

		STRATEGIC ASSET MANAGEMENT QUALITY MANGEMENT SYSTEM SPECIFICATION	
TITLE: AUTOMATION PANELS SPECIFICATION		DOC NO: SAM AAM 00004 Spec	
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1. PURPOSE

The purpose of this specification is to address the supply, installation and commissioning of Automation panels, which are installed on Rand Water sites.

2. SCOPE

This standard applies to all Rand Water sites, suppliers and contractors.

3. APPLICABILITY

This Specification defines the requirements when supplying, installing and commissioning Automation panels at Rand Water sites

4. REFERENCES

Document Title	Document No.	Location
Automation Asset Management Specification.	SAM AAM 00003 Spec	AAM
Automation Design Procedure	DOA 00001 Pr	DOM
Fibre Optic Cable Specification	SAM AAM 00001 Spec	AAM
Programable Logic Controller Specification	SAM AAM 00015 Spec	AAM
Human Machine Interface Touchpanel Specification	SAM AAM 00012 Spec	AAM
Industrial Communication Specification	SAM AAM 00008 Spec	AAM
Automation Cybersecurity Standard	SAM AAM 00003 Std	AAM
Rand Water WKS Identification System Pocket Guide	RW/01200/L/012	Maintenance Planning
National Colour Standard	SANS 1091	RW Library
Galvanising	SANS 121	RW Library
Quality management systems - Requirements	SANS/ISO 9001	RW Library
Quality management systems – Guidelines for the application of ISO 9001: 2015	ISO 9002	RW Library
Occupational health and safety management systems - Requirements	ISO 18001	RW Library
Specification for plant codification labels	RW Maint 00007 Pr	Maintenance Planning

WKS Coding System General Label and Nameplate Detail for Plant and Equipment – Type A and B	RA10550	Maintenance Planning
WKS Coding System General Label and Nameplate Detail for Mechanical Plant and Valve Equipment – Type C and D	RA10551	Maintenance Planning
WKS Coding System General Label and Nameplate Detail for Plant and Equipment – Type E and F	RA10552	Maintenance Planning
WKS Coding System General Label and Nameplate Detail for Plant and Equipment – Type G and H	RA10553	Maintenance Planning
WKS Coding System General Label and Nameplate Detail for Plant and Equipment – Type I	RA10554	Maintenance Planning
WKS Coding System General Label and Nameplate Detail for Plant and Equipment – Type K and L	RA10555	Maintenance Planning
WKS Coding System General Label and Nameplate Type: M. Structure and Area Identification Label	RA10556	Maintenance Planning
WKS Coding System General Label and Nameplate Type: N. Plant Label	RA10557	Maintenance Planning
WKS Coding System Label and Nameplate Detail for LV, MV, DC Switchgear and Multi Cubicle Panels	RA10558	Maintenance Planning
WKS Coding System Label and nameplate Detail for LV, MV, DC Switchgear and Multicubicle Panels	RA10559	Maintenance Planning
Degrees of protection provided by enclosures (IP Code)	SANS/IEC 60529	RW Library
Standard Automation Kiosk General Arrangement	RA29317/001	DOA
Standard Automation Kiosk Concrete Foundation	RA29317/002	DOA

5. TERMS, DEFINITIONS AND ABBREVIATIONS

5.1. TERMS

- 5.1.1 Rand Water Representative:** Refers to the person appointed by Rand Water to act as the Design Engineer, Project Execution Engineer, Programme Manager, Project Manager or Station representative for the purposes of the Contract and notified to the Contractor.
- 5.1.2 Contractor:** Refers to a person, company or organisation that is appointed by Rand Water to provide goods or services or perform construction work.
- 5.1.3 OEM:** Original Equipment manufacturer which is a company that has sole intellectual property rights to equipment that is used by Rand Water. The equipment cannot be sourced from any other supplier/manufacturer other than the OEM. This includes services to repair and/or maintain such equipment where such services are declared by the supplier/manufacturer to be governed by sole intellectual property rights.
- 5.1.4 Supplier:** An entity or person who provides Rand Water with goods and/or services. The supplier must comply with all the applicable provisions of law including procurement related laws. The term “supplier” is all encompassing and shall be used in place “supplier”, “service provider”, “consultant” and “vendor”.
- 5.1.5 Data Sheets:** The drawings, tabulations and sketches, which clearly indicate the technical, electrical and physical requirements of the equipment.

5.2. DEFINITIONS

- 5.2.1 IP Rating:** Are defined in international standard EN 60529 (British BS EN 60529:1992, European IEC 60509:1989). IP Ratings are used to define levels of sealing effectiveness of electrical enclosures against intrusion from foreign bodies (tools, dirt etc.) and moisture.]
- 5.2.2 Factory Acceptance Test (FAT):** Is the process that evaluates the equipment during and after the assembly process by verifying that it is built and operating in accordance with the design Specification.
- 5.2.3 Automation Panels:** Refer to all the panels which house Automation (OT) equipment (PLC, HMI, telemetry, industrial network and instrumentation); and also includes junction boxes and kiosks.

5.3. ABBREVIATIONS

A	Amperes
AAM	Automation Asset Manager
AC	Alternating Current
ADS	Application data sheet
AMSL	Above mean sea level
ANSI	American National Standards Institute
DC	Direct Current
ETH	Ethernet
FAT	Factory Acceptance Test
GMO	General Manager Operations
GMSAM	General Manager Strategic Asset Manager
HMI	Human Machine Interface
HRC	High Rupturing Capacity
Hz	Hertz
IEC	International Electrotechnical Commission
InSQL	Industrial Structured Query Language
I/O	Input / Output
IP	Ingress Protection
kPa	Kilo Pascal
LCD	Liquid Crystal Display
LED	Light Emitting Diode
M	Meters
mA	Milliamps
MCB	Miniature Circuit Breaker
mm	Millimetres
IP	Ingress Protection
NPT	National Pipe Thread
PLC	Programmable Logic Controller
QAP	Quality Assurance Plan and Procedures
RFB	Request for Bid
RFI	Request for Information
RFP	Request for Proposal
RTD	Resistance Temperature Detector
RTU	Remote Terminal Unit
RW	Rand Water
SABS	South African Bureau of Standards
RS485	Recommended Standard 485
SCADA	Supervisory Control and Data Acquisition
UPS	Uninterruptible Power Supply
WKS	Water Codification System
V	Volts
Ω	Ohm

°C

Degrees Celsius

6. RESPONSIBILITY AND AUTHORITY

6.1. OWNERSHIP

6.1.1 Automation Asset Manager is the custodian of this specification.

6.2. INTERESTED / AFFECTED PARTIES

6.2.1. The specification shall be made available to all interested / affected parties on request; and

6.2.2. Interested / affected parties shall adhere to the Automation Panels Specification.

6.2.3. Interested / affected parties shall only use the latest reversion of the specifications referenced in this standard specification.

6.3. CONTRACTORS / SUPPLIERS

6.3.1 The contractor or supplier shall ensure that the installations are done in accordance with the External Body standards referenced in the document.

6.3.2 Rand Water shall not issue any copies of the External Body standards referenced in the document to any contractor; it is the responsibility of the suppliers to have their own copies.

6.3.3 No claims for extras in respect of failure by the suppliers / contractors to comply with any of the above regulations or specifications will be entertained by Rand Water.

6.4. ACCREDITATIONS / VENDOR RESPONSIBILITIES

6.4.1 No claims for extras in respect of failure by the suppliers or contractors to comply with any of the above regulations or specifications will be entertained by Rand Water.

6.4.2 Where conflict exists between any Rand Water technical specifications, the above regulations and the detailed technical specification or notes on drawings, the said conflict shall be referred to the Rand Water Representative for clarification.

7. ACTION / PROCEDURE / METHOD

7.1 CONTROL PANEL

7.1.1 Operational Requirements

7.1.1 The Panel shall be capable of continuous operation at full rating without temperature rise as recommended by the relevant SANS or IEC standard.

7.1.2 Mechanical Construction

<u>Place of Installation</u>	<u>Junction Boxes</u>	<u>Indoor</u>	<u>Outdoor</u>	<u>Chlorine, Ammonia, Ferric Chloride, Poly & Online Labs</u>	<u>Telemetry</u>
POWER SUPPLY DETAILS					
<u>Supply Voltage</u>	N/A	All panels must be fed from the UPS (Refer to the Electrical System Specification)	All panels must be fed from the UPS (Refer to the Electrical System Specification)	All panels must be fed from the UPS (Refer to the Electrical System Specification)	All panels must be fed from the UPS (Refer to the Electrical System Specification)
<u>Neutral Earthing (Secondary)</u>	N/A	Solid (Refer to the Electrical System Specification)	Solid (Refer to the Electrical System Specification)	Solid (Refer to the Electrical System Specification)	Solid (Refer to the Electrical System Specification)
OTHER					
<u>IP Rating</u>	IP68 minimum	IP55 minimum	IP65 minimum	IP55 minimum	IP55 minimum
<u>Type of access</u>	Specified in System specification	Specified in System specification	Specified in System specification	Specified in System specification	Specified in System specification
<u>Type of entry</u>	Specified in System specification	Specified in System specification	Specified in System specification	Specified in System specification	Specified in System specification
<u>Panel enclosure material Type</u>	304 Stainless Steel	3CR12 (minimum)	3CR12 (minimum)	Polycarbonate	3CR12 (minimum)
<u>Door Thickness</u>	2mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)
<u>Door latching mechanisms</u>	All front and rear doors shall be hinged and	<ul style="list-style-type: none"> All front and rear doors shall be hinged and provided with a minimum of two 7mm square key locks, of which one shall be pad lockable. 			

	provided with a minimum of two 7mm square key locks, of which one shall be pad lockable	<ul style="list-style-type: none"> The doors shall be reinforced on the inside. Fit sensors when doors open and close (intruder detection). Security Access control shall be done via biometrics only on the PLC and server panels. 			
<u>Chassis plate thickness</u>	1.6 mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)	1.6 mm (minimum)
<u>Gland plate thickness</u>	2.5mm Galvanised steel (minimum)	2.5mm Galvanised steel (minimum)	2.5mm Galvanised steel (minimum)	2.5mm Galvanised steel (minimum)	2.5mm Galvanised steel (minimum)
<u>Finish</u>	Powder coated, Structured	Powder coated, Structured	Powder coated, Structured	Powder coated, Structured	Powder coated, Structured
<u>Colour</u>	Cornflower, F29, SANS 1091	Cornflower, F29, SANS 1091	Cornflower, F29, SANS 1091	Cornflower, F29, SANS 1091	Cornflower, F29, SANS 1091
<u>Humidity</u>	N/A	<ul style="list-style-type: none"> 80% (condensing for PLC panels located outdoors). Air conditioners for Filter Houses and Engine Rooms. Humidity and temperature sensors shall be fitted to the panels. 			N/A

7.1.3 General Requirements

- 7.1.3.1. A rigid assembly shall be ensured by a suitable profiled base frame to eliminate distortion in lifting, transportation and installation.
- 7.1.3.2. Suitable and easily accessible lifting lugs must be provided.
- 7.1.3.3. A fully bolted modular system is preferred.
- 7.1.3.4. Permitted enclosure configurations:
- 7.1.3.4.1. Front access, rear access and rear termination is preferred.
- 7.1.3.4.2. Front access, front termination (where rear access is not possible).
- 7.1.3.5. The doors shall be suitably braced and stiffened; and have the appropriate types and numbers of hinges to carry the weight of equipment mounted on the door to prevent distortion.
- 7.1.3.6. Doors located with pins are not acceptable.
- 7.1.3.7. Bolts, studs, and domed nuts are not acceptable for fastening the PLC panel doors.
- 7.1.3.8. Doors shall be fitted with non-hardening rubber or neoprene seals.
- 7.1.3.9. The doors shall be fitted with shatterproof glass window held in place with rubber or neoprene seals.

- 7.1.3.10. Panels which are installed outdoor the shatterproof glass shall be fitted with a UV protected tint.
- 7.1.3.11. The glass windows shall be sized so that all PLC cards, transmitters and device status indication lights are visible without having to open the doors.
- 7.1.3.12. The HMI shall be mounted on the door of the terminal side of the panel.
- 7.1.3.13. All doors shall be bonded to earth with a green with yellow trace, or bare stranded copper earth conductor.
- 7.1.3.14. Arrangements shall be made to ensure effective metallic contact between the earth conductor and the panel door.
- 7.1.3.15. The minimum size of the earth conductor shall be 2.5mm².
- 7.1.3.16. Only polycarbonate enclosures shall be utilised in installations where Chlorine, Ferric Chloride, Poly, Online Laboratories or Ammonia is present unless the PLC panel is located remotely from any possible contamination; approval shall be obtained from the Rand Water Representative before sheet metal enclosures are used in these applications.
- 7.1.3.17. The PLC panel shall be provided with a separate cable marshalling termination compartment.
- 7.1.3.18. The PLC panel shall be fitted with LED lights which shall switch on when the panel door(s) are opened.
- 7.1.3.19. The PLC panel door shall have a cut-out for the HMI, please refer to **Human Machine Interface Touch Panel Specification SAM AAM 00012** Spec for the size and specification of the HMI, System specification shall specify the need.
- 7.1.3.20. Refer to the **Programable Logic Controller Specification SAM AAM 00015 Spec** for the PLC specifications as well as the applicable System Specifications.
- 7.1.3.21. Panels which are installed in the Filter Houses and Engine Rooms shall be fitted with Air Conditioners.
- 7.1.3.22. Drawing pockets shall be fitted in the panels.
- 7.1.3.23. PLC panels shall be fitted with a UPS plug.
- 7.1.3.24. PLC panels shall be fitted with a foldable table.
- 7.1.3.25. The intruder detection, temperature and humidity sensors must be wired to the PLC and displayed on the SCADA.
- 7.1.3.26. The biometric system shall be linked PLC and SCADA.

7.1.4. Equipment mounting plates (chassis plates)

- 7.1.4.1. Chassis plates shall be sufficiently rigid to carry the components mounted thereon without deflection.
- 7.1.4.2. The drilling and tapping of holes for the mounting of components or “hank” captive nuts shall be used to secure components; loose bolt and nut arrangements shall not be accepted.
- 7.1.4.3. Chassis plates manufactured from galvanised steel shall be powder coated white, galvanised or Aluzinc coated.

7.12.5. Gland Plates

- 7.1.5.1. Sectionalised removable gland plates shall be provided and secured by means of “hank” captive nuts or screws and so located that ample space is afforded for the satisfactory entry and termination of cables.
- 7.1.5.2. Cable entry shall be from the bottom; top entry shall only be permitted at the discretion of the Rand Water Representative.
- 7.1.5.3. The gland plates shall be mounted at least 150mm (minimum) above floor level.
- 7.1.5.4. The gland plates shall be manufactured from galvanised steel, with a minimum thickness of 2.5mm and shall be galvanised; painted cable gland plates are not acceptable.
- 7.1.5.5. The gland plates shall be adequately sized for the expected number of cables to be installed in that tier.
- 7.1.5.6. The gland plate shall have 25% spare capacity of knock out holes.

7.1.6 Screws, Nuts and Bolts

- 7.1.6.1. All screws, nuts and bolts shall be hexagonal to ISO metric, commercial standards and shall be rust proof.
- 7.1.6.2. Nuts protruding from exterior surfaces shall be domed and either chrome or cadmium plated.
- 7.1.6.3. Self-tapping screws shall not be utilised for any purpose.

7.1.7 Painting of Sheet Metal Fabrications

- 7.1.7.1. The final paint finish shall be epoxy powder.
- 7.1.7.2. The minimum final paint thickness shall be 70 micrometres and shall be measured at various points as indicated by the Rand Water Representative.
- 7.1.7.3. The Panel manufacturer shall provide a calibrated test instrument capable of accurately determining the final paint thickness.
- 7.1.7.4. This instrument shall be made available at the Panel painted, sheet metal inspection.

7.1.8 Quality of Final Finish

- 7.1.8.1. The application of the paint shall be uniform to prevent running.
- 7.1.8.2. Careful attention shall be applied to the application of the paint to sharp edges and corners to prevent cracking or peeling of paint.
- 7.1.8.3. Any surface exhibiting these symptoms shall be rejected and shall be stripped and completely repainted.

7.1.9 Control and Instrument Wiring

- 7.1.9.1. Control and instrument wiring shall be carried out using 600V grade flame retardant PVC insulation, multistrand wire with a minimum of 19 strands.
- 7.1.9.2. The minimum wire sizing for control circuits shall be 1mm², minimum of 0.75mm² wire will be permitted for connections between the PLC panel and the PLC cards.
- 7.1.9.3. All 4 -20mA current loops shall be wired using individually screened wires; screens shall be earthed at PLC side only.
- 7.1.9.4. All wires shall be terminated using compression crimp lugs unless the wire terminates in a pressure pad type terminal in which case compression ferrules shall be used.
- 7.1.9.5. All wires shall be numbered at both ends using colour coded Legrande type, CAB or TAB ferrules (or an approved equivalent).
- 7.1.9.6. The Wires between the PLC card and the terminal strip shall be numbered on the terminal side only.
- 7.1.9.7. Numbering shall be strictly in accordance with the relevant schematic diagrams.

7.1.10 Colour Coding of Wiring

- 7.1.10.1. The wire colours shall be of the same standard and colour, if the wire colour differ during the wiring of the panel, the panel shall be rewired.

AC Live	Brown or red
AC Neutral	Black
Metering (phase circuits)	Red, White, Blue for respective phase circuits
Metering (neutral)	Black
110V DC positive	Grey
110V DC negative	Grey
24V DC positive	Pink
24V DC negative	Orange
4 20mA signal	Purple
Earth	Green with yellow trace
110V AC	Red, White and Blue phases respectively
Other	Yellow

7.1.11 Terminals for Control and Instrumentation Wiring

- 7.1.11.1. Terminals for control circuits for connections to components external to the PLC panel and to the PLC shall UK 5-MTK-P/P (Knife disconnect terminal block).
- 7.1.11.2. 10% spare terminals shall be provided on any terminal block or assembly.
- 7.1.11.3. Only one wire per side of the terminal is permitted and insulated copper bridge pieces shall be used between terminals where more than one wire is required to be connected.
- 7.1.11.4. Terminals shall be arranged as per the loop drawings.

- 7.1.11.5. Each terminal shall carry a number on both the input and output side and each terminal strip shall be numbered in accordance with the relevant loop drawings.
- 7.1.11.6. No terminals shall be mounted on the sides of the panel and shall only be mounted on the chassis plates.

7.1.12 Trunking and Control of Wiring

- 7.1.12.1. Wiring trunking shall be used for the control of wiring in the PLC panel(s).
- 7.1.12.2. The trunking shall be sized such that after all cabling has been completed the trunking shall be no more than 50% full.
- 7.1.12.3. Wiring to devices mounted on cubicle doors shall be arranged so that when the door is opened, a twisting rather than bending motion is imparted to the wires.
- 7.1.12.4. Wiring to the panel's doors shall be secured and controlled using spiral bindings.
- 7.1.12.5. No wires joints are allowed inside the trunking.

7.1.13 Specific Requirements for PLC Panel Wiring

- 7.1.13.1. Two sets of marshalling terminals shall be provided for interfacing with PLC's.
- 7.1.13.2. LED type relays terminals shall serve as field marshalling terminals.
- 7.1.13.3. All input and output card terminals shall be wired to a set of terminals arranged to mimic the PLC input or output card and shall bear a code number reflecting the PLC card number.
- 7.1.13.4. The terminals shall bear the same number as the PLC card terminal numbers and the wires shall also carry this number.
- 7.1.13.5. A second set of terminals shall be installed to permit termination of all the cable cores or inter-panel wires.
- 7.1.13.6. The arrangement of this second set of terminals shall be grouped by cable and each block of terminals shall be provided with a number.
- 7.1.13.7. Patch wiring shall be provided as required between these sets of terminals.
- 7.1.13.8. Terminals used for this purpose shall be UK 5-MTK-P/P (Knife disconnect terminal block).
- 7.1.13.9. Only 24VDC shall be wired to the PLC cards, all other voltages shall be wired through interposing relays with LED's, the interposing relays shall act as field terminals
- 7.1.13.10. When wires cross through sheet metal holes, the hole shall be fitted with grommets.

7.1.14 Surge Arrestors

- 7.1.14.1. Current loops (4 – 20mA) and PLC input signals shall be protected with surge arrestors on the incoming terminals of field wiring.
- 7.1.14.2. Internal loops with wiring that does not leave the PLC panel do not require surge protection.
- 7.1.14.3. The PLC panel shall be powered through Class 1 / Class 2 combined surge arrestors

7.1.15 Indication Lamp, Pushbuttons and Selector Switches

- 7.1.15.1. Indicating devices may be mounted inside the enclosure behind a transparent window or cover.
- 7.1.15.2. Emergency Stop pushbuttons shall be of the latching, twist to release type and shall be provided with padlocking facilities to permit padlocking in the OFF position.
- 7.1.15.3. Stacker light shall be installed on top of the pumpset PLC panel.

7.1.16 DC Power Supplies

- 7.1.16.1. Where required 24V DC power supplies shall be provided and have voltage regulation characteristics, current limiting in its output and suitable output short circuit protection.
- 7.1.16.2. The 24V DC supplies shall be rated at twice the connected load and each circuit provided with a miniature circuit breaker suitably rated for the circuit.
- 7.1.16.3. Where the minimum required rating of the DC circuit breaker is below the minimum rating; fuses of the correct rating shall be employed.
- 7.1.16.4. All 24VDC supply shall have LED type fuse terminals.

7.1.17 Control Voltage Supplies

- 7.1.17.1. The control voltage supply shall be 230V AC derived from a supply taken from UPS distribution section in the Panel 400V Board.
- 7.1.17.2. This MCB shall have single pole short circuit protection with neutral isolation i.e., it shall be rated to trip at its nominal current rating at 230V AC.
- 7.1.17.3. 110V DC control supplies shall be taken from the DC distribution section in the Panel 400V Board or a DC distribution board.

7.1.18 Polycarbonate PLC panels

- 7.1.18.1. Polycarbonate enclosures shall have bases manufactured from glass filled polycarbonate thermoplastic.
- 7.1.18.2. Clear covers shall be non-filled thermoplastic.
- 7.1.18.4. The enclosures shall have a high impact resistance, shall be flame resistant and self-extinguishing.
- 7.1.18.5. The enclosures shall be non-hygroscopic and shall be ultraviolet light resistant.
- 7.1.18.6. Panels assembled from polyester enclosures shall be provided with a substantial metal frame to permit handling and installation without distortion or excessive flexing occurring.
- 7.1.18.7. The finish of the frame shall be suitable for the environmental conditions specified.
- 7.1.18.8. Removable covers shall be secured by means of captive screws.
- 7.1.18.9. The individual cubicles shall be IP66.
- 7.1.18.10. The coupling of individual enclosures to form panel (s) shall in no way cause a deterioration in the degree of protection of the overall assembly, or of any individual enclosures.

7.1.18.11. The PLC panel shall be provided with a separate cable termination compartment.

7.2. WALL MOUNTED NETWORK CABINETS

- 7.2.1. The size of the wall mounted network cabinet shall be specified in the System Specification.
- 7.2.2. The cabinet shall be fitted with two fans, applicable to indoor network cabinets.
- 7.2.3. Material: Mid Steel, powder coated, applicable to indoor network cabinets.
- 7.2.4. Colour: Black.
- 7.2.5. Doors: Glass front door and swing frame back (open). Glass door shall be south facing.
- 7.2.6. Side panels: Solid panels – removable and lockable.
- 7.2.7. Shatterproof glass front door with security lock.
- 7.2.8. Adjustable rail depth to suit equipment.
- 7.2.9. Refer to the **Industrial Communication Specification SAM AAM 00008 Spec** and the **Fibre Optic Cable Specification SAM AAM 00001 Spec** for the network equipment specifications as well as the applicable System Specifications.

7.3 AUTOMATION KIOSK

- 7.3.1. Refer to drawings no: **RA29317/001** and **RA29317/002**.

7.4 INSPECTION DURING MANUFACTURING

- 7.4.1. The Rand Water Representative shall be permitted to carry out, during normal working hours, periodic inspections of the Panel and equipment covered by this specification over and above the witness and hold points indicated on the QAP.
- 7.4.2. Inspections shall include but shall not be limited to:
- 7.4.3. Checks to determine that the Panel steelwork and painting fully and strictly comply with specification.
- 7.4.4. Checks to determine that the Panel and components fully and strictly comply with this specification.

7.5 FACTORY ACCEPTANCE TESTING

- 7.5.1 The Rand Water Representative shall be invited to witness the final Factory Tests of the Panel and equipment before delivery will be permitted.
- 7.5.2 The following checks / tests shall include but shall not be limited to:
- 7.5.3 Checks to determine that the PANEL and components fully and strictly comply with this specification and all relevant design drawings.
- 7.5.4 Full functional tests of all mechanical and electrical components and electrical circuits.
- 7.5.5 The manufacturer shall provide all power supplies, testing equipment, means of simulating related remote devices and competent personnel to conduct the tests.

- 7.5.6 The manufacturer shall give at least ten (10) working days' notice of readiness for final inspection and factory tests.
- 7.5.7 A list of defects and deviations will be provided by the Rand Water Representative during the inspections.
- 7.5.8 The issue of such list does not relieve the manufacturer of his responsibility to ensure full compliance with this specification.
- 7.5.9 Items considered as deviations by the contractor, from this specification shall be dealt with as per the contractual requirements.
- 7.5.10 All test results shall be recorded on the manufacturer's standard test certificates; three copies of which, duly approved shall be supplied to the Rand Water Representative as per the contractual requirements.
- 7.5.11 Equipment may not be delivered to site until the manufacturer has cleared all defects listed by the Rand Water Representative and the Rand Water Representative has re-inspected the PANEL to confirm rectification of work on the defects list.

7.6 PREPARATION FOR DELIVERY

- 7.6.1 Panels transported to site shall be wrapped in suitable materials to prevent damage during shipment, from both mechanical and environmental damage.
- 7.6.2 The contractor shall ensure that the site is ready for offloading and installation prior to delivery.

7.7 OFFLOADING

- 7.7.1 Only qualified personnel and certified equipment shall be utilised for lifting the Panel onto and off the transport vehicle and positioning it in the final installation location.
- 7.7.2 The contractor shall ascertain the exact position of the Panel before delivery.

7.8 WKS CODING SYSTEM

- 7.8.1 For WKS numbering refer to the **Rand Water WKS Identification System Pocket Guide RW/01200/L/012** and **Specification for plant codification labels RW Maint 00007 Pr.**
- 7.8.2 The Rand Water Representative shall, in accordance with Rand Water's standard documentation, provide a list of all WKS codes to be issued to the contractor.
- 7.8.3 The relevant WKS code shall be included on the label/s according to the required Rand Water format.
- 7.8.4 The Contractor shall be responsible for labelling of all plant, equipment and components for which he/she is responsible for in terms of engineering and design as per RW Maint 00007 Pr.

7.9 OPERATION AND MAINTENANCE MANUALS

- 7.9.1 The Contractor shall provide fully indexed illustrated operating and maintenance (O&M) manuals for the complete equipment / plant.
- 7.9.2 The O&M manual shall contain at minimum the following documentation:
 - 7.9.2.1. OEM documentation / equipment specification.
 - 7.9.2.2. Training manuals
 - 7.9.2.3. “As Commissioned” Schematic and loop diagrams.
 - 7.9.2.4. Or any other documentation as specified in the tender document.

7.10 QUALITY ASSURANCE REQUIREMENTS

- 7.10.1 Quality Assurance Plan and Procedures (QAP).
- 7.10.2 testing procedures shall be developed by the contractor and approved by Rand Water Representative.
- 7.10.3 This system must be registered to ISO 9002 and regularly reviewed and audited by a third-party registrar or an in-house quality management system.
- 7.10.4 All material shall be inspected and / or tested for conformance to quality assurance specifications.
- 7.10.5 All sub-assemblies and panels shall be inspected and/ or tested for conformance to supplier’s engineering and quality assurance specifications.
- 7.10.6 The manufacturer shall submit to Rand Water a short form of a copy of its Quality Assurance Procedures manual for approval by the Rand Water Design Office after detailed design freeze.
- 7.10.7 Rand Water shall be given the opportunity to indicate hold and witness points on the plan.

7.11 DRAWINGS AND DOCUMENTATION

- 7.11.1 All drawings shall be completed according to Rand Water’s drawing standard.
- 7.11.2 Prior to commencement of manufacture of the PANEL, all drawings for construction shall be of Rev.0 and shall have been accepted by the Rand Water Representative for approval.
- 7.11.3 The following drawings shall be submitted to the Rand Water Representative for acceptance:
 - 7.11.3.1. Loop diagrams and schematic diagrams.
 - 7.11.3.2. Panel arrangements drawings(s) showing overall dimensions and positions.
 - 7.11.3.3. Front and rear panel layout showing mounting positions of all equipment, chassis layouts, terminals, trunking and free space between equipment.
 - 7.11.3.4. Panel door layouts showing relative positions and dimensions of equipment mounted on the panel doors.
 - 7.11.3.5. Schedule of all labels showing size of label and letters and the wording of the label.
 - 7.11.3.6. Material list containing make and model number of all equipment of all equipment, ratings and manufacturer / supplier contact details.

- 7.11.4 Failure to comply with this requirement timeously may result in rejection of the Panel.
- 7.11.5 Prior to the delivery of the Panel, the following drawings and documentation shall be submitted to the Rand Water Representative for acceptance:
 - 7.11.5.1. Data sheets.
 - 7.11.5.2. "As Built" drawings to Rev. 01.
 - 7.11.5.3. Test certificates.
 - 7.11.5.4. The following post commissioning drawings and documentation shall be submitted to the Rand Water Representative for acceptance:
 - 7.11.5.5. "As Commissioned" drawings to Rev. 02.
 - 7.11.5.6. Operation and Maintenance manuals as per Rand Water's guideline.
 - 7.11.5.7. Any additional documentation as required.

7.12 LABELLING

- 7.12.1. Labelling of all Automation panels refer to Specification for plant codification labels **RW Maint 00007 Pr.**

8. RECORD AND DATA KEEPING

Record Document	Form/Doc Number	Location	Retention Period
Project File	As per project	Document Management Office	5 years

9. DOCUMENT CHANGE HISTORY

The following table contains the history of this document with a description of each revision.

Date	Previous Revision Number	New Revision Number	Description of Each Revision
July 2020	None	01	New document
September 2022	01	02	Change document name and scope