

# ROADS AND MARITIME SERVICES (RMS)

## QA SPECIFICATION R315

### MAINTENANCE OF ADVANCE WARNING SYSTEMS

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**GUIDE NOTES**  
(Not Part of Contract Document)



**Transport**  
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QA SPECIFICATION **R315**

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# MAINTENANCE OF ADVANCE WARNING SYSTEMS

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## RMS QA SPECIFICATION R315

### MAINTENANCE OF ADVANCE WARNING SYSTEMS

## 1 GENERAL

### 1.1 SCOPE

This document sets out requirements for the Maintenance of Advance Warning Systems (AWS) (the “Services”). The Specification is formed only when this document is read together with RMS QA R300 ITS Maintenance Services – General Requirements.

AWS includes the sign and all supporting components of the system and site. The requirements herein is for Services relevant to a AWS site, so that they remain in good condition, operate as designed and meet the specified performance requirements.

Major components of a AWS site are listed below:-

- a) AWS controller, related communication equipment and all auxiliary equipment;
- b) AWS (Connected to Traffic Controllers, isolated one; and in Tunnel and Bridge portals)
- c) Power supply and regulation equipment, surge protection systems;
- d) Power backup equipment (e.g. backup power generator; emergency power supply, un-interruptible power supply, etc);
- e) Controller cabinet;
- f) AWS enclosure;
- g) Support structures.

### 1.2 TERMS AND DEFINITIONS

The following definitions and abbreviations, in combination with those listed in R300, are applicable to this Specification.

Term/Acronym	Definition
<b>Asset Maintenance Plan</b>	Your maintenance plan for the AWS assets. Defines and agrees the intended longer term strategy for management of the AWS assets and key issues and constraints.
<b>Availability</b>	A dimension in the assessment of the Technical Condition of an Application or Technology Asset. It measures absolute availability (the proportion of time a system is up and running).
<b>AWS</b>	Advanced Warning Systems provide earlier warning and therefore increased time to react. They additionally provide an alert to the presence of specific upcoming changes.

<b>Cabinet</b>	An approved housing for a controller, control relays, auxiliary equipment, terminal blocks, sockets, flasher units, wiring, etc., which may or may not include vehicle detectors and linking equipment.. Also called Cubicle or Housing
<b>CBD</b>	Central Business District (CBD).
<b>CMCS</b>	Central Management Computer System.
<b>Critical infrastructure asset/</b>	Those physical facilities, supply chains, information technologies and communication networks, which if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic wellbeing of the state (e.g. Traffic Control Signals (TCS); Tidal Flow Systems (TFS); and Variable Speed Limit Signs (VSLS)).
<b>Day</b>	Means calendar day.
<b>Defect</b>	The visible or measurable evidence of failure or other undesirable condition that requires intervention or that is likely to become a Hazard (as reasonably determined by you) before the next scheduled Asset Inspection or Planned Maintenance. The defect may affect the safety, serviceability, structural capacity or appearance of the asset.
<b>Down time</b>	Time the asset is inoperable due to failures or scheduled maintenance. It includes the time between occurrence of fault and fault notification. It is a missing period when the service is unavailable to the road user. It should be stated if this time is excluded from the Repair time and Response time. Accidents damage and/or site function unavailability should not count towards total downtime for the asset. But should be considered for time to restore to service measurements.
<b>Enclosure</b>	A housing providing an appropriate degree of environmental protection and against contact with live parts (AS/NZS 60529).
<b>Failure</b>	Any fault which results in the loss of an item to perform its function.
<b>Fault</b>	Any malfunction or undesirable condition of the AWS equipment which requires Reactive Maintenance.
<b>Fault-dispatch</b>	On receipt of fault from any source, the action of forwarding that fault to the service crew.
<b>FFA</b>	‘for further attention’ or ‘for further action’.
<b>FMS</b>	Fault Management System(s).
<b>Functional check</b>	The regular inspection of the AWS to ensure their safety and general operating condition.
<b>FWP</b>	Forward Works Program. Program which defines and agrees a broad range of Services to be performed by you, the timeframe they are to be completed in and the intended outcomes.
<b>Hazard</b>	Any state of the item which could lead to harm. Implicit in this is harm to a human. The definition is frequently expanded to include environmental harm.
<b>ITS</b>	Intelligent Transport Systems.
<b>KPA</b>	Key Result Areas.
<b>KPI</b>	Key Performance Indicators.

<b>Maintain or maintenance</b>	These terms shall include, regardless of cause and in addition to all other work specified, the following: <ul style="list-style-type: none"> <li>a) The repair and/or replacement of all defective, damaged or worn-out components or parts to ensure the proper operation of the AWS equipment.</li> <li>b) The regular inspection and servicing of all AWS devices and associated equipment.</li> </ul>
<b>MEN</b>	Multiple Earthed Neutral.
<b>NDT</b>	Non Destructive Testing
<b>Non-conformance</b>	A non-conformance event occurs when the availability KPI is not met or an event occurs when the fault response time or repair time in relation to a fault is exceeded.
<b>NRDT</b>	Non-reportable down time.
<b>OEM</b>	Original Equipment Manufacturer
<b>PEGA</b>	SCADA Application Server in the TMC Business Solutions Development Environment (Pegasystems) for hosting e.g. the Fault Management System (FMS).
<b>QA</b>	Quality Assurance procedure.
<b>Repair time</b>	The time elapsed from initial attendance at the Work Site to fault rectification or repair completion.
<b>Response time</b>	The time elapsed from fault notification to attendance at the Work Site.
<b>RMS</b>	Roads and Maritime Services of NSW
<b>SMC Service Providers</b>	Stewardship Maintenance Contractors providing road maintenance services to RMS in the Sydney Region
<b>Supply Point (also known as Connection Point)</b>	The junction of the electricity distributor's low voltage network conductors with the consumer's mains, i.e. the point at which the power supply is connected to the Utility network.
<b>Supports</b>	All structural components, brackets, clamps, straps and parts thereof, used to support the AWS equipment.
<b>TDT</b>	Total down time.
<b>Tidal Flow Scheme</b>	Tidal Flow Systems are a site specific system developed so the directional flow in one or more lanes can be safely reversed according to traffic flow needs (ILC-ITS-TP0-002-G02). A Tidal Flow Systems may consist of various devices, systems and components (e.g. Changeable Message Signs (CMS -Prism); In Pavement Lights (IPL); Lane Usage Signs (LUS); Shutter Message Signs (SMS); Variable Message Signs VMS); LED Lanterns Signs (LLS); Candy bars; Movable medians (MM); Close Circuit Television (CCTV) Systems; Tidal Flow Controller (TFC)).
<b>TMC</b>	Transport Management Centre
<b>UPS</b>	Uninterrupted Power Supply.
<b>VMS</b>	Permanent - a programmable message display device for conveying information to drivers.
<b>VPN</b>	Virtual Private Network.



<b>WAE</b>	Work-as-executed.
<b>Work site</b>	AWS site.
<b>You/Your</b>	the ITS Contractor/the ITS Contractor's.
<b>Zone</b>	The geographical area containing the ITS assets included in your ITS Maintenance Contract.

### **1.3 RELEVANT DOCUMENTS AND ORDER OF PRECEDENCE**

This specification shall be read together with RMS QA Specification [R300] – “ITS Maintenance Services – General Requirements”.

Other relevant RMS specifications and OEM manuals are listed in **Annexure R315/A**.

In absence of specific requirements within this or other RMS Specifications or OEM manuals, the current versions of published Australian Standards shall apply.

In case of conflict the order of precedence shall be:

1. Statutory and legislated requirements;
2. This specification (QA Specification R315) read in conjunction with QA Specification R300;
3. RMS QA Specification;
4. Other relevant RMS specifications;
5. OEM manuals;
6. Australian Standards.

## **2 MAINTENANCE SERVICES**

You must undertake maintenance services of the AWS system and site components as described in clause 1.1 and in accordance with the approved Asset Maintenance Plan and Forward Works Program.

### **2.1 PLANNED MAINTENANCE**

Planned Maintenance Services must adhere to requirements given in QA Specification R300, ITS Maintenance Services – General Requirements. A combination of inspections/checks and preventative maintenance activities constitute planned maintenance to ensure continued serviceability and availability of a AWS asset.

Minimum planned maintenance inspection/checks are;

- a) AWS display/flasher operation.
- b) Condition of AWS enclosure, support structure, controller cabinet and other externally mounted accessories for damage, disfigurement (including vandalism), peeling or damaged galvanizing/paint surface coating and corrosion.
- c) Presence of moisture, dirt, vermin/insects inside AWS enclosure, Controller cabinet, pits, exposed ducts and steel structure crevices.
- d) Wearing off or damaged site infrastructure i.e. concrete pathways, platforms, retaining walls, safety barriers, handrails, drains, landscaping etc.

**Annexure R315/B** is a sample Planned Maintenance Service checklist for both checks/inspections and preventative maintenance items. AWS are supplied by a number of Original Equipment Manufacturers (OEMs). The Operation & maintenance manual of the OEMs will be consulted along with the planned maintenance specifications as required.

Planned maintenance frequency will be 12 months.

## **2.2 REACTIVE MAINTENANCE**

### **2.2.1 Fault Attendance Service**

You must provide a fault attendance service on twenty-four (24) hours per day, seven (7) days per week basis for all AWS faults.

Typical causes of AWS faults include:

- a) AWS controller malfunction,
- b) AWS sensors malfunction,
- c) AWS sign flasher failure,
- d) overheating,
- e) moisture or dust ingress,
- f) accident damage,
- g) storm damage, and
- h) vandalism.

All repair works must be in accordance with RMS specification listed in section 1.3 as amended.

### **2.2.2 Procedure**

You must make arrangements to continually monitor the Fault Management System(s) for AWS.

These systems, hosted by TMC, RMS currently include:

- SCATS Fault Management (F Man.)
- PC inventory; and
- FMS web page on the TMC intranet,

You will be provided with access (e.g. remote login via VPN) to these systems. You may also develop your own software interface to access the above systems.

Upon fault notification, you must review the nature and urgency of the problem and prioritise your response. You must dispatch appropriately skilled resource(s)/technician(s) to attend the site as soon as possible, but in any case within the specified response time. Notification of the fault is either via phone callout or at the start of shift of your qualified resource(s)/technician(s). It is expected that your skilled resource(s)/technician(s) review their current faults at the start of their shift to determine their work priorities.

Upon arriving on site you must log the time of attendance in FMAN together with your initial findings and any other relevant information (e.g. estimated time to repair). Alternatively, if FMAN is unavailable, you may notify the TMC by phone.

You must assess whether the condition of the site poses any safety hazards to motorists or the public and make the site safe as a matter of priority.

In the event of a power failure, you must first contact the electricity distributor from off-site to ascertain that the cause of the outage is upstream of the AWS supply point. You must still ascertain from site that there are no other power equipment failures at the AWS site and then enter the appropriate fault response details in FMAN.

In the event of a communications failure, you must first contact the service providers i.e. Telstra, Optus etc to ascertain that the failure is external to the AWS system. Once confirmed, you must log communications faults with the appropriate third party communications service provider and follow-up to expedite rectification of the fault. You must still ascertain from site that there are no other communication equipment failures at the AWS site and then enter the appropriate fault response details in FMAN.

### **2.2.3 Response Times for Fault Attendance**

Response time starts from the initial fault occurrence time stamp in the appropriate electronic Fault Management System or from the time of the fault call (whichever is earlier) and is the sum of following;

- Remote investigation time to ascertain nature of defect(s)
- Equipment/parts/materials preparation time, and
- Travel time to the site.

Response times for initial site attendance upon notification of an AWS fault is guided by the criterion in **Annexure R315/C**.

Service provider to locate maintenance crews to facilitate their travel time to site.

### **2.2.4 Repair Time**

**Repair time** at site is the time taken to trouble-shoot the fault, completely repair the asset and make it available for service. Asset downtime directly effects operational availability. Swift, efficient and well coordinated repairs will bring the asset back into operation quickly and positively affect performance targets.

You must inform RMS as soon as possible of any abnormal delays, reasons for delayed repairs and estimate of the time required to complete the repairs.

### **2.2.5 Repetitive Failures**

Where the same reported fault requires callouts on three (3) occasions within a fourteen (14) day period you must carry out root cause analysis, identify and implement appropriate actions to prevent recurrence.

Where these actions recommend replacement or major renewal of the AWS asset and these works have not been included in the current Forward Works Program (FWP) you must submit a Business Case to RMS for approval. The Business Case must be based on a life cycle cost comparison of the proposed action against a “business as usual” maintenance approach. If RMS agrees with your recommendations the renewal or replacement works will be included in the next FWP.

Till the recommended and approved replacement works in the FWP are completed, the availability target (%) will be reviewed and a lower KPI may be accepted or under unsustainable operating conditions, the asset excluded from the KPI assessment until replaced.

### **2.2.6 Requests for RMS Assistance**

Where a technical problem cannot be resolved by you, you may request assistance from RMS. When requesting assistance you must be able to demonstrate to RMS that the technical problem is complex and/or outside your scope of services, e.g. system integration issues with RMS or TMC systems.

If the technical problem cannot be resolved by the RMS remotely, a site visit meeting will be arranged by RMS at a mutually agreeable time. You shall attend the site meeting with relevant documents and information related to the technical problem.

## **2.3 INCIDENT SUPPORT**

An Incident Support report should be raised when;

- an incident is known to your team
- or when informed by the TMC
- or by the relevant SMC Service Provider.

In the event of an incident, response time and repair time for Reactive Maintenance applies.

On site attendance, you must assess whether the condition of the site poses any safety hazards to the public and make the site safe as a matter of priority.

You must also prioritise and rectify all other faults and defects as if for Reactive Maintenance.

You must record the Incident Support details in SCATS Fault Management (F Man.) / PC inventory. If F man or PC Inventory are unavailable or inaccessible, the report form in **Annexure R315/D** may be used on site. Information should be updated on first available opportunity in SCATS Fault Management (F Man.) / PC inventory.

You must assist RMS with all insurance claims and recovery actions arising from the incident.

Incident Support reports must be submitted as part of your monthly report to RMS.

## **3 PARTS AND EQUIPMENT**

### **3.1 SUPPLY**

You must arrange and manage supply of all parts, equipment, materials and technical services from OEM suppliers for the purpose of making available the AWS site. Quality of parts, equipment and technical services from OEMs is to be assured.

When supply disruptions occur due to unavailability or obsolescence of a part or equipment, a Replacement part or equipment is to be recommended to RMS as a business case. RMS may approve use of the Replacement part or equipment after necessary technical review and testing.

### **3.2 HOLDING STOCK**

At all times, you must hold in stock adequate minimum levels of parts and equipment to meet Planned and Reactive Maintenance needs.

Service provider is to determine minimum stock levels for parts, equipment and materials based on AWS maintenance scope.

An inventory of spares for parts, equipment, materials and technical services is to be maintained by the service provider. Inventory is to update minimum stock levels and holding stock periodically to match the AWS maintenance scope.

Inventory of spares is to be updated for Replacement parts and equipment, on approval by RMS.

### **3.3 DISPOSAL OF DAMAGED, DEFECTIVE, OBSOLETE OR REDUNDANT EQUIPMENT PARTS & EQUIPMENT**

Due to maintenance or incidents, parts and equipment which are damaged, defective, obsolete or redundant are required to be removed from the Work Site and disposed. Such removal is to be done after formal information and agreement with RMS.

Such parts and equipment are to be distinctly and permanently marked prior to disposal by indicating their condition.

Disposal of parts and equipment is to be done as follows;

- a) Repair or refurbish the parts or equipment and hold them as spares in store for future use. For purposes of quality assurance, repaired or refurbished parts are to be treated the same as Replacement parts & equipment (Clause 3.1). Their repair history is to be maintained and made available to RMS when requested.
- b) Carry out disposal of parts and equipment that are beyond-economical-repair (BER) by recycling. Items being disposed must be physically disfigured prior to recycling at a certified facility. Certificate of disposal must be provided.

## **4 PERFORMANCE REQUIREMENTS (ASSET SPECIFIC)**

You must meet the included KRAs and KPIs for performance of your Services.

Your asset Inspection and Planned Maintenance Services must support a design life for each AWS asset i.e. site availability should be sustained during design life for different components comprising each AWS site. Design life of different components varies as follows;

- AWS electronics and electrical components- Fifteen (15) years.
- Steel fabricated Sign Support Structures, Brackets and Fixtures – Fifty (50) years.
- Concrete & Masonry construction at Site - Thirty (30) years.
- Power back-up system / Batteries – Five (5) years.

As per definitions given in R300 the following performance criteria will be measured:

- a) Availability

- b) Response Time
- c) Repair effectiveness Time

As per definitions given in R300 the following performance criteria will be measured:

- d) Availability
- e) Response Time
- f) Repair effectiveness Time

Premature asset failures requiring major renewal or replacement of the asset (other than due to Incidents or Force Majeure events) may reduce your overall Stewardship Performance KPI score.

#### **4.1 AVAILABILITY (OPERATIONAL)**

RMS QA R300 defines Availability for ITS assets. Performance calculation method is provided in the contract. The performance target for AWS availability is at least **98%** (If standalone) or **99.95%** (if on SCATS).

Availability as defined in R300 will be measured monthly by you across all AWS assets in your Zone.

Failure to meet the Availability performance targets will impact on your Asset Performance KPI score.

#### **4.2 RESPONSE TIME AND REPAIR EFFECTIVENESS**

The measure of Response Time and Repair Effectiveness is defined in R300.

### **5 REPORTING AND RECORD KEEPING**

#### **5.1 REPORTING**

You must provide a monthly performance report to RMS on work achievement against the FWP and asset performance statistics by the second week of the following month. The report must include the following items:

- (i) Availability
- (ii) Response Time
- (iii) Repair Effectiveness

See R300 for Availability, Response Time and Repair Effectiveness definitions.

You must report on the status of fault attendance and repairs through the appropriate Fault Management Systems in accordance with Clause 6.3 in R300.

These reports will be included in the KPI assessments by end of every month in accordance with the contract.

## **5.2 RECORD KEEPING**

You must keep and maintain accurate records of all repairs, calibrations, replacements and design alterations made to any AWS Equipment/site.

All Reactive and Planned Maintenance service attendances must be recorded in the electronic fault management system. Details of each attendance must also be manually recorded with you and should include the date and details of service carried out with the technician's name.

You must maintain all necessary records to support the monthly evaluation of actual performance against the specific performance targets.

You must retain records, including all details for accidents/damages/repairs for a period of at least five (5) years.





**ANNEXURE R315/A – RMS SPECIFICATIONS AND OEM MANUALS**

<b>ITS Document Register</b>	
Specification R300	ITS General Maintenance Requirements
TSI-SP-014	General Requirements for the Design, Supply and Installation of Intelligent Transport Systems
TSI-SP-008	General Requirements for Variable Message Signs
TSI-SP-016	General Requirements for Outdoor Electronic Equipment.
ILC-ITS-REG-001	ITS - Document Register
<b>ITS Handbook</b>	
ILC-ITS-M-001	Intelligent Transport System Document Planning Manual
ILC-ITS-TP0-002	ITS Project Life Cycle Procedure
ILC-ITS-TP0-002-G01	ITS Project Life Cycle Guideline
ILC-ITS-TP0-002-G02	Tidal Flow Schemes
ILC-ITS-TP0-002-G07	Variable Message Signs
ILC-ITS-TP0-002-G14	Communication Networks
ILC-ITS-TP0-004-G01	Failure Modes & Criticality Analysis
<b>Handover – Consideration of maintenance issues</b>	
ILC-ITS-TP4-001	Testing of ITS Devices
ILC-GEN-TP0-901-G01	Handover of intelligent transport systems – user guide

## **ANNEXURE R315/B – SAMPLE PLANNED MAINTENANCE SERVICE REPORT**

**AWS ID:** ..... **LOCATION:** .....

**REPORT DATE:** .....

1. Mark as actioned for each item with a ✓ in the “ACTIONED” columns.
2. If any item requires further attention, write reasons in comments column and mark that item with a ✓ in the “for further action (FFA)” column.
3. Enter date in dd/mm/yy format and time in 24 hour format.

<b>PREVENTATIVE MAINTENANCE ITEMS</b>	<b>ACTIONED</b>	<b>COMMENTS</b>	<b>FFA</b>
Inspect Power in ON/OFF modes.			
Inspect equipment integrity and connection as per OEM manual.			
Inspect communications cable and connectivity.			
Inspect alignment of sign to point of view and realign if necessary.			
Clean sign face so that it is clearly visible. In case sign is not legible after cleaning report to next maintenance level.			
Trim tree branches to ensure signs are clearly visible to road users.			
Inspect support structures, brackets and attachments.			
Inspect controller cabinets, and enclosure for ingress of vermin, dust or moisture. Clean as required.			
Inspect Door Locks, Hinges and Seals. Replace if found defective.			
Inspect all cables and switches for any damage and report to next maintenance level if required.			

Inspect pits for water or vermin damage and report to next level of maintenance level if required.			
Inspect and records all serial numbers, asset numbers of equipment installed at site for asset register purposes.			
Inspect calibrations for compliance.			

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

<b>FUNCTIONAL INSPECTION ITEMS</b>	<b>PASSED</b>	<b>FAILED</b>	<b>REPAIRED</b>	<b>COMMENTS</b>	<b>FFA</b>
Check Power can be turned ON/OFF.					
Check communications link in working order.					
When power ON check flashers operating.					
With Oscilloscope confirm flasher timing is as per OEM specifications.					
Check signs in local mode.					
Check signs in remote mode.					
Generate power and comms faults and check if they are reported.					
Retrieve data log and check logging of faults/errors.					
Check operational latency/delays are acceptable.					
Check installation safety and safe operations.					

Check supplementary and auxiliary devices such as solar panels, battery, UPS for operation where available.					
Check UPS (Battery Backup) and Alarms (if with AWS).					
Check equipment earthing and MEN					
Check equipment calibrations are within required limits and is compliance.					

**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....

## **ANNEXURE R315/C – FAULTS TYPES AND RESPONSE TIMES**

Response times for initial site attendance upon notification of AWS faults are detailed in R300 (Clause 6.2.1 Response Times and **Annexure D**). R300 categorizes ITS assets as either High Priority or Normal Priority and assigns suitable response times.

**ANNEXURE R315/D – SAMPLE INCIDENT SUPPORT REPORT**

**AWS ID:** ..... **LOCATION:** .....

**INCIDENT DATE:** ..... **REPORT DATE:** .....

Incident Details	
When reported	
Who reported	
Was Incident or fault a dangerous situation? (Y/N)	
Police attendance? (Yes/No) Police Report #:	
Details of any vehicles involved	
Attending supervisor and team at site. Date and time.	
Immediate Safety measures taken. Date & time.	
Power Supply Point / post identification number	
Initial Repair undertaken. Date & time	

Details of long term repair. Whom forwarded to for action.	
Description of replaced equipment and cost of equipment plus materials	
Number of hours claimed for complete repair	
Notes & Comments	

**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....