



ACT
Government

ROAD SIGNS 14

MUNICIPAL
INFRASTRUCTURE
TECHNICAL
SPECIFICATION
14 - ROAD SIGNS

Transport Canberra and
City Services

July 2019



Publication Number:	MITS 14 Edition 1 Revision 0
---------------------	------------------------------

Date of Effect:	July 2019
-----------------	-----------

Supersedes: Standard Specification for Urban Infrastructure Works Section 10
Edition 1 Revision 0 September 2002

Endorsed By:	Karl Cloos	Director, Infrastructure Planning
--------------	------------	-----------------------------------

Approved By: Ken Marshall Executive Branch Manager, Roads ACT

Document Information

Document	Key Information
----------	-----------------

Document Title MITS 14 Road signs

Next review date	
------------------	--

Key words

AUS-SPEC Base Document	0161 Quality (Construction) 1192 Signposting
------------------------	---

Revision Register

Edition/ Revision Number	Clause Number	Description of Revision	Authorised By	Date
--------------------------	---------------	-------------------------	---------------	------

1/0

--	--	--	--	--

CONTENTS

- 1 Road Signs 6**
 - 1.1 General 6
 - 1.1.1 Responsibilities..... 6
 - 1.1.2 Cross references..... 6
 - 1.1.3 Referenced documents 7
 - 1.1.4 Interpretation..... 8
 - 1.1.5 Submissions..... 9
 - 1.1.6 Hold points 9
 - 1.2 Pre-construction planning 11
 - 1.2.1 General..... 11
 - 1.2.2 Activity plan..... 11
- 2 MATERIALS.....12**
 - 2.1 Approval of materials for use 12
 - 2.1.1 Compliance..... 12
 - 2.1.2 Non-compliance 12
 - 2.1.3 Samples 12
 - 2.2 Sign blanks 12
 - 2.2.1 Guide signs, warning and regulatory signs..... 12
 - 2.2.2 Fingerboards and street name signs 12
 - 2.3 Retroreflective material for backgrounds, legends, symbols and borders 13
 - 2.4 Non-reflective material 14
 - 2.5 Fluorescent material..... 14
 - 2.6 Paint material for non-reflective backgrounds and sign backs 15
 - 2.7 Posts..... 15
- 3 SIGN FABRICATION15**
 - 3.1 Sign blanks for guide signs, regulatory and warning signs 15
 - 3.2 Sign blanks for fingerboards and street name signs 17
 - 3.3 Provision for mounting 17
 - 3.3.1 Regulatory signs 17
 - 3.3.2 Warning signs 18
 - 3.3.3 Guide signs 18
 - 3.3.4 Fingerboards and street name signs 18
 - 3.4 Sign blank preparation..... 19
 - 3.5 Non-reflective backgrounds 19
 - 3.5.1 Regulatory, warning, fingerboard and street name signs 19
 - 3.5.2 Guide signs 20
 - 3.6 Application of sign face material 20

4	LEGENDS, SYMBOLS AND BORDERS	22
4.1	General	22
4.2	Abbreviations	22
4.3	Tolerances	22
4.4	Application	23
4.4.1	Fingerboards and street name signs	23
4.4.2	Regulatory and warning signs	23
4.4.3	Guide signs	24
4.5	Packing, transportation and storage of sign blades	24
5	DURABILITY AND WARRANTIES	25
5.1	Sign face materials	25
5.2	Sign structure	26
5.3	Warranty claims	26
6	INSTALLATION	27
6.1	Provision for traffic	27
6.2	Reference markings	27
6.3	Location	28
6.4	Mounting height	28
6.5	Supports	28
6.5.1	General	28
6.5.2	Sign support details	30
6.5.3	Support set-out tolerances	31
6.6	Footings	32
6.7	Mounting height	32
6.8	Sign blade attachment	33
6.8.1	Fingerboards and street name signs	33
6.8.2	Regulatory and warning signs	33
6.8.3	Guide signs	33
7	Completion	34
7.1.1	Submissions	34
7.1.2	Testing	34
7.1.3	Nonconforming work	34
8	MEASUREMENT AND PAYMENT	34
8.1	Measurement	34
8.1.1	General	34
8.1.2	Methodology	34

8.2 Pay items 35

LIST OF TABLES

Table 14-1 Hold point table..... 9
Table 14-2 Sign face materials for legends and backgrounds 13
Table 14-3 Regulatory signs mounting hole positions table 17
Table 14-4 Warning signs mounting hole positions table 18
Table 14-5 Tolerances for lettering legends, symbols and borders table 22
Table 14-6 Sign warranty periods table 25
Table 14-7 Tolerances for spacing and alignment of support posts table 31
Table 14-8 Pay items table 35

1 ROAD SIGNS

1.1 General

Requirement: Manufacture, supply and install signs and support structures for regulatory, warning information, direction and guide signs, extruded aluminium street name and fingerboard guide signs, and adjust existing signs and support structures, as documented.

1.1.1 Responsibilities

1.1.1.1 Objectives

Requirement: Signs shall consist of aluminium alloy sign blanks to which have been applied various combinations of digital printing, retro-reflective sheeting, Electronically Cuttable Films (ECF), polyurethane paint, legends, numerals, arrows, borders, route markers and other road symbols. Where specified, mild steel or aluminium alloy backing plates and lateral support extrusions designed for stiffening and mounting shall be affixed to the rear of the sign.

1.1.1.2 Precedence

Where any document except legislation or the Territory Plan issued in conjunction with this Specification includes technical requirements that conflict with this Specification the requirements of this Specification take precedence.

1.1.2 Cross references

General: The following documents are related to this specification:

1.1.2.1 Legislation

Road Transport (General) Act
Road Transport (Safety and Traffic Management) Act
Road Transport (Mass, Dimensions and Loading) Act
Road Transport (Safety and Traffic Management) Regulation
Territory Plan and related Codes

1.1.2.2 Specifications

Requirement: Conform to the following:

MITS 00 Preliminaries
MITS 01 Roadwork

1.1.2.3 Design Standards

General: The following Design Standards are related to this Specification:

MIS 13 Traffic Control Devices

ACTSDACT Standard Drawings - as referenced through this Specification.

1.1.2.4 TCCS Reference Documents

General: The following TCCS reference documents are related to this specification

- Reference document 7 Operational acceptance submissions
- Reference document 8 Works as executed quality records
- Reference document 9 Final acceptance submissions
- Reference document 11 Drafting Standard for Civil and Landscape works

1.1.3 Referenced documents

1.1.3.1 Standards

General: The following documents are incorporated into this Specification by reference:

Australian Standards

- AS 1074 Steel Tubes and Tubulars for Ordinary Service
- AS 1111.1 ISO Metric Hexagon Bolts and Screws – Product Grade C – Bolts
- AS 1111.2 ISO Metric Hexagon Bolts and Screws – Product Grade C – Screws
- AS 1112 ISO Metric Hexagon Nuts (multiple parts)
- AS 1163 Cold-formed Structural Steel Hollow Sections
- AS 1214 Hot-Dip Galvanized Coatings on Threaded Fasteners (ISO Metric Coarse Thread Series)
- AS 1365 Tolerances for Flat-Rolled Steel Products
- AS 1390 Cup Head Bolts with ISO Metric Coarse Pitch Threads
- AS 1397 Continuous Hot-Dip Metallic Coated Steel Sheet and Strip - Coatings of Zinc and Zinc Alloyed with Aluminium and Magnesium
- AS 1554.1 Structural Steel Welding - Welding of Steel Structures
- AS 1580 Paints and Related Materials - Methods of Test - Introduction and List of Methods
- AS 1627.0 Metal Finishing - Preparation and Pretreatment of Surfaces - Method Selection Guide
- AS 1627.1 Metal Finishing - Preparation and Pretreatment of Surfaces – Removal of Oil, Grease, and Related Contamination
- AS 1627.2 Metal Finishing - Preparation and Pretreatment of Surfaces – Power Tool Cleaning
- AS 1627.4 Metal Finishing - Preparation and Pretreatment of Surfaces – Abrasive Blast Cleaning
- AS 1734 Aluminium and Aluminium Alloy – Flat Sheet, Coil Sheet and Plate
- AS 1742.1 to 15 Manual of Uniform Traffic Control Devices (multiple parts)
- AS 1743 Road Signs - Specifications
- AS 1744 Standard Alphabets for Road Signs
- AS 1866 Aluminium and Aluminium Alloys - Extruded Rod, Bar, Solid and Hollow Shapes
- AS 1906.1 Retro-reflective Materials & Devices for Traffic Control Purposes – Retroreflective Sheeting
- AS 2700 Colour Standards for General Purposes (Set)
- AS 3600 Concrete Structures

- AS 3750.16 Paints for Steel Structures - Waterbourne Primer and Paint for Galvanised, Zinc/Aluminium Alloy Coated and Zinc-Primed Steel
- AS 4100 Steel Structures
- AS 4680 Hot-Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles
- AS 4792 Hot-Dip Galvanized (Zinc) Coatings on Ferrous Hollow Sections, Applied by a Continuous or a Specialized Process
- AS/NZS ISO 9001 Quality Management Systems – Requirements

1.1.3.2 Other publications

Proprietary products: To *TCCS Products previously considered for use list*

1.1.4 Interpretation

1.1.4.1 Abbreviations

General: For the purposes of this Specification the following abbreviations apply:

NATA: National Association of Testing Authorities.

RMS: NSW Roads and Maritime Services.

TCCS: Transport Canberra and City Services.

1.1.4.2 Definitions

General: For the purposes of this Specification the definitions given below apply:

Authorised Person: Person or body responsible for administering the works contract. May include Principals Authorised Persons, Superintendent’s Representatives or any other parties in accordance with the works contract

Frangible Post: Post manufactured to facilitate controlled breakaway in the event of vehicular impact – may incorporate a slip base (see below). Frangible posts shall be tested to meet relevant Australian and State Codes of Practice for the particular speed limit zones in which they are to be placed.

Lateral Distance: Distance from the edge of a sign blade to the centre of the edge line of a roadway, kerb face or other measurement point designated on the sign inventory form.

Multi-Panel Sign: Sign with a blade manufactured from more than one sheet of aluminium but erected as one section

Multi-Section Sign: Sign with a large blade manufactured from more than one section allowing field bolting together. Individual sections may be of single panel or multi-panel construction.

Reverse Cut: A sign manufacturing process whereby a white retro-reflective background is overlaid with a coloured, translucent, electronically cuttable film (ECF) from which the legend has been cut to expose the white background.

Sign Blank: Aluminium plate or extruded section substrate forming support for sign face materials.

Sign Blade: Sign blank complete with background and legend.

Slip Base: Post base which incorporates special mating flanges bolted or otherwise fixed together to provide tension and compression capacity but which allows controlled shear failure to occur in the event of vehicular impact.

1.1.5 Submissions

1.1.5.1 General

Submissions: To the Authorised Person's approval.

Approvals: Submit NATA and other specified materials certification, conform to **Hold points**

Drawings: Prepare drawings and other documentation including asset sheets to record extent and constitution of final works in accordance with *TCCS Reference document 8* and submit electronic TCD documentation in accordance with *TCCS Reference document 11*.

1.1.6 Hold points

1.1.6.1 Notice

General: Give written notice so that the documented inspection and submissions may be made in accordance with the **Hold point table**.

Table 14-1 Hold point table

Item	Clause title	Requirement	Notice for inspection	Release by
Activity plan				
14.1	Quality plan	Submit a quality plan with documentation as specified in the Contract	5 working days prior to signage manufacture	Authorised Person
Approval of materials for use, Non compliance				
14.2	Non-complying materials proposed for use.	Submit details of proposed materials with documentation supporting its use.	5 working days prior to signage manufacture	Authorised Person
Sign blanks for fingerboards and street name signs				
14.3	Details of fingerboard sections proposed for use.	Submission of the details of the proposed sections of fingerboards proposed for use including certification that the sections meet the requirements.	5 working days prior to commencement of sign manufacture.	Authorised Person
Provision for mounting, Regulatory signs				
14.4	Non-listed regulatory signs	Submission of proposed mounting details	5 working days prior to commencement of sign manufacture.	Authorised Person

Item	Clause title	Requirement	Notice for inspection	Release by
------	--------------	-------------	-----------------------	------------

Provision for mounting, Warning signs

14.5	Non-listed warning signs	Submission of proposed mounting details	5 working days prior to commencement of sign manufacture.	Authorised Person
------	--------------------------	---	---	-------------------

Sign blank preparation

14.6	Processes for sign blank preparation	Submission of details of the proposed processes for sign blank preparation with certification that the processes are in accordance with recommendations made by the manufacturers of sheeting or paint coatings to be applied to the blank	5 working days prior to commencement of sign manufacture.	Authorised Person
------	--------------------------------------	--	---	-------------------

Non-reflective backgrounds

14.7	Non-reflective material and application technique	Submission of details of the proposed non-reflective material and application technique.	5 working days prior to commencement of sign manufacture.	Authorised Person
------	---	--	---	-------------------

Application of sign face material

14.8	Retro-reflective material and application technique	Submission of details of the proposed retro-reflective material and application technique.	5 working days prior to commencement of sign manufacture.	Authorised Person
------	---	--	---	-------------------

Application

14.9	Material type for use on legends and method of application– all sign types	Submission of details of the proposed type of material and method of application to be used for the legends including manufacturer and trade name	5 working days prior to commencement of sign manufacture.	Authorised Person
------	--	---	---	-------------------

Location

14.10	Sign set-out including proposed location and alignment of each sign support structure	Submission of set-out details of each sign including details of the proposed location and alignment of each sign support structure	5 working days prior to commencement of sign manufacture.	Authorised Person
-------	---	--	---	-------------------

Item	Clause title	Requirement	Notice for inspection	Release by
------	--------------	-------------	-----------------------	------------

Supports, Sign support details

14.11	Sign support details including calculations and detail design drawings if required	Submission of detailed design drawings and calculations for signs, such as urban arterial / freeway signs	5 working days prior to commencement of sign installation.	Authorised Person
14.12	Excavation of support structure footings	Inspection of excavated footings prior to backfilling	1 working day prior to commencement of backfilling	Authorised Person

Testing, Nonconforming work

14.13	Non conformance of installed products	Submission of a non-conformance report with appropriate disposition	As soon as non-conformance is detected. Work held until disposition is approved	Authorised Person
-------	---------------------------------------	---	---	-------------------

1.2 Pre-construction planning

1.2.1 General

1.2.1.1 Traffic management

General: Take all necessary steps to avoid or minimise delays and inconvenience to all users of the road reserve or open space area during the course of the work but without compromise to the safety of the employees and the public or quality of the works.

Plan: Submit a Temporary Traffic Management Plan for approval in conformance with *MITS 01 Traffic Management*.

1.2.2 Activity plan

1.2.2.1 Quality plan

Requirements: Prepare and submit a quality plan for the sign posting consistent with the drawings and subject to direction by the Authorised Person. Include the following:

- > A time based program to conform to contract schedule, if required under the contract.
- > Allocation of plant and personnel for the contract period, if required under the contract.
- > Inspection and Test Plans.
- > Work programming to meet the requirements of hold points and witness points.

This is a **HOLD POINT**.

2 MATERIALS

2.1 Approval of materials for use

2.1.1 Compliance

Complying materials documentation: A statement verifying that materials meet the requirements shall be submitted prior to their proposed use. The statement shall include documentation verifying that the materials comply with the requirements of this specification. The documentation shall be from a NATA registered laboratory approved by the Road Authority as appropriate. Any required documentation from a NATA documentation registered laboratory shall be valid for tests conducted no more than thirty six months previously. Documentation required is as per each section of this Standard. Approved retro-reflective sheeting materials for road signs shall be as per the latest version of the *NSW RMS technical direction TTD 2013/08*.

2.1.2 Non-compliance

Non-complying materials documentation: Where a material proposed for use does not comply with this specification or composition or manufacturers specified application rates vary from those referred to within this specification, samples of the materials shall be submitted to the Authorised Person prior to their proposed use. The samples shall be submitted together with a statement verifying the materials compliance and/or non-compliance with the requirements of this specification, the manufacturer's recommendations for application, application rates, previous history of use, details of retro reflectivity, previous test results and any related Material Safety Data Sheets.

This is a **HOLD POINT**.

2.1.3 Samples

Requirement: If required by the Authorised Person, the Contractor shall submit samples of the proposed signs which shall be similar in every respect to the signs which will be supplied under the Contract. The Authorised Person shall have the right to undertake any tests of the sample signs to assess performance and durability.

2.2 Sign blanks

Requirement: The aluminium used for sign blanks shall be free of cracks, tears, and other surface blemishes, and shall conform to the following requirements for the various types of signs.

2.2.1 Guide signs, warning and regulatory signs

Requirement: Sign blanks shall be manufactured from 1.6mm thickness aluminium alloy 5251-H38 or 5052-H38 as specified in *AS 1734*.

2.2.2 Fingerboards and street name signs

Requirement: Sign blanks shall be manufactured from high tensile 6061-T5 extruded aluminium alloy in accordance with *AS 1866*.

2.3 Retroreflective material for backgrounds, legends, symbols and borders

Requirement: The retro-reflective material used for backgrounds, legends, symbols and borders on the sign face shall:

- > Signs materials are to be specified on the drawings and/or sign inventory form. Sign face material to be pre-coated with pressure sensitive adhesive in accordance with *AS 1906*.
- > Colours are based on those shown in *AS 1743*.

Requirements: The type, grade or class of sign face material for legend and background shall be in accordance with the **Sign face materials for legends and backgrounds table**.

Table 14-2 Sign face materials for legends and backgrounds

	Sign Type	Sign Face Material*	
		Legend	Background
1	Guide signs (including Advance direction, Intersection direction, Reassurance direction, Service and Freeway guide signs)		
	Left side mounted	Class 400 sheet or black non-reflective	Class 400 sheet
	Overhead, cantilever and right side mounted	Class 1100 sheet or black non-reflective	Class 1100 sheet
2	Warning signs		
	Standard Warning signs other than those stated below	Class 400 sheet or black non-reflective	Class 400 sheet
	Standard Warning signs: W6-1, W6-2, W6-3, W6-4, W6-9, W8-13, W8-14, W8-18, W8-19, W8-20, W8-22, W8-24 and W8-25	Class 1100 sheet or black non-reflective	Class 1100 fluorescent yellow green reflective sheet
3	Regulatory signs		
	Standard Regulatory signs other than those stated below	Class 400 sheet or black non-reflective or screen print	Class 400 sheet
	Standard Regulatory signs R1-1, R1-2, R1-3, R2-3A(L), R2-4	Class 1100 sheet or black non-reflective	Class 1100 sheet
	Standard Regulatory sign R3-1	Class 1100 sheet or black non-reflective	Class 1100 fluorescent yellow green reflective sheet

	Sign Type	Sign Face Material*	
		Legend	Background
	Reflective Parking signs	Class 100 sheet or black non-reflective or screen print	Class 100 sheet
4	Temporary signs for road works		
	Standard Temporary signs	Class 400 sheet or Class 1100 or black non-reflective	Class 400 sheet or Class 1100 fluorescent yellow reflective sheet
	Special Temporary signs for night work T1-200-3, T1-223, T1-224, T1-225	Class 400 sheet	Black
5	Hazard Markers		
	Chevron alignment marker D4-6, Marker (slash) G9-257	Black non-reflective	Class 400 yellow reflective sheet or Class 1100 fluorescent yellow green reflective sheet by special approval
	Other	Black non-reflective	Class 400 sheet

* All sheeting material other than those stated as 'non-reflective' must be retroreflective

2.4 Non-reflective material

Requirement. Non-reflective material used for backgrounds, legends, symbols and borders on the sign face shall be:

- > Vinyl sheet, pre-coated with pressure sensitive adhesive in accordance with AS 1906, and equal to "3M Scotchcal".
- > Material of uniform density and compatible with the material used for the legend both in application and durability.

2.5 Fluorescent material

Use: Fluorescent material may be used for sign faces intended for day-time use only.

Requirement: Fluorescent material used for sign faces shall be Red-Orange vinyl sheeting or approved equivalent in accordance with the relevant Australian or British Standard specification. Red-Orange sheeting for both day and night use shall be Class 400 or 100 retro-reflective material as specified in **Retroreflective material for backgrounds, legends, symbols and borders**

2.6 Paint material for non-reflective backgrounds and sign backs

Requirement: The backs of signs shall be of neutral appearance. Light coloured, glossy or polished surfaces shall not be used.

2.7 Posts

Requirement: Posts shall be:

- > Grade 250 or 350 hot dipped galvanised tubing (direct buried or frangible) meeting the requirements of *AS 1074* and *AS 1163*.
- > Proprietary frangible Signfix fluted aluminium.
- > In conformance with the diameters and wall thicknesses shown on the inventory form or calculated in accordance with the requirements shown on *ACTSD-3630*.

3 SIGN FABRICATION

3.1 Sign blanks for guide signs, regulatory and warning signs

Requirement: The aluminium plate material shall be cut to ensure that signs are supplied to the finished dimensions shown on the relevant drawings.

Sizes not detailed: If sizes are not detailed, dimensions shall be determined from details given in *AS 1743*. Requirements for sign blanks and tolerances on dimensions are as follows:

Guide signs:

Joins	Signs with overall dimensions of 2400mm x 1200mm or less shall be constructed from a single piece of aluminium. Signs larger than 2400mm x 1200mm overall dimensions shall be constructed utilising a minimum number of panels of aluminium sheet consistent with a maximum panel size of 1800 x 1200mm. The individual sizes of panels of aluminium sheet used in the construction of a multi panel sign shall be such that the horizontal or vertical dimension of the smallest panel shall not be less than half the corresponding horizontal or vertical dimension of the largest panel.
Corner Radii	90° Corners - radii +/- 2mm. All other angles - no corner radii required.
Overall Dimensions	May be adjusted as set out below to best suit the cutting and joining of standard sheet sizes +5% / -1%.
Face Alignment	The finished sign face shall be flat within a maximum tolerance of +/- 0.5% in any direction.

No variation to the calculated area of the signs will be made for the above adjustments.

Regulatory and warning signs:

Joints	Unless otherwise specified, all signs shall be made from a single piece of aluminium (i.e.no vertical or horizontal joints).
Overall Dimensions	+/- 5mm. The finished sign face shall be flat within a maximum tolerance of +/- 0.5 % in any direction.

Multi panel signs:

Joints	For signs constructed from more than one panel of aluminium sheet, the panels shall be neatly butt jointed together.
Gaps between panels	The gap between two adjoining panels shall not exceed 0.25mm at any panels location along the joint, and adjoining panel edges shall be aligned longitudinally so steps between sheets at the ends of joints do not exceed 0.5mm for external edges, or 0.25mm for internal edges forming part of another joint. Where prefaced sheets are used in the guide sign manufacture, these tolerances shall apply to both the aluminium backing and the retroreflective background material panels.
Butt jointing	<p>Vertical butt joints are preferred, but horizontal butt joints shall be acceptable if the full strength of the aluminium sheet can be transferred through the joint. Horizontal joints may only be located between lines of legend unless otherwise approved in writing by the Authorised Person.</p> <p>Vertical butt joints shall not be made through the vertical stroke of letters, symbols or vertical borders.</p> <p>The face of both panels on either side of the joint shall be matched for both colour and material type.</p>
Butt jointing reinforcing	Vertical butt joints shall be reinforced with a 100mm wide 1.6mm thick reinforcing aluminium backing strip of the same grade as the sign blank. The strip shall be fixed on the reverse face of the sign for the full length of the butt joint, except that backing strips shall be cut a maximum 2mm clear of each edge of lateral supports to enable the lateral supports to be mounted flush with the reverse face of the sign. The joint shall be located centrally along the backing strips which shall be neatly affixed flush to the reverse face of the sign using Very High Bond (VHB) cold weather joining tape in accordance with the manufacturers recommendations in a manner which transfers the full panel strength through the joint.
Transportation Sign size limit	Where the Contractor considers a sign is too large to be constructed and transported as a single sign, written acceptance may be sought from the Authorised Person for construction of a sign in more than one section.
Assembly	<p>Multi panel signs shall be assembled by the fabricator prior to delivery to site to ensure correct fitting, conformance with specified tolerances, alignment and matching of all components.</p> <p>Sufficient 6mm diameter 65mm long zinc plated hexagon head bolts and nuts shall be supplied with each multi-section sign for bolting the sections together.</p>

3.2 Sign blanks for fingerboards and street name signs

Requirement: Unless otherwise specified or approved by the Authorised Person, blanks shall be sized to suit the requirements of AS 1743 for G5 series signs. Sign blanks for fingerboards and street name signs shall be manufactured from an approved "I" Section or similar shape, with the following properties:

150mm overall depth blank

- > Web thickness 2.5mm
- > Moments of inertia
(Minimum values) $I_{xx} = 1.8 \times 10^6 \text{ mm}^4$
 $I_{yy} = 5.4 \times 10^3 \text{ mm}^4$
- > Overall length Not less than 450mm nor more than 850mm. Increments shall be multiples of 50mm

200mm overall depth blank

- > Web thickness 2.5mm
- > Moments of inertia
(Minimum values) $I_{xx} = 3.6 \times 10^6 \text{ mm}^4$
 $I_{yy} = 5.45 \times 10^3 \text{ mm}^4$
- > Overall length Not less than 600mm nor more than 850mm. Increments shall be multiples of 50mm

Approval: Submission of documentation including full details of the section or sections proposed for use certifying conformance with the requirements is a **HOLD POINT**.

3.3 Provision for mounting

3.3.1 Regulatory signs

Requirement: For A and B size regulatory signs (excluding parking restriction signs),

- > 11mm square holes shall be provided on the vertical axis of each sign to take 10mm diameter cup head square neck bolts.
- > Holes shall be positioned to suit the varying size of sign with standard hole centres
- > Minimum distances from the lower hole to the bottom edge of the sign to be as shown in the **Regulatory signs mounting hole positions table**
- > For each sign, the largest combination of hole centres and bottom distances is to be used which will fit the sign blank and provide a minimum distance of 25mm between the centre of the top hole and the top of the sign blade.

Table 14-3 Regulatory signs mounting hole positions table

Hole Centres	Distance from Bottom
520mm	40mm
406mm	22mm
230mm	60mm
230mm	25mm
130mm	60mm

Unlisted regulatory signs: Regulatory signs not listed above are to be fitted with approved aluminium extrusion stiffeners at 450mm maximum centres. Submission of the proposed mounting details for unlisted signs is a **HOLD POINT**.

3.3.2 Warning signs

Requirements: 11mm square holes shall be provided on the vertical axis of each sign to take 10mm diameter cup head square neck bolts. Holes shall be positioned as shown in the **Warning signs mounting hole positions table**.

Table 14-4 Warning signs mounting hole positions table

Sign Size and Type	Hole Centres	Distance from Bottom
Diagonally mounted A and B sized square W1 – W7 series signs	520mm	100mm
Normally mounted A sized W8 series signs:		
W8-3, 7, 8, 9, 13, 24 & 203	300mm	50mm
W8-5, 6	130mm	35mm

Unlisted Warning signs: Warning signs not listed in the above table are to be fitted with approved aluminium extrusion stiffeners at 450mm maximum centres. Submission of the proposed mounting details for unlisted signs is a **HOLD POINT**.

3.3.3 Guide signs

Requirements: Guide signs shall be supplied complete with lateral supports as follows:

- > Manufactured from 28.5mm x 25.5mm extruded aluminium 'C' section to CAPRAL die E15052 or approved equal, or manufactured from Grade 5050 – T5 aluminium, slotted to receive M10 square neck galvanised cup head bolts, or M10 galvanised bolts with 'twist-lock' heads.
- > Continuously flush with the reverse of the sign face for the full length of the lateral supports.
- > Extrusions shall be affixed to the reverse face of signs by Very High Bond (VHB) cold weather joining tape or Henrob flush finish self-piercing rivet so that the sign face is free of perforation or blemishes.
- > Lateral supports shall finish 50mm clear of the edges of signs.
- > Fixing of lateral supports shall be at a maximum spacing of 450mm centres. The uppermost and lowest lateral support shall be fixed with the centre line of the support at a distance of 100mm from the top and lower edge of the sign respectively.
- > Rivets that penetrate the sign face are not permitted.

Guide signs that incorporate chevrons at one or both ends: For these signs a lateral support shall be provided between the point of each chevron and the closest post, extending a minimum distance of 100mm beyond the post, or, where required due to the height of the blade, the support shall extend for the full width of the blade at the height of the chevron point/s.

3.3.4 Fingerboards and street name signs

Requirement: Provision shall be made for fixing of fingerboards and street name signs using ACT Government approved proprietary post mounting clamps. For fixing details also refer to *ACTSD-3620*.

3.4 Sign blank preparation

Requirements: After cutting the sign blanks to size, including corner radii where applicable, and any necessary trimming and shaping and punching of holes, and before application of the retro-reflective sheeting, fluorescent sheeting, or non-reflective paint coatings, the sign blanks shall be prepared as follows:

- > All burrs shall be removed. All rough edges shall be dressed. Blanks shall be smooth with true edges and be free from fabrication defects.
- > Prior to the application of sheeting and legend, all unpainted blanks or blank components, excluding stiffening sections, shall be degreased in a vapour degreaser or by total immersion in a suitable alkaline bath during which all trademarks and all identification marks shall be removed from both sides of each sheet. Where the size of the blank precludes both of these processes, degreasing shall be achieved by thorough swabbing with a solvent. Such degreasing shall be followed by an effective rinse in, or with, clean water.

Following degreasing: Blanks shall be etched on both sides by one of the following methods:

- > Method A - Acid etching in a 6-8% phosphoric acid bath at a temperature in the range 35 degrees to 40 degrees Celsius, followed by thorough rinsing in clean water; OR
- > Method B - Acid etching in a bath of commercial acid etching solution at the temperature recommended by the manufacturer of the solution, followed by thorough rinsing in clean water, chromate conversion, and further rinsing; OR
- > Method C - Alkaline etching in a bath of commercial alkaline etching solution at the temperature recommended by the manufacturer of the solution, followed by thorough rinsing in clean water, chromate conversion, and further rinsing; OR
- > Method D - Abrasive etching producing a finished finish no coarser in texture than that produced with a dull 100 grit belt, followed by cleaning with a suitable solution to remove all foreign materials.

Sign blank handling: The sign blanks shall not be handled between all cleaning and etching operations except by device or clean gloves. The sign blanks shall be kept free from contact with greases, oils or other contaminants prior to the application of the specified coating.

Preparation processes. Submission of full details of the proposed processes and certification that the processes are in accordance with recommendations made by the manufacturers of sheeting or paint coatings to be applied to the blanks is a **HOLD POINT**.

3.5 Non-reflective backgrounds

3.5.1 Regulatory, warning, fingerboard and street name signs

Requirement: For non-reflective regulatory, warning, fingerboard and street name signs, the face of the prepared blanks shall be coated with the specified colour of either stoving enamel to a dry film thickness of 0.035mm to 0.045mm, or an approved low gloss polyurethane paint applied as specified for guide signs below, after appropriate pre-treatment and priming in accordance with manufacturers directions.

3.5.2 Guide signs

Requirement: For non-reflective guide signs, the sign face background shall be painted after appropriate pre-treatment and priming, with an approved low gloss finish polyurethane paint with the following requirements:

- > The polyurethane paint shall be applied using conventional spray methods to give a total dry film thickness of 0.04mm.
- > The film thickness shall be achieved by a wet on wet application, allowing a five minute flash-off period between coats, or a light bake through infra-red heaters when placed on an endless conveyor.
- > Touching up of small areas by brush to fully match the spray painted surface shall be carried out without the addition of a reducer.

Colour of non-reflective background: The colour of the sign face shall be either X 65 dark brown polyurethane ground or G12 standard green polyurethane ground, as specified in *AS 2700* and *AS 1743*.

Paint curing: Full curing of the paint is critical, in order that blistering of the retro-reflective lettering, symbols and borders does not occur in the subsequent process, which may involve exposure for several minutes of approximately 90°C.

Approval: Primer and paint details: Submission of the full details of proposed primer and paint materials is a **HOLD POINT**.

3.6 Application of sign face material

Requirement: All retro-reflective or fluorescent sheeting, lettering, symbols and borders shall be applied to the sign blank and background in strict accordance with the sheeting manufacturer's recommendations.

Approval: Retro-reflective material and application technique: Submission of the full details of the retro-reflective material and application technique is a **HOLD POINT**.

Background sheeting for fingerboards and street name signs: Background sheeting shall meet the following requirements:

- > Centrally spaced in the blank, 125mm deep for 150mm deep blanks, 175mm deep for 200mm deep blanks, and shall comprise not more than one piece of sheeting per side of blank.
- > For single sided fingerboards and street name signs, the background shall extend the full length of the blank, and for double sided signs, the full length except for 100mm at the end containing the mounting holes.

Other blanks: Requirements for other blanks or panels are as follows:

- > 900mm or less in width, no splices in the reflective sheeting applied to the blank or panel will be permitted.
- > On other blanks or panels more than 900mm wide, longitudinal and transverse splices will be permitted parallel to the edges of the blank, but not within 50mm of any edge parallel with the splice.
- > Parallel splices less than 900mm apart shall not be used unless on each occasion consent in writing is given by the Authorised Person.

Splice positions and requirements:

- > When fabricating large single panel signs or sign backgrounds the sheeting shall normally run the long dimension of the sign in order that splices are horizontal and a minimum number of splices are made.
- > The bottom piece of sheeting shall be applied first so that the top sheet overlaps the bottom sheet.
- > Splices shall be lapped 5mm to 10mm, and sheeting on both sides of the splice shall be colour matched when viewed in daylight.
- > Retro-reflective sheeting shall be butt spliced rather than overlapped.
- > Overlays and thinner materials shall be matched for retro-reflective colour and night reflective appearance. For proper matching of sheeting, only sheeting from rolls having the same shipping date and matching symbol or the same ink batch shall be used on any one sign blank.
- > After sheets or applied panels have been matched, particular care should be taken to ensure that the matched sheets or panels are not mixed during the application and construction of the sign.

Sheeting application requirements:

- > Sheeting on both sides of a panel joint shall be colour matched.
- > All sheeting shall be applied strictly in accordance with the sheeting manufacturer's instruction using a mechanical applicator fitted with a heater accessory as approved by the sheeting manufacturer.
- > Legends, symbols, borders and strip sheeting less than 150mm in width may be direct hand applied using a plastic squeegee or 50mm diameter rubber roller.
- > Sheeting shall not be applied over any protuberance including bolts or non Henob rivet.
- > Unsatisfactory adhesion of the retro-reflective sheeting to the sign blank, in particular creases and bubbles shall be cause for rejection of the sign by the Authorised Person.

Digital printing technologies may be used in the manufacturer of signs in accordance with the manufacturers' specification and in accordance with relevant NSW RMS specifications and shall meet the warranty period specified in the **Sign warranty periods table**

4 LEGENDS, SYMBOLS AND BORDERS

4.1 General

Standard: All letters, numerals, symbols and borders shall comply with AS 1743.

Requirements: All letters and numerals shall comply with AS 1744 in respect of height, series and spacing and shall be in accordance with the following:

Fingerboards and street name signs:

- > Letters and numerals for fingerboards and street name signs shall have series D dimensions.
- > Where D letters and numerals would result in a sign in excess of 850mm long, letters and numerals shall be the widest of series C, B or A which will result in a sign less than 850mm long.

Other signs

- > Letters and numerals shall be as specified in the relevant drawing and/or sign inventory form for the particular sign.

4.2 Abbreviations

Standard: Abbreviations acceptable for legends on fingerboards and street name signs are as per AS1742.

4.3 Tolerances

Requirement: Tolerances for placing of lettering, legends, symbols and borders shall be as per the **Tolerances for lettering legends, symbols and borders table**.

Table 14-5 Tolerances for lettering legends, symbols and borders table

Item	Tolerance
Borders and location of bottom of each line of lettering	+ 5mm from nearest edge of sign
Lettering and spaces along each bottom line of lettering	+ 3 mm
Vertical axis of each letter	3 degrees
Width of borders	+0.5mm
All other dimensions	+5%

4.4 Application

4.4.1 Fingerboards and street name signs

Requirement: Legends shall be provided on the reflective material by either:

- > Silk screening in opaque black screening ink; OR
- > Digital printing; OR
- > Approved black plastic film die cut with sharp even edges applied to the background by means of a heat and pressure process in accordance with the material manufacturers recommendations.

Letter spacing: Legends shall fill the length of sign blanks to the extent that a length of clear reflectorised background approximately equal to 1.5 times the letter spacing remains at each end of the blank.

Approval: The submission of details of the type of material to be used for the legends including manufacturer and trade name is a **HOLD POINT**.

4.4.2 Regulatory and warning signs

Requirement: Where specified symbols, legends and borders on regulatory and warning signs shall be provided on the reflective material by either:

- > Silk screening or Digital printing in transparent ink, the colours of which shall closely match the standard colours given in *AS 2700* as follows.

Red	Colour code R13	Signal Red
Green	Colour code G12	Standard Green

The ink shall be applied in such a thickness as to give a luminance contrast ratio between screened surface and adjacent unscreened background material of not less than 7 to 1 nor more than 15 to 1, when viewed under retro-reflected light at 4 degrees entrance angle as defined in *AS 1906*.

OR

- > Silk screening in opaque black screening ink of an approved brand compatible with the sheeting as recommended by the sheeting manufacturer;

OR

- > Reverse screen processing for signs with a narrow width of legend, border or symbol.

Inks: In all cases, inks shall be applied without toner unless otherwise specified, and shall be thinned only as recommended by the ink manufacturer, and to the extent necessary to obtain an even coating. The inks used shall be of an approved brand recommended by the sheeting manufacturer as compatible with the sheeting.

Approval: Submission of the details of the type of material to be used for the legends etc., including manufacturer and trade name is a **HOLD POINT**.

4.4.3 Guide signs

Requirement: The application of retro-reflective lettering, symbols and borders to the background shall be performed in strict accordance with the sheeting manufacturer's recommendations.

Chevrons requirements:

- > Chevrons shall be cut from a single sheet of retro-reflective material.
- > Formation of the chevron symbol using a number of strips of retro-reflective material is not permitted.

Letters and numerals in retro-reflective material requirements:

- > Letters and numerals in retro-reflective material shall be die cut.
- > All letters and numerals on the one sign shall be cut using the same roll of sheeting and the same set of dies.

Letter over butt joints requirements:

- > The vertical stroke of letters and numerals shall not be located over a vertical butt joint in the sign blank.
- > Where the horizontal stroke of letters, numerals, symbols and borders is located over a vertical butt joint in the sign blank, the retro-reflective material shall be cleanly cut on the line of the vertical butt joint.

Application of non-reflective lettering, symbols and borders requirements:

- > Application shall be by silk screen or digital printing or by applying letters, symbols and borders which have been die cut from an approved non-reflective sheeting which is suitable for use and compatible with the reflective sheeting background.
- > The application of the non-reflective lettering, symbols and borders shall be carried out in accordance with the recommendations of the manufacturer of the reflective background sheeting.

Durability: The lettering symbols and borders shall have a life expectancy equal to or greater than the life expectancy of the reflective sheeting background to which they are applied.

Approval: Submission of the details of the type of material and method of application of non-reflective lettering symbols and borders is a **HOLD POINT**.

4.5 Packing, transportation and storage of sign blades

Requirements:

- > Signs shall be braced, packaged and wrapped to prevent damage during storage, transit and handling. Interleaves of suitable material shall be provided between adjoining faces.
- > Each package of sign blades shall have a manufacturers notice fixed to the outside giving clear instructions of the particular transportation and storage requirements.
- > All packaging, transportation and storage shall be in strict accordance with the sheeting manufacturer's recommendations.

Damaged signs: The Authorised Person may reject any or all signs found to be damaged through the actions of the Contractor or his agents. The Contractor shall raise a non-conformance report with a proposed disposition for approval of the Authorised Person for any damaged signs as soon as practicable after discovery of such damage.

5 DURABILITY AND WARRANTIES

5.1 Sign face materials

Requirement: The Contractor shall provide a warranty that all retro-reflective and fluorescent materials used in the manufacture of signs to this Specification shall, when exposed to normal usage, remain in good condition in the following respects:

- > No evidence of cracking, crazing, peeling or lifting from the substrate, delamination, blistering, chalking, wrinkling or edge shrinkage greater than 2mm;
- > No evidence of fading or appreciable colour change, except that loss of fluorescence in a fluorescent material will be accepted, provided that the colour change is not significant;

Retro-reflective materials warranty requirements:

- > The warranty requires maintenance of a photometric performance equal to at least the percentage of the Coefficients of Luminous Intensity (CIL) values shown in the **Sign warranty periods table** as given in the *photometric performance tables in Section 2 of AS 1906.1* for the corresponding type and colour at all entrance and observation angles given in those Tables.
- > The warranty shall apply for the following periods as shown in the **Sign warranty periods table**. The time for the end of the warranty shall be from the date of manufacture as indicated on the sign by stampings or engravings in accordance with **Installation, Reference markings**

Table 14-6 Sign warranty periods table

Sign Face Material	Sign Warranty Period	Retained Min CIL (%)
Class 1100	12	80
Class 1100 (White with EC(1) overlay film)	12	80
Class 1100 digital printed	12	80
Class 1100 screen printed	12	80
Class 1100 fluorescent reflective Orange	12	80
Class 1100 fluorescent reflective Yellow and Yellow Green	12	80
Class 400	12	80
Class 400 (White with EC ⁽¹⁾ overlay film)	12	80
Class 400 digital printed	12	80
Class 400 screen printed	12	80
Class 100	7	50

Sign Face Material	Sign Warranty Period	Retained Min CIL (%)
Class 100 screen or digital printed or White with EC ⁽¹⁾ overlay film	7	50
Non-reflective (sheeting or coating)	7	Not applicable
VHB joining strip	12	Not applicable

Notes:

(1) EC = electronic cuttable

Retroreflective materials must retain a photometric performance (CIL %) of at least the percentage shown in the **Sign warranty periods table** throughout the warranty period. Non-reflective material must retain its integrity and effective colour and appearance.

5.2 Sign structure

Requirement: The Contractor shall provide a warranty that the sign structure shall remain in good condition in all respects, except from damage caused by accidents or vandalism. The warranty period shall be equal to that specified in the **Sign warranty periods table** for the relevant legend/border and background combination of sign face material.

5.3 Warranty claims

Claims: If any sign structure, retro-reflective or fluorescent material used on a sign deteriorates to a condition poorer than those indicated in **Sign face materials and Sign Structure** within the time limits therein specified, the Contractor shall replace the sign on a pro-rata basis as follows:

- > Failure within 1 year of stamped date - total cost of supply, delivery and erection of a new sign to be borne by the Contractor.
- > Failure after more than 1 year from the stamped date - the Contractor to bear the total cost of supply and delivery of a new sign less an allowance equal to that cost multiplied by the ratio of the expired life to the total warranty life.

Responsibility: The Contractor shall be solely responsible for meeting all claims under these provisions, and shall not reassign any such responsibility to any other organisation, excepting that in the case of sign face material, the Principal will accept a performance warranty complying with the requirements of **Sign face materials** from the manufacturer of the material.

6 INSTALLATION

6.1 Provision for traffic

Requirement: Conform to *MITS 01 Traffic Management*.

Works protection: The Contractor shall provide for traffic management in accordance with the requirements of *AS 1743* while undertaking the work.

Temporary traffic arrangements: Details of Temporary Traffic Management (TTM) Plans shall be submitted to the Authorised Person for endorsement prior to submission for approval to the Road Authority for each situation. The Contractor shall obtain approval from the Road Authority for all necessary temporary traffic management prior to commencing any work. The traffic management used on site must comply with the approved details. The Authorised Person shall have the right to remove any personnel and equipment from site that do not comply with the approved details.

Costs: All costs associated with traffic management including the preparation and submission of TTM Plans to the Road Authority including payment of all fees shall be allowed for by the Contractor.

Timing: The approval of TTM Plans by the Road Authority may take up to seven working days to process. The Contractor must allow for this lead time in their works program scheduling.

Traffic controllers: All personnel involved in traffic management shall be fully trained and be able to demonstrate their competency by holding relevant RMS traffic controller cards. Traffic controllers shall be clearly identified on site and shall carry their card on their person while engaged in traffic control.

6.2 Reference markings

Requirement: The manufacturer's symbol, computer drawing number and where applicable, sign number and the month and year of delivery shall be clearly and permanently stamped or engraved in ciphers, approximately 12mm high on the rear of each sign, positioned as follows:

Fingerboards and street name signs

- > For single sided signs, the markings shall be located on the rear of the sign blade between the bolt holes.
- > For double sided signs, the markings shall be located between the bolt holes on the side of the sign blade which has the initial letter of the legend on the left end and the bolt holes on the right end.

Other signs:

- > On the rear of each sign blade, parallel to and close to the lower right hand edge, include the month and year of delivery. The month and year shall be separated by a stroke.
- > Marking shall be done in such a manner that the faces of the signs are not damaged in any way.

6.3 Location

Requirement: Signs shall be located in strict accordance with details shown on the authorised Traffic Control Device Plans, approved Inventory Forms and with details as shown on *ACTSD-3601*.

Non-conformance: Any sign which is deemed by the Authorised Person to be incorrectly located, shall be relocated at no additional cost.

Sign orientation requirements shall be in accordance with *Appendix D of AS1742.2*:

- > Signs shall generally be aligned approximately 95 degrees to the direction of the traffic they are intended to serve.
- > On left hand curved alignments, the angle of placement should be determined by the course of approaching traffic (200m from the sign) rather than the orientation of the road at the point where the sign is located.
- > On right hand curved alignments, the sign shall be placed on the normal to the road to the sign position.
- > Any trees and undergrowth within three metres of the sign support structure and along a driver's line of sight to the front of the sign shall be cleared and removed.

Approval: Submission of details of set out for inspection by the Authorised Person including the proposed location and alignment of each sign support structure is a **HOLD POINT**.

6.4 Mounting height

Requirement: The mounting height for each sign shall be in accordance with details shown on

ACTSD-3601, *ACTSD-3620* and *ACTSD-3630* and in accordance with *AS 1742.2* for the appropriate sign.

Existing support posts shall be extended or trimmed to achieve the specified sign mounting height.

Frangible slip base support posts have minimum clearance heights that shall be complied with.

6.5 Supports

6.5.1 General

Requirements for the supply and installation of support posts are as follows:

- > Support posts shall be permanently secured and free standing in the ground, without supplementary props or supports.
- > Frangible posts may be required, refer *ACTSD-3630* for requirements.
- > All materials used shall be compliant with the relevant Standards.
- > Support posts shall be cut from a continuous length of stock material. Welding of pieces together to make up the required post length will not be allowed unless approval is given for existing installed posts to be extended to suit new sign blades.
- > The top of each support post shall extend sufficiently beyond the upper extrusion section or bolt holes on the sign panels to enable attachment of the signs.
- > All posts shall finish 50mm below the top of the sign blade and be fitted with approved galvanised steel caps.

- > Where extension of posts is approved or directed, extensions shall be formed from one piece of the same diameter and equal or greater wall thickness pipe and shall be securely clamped to match the existing post alignment prior to being continuously butt welded around the circumference. Welds shall be ground flush and painted with two coats of inorganic zinc silicate followed by an approved 'chrome' spray top coat to match adjacent galvanised finishes.
- > Where details of posts and footings are not specified in the Contract, the basic design of the sign supports shall be in accordance with details shown on *ACTSD-3630*.

Multi-post support requirements:

- > Posts in multi-post supports shall be of the same diameter and wall thickness, be uniformly spaced, aligned accurately and finished to a common level. For signs with aluminium stiffeners, the maximum spacing between the centres of posts shall be 2300mm and the maximum end overhang of the sign from the centre of post to the edge of the sign blade shall be 750mm.
- > The tops of the posts on multi-post support installations shall be at the same level except where sign shape or the arrangement of sign panels dictates otherwise.

Support structures in high risk areas shall meet the following requirements:

- > High risk areas include zones within 50 metres of urban arterial intersections including intersections with major collector roads, traffic islands, roundabouts, the verge adjacent to the outside edge of small radius curves, traffic calming devices such as slow points and raised platforms, pedestrian crossings, parking areas, town centres and group centres)
- > A low maintenance sign socket system shall be used for all posts sizes up to and including 114.3mm diameter. This system allows removal and replacement of damaged posts without excavation and shall be used where tubular posts are surrounded by paving (e.g. concrete, asphalt, segmental paving etc.) and in locations identified as high risk areas.
- > Alternative mounting systems proposed for use will require approval from the Road Authority.

Support structures in low risk areas: Locations identified as low risk areas (for example rural roads and residential streets), posts shall be cast directly into concrete footings.

Support structures bracing and repair requirements are as follows

- > Sign panels shall be suitably supported and braced and the sign face protected from damage. Signs damaged during erection shall be repaired to a standard equivalent to the original sign or replaced by the Contractor at the Contractor's cost.
- > Galvanised coatings on purpose-designed support structures which are scratched or slightly damaged during erection shall be renovated by using an organic zinc-rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in *Appendix E of AS 4680*.
- > The method of renovation shall be restricted to areas not exceeding 2500 square millimetres on any one structure.
- > Any structure with totally damaged coating areas exceeding 2500 square millimetres shall be regalvanised.
- > The cost of regalvanising such damaged coating areas shall be borne by the Contractor.

6.5.2 Sign support details

6.5.2.1 General

Requirement: Any detailed design drawings and calculations for signs, such as urban arterial / freeway signs or others as required in the following Sections or in special circumstances, require the submission of detailed design calculations and drawings. The preparation and submission of the required details shall be the responsibility of the Contractor and is a **HOLD POINT**.

6.5.2.2 Street Name Signs, Regulatory Signs, Warning Signs and Hazard Markers

Requirement: Street name signs, regulatory signs, warning signs and hazard markers shall be installed on either single or multiple tubular steel posts. Frangible slip base galvanised steel or proprietary frangible fluted aluminium posts may be required for large signs. Posts shall be as detailed on *ACTSD-3630* unless otherwise specified.

6.5.2.3 Guide signs

Requirement: Guide sign supports shall be installed in accordance with **Supports, General** with the following additional requirements related to the proposed support structure:

Tubular post mounted

- > Guide signs shall be installed on either single or multiple galvanised tubular steel posts,

Frangible post mounted

- > Unless otherwise specified, posts for frangible support systems shall be slip base galvanised steel or proprietary fluted aluminium complying with the relevant Standards.
- > Galvanised steel frangible posts shall comply with the requirements of the *Queensland Department of Main Roads Standard Drawings 1363 Drawing 2 of 2, 1365 and 1368*.
- > Proprietary fluted Signfix aluminium posts installed to the manufacturers instructions. Multiple post support systems shall utilise the same material type per sign installation.
- > Unless otherwise specified, frangible supports are to be used for all modular installations.
- > Where details of the support and sign face stiffening are not provided in the Contract Documentation, drawings and calculations shall be prepared by an approved Practising Structural Engineer for the Contractor prior to manufacture. Drawings shall be fully detailed and shall show the proposed means of strengthening the sign face and achieving post frangibility.
- > The cost of these drawings, calculations and submission shall be included in the rates generally.
- > The granting of any approval by the Superintendent shall not remove the liability for the performance of the support system from the Contractor.

Overhead gantry mounted

- > Support posts for overhead gantry mounted guide signs shall be galvanised steel complying with the relevant Standards.
- > Where details of the support and sign face stiffening are not provided in the Contract, drawings and calculations shall be prepared by a Chartered Professional Engineer specialising in Structural Engineering for the Contractor and submitted for approval prior to manufacture. Drawings shall be fully detailed and shall show the proposed means of strengthening the sign face and providing protection of the posts against impact by errant vehicles.
- > All supports shall be attached to the concrete footing by securing with suitable strength galvanised bolts cast into the concrete foundation.
- > The granting of any approval by the Superintendent shall not remove the liability for the performance of the support system from the Contractor.

Overhead cantilever mounted

- > Posts for overhead cantilever mounted guide signs shall be galvanised steel complying with the relevant Standards.
- > Where details of the support and sign face stiffening are not provided in the Contract, drawings and calculations shall be prepared by a Chartered Professional Engineer specialising in Structural Engineering for the Contractor and submitted for approval prior to manufacture. Drawings shall be fully detailed and shall show the proposed means of strengthening the sign face and achieving post frangibility.
- > All supports shall be attached to the concrete footing by securing with suitable strength galvanised bolts cast into the concrete foundation.
- > Where a frangible support cannot be provided, details for a proposed alternative arrangement are to be submitted for approval.

6.5.3 Support set-out tolerances

Requirement: Tolerances on spacing and alignment for posts shall be as set out in the **Tolerances for spacing and alignment of support posts table**

Table 14-7 Tolerances for spacing and alignment of support posts table

Post Type	Tolerance
Face alignment (multi-post signs)	+/- 5mm
Verticality over the height of the sign	+/- 2.5mm
Post spacing (centre to centre) (multi-post signs)	Average spacing +/- 5mm

6.6 Footings

General requirements:

- > The footings for a simple post support or the footings for each post of a purpose-designed sign support structure shall be constructed in accordance with the drawings, or with the details shown on *ACTSD-3630* or as directed by the Authorised Person.
- > The footings shall be neatly excavated to the depth, diameter and width shown on the drawings. The material from the excavation shall be disposed of in a responsible and legal manner.
- > Concrete used in the footings of sign support structures shall comply with *MITS 06 Concrete kerbs, footpaths and minor works* and have a minimum compressive strength at 28 days of 20MPa for post support footings and 32MPa for purpose designed support footings. If ready mixed concrete is used, the concrete shall be mixed and delivered in accordance with *AS 1379*
- > Steel reinforcement shall be placed as shown on the Drawings.
- > When anchor bolt assemblies are specified they shall be accurately placed and firmly supported. Anchor bolt assemblies shall be provided with levelling nuts under the sign structure baseplates to allow adjustment of the structure after installation.

Socket requirements:

- > Anchor sockets for single post signs shall be fitted with a locking pin as detailed or similar approved method, to prevent twisting of the socket within the footing.
- > Sockets shall finish flush with the finished ground surface and be installed in such a manner as to ensure verticality and correct alignment and spacing of sign posts.

The preparation and submission of the required details for the excavation of support Structure footings shall be the responsibility of the Contractor and is a **HOLD POINT**.

6.7 Mounting height

Requirement: The mounting height for each sign shall be in accordance with details shown on

ACTSD-3601 and in accordance with *AS 1742.2* for the appropriate sign. Sign heights shall be adjusted to the Authorised Persons approval to ensure that signs and brackets do not obscure light column asset numbers.

6.8 Sign blade attachment

6.8.1 Fingerboards and street name signs

Requirements:

- > Fingerboards and street name sign blades shall be fixed to posts with 10mm diameter galvanised hexagon head bolts, either directly in the case of centrally mounted signs, or with approved proprietary mounting brackets to facilitate end-of-blade mounting or top-of-post mounting.
- > Where sign blades are required to be attached to lighting columns or similar column structures which cannot be drilled for through bolting, they shall be fixed to the columns with 12mm wide by 0.75mm thick Grade 201 stainless steel banding, secured with approved mechanical locking devices.
 - One strap shall be provided at each sign bolt location and shall be fitted with a stainless steel stand-off bracket to accept the sign bolt or where necessary, the blade mounting bracket.
 - The stand-off brackets shall be fixed to the banding in such a way as to prevent removal.
 - Where necessary to facilitate tightening of the banding around octagonal columns and the like, stainless steel packing pieces shall be fitted between the column and the banding, and the whole assembly made secure.
 - Loose or otherwise poorly constructed banding assemblies will be rejected.

6.8.2 Regulatory and warning signs

Requirements:

- > Regulatory and warning signs shall be fixed to posts with 10mm diameter galvanised cup head bolts.
- > Nuts shall be fitted and tightened within a cup washer of a size which will not allow the entry of a standard 10mm. socket.
- > Where sign blades are required to be attached to lighting columns or similar column structures which cannot be drilled for through bolting, they shall be fixed to the columns with 12mm wide by 0.75mm thick Grade 201 stainless steel banding, secured with approved mechanical locking devices.
 - One strap shall be provided at each sign bolt location and shall be fitted with a stainless steel stand-off bracket to accept the sign bolt.
 - The brackets shall be fixed to the banding in such a way as to prevent removal.
 - Where necessary to facilitate tightening of the banding around octagonal columns and the like, stainless steel packing pieces shall be fitted between the column and the banding, and the whole assembly made secure.
 - Loose or otherwise poorly constructed banding assemblies will be rejected.

6.8.3 Guide signs

Requirements:

- > Guide signs shall be attached to posts by the use of approved proprietary sand-cast aluminium adjustable brackets or galvanised steel saddle brackets, both complete with 10mm diameter galvanised cuphead square necked bolts.
- > One bracket shall be provided at each available connecting point between posts and lateral supports. Each bracket shall be a snug fit over the sign post.
- > Oversize and undersize brackets will be rejected and each sign shall have only one type of fixing bracket.
- > Care shall be taken to avoid distortion of the blade stiffeners by overtightening of fixing bolts.

7 COMPLETION

7.1.1 Submissions

Work as Executed Records: To *MIT5 00B Quality Requirements*.

7.1.2 Testing

Testing: Unless otherwise specified all testing required to prove conformance under this Section of the Specification shall be carried out by a laboratory which is registered with the National Association of Testing Authorities.

Records: Submit copies of all test results to the Authorised Person within two working days of receipt unless noted otherwise in this Specification. The Contractor shall store and distribute the test certificates and other inspection records as specified.

7.1.3 Nonconforming work

Requirement: Unless otherwise specified, a non-conformance report shall be submitted to the Authorised Person for any non-conformance detected. Work shall not proceed on any nonconforming item until the Authorised Person has approved the disposition for the non-conformance.

This is a **HOLD POINT**.

8 MEASUREMENT AND PAYMENT

8.1 Measurement

8.1.1 General

Payments made to the Bill of Quantities: To *MIT5 00A General requirements*, this Specification, the drawings and **Pay items**.

Warranties: Any costs associated with the provision of warranties as set out in this Specification are to be included in the rates generally

8.1.2 Methodology

The following methodology will be applied for measurement and payment:

- > Allow for all work, materials, testing and quality assurance requirements in each Pay Item.
- > Concrete footings for posts: Paid under this Specification and not *MIT5 06B Paths, Driveways and Medians*.
- > Direction, information and route numbering Guide Signs: To the following pay items:
 - 14.1 Manufacture of Guide Signs
 - 14.2 Manufacture of Guide Sign support structures
 - 14.3 Erection of Guide Sign support structures
 - 14.4 Erection of Guide Signs
 - 14.5 Dismantle and remove Guide Signs including structure
 - 14.6 Relocate Guide Sign

> All other signs (including 'I' section street name blades) excluding direction, information and route numbering Guide Signs: To the following pay items:

- 14.7 Manufacture of General Signs
- 14.8 Erection of General Signs support structure
- 14.9 Dismantle and Remove General Signs
- 14.10 Dismantle and Remove of General Signs support structure
- 14.11 Relocate General Sign

8.2 Pay items

Table 14-8 Pay items table

Item No	Pay items	Unit of measurement	Schedule of rates scope
14.1	Manufacture of Guide Signs	Square metre of sign	All costs associated with the manufacture of the sign including mounting extrusions, labelling, packaging, delivery to site, storage and handling and erection including hessian covers where required. Signs are to have the background and legend type as specified.
14.2	Manufacture of Guide Sign support structures	Tonne of sign support structure	All costs associated with the manufacture of the support structure including hot dip galvanising of steel support posts, fittings, packaging and delivery. A separate pay item shall be included in the Contract for each sign structure type. For example; <ul style="list-style-type: none"> 14.2.1 Steel Tubular Post Mounted 14.2.2 Steel Tubular Post Mounted – Frangible 14.2.3 Proprietary Fluted Aluminium Tubular Post Mounted – Frangible 14.2.4 Overhead Gantry Mounted 14.2.5 Overhead Cantilever Mounted
14.3	Erection of Guide Sign support structures	Per post	All costs associated with the setting out of the work, clearing, excavation of footings in any material (including rock), erection of the sign support structure, bracing, casting of concrete footings (regardless of size) and hold down bolt assemblies where required. For example; <ul style="list-style-type: none"> 14.3.1 Steel Tubular Post Mounted 14.3.2 Steel Tubular Post Mounted – Frangible 14.3.3 Proprietary Fluted Aluminium Tubular Post Mounted – Frangible 14.3.4 Overhead Gantry Mounted 14.3.5 Overhead Cantilever Mounted
14.4	Erection of Guide Signs	Square metre of sign	All costs associated with the erection of the guide sign including all fixings.

Item No	Pay items	Unit of measurement	Schedule of rates scope
14.5	Dismantle and remove Guide Signs including structure	Per sign	All costs associated with dismantling supporting structures including footings, backfilling of footings, transport to spoil site, disposal fees and restoring the location where they were dismantled with topsoil, seed and bitumen straw mulch or restored to match the existing adjacent surface or as directed otherwise by the Authorised Person.
14.6	Relocate Guide Sign	Per sign	All costs associated with the re-erection of the existing guide sign including all fixings.
14.7	Manufacture of General Signs	Per sign	All costs associated with the manufacture of the sign including mounting extrusions, labelling, packaging, delivery to site, storage and handling and erection including hessian covers where required. Signs are to have the background and legend type as specified.
14.8	Erection of General Signs support structure	Per post	All costs associated with the setting out of the work, clearing, excavation of footings in any material (including rock), erection of the sign support structure, bracing, casting of concrete footings (regardless of size) and hold down bolt assemblies where required.
14.9	Dismantle and Remove General Signs	Per sign	All costs associated with dismantling the road signs including disposal fees and labour.
14.10	Dismantle and Remove of General Signs support structure	Per post	All costs associated with dismantling supporting structures including footings, backfilling of footings, transport to spoil site, disposal fees and restoring the location where they were dismantled with topsoil, seed and bitumen straw mulch or restored to match the existing adjacent surface or as directed otherwise by the Authorised Person.
14.11	Relocate General Sign	Per sign	All costs associated with the re-erection of the existing general sign including all fixings and extension of existing posts to achieve the specified sign mounting height.
14.12	Provision of low maintenance sign socket system	Per sign socket	Extra over Pay Item 14.3 or Pay Item 14.8 to supply and install an approved sign socket system including all materials.



Transport Canberra and
City Services

July 2019