# ROAD FURNITURE AND TRAFFIC CONTROL DEVICES

DIPL Roadworks Master - July 2023

## Cross Reference

PAVEMENT MARKING for Audio Tactile Pavement Marking.

## Standards and Publications

Conform to the following Standards and Publications unless specified otherwise:

**AUSTRALIAN STANDARDS**

| **Table – Australian Standards** | |
| --- | --- |
| Use Standards, and their amendments, current as at the date for the close of tenders except where different editions and/or amendments are required by statutory authorities, including, but not limited to, NATA and the National Construction Code including the Building Code of Australia. | |
| **Designation** | **Title** |
| AS 1012(series) | Methods of testing concrete |
| AS 1074 | Steel tubes and tubulars for ordinary services |
| AS 1111(series) | ISO metric hexagon commercial bolts and screws |
| AS 1112(series) | ISO metric hexagon nuts, Including thin nuts, slotted nuts and castle nuts |
| AS/NZS 1252 (series) | High strength steel bolts with associated nuts and washers for structural engineering |
| AS 1273 | Unplasticised PVC (UPVC) downpipe and fittings for rainwater |
| AS 1397 | Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium |
| AS/NZS 1428.4.1 | Design for access and mobility – Means to assist the orientation of people with vision impairment - Tactile ground surface indicators |
| AS/NZS 1554(series) | Structural steel welding |
| AS/NZS 1594 | Hot rolled steel flat products |
| AS/NZS 1604.1 | Specification for preservative treatment – Sawn and round timber |
| AS 1722 | Pipe threads of Whitworth form - Fastening pipe threads |
| AS 1725(series) | Chain link fabric fencing |
| AS/NZS 1734 | Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate |
| AS 1742(series) | Manual of uniform traffic control devices |
| AS 1743 | Road signs - Specifications |
| AS 1744 | Standard alphabets for road signs |
| AS 1906(series) | Retroreflective materials and devices for road traffic control purposes |
| AS 1906.1 | * Retroreflective sheeting |
| AS/NZS 1906.2 | * Retroreflective devices (non pavement application) |
| AS 2423 | Coated steel wire fencing products for terrestrial, aquatic and general use |
| AS 2700(series) | Colour standards for general purposes |
| AS 2759 | Steel wire rope – Use, operation and maintenance |
| AS/NZS 3750.9 | Paints for steel structures - Organic zinc rich primer. |
| AS/NZS 3845.1 | Road safety barrier systems and devices - Road safety barrier systems |
| AS/NZS 4680 | Hot dip galvanized (zinc) coatings on fabricated ferrous articles |
| AS 4687 | Temporary fencing and hoardings |

**APAS SPECIFICATIONS**

APAS 1441/1 Permanent graffiti barrier, clear, exterior

APAS 1442/1 Temporary graffiti barrier, clear, exterior

APAS 1443 Graffiti Remover

APAS 2916 Organic zinc rich coating for protection of steel

**NT TEST METHODS AND MANUAL**

NTMTM NT Materials Testing Manual accessible via <https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/materials-testing-manual>

NTTM NT Test Methods

**OTHERS**

Department of Infrastructure, Planning and Logistics accepted road safety barriers at <https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/road-safety-barriers>

EN 1317 Road restraint systems

NCHRP 350 Recommended Procedures for the Safety Performance Evaluation of Highway Features

## Definitions

| **Table - Definitions – Road Furniture and Traffic Control Devices** | |
| --- | --- |
| **TERM** | **DEFINITION** |
| **CS** | Civil Standard drawing. Use the most recent version. Accessible via |
| <https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/standard-drawings> . |
| **Graffiti** | The name for images or lettering scratched, scrawled, painted or marked in any manner on property. |
| **Longitudinal Lines** | Any line which runs parallel to the road centre line, e.g. broken line, edge line, separation line, barrier line. |
| **Other Markings** | All diagonal lines, chevron markings and messages on the pavement, including symbols, words, numerals, arrows, and kerb markings. |
| **Tactile Ground Surface Indicator (TGSI)** | A device, or a number of devices, installed on a surface in a pedestrian path of travel, designed to provide pedestrians who are blind or vision-impaired with warning or directional orientation information. |
| **Traffic Control Device** | Any sign, signal, pavement marking or other installation placed or erected for the purpose of regulating, warning, guiding or providing for the safety of road users. It does not include temporary warning devices and control measures erected only for the construction period. |
| **Transverse Markings** | Any line which is at right angles to the centre line of the road, e.g. stop line, hold line, pedestrian cross walk. |

## Tactile Ground Surface Indicators – Witness Point

TGSI devices used must conform to AS/NZS 1428.4.1.

TGSI devices used must conform to AS 4586.

Use preformed plastic units.

Use integrated units. Do not use discrete units in outdoor applications.

Material is to be high density, fibre reinforced, UV stabilised, polymer containing Herculite, fabricated by a sheet moulding compression method.

Units must be fixed with tamper resistant screw fasteners.

Surface fixed units must have tapered edges.

Provide cast-in units which have lugs which are embedded in the concrete substrate and which enable replacement of the TGSI unit if it needs to be replaced. Concrete to be flush with TGSI units at the abutting edges.

Units must achieve, as a minimum, the performance criteria detailed in ***Table – TGSI Minimum Performance Standards***.

**Witness Point** – Provide a 5 year warranty for the materials used, and for the devices installed as tactile ground surface indicators. Provide a 5 year warranty for the workmanship for the installation of the tactile ground surface indicators. Both warranties to be in the name of the Principal.

**Witness Point** – Provide documentary evidence that the TGSIs meet the minimum performance criteria.

| **Table – TGSI Minimum Performance Standards** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Slip Resistance** | | | | | |
| **Test** | **Method** | **Result** | | **Class** | |
| **Warning Type** | **Directional Type** | **Warning Type** | **Directional Type** |
| AS 4586 Appendix A | Wet Pendulum  Slider 96 | 71 | 54 | P5 | P4 |
| Wet Pendulum  Slider 55 | 65 | 41 | P5 | P4 |
| AS 4586 Appendix C | Wet Barefoot Inclining Platform | 29° | 16° | C | A |
| AS 4586 Appendix D | Oil - Wet Inclining Platform | 24° | 22° | R11 | R11 |
| **Luminous Reflectance** | | | | | |
| **Test** | **Method** | **Dry Luminous Reflectance** | | **Wet Luminous Reflectance** | |
| **Warning Type** | **Directional Type** | **Warning Type** | **Directional Type** |
| AS/NZS 1428.4.1 Appendix E Luminous Reflectance | Luminous Reflectance  Material Colour - **White** | 73.5 | 74.6 | 72.5 | 73.7 |
| Luminous Reflectance  Material Colour - **Black** | 3.1 | 5.2 | 2.5 | 3.5 |
| Luminous Reflectance  Material Colour - **Yellow** | 55.3 | 57.2 | 54.2 | 54.3 |
| Luminous Reflectance  Material Colour - **Blue** | 19.5 | 20.9 | 18.4 | 19.5 |
| Minimum required luminance contrast between TGSI units and the surrounds/substrate is 30%. | | | | | |
| **Dimensions**: Must comply with AS/NZS 1428.4.1 | | | | | |
| **Colours**: Refer to drawings. | | | | | |

[Indicate any special requirements for TGSI colours if not shown on drawings.]

## Fencing

### General

Clearing fence lines includes the removal of trees, shrubs, vegetable matter and debris. Grub out all roots that interfere with the placement of posts.

Erect fences so that the line of the tops of the posts is uniform.

Adjust the position of posts to compensate for the irregularities of the ground.

Provide gates where specified and across existing access tracks or roads.

### Existing Fences

Install a post at the intersection of new fence with existing fence and fix the wiring of both fences to that post.

Complete the necessary sections of new fencing before removing or opening a boundary or internal fence.

[Not suitable for removal and re‑erection of fencing. Delete one of the options]

Obtain owner's agreement to proposed removal.

Notify the occupier in writing of the date the fence will be removed.

Erect gates or grids at fence openings as specified.

### Materials

Barbed wire: 1.57 mm diameter minimum, high tensile.

Plain wire: 2.50 mm diameter minimum, high tensile.

Wire mesh: Galvanized 3.15 mm diameter x 50 mm chain mesh.

### Stock Fence

Stock fencing to consist of tubular steel strainer assemblies with star pickets and galvanized wire. Construct as specified on Civil Standard Drawing CS 3310.

Include the crossing of gullies, watercourses and hollows on the ground.

### Security Fence

Security fencing to consist of tubular steel posts complete with post caps, cable straining wires, chainwire mesh and three barbed wires. Construct as specified on Civil Standard Drawing CS 3308.

### Temporary Site Safety Fence

[Indicate any special requirements for temporary site safety fences here.]

Materials, construction, and installation to AS 4687.

Erect the fence in accordance with manufacturer's and/or supplier’s specifications. Ensure installation methods are consistent with possible local weather events.

This sub-clause is not applicable to temporary road safety barriers for works. Refer to PROVISION FOR TRAFFIC, **NT Specific Directions for Road Work Signs** clause, **Road Safety Barriers** sub-clause, for temporary road safety barriers.

### Pedestrian Fence

To civil standard drawing CS 3307.

Refer to AS 1742.10, Pedestrian Fencing clause.

### Log Barrier Fence

Refer to **Recycled Plastic Bollards** sub-clause.

Provide log barrier fencing consisting of close spaced vertical bollards.

Use recycled plastic bollards or Stringybark, Woollybutt or Pine timber, pressure impregnated with ACQ preservative formulation, copper oxide (CuO) and quaternary ammonium compound (DDAC) to Category H4 of AS/NZS 1604.

Do not use preservative treatments that contain arsenic or chromium.

### Vehicle Movement Barriers/Fences

As per Civil Standard Drawing CS 3305.

Supply stock & half stock length pipe barriers.

Erect fences as ordered, so that the line of the tops of the posts is uniform.

Make allowance for excavation and concreting of anchor/footings.

Adjust the position of posts to compensate for the irregularities of the ground.

Minor clearing fence lines may include the removal of trees, shrubs, vegetable matter and debris. Grub out all roots that interfere with the placement of posts.

### Cyclist Holding Rails

Supply and erect new cyclist holding rails and delineators as per Civil Standard Drawings numberedCS 3302 and CS 3305

Or

Remove damaged rail and replace with new rail as per drawing.

Make allowance for excavation and concreting of anchor/footings.

Make allowance for minor clearing of fence lines

### Recycled Plastic Bollards

Supply round pre-moulded recycled plastic bollards, 1.5 m length x 150 mm dia with built in colours and UV stabilised, resistant to termites, microorganisms and moisture.

Install and ensure security of recycled plastic bollards as per manufacturer’s recommendations.

Make allowance for excavation and concreting of anchor/footings.

Make allowance for minor clearing of fence lines.

### Culvert Crossing Fences

Supply and erect Culvert Crossing Fences and delineators as per drawing.

Make allowance for Hot Dip galvanising and masonry chemical anchorage to headwalls.

Make allowance for excavation and concreting of anchor/footings. Refer to Civil Standard Drawing CS 3306.

Make allowance for minor clearing of fence lines.

Or

Remove damaged Culvert Crossing Fences and replace with new fences as per drawing.

Make allowance for excavation, removal and rehabilitation of anchor/footings.

## Plastic Flexible Guide Posts

### General

For the purposes of these Flexible Guide Posts clauses the following definitions apply:

* **Delineator:** Small retroreflectors or panels of retroreflective sheeting attached to guide posts to provide a coherent pattern of delineation of carriageway edges as an aid to night driving.
* **Flexible guide post:** A guide post that when impacted by a vehicle, deflects and returns to the vertical position without maintenance intervention.

Guide posts shall be constructed so that they do not constitute a hazard if struck by a

vehicle.

Guide posts shall be constructed of plastic, rubber, or similar proprietary product capable of recovering from an impact by returning to, or returning to within a margin of 5 degrees, of their original vertical state, post impact, without maintenance intervention, for the life of the guide post.

### Product data – Witness Point

**Witness Point -** Submit details of the proposed flexible guide post including the following:

* Manufacturer’s details on the materials, and the properties of the materials, used in the manufacture of the guide posts.
* Manufacturer’s recommended installation procedures.
* Technical specifications.
* Test results per the test sub-clauses

### Warranties – Witness Point

**Witness Point –** Submit the manufacturer’s published product warranties in the name of the Principal.

### Samples – Hold Point

**Hold Point -** Provide a sample flexible guide post from each batch purchased for this contract for inspection and approval before installing any posts.

### Materials

Flexible guide posts shall be composed of material which is:

* Heat resistant.
* Fire retardant.
* Capable of retaining 85% of its colour, appearance and physical properties for at least five years when exposed to weather conditions existing in the Northern Territory.
* Resistant to mould growth, and mildew.
* Not be affected by hydrocarbon solvents.
* Corrosion resistant or treated to resist corrosion.
* Resistant to ultraviolet light.
* Termite resistant.

#### Surface finish

Durable gloss or semi-gloss opaque white which is smooth and easy to clean. Free of sharp edges and burrs and discolouration or other defects that may affect its appearance and/or serviceability.

#### Colour

Whiter than Y35 Off White of AS 2700.

#### Dimensions

Minimum width: 100 ± 5 mm.

Minimum thickness: 4 mm.

Minimum height above ground surface: 1000 ± 100 mm.

#### Markings

Traceability: Mark each post legibly and indelibly with the following:

* Name of the manufacturer
* Name of the supplier (optional)
* Month and year of manufacture
* Batch number
* Product code or model/type identifier (to differentiate the supplied product from other similar products of different type or model)
* End of warranty date

Letter size: 5 to 10 mm high.

Marking of ground level: Mark 1000 mm from the top of the post.

#### Anchorage

Resistance to impact: Resistant to overturning, twisting and displacement from wind and impact forces when installed in the ground to manufacturer’s recommendations.

Resistance to removal: Installation must be resistant to vertical removal by persons other than authorised personnel using approved removal tools.

#### Delineators

**Rectangular retroreflectors**

Class 1A retroreflective material to AS 1906.1.

Size to be 200 mm x 50 mm for red delineators, white delineators, and for yellow delineators. Area minimum 100 cm² (10,000 mm²).

**Discrete device type retroreflectors**

Maximum projected face area for delineator devices to be 100 cm² (10,000 mm²). Minimum length of shortest projected dimension to be 60 mm.

[Not to be used except to denote special hazards. Ensure hazard is identified on appropriate drawing.]

**Installation of delineators**

Fix the delineators to the flexible guide post so that they are weatherproof and vandal resistant and so that they can be replaced if necessary without damaging the guide post.

Centrally locate delineators between the edges of the guide post and 50 mm from the top of the guide post.

The red delineator to be attached to the convex side of curved or shaped flexible guide posts where applicable.

On a two way single carriageway, attach one red delineator to the face of the road edge flexible guide post on the left hand side of the carriageway and one white delineator to the face of the road edge flexible guide post on the right hand side of carriageway. Note that these road edge flexible guide posts will have delineators on both sides.

On a single direction, single carriageway, attach red delineators to the face of the road edge flexible guide posts on the left hand side of the carriageway and yellow delineator to the face of the road edge flexible guide post on the right hand side of carriageway facing the traffic. Note that these road edge flexible guide posts will have delineators on one side only.

Attach any required discrete device type retroreflectors to manufacturer’s recommendations.

[Ensure drawings are included.]

### Installation of guide posts

Installation of the guide posts is to be to AS 1742.2.

Installation of the guide posts is to be to CS 3500.

Installation of the guide posts is to be to the manufacturer’s written installation guide or manual.

Curved or shaped guide posts installed on the left hand side of traffic lanes must be installed with the convex surface facing the traffic.

### Tests – Hold Point

**Hold Point** - Test results are to be provided as detailed in **Testing of Flexible Guide Posts** clause in this work section.

## Steel Flexible Guide Posts

Steel guide posts must conform to AS 1742.

Delineators fitted to them must conform to AS 1906.

Provide steel guide posts which are galvanized, and which are made from are 2mm thick steel or made from spring steel.

### General

For the purposes of these Steel Guide Posts clauses the following definition applies:

**Delineator:** Small retroreflectors or panels of retroreflective sheeting attached to guide posts to provide a coherent pattern of delineation of carriageway edges as an aid to night driving.

Steel guide posts shall be constructed so that they do not constitute a hazard if struck by a vehicle.

Stubs of broken steel guide posts which protrude from the ground are to be extracted from the ground and disposed of in a legal disposal site.

### Product data – Witness Point

**Witness Point -** Submit details of the proposed steel guide post including the following:

* Manufacturer’s details on the materials used in the manufacture of the guide posts.
* Manufacturer’s recommended installation procedures.
* Technical specifications.

### Warranties – Witness Point

**Witness Point –** Submit the manufacturer’s published product warranties in the name of the Principal.

### Samples – Hold Point

**Hold Point -** Provide a sample flexible steel guide post from each batch purchased for this contract for inspection and approval before installing any posts.

### Materials

Steel guide posts shall be composed of materials which are:

* Heat resistant.
* Fire retardant.
* Capable of retaining 85% of its colour, appearance and physical properties for at least five years when exposed to weather conditions existing in the Northern Territory.
* Resistant to mould growth, and mildew.
* Not be affected by hydrocarbon solvents.
* Corrosion resistant or treated to resist corrosion.
* Resistant to ultraviolet light.

#### Surface finish

Durable gloss or semi-gloss opaque white which is smooth and easy to clean. Free of sharp edges and burrs and discolouration or other defects that may affect its appearance and/or serviceability.

#### Colour

Whiter than Y35 Off White of AS 2700.

#### Dimensions

Minimum width: 100 ± 5 mm.

Minimum thickness: 2 mm.

Minimum height above ground surface: 1000 ± 100 mm.

#### Markings

Traceability: Mark each post legibly and indelibly with the following:

* Name of the manufacturer
* Name of the supplier (optional)
* Month and year of manufacture
* Batch number
* Product code or model/type identifier (to differentiate the supplied product from other similar products of different type or model)
* End of warranty date

Letter size: 5 to 10 mm high.

Marking of ground level: Mark 1000 mm from the top of the post.

#### Anchorage

**Resistance to impact:** Resistant to overturning, twisting and displacement from wind and impact forces when installed in the ground to manufacturer’s recommendations.

**Resistance to removal:** Installation must be resistant to vertical removal by persons other than authorised personnel using approved removal tools.

#### Delineators

**Rectangular retroreflectors**

Class 1A retroreflective material to AS 1906.1.

Size to be 200 mm x 50 mm for red delineators, white delineators, and for yellow delineators. Area minimum 100 cm² (10,000 mm²).

**Discrete device type retroreflectors**

Maximum projected face area for delineator devices to be 100 cm² (10,000 mm²). Minimum length of shortest projected dimension to be 60 mm.

[Not to be used except to denote special hazards. Ensure hazard is identified on appropriate drawing.]

**Installation of delineators**

Fix the delineators to the steel guide post so that they are weatherproof and vandal resistant and so that they can be replaced if necessary without damaging the guide post.

Centrally locate delineators between the edges of the guide post and 50 mm from the top of the guide post.

The red delineator to be attached to the convex side of curved or shaped steel guide posts where applicable.

On a two way single carriageway, attach one red delineator to the face of the road edge steel guide post on the left hand side of the carriageway and one white delineator to the face of the road edge steel guide post on the right hand side of carriageway. Note that these road edge steel guide posts will have delineators on both sides.

On a single direction, single carriageway, attach red delineators to the face of the road edge steel guide posts on the left hand side of the carriageway and yellow delineator to the face of the road edge steel guide post on the right hand side of carriageway facing the traffic. Note that these road edge steel guide posts will have delineators on one side only.

Attach any required discrete device type retroreflectors to manufacturer’s recommendations.

[Ensure drawings are included.]

### Installation of guide posts

Installation of the steel guide posts is to be to AS 1742.2.

Installation of the steel guide posts is to be to CS 3500.

Installation of the steel guide posts is to be to the manufacturer’s written installation guide or manual.

Curved or shaped steel guide posts installed on the left hand side of traffic lanes must be installed with the convex surface facing the traffic.

### Tests – Hold Point

**Hold Point** - Test results are to be provided as detailed in **Testing of Flexible Guide Posts** clause in this work section.

## Testing of Flexible Guide Posts

### Tests – Hold Point

All testing specified in this clause shall be undertaken by a NATA accredited laboratory. The vehicle impact testing can be undertaken by a non NATA accredited laboratory.

Testing and associated reports must not be more than three years old as of the date of tenders unless otherwise approved by the Principal.

[This requirement is to take in to account that manufacturing processes and materials used during manufacture may change. The tests must be done on posts which are proposed to be provided under the contract. Guide posts of each type or model from each batch must be tested.]

Test reports must verify that the tested samples have been marked as required by the **Markings** sub-clause. The reports must include photos of the markings, which must be clearly legible in the reports. At least one photo of the markings of each type or model of guide post from each different batch must be included in the reports.

**Hold Point –** This hold point is covered by the hold points in the clauses **Plastic Flexible Guide Posts** and **Steel Flexible Guide Posts** above.

Submit test results to the Superintendent in respect to the following characteristics before ordering the guide posts:

* Heat resistance.
* Cold resistance.
* Rigidity
* Vehicle impact.

#### Heat resistance testing

Heating: Condition posts at 60± 2°C for 2 hours in an oven.

Test procedure: Conform to the following:

* After conditioning, remove the post from the oven and clamp the base so that the post is vertical and protruding 1000 mm from the post top.
* Bend the conditioned post adjacent to the clamp in the direction of the adjacent traffic flow to form a 90° angle.
* Subject the post to 3 cycles of bending through 180° within 2 minutes of its removal from the oven so that the post is bent in a right angle. Release the post after the third cycle.
* Record the physical condition and horizontal deflection at the top of the post from a vertical line 30 seconds after release from the bent position. The deflection must not exceed 50 mm.

#### Cold resistance testing

Cooling: Condition post at 0 ± 2°C for 2 hours in an ice bath.

Test procedures: Conform to the following:

* After conditioning, remove post from the ice bath and clamp in a vertical position with the top of the post protruding 1000 mm.
* Bend the conditioned post adjacent to the clamp in the direction of the adjacent traffic flow to form a 90° angle within 30 seconds of its removal from the ice bath.
* Release the post from the clamp 60 seconds after removing it from the ice bath and place in the ice bath for an additional 60 seconds.
* Repeat the bending and ice bath procedure a further three times and release post from the bent position and record the horizontal deflection at the top of the post from a vertical line 60 seconds after release. The deflection must not exceed 50 mm.
* Return the post to ice bath for 60 seconds minimum.
* Remove the post from ice bath and place in a horizontal position, securely clamped so that the minimum clear length between supports is 1000 mm.
* Drop a 1 kg steel ball for a distance of 1500 mm vertically through a low friction guide so that it impacts the centre face of the post displayed towards the traffic.
* Recondition post in ice bath for 60 seconds.

Repeat ball dropping and reconditioning procedures. After the fifth ball drop, record the condition of the post. The flexible guide post must show no signs of fractures, cracks or splits.

#### Rigidity testing

Testing conditions: Conduct tests under the following conditions:

* Temperature: At 35°C ± 2°C.
* Clamps: Shape jaws of clamps to suit post profile so that the post cannot rotate in the clamp.

Test procedures: Conform to the following:

* Securely clamp post to a bench in a horizontal position with the top of post unsupported and protruding 1000 mm.
* Bend the post adjacent to the clamp in the direction of adjacent traffic flow to 90° and straighten. Repeat this procedure 10 times with maximum 3 minute intervals between procedures.
* Apply a 0.9 kg mass to a point 50 mm from the top of the post, in the direction of adjacent traffic flow. Record the vertical deflection of post top from its original position. The deflection must not exceed 130 mm
* Remove the mass and record the final deflection. The top of the flexible guide post must return unassisted to no more than 10 mm from its initial position within 10 minutes of the removal of the mass. Record the final deflection.

Alternative testing procedures: Conduct testing as for standard testing procedures. Instead of applying a mass, conduct testing in a wind tunnel with a wind speed of 12.5 m/s applied in the direction of the adjacent traffic flow with a maximum horizontal deflection at the top of 130 mm. After the wind is removed, the top of the flexible guide post must return unassisted to no more than 10 mm from the vertical position.

#### Maximum rigidity of flexible guide posts

Test procedures: Conform to the following:

* Securely clamp post to a bench in a horizontal position with the top of post unsupported and protruding 1000 mm.
* Apply a 10 kg mass to a point 50 mm from the top of the post, in the direction of adjacent traffic flow.
* Record the vertical deflection of post top from its original position. The deflection must exceed 500 mm.

#### Vehicle impact testing

Flexible guide 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 15ºC and 30ºC.

Flexible guide posts to be tested shall be installed in accordance with manufacturer’s recommendations, and shall be furnished complete with delineators.

The guide post shall be capable of withstanding a series of 10 bumper bar impacts at a speed of 60 km/h and five bumper bar impacts at a speed of 100 km/h directed at 90 degrees to the face of the guide post which has the red delineator attached to it.

The impacting vehicle shall suffer little or no damage during the impact tests. The guide post shall return to within five degrees of vertical within ½ hour of impact.

Test results which show the flexible guide posts are capable of withstanding the above vehicle impacts are to be provided to the Superintendent upon request. Test results to include video or photographic evidence. A minimum sample of three flexible guide posts must be tested.

## Road Signs

### General

This subsection specifies the manufacture, supply, delivery and erection of road signs.

### Anti-spear fixings for hazard markers (sight boards)

Anti-spear fixings and stiffener rails must be installed for hazard markers (D4-1-1A), and other signs at similar heights and with similar dimensions, which are installed parallel to the path of travel of traffic.

Hazard marker signs are to comprise two unidirectional D4-1-1A signs, mounted end to end.

The stiffener rails are to be aluminium extrusions, each made up of two equal length sections, spliced at the centre line. The aluminium extrusions are to be of alloy and temper as shown on the drawings.

Refer to Civil Standard Drawings CS-3516, CS-3517, and CS-3518, accessible via <https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/standard-drawings> .

### Remotely activated road condition information signs

These are fixed signs with some permanent messaging/text, and some variable messaging/text, with messaging varied via remote connection to electronic displays built in to the sign board.

Refer to the drawings.

Provide the signs including, but not limited to:

* the permanent messaging on the sign,
* the sign board and its posts, footings, and fixings,
* the solar panels, their support structures, the footings if any, and any ancillary cabling, conduits, fixtures and fittings,
* the cabinets, their footings if any, and any ancillary cabling, conduits, fixtures and fittings,
* all the components housed in the cabinets,
* the batteries,
* the electronic message display units,
* any slide in message plates (back up for when there is a failure of the electronic message display units which cannot be repaired in a short time frame),
* the communications devices and associated cabling, conduits, aerials, and connectors at the sign,
* any power supply devices and connectors at the sign,
* the communications devices and ancillary items at the base station, including portable computers, and
* all software required for the system to function properly. Software is to include notification back to base verifying sign display changes.

Make all connections and test the connections. Install and test all software. Ensure the sign works as intended.

Provide documented licensing details for any software or other items requiring licensing. Licences to be in the name of the Principal.

### Materials – Hold Point

NON‑REFLECTIVE MATERIALS

In accordance with AS 1743.

REFLECTIVE MATERIAL

Use high intensity Class 400 standard in accordance with AS 1906.1 for all signs, including temporary signs, and hazard markers with the exception that all black legends are to be non‑reflective.

BLANKS

Use aluminium marine grade alloy designation 5052 ‑ H38. Thickness 1.6 mm.

Steel sheets may only be used for temporary signs.

MANUFACTURE

Chemically clean aluminium blanks before painting or bonding of reflective material.

Stamp the month and year of manufacture and the symbol DIPL on the backs of all signs.

POSTS

Post sizes to conform to the ***Table - Roadside Signs - Mounting Selection*** unless specified otherwise.

| **Table – Roadside Signs – Mounting Selection** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sign Size** | | **Number of post** | **Sign Attachment Bracket (Or M8 Bolts) per Post** | **Galvanised Post size** | | **Min. Bored Pier footing size** | |
| **Width (mm)** | **Depth (mm)** | **OD**  **(mm)** | **Thickness (mm)** | **Diameter (mm)** | **Depth (mm)** |
| 300 | 300 | 1 | 2 | 60.3 | 4.5 | 300 | 600 |
| 300 | 450 | 1 | 2 | 60.3 | 4.5 | 300 | 700 |
| 450 | 450 | 1 | 2 | 60.3 | 4.5 | 300 | 800 |
| 450 | 300 | 1 | 2 | 60.3 | 4.5 | 300 | 700 |
| 450 | 600 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 450 | 750 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 450 | 900 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 600 | 450 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 600 | 600 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 600 | 750 | 1 | 2 | 60.3 | 4.5 | 300 | 1000 |
| 600 | 900 | 1 | 3 | 60.3 | 4.5 | 300 | 1000 |
| 600 | 1050 | 1 | 3 | 76.1 | 4.5 | 450 | 900 |
| 750 | 450 | 1 | 2 | 60.3 | 4.5 | 300 | 900 |
| 750 | 600 | 1 | 2 | 60.3 | 4.5 | 300 | 1000 |
| 750 | 750 | 1 | 2 | 60.3 | 4.5 | 450 | 900 |
| 750 | 900 | 1 | 2 | 76.1 | 4.5 | 300 | 1100 |
| 750 | 1200 | 1 | 3 | 76.1 | 4.5 | 450 | 1000 |
| 900 | 300 | 2 | 2 | 60.3 | 4.5 | 300 | 700 |
| 900 | 600 | 2 | 2 | 60.3 | 4.5 | 300 | 900 |
| 900 | 900 | 2 | 3 | 60.3 | 4.5 | 300 | 900 |
| 900 | 1200 | 2 | 4 | 60.3 | 4.5 | 300 | 1000 |
| 900 | 1350 | 2 | 4 | 60.3 | 4.5 | 300 | 1000 |
| 1050 | 600 | 2 | 2 | 60.3 | 4.5 | 300 | 900 |
| 1050 | 900 | 2 | 3 | 60.3 | 4.5 | 300 | 1000 |
| 1200 | 600 | 2 | 3 | 60.3 | 4.5 | 300 | 900 |
| 1200 | 900 | 2 | 5 | 60.3 | 4.5 | 300 | 1000 |
| 1500 | 800 | 2 | 4 | 76.1 | 4.5 | 300 | 1100 |
| 1800 | 600 | 2 | 3 | 76.1 | 4.5 | 300 | 1100 |
| 1800 | 1200 | 2 | 6 | 88.9 | 5.0 | 450 | 1100 |
| 2000 | 1200 | 2 | 6 | 88.9 | 5.0 | 600 | 1100 |
| 2400 | 1200 | 2 | 6 | 88.9 | 5.0 | 600 | 1100 |
| 2400 | 1800 | 2 | 9 | 101.6 | 5.0 | 600 | 1200 |
| 3000 | 600 | 2 | 3 | 88.9 | 5.0 | 600 | 1000 |
| 3000 | 1200 | 2 | 6 | 101.6 | 5.0 | 600 | 1200 |
| 3000 | 1500 | 2 | 8 | 114.3 | 5.4 | 600 | 1300 |
| 3000 | 1800 | 2 | 9 | 114.3 | 5.4 | 600 | 1300 |
| 3700 | 600 | 2 | 3 | 88.9 | 5.0 | 600 | 1000 |
| 3700 | 1200 | 3 | 6 | 101.6 | 5.0 | 600 | 1000 |
| 3700 | 1800 | 3 | 9 | 101.6 | 5.0 | 600 | 1200 |
| 3700 | 2400 | 4 | 12 | 101.6 | 5.0 | 450 | 1300 |
| 4300 | 600 | 2 | 3 | 101.6 | 5.0 | 600 | 1200 |
| 4300 | 1200 | 3 | 6 | 101.6 | 5.0 | 600 | 1200 |
| 4300 | 1800 | 3 | 9 | 114.3 | 5.4 | 600 | 1300 |
| 4900 | 600 | 3 | 3 | 88.9 | 5.0 | 600 | 1100 |
| 4900 | 1200 | 3 | 6 | 114.3 | 5.4 | 600 | 1300 |
| 4900 | 1800 | 3 | 9 | 114.3 | 5.4 | 600 | 1300 |
| 5500 | 600 | 3 | 3 | 88.9 | 5.0 | 600 | 1100 |
| 5500 | 1200 | 4.0 | 6 | 101.6 | 5 | 600 | 1200 |
| 5500 | 1800 | 3.0 | 9 | 139.7 | 5.4 | 600 | 1400 |
| 6100 | 600 | 3.0 | 4 | 101.6 | 5 | 600 | 1200 |
| 6100 | 1200 | 3.0 | 6 | 114.3 | 5.4 | 600 | 1400 |
| 6100 | 1800 | 4.0 | 9 | 114.3 | 5.4 | 600 | 1300 |
| **Note:**   1. All designs are based on wind load, not traffic impact force 2. All posts shall be Grade 250min. 3. All posts must be capped for corrosion protection. 4. All posts must be **HOT DIP GALVANISED**. 5. All Posts must be fully cast in (with 100mm clearance from the base) and located centrally to footing. 6. Top of concrete footing must be domed around post to eliminate water pooling. 7. Dimensions above are **NOT APPLICABLE** for structure has overall height **exceed 3m above ground**. 8. Dimensions above are **NOT APPLICABLE** for soil has bearing capacity **less than 100kpa.** 9. For signs highlighted above posts shall be installed with **slip base** as per NTG standard drawing CS3508.   V.17May2021 | | | | | | | | |

Road signs mounting pole sizes other than the sizes shown in the ***Table - Roadside Signs - Mounting Selection*** are:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table - Roadside Signs – Non Standard Mounting Poles Selection** | | | | | | |
| **Location** | **Sign size W x D (mm)** | **No. and NB Gal. Pipe Posts** | **Brackets or M8 bolts per post** | **Bracing req. (Yes/No)** | **Footing** | |
| **Depth (mm)** | **Dia. (mm)** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

*[Delete this clause and the table if no non-standard pole sizes are required.]*

Posts to be hot-dip galvanized pipe with plain ends and constructed from a single length of pipe. Cap each post with a galvanized cap. Do not use “Ingal” posts.

Standard; to AS 1074.

ANTI-GRAFFITI COATING

**Hold Point –** Obtain Superintendent’s approval for the use of anti-graffiti film or coating products. Apply anti-graffiti products only to the new road signs specified by the Superintendent.

Ensure anti-graffiti products used do not compromise or void any warranty on the road signs on which the anti-graffiti products are used.

[All roads Project Officers BE AWARE that 3M warrants their road signs only if their anti-graffiti film is used. Use of non-3M anti-graffiti product voids the 3M warranty.]

### Supply and Delivery

Supply all brackets, bolts, nuts and bracings.

Fix bracings to the signs prior to delivery.

### Location

Signs to be located clear of vegetation and be clearly visible under headlight illumination.

LATERAL PLACEMENT

[Ensure the sign location is shown on the drawings and is designed to allow easy sighting, for ease of road maintenance, and in compliance with design requirements.]

Lateral placement to be measured to the edge of the sign nearest the road.

Lateral placement to be as follows:

Unkerbed roads: 2 to 4 m clear from the edge of the traffic lane, and 600 mm minimum clear from the outer edge of the road shoulder.

Kerbed roads: 500 mm to 1000 mm from the front face of the kerb.

HEIGHT

Height to be measured as the clearance to the lowest edge of the lowest sign in an assembly.

Heights for signs to be as follows:

|  |  |
| --- | --- |
| **Table – Heights for signs** | |
| **Unkerbed Roads** | |
| Fingerboard (G3) and  street name signs (G5): | 2 m above the near edge of the pavement. |
| Other signs: | 1 m to 1.5 m above the near edge of the pavement. |
| **Kerbed Roads:** | |
| Signs overhanging a footway: | 2.5 m minimum above footway. |
| Signs not overhanging a footway: | 1 m to 1.5 m clearance except for those specific signs on medians and islands given below. |

|  |
| --- |
| **Table – Height of specific signs on medians and islands** |
| The following signs, when used on medians and islands, to have a clearance 150 mm above the kerb: |
| D4‑1‑2 Hazard Marker |
| D4‑2‑2 Hazard Marker |
| D4‑3 Hazard Marker |
| R2‑3 (Keep Left) (Keep Right) |
| R2‑5 (No U Turn) |
| R2‑6 (No Right Turn) (No Left Turn) |
| R2‑15 (U Turn Permitted). |

### Installation

Conform to the ***Table Roadside Signs - Mounting Selection*** in **Materials** sub-clause in **Road Signs** clause in this work section.

Install posts vertically.

Provide and install a galvanised steel sleeve when installing sign posts in concreted or paved medians.

Sleeves, when specified, to be 50 mm longer than the specified ground anchor (footing) depth and extend 50 mm above the finished surface level.

Attach the post to the sleeve with a galvanized M10 bolt, 25 mm from the top of the sleeve.

Where post sleeves are not used, embed posts in a concrete footing.

Encase/ embed the post, or sleeve when used, in a footing of 25 MPa concrete (as per **Table – Roadside Signs – Mounting Selection**).

Orientation of sign face: Vertical, and turned 3 degrees to 5 degrees horizontally from oncoming traffic on straight sections. On curves, at right angles to centre line of road.

Exception: Parking signs to be oriented 5 degrees from parallel to the kerb to face oncoming traffic.

### Reinstatement and Relocation of Existing Signs

Dismantle existing post and signs carefully.

Store in a manner to prevent damage.

Backfill the hole left by the post and its footing and compact the fill to the same density as the surrounding area.

Erect signs in new locations as shown on the drawings.

GENERAL REQUIREMENTS

* Adopt the post requirements for the nearest sign size in the list for intermediate sizes.
* Refer to ***Table Roadside Signs - Mounting Selection*** for post sizes and footing requirements

## Flood Gauge Posts

### Posts and Gauges

Use a standard flood gauge in accordance with Civil Standard Drawing CS 3501.

Use galvanized posts, single length 150 mm x 50 mm x 3 mm RHS with a 3 mm end cap welded to the top.

Paint welds with zinc rich organic paint to APAS specification 2916.

### Installation

Erect the post vertically at the outer edge of the road shoulder or margin, on the left hand side when viewed in the direction of travel.

Install a concrete anchor, of 20 MPa concrete, with a depth of 650 mm and a diameter of 300 mm.

Cast a suitable galvanized sleeve, 650 mm in length, in the anchor so that the sleeve extends 50 mm above the finished surface level.

Attach post to sleeve with a galvanized M10 bolt 25 mm from the top of the sleeve.

Secure gauge to post with No 10 galvanized Tek screws or 4 mm blind pop rivets at 300 mm centres staggered alternately each side.

Position gauge zero to comply with lowest spot on floodway along the centre line.

## Cattle Grids

Construct grids to the details shown on the Civil Standard Drawings CS 3310, CS 3313, CS 3314, and CS 3315.

Place the grid centre line on the centre line of the road pavement.

The grid grade and levels to conform to the grade and levels of the adjacent road pavement.

Place and compact select fill behind the abutments of the grid, up to the base of the pavement.

Reinstate pavement layers with base material.

Reinstate surface.

Tighten all hold down bolts as specified.

Paint the portion of guardrails above ground with one coat zinc phosphate primer and two coats of white alkyd paint.

Fix width markers with epoxy adhesive to each guardrail.

Construct strainer post assemblies as specified.

Fix the stock fence to the strainer assembly.

Supply and install a gate in the fencing adjacent to the grid as specified.

Refer to Civil Standard Drawings CS 3310 and CS 3312.

[Ensure that the required Standard Drawings are included. Delete reference to drawings not applicable to project.]

## Road Safety Barriers - Steel Beam Guardrail System

### Materials

Refer to Civil Standard Drawing CS 3200 and <https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/road-safety-barriers> for the installation of accepted MASH tested products.

RAILS

Use accepted MASH tested steel beam rail to AS/NZS 3845.1and per the Department’s Safety Barrier Technical Conditions of Use, which are accessible via the link shown above, and the related Manufacturer’s product manual.

TERMINAL SECTIONS

Use accepted MASH tested terminals as per the Department’s Safety Barrier Technical Conditions of Use and the related Manufacturer’s product manual.

POSTS

Use posts and block outs as detailed in the Manufacturer’s product manual of accepted MASH tested safety barriers as per the Department’s Safety Barrier Technical Conditions of Use.

GALVANIZING

All accepted MASH tested steel rail product components as per the Department’s Safety Barrier Technical Conditions of Use and the related Manufacturer’s product manual shall have been hot dip galvanized, after fabrication, to AS/NZS 4680.

Where the galvanising on guard rail or associated fittings has been damaged, the coating shall be repaired by regalvanising or by painting with a minimum of two coats of a zinc‑rich inorganic paint in accordance with AS/NZS 3750.9 and one coat of aluminium paint.

Provide certificate(s) of compliance from the galvanizer that the galvanizing complies with AS/NZS 4680.

### Compliance

**Traceability of components -** To AS/NZS 3845 Part 1.

(a) All steel rails, posts and other critical components shall be permanently marked in lettering at least 10 mm high with the name of System Manufacturer, the date and month of manufacture the grade of steel and base metal thickness (BMT) to allow the product to be traced.

(b) Where plastic components make up a key element of the system, they shall be permanently marked clearly indicating the month and year of manufacture in a location that can be easily inspected.

(c) Bolts shall be marked in accordance with AS 1111.1 or AS/NZS 1252.

### Installation

Erect the rail in a manner that produces a smooth, continuous, taut rail closely conforming to the line and grade of the roadway.

Lap rails so that the exposed ends of the rails do not face oncoming traffic from the adjacent lane.

Attach retroreflective delineators to the guardrail in accordance with the manufacturer's specification.

Delineator heights to match heights of delineators on guide posts.

Delineator dimensions shown in **Flexible Guide Posts** clauses, **Materials** sub-clauses, **Delineators** sub-sub-clauses, in this work section.

## Road Safety Barriers – Steel Wire Rope System – Hold Point

Materials and installation to AS/NZS 3845.1, to AS 2759, to the Department’s Safety Barrier Technical Conditions of Use, and to the manufacturers’ product manuals.

Use only accepted MASH tested steel wire safety systems.

**Hold Point** – Obtain Superintendent’s approval for any proposed Steel Wire Rope Road Safety Barrier System before ordering any components.

Attach retroreflective delineators to the guardrail in accordance with the manufacturer's specification.

Delineator heights to match heights of delineators on guide posts.

Delineator dimensions shown in **Flexible Guide Posts** clauses, **Materials** sub-clauses, **Delineators** sub-sub-clauses, in this work section.