Technical Note 189

Generic Road Safety Poles

July 2024

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Contents

1 Purpose

The purpose of this technical note is to provide the functional specification and minimum structural requirements for the design, manufacture and installation of 3.5 m and 5.6 m generic poles for road safety equipment.

2 Definition of terms

Table 2 – Definition of terms

Term	Definition
OD	Outer Diameter
PCD	Pitch Circle Diameter
RPEQ	Registered Professional Engineer Queensland
RSP	Road safety pole

3 Referenced documents

Table 3 lists the referenced documents in this technical note.

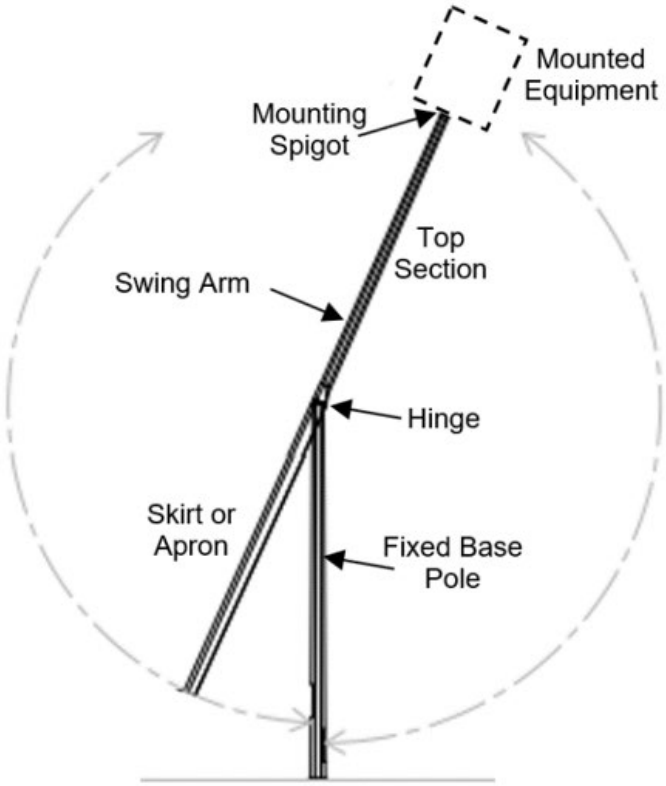
Table 3 – Referenced documents

Reference	Title
AS 2339	*Traffic signal posts, mast arms and attachments*
AS/NZS 1170.2	*Structural design actions. Part 2: Wind actions*
Electrical Safety Act	*Electrical Safety Act 2002*
MRTS78	*Fabrication of Structural Steelwork*
MRTS97	*Mounting Structures for Roadside Equipment*
MRTS225	*Imaging*
MRTS228	*Electrical Switchboards*
Standard Drawing 1328	*Road Lighting/ITS – Lighting/Camera Pole Anchor Cage Fabrication Details*
Standard Drawing 1684	*Road Lighting/ITS - Base Plate Mounted Hinged Pole Footing Installation Details for Crossfalls Up to and Including 1:2*

4 General

Generic road safety poles (RSP) shall be either fixed length poles or mid-hinged poles consisting of two sections connected by a hinge that enables the top section to swing down at the hinge around the fixed base pole. Refer Figure 4 indicative layout and key terminology for mid-hinge pole.

Figure 4 – Mid-hinge pole key terms



The RSPs shall be a generic design that can accommodate a variety of different road safety equipment (mounted equipment) such as road safety cameras, flash units or radar units. The poles shall:

- be fit for purpose
- require minimal maintenance, and
- comply with the Workplace and Health and Safety requirements, i.e. any safety chain and connection device shall be secured and robust.

5 Design requirements

5.1 General

All RSPs shall:

- have a 50 year minimum design life
- be made of structural steel with hot dip galvanised finish
- be fixed base plate mounted type, utilising anchor cage in accordance with Standard Drawing 1328. Footing design to be site specific as per Section 5.8, and
- RSPs shall be permanently labelled (refer Section 5.2 for codes) to allow easy identification of pole type.

Mid-hinge RSPs shall:

- be able to utilise counterweights to balance the pole around the hinge so that the pole can be safely swung with minimal effort
- include skirt or apron designs such that the open section encompasses the fixed base pole
- provide one pulling eye located near the bottom of the skirt or apron so that a rope may be connected and used to lower / raise the hinged section
- have two independent latching systems to hold the swing arm in a vertical position (skirt or apron in place), each of sufficient strength to restrain the RSP from lowering:
  - one system shall comprise a tamper-proof stainless-steel bolt of appropriate strength to hold the apron rigidly to the fixed base component of the RSP, free from movement. This 'lock down' retaining bolt to be located minimum 800 mm above the base of the RSP
  - the other system shall comprise a lug welded to the outside face of the fixed base section and protrude through the apron when in the upright position. A padlock shall be used to prevent unauthorised lowering of the top section, therefore provision to be made to protect the padlock from being tampered with, i.e. being cut with an angle grinder. This padlock protection system shall not impede the removal of the lock down retaining bolt (for example, impacting the operator's hand), and
- be designed such that it is not possible for the mounted equipment to touch the ground when the swing arm is lowered. For design, assume that the maximum height of the mounted equipment is 1 m.

5.2 Loading

The RSPs shall be designed to withstand dead and wind loads, without permanent deformation of the pole, including all potential attached components and equipment (such as various mounted equipment and any internal electrical cabling / equipment).

Five different configurations of RSPs are acceptable:

- Three types of 3.5 m poles:
  - Type 1 mid-hinged to handle mounted equipment in the range 0 to 50 kg (35RSPT1)
  - Type 2 mid-hinged to handle mounted equipment in the range 51 to 100 kg (35RSPT2)
  - Type 3 fixed to handle mounted equipment in the range 0 to 100 kg (35RSPT3).
- Two types of 5.6 m poles:
  - Type 1 mid-hinged to handle mounted equipment in the range 0 to 30 kg (56RSPT1)
  - Type 2 fixed to handle mounted equipment in the range 0 to 100 kg (56RSPT2).

Mid-hinge designs shall incorporate suitable counterweights. Refer Section 5.4 for details.

5.2.1 Wind loading

The RSP design shall comply to MRTS97 *Mounting Structures for Roadside Equipment*.

5.2.2 Sail area

Due to the number of various devices that need be catered for and the expected addition of new devices in future, the RSPs will need to be designed for a conservative sail area as provided in the following tables, refer Section 5.3.

5.3 Design Parameters for the RSPs

All poles shall be designed for common top and base connections.

Table 5.3(a) – Pole top spigot and base connection requirements

Element	Dimension	Unit
Pole top, to connect to	101.6 OD spigot with max 113.6 (+0/-2) OD lip	mm
Pole base, to connect to	350 PCD anchor cage via 4 x M24 bolts	mm

Variations in design parameters for the five different RSP configurations are noted below.

Table 5.3(b) – Design parameters for RSP types

RSP Type	Overall pole height (m)	Mid-Hinge or Fixed	Mounted Equipment	
			Weight range (kg)	Sail area (m²)
35RSPT1	3.5	Mid-hinge	0-50	1.0
35RSPT2	3.5	Mid-hinge	51-100	1.0
35RSPT3	3.5	Fixed	0-100	1.0
56RSPT1	5.6	Mid-hinge	0-30[1]	0.5[1]
56RSPT2	5.6	Fixed	0-100[1]	0.5[1]

Note 1: 5.6 m poles allow for multilevel attachments as per Section 5.12. Weight and sail area listed are total with pole design to allow for full load to be located at top of spigot.

5.4 Counterweight system for mid-hinge poles

The design shall incorporate a suitable counterweight system securely housed within the skirt or apron of the swing arm as well as the pole top. Counterweights are to be in nominal 3.0 kg or 6.0 kg increments with the design drawings to include a table of counterweight installation arrangements required to counterbalance the various combinations of mounted equipment at the top of the pole, to enable safe lowering and raising of the swing arm.

Mid-hinge RSPs to be supplied with all required counterweights positioned as required for the proposed attachments for each individual pole. Refer to Section 7.2 for additional details regarding installation and operation of mid-hinge poles. Refer to Appendix A for details of different attachments.

5.5 Deflection

Lateral deflection of the pole from the vertical position under serviceability limit state shall be calculated according to AS/NZS 1170.2 and shall not exceed 1% of the vertical section height of the RSP. Deflection is to be measured at the base of the mounting spigot.

5.6 Mounting spigot requirement

At the top of the swing arm of the RSP, a 300 mm mounting spigot is required to support various mounted equipment. The spigot design shall have a suitable restraining mechanism for the maximum weight and sail area, refer tables in Section 5.3. The spigot shall be 101.6 mm outside diameter with an additional lip in the form of flat plate welded to the spigot 40 mm from the spigot top. Outside diameter of lip to be 113.6 mm with a + mm / -2 mm tolerance.

5.7 Electrical requirements

5.7.1 Internal conduits

Provide two internal 1 x 50 mm Orange and 1 x 50 mm White flexible, corrugated medium duty, conduits affixed to the inside of the pole to protect the electrical and communication cables at the hinge during lowering and raising operations. The electrical conduit shall be extended to the top of the spigot below the cap and the communications conduit will finish at the bottom of the spigot.

The length of the conduit shall be from the top of pole to 100 mm past the lower switchboard mounting plate when pole in folded position and secured at an accessible point above the lower switchboard mounting plate to prevent movement.

5.7.2 Internal equipment

Refer to Section 7.1 for details and dimensions regarding internal equipment such as switchboards and terminal strips that need to be housed within the RSP opposite the access hatch opening.

5.8 Mounting foundation 350 PCD

The pole design shall be compatible with a 350PCD anchor cage as per Standard Drawing 1328.

Typical footing and anchorage details to be in line with Standard Drawing 1684 with 1 x 50 mm White and 1 x 80 mm Orange conduits are required through the foundation and the pole base to permit electrical cabling access. As Standard Drawing 1684 footing details table does not cover RSPs, a pole with site specific footing design is required to be certified by a Registered Professional Engineer Queensland (RPEQ).

Where non-standard foundations are proposed, such as reuse of existing or attachment to a structure, RPEQ certification is required which includes assessment of the structure's suitability to take pole loading, the ability to attach without causing damage and suitable stiffness to prevent excessive deflection and vibration of the pole.

5.9 Access hatch

An access hatch and door are required in the fixed base component of the RSP to access the internal electrical equipment (refer Section 7.1).

The minimum hatchway size is height 600 mm x width 180 mm. The door needs to be lockable and at least two keys are required to be supplied with the RSP. The RSP needs to be designed in a way that there is unobstructed access to the hatch and operation of the door including for mid-hinge poles when the swing arm is either in the upright or lowered positions. The locking mechanism cover / lock cover hatch shall be designed to open 180°.

Additional access doors shall be provided in RSP to connect mounted equipment as per the below table.

Table 5.9 – Details of additional access door location and size for the RSP types

RSP Type	Additional Access Door Location (to connect mounted equipment)		Access door size, minimum (mm x mm)
	Mid-height (for multi-level attachment)	Below Spigot	
35RSPT1	No	Yes	190 x 70
35RSPT2	No	Yes	190 x 70
35RSPT3	No	Yes	190 x 70
56RSPT1	Yes (above hinge, approximately 100 mm form the hinge)	Yes	190 x 70
56RSPT2	Yes (to suit mounted equipment at approximately 3 m from the base)	Yes	190 x 70

5.10 Mid-hinge pole securing tether

A securing tether (chain or wire) is required to hold the swing arm in the lowered position. It shall be permanently connected to the top section of the swing arm, 300 mm below the mounting spigot. The tether length shall be nominated by the designer to secure the pole in the tether hold at the lowered position. An associated connecting eye is required on the fixed base pole to connect the securing tether when swing arm is in lowered position.

5.11 Spigot attachments

Top of pole attachments, as noted in Appendix A, are to utilise a socket to mount over the spigot with details as per Section 5.6. The attachment socket over the spigot is to be designed and fabricated by the mounted equipment vender and fixed with grub screws located under the spigot lip designed to prevent movement during operation and prevent release in the event of a collision.

5.12 Multi-level attachments

Multi-Level attachments can be considered for 5.6 m poles (both fixed and mid-hinge) where required as stated below:

- Devices can be connected to the top Spigot via a special bracket fabricated by mounted equipment vendor.
- Devices can be connected at 3 m high for fixed poles or slightly above hinge for mid-hinge poles with a bracket fabricated by mounted equipment vendor. Bracket to be secured such that it won’t slip in either upright or hinged pole position.
- Total weight and sale area limits as per Section 5.3. Design is to accommodate total limits at top of pole. Any attachment at lower location will reduce top spigot load proportionally to ensure allowable total weight and sail area are not exceeded.
- Access door and cable gland penetrations (4x16dia holes @ 90°) in pole to be provided to suit.

5.13 RSP design acceptance

RSP designs shall be reviewed and accepted by the Department of Transport and Main Roads, Engineering and Technology, Structures Directorate prior to commencement of fabrication. The submission shall consist of all relevant engineering drawings, structural design calculations and RPEQ certification.

6 Manufacture

6.1 Fabrication requirement

All steelwork shall be fabricated in accordance with the supplier's departmental-approved engineering drawings for RSPs and MRTS78 *Fabrication of Structural Steelwork*.

6.2 Pole Marking

Manufacturer must clearly mark the RSPs with their pole type as either 35RSPT1, 35RSPT2, 35RSPT3, 56RSPT1 or 56RSPT2 depending on the type manufactured.

7 Installation

7.1 Electrical installation requirements

The RSP shall internally house an electrical switchboard with an underground power supply. This shall comply with MRTS228 *Electrical Switchboards* and *Electrical Safety Act* 2002 requirements. Access to the internal void of the fixed base section of the pole is via the access hatch. The RSP shall be designed to securely support the entire switchboard with the backing plate and a loop terminal strip inside the pole and opposite the access hatch door. Requirements are:

- A mounting plate (welding inside the pole) for mounting an IP66 rated electrical switchboard and a loop terminal strip, using self-drilling galvanised tek screws. The overall provisional allowance is:
  - For an electrical switchboard including the connectors and a backing plate of:
    - 3 kg weight, and
    - 450 mm height, 155 mm width and 110 mm depth (Figure 7.1(a)).
  - The switchboard is delivered with an attached 2 mm thick backing plate. The top edge of the backing plate is rolled to an inverted U shape and the inner gap is 5 mm (Figure 7.1(b)), and
  - For a terminal strip 100 mm below the switchboard, mounting via a horizontal DIN rail of 125 mm long (Figure 7.1(c)).

The same RSP design shall also be used for flash equipment, where power is sourced from the camera pole. The backing plate shall contain the flash electrical components.

Figure 7.1(a) – Switchboard for camera front view

Note:

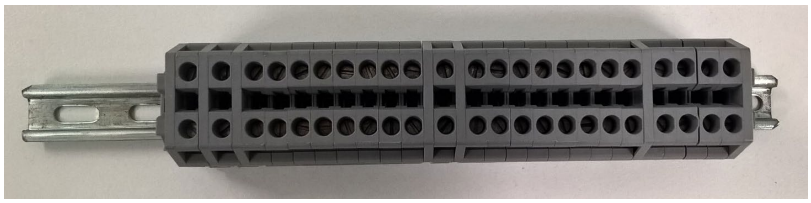
- Electrical switchboard 360 mm high, 125 mm wide and 100 mm deep.
- With the backing plate and connectors 450 mm high, 155 mm wide and 110 mm deep.

Figure 7.1(b) – Switchboard for camera side view with the backing plate and connections

Note:

- Side view of the switchboard with the 450 mm high backing plate.
- Glands shown for entry of the doubled insulated cables.

Figure 7.1(c) – Loop terminal connected to 125 mm long DIN rail



Further, equipotential bonding is intended to minimize the risks associated with the occurrence of voltage differences between exposed conductive parts of electrical equipment and extraneous conductive parts. The pole and unbonded conductive parts shall be bonded to the earthing stud arrangement as defined in Figure 2.5 of AS 2339.

For the mid-hinge RSP, an additional earthing stud shall be provided in both the pole sections to ensure equipotential bonding is achieved. The earthing stud in the lower fixed pole section shall be in a position to not obstruct the mounting of equipment on the mounting plate, using the earthing stud arrangement above. The earthing stud in the upper swing pole section shall be in a position that can be clearly accessed when the pole is folded and allows cabling connection between the two earthing studs.

7.2 RSP installation and operation

An installation and operation manual is to be supplied by the pole manufacturer. This manual needs to guide asset owner / operator to develop detailed safe work method statements for maintenance operations. This shall include the following at a minimum.

- installation of the pole
- safe operation for maintenance
- temporary removal of pole attachments which is critical for the counterweighted mid-hinge poles
- changing counterweights and any special training required, and
- maintenance access requirements

To comply with departmental guidelines, mid-hinge RSPs shall be positioned such that the swing arc of the top section is parallel with the adjacent roadway.

Using the tables in Appendix A for mid-hinge RSPs, the asset owner will advise the type of equipment to be installed once the poles are fabricated. The pole manufacturer can then balance the pole accordingly prior to shipping.

Appendix A – Load Table

Table A1 – 3.5 m pole loading

Model	Housing Only (kg)	Camera Only (kg)	Flash Only (kg)	QPS other devices (kg)	Total Weight (kg)
Redflex					
NK6 (camera)	38	30	N/A	3	71
NK6 (flash)	16.5	N/A	4	N/A	20.5
NK6 (flash double)	48	N/A	8	N/A	56
Halo 2.0[1]	21 (housing, camera and flash)	included in housing	included in housing	31 (pole top mounted cabinet)	52
Halo 2.1	36 (housing, camera and flash)	included in housing	included in housing	N/A	36
Distributed Halo	N/A	3.8 (1 camera)	3.7 (1 flash)	4.4 (1 radar)	11.9
	N/A	7.6 (2 cameras)	7.4 (2 flashes)	4.4 (1 radar)	19.4
	N/A	11.4 (3 cameras)	11.1 (3 flashes)	4.4 (1 radar)	26.9
Gatso					
RLC-GS (camera) – standard housing	45	17	N/A	3	65
RLC-GS (camera) – DAVRO housing	38	17	N/A	3	58
RLC-GS11 (flash)	15	N/A	3.5	N/A	18.5
RLC-GS11 (dual flash)	22		7	N/A	29

Model	Housing Only (kg)	Camera Only (kg)	Flash Only (kg)	QPS other devices (kg)	Total Weight (kg)
Jenoptik					
TraffiStar (camera)	65	20	N/A	3	88
TraffiStar (flash)	5	N/A	5	N/A	10
VECTOR point to Point (camera)	N/A	2.9 (1 camera)	N/A	N/A	2.9
	N/A	5.8 (2 cameras)	N/A	N/A	5.8
VECTOR point to Point (flash)	N/A	N/A	5.8 (2 floodlamps)	N/A	5.8
	N/A	N/A	11.6 (4 floodlamps)	N/A	11.6
	N/A	N/A	17.4 (6 floodlamps)	N/A	17.4
	N/A	N/A	23.2 (8 floodlamps)	N/A	23.2

Note 1: Halo 2.0 system is being replaced by the Halo 2.1 system. The pole mounted cabinet will be installed approximately 2.4 m high to the base of the cabinet.

Table A2 – 5.6 m pole loading

Model	Housing Only (kg)	Camera Only (kg)	Flash Only (kg)	QPS other devices (kg)	Total Weight (kg)
Redflex					
Distributed Halo	N/A	3.8 (1 camera)	3.7 (1 flash)	4.4 (1 radar)	11.9
	N/A	7.6 (2 cameras)	7.4 (2 flashes)	4.4 (1 radar)	19.4
	N/A	11.4 (3 cameras)	11.1 (3 flashes)	4.4 (1 radar)	26.9
Gatso					
GT20-S	N/A	14	N/A	7.32 (bracket)	21.32
Jenoptik					
VECTOR point to Point (camera)	N/A	2.9 (1 camera)	N/A	N/A	2.9
	N/A	5.8 (2 cameras)	N/A	N/A	5.8
VECTOR point to Point (flash)	N/A	N/A	5.8 (2 floodlamps)	N/A	5.8
	N/A	N/A	11.6 (4 floodlamps)	N/A	11.6
	N/A	N/A	17.4 (6 floodlamps)	N/A	17.4
	N/A	N/A	23.2 (8 floodlamps)	N/A	23.2