

**Specification (Measurement)**

**Transport and Main Roads Specifications  
MRS233 Roadway Flood Monitoring Systems**

**July 2017**

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## 1 Introduction

This Specification applies to the requirements for the supply, installation, testing, commissioning and maintenance handover documentation (including the provision for operator training) of Roadway Flood Monitoring Systems.

This Specification shall be read in conjunction with MRS01 *Introduction to Specifications* and other Specifications as appropriate.

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

## 2 Measurement of works

### 2.1 Standard Work Items

In accordance with the provisions of Clause 2 of MRS01 *Introduction to Specifications*, the Standard Work Items covered by this Specification are listed in Table 2.1.

**Table 2.1 – Standard Work Items**

Standard Item No.	Description	Unit of measurement
<b>Roadway Flood Monitoring System</b>		
64701	Supply of [ <i>tilt</i>   <i>fixed</i> ] pole support structure with approved [ <i>fixed</i>   <i>relocatable</i> ] footing assembly as detailed on referenced approved drawings	each
64702	Installation of [ <i>tilt</i>   <i>fixed</i> ] pole support structure with approved [ <i>fixed</i>   <i>relocatable</i> ] footing assembly as detailed on referenced approved drawings	each
64703	Supply and Installation of [ <i>tilt</i>   <i>fixed</i> ] pole support structure with approved [ <i>fixed</i>   <i>relocatable</i> ] footing assembly as detailed on referenced approved drawings	each
64704	Supply of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment	each
64705	Installation of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment	each
64706	Supply and installation of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment	each
64707	Supply of pole mounted solar power supply and charging system	each
64708	Installation of pole mounted pole mounted solar power supply and charging system	each
64709	Supply and installation of pole mounted solar power supply and charging system	each

Standard Item No.	Description	Unit of measurement
64710	Supply of [ <i>Radar   Ultrasonic   Conductive probe   Gas bubbler</i> ] Flood Level sensor, or other approved types	each
64711	Installation of [ <i>Radar   Ultrasonic   Conductive probe   Gas bubbler</i> ] Flood Level sensor, or other approved types	each
64712	Supply and installation of [ <i>Radar   Ultrasonic   Conductive probe   Gas bubbler</i> ] Flood Level sensor, or other approved types	each
64713	Supply of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems	each
64714	Installation of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems	each
64715	Supply and installation of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems	each
<b>Ancillary / optional items</b>		
64751	Supply of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment	each
64752	Installation of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment	each
64753	Supply and installation of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment	each
64754	Supply of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination	each
64755	Installation of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination	each
64756	Supply and installation of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination	each
<b>Removal of existing roadway flood monitoring system</b>		
64791	Removal of roadway flood monitoring equipment for re-use	each
64792	Removal of roadway flood monitoring equipment for disposal	each

## 2.2 Work Operations

**Item 64701 Supply of [*tilt | fixed*] pole support structure with approved [*fixed | relocatable*] footing assembly as detailed on referenced approved drawings**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and fabrication of as appropriate

- c) for fixed base poles, supply and installation of eyebolt and bushing for aerial supply if appropriate
- d) for relocatable poles, supply of slip base mount, shear washer and clamping bolts, and
- e) supply of all fixing bolts, nuts and washers as appropriate.

**Item 64702      Installation of [*tilt* | *fixed*] pole support structure with approved [*fixed* | *relocatable*] footing assembly as detailed on referenced approved drawings**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) excavation for footing
- c) disposal of excavated material
- d) provision of formwork, where necessary
- e) installation of base mounts, shear washer, clamping bolts and nuts and cable clamping blocks
- f) installation of cable clamping blocks as appropriate
- g) Installation and termination of all internal cabling
- h) Installation of pole, as appropriate
- i) installation and termination of cabling from base connectors to sensors including supply and installation of pit junction box, if applicable, and
- j) testing of installation.

**Item 64703      Supply and Installation of [*tilt* | *fixed*] pole support structure with approved [*fixed* | *relocatable*] footing assembly as detailed on referenced approved drawings**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and fabrication of as appropriate
- c) excavation for footing
- d) disposal of excavated material
- e) provision of formwork, where necessary
- f) supply and installation of eyebolt and bushing for aerial supply if appropriate
- g) supply and installation of slip base mount, shear washer and clamping bolts
- h) supply and installation of base mounts, shear washer, clamping bolts and nuts and cable clamping blocks
- i) supply and installation of cable clamping blocks as appropriate
- j) supply and installation and termination of all internal cabling
- k) supply and installation of pole, as appropriate

- l) supply and installation and termination of cabling from base connectors to sensors including supply and installation of pit junction box, if applicable
- m) supply and installation of all fixing bolts, nuts and washers as appropriate
- n) stripping formwork, reinstatement of soil cover and general making good on site, and
- o) testing of installation.

**Item 64704      Supply of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) supply of approved telecommunications enclosure.

**Item 64705      Installation of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment**

Work Operations incorporated in the above item include:

Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

- a) installation of the approved telecommunications enclosure, and
- b) installation and termination of all internal cabling.

**Item 64706      Supply and installation of all-weather pole mounted equipment enclosure fixed to the support structure to house all relevant Flood Monitoring electronic equipment including batteries, routers, radio equipment, digital input/output equipment, data logging and telecommunication equipment**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply of approved telecommunications enclosure
- c) installation of the approved telecommunications enclosure, and
- d) installation and termination of all internal cabling.

**Item 64707      Supply of pole mounted solar power supply and charging system**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply of pole mounted Solar Panel/s including mounting brackets and accessories, and
- c) supply of Solar Panel charger/Controller, batteries and associated protective devices.

**Item 64708      Installation of pole mounted solar power supply and charging system**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) installation of pole mounted Solar panels, and
- c) installation of charger and batteries and associated cabling, terminations and protective devices.

**Item 64709      Supply and installation of pole mounted solar power supply and charging system**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and installation of pole mounted solar panels, and
- c) supply and installation of charger assembly, batteries, protective devices and associated cabling.

**Item 64710      Supply of [Radar | Ultrasonic | Conductive probe | Gas bubbler] Flood Level sensor, or other approved types**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) supply of flood level sensor as appropriate.

**Item 64711      Installation of [Radar | Ultrasonic | Conductive probe | Gas bubbler] Flood Level sensor, or other approved types**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) installation of flood level sensor to manufacturer's instructions and TMR guidelines, and
- c) testing of flood level sensor.

**Item 64712      Supply and installation of [Radar | Ultrasonic | Conductive probe | Gas bubbler] Flood Level sensor, or other approved types**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and installation of flood level sensor to manufacturer's instructions and contract requirements, and
- c) testing of flood level sensor.

**Item 64713      Supply of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*



- b) supply of copper or fibre communication, as appropriate
- c) supply of 3G/NextG/4G communication systems and accessories, as appropriate
- d) supply of satellite communication systems and accessories, as appropriate
- e) supply of repeater sites and accessories, as appropriate, and
- f) supply of pole mounted antenna systems as appropriate.

**Item 64714 Installation of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) installation of copper or fibre communication, as appropriate
- c) installation of 3G/NextG/4G communication systems and accessories as appropriate
- d) installation of satellite communication systems and accessories, as appropriate
- e) installation of repeater sites and accessories as appropriate
- f) installation of pole mounted antenna systems as appropriate, and
- g) testing of telecommunication link between head end monitoring site, flood monitoring site, cameras and signage as appropriate.

**Item 64715 Supply and installation of integrated Telecommunications link for backhaul of flood height data to head end monitoring site, as well as any pole mounted antenna systems**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and installation of copper or fibre communication, as appropriate
- c) supply and installation of 3G/NextG/4G communication systems and accessories, as appropriate
- d) supply and installation of satellite communication systems and accessories, as appropriate
- e) supply and installation of repeater sites and accessories, as appropriate
- f) supply and installation of pole mounted antenna systems as appropriate, and
- g) testing of telecommunication link between head end monitoring site, flood monitoring site, cameras and signage as appropriate.

**Item 64751 Supply of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) Supply of TC 1768 Flood warning signage and accessories.

**Item 64752 Installation of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) excavation for footing
- c) disposal of excavated material
- d) provision of formwork, where necessary
- e) installation of TC 1768 Flood warning signage and accessories
- f) installation of conduit to electrical and/or communications pit, as appropriate
- g) installation of antennae for wireless communication as appropriate
- h) installation of binding concrete to MRTS 70
- i) pouring, curing and finishing of concrete to MRTS 70, and
- j) stripping formwork, reinstatement of soil cover and general making good on site.

**Item 64753 Supply and installation of approved local Roadway Flood warning signage as per TC 1768, and any related wireless or cable system to connect this signage to the nearby roadway flood monitoring equipment**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) excavation for footing
- c) disposal of excavated material
- d) provision of formwork, where necessary
- e) supply and Installation of TC 1768 Flood warning signage and accessories
- f) supply and installation of antenna for wireless communication, as appropriate
- g) supply and installation of conduit to electrical and/or communications pit, as appropriate
- h) supply and Installation of binding concrete to MRTS 70
- i) pouring, curing and finishing of concrete to MRTS 70, and
- j) stripping formwork, reinstatement of soil cover and general making good on site.

**Item 64754 Supply of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply of camera and associated equipment, and
- c) supply of camera pole as appropriate.

**Item 64755 Installation of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) installation of camera pole as appropriate, and
- c) cabling and termination of power and communication cables to camera and associated equipment.

**Item 64756 Supply and installation of pole mounted camera equipment for roadway flood image capture back to a remote head end with or without infrared illuminator for night time roadway illumination**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and Installation of camera pole as appropriate
- c) supply and installation of camera and associated equipment, and
- d) cabling and termination of power and communication cables to camera and associated equipment.

**Item 64791 Removal of roadway flood monitoring equipment for re-use**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) disconnection of Electrical Supply including termination and “making safe” of supply cable, as appropriate
- c) disconnection of Telecommunications connection, as appropriate
- d) removal of flood monitoring equipment and supporting pole and associated cabinet enclosure, as appropriate
- e) reinstatement of soil cover and general making good on site, and
- f) transport of all components to Principal's storage facility or designated site storage area for reuse.

**Item 64792 Removal of roadway flood monitoring equipment for disposal**

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) disconnection of Electrical Supply including termination and “making safe” of supply cable
- c) disconnection of Telecommunications connection
- d) removal of VSL/LC and supporting pole and associated cabinet enclosure
- e) reinstatement of soil cover and general making good on site, and
- f) transport of all components and disposal.

### **2.3 Method of measurement of roadway flood monitoring systems**

This Specification provides Standard Work Items for:

- a) supply only
- b) installation only
- c) supply and installation, or
- d) lease arrangements for hardware and/or related support services and maintenance of Roadway Flood monitoring Systems.

Any combination of Standard Work Items relating to these methods of measurement may be used in the Schedule of Rates. However, where a Standard Work Item for supply and installation of a particular component or group of components is included in the Schedule of Rates, no supply only nor installation only Standard Work Item shall also apply to that component or group of components, as applicable.

### **2.4 Supply of materials**

Any materials to be supplied by the Principal will be as stated in the Principal Supplied Material List, Form C6827. All other material shall be supplied by the Contractor.

The responsibility for transport to the Site of materials supplied by the Principal shall be as stated in the Principal Supplied Material List, Form C6827. Transport to the Site of all other materials shall be the responsibility of the Contractor.

