

Superseded

Technical Specification

**MRTS220 Third-Party Radio Facilities in Transport and
Main Roads Transport Corridors**

November 2022

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1 Introduction

This Technical Specification defines the technical requirements for the installation of radiotelecommunications Radio Facilities on Department of Transport and Main Roads transport infrastructure support structures such as Road lighting, Traffic Signals and ITS poles. It also defines the technical requirements for the location of Radio Facility ancillary infrastructure, including the typical location of Radio Facility pillars and cabinets, and new poles installed by a Carrier.

The department aims to uphold the *Mobile Phone Base Station Deployment Industry Code* (C564:2020), by promoting greater transparency between Transport and Main Roads and the Carriers for planning, site selection, installation and operation of Radio Facility Infrastructure on departmental assets.

For the purpose of this Technical Specification, a 'Radio Facility' is defined in Clause 2 and consists of equipment such as power supply, control devices (transceivers), modems, antennas, cabling, enclosures and mounting accessories associated with the broadcasting of mobile telecommunications owned by a licensed Carrier and installed onto a Transport and Main Roads transport infrastructure asset or assets located in close proximity to departmental transport infrastructure assets. Radio Facilities currently include 4G, 4G+, 5G, small cell and microcell infrastructure.

Radio Facilities are deployed by licenced telecommunication service providers (Carriers) in order to increase the capacity and coverage of their telecommunications network. It is anticipated that residential and commercial areas will need the highest density of such assets.

Safety is of paramount importance for the department so Radio Facilities mounted on departmental support structures must stay within the safe Electromagnetic Energy (EME) levels.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

2 Definitions of terms

The terms defined in MRTS01 *Introduction to Technical Specifications* apply to this Technical Specification. Additional terminology relevant to this Technical Specification is defined in Table 2 below.

Table 2 – Definitions of terms

Term	Definition
ACMA	Australian Communications and Media Authority
ANPR	Automatic Number Plate Recognition (Cameras)
ARI	Average Recurrence Interval
Carrier	The licenced telecommunications service provider seeking to install Radio Facility equipment on Transport and Main Roads poles, or their designated service provider for installation and/or maintenance
CCTV	Closed Circuit Television
CF	Condition Factor
COT	Certificate of Test

Term	Definition
Transceiver unit	A combination of the radiofrequency transmitter and receiver unit, (including power supply and accessories) for Radio Facility applications
EMC	Electromagnetic Compatibility
EME	Electromagnetic Energy
ELV	Extra Low Voltage – As defined in the Wiring Rules AS/NZS 3000
JUP	Joint Use Pole
HV	High Voltage - exceeding LV limits
ITS	Intelligent Transport Systems
LV	Low Voltage (between 50V-1000V a.c, or 120V-1500V d.c) – in this document LV generally refers to mains voltage (~ 230V)
NATA	National Accreditation and Testing Authority
NMI	National Meter Identifier
Radio Facility	<p>Radio Facility means a multiband capable, multiple input or output telecommunications system that is comprised of Equipment and to be mounted above ground for the purpose of connecting the Carrier's telecommunications network with its customers through the use of radiowaves, which is any of the following:</p> <ol style="list-style-type: none"> 1. Small Cell defined as: <ol style="list-style-type: none"> a. one or two omni antennae or dual panel antennae b. a radio frequency tilt and/or isolation switch c. fibre optic cable installed within or outside the column of a mounting structure d. an electricity connection installed within or outside the column of a mounting structure, and e. located on a pole or post. <p>or</p> <ol style="list-style-type: none"> 2. Microcell defined as: <ol style="list-style-type: none"> a. one or more single sector panels, flat, or omni-antenna b. physically compact ancillary infrastructure c. have separate or combined co-located baseband processing and radio module units which produce up to 15 watts of radio frequency transmission power in total d. operates in licenced spectrum with planned coverage of up 500 metres urban range, two or three high-bands, with the multiport capacity for multiple technology inputs (4G LTE, 5G, Wi-Fi, etc....) e. multiband a radio frequency tilt and/or isolation switch f. fibre optic cable installed within or outside the column of a mounting structure g. an electricity connection installed within or outside the column of a mounting structure, and h. located on a pole or post. <p>or</p>

Term	Definition
	3. is a low impact facility within the meaning of the <i>Telecommunications (Low Impact Facilities) Determination 2018 (Cth)</i> (as amended from time to time); and where the relevant telecommunication technology which would operate on the Radio Facility and Equipment is a replacement or advancement of the Radio Facility and Equipment is comprised of assets that fulfil the same limited range functions. For removal of doubt, this definition does not extend to the Carriers constructing new towers or poles in a State-controlled Road.
RITSS	Roadside ITS station
RCM	Regulatory Compliance Mark
RFNSA	Radio Frequency National Site Archive
RFR	Radiofrequency Radiation
RRU	Remote Radio Units – transceivers that enable connection to Radio Facilities networks
RPEQ	Registered Professional Engineer Queensland in accordance with <i>Professional Engineers Act 2002 (Qld)</i> for the relevant area of practice
SID	Safety in Design in accordance with <i>Work Health Safety Act 2011</i> and <i>WHSQ - Safe Design of Structures Code of Practice 2021</i>

3 Referenced documents

The requirements of the referenced documents listed in Table 3 below apply to this Technical Specification. Where there are inconsistencies between this Technical Specification and the referenced documents, the requirements specified in this Technical Specification shall take precedence.

Table 3 – Referenced documents

Reference	Title
-	<i>Electricity Act 1994</i>
AS/NZS 1170.2	<i>Structural design actions - Wind actions</i>
AS/NZS 2144	<i>Traffic signal lanterns</i>
AS/NZS 3000	<i>Electrical installations (known as the Australian/New Zealand Wiring Rules)</i>
AS/NZS 3015	<i>Electrical Installations - Extra-Low Voltage D.C. Power Supplies and Service Earthing Within Public Telecommunications Networks</i>
AS/NZS 3845.2	<i>Road Safety Barrier Systems and devices - Part 2: Road safety Devices</i>
AS/NZS 61000.6.1	<i>Generic standards—Immunity for residential, commercial and light industrial environments</i>
AS/NZS 61000.6.2.2	<i>Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems</i>
AS/NZS 61000.6.3	<i>Generic standards—Emission standard for residential, commercial and light-industrial environments</i>
AS1319	<i>Safety signs for the occupational environment</i>
AS4702	<i>Polymeric cable protection covers</i>
C564:2011 (Industry Code)	<i>Mobile Phone Base Station Deployment</i>
ES COP	<i>Electrical Safety Code of Practice 2020</i>

Reference	Title
ESA	<i>Electrical Safety Act 2002</i>
ESR	<i>Electrical Safety Regulation 2013</i>
Guideline	<i>Treatment options to improve safety of pedestrians, bicycle riders and other path users at driveways</i>
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS14	<i>Road Furniture</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS51	<i>Environmental Management</i>
MRTS61	<i>Gantries and Support Structures for Road Signs, Tolling Systems and ITS Devices</i>
MRTS71	<i>Reinforcing Steel</i>
MRTS78	<i>Fabrication of Structural Steelwork</i>
MRTS91	<i>Conduits and Pits</i>
MRTS97	<i>Mounting Structures for Roadside Equipment</i>
MRTS201	<i>General Equipment Requirements</i>
MRTS210	<i>Provision of Mains Power</i>
RPDM Volume 3 Part 3	<i>Road Planning and Design Manual (RPDM), Volume 3, Part 3: Geometric Design</i>
RPDM Volume 3 Part 4A	<i>Road Planning and Design Manual (RPDM), Volume 3, Part 4A: Unsignalised and Signalised Intersections</i>
RPDM Volume 3 Part 6	<i>Road Planning and Design Manual (RPDM), Volume 3, Part 6: Roadside Design, Safety and Barriers</i>
RPDM Volume 3 Part 6A	<i>Road Planning and Design Manual (RPDM), Volume 3, Part 6A: Paths for Walking and Cycling</i>
RPDM Volume 3 Part 6B	<i>Road Planning and Design Manual (RPDM), Volume 3, Part 6B: Roadside Environment</i>
SD1327	<i>Traffic Signals/Road Lighting - Mains Connections</i>
SD1333	<i>Traffic Signals/Road Lighting/ITS - Minimum Clearance of Overhead Electric Lines from Ground and Structures</i>
SD1370	<i>Road Lighting - General Arrangements</i>
SD1371	<i>Road Lighting - Base Plate Mounted Pole</i>
SD1372	<i>Road Lighting - Slip Base Pole</i>
SD1373	<i>Road Lighting - Base Plate Mounted Pole in Concrete Median Barrier</i>
SD1375	<i>Road Lighting - High Mast Pole</i>
SD1376	<i>Road Lighting - Base Plate Mounted Pole with Pedestrian Crossing Floodlight</i>
SD1377	<i>Traffic Signals/Road Lighting - Joint Use Traffic Signal and Road Lighting Pole</i>
SD1389	<i>Road Lighting - Slip Base Pole Male/Female Connectors Installation Details</i>
SD1390	<i>Road Lighting - Base Plate Mounted Pole Aerial Connection Wiring Details</i>
SD1399	<i>Road Lighting - Base Plate Mounted Pole Wiring Details</i>

Reference	Title
SD1400	<i>Road Lighting - Slip Base Pole Wiring Details</i>
SD1420	<i>Traffic Signals - General Arrangements</i>
SD1427	<i>Traffic Signals/Road Lighting - Mast Arm (U Series) Installation Details</i>
SD1428	<i>Traffic Signals - Traffic Signal Post Base Mounted</i>
SD1434	<i>Traffic Signals/Road Lighting - Cable Guard Manufacturing Details</i>
SD1624	<i>Road Lighting - Junction Box Single Phase Wiring Details</i>
SD1625	<i>Road Lighting - Junction Box Three Phase Wiring Details</i>
SDS - COP	<i>Safe Design of Structures – Code of Practice 2021</i>
TIA	<i>Transport Infrastructure Act 1994</i>
TRUM Volume 4 Part 3	<i>Traffic and Road Use Management (TRUM), Volume 4, Part 3: Electrical Design for Roadside devices</i>
TRUM Volume 4 Part 8	<i>Traffic and Road Use Management (TRUM), Volume 4, Part 3: Electrical Verification Requirements for New or Altered Roadside Installations</i>

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 4.1.

There are no Witness Points or Milestones defined in this Technical Specification.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
7.2.2.2	1. Pole condition assessment by Structural Engineering RPEQ.		
8.2.1	2. Detailed Design Documentation for review by Transport and Main Roads.		
8.2.2	3. Final As-Constructed documentation including drawings and Radiofrequency radiation information.		

5 Radio Facility Components

Radio Facilities that can be installed on departmental mounting structure poles are predominantly of the 5G type but can be of the 4G+ type. Radio Facility equipment typically consist of combinations of the following:

- pole-mounted (or ground mounted) radio facility transceiver unit comprising power supply unit and radio frequency modules

- cabling infrastructure including conduits, pits and cable guards
- telecommunications cabling (Fibre)
 - for pole mounted transceiver units, there is fibre cable to the pole.
 - for ground mounted cabinets, there is no fibre cable to the pole.
- electrical installation wiring including consumers mains, earthing, and electrical installation MEN earth cable. Power supply to the pole is typically:
 - LV mains to the pole, where pole-mounted enclosure is used, or
 - ELV submains to the pole, where ground-mounted enclosure is used.
- off-pole isolation, typically in the pit
- two on-pole isolation switches for isolating power and RFR, as follows:
 - tilt switch, for automatic isolation, and
 - manual switch.
- coaxial telecommunications feeder cabling connecting antennas to transceiver units, noting that the coaxial cable is longer when transceiver units on ground mounted cabinets are used than for pole mounted transceiver units
- antennas, and
- signage and labelling.

The installation requirements including placement and cabling requirements will depend on the radio facility configuration, namely, pole-mounted vs ground-mounted enclosure.

Installation requirements are discussed in Clause 7.

6 Transport and Main Roads poles

6.1 General

This Technical Specification only covers Radio Facility installations on transport infrastructure mounting poles owned by Transport and Main Roads and does not apply to Rate 1 or 2 road lighting poles. For Rate 1 or 2 lighting poles such as owned by electricity entities or poles owned by other local Government Authorities or other third parties' reference shall be made to their relevant standards and Technical Specifications.

Transport and Main Roads poles for mounting roadside devices are specified in MRTS97 *Mounting Structures for Roadside Equipment*. The standard drawings for the poles are listed in Table 3.

Poles which are hinged, such as CCTV swing poles and folding poles designed for equipment maintenance shall not be used for mounting Radio Facility infrastructure.

6.2 Slip base poles

Slip-base poles are equipped with safety mechanisms for the purpose of safely disconnecting in the event the pole is hit by an errant vehicle. The disconnection of slip-base pole has been tested to meet the expected conditions on the roadside environment.

Slip base poles are not to be used for the purpose of Radio Facility equipment installation unless it can be demonstrated by a qualified RPEQ engineer through appropriate testing that there is no reduction in all aspects of safety risk (that is, vehicular collision risk to all road users) and the existing safety mechanisms in place can be maintained.

The Carrier's RPEQ engineer is required to demonstrate through similar crash tests in accordance with the methodology specified in AS/NZS 3845.2, that the additional Radio Facility installation does not degrade the expected performance of the safety mechanism.

For details of slip base pole connection and wiring details, refer to SD1389 *Road Lighting - Slip Base Pole Male/Female Connectors Installation Details* and SD1400 *Road Lighting - Slip Base Pole Wiring Details*.

Additional installation requirements are detailed in Clause 7.

6.3 Poles with aerial wiring

Where base plate mounted poles supplied by an overhead electricity supply are selected for Radio Facility installation, the RPEQ designer of the Radio Facility installation is to undertake and certify the required engineering calculations and assessments to ensure the structural integrity of the Overhead Asset is maintained with the increased or otherwise altered structural loadings on the Overhead Asset.

For wiring details of base plate mounted poles where power is supplied by an overhead cable, refer to SD1390 *Road Lighting - Base Plate Mounted Pole Aerial Connection Wiring Details*.

Additional installation requirements are detailed in Clause 7.

6.4 Timber poles

Where Transport and Main Roads transport infrastructure timber poles are selected for Radio Facility installation, cable guards manufactured to departmental requirements shall be used for LV wiring.

Details of the cable guard manufacture can be found in SD1434 *Traffic Signals/Road Lighting - Cable Guard Manufacturing Details*. Transport and Main Roads approved polymeric guards designed to AS 4702 *Polymeric cable protection covers* may be used on timber poles.

An example of the use of the cable guard on a timber pole can be found in SD1327 *Traffic Signals/Road Lighting - Mains Connections*.

Additional installation requirements are detailed in Clause 7.

7 Installation requirements

This clause details the departmental requirements for:

- radio facility equipment placement, and geometric layout
- physical, mechanical and structural requirements, and
- electrical requirements.

7.1 General Placement / Geometric Layout

The Radio Facility equipment installed shall not:

- Infringe upon verge user or vehicle access on footpaths or vehicle running lanes.
- Infringe upon pedestrian or vehicle clear zones from footpaths or vehicle running lanes.

- Infringe upon pedestrian or vehicle sight lines on footpaths or vehicle running lanes, or
- Obstruct or infringe upon the service of Transport and Main Roads or other third-party devices already on the pole, or diminish the road safety function of any road safety installation. These include:
 - Luminaires or the distribution of light from the luminaires
 - Traffic signal lanterns or the visibility of the lanterns to road users
 - Pedestrian push buttons
 - Maintenance access openings for the poles
 - Maintenance access openings for signal cabinets poles
 - ITS devices such as CCTV cameras, Bluetooth, radars, Automatic Number Plate Recognition (ANPR) Cameras, pedestrian counters, RITSS devices and so on, and
 - Banner signage brackets.

Due to the typically limited structural loading capacity and internal chamber cross sectional area of poles, the general permitted arrangement for Radio Facility equipment installation is detailed below.

No part of the Radio Facility or associated cabling shall be attached to the street lighting outreach bracket on Transport and Main Roads poles.

The installation of a Radio Facility shall not block the full perimeter of the pole, so that a climbing zone is available to allow ladder access to the Pole top in a position that does not require the ladder to be placed on the road pavement. This will be assessed on a site-by-site basis.

7.1.1 Radio Facility enclosure placement

Where a Radio Facility installation is implemented using pole-mounted enclosure for housing the transceiver unit, the power supply to the pole may be LV.

Where a Radio Facility installation is implemented using ground-mounted cabinet for housing the transceiver unit, the power supply to the pole shall be ELV.

7.1.1.1 Radio Facility Transceiver unit

All transceiver unit equipment shall be mounted (in order of preference):

- within a suitable ground-mounted cabinet located at an approved position specified in Clause 7.1.4, with ELV to the pole, or
- within an approved pole mounted cabinet.

Where equipment is installed on a pole, it shall be placed 1 metre away from any existing hardware such as traffic signal, road lighting or ITS equipment and not more than 7 m up the pole.

Except where permitted in writing by Transport and Main Roads on an individual pole basis, the lockable transceiver unit enclosure, including the integral power supply unit and radio frequency modules, where installed on a pole, will not exceed 600 mm x 500 mm x 400 mm (Height x Width x Depth).

The transceiver unit enclosure shall be mounted within the permitted zones shown in Appendix A, and on the property / footpath side of the pole, and not be mounted over any part of the roadway including the kerb.

For enclosure structural and mounting requirements refer to Clause 7.2.

7.1.1.2 Cabling infrastructure including conduits and pits

Conduits and pits provided for Radio Facility installations shall comply with the requirements of MRTS91 *Conduits and Pits*.

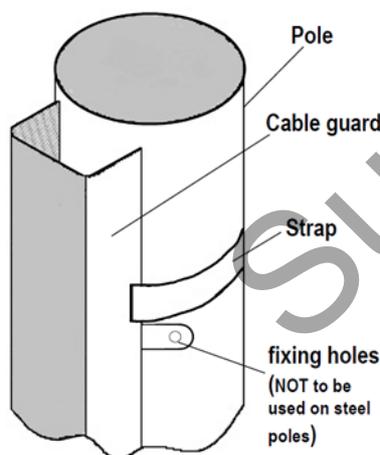
7.1.1.3 Cable guards

Cable guards used in Radio Facility installations shall be manufactured to the requirements of SD1434 *Traffic Signals/Road Lighting - Cable Guard Manufacturing Details*. Transport and Main Roads approved polymeric guards designed to AS 4702 *Polymeric cable protection covers* may also be used where the site is not in an area subject to grass fire. For steel poles, the cable guards shall be affixed to the pole using stainless steel straps. For timber poles, the cable guards may be affixed to the pole using screws as well as straps.

Where cables guards are used, these shall:

- cover the cables from ground level to a minimum height of 2.2 m
- not cover or obstruct any access hatches on the pole
- not obstruct or interfere with any other assets on the pole
- be designed and installed in a way not to be deemed a potential safety hazard to pedestrians or vehicles, and
- appropriately earthed, where required.

Figure 7.1.1.3 – Cable guard on Transport and Main Roads pole (Timber, or Steel)



7.1.1.4 Telecommunications cabling

All telecommunication cabling shall be installed externally to the pole. Where cables guards are used, these shall be in accordance with Clause 7.1.1.3. and be fixed by stainless steel straps. Fixing holes are not permitted in steel poles.

7.1.1.5 Electrical installation wiring

Where the Radio Facility installation is powered by an LV source to supply the pole-mounted transceiver units, the supply shall be:

- internal to the pole via a Transport and Main Roads shared conduit in the pole footing, or
- external to the pole via a cable guard and be fixed by stainless steel straps. Fixing holes are not permitted in steel poles.

Where the pole mounted equipment powered by an ELV source from a ground-mounted cabinet, the supply cables shall be external to the pole.

Cable guards shall be in accordance with Clause 7.1.1.3.

For detailed electrical requirements refer to Clause 7.3.

7.1.1.6 Off-pole isolation

Where the on-pole Radio Facility transceiver unit is powered by LV, an off-pole isolation shall be provided. This can be an inline fuse or breaker located within the Carrier's underground cable pit or, where accessible, in the above ground roadside cabinet.

The pit shall be clearly marked with the Carrier's name and be not more than 2 metres from the pole where the associated Radio Facility is installed.

In the event of an emergency, Transport and Main Roads shall have authority to access the isolator in the Carrier's pit and isolate the supply.

7.1.1.7 On-pole Isolation – tilt switch

Each Radio Facility installed on a Transport and Main Roads pole shall have an on-pole isolation tilt switch intended for reactive power down of all operational equipment, including antennas, in case the pole is damaged, causing the pole to lean from the vertical position or fall to the ground.

Where the tilt switch is used as the means of powering down the equipment, it is not to act as the main switch for the electrical installation. A separate dedicated main switch is to be installed at the electrical installation enclosure.

The isolation tilt switch is to be installed immediately on the load side of the main switch.

The isolation tilt switch shall be installed within the permitted zone shown in Appendix A of this Technical Specification.

Each isolation tilt switch shall have warning label on it with the information as specified in Clause 7.1.1.11.

The isolation tilt switch shall be housed in a single compact unit with an integrated LED indicator light to indicate whether the antenna(s) is operational or switched off.

In the event of an emergency, Transport and Main Roads shall have authority to access the isolator in the Carrier's pit and isolate the supply.

7.1.1.8 On-pole RFR Isolation - manual switch

In addition to the isolation tilt-switch, an on-pole isolation manual switch shall be provided which will be used for manually isolating all operational equipment, including antennas, for the purpose of maintenance. The on-pole isolation manual switch shall be placed in the zones prescribed in Appendix A of this Technical Specification.

7.1.1.9 Antenna cabling

All antenna cables connecting antennas to transceiver units shall be run externally to the pole.

Where a ground mounted enclosure is used for housing the transceiver unit, the cabling from the cabinet to the antenna shall run external to the pole via a cable guard designed in accordance with Clause 7.1.1.3.

7.1.1.10 Antennas

The Carrier shall ensure that the antenna unit utilises the most compact, vertically orientated, omni-directional antenna or compact panel antenna arrays where possible.

The total static weight for antenna(s) and adapter mount (accounting for additional static weight associated with the other Radio Facility installation components) shall be subject to pole:

- Strength limit states structural load limit not being exceeded.
- Serviceability limits and safety actions not being diminished or compromised.

Antennas shall only be installed within the permitted zones shown in Figure A1 and Figure A2 in Appendix A.

The antenna base shall be mounted on the pole in a manner that provides a safe working clearance from the top of any existing hardware.

The base of the antenna shall be installed within the area 1m from top of signal lantern or any other existing hardware and 1m below a street lighting outreach.

The installation of antennas shall not diminish the designed roadway or pathway light output.

Antenna mounting requirements are detailed in Clause 7.2.5.

7.1.1.11 Signage and labelling

7.1.1.11.1 On-pole labelling

Labelling shall be provided to warn against hazards associated with Radio Facility installation. All labels shall be legibly and durably marked and comply with the requirements of AS 1319 *Safety signs for the occupational environment* and C564 - *Mobile Phone Base Station Deployment*.

The following signage shall be provided:

- Two RFR hazard zone signage installed a minimum of 2 m below the antenna base – one on each side of the pole, advising of:
 - hazard from the transmission equipment, and
 - Safe working distance from the antenna.
- Two EME isolation switch instructions signage shall be installed at least 400 mm below the RF tilt switch, on both sides of the pole.

- Two *customer contact signage* shall be installed, one on each side of the pole showing the name of the communication Carrier, RFNSA number, site identification number and the emergency contact number, and
- A signage to indicate there are multiple points of supply, in accordance with SD1673 *Traffic Signals/Road Lighting - Labels*.

7.1.1.11.2 Enclosure labelling

Labels on pole-mounted and ground mounted cabinets and pits for Radio Facility enclosures shall as a minimum include the "DANGER-240V sign" designed to AS1319 *Safety signs for the occupational environment*.

7.1.2 Clearance from Overhead HV powerlines

The Carrier shall:

- Ensure all parts of Radio Facility installation components on Transport and Main Roads poles are in accordance with the clearance requirements detailed in SD1333 *Minimum Clearance of Overhead Electric Lines from Ground and Structures*.
- Ensure the Radio Facility installation mounting height and dimensions comply with the general placement requirements of above-ground infrastructure specified in Clause 7.1.4, thus ensuring that the pole mounted enclosure introduces no obstructions to the immediate driving environment.

7.1.3 Drilling of poles

There shall be no holes drilled in Transport and Main Roads poles for Radio Facility installation, except where the Carrier selects to use Transport and Main Roads conduits for the supply of LV to the pole.

A maximum of one hole of no more than 25 mm diameter may be drilled for the purpose of connecting pole-mounted radio equipment to the LV electrical supply.

The drilling of breakout hole shall:

- be positioned directly behind the relevant Radio Facility installation component or below and as close as possible to (and no further than 200 mm from) the Radio Facility installation component
- be in accordance with the structural requirements detailed in Clause 7.2, and
- be treated with "cold gal" or equivalent to maintain performance life of the pole.

Before performing work that requires the drilling of hole into the pole, the Carrier is to ensure that the installation electrical sub-circuit(s) are de-energised and isolated from electricity supply.

7.1.3.1 Ingress protection

Where a hole is drilled into a pole for the purpose of delivering AC sub-main leads to the transceiver unit, it shall be sealed by following approved methods.

This can be done by inserting threaded spigot onto the hole to ensure watertight seal, preventing water ingress into internal cavity of the pole.

Pole penetration needs to be treated with an appropriate treatment including galvanising product available from the pole suppliers.

7.1.4 Above-ground equipment placement requirements

The placement of above ground infrastructure by the Carrier shall not diminish the level of existing safety with regards to Roadside Hazards and risks to vehicles, pedestrian and cyclists. The installation shall not introduce adverse environmental impacts.

Placement of all above-ground infrastructure by the Carrier shall be in accordance with Transport and Main Roads specifications and guidelines below:

- The Roadside Hazards and Clear Zone requirements detailed in *RPDM Volume 3 Part 6: Roadside Design, Safety and Barriers* apply to all above ground infrastructure proposed for installation by the Carrier.
- Above-ground roadside infrastructure shall meet the requirements of Safe Stopping Distances detailed in *RPDM Volume 3 Part 3: Geometric Design*. Safe stopping distances need to be available at all times along a road. Safe stopping distance is likely to be an issue with cabinets if they are located on the inside of curves.
- Above-ground installations shall meet the requirements of Safe Intersection Sight Distances, Minimum Gap Stopping Distance and Crossing Sight Distance detailed in *RPDM Volume 3 Part 4A: Unsignalised and Signalised Intersections*. Sight distances are required between a vehicle in the through lane and a car at an intersection (including driveways) or a pedestrian at a crossing.
- The installation of above ground infrastructure shall be in accordance with the requirements of *RPDM Volume 3 Part 6A: Paths for Walking and Cycling* which include provisions for sight distances.
- Where the proposed above-ground infrastructure is likely to adjoin an exit/entry point of an existing property, the Transport and Main Roads guidelines for *Treatment options to improve safety of pedestrians, bicycle riders and other path users at driveways*. This is particularly relevant to vehicles exiting and entering properties – to be able to see footpath users (particularly mobility scooters and runners and slow bicycles).
- All roadside infrastructures shall be designed and installed in accordance with the environmental requirements detailed in *RPDM Volume 3 Part 6B: Roadside Environment*.

7.2 Physical and Mechanical requirement

7.2.1 General

Unless otherwise agreed in writing by Transport and Main Roads, all Radio Facility installations shall be non-intrusive. There shall be no more than one hole drilled on a single pole and only for the purpose of delivering LV power to the Radio Facility equipment on the pole. Refer to Clause 7.1.3 above.

7.2.2 Pole Condition inspection

7.2.2.1 Pole characteristics

Prior to the commencement of any structural design, the physical pole characteristics including the onsite pole identification plate details are to be obtained to enable the confirmation of the pole type and physical capacity including and not limited to:

- pole supplier

- pole length (including the buried section)
- pole tip load strength when new
- pole installation date
- pole treatment date
- pole type and strength group, and
- pole foundation construction details.

7.2.2.2 Pole condition assessment

The Carrier shall arrange for a full site inspection and assessment of each candidate pole, including:

- above and below ground visual inspection
- any signs of fatigue, corrosion or degradation
- aerial conductor attachments, and
- any other detail relevant to the condition assessment.

As an outcome of the condition assessment, a Condition Factor (CF) is to be nominated for each pole – where a CF of 1.0 is for a new pole.

The assessment is to be undertaken and certified by a duly qualified RPEQ Engineer. **Hold Point 1**

The Carrier shall identify Energy Queensland conductors and third-party broadband network cable types, spans and mounting heights, to obtain data for pole structural loading assessment.

All poles that are classified as suspect or unserviceable at the time of inspection, are immediately deemed as unsuitable for any Radio Facility installation attachment or for other associated works to proceed and are to be reported to the department for further investigation.

The Carrier is not to access, work on, or attach a Radio Facility installation on any pole which is:

- marked on site as suspect (with a painted diagonal marking), or
- marked on site as scheduled for replacement (with a painted cross marking), or
- found to be in a condition which is considered unserviceable or a risk to any party's safety, in which case the Carrier is to immediately report such poles to Transport and Main Roads.

7.2.3 Structural adequacy

Following a complete condition assessment, the Carrier is to arrange to undertake in accordance with Transport and Main Roads design requirements, all required load and foundation design calculations, including allowance for:

- existing Transport and Main Roads asset component structural loadings including pole and conductor loadings
- existing External Party asset structural loadings, and
- confirmation that no worsening of the structure will result from the proposed Radio Facility installation component attachment, relocation or replacement due to:
 - fatigue
 - drilling of holes additional, or

- revised applied structural loads.
- reduced service life.

For the installation of Radio Facilities on road lighting poles, the design calculations to determine the structural adequacy shall comply with the requirements of MRTS97 *Mounting Structures for Roadside Equipment* and shall include:

- The design of the Radio Facility installation and associated attachments ensuring that the total applied limit state structural actions, based on the Regional Wind Speed with a minimum Average Recurrence Interval (ARI) of 250 years shall be in accordance with AS/NZS 1170.2, and shall not exceed the structural capacity of the pole and the pole's foundation.
- Factoring in the appropriate condition factor (CF) to the structure member and section capacity based on the condition.
- Ensuring the serviceability deflection shall be less than 4% of the vertical height of the pole.

For the installation of Radio Facilities on Combination Traffic Signal Mast Arm and Traffic Signal Mast Arm:

- The design of the Mast Arms on the Transport and Main Roads network complies to AS 2339 and SD1716. The design of the Radio Facility installation and associated attachments ensuring that the total applied limit state structural actions based on the Regional Wind Speed with a minimum Average Recurrence Interval (ARI) of 1000 years shall be in accordance with AS/NZS 2339 and SD1716 and shall not exceed the structural capacity of the mast arm and mast arm foundation.
- Factoring in the appropriate condition factor (CF) to the structure member and section capacity based on the condition.

RPEQ-certified detailed drawings, statement and appropriate engineering calculations by an RPEQ shall be provided with each application.

7.2.3.1 Reporting structural defects

The Carrier shall report to Transport and Main Roads on the same Business Day or at commencement of next Business Day if any of the proposed poles are found by the Carrier to be in a suspect or unserviceable condition due to any cause; for example and not limited to:

- corrosion
- rot
- termite infestation
- terminal panel door missing
- excessive leaning
- vehicle impact damage, and/or
- issues with footing.

7.2.4 New poles for Radio Facility installations

Where a Carrier determines to install new poles on an alternative site or replace existing poles due to the structural inadequacy of existing poles, the proposal shall be made to Transport and Main Roads in writing.

The proposal shall include:

- Evidence of compliance with the above ground road furniture requirements detailed in Clause 7.1.4.
- Structural design calculations and statement signed by RPEQ engineer, in compliance with MRTS97 *Mounting Structures for Roadside Equipment*.

All cost associated with installation of new pole(s) at alternative sites or replacement of existing pole(s), shall be borne by the Carrier.

7.2.5 Mounting requirement

Mounting arrangements for Radio Facility components including antennas and transceiver unit components shall be:

- fabricated in accordance with the requirements of MRTS78 *Fabrication of Structural Steelwork*
- supplied by a fabricator from the department's approved list of Registered Fabricated Steelwork Suppliers
- suited to the pole and facilitate installations on poles of varying cross sections and with inconsistent surfaces
- securely fixed to the pole by hot dipped galvanised steel or stainless-steel fittings with material installed between the Column and the fittings to protect the surface of the Column from mechanical damage, and
- not of the type that uses chain attachments, bandit straps or any other strapping method of circumferential attachment for Radio Facility installation attachment.

7.3 Electrical requirements

7.3.1 General

All Radio Facility installations electricity supply will comply with the requirements of all applicable legislation and standards including, and not limited to:

- *Queensland Electricity Act and Regulations*
- *Queensland Electrical Safety Act and Regulations*
- *Queensland Electrical Safety Code of Practice 2020 –Works*
- *AS/NZS 3000 – The Wiring Rules*
- *TRUM Volume 4 Part 3 - Electrical Design for Roadside Devices.*

The Carrier is to ensure all electrical work is undertaken by a licensed electrical contractor.

7.3.1.1 Electromagnetic Compatibility (EMC)

All Radio Facility electrical equipment, such as power supplies, switches, circuit breakers etc, covered by this specification shall not interfere with the operation of Transport Main Road's equipment and shall comply with:

- AS/NZS 61000.6.1 for immunity
- AS/NZS 61000.6.3 for emissions, and
- AS/NZS 61000.6.2.2 for low voltage frequency harmonics compatibility.

In addition, all transmission equipment used for the purpose of transmission of 4G+ and 5G communications shall comply with relevant telecommunications EMC requirements.

Electrical equipment shall also comply with the relevant requirements of the Australian Communications and Media Authority (ACMA) for EMC and shall be labelled with a conforming Regulatory Compliance Mark (RCM).

7.3.2 Source of Supply

Electrical supply to installations owned by Transport and Main Roads are subject to controlled tariffs, and therefore the department is prohibited from providing power to a third-party from a departmental installation.

Power to the Radio Facility installation transceiver unit shall be sourced from a separate point of supply and therefore a separate NMI negotiated directly between the Carrier and the electricity entity.

The supply voltage to the pole shall typically be:

- Low voltage (~230V AC)– where the Radio Facility installation transceiver unit is pole-mounted, and
- Extra low voltage (max 50V AC or 120V DC), where the Radio Facility installation transceiver unit is enclosed in a ground-mounted cabinet.

Where there must be multiple LV supplies inside a pole the carrier LV cable shall be installed in a conduit.

ELV cabling shall be external to the pole.

Refer to Appendix A of this Technical Specification for typical LV wiring details.

7.3.2.1 Labelling

A label shall be affixed onto all poles mounting Radio Facility installations, indicating the presence of multiple sources of 230V supply in accordance with the labelling requirements defined in SD1673 *Traffic Signals/Road Lighting - Labels*.

There may be 2 or 3 sources of 230V supply depending on the pole type. For instance, a Radio Facility installation on a joint use pole (already 2 sources), will result in 3 sources of supply.

Where the Radio Facility supply is ELV, this should also be labelled in accordance with the labelling requirements defined in SD1673 *Traffic Signals/Road Lighting – Labels*.

7.3.3 Points of isolation

The Carrier shall:

- provide a process to turn off a site in the event of an emergency, and
- provide clearly labelled isolation points, with instructions, for each Radio Facility installation to enable departmental personnel to isolate the installation for maintenance works.

For placement of off-pole and on-pole isolation, refer to Clause 7.1.1.

7.3.4 Cabling

Placement of cabling including, Antenna, power and telecommunications cabling are detailed in Clause 7.1.1. Further specific details are provided below.

7.3.4.1 Power Cabling

ELV power cables shall be installed external to the pole. where cable guards are used, they shall be in accordance with Clause 7.1.1.3.

LV power cables may be installed internal or external to the pole. All LV cables internal to the pole shall be double insulated. Where a hole is required to be drilled on the pole to deliver LV supply to the Radio Facility equipment, it shall be in accordance with the requirements for ingress protection and structural adequacy detailed in Clauses 7.1.3 and 7.2 respectively.

LV cables external to the pole shall be enclosed in cable guards in accordance with Clause 7.1.1.3.

All externally installed cables associated with the Radio Facility installation shall be protected by suitably colour matched covering such as galvanised steel conduit or galvanised steel duct or sheathing of an acceptable type approved by Transport and Main Roads.

The Carrier shall detail in their design whether they intend to run a LV cable internal to the pole, as this will require sharing of Transport and Main Roads conduit leading to the pole. Typical layout is shown in Appendix A of this Technical Specification.

Conduit and pit requirements set-out in MRTS91 *Conduits and Pits* must be used for all underground power cables.

7.3.4.2 Earthing and bonding

The Carrier shall ensure that the installation and maintenance of all metallic Radio Facility installation component earthing systems is in accordance with all relevant legislation and standards including and not limited to the requirements of *Queensland Electrical Safety Code of Practice 2020 –Works*; and the *Electrical Safety Act 2002*, AS/NZS 3000, and AS 3015.

The Carrier shall provide a separate earth pit to be located within 2 m from the Radio Facility installation pole.

The insulated earthing cable for the Radio Facility installation metallic components shall comply with all relevant Australian standards for management of fault conditions including disconnection times in the event of electrical fault. Earth fault loop impedance values shall meet 0.4 seconds disconnection time requirements as specified in *TRUM Volume 4, Part 3 - Electrical Design for Roadside Devices*.

The Carrier is responsible for the maintenance of all Radio Facility installation telecommunication earthing components, including maintaining the impedance of the earthing system in accordance with the relevant Transport and Main Roads technical requirements and Australian Standard(s).

The earthing system of the Radio Facility installation shall be bonded to the Transport and Main Roads installation to minimise the risks associated with the occurrence of voltage differences.

The bonding connection and MEN link in the enclosure shall be accessible to the department's maintenance personnel who conduct periodic verification on departmental electrical installations and will require to temporarily disconnect the bonding connection as well as the MEN-link.

Refer to Appendix A of this Technical Specification for wiring schematic showing a typical earth bonding arrangement.

7.3.4.3 Communications Cabling

Communications cables shall be run on the outside of the pole and protected by suitable colour matched covering such as galvanised steel conduit or steel sheathing of an acceptable type.

Where cable guards are used, these shall be in accordance with Clause 7.1.1.3.

Underground communications cables including fibre transmission cables and co-axial feeder cables shall be enclosed in conduits in accordance with Australian industry standards.

7.3.5 Radiofrequency radiation (RFR) management

The Carrier shall ensure that the Radio Facility installation telecommunications components and operations comply with the requirements of the Law, and relevant Australian standards. In particular, the Carrier's radiation management; and radiofrequency spectrum use shall be in accordance with the ARPANSA radiation protection standard for *Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz*).

All RFR emissions from the antenna of Radio Facility installations shall be shown to be safe for Transport and Main Roads technicians to work on pole mounted hardware, and the Carrier shall provide evidence of this, including:

- provision of safe system for the management of Radio Frequency Radiation (RFR) in the vicinity of any Worksite, such as procedures to be used for deenergising or powering down any RFR emitting Radio Facility installation mounted on or in the vicinity of any departmental asset so that safe access for the department or other third-party works can proceed
- verification of compliance with ARPANSA standard's restrictions and reference levels including antenna calculations for positioning and approach distances of persons. The relevant general public Specific Absorption Rate (SAR) in exposure limit calculations shall be used. departmental personnel and contractors are considered as members of general public for this purpose, and
- determination of boundaries of exclusion zone areas within which general public EME exposure levels may exceed ARPANSA specified limits.

7.3.5.1 RFR Isolation

Automatic power down of antennas shall be provided via tilt switch in accordance with Clause 7.1.1.7.

Manual power down of antennas shall be provided, for maintenance purposes in accordance with Clause 7.1.1.8.

7.3.5.2 RFR Isolation signage

Instructions on the operation of the RFR isolation signage shall be mounted on the pole within a mounting height range of 3.0 metres to 3.5 metres above ground level and below the level of the RFR isolation / tilt switch on the roadside and the footpath side of each RFR affected departmental asset.

Signage and labelling placement details are provided in Clause 7.1.1.11.

8 Access requirements

8.1 General

The installation of all Radio Facility antenna units onto Transport and Main Roads poles shall be in accordance with this Technical Specification.

The Carrier shall undertake access processes as per legislation or via other agreed process for each Radio Facility installation.

Detailed drawings and appropriate engineering calculations shall be provided with each submission to Transport and Main Roads. Refer to Clause 8.2 for all required documentation.

The Radio Facility installation component(s) design, acceptance and certification process is to be repeated after any change in components(s), design parameters, source materials, or fabrication process.

Acceptance or consideration of engineering material by Transport and Main Roads does not indicate or grant:

- an engineering approval or certification, or
- acceptance of liability for any activities or operation of or incidents associated with or related to any Radio Facility installation under any circumstances.

8.2 Documentation to be provided

8.2.1 Detailed Design Documentation

The following documentation shall be supplied with the Carrier's Radio Facility installation submission:

- a drawing showing the type and location of proposed Transport and Main Roads pole to be used
- a drawing showing the position of Radio Facility elements including above ground infrastructure:
 - relative to road clear zone, and
 - relative to pathway clear zone, and
 - relative to vehicle sight lines on roadway, and
 - relative to vehicle sight lines entering and exiting properties.
- detailed drawings showing the proposed installation of all equipment and associated labelling on proposed Transport and Main Roads pole (refer to Clause 7.1.1 for placement requirements)
- location of pits for power, earthing and communication pits
- proposed isolation points and/or inline supply fuse location

- proposed off-pole cabinet design and location, where applicable
- certifying RPEQ statement confirming that the proposed Transport and Main Roads pole has spare capacity for the additional load
- certifying RPEQ statement confirming that the proposed Electrical design meets the safety requirements specified in this document
- certifying RPEQ statement confirming that the installation does not impede sight lines
- certifying RPEQ statement confirming that the installation is:
 - outside of clear zones (road and verge) or
 - within clear zones and provide a hazard and risk assessment.
- certifying RPEQ statement confirming Safety In Design (SID) considerations in accordance with the Safe Design of Structures Code of Practice
- evidence of safe working distances from antenna, and
- a report of the typical worst case general public electromagnetic radiation approach limit profiles in plan and elevation views for each of the proposed Radio Facility installation's operational antennas, demonstrating conformance to the requirements of the current Australian / ARPANSA standards and produced by an appropriately qualified, NATA accredited organisation. **Hold Point 2**

8.2.2 Final documentation

Before any final service connections to the Low Voltage distribution network are undertaken, the Carrier's licensed electrical contractor is to provide a Certificate of Test (COT) which certifies all required tests have been carried out and the electrical reticulation is electrically safe and ready for connection as required by Section 155 and 156 of the Queensland Electrical Safety Regulation 2013 (as amended from time to time). The contractor may refer to the department's process detailed in *TRUM Volume 4 Part 8: Electrical Verification Requirements for New or Altered Roadside Installations*.

The Carrier will provide Transport and Main Roads and relevant authorities an 'As Constructed' drawing indicating the exact location(s) and depth(s) of all underground Radio Facility installation's cables within the transport corridor. A copy of the 'As Constructed' drawing shall be retained in the document pocket of the upstream Transport and Main Roads electrical switchboard, where available.

Profiles are to clearly indicate the actual measurements in horizontal and vertical planes for non-access areas in all planes; whilst the antennas are operating at the planned maximum levels for general public persons which include departmental personnel and contractors performing works Radio Facility Installation sites.

Transport and Main Roads will record this information on each RFR site types within the Road Operations Asset Register (ROAR), to indicate the minimum clearances to be observed by the department's personnel and contractors. **Hold Point 3**

9 Installation, commissioning and site maintenance

9.1 Installation works

The Carrier shall obtain prior approval from Transport and Main Roads for accessing pits and conduits, were required.

The Carrier is to, during and following completion of works, ensure the worksite on the transport corridor is:

- maintained and left in a safe condition
- maintained in a tidy condition, and maintains visual amenity of the Radio Facility installations at all times, and
- reinstated to at least the condition which existed prior to the commencement of works.

Unused or waste materials shall be removed from the site The Carrier is to ensure the completed Radio Facility Installation conforms to all statutory and regulatory requirements, including and not limited to the:

- *Telecommunication Act 1997* (Cwth), including all subordinate legislative instruments, codes and determinations as amended or replaced from time to time
- *Electrical Safety Act 2002* (Qld), regulation and subordinate legislative instruments, and
- specific electrical/structural requirements and dimensional limitations of the Radio Facilities and departmental assets as specified in this document.

The Carrier is to confirm to Transport and Main Roads, and all other relevant third-parties, in writing on the completion of installation, upgrade or maintenance works on the Radio Facility installation.

9.2 Installation certification process

The Carrier is to ensure that each Radio Facility installation is constructed and placed into service on Transport and Main Roads poles in accordance with:

- the RPEQ approved engineering design and construction drawings, specifications and relevant Australian standards all statutory requirements, approvals, authorisations and RPEQ construction certifications pertaining to the Radio Facility installation, and
- a satisfactory standard of workmanship.

Where there are any deviations from the original RPEQ certified design, the Carrier shall ensure that these have been inspected and approved by the relevant RPEQ(s).

9.2.1 Radio Facility site commissioning

On completion of the works, the Carrier is to provide Transport and Main Roads and relevant third-parties, RPEQ signed and certified 'As Constructed' Drawings including all Radio Facility installation component attachment locations, and RPEQ certification of any departmental accepted variations to the original RPEQ certified and Transport and Main Roads accepted design, within five Business Days of installing the Radio Facility to enable departmental inspection of the site should it wish to as part of its audit processes.

9.3 Transport and Main Roads asset maintenance

Transport and Main Roads routinely inspect roadside transport infrastructure installations as part of an ongoing program of maintenance to enable these installations to continue operating safely, reliably, efficiently and effectively for the duration of their economic service life. The maintenance regimes broadly fall into two categories, namely:

- scheduled maintenance, and
- unscheduled maintenance.

The maintenance activities cover electrical, operational, structural and environmental aspects.

The Radio Facility installation shall provide means of disconnecting antennas to enable Transport and Main Roads personnel conduct maintenance activities.

The earth bonding connection linking the Radio Facility earth to Transport and Main Roads conductive poles, and the Carrier's MEN link shall be accessible to department's maintenance personnel who will require to temporarily disconnect both connections as part of the maintenance activities.

9.4 Radio Facility asset inspection and maintenance

The Carrier is to remove and satisfactorily replace or repair any Radio Facility Installation that fails or fractures, which is erected on an Transport and Main Roads transport infrastructure asset, undertake all remedial works, and advise Transport and Main Roads of any such instances.

The Carrier is to routinely inspect each Radio Facility Installation; including connection hardware, point of attachment surface and all electrical wiring; as part of an appropriate site inspection and maintenance program, and each time a site is visited, for:

- damage, failure, mal-operation or deterioration of the Radio Facility installation components, and
- any degradation of the structural integrity of the supporting Transport and Main Roads pole, at the Radio Facility installation attachment interface.

The Carrier shall keep the site at good working order at all times including inspections following major weather events.

A Radio Facility reattachment to a pole is to occur only after:

- the Radio Facility design has been recertified by the relevant RPEQ and confirmed to be satisfactory for installation
- satisfactory work conditions for small Installation reinstatement occur
- the Transport and Main Roads pole is in an appropriate structural condition, and
- the Radio Facility Installation can be totally and safely reinstated.

Appendix A: Radio Facility equipment mounting permitted zones

Figure A1 – Radio Facility equipment permitted zone - Road lighting pole

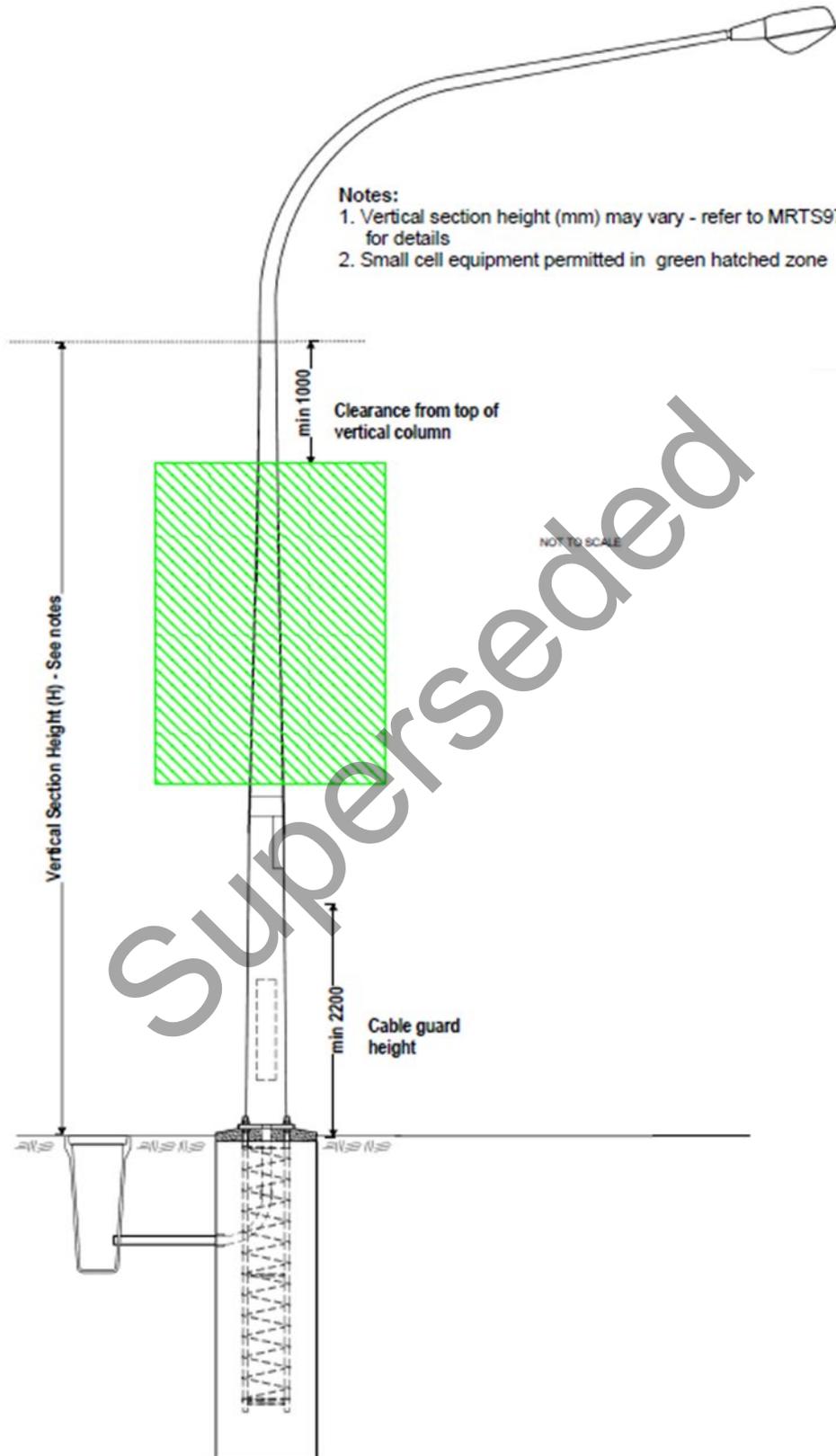


Figure A2 – Radio Facility equipment permitted zone - Combination Traffic Signal Mast Arm and Road Lighting Pole – SD1420/SD1427

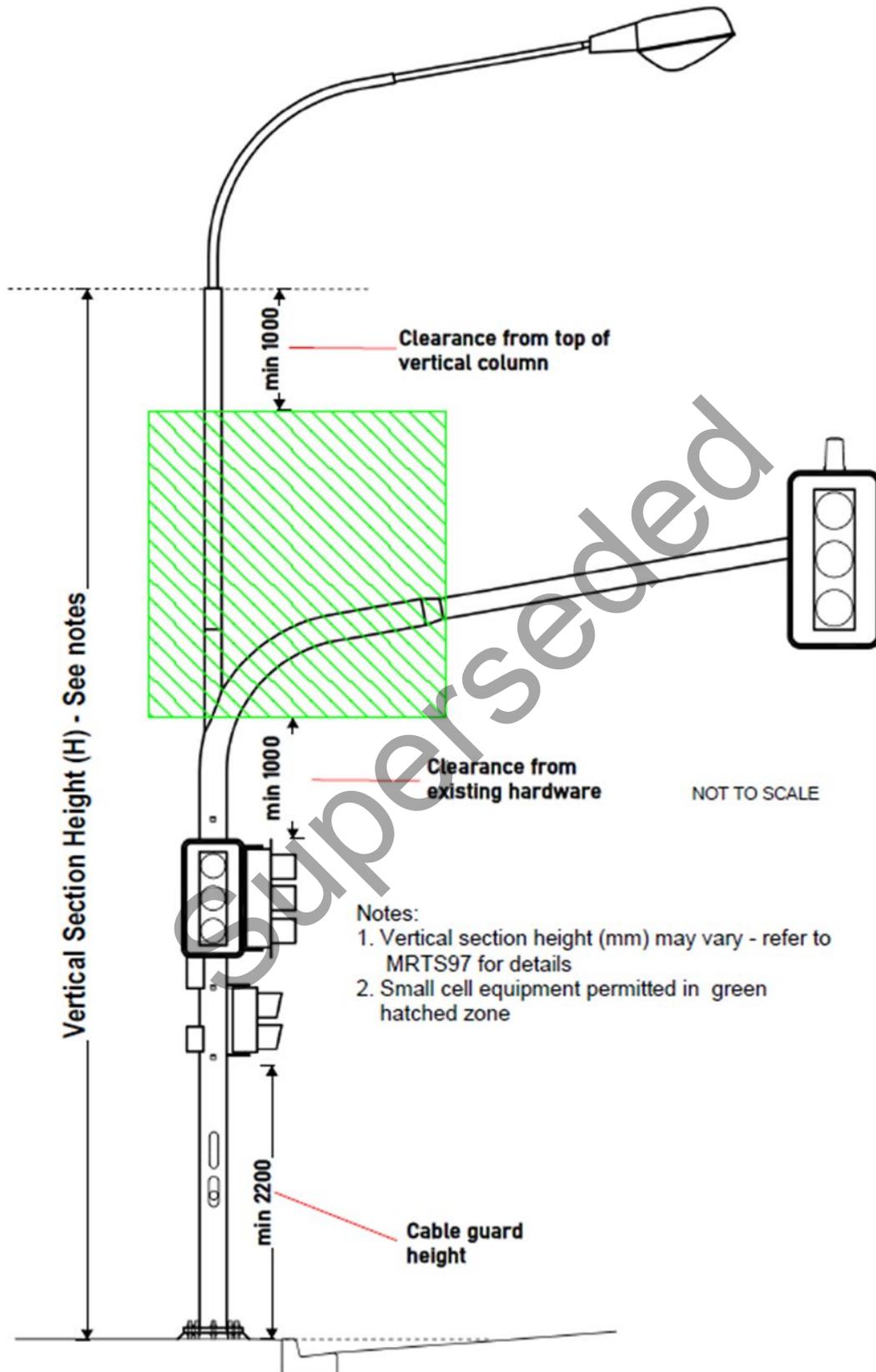
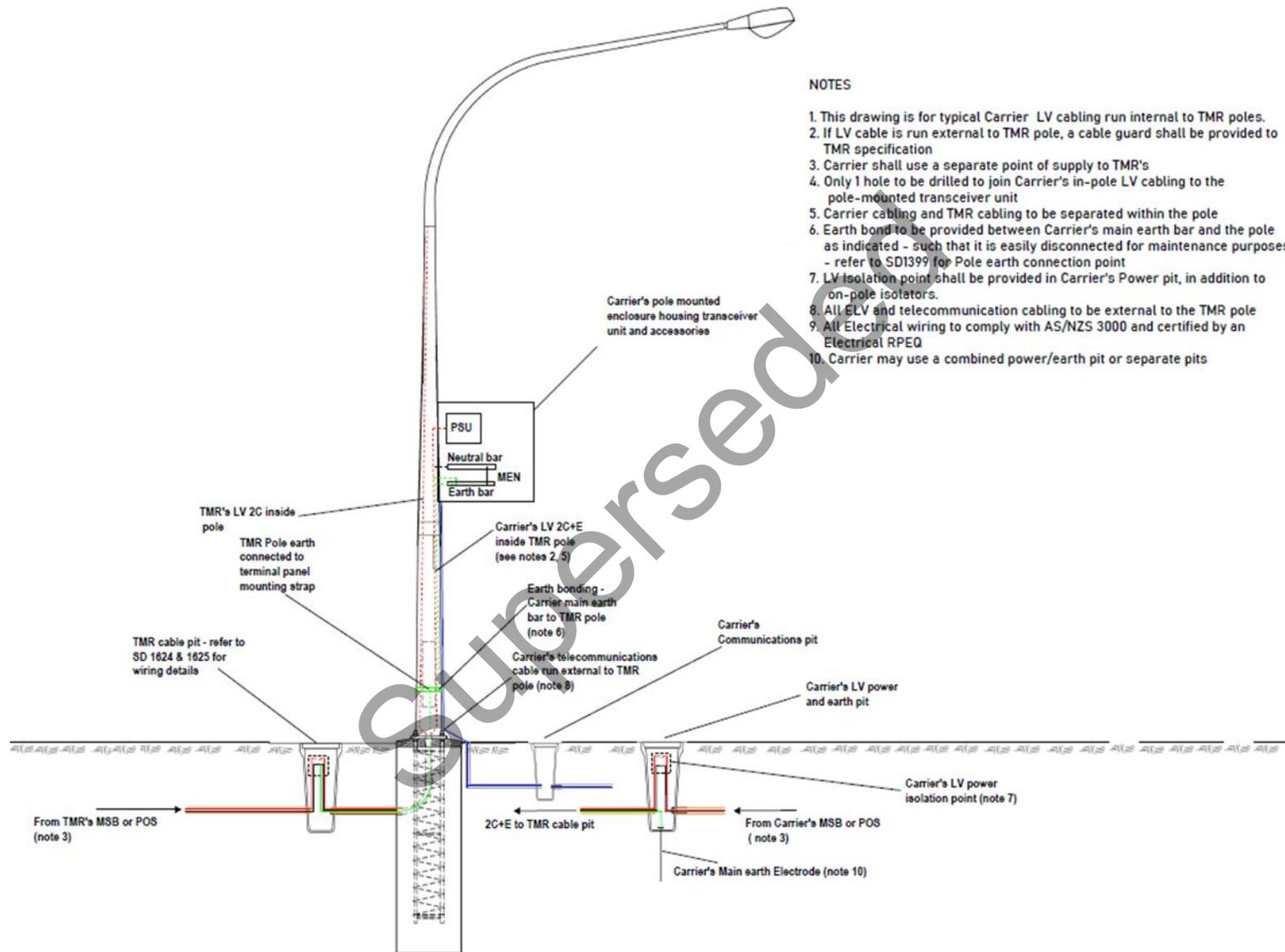


Figure A3 – Typical LV in-pole wiring details for Radio Facility installations



Superseded