

EICC Inspection, Testing, Completions & Decommissioning

Document Number AM 2851

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Document Control

Rev	Date	Revision Details	Clause	Author	Approved
0	13/08/20	<p>The EIC committee had reviewed various sections of this Standard on 5 occasions. We have set revision to rev 0.</p> <p>We have decided to segregate the original AM2714 into separate standards, namely:</p> <ul style="list-style-type: none"> • AM2714 – Electrical Standards • <u>AM2832 – Instrumentation & Controls Standards</u> • <u>AM2847 – Communications Standards</u> • <u>AM2851 – EIC Inspection, Testing & Completion and Decommissioning Standards (this document)</u> • <u>AM2848 – EIC Approved Equipment List</u> 	All	EIC Committee	A. Gabriel C. Paxman
0.1	08 May 2022	<p>Updated references, FAT /SAT requirements, Completions and Spare Parts</p> <p>Document title to include 'Decommissioning'</p>	2.1, 2.4, 2.5, 2.6, 2.9. 2.10	EIC Committee	A. Gabriel C. Paxman

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1. General Requirements

1.1 Acronyms and Abbreviations

All abbreviations and acronyms used in additional documentation, shall follow the conventions used through this and other related project documents.

Acronym	Description
3G 4G	Cellular Communications Service
ABS	Acrylonitrile Butadiene Styrene
AD	Active Directory
AI	Analogue Input
AO	Analogue Output
ATS	Auto Transfer Switch
COTS	Commercial Off The Shelf
CT	Current Transformer
Cu	Copper
DI	Digital Input
DIN	German Institute for Standards (Deutsches Institut für Normung)
DNP3	Distributed Network Protocol (version 3)
DO	Digital Output
ELV	Extra Low Voltage
EMC	Electromagnetic Compatibility
FAT	Factory Acceptance Test
FDS	Functional Description Specification
FOBOT	Fibre Optic Break Out Tray
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ICS	Industrial Control system
iLO	Integrated Lights Out
IO	Input Output
IP	Ingress Protection
IR	Insulation Resistance
IT	Information Technology
ITP	Inspection Test Plan
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LV	Low Voltage

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mAHD	Metre Australian Height Datum
NTP	Network Time Protocol
OTDR	Optical Time Domain Reflectometer
P&ID	Process & Instrumentation Diagram
PC	Personal Computer
PLC	Programmable Logic Controller
PSU	Power Supply Unit
PTC	Positive Temperature Coefficient
PVC	Polyvinyl Chloride
RCD	Residual Current Device
RTU	Remote Telemetry Unit
SAL	Site Alarm List
SAT	Site Acceptance Test
SCADA	Supervisory Control And Data Acquisition
SDM	System Design Matrix
SEW	South East Water
SFP	Small Form Pluggable
STP	Sewage Treatment Plant
TBA	To be advised
TBC	To Be Confirmed
TFT	Thin Film Transistor
TTP	Tertiary Treatment Plant
UF	Ultra Filtration
UPS	Uninterruptable Power Supply
UPVC	Unplasticised Polyvinyl Chloride
UV	Ultra Violet
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
VSD	Variable Speed Drive
WAN	Wide Area Network

1.2 Scope

This specification outlines South East Water's minimum standards for the inspection, testing, completion and decommissioning of electrical, instrumentation, automation, data networks equipment and associated items used at new or renewed water and sewerage infrastructure sites. This standard shall be used in conjunction with AM2755_Testing, Commissioning and Handover Plan.

Excluded from the scope of this specification are:

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- a. South East Water assets not containing water and sewerage infrastructure (eg: WatersEdge office, depots)
- b. Functional or operational requirements relating to electrical assets.
- c. Monitoring, protection, control and communication system design, configuration and programming. This is covered by other South East Water standards such as AM2779_Treatment Plant Monitoring and Control Specification.
- d. Civil, mechanical arrangements, pump selection, pump performance or hydraulic assessment.
- e. Work practices associated with the management of electrical risks during construction and installation works.

1.3 Standards

The following standards shall apply in the given order of preference:

- a) Australian Standards or its IEC/ISO equivalent
- b) OH&S Regulations 2017 (Victoria)
- c) Electricity Safety (Installations) Regulations (Victoria)
- d) Victorian Service & Installation Rules
- e) Essential Services Commission Electricity Distribution Code
- f) Requirements of the Electricity Distribution Company
- g) Electricity Safety Act (Victoria)
- h) Manufacturer's Guidelines
- i) Water Industry Standards, including:
 - i. WSA04 Sewage Pumping Station Code Of Australia
 - ii. South East Water supplementary manual to WSA04
 - iii. South East Water Standard Electrical Drawings
 - iv. AM2779_Treatment Plant Monitoring and Control Specification (SEW)
 - v. AM2717_Generator Specification (SEW)
 - vi. AM2522_O&M Manual Specification (SEW)
 - vii. AM2755_Testing, Commissioning and Handover Plan (SEW)
 - viii. AM2739_Corrosion Mitigation Specification (SEW)
 - ix. AM2727_Covers for Underground Structures (SEW)
 - x. AM 2758_Noise Specification (SEW)
 - xi. AM2775_Watershed Collection Details (SEW)
 - xii. AM2776.3_Air Treatment Unit Specification and Commissioning (SEW)
 - xiii. AM2488_2D and 3D Drafting

The order of precedence of documents shall be as follows:

- a) Legislated requirements
- b) Project specific specifications
- c) Project specific drawings
- d) South East Water standards
- e) South East Water standard drawings
- f) Water Industry Standards (WSAA)

1.4 Quality of Workmanship

Please refer to AM2714.

2. Inspection, Testing and Completion

The contractor shall develop an ITP during the design process which details all tests and procedures to be completed through fabrication and installation. It shall at least include plans for Factory Acceptance Testing (FAT), Site Acceptance Testing (SAT), Instrument Calibration, Communications Cable testing and Performance Testing.

Tests shall ensure all equipment operates correctly, safely, and efficiently and meets the correct operation in accordance with the drawings, specifications and manufacturer's requirements.

The ITP shall be submitted to SEW during the design process with no testing to commence until the ITP has been approved in writing by SEW.

Notice shall be given to South East Water's superintendent or nominated representative to witness key stages of construction (important ITP milestones, FAT, SAT, Performance Testing). Nominally 5 working days' notice shall be given unless otherwise negotiated.

All tests shall be witnessed and signed off by an SEW representative.

2.1 Key References

- AM2755 Testing, Commissioning and Handover Plan
- AM2775 Watershed Collection Details (Equipment data sheets)
- AM2522 O&M Manual and Operating Training Specification
- Appendix A – Site Acceptance & Inspection Test Sheets
- Appendix B – Consumer / Submain, Motor, DC Supply Test Results.
- Appendix C – Instrument Calibration Record

2.2 Installation & Transition Management Plan

The Contractor must develop an Installation & Transition Management Plan (ITMP) that details the transition planning to either commission a new plant or transition an existing plant from its current control system to the new control system. The plan is to also include rollback plans in the event the cutover cannot be completed.

2.3 Inspection

Inspection during construction shall ensure all equipment is assembled and installed compliant to relevant standards, regulations, manufacturer's guidelines and the requirements of this specification. Inspection shall at least consist of:

- Installation of underground electricity supply mains prior to backfill.
- Installation of underground conduits prior to backfill. Inspect points can be prepared if immediate backfill is required.
- Installation of conduits under concrete or asphalt prior to laying.
- Site electrical inspection conducted by a South East Water nominated registered electrical inspector.

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- Visual inspection for construction, finish and standard of work
- Inspection for consistency with design and specifications
- Complete check of wiring and terminations

Photographs of all inspections undertaken shall be included as part of the ITP record.

2.4 Factory Acceptance Testing (FAT)

Prior to delivery of equipment to site, all preassembled equipment shall be tested in accordance with the approved FAT contained within the ITP.

The FAT shall reference the FDS such that the testing replicates the actual operating scenarios. FAT shall be conducted using as much of the “real world” equipment as possible to accurately simulate operating conditions. Prior to FAT, the Contractor shall advise what parts of the testing or equipment will be simulated.

Ensure all solid state devices are protected from excessive voltage or current during testing.

All documentation listed in section 2.6 and section 2.7 shall be made available at the time of FAT.

Equipment shall not be delivered to site until FAT has been completed, fully documented, witnessed and verified in writing by an SEW representative.

The following tests and activities shall be undertaken as a minimum:

- Insulation resistance tests on wiring.
Carry out insulation resistance tests on the switchboard assembly prior to energisation, to verify the IR readings. Demonstrate >1000 mega Ohm resistance using 1kV megger, with all submains connected.
- Conductance testing: Millivolt drop tests on busbar joints.
- Point to point checks of all input, output and circuit wiring.
- Fault loop impedance tests.
- Testing of interfaces to other equipment
- Functional tests using externally connected simulated circuits and or equipment. Operate and functionally test relays, PLC digital and analogy input outputs, protection, interlocking, metering, indications, switches, ATS systems, thermostats, ventilation and anti-condensation devices. Test all controls, processes, interlocks & protection circuits in reference to the FDS.
- Adjust power supply nominated output voltages.
- Check and adjust settings of motor starting devices.
- Check Current Transformers for polarity and connection.
- Check termination and gland provisions to ensure that they are suitable for cables to be installed on site. Mechanically check clamps, fixings and terminations.
- Full functional testing of local Human Machine Interfaces with reference to the FDS
- Complete testing of all alarms referencing the SAL
- Verification of the range, units, failure mode and deadbands of tags referencing the SDM
- Set settings of protection devices.
- Earth system continuity and resistance tests.

- Continuity and resistance of incoming neutral.
- Polarity.
- Power Factor.
- Phase Sequence.
- Verify operation of residual current devices.
- Confirmation that circuit protective devices are sized and adjusted to protect installed circuits.
- Compliance dossier (details TBA)
- Nominated EIC committee members shall be present during the FAT

2.5 Site Acceptance Testing (SAT)

Following completion of FAT and site installation works, SAT shall be conducted. Where testing involves signals from and commands to field devices these shall be done to/from the completed field device installation as far as practical to minimise the amount of simulation required.

There shall be no soft or PLC simulation during SAT.

The following tests and activities shall be undertaken as a minimum:

- Functional tests of all instrumentation, control, interlock, process, protection and communications in all modes of operation (eg: manual, automatic and remote operation) in reference to the FDS.
- Demonstrate operation of all IO by initiation from the alarm / status source i.e. float, pressure switch, motor overload, limit switch.
- Check correct display of all IO and equipment operation on any local HMI display, South East Water remote SCADA device and the South East Water SCADA Host in reference to the FDS and site alarm list (SAL).
- Off-line load tests for any standby generators and UPS's.
- Motor insulation resistance, winding resistance and running load current (if not completed in FAT).
- Process instrumentation equipment verification challenged at 0, 25, 50, 75 and 100% of the calibrated measurement range (if not completed in FAT). Refer Appendix C for Instrument Calibration record requirements.
- Position accuracy checks for all actuators and valves (if not completed in FAT).
- Actuator operational configuration shall be performed by the actuator vendor.
Relevant configuration files shall be downloaded from the commissioned actuator and forwarded as part of the Final Commissioning Submission.
- Electromagnetic flowmeter verification test and report.
- Thermographic scan of all main switchboards, sub-assemblies, distribution load centres, motor drives, motors and cable terminations operating under designed loads. Lighting and general-purpose outlets excluded. Scan performed by persons accredited with a Level I Infrared Thermography Certification (IRT Cat 1 or equivalent that complies with ISO-18436, ASNT SNT-TC-1A) or higher. Provide a formalised report indicating equipment scanned, defects and corrections.
- OSI PI historian data verification
- Testing of interfaces to other equipment

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- Functionality and signal testing of all communication networks
- Testing of all emergency stops, limit switches and safety devices
- Nominated EIC committee members shall be present during the SAT

2.6 Final Submissions

Prior to final performance testing, submit:

- Reports indicating results obtained during pre-commissioning (ITP, FAT and SAT results) indicating compliance or non-compliance with the requirements.
- A full list of telemetry digital and analogy points clearly identifying successful indication and transmission. The list shall indicate Tag No, Description, Status Value, Analog Span, Applied Offset and relevant Engineering Units.
- All software source code and equipment software settings where relevant.
- As-built drawings, operation and equipment maintenance manuals, spare parts schedule, authorities and utilities approvals.
- Where equipment is non-standard and SEW do not own the software, an unlocked software package must be provided with an unlocked copy of the source code/program.
- Submit a final commissioning program (Performance Testing) which outlines the operational specifics to demonstrate the operation of the plant.
- Provide valve actuator supplier commissioning setup documentation indicating valve position, direction, speed, open / close position limits, actuator torque set point, alarm outputs, HMI, fail position, manual lever operation
- A complete list of all settings applied to each item of equipment and instrumentation. Include instrument calibration, ranges, instrument relative offsets (i.e. level to mAHD). Refer Appendix E.
- Signed Certificates of Electrical Safety (if applicable) shall be submitted to the SEW representative on satisfactory completion of any work associated with the connection, or modification of AC power supplies.

The various versions of these documents shall be clearly identified. For designated tests, including pre-delivery tests, submit reports or certificates in a form suitable for inclusion in the operation and maintenance manuals.

2.7 Certificates of Electrical Safety

Signed Certificates of Electrical Safety (if applicable) shall be submitted to the SEW representative on satisfactory completion of any work associated with the connection, installation or modification of AC power equipment.

2.8 Cleaning

Prior to final commissioning, clean the following:

- Switch rooms.
- Luminaries.

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- Insides of switchboard, switchgear and control gear assemblies, contactors and the like. Adjust as necessary.
- Control escutcheons.
- Face plates of services outlets and panels.

2.9 Completion

A number of electrical equipment related activities which are required to be completed are described within other South East Water Standards. These include:

- Performance Testing (to validate hydraulic, operational and process conformance). Primarily described within AM2755 Testing, Commissioning and Handover Plan.
- As Constructed Drawings. Primarily described within AM2488 2D and 3D Drafting. 2D CAD drawings must be supplied as soon as the installation is on-line or running. Paper copies must be kept on site at all times during construction and testing/handover process.
- Operations and Maintenance Manuals and Training Primarily described within AM2522 O&M Manual and Operating Training Specification.
- Submission of Datasheets Primarily described within AM2775 Watershed Collection Details.

2.10 Spare Parts

Unless otherwise specified, only the following spares shall be provided for network facilities: water pumps, dosing pumps, sewer pumps, vent fans and odour filters. All network spares shall be labelled with their facility and location and sent to SEW store at Lynbrook.

For treatment plants, provide spares for the facility in accordance with Appendix A where the column "TP Spares" has been marked or as agreed with South East Water.

At least 4 weeks before the date for final commissioning, submit a schedule of spare parts necessary for maintenance of the installation. State against each item the recommended quantity, and the manufacturer's current price, including for:

- packaging and delivery to site;
- checking receipt, marking and numbering in accordance with the spare parts schedule;
- referencing equipment schedules in the operation and maintenance manuals; and
- painting, greasing and packing to prevent deterioration during storage.

Any custom-made items shall be provided with a spare, eg: spare fans. Spares shall be purchased as per this section, unless otherwise approved by South East Water. Tender submissions shall list all spares which will be provided as part of the project.

All spares shall be on-site before final commissioning.

2.11 Warrantees

The principal contractor shall be named as the warrantee. The contractor shall register equipment with manufacturers as necessary. Retain copies delivered with components and equipment.

Commencement of warranty periods shall commence at final commissioning at acceptance of installation. Warranty periods to end at expiry of defects liability period (52 weeks) unless specified otherwise.

If installation is not by manufacturer, and the product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

3. Decommissioning

Unused equipment, switchboards, cables and supporting structures shall be decommissioned or removed as identified within the indented project Scope of Works.

The site documentation shall be updated depicting removal or status information.

- Cable schedules.
- Equipment schedules.
- Single line diagrams.
- Control schematics
- Piping & Instrumentation diagrams.
- Service plans.

Unless otherwise specified unused protection devices shall be removed.

Items not removed and inoperative shall be made safe by the following means, but not limited to.

- Disconnect equipment so that it cannot become energized.
- Remove unused cable glands and fill penetrations with stop ends.
- Effectively seal conduits with polyurethane polymer expandable foam fill.
- Replace switchboard panels where panel mounted equipment is removed to retain the relevant IP.
- Label equipment with status information affixed appropriately.

Unless otherwise specified all redundant cables shall be removed. Where cables are left in situ, for example cannot be removed or are left intentionally a South East Water M&E Electrical representative shall be notified with and the following information:

Site No	Location Start Description	Approx. Length
Site Name	Location End Description	Termination Type
Reporting Contractor Company	Type of & Size of Cable	Rectification Photo of Start
Reporting Contractor Employee	Cable Depth	Rectification Photo of End
Reason Left In Situ	Associated Drawing Numbers	

The cable conductors shall be terminated in a manner that provides a minimum degree of protection of IP 2X in accordance with AS 60529 and be labelled with unique reference tag as assigned by East Water M&E Electrical representative. The reference tag shall include the cable operational status i.e. spare, immovable, reserved etc.

Cable termination methods shall include.

Within switchboards – terminate cable ends to DIN mounted screw terminals or cover cable ends with resin heat shrink sleeve and affix to cables, termination and status information of cables, refer 2.2.3 Cable Markers.

Within cable trenches or pits – cover cable ends with resin heat shrink sleeve or cover cable ends within a polycarbonate termination enclosure appropriately glanded.

Appendix A – Site Acceptance and Inspection Test Sheet

Date:	Site ID:
Location:	
Inspected by :	
Contractor:	

SECTION 1: APPLICATION AND FUNDAMENTAL PRINCIPLES				
No.		AS3000	Y	N
1.1	Ensure that all electrical insulation and electrical enclosures provide effective protection against direct contact with live parts in normal operation.	1.5.4		
1.2	Ensure that all electrical insulation and electrical enclosures, double insulation and/or isolation transformers provide effective protection against indirect contact with live parts under fault conditions	1.5.5		
1.3	Ensure exposed conductive parts be located behind an insulating barrier that provides a degree of protection not less than IPXXB or IP2X and which shall be removable only by use of a tool.	1.5.5.4		
1.4	Protection provided against thermal effects, e.g. enclosure, guarding or screening of flammable materials, hot surfaces and parts that may cause physical injury.	1.5.8		
1.5	Ensure that unused cables are protected against unwanted voltages by suitable termination at both ends in the same manner as is required for live conductors.	1.5.11.4		
1.6	Ensure that where electrical cables and/or equipment penetrate fire barriers, that effective protection is provided to prevent spread of fire.	1.5.12		
1.7	Ensure that electrical equipment and accessories are safe to use. There is no damage that could impair safe operation. Unused electrical equipment is safely disconnected.	1.7		
1.8	Ensure that all electrical equipment intended to be installed within an installation complies with required standards.	1.9		
SECTION 2: GENERAL ARRANGEMENT, CONTROL AND PROTECTION				
2.1	Ensure that switchgear is correctly selected and installed to provide isolation, fault protection, accessibility and arranged without affecting other parts of the installation.	2.1		

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2.2	Ensure each circuit that requires a neutral shall incorporate a neutral conductor labelled to identify the associated active conductors.	2.2.1		
2.3	Ensure that the current carrying capacity of consumer's mains and sub-mains is correct.	2.2.2		
2.4	Ensure that main switch(s) are fitted and clearly labelled.	2.3.3		
2.5	Ensure that isolation and switching devices are fitted to protect against injury from mechanical movement in electrical devices and motors.	2.3.6		
2.6	Ensure that correct protective overload devices are fitted, especially for max circuit lengths as per Appendix B5.	2.5		
2.7	Ensure that the fault current ratings for RCD/MCB's are appropriate.	2.5.4.5		
2.8	Ensure that correct residual current devices are fitted.	2.6.1		
2.9	Ensure the switchboard is installed correctly, including restricted locations and exit facilities are considered.	2.9.2		
2.10	Ensure that emergency exits are provided.	2.9.2.2		
2.11	Ensure that neutral bars, earth bars, and active links are fitted and correctly terminated.	2.9.4		
2.12	Ensure that switchboards and their electrical equipment are clearly labelled.	2.9.5		
2.13	Ensure that switchboard wiring is correctly terminated.	2.9.6		
SECTION 3: SELECTION AND INSTALLATION OF WIRING SYSTEMS				
3.1	Ensure that cables are protected against external influences.	3.3		
3.2	Ensure that electrical equipment is protected against external influences.	3.3		
3.3	Ensure that switchboards are protected against external influences.	3.3		
3.4	Ensure that cables are protected against external influence.	3.3.1		
3.5	Ensure that the current carrying capacity of circuit wiring is correct in accordance with AS3008.1	3.4		
3.6	Ensure that wiring connections are correct and under no undue pressure.	3.7		
3.7	Ensure that all connections, joints and terminations in earthing conductors are correct.	3.7		
3.8	Ensure that the cable cores are identified.	3.8		

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3.9	Ensure that all electrical equipment is connected, supported and fixed, in an acceptable manner and protected from damage.	3.9		
3.10	Ensure that there is adequate support and fixing for cables.	3.9.3		
3.11	Ensure that cables are segregated from other services and electrical installations.	3.9.8		
3.12	Ensure that underground wiring is installed correctly.	3.11		
3.13	Ensure that aerial installation conditions are correct.	3.12		
3.14	Underground Location Diagram	3.11.4.6		
SECTION 4: SELECTION AND INSTALLATION OF APPLIANCES AND ACCESSORIES				
4.1	Ensure that isolation and switching devices are fitted to protect against thermal effects produced by motors, room heaters , water heaters, etc.	4.2		
4.2	Ensure that switching devices for socket outlets are installed as required. Rating, location, IP and isolation.	4.4.4		
4.3	Ensure motor isolation and appropriate interrupt rating.	4.4.4		
SECTION 5: EARTHING ARRANGEMENTS AND EARTHING CONDUCTORS				
5.1	Ensure that all the earthing conductors are the appropriate size and colour.	5.3		
5.2	Ensure that the MEN connection is installed correctly.	5.3.5		
5.3	Ensure that the earth electrode is installed correctly.	5.3.6		
5.4	Ensure that the creation of an earthed situation that may require earthing of additional electrical equipment is addressed.	1.4.44		
5.5	Ensure a permanent label is attached to the main earthing conductor at the earth electrode: WARNING: 'MAIN ELECTRICAL EARTHING CONDUCTOR—DO NOT DISCONNECT'	5.5.1.3		
5.6	Ensure that earthing in outbuildings and detached portions of an electrical installation comply with standards, especially neutral connection.	5.5.3.1		
5.7	Ensure that all the equipotential bonding conductors are the appropriate size and colour.	5.6		
5.8	Ensure circuit loop impedance and protection devices provide protection under earth fault loop conditions.	5.7		
SECTION 6: DAMP SITUATIONS				
6.1	Particular installation conditions for socket outlets around showers and other fixed water containers. There will not be any socket outlets fitted within Zones 0, 1 and 2. Socket outlets installed in a Zone 3 area must be protected by an approved method.	6.2.4.2		

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6.2	Particular installation conditions for the selection and installation of electrical equipment for hose down areas. The correct degree of protection shall be provided.	6.7.4.2		
6.3	Particular installation conditions for switches and other accessories around showers and other fixed water containers. There will not be any switches or accessories fitted in a Zone 0 area. Switches and accessories fitted within Zone 1, 2 and 3 areas will be protected by an approved method.	6.2.4.3		
6.4	Particular installation conditions for other electrical equipment around showers and other fixed water containers. The correct degree of protection required for each Zone will be provided for all other electrical equipment.	6.2.4.5		
SECTION 7: SPECIAL ELECTRICAL INSTALLATIONS				
7.1	Ensure that emergency wiring systems are installed correctly.	7.2.7		
7.2	Ensure electricity generation systems are installed correctly.	7.3		
7.3	Particular installation conditions for the selection and installation of electrical equipment for separated and protected extra low voltage installations.	7.5		
7.4	Ensure electrical equipment installed in hazardous areas comply	7.8		
SECTION 8: VERIFICATION				
8.1	Visual inspection and compliance.	8.1		
8.2	Mandatory tests of continuity of earthing, insulation resistance, polarity, correct circuit connections, impedance and operation of RCDs. Refer APPENDIX PART D – Consumer / Submain, Motor, DC Supply Test Results.	8.3.3		

Appendix B – Consumer / Submain, Motor, DC Supply Test Results

Date:															1. CONSUMER-SUBMAIN SWITCHBOARD TEST RESULTS														
Mandatory testing shall be carried out in accordance with AS/NZS 3000:2007 clause 8.3.																													
AS/NZS 3017:2007 sets out some of the common test methods required to test that a low voltage electrical installation complies with AS/NZS 3000:2007.																													
Address / location:															Site ID:					Company Name:									
Registered Electrical Workers name:															Signature:					Licence No.									
Switchboard / distribution board No:										PSC ^b at Main Switch: kA					All live parts screened from touch without use of tool: (IP2X < 12mm) Yes / No														
Incoming voltage (if supply avail.): RØ V, WØ V, BØ V.															Electricity Meter No					Phase Failure (%)					Phase Failure Delay (s)				
Test Equipment:			Type:			Serial No.			Calibration date:			Type:			Serial No.			Calibration date:											
			Type:			Serial No.			Calibration date:			Type:			Serial No.			Calibration date:											
MAIN SWITCHBOARD, CONSUMERS MAINS & MAIN EARTH																													
M.E.N. Connection & Main Switchboard earthing compliant :- Y / N	Main Switch / Load Limiter			Conductor		Earth Continuity - ohms		Insulation Resistance - Megohms				Rotation /Polarity		Comments:															
	Type ^a	Current rating A	PSC ^b rating kA	C.C.C ^c A	Size mm ²	Main earth conductor	EQ bonding conductors ^d	A - E ^d	A - N ^d	N - E	Phase - Phase ^d																		
						Ω	Ω					Y / N																	
SUBMAINS																													
Circuit ID & no. of Phases	Over Current Protective Device			Conductor		Earth Continuity - ohms		Insulation Resistance - Megohms				Rotation /Polarity	Earth fault loop impedance	RCD test results															
	Type ^a	Current rating A	PSC ^b rating kA	C.C.C ^c A	Size mm ²	Submain earths	EQ bonding conductors ^d	A - E ^d	A - N ^d	N - E	Phase - Phase ^d			Push button test	Current trip test - ms	Supply not avail.	No RCD												
						Ω	Ω						Ω																
						Ω	Ω						Ω																
						Ω	Ω						v																
						Ω	Ω						Ω																
						Ω	Ω						Ω																
FINAL SUB CIRCUITS																													
Circuit ID & no. of Phases	Over Current Protective Device			Conductor		Earth Continuity - ohms		Insulation Resistance - Megohms				Rotation /Polarity	Earth fault loop impedance	RCD test results															
	Type ^a	Current rating A	PSC ^b rating kA	C.C.C ^c A	Size mm ²	Protective earths	EQ bonding conductors ^d	A - E ^d	A - N ^d	N - E	Phase - Phase ^d			Push button test	Current trip test - ms	Supply not avail.	No RCD												
						Ω	Ω					R / S	Ω																
						Ω	Ω						Ω																
						Ω	Ω						Ω																
						Ω	Ω						Ω																
						v							Ω																

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						Ω	Ω							Ω					
						Ω	Ω							Ω					
						Ω	Ω							Ω					
						Ω	Ω							Ω					
						Ω	Ω							Ω					
						Ω	Ω							Ω					

NOTES:

- a. Protective device types : Rewirable fuse = rf, HRC fuse = hrc, Circuit breaker = c/b B,C or D, MCB/RCD combo = rcd, Isolator = isol.
- b. PSC = Prospective Short-circuit current in kA. Ref: AS/NZS 3000:2007 clause 2.5.
- c. C.C.C = Current Carrying Capacity of the conductor after derating in A. Ref: AS/NZS 3000:2007 clause 3.4.
- d. Where multiple results are obtained due to multiphase, multiple EQ bonds etc. record the lowest insulation resistance & highest earth resistance readings obtained.

2. MOTOR LOADS									
Motor ID	Insulation Resistance			Currents		Windings			Rotation
	MegOhms	MegOhms	MegOhms	FLC	Running Current	Ohms	Ohms	Ohms	
	R-E	W-E	B-E			U	V	W	Y/N
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	
	Ω	Ω	Ω	A	A	Ω	Ω	Ω	

3. DC SUPPLY

Battery Voltage	VDC
Battery Charger Output Voltage	VDC
DC Convertor Output Voltage	VDC

Appendix C – Instrument Calibration Record

Site ID:		Site Description:				Date:					
Instrument Location:					Watershed Tag No:						
Instrument Function:					SCADA Tag No:						
Make:			Model:			Serial No:					
Supplier:					Instrument Supply Voltage:						
Calibrated Range			to		Units		Output		to		Units
Calibration Check <input type="checkbox"/>		Re-Range <input type="checkbox"/>		Verification <input type="checkbox"/>		Replacement		Instrument Accuracy %			
Instrument Datum:			Offset:		Measuring Reference:						
CALIBRATION RESULTS											
Input		Desired			Pre Cal			Post Cal			
Span %	Input units	Output units	Units	Output Units	Error %	Units	Output units	Error %	Units		
0%											
25%											
50%											
75%											
100%											
PRESSURE SWITCH											
Contacts	M.O.F Value		B.O.F Value		M.O.R Values		Process Units	Electrical Value/units			
	Post	Pre	Pre	Post	Pre	Post					
SCADA VALUES											
Tag No			Zero			Full Scale					
Office <input type="checkbox"/>		Plant Computer <input type="checkbox"/>									
FLOW METER DETAILS											
Flow Sensor Model:					Flow Sensor Serial No:						
Sensor Size:			Cal Factor			Insertion Depth:					
Sensor Prom Code Number:			Transmitter Serial No:			Flow Direction Uni. <input type="checkbox"/> Bi. <input type="checkbox"/>					
CALIBRATION EQUIPMENT											
Input:			Serial No:			Calibration Date:					
Output:			Serial No:			Calibration Date:					
CALIBRATED BY											
Technician Name:			Company:			Signature:					
Comments:					Pass <input type="checkbox"/>		Fail <input type="checkbox"/>				
					Action Raised <input type="checkbox"/>		Operator informed <input type="checkbox"/>				