic Blue, Dark Green, Traffic Brown

1. * Interim approval only. Full approval is pending satisfactory completion of the durability test in progress.
2. DS means the product is only approved for use with the EFI and Durst printers.

3. Retroreflective Sheeting Manufacturer – Avery Dennison

CLASS	PRODUCT
AS/NZS 1906.1 Class 100	Engineering Grade T-1500 – White T-1501 – Yellow T-1505 – Blue T-1508 – Red T-1509 – Brown
AS/NZS 1906.1 Class 400	High Intensity Prismatic Grade T-6500 – White T-6501 – Yellow T-6505 – Blue T-6508 – Red T-6509 – Brown
AS/NZS 1906.1 Class 400T	High Intensity Prismatic Grade W-6500 – White W-6501 – Yellow
AS/NZS 1906.1 Class 900/1100	Omnicube Prismatic Grade T-11500 – White T-11501 – Yellow T-11505 – Blue T-11508 – Red T-11511 – Fluorescent Yellow T-11513 – Fluorescent Yellow Green W-11514 – Fluorescent Orange
Overlay Film	Transparent Film OL-2001 – Yellow OL-2005 – Blue OL-2008 – Red OL-2009 – Brown OL-2027 – Green (Std. Green)
Screen Printing Inks	Series 4930 Nazdar Screen Print Ink 849300 – Black 849302 – Red 849304 – Blue

CLASS	PRODUCT
Printers: Avery Dennison TrafficJet Digital Printer	Digital ink Avery Dennison TrafficJet Ink – Black Avery Dennison TrafficJet Ink – Blue Avery Dennison TrafficJet Ink – Brown Avery Dennison TrafficJet Ink – Yellow Avery Dennison TrafficJet Ink – Green Avery Dennison TrafficJet Ink – Red Avery Dennison TrafficJet Ink – Cyan Avery Dennison TrafficJet Ink – Magenta

4. Retroreflective Sheeting Manufacturer – Orafol

CLASS	PRODUCT
AS/NZS 1906.1 Class 400	Prismatic Grade Oralite 5910-010 – White Oralite 5910-020 – Yellow Oralite 5910-030 – Red Oralite 5910-035 – Orange Oralite 5910-050 – Blue Oralite 5910-080 – Brown
AS/NZS 1906.1 Class 400T	High Intensity Prismatic Construction Grade Oralite 5960-010 – White Oralite 5960-020 – Yellow Oralite 5960-038 – Fluorescent Orange Oralite 5930-010 – White Oralite 5930-020 – Yellow Oralite 5930-029 – Fluorescent Yellow Green Oralite 5930-037 – Fluorescent Yellow Oralite 5930-038 – Fluorescent Orange
AS/NZS 1906.1 Class 400 Oralite 5910 with clear overlay or graffiti coat	Screen ink Oralite 5018-020 – Yellow Oralite 5018-030 – Red Oralite 5018-035 – Orange Oralite 5018-050 – Blue Oralite 5018-070 – Black Oralite 5018-080 – Brown

CLASS	PRODUCT
AS/NZS 1906.1 Class 400 Oralite 5910 with clear overlay or graffiti coat	Eco solvent ink Oralite 5017-020 – Yellow Oralite 5017-030 – Red Oralite 5017-035 – Orange Oralite 5017-050 – Blue Oralite 5018-070 – Black Oralite 5018-080 – Brown Oralite 5018-625 – Std. Green
AS 1906.1 – 2017 Class 400	* ORALITE 5910-010-WHITE with ORALITE 5061 Transparent Film Digital Ink – Process UV Digital Ink Colour * ORALITE 5017 – 020 – Yellow * ORALITE 5017 – 030 – Red * ORALITE 5017 – 050 – Blue * ORALITE 5017 – 070 – Black * ORALITE 5017 – 080 – Brown * ORALITE 5017 – 625 – Std Green
AS 1906.1 – 2017 Class 1100	* ORALITE 9910-010-WHITE with ORALITE 5061 Transparent Film Digital Ink – Process UV Digital Ink Colour * ORALITE 5017 – 020 – Yellow * ORALITE 5017 – 030 – Red * ORALITE 5017 – 050 – Blue * ORALITE 5017 – 070 – Black * ORALITE 5017 – 080 – Brown * ORALITE 5017 – 625 – Std Green
AS/NZS 1906.1 Class 900/1100	Brilliant Premium Grade Oralite 9910-010 – White Oralite 9910-020 – Yellow Oralite 9910-029 – Fluorescent Yellow Green Oralite 9910-030 – Red Oralite 9910-035 – Orange Oralite 9910-037 – Fluorescent Yellow Oralite 9910-038 – Fluorescent Orange Oralite 9910-050 – Blue Oralite 9910-080 – Brown

CLASS	PRODUCT
AS/NZS 1906.1 Class 900/1100 Oralite 9910 with clear overlay or graffiti coat	Digital ink Oralite 5019-020 – Yellow Oralite 5019-030 – Red Oralite 5019-035 – Orange Oralite 5019-050 – Blue Oralite 5019-070 – Black Oralite 5018-080 – Brown Oralite 5018-0625 – Std. Green
AS/NZS 1906.1 Overlay Film	Transparent Film Oralite 5061-020 – Yellow Oralite 5061-030 – Red Oralite 5061-035 – Orange Oralite 5061-050 – Blue Oralite 5061-080 – Brown Oralite 5061-625 – Std. Green
Printers: Anapurna 2050 Anapurna 2050i	Digital ink Oralite 5019i-020 – Yellow Oralite 5019i-030 – Red Oralite 5019i-035 – Orange Oralite 5019i-050 – Blue Oralite 5019i-070 – Black Oralite 5019i-080 – Brown
AS 1909.1 – 2017 Printers: * ORALITE Traffic Printing System Roland TrueVIS VG3-540	Digital Inks: Process UV Digital Ink Colour * ORALITE 5017 – 020 – Yellow * ORALITE 5017 – 030 – Red * ORALITE 5017 – 050 – Blue * ORALITE 5017 – 070 – Black * ORALITE 5017 – 080 – Brown * ORALITE 5017 – 625 – Std Green
Eco Solvent Printing System, Printer: M64 OKI	Digital ink Oralite 5017-020 – Yellow Oralite 5017-030 – Red Oralite 5017-035 – Orange Oralite 5017-050 – Blue Oralite 5017-070 – Black Oralite 5017-080 – Brown Oralite 5017-625 – Std. Green

1. * Interim approval only. Full approval is pending satisfactory completion of the durability test in progress.

5. Retroreflective Sheeting Manufacturer – MNTECH Global Co. LTD (MNTG)

CLASS	PRODUCT
AS/NZS 1906.1 Class 400	Prismatic Grade RS 7000 – White RS 7001 – Yellow
Overlay Film	Transparent Film EC1000 – Clear EC1001 – Yellow EC1003 – Blue EC1005 – Red
AS/NZS 1906.1 Class 1100	Nil

6. Retroreflective Sheeting Manufacturer – Reflomax Co. Ltd

CLASS	PRODUCT
AS/NZS 1906.1 Class 400T	Prismatic High Intensity Grade HIP4001 – White HIP4002 – Fluorescent Yellow Green HIP4003 – Yellow HIP4004 – Fluorescent Orange
AS/NZS 1906.1 Class 900T	Prismatic Superfine Grade SG9001 – White SG9002 – Fluorescent Yellow Green SG9003 – Yellow SG9004 – Fluorescent Orange

ANNEXURE 601I**SIGN MAKERS ACCREDITED BY RETROREFLECTIVE SHEETING MANUFACTURERS**

The table will be updated periodically however it is paramount that the sign makers hold a valid accreditation at the time of carrying out works for Main Roads.

1. Sheeting Manufacturer – Kiwalite

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
Hartac Sales & Distribution Pty Ltd	19-21 Wheeler St Belmont WA 6104 Tel: (08) 9373 3700	August 2025	August 2027	Kiwalite Engineer grade #2600 series White, Yellow, Orange, Red and Blue for Class 100
Safety Signs Service (Brady Corporation)	133 Logistics Bvd Kenwick WA 6107 Tel: (08) 6310 2700	August 2025	August 2027	Kiwalite Engineer grade #2600 series White, Yellow, Orange, Red and Blue for Class 100
Ascot Sign Company	5 Radius Loop Bayswater WA 6053 Tel: (08) 9371 0077	August 2025	August 2027	Kiwalite Engineer grade #2600 series White, Yellow, Orange, Red and Blue for Class 100

2. Sheeting Manufacturer – 3M Australia Pty Ltd

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
Hartac Sales & Distribution Pty Ltd	19-21 Wheeler St Belmont WA 6104 Tel: (08) 9373 3700	April 2024	December 2025	Full Accreditation
Jason Signmakers	1 McDowell St Welshpool WA 6106 Tel: (08) 9458 7033	April 2024	December 2025	Accreditation for Screen Printing ONLY PENDING Full Accreditation
SignBiz Group	8 Bellingham St, Narellan NSW 2567 Tel: (02) 4647 0506	October 2024	December 2025	Accreditation for Digital and ECF Printing ONLY
Uniform Safety Signs Pty Ltd	42-50 Lucknow Cres, Thomastown VIC 3074 Tel: (03) 9357 9820	July 2025	December 2025	Full Accreditation

3. Sheeting Manufacturer – Avery Dennison

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
Corsign WA Pty Ltd	8 Accomplish Wy Gnangara WA 6065 Tel: (08) 9248 9262	February 2025	February 2027	Full Accreditation
Jason Signmakers	1 McDowell St Welshpool WA 6106 Tel: (08) 9458 7033	June 2024	June 2026	Full Accreditation
Yungatha Pty Ltd	Unit 3, 106 Robinson Ave Belmont WA 6104 Mob: 0401 684 831	February 2025	February 2027	Full Accreditation
Global Spill & Safety	202 Settlement Rd Thomastown VIC 3074 Tel: 1300 774 557 Contact: 21 Glassford Road Kewdale WA 6105 Tel: (08) 9258 5877	November 2024	November 2026	Full Accreditation
Signhere Signs Pty Ltd	22 Weir Rd Malaga WA 6090 Tel: (08) 9248 1184	September 2025	September 2027	Full Accreditation

4. Sheeting Manufacturer – Orafol

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
Corsign WA Pty Ltd	8 Accomplish Way Gnangara WA 6065 Tel: (08) 9248 9262	June 2024	July 2026	Full Accreditation
Hartac Signs & Safety Solutions	19-21 Wheeler St Belmont WA 6104 Tel: (08) 9373 3700	June 2024	July 2026	Full Accreditation
Jason Signmakers	1 McDowell St Welshpool WA 6106 Tel: (08) 9458 7033	June 2024	July 2026	Full Accreditation
Brady Safety Signs	133 Logistics Bvd Kenwick WA 6107 Tel: 1300 723 549	June 2024	July 2026	Full Accreditation
Civil Products WA	68 Luisini Rd Wangara WA 6065 Tel: (08) 9248 7313	June 2024	July 2026	Full Accreditation
Jaybro WA	6 Riversdale Road Welshpool WA 6106 Tel: 1300 885 364	June 2024	July 2026	Full Accreditation
Aus Safesigns & Products	Unit 3/10 Carbon Ct Osborne Park WA 6017 Tel: (08) 6285 4003	February 2026	February 2028	Full Accreditation

5. Sheeting Manufacturer – MNTECH Global Co. Ltd (MNTG)

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
None				

6. Sheeting Manufacturer – Reflomax Co. Ltd

Sign Manufacturer	Location	Date of Accreditation	Date of Expiry or Validity Period	Comments
None				

ANNEXURE 601J

LINK TO GUIDELINE FOR CLEANING AND MAINTENANCE OF RETROREFLECTIVE SHEETING

1. Sheeting Manufacturer – Kiwalite

<http://www.sakai.com.au/bm.doc/kiwa-guide-to-storing-and-handling-2006.pdf>

2. Sheeting Manufacturer – 3M Australia Pty Ltd

<http://multimedia.3m.com/mws/media/42262O/if-1-11-3m-reflective-shtg-sign-maintenance-management.pdf>

3. Sheeting Manufacturer – Avery Dennison

https://reflectives.averydennison.com/content/dam/averydennison/reflective-responsive/documents/english/ib/general-converting/IB8.00_Storage-Handling-Cleaning_04062017.pdf

4. Sheeting Manufacturer – Orafol

<https://www.orafol.com/products/europe/en/application-instructions/oralite-RA2C-eu-en-application.pdf>

5. Sheeting Manufacturer – MNTECH Global Co. Ltd (MNTG)

<http://www.sakai.com.au/bm.doc/jobspecificationeng.pdf>

6. Sheeting Manufacturer – Reflomap Co. Ltd

https://reflomap.com/page/sub0201_1.php?uid=1

ANNEXURE 601K**MANUFACTURE AND INSTALLATION OF MULTI-POST SIGNS CHECKLIST**

Sheet 1 of 6

Road Name:			
Direction (North/South Bound)			
Sign Description/ Drawing No:			
Location No:			
No.	Item Description	Requirement	Field Observation / Comments
1	Coefficient of luminous intensity Sign spec. CL601.06.03/04	Intensity at entrance angles and observation angles to comply with values given in AS/NZS 1906.1 for all classes except Class 1100, for which refer sign spec. Table 601.1, taking into consideration the warranty requirements given in sign specification Table 601.2.	
2	Overlap type Sign spec. CL601.07.06	Decal (if < 1000 mm x 300 mm).	
		1.6 mm flat aluminium (if > 1000 mm x 300 mm).	
		Aluminium sheet overlay fastened by monel or stainless steel pop rivets of 4 mm dia, and 250 mm spacing with first and last not more than 30 mm from the edge.	

No.	Item Description	Requirement	Field Observation / Comments
3	Aluminium sheet sizes and joint limitations Sign Spec. CL601.12.01/02	If length (l) > 2400 mm, height (h) < 1200 mm, minimum number of sheets should be used.	
		If l > 2400 mm, vertical joint spacing should be either 600 mm, 900 mm or 1200 mm.	
		If h > 1200 mm, horizontal joints should be interlocked using Z stiffener or an additional stiffener with horizontal alignment bracket at maximum spacing of 450 mm (MRWA DRG.NO.200831-0017).	
4	Aluminium sheet joints Sign spec. CL601.12.02	A cover strip is required when the length is 120 mm and the join is backed with a cover strip of same sheet and width 60 ± 5 mm and terminated short of 5 ± 5 mm from edge or not less than 5 mm from stiffener. The gap (join width) should not exceed 1.5 mm.	
		Alternative method for joint construction is using an approved tape such as 3M VHB.	
5	Stiffeners Length Sign Spec. CL601.12.03	If l < 6500 mm – should be continuous.	
		Otherwise joints should be butt welded and staggered by distance greater than 2 m.	

No.	Item Description	Requirement	Field Observation / Comments
6	Stiffener type for tags Sign spec. CL601.12.04	Same as main sign stiffeners (MRWA Drg. Nos. 9334-4051, 9334-4052, 9334-4383).	
7	Rivets and fixing for stiffeners and back strips Sign spec. CL601.12.05	Monel or stainless steel pop rivets, 4 mm dia, 250 mm maximum spacing, colour to match legend and background, continues as possible, not exceeding 30 mm from the edge, minimum two on each side of back strip.	
8	Reflective Sheeting Sign spec. CL601.16.01	The join for reflective sheeting or transparent film shall be butt join.	
9	Protective Overlay Sign spec. CL601.17	Film or coating required in Perth.	
		Along top of sign or interlocking sign segment, the film or coating should be extended 15 mm from the top of sign.	
10	Rear of Signs Sign spec. CL601.18	Poles, brackets and other fixings located in Green Zone, (MRWA Drg. No. 9448-0144) should be painted in Bottle Green (G11).	

No.	Item Description	Requirement	Field Observation / Comments
11	Marking traffic signs (Braced) Sign spec. CL601.19.02	Plate fixing method – rivet or approved as.	
		Plate position – rear bottom corner of the sign nearest to the road and 80 mm above the lowest stiffener.	
		Lettering/ Numbering – Stamped or engraved using engraving tool & stencil in capital block and height 10 mm.	
		Contents – MRWA	
		Sign manufacturer's identification and state.	
		Month and year of manufacture (format – 10/98).	
		Coding to identify reflective sheeting manufacturer and class.	
		Aluminium sheet thickness and international registered designation of alloy and temper (1.6/5251-H36).	
		Sign drawing number or AS1743/MRWA sign number.	
		Sign location number as per drawing.	
		Identification for protective layer (anodised bronze colour plate and letter G on lower right corner).	

No.	Item Description	Requirement	Field Observation / Comments
12	Installation MRWA Drg No. 8720-0762	Sign face edge (lateral displacement) 1000 mm from unsealed shoulder edge or kerb face	
		Mounting Height (flat ground) breakaway posts 2200 mm for both Urban and Rural	
		Non-Breakaway posts 2000 mm Urban and 1500 mm Rural	
		Above path for both breakaway and non-break away 2500 mm	
		Mounting Height (Embankment Fill) nearest post same as flat ground	
		Mounting Height (Cut slope) nearest post same as flat ground, also the furthest which is the smallest post should not be less than 800 mm	

No.	Item Description	Requirement	Field Observation / Comments
13	Breakaway Posts MRWA Drg No. 1830-0011	Height of stub post above ground level which is top of concrete footing, is 75 mm.	
		Hinge position below sign panel is 100 mm.	
		Breakaway direction – unidirectional in direction of traffic.	
	MRWA Drg No. 1830-0012	Fuse plate (perforated) arrangement should be to MRWA Drg. No. 1830-0012. Fuse plate shall be manufactured from bisalloy (shall not be galvanised steel).	

GUIDANCE NOTES

FOR REFERENCE ONLY – DELETE GUIDANCE NOTES FROM FINAL DOCUMENT

1. All edits to this specification are to be made using track changes, to clearly show added/ deleted text.
2. If **all** information relating to a clause is deleted, the clause number should be retained and the words **“NOT USED”** should be inserted.
3. The proposed document with tracked changes must be submitted to the Project Manager for review, prior to finalising the document.
4. Once the Project Manager’s review is complete, accept all changes in the document, turn off track changes and refresh the Table of Contents.
5. The Custodian of this specification is the Traffic Engineering Standards Manager.

1. SIGN TYPES

This Specification includes details for various types of signs – braced, un-braced, extruded, temporary and boxed edge. The Contract documentation needs to:

- (a) Make clear instruction to the type of signs required.
- (b) Provide or refer to design details for all signs other than signs contained in the Australian Standard 1743. Details to include sign size, colour, reflective sheeting class, post and footing details.
- (c) Provide information about sign location asset number for all two posted signs.

2. SIGN LEGEND

Sign legend designs to be in accordance with:

- (a) Main Roads Signs Indexes
- (b) Main Roads Guidelines for Directional, Service and Tourist Signing.

3. STRUCTURAL DESIGN

Structural designs for sign panels, posts and footings to be in accordance with Main Roads Sign Structural Design Guidelines on the website.

4. WARRANTY

The specification includes a 36-month warranty for sign construction and a range of sign sheeting warranties between 7 to 12 years.

CONTRACT SPECIFIC REQUIREMENTS

The following clauses are to be placed under the CONTRACT SPECIFIC REQUIREMENTS, as required. After inserting the clause, change the clause number and heading to style “H2 SP” so it appears in the Table of Contents. Delete this page from the final document.

601.XX SUBHEADING (H2 SP)

1. Insert text (Main Table SP)

Keyword SP

601.XX SUBHEADING (H2 SP)

1. Insert text (Main Table SP)

AMENDMENT CHECKLIST

Specification No. **601** Title: **SIGNS**

Revision No: _____

Project Manager: _____ Signature: _____ Date: _____

Checked by: _____ Signature: _____ Date: _____

Contract No: _____ Contract Name: _____

ITEM	DESCRIPTION	SIGN OFF
<i>Note: All changes/amendments must be shown in tracked changes until approved.</i>		
6.	Project Manager has reviewed the Specification and identified additions and amendments.	
7.	Standard clauses amended? MUST SEEK approval from the Specification Custodian.	
8.	Any unlisted materials/products proposed and approved by the Project Manager? If "Yes" provide details at 16.	
9.	Deleted clauses shown as " NOT USED ".	
10.	Ensure appropriate INSPECTION AND TESTING parameters are included in Specification 201 (test methods, minimum testing frequencies verified).	
11.	AS-BUILT AND HANDOVER requirements addressed.	
12.	CONTRACT SPECIFIC REQUIREMENTS addressed? Contract specific materials, products, clauses added? (refer Specification Guidance Notes).	
13.	ANNEXURES completed (refer Specification Guidance Notes).	
14.	Estimates Manager has approved changes to SMM .	
15.	Project Manager certifies completed Specification reflects intent of the design.	
16.	Independent verification of completed Specification arranged by Project Manager.	
17.	Project Manager's review completed.	
18.	SPECIFICATION GUIDANCE NOTES deleted.	
19.	TABLE OF CONTENTS updated.	
20.	FOOTER updated with Document No., Contract No. and Contract Name.	
21.	Supporting information prepared and submitted to Project Manager.	
Additional information or further action:		

Signed: _____ (Project Manager) Date: _____