Hunter Water Corporation A.B.N. 46 228 513 446

Standard Technical Specification for:

STS 510

GENERAL REQUIREMENTS FOR SWITCHROOMS

This Standard Technical Specification (STS) was developed by Hunter Water Corporation to be used in the design, construction or installation and maintenance of facilities that are, or are to become, the property of Hunter Water Corporation. It is intended that this STS be used in conjunction with various other standards and project specific drawings and design requirements as defined by Hunter Water Corporation for a particular project.

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1 Purpose

This standard technical specification (STS) details the requirements of Hunter Water Corporation (HWC) for the design, construction, supply, modification and operation of switchrooms that are, or will become, the property of HWC.

Structural elements associated with the design and construction, must comply with the requirements of the National Construction Code (NCC) and STS 410. Compliance with this standard does not exempt structural components from meeting applicable regulatory and industry standards. The structural design must be reviewed by a Hunter Water structural engineer.

All materials and equipment must conform to the requirements of all current and applicable Australian Standards (AS) and the National Construction Code (NCC). The Contractor must refer any conflicts in the information to HWC for clarification.

2 Interpretation

For the purposes of interpreting STS 510 General Requirements for Switchrooms, except where the context requires otherwise:

- 'drawings' means the drawings detailing the work involved in a particular project.
- ‘include’ means including but not limited to and is used to provide clarification or examples of the type and nature of items intended.
- 'specification' means a specification detailing the work involved in a particular project.
- ‘Standards’ means applicable industry standards, including:
    - Australian Standards (AS)
    - Australian/New Zealand Standards (AS/NZS)
    - American National Standards Institute (ANSI), and
    - International Organization for Standardization (ISO)
    - National Construction Code (NCC)
- 'Standard technical specification' (STS) references any of Hunter Water’s standard technical specifications, as implied by the text.

Headings are for the convenience of the reader and must not be used in the interpretation of this STS, nor limit compliance to other applicable sections of this STS.

Unless otherwise stated, any expression such as ‘give notice’, ‘submit’, ‘approval’, or ‘directed’ means give notice to, submit to, approval by, or directed by Hunter Water or its delegate.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this STS. Unless approval has been issued in writing, approval has not been granted.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment or manufacture is rejected, notice will be given by Hunter Water in writing. All associated rectification work must be completed by the contractor at their cost.

2.1 Order of precedence

The order of precedence for this STS are, from highest to lowest are:

- Legislative requirements
- Australian Standards & NCC
- Content in this STS

Where contradiction exists between this specification and any other STS, This STS (STS 510) must take precedence unless approved by HWC.

2.2 Exception to this Document

Where a deviation from this STS is required to meet installation specific requirements, a request for dispensation must be submitted to Hunter Water. Approval in writing from the document owner must be obtained prior to proceeding with any deviation. All dispensation requests will be reviewed on a case-by-case, application/site specific basis by Hunter Water’s document owner.

3 Roles and responsibilities

3.1 Document Owner

The document owner of this STS is Hunter Water's Manager of Electrical Engineering.

3.2 Responsibilities

The document owner must approve in writing the issue of any updated version of this STS.

Any deviation to any requirement in this STS is valid only when authorised in writing by the document owner or their delegate.

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4 Definitions

Dimensions indicated herein are in millimetres (mm), unless otherwise stated.

Where the following term, abbreviation or expression occurs in this STS, it is defined as follows, unless the context implies otherwise.

Term, abbreviation, or expression	**Definition**
A	Amps
Approval	Approved by Hunter Water
Approved	Included on a list prepared by Hunter Water of approved products and services
AHF	Active harmonic filter
AS	Australian Standard
AS/NZS	Australian/New Zealand Standards
Contract Manager	A person appointed by Hunter Water to act on behalf of the principal, as detailed in the Contract
Critical Site	A Hunter Water Corporation (HWC) facility where failure or prolonged downtime of assets would result in significant impacts to public health, environmental protection, water supply, wastewater services, or regulatory compliance. These sites include but not limited to major treatment plants and strategic pump stations.
DP	Desalination Plant
Directed	Directed by Hunter Water or its Delegate
FAT	Factory acceptance test
FIP	Fire indication panel
GCP	Generator Connection Panel
Hold Point	An opportunity provided to Hunter Water to confirm compliance of an event. Notice is to be provided, and work is required to stop.
HWC	Hunter Water Corporation
HV	High Voltage

Term, abbreviation, or expression	Definition
ICT	Information and Communications Technology
IP rating	Degree of protection as described in *AS 1939*
ISO	International organisation for standardisation
ITC	Inspection test checklist
ITP	Inspection test plan
LV	Low voltage
Masonry	Fired clay or concrete
MCC	Motor control centre
MSB	Main switchboard
NCC	National Construction Code (formerly known as the Building Code of Australia)
Network Site	A facility that forms part of Hunter Water's distribution or collection network, such as a water pumping station, wastewater pumping station, reservoir, or sewer network asset. Network sites primarily manage the transfer or storage of water and wastewater rather than treatment.
Prefabricated Switchroom	A switchroom made primarily from steel and pre-painted steel cladding (This does not include communication huts)
Proprietary	A commercial supplier's standard design of equipment
PVC	Polyvinylchloride
SAT	Site acceptance test
SCA	Switchgear and control gear assembly
SCADA	Supervisory control and data acquisition. A control system architecture that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management.
SLD	Single-line diagram

Term, abbreviation, or expression	**Definition**
Submit	Submit to Hunter Water or its Delegate
Supply authority	The authority that supplies electricity to the locality of the project
Switchboard	A generic term used interchangeably that includes DBs, MCCs, MSBs, SCAs, remote I/O panels, LCPs, operator panels, marshalling cabinets, junction boxes, free- standing VSD, AHF, or similar electrical enclosure with hinged door. This definition is in addition to that contained within AS/NZS 3000.
Treatment Site	A facility where raw water, wastewater, or desalinated water undergoes treatment processes to meet regulatory or operational standards. Includes water treatment plants, wastewater treatment works, and desalination plants.
UPS	Uninterruptible power supply
VSD	Variable speed drive
Wet environment	Any of the following: • outdoor area • room containing process pipework which contains liquid under pressure • area where equipment is located that requires wash down • area below natural ground level
Witness point	An opportunity provided to Hunter Water to witness an event. Notice is to be provided but work is not required to stop.
WPS	Water pumping station
WTP	Water treatment plant
WWPS	Wastewater pumping station
WWTW	Wastewater treatment works

5 General Requirements

5.1 Introduction

This specification ensures the switchroom/s will be built to the minimum acceptable requirements.

The key stakeholders for this specification include the Hunter Water Corporation operations team, engineering team, maintenance team and project delivery team.

This specification includes but is not limited to details regarding the following:

- Switchroom design and construction.
- Switchroom electrical infrastructure.
- Switchroom signage.
- Switchroom testing and documentation.

5.2 Purpose of Switchrooms

Switchrooms are designated areas for housing switchboards and electrical equipment for the operation of treatment plants, pump stations, and other critical infrastructure.

Switchrooms must house the following equipment, but not limited to:

- High voltage (HV) switchboards. Note – HV switchboards must be in a separate switchroom to LV switchboards. The HV switchroom must be a standalone building.
- Low voltage (LV) switchboards.
- Electronic equipment (e.g. variable speed drives, active harmonic filters, etc.).
- General light and power.
- UPS and batteries.
- HVAC and ventilation.
- Fire protection equipment (e.g. smoke detectors, VESDA, fire indication panel, etc.).
- Earth bar.
- Solar equipment (e.g. inverters, solar protection panels etc.)
- ICT and automation equipment.
- Security system.

5.3 Application Criteria

The requirement for the installation and/or modification of switchrooms is to be considered during the early planning/design phase of a project in consultation with Hunter Water. The intent of this approach is to ensure that the scope for new or modified switchrooms is clearly understood by the designer prior to a project moving into the detailed design phase.

These following sections establish the mandatory criteria for determining when a switchroom is required and is provided to assist designers during the early project planning/design phases.

In determining the number of switchrooms required the designer must consider location, operations, maintenance, constructability, redundancy, future replacement and building cost.

5.3.1 Treatment Sites

All treatment sites (e.g. water, wastewater, desalination etc.) must include a switchroom or multiple switchrooms.

5.3.2 Network Sites

Unless otherwise nominated by Hunter Water, network sites must have a switchroom if one or more of the below criteria is met:

- Increased redundancy is required for essential services. (i.e.: hospitals)
- Increased environmental controls are required (i.e. HVAC, ventilation, fire, etc).
- A Schneider EcoStruxure Geo SCADA ViewX terminal is required.
- Where VSDs must be floor standing as per STS 500.

Where not nominated by Hunter Water or none of the above criteria are met, the structure must not be classified as a switchroom under this specification.

5.4 Standardisation

Equipment, materials and fixings used in the design and construction of switchrooms must be readily available within Australia. All replaceable and consumable equipment, materials and fixings must be standard/common supply equipment items. The use of “one off” special equipment, materials and fixings is not permitted.

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6 Design

6.1 Coordination with other STS'

The switchroom design must incorporate the requirements of all relevant Hunter Water standards

6.2 General

All switchrooms must be designed and constructed in accordance with the National Construction Code of Australia (NCC), relevant legislation, Australian Standards and Hunter Water Standards. All switchrooms must be considered Class 8 as per the NCC.

Process pipework must not be installed within switchrooms under any circumstances. This includes, but not limited to water, wastewater, chemical or compressed air services associated with process infrastructure. For liquid cooling of VSD's refer to liquid cooling section.

In addition to the NCC, all switchrooms must be designed with these minimum requirements.

6.3 Design Report

6.3.1 Concept Design Report

Where a concept design is being undertaken for either an existing or new site, the following studies must, at a minimum, be completed to inform the design scope and pricing.

- Heat loading assessment.
- Earthing study.
- Lightning protection study.
- HVAC performance assessment (existing sites)
- Identification of site-specific constraints that may impact constructability, equipment integration or compliance

6.3.2 Detailed Design Report

A detailed design report must be submitted for review and approval prior to construction and include documented evidence of compliance to all relevant standards.

The design report must be based on the criticality of the site (A, B or N).

The following, where relevant to the scope of the design works, must be submitted as part of the design report:

- Heat loading assessment.
- HVAC design including but not limited to equipment location plans, equipment sizing, equipment selections, and ventilation system design (includes external venting for VSDs where applicable). Includes assessment of existing HVAC systems were heat generating equipment is added to a switchroom (e.g. VSD's, inverters or switchboards added to an existing switchroom).
- Earthing study.
- Lighting study.
- Lightning protection study.
- Security system design.
- Fire system design.
- Load calculations for roof (solar – if applicable), walls (equipment) and floors (equipment and stands).

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- Structural (equipment) stand certification.
- Load calculations for foundations, piers and column support reactions (considering all equipment, steel support frames, wind and earthquake forces) (Prefabricated switchroom)

6.4 Drawings

6.4.1 Concept Drawings

Where a concept design is being undertaken for either an existing or new site, the following drawings must, at a minimum, be completed to inform the design scope and pricing.

- General arrangements (showing all equipment, dimensions, door swings and clearances). Nominate space for future equipment requirements.

6.4.2 Detailed Drawings

Drawings must be submitted for review and approval prior to construction.

The following, where relevant to the scope of the design works, must be submitted as part of the drawing set:

- Building services layout (i.e. General light and power, HVAC, security, fire, solar etc).
- General arrangements (showing all equipment, dimensions, door swings and clearances). Nominate space for future equipment requirements.
- Earthing connections.
- Structural (equipment) stands.
- Lifting plan (Electrical equipment and prefabricated switchroom).
- Conduit penetrations.
- Cable ladder layout.
- Floor plan layout (floor penetrations, gland plates, etc) (Prefabricated switchroom).

6.5 Functional Requirements

Unless stated elsewhere in the contract, all functional requirements must comply with the relevant requirements of STS 410 and STS 500.

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7 Construction

7.1 General

All works must be completed by competent, qualified personnel in accordance with relevant standards, codes of practice and manufacturers' recommendations.

In addition to the NCC, all switchrooms must be constructed with these minimum requirements.

7.2 Building Elements

One of the following construction types must be used:

- Masonry, core filled blockwork or struck flush mortar and non-textured bricks.
- Pre-cast insulated concrete sandwich panels.
- Prefabricated materials (Treatment Sites Only).
  (Approval from HWC Electrical Engineering is required if within 5km of sea water coastlines or corrosive environments i.e.: Lake Macquarie coastline).

The switchroom must be made watertight against absorption, leaks, flooding, etc.

The designer is encouraged to approach Hunter Water with alternatives where there is an advantage for a particular application (i.e.: part of a larger structure).

Where building elements (i.e.: concrete, steelwork, wall and roof cladding, masonry, etc) are not mentioned in this STS, they must comply with the relevant requirements of STS 410.

7.3 Civil Works

All civil works must comply with the relevant requirements of STS 410.

In addition to the above, All switchrooms must:

- The foundations must be designed to carry the full weight of the switchroom with all switchgear and equipment installation in the switchroom.
- Have a continuous pathway provided around the perimeter of the building. The pathway must be minimum 800mm wide. This width is in addition to the width of any plinths or equipment installed i.e.: gas suppression bottles or air conditioner units. It is acceptable to have cable draw-in pit covers in pathway mounted flush and not under equipment. The pathway must also direct surface water away from the building.
- Have a concrete laydown area for a generator next to the switchroom, suitably designed and sized for the selected generator with clear access for the mode of transport i.e.: tilt tray or shipping container. The construction and location of the GCP shall comply with STS 500.

7.4 Fit out and Layout

7.4.1 All Switchrooms

All switchrooms must:

- Be free from moisture, ground water and flooding during its service life.
- Be termite, bird and vermin proof.
- Have all exposed metal components made from galvanised or stainless steel. Cable ladder fixings, mounts and brackets must be stainless steel only.

- For structural steel, any repairs to galvanised sections must be regalvanised or replaced in full. No welding or drilling after galvanising. Galmet spray or a 2-pack epoxy coating is not acceptable.
- Achieve a Fire Resistance Level (FRL) of 120/120/120.
- Have all clearances comply with AS/NZS 3000.
- Be designed for future provision of switchboard extensions, a minimum of two tiers per switchboard. 900mm minimum per tier must be allowed for.
- Have all ceilings be minimum 3000mm high from top of flooring system and maximum 4000mm unless approved by HWC.
- Have all internal perimeter walls to be load rated for wall mounted equipment.
- Allow 20% horizontal spare capacity on internal walls for future equipment.
- **Masonry / Concrete switchrooms only** – must have a subfloor.
- **Prefabricated switchrooms only** – must be installed on piers. The piers must be minimum 1800mm high from finished ground level to allow access under switchroom.
- If using pre-painted steel cladding products, they must:
    - Have colour nominated by HWC during design.
    - Be at least 0.48mm think.
    - Be fixed at centres not less than 200mm.
    - Be earthed.
    - All fixings must be galvanised fasteners with neoprene washers. (Painted to match cladding)
- If switchrooms require detachable stairs, landings or handrails, they must:
    - Have a concrete slab under the entire structure
    - Be included in the design for personnel access to all doors.
    - Be included in the design for equipment access to at least one set of double doors.
    - Landings must be suitable size and have removable rails at the double access door “loading dock” platform to facilitate equipment installation.
    - Each end of switchroom landings must be the width of the switchroom and extend out 1500mm at a minimum.
    - Access stairs must not be impeded by equipment access door swing.

7.4.2 Prefabricated Switchrooms

In addition to the above, all prefabricated switchrooms must:

- Be built with a hot dipped galvanised steel frame with suitable reinforcement around the loadings.
- Be of modular prefabricated construction suitable for transport to site fully fitted out (internal and external) and suitable for mounting in an elevated position.
- Consist of a single transportable section with detachable steps, landings and hand railings.
- Internal wiring between equipment is to be done using cable ladder below the switchroom incorporated within the steel frame. Cable ladder must not protrude below the frame. All internal wiring is to be wired and tested before shipment to site.
- The base and floors must be designed with fixing facilities and bottom cable entry facilities for all switchgear shown on the drawings and with any penetrations for other cable, conduit and ladder routes.
- Have all cable entries to be bottom-entry cable access. Exterior building services are excluded from this.

- Have 6mm thick, aluminium, undrilled cable gland plates under all equipment where wiring is to leave the switchroom.
- Be provided with an earth bar internal and external (on subframe) to the switchroom connected by a suitably sized conductor.
- Lifting lugs are to be supplied with the switchroom. The design of the lugs must consider the full final loading of the completed switchroom, as shipped.
- Have certified crane lifting points (4 off) built into the steel frame. Appropriate signage that identifies the Working Load Limit (WLL) must be installed on the frame.
- Have earthing points (2 off) built into the steel frame.
- Prior to transport to site, instructions for lifting, transportation, assembly, site erection and site testing must be submitted.
- The tested switchroom, prefabricated substructure, stairs and landings, must be delivered to the site.

7.5 Thermal Efficiency

To reduce energy consumption and assist in meeting organisational carbon neutrality goals, all thermal insulation must:

- Comply with AS/NZS 4859 and AS 3999.
- Achieve a minimum R-Value of R3.7 for roofs.
- Achieve a minimum R-Value of R2.0 for walls.
- Achieve a minimum R-Value of R1.0 for floors.

7.6 Finish

All finishes must:

- Comply with AS 2700.

7.6.1 Interior

All internal finishes (ceilings, cornices and walls) must:

- Be painted white (N14) with a durable, non-reflective finish.

7.6.2 Exterior

All external finishes (walls) must:

- Have a colour scheme that complements existing buildings and/or the surrounding area. Where this is not applicable, the colour must be nominated by HWC.
- **Network sites only** – must have an anti-graffiti coating.
- **Masonry / Concrete switchrooms only** - must be painted with a durable, non-reflective finish.
- **Prefabricated switchrooms only** – must be pre-painted steel cladding steel.

7.7 Roof

7.7.1 All roofing

All roofing must:

- Have a colour scheme that complements existing buildings and/or the surrounding area. Where this is not applicable, the colour must be nominated by HWC.
- Have no penetrations besides mounting screws.
- Be sloped away from personnel access doors.

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- Be orientated to maximise the solar radiance (north facing).
- Each external door must be fitted with an awning to protect personnel from weather as they enter the building. Awnings must extend at least 600mm beyond the doorframe and must be independent to the roof / eaves.
- **Treatment sites only** – must have eaves extend a minimum horizontal overhang of 600mm from the external face of the wall.

For solar requirements, refer to Solar clause.

7.7.2 Gutter and downpipes

- **Treatment sites only** – must have large "half round" profile with gutter guards, down pipes to be a minimum of 90mm diameter and connected to stormwater.
- **Network sites only** – must have no guttering or downpipes. Roof sheeting to extend a minimum of 250mm beyond the fascia on the runoff side.

7.8 Doors

All doors must:

- Comply with AS/NZS 3000.
- Achieve a Fire Resistance Level (FRL) of -/120/30.
- Have door hardware comply with AS 4145 and a durability rating of D8 (minimum 500,000 latching cycles)
- Have door hardware locks fitted with HWC lock barrels.
- Open >170°.
- **Where part of another structure / building only** – Be automatic self-closing.
- **Where an isolated structure / building only** – Be latched back to wall using an auto scope hook door holder.
- Be fitted with crash bars that operate independently of the lock on the exterior.
- Have weatherproof and dustproof seals.
- Have kickplates and doorstops.
- At least one of the switchroom doors must be a double access door. The double access doors must be sized to allow for the install or removal of the largest individual switchboard or piece of electrical equipment.
- The double access doors must allow one leaf of the double door to be used for access/exit. The other may be held in place with tower bolts.
- **Treatment sites only** – one of the double access doors must be fitted with a double glazed, toughened glass inspection window. The window must have the equivalent IP and fire rating of the door.
- Include flush thresholds for unobstructed equipment movement.

7.9 Flooring

7.9.1 Masonry / Concrete Switchrooms

Masonry / Concrete switchroom flooring systems must:

- Use a suspended compressed concrete flooring system.
- Be modular extra heavy-duty computer/equipment room access type, with removable panels for access to cabling.
- Panels must be square with approximate dimensions of 600mm x 600mm.
- Panels must be minimum 40mm thick.
- Panels must not be more than 18kg each.

- Panels must be removable by one person.
- Panels must be rated to a floor loading of 5 kPa.
- Panels must have high pressure laminate panel surface finishes.
- Panels must be cut to size to fit around all permanent features.
- Be free from vibration and rocking panels and within a ± 3mm level over the entire space.
- The mounting system (stringers and pedestals) must be galvanized or otherwise treated to prevent corrosion.
- Height adjusters on pedestals must not extend more than 50mm.
- Be designed to allow easy access for installing and removing cables.
- Be supplied with a minimum of two proprietary lifting handles per switchroom, one mounted on the wall adjacent to each access door.

The subfloor must:

- Be waterproof.
- Be minimum 600mm in height and a maximum of 1000mm.

7.9.2 Prefabricated Switchrooms

Prefabricated switchroom flooring systems must:

- Be built on a hot dipped galvanised steel frame with suitable reinforcement around the loadings.
- Consist of grey compressed fibre cement sheeting.
- Be minimum 18mm thick.
- Be rated to a floor loading of 5 kPa.
- Be waterproof coated with 2mm thick seam welded industrial vinyl.
- Skirting must be 100mm high stainless steel.
- All floor joints must be fully sealed.
- Mounting points must be provided to meet specific requirements of all equipment and beams/joists must be positioned to clear cable access zones.
- Have 6mm thick, aluminium, undrilled cable gland plates under all equipment where wiring is to leave the switchroom.

7.10 Equipment Stands

This section does not apply to prefabricated switchrooms.

All floor-mounted equipment must be installed on stands. The subfloor cable ladder design must consider the provision for future switchboard extensions and their stands.

All stands must:

- Be structurally certified.
- Be designed to support the load of the equipment.
- Be galvanised or otherwise treated to prevent corrosion. For structural steel, any repairs to galvanised sections must be regalvanised. No welding or drilling after galvanising. Galmet spray or 2 pack epoxy coating is not accepted.
- Be designed to allow easy access for cable installation and removal.

7.11 Conduits

This section does not apply to prefabricated switchrooms.

All conduits must:

- Enter switchrooms through the side wall of the sub-floor space and be fitted with bell mouths. Bell mouths must be formed or cast in and enter perpendicular to the wall.

7.12 Drainage

This section does not apply to prefabricated switchrooms.

All switchrooms must:

- Contain a sump (400 x 400 x 400mm) at the subfloors lowest point with a float switch high level integrated into the SCADA system. The sump must be less than 1 metre from the wall in an easily accessible location, not in front of access doors, under equipment or stands.
- Where practical, to prevent water accumulation during unattended periods, provide gravity drainage from subfloor sump to external stormwater system in addition to sump pump alarm.

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8 Electrical Infrastructure

8.1 Switchboards

All switchboards must:

- Be constructed for bottom-entry cable access.
- Be positioned to allow an individual switchboard to be removed and installed from a building while all other switchboards and fixed equipment i.e.: UPS remain in place.
- Be designed for future provision of switchboard extensions, a minimum of two tiers per switchboard.
- All general light and power distribution boards must be wall mounted.

For switchboard construction and labelling refer to STS 500.

8.2 Wiring

All building services (power) wiring must:

- Comply with AS/NZS 3000, AS/NZS 3007, AS/NZS 3008 and STS 500.
- Be orange circular multicore cabling rated at 0.6/1kV.
- Be cavity installed if gyprock or a prefabricated room. Be surface mount with mechanical protection if masonry or concrete. (Surface mounted conduit, tray or ducting is not acceptable for prefabricated switchrooms).
- Have mechanical protection installed (aluminium kick plate) up to 300mm above floor level for conduits.
- Have mechanical protection installed (aluminium cable ladder lid) up to 2400mm above floor level for cable ladders.
- Prefabricated switchroom cable joints for transportation purposes are not accepted. Cables must be disconnected at one end and coiled up after FAT is complete.

8.3 Power

All switchrooms must:

- Have a minimum of two double GPOs in each switchroom in addition to any that may be dedicated for particular use, then 1 every 10 metres, installed at least 300mm above floor level. One of the GPOs must be within 2 metres of the sump.
- For desk locations, provide two double GPOs per seat. One of the GPOs must be UPS backed and red in colour with a label clearly identifying it is UPS backed. (If there is no UPS on site, the UPS backed GPO must not be installed).

For labelling refer to STS 500.

8.4 Lighting

All lighting must:

- Comply with AS/NZS 2293, AS/NZS 1680, AS/NZS 4282 and the NCC.
- Be supplied by dedicated lighting circuits.
- Be LED luminaires with a natural-white colour temperature (4000-5000K).
- Be easily accessible and not mounted above fixed/heavy objects or equipment that impedes maintenance access.
- Lighting height must not exceed 4000mm from ground level to facilitate maintenance.

- If the switchroom has more than 10 luminaires, they must be connected such that a loss of one phase does not cause a total failure of the switchroom lighting. i.e. two dedicated circuits.

For labelling refer to STS 500.

8.4.1 Interior Lighting

Interior lighting must:

- Be classed as an intermittently monitored control room as per AS/NZS 1680.2.1 Table D1.
- Have every second light as an emergency fitting.
- Facilities for emergency lighting and testing must be in the general light and power distribution board.
- Have a light switch to be installed adjacent to every access point, the light switch must supply a contactor in the general light and power distribution board.
- Lights must be supplied from a contactor in the general light and power distribution board.

8.4.2 Exterior Lighting

Exterior lighting must:

- Be weatherproof IP55 luminaires.
- Be installed 300mm above all access doors.
- Be installed above stairs and landings. Stairs and landings must be illuminated by emergency lighting.
- Have no wiring to be installed through the top of the luminaire.
- **For network sites** – switchroom exterior lighting must be controlled with a motion sensor and manual override functionality. The motion sensor must be positioned away from UV light, and the manual override must be in the general light and power distribution board. The motion sensor must switch when personnel are 10 metres from the main access door.
- **For treatment sites** – switchroom exterior lighting must be controlled from SCADA (operator must be able to turn lights on from admin building on arrival) and manual override functionality. The manual override must be in the general light and power distribution board in the associated switchroom. If SCADA control is not possible, manual override and daylight switching shall be installed as fallback control modes. The daylight switch must be positioned away from UV light, be designed to withstand momentary exposure to light sources and have a minimum current rating of 15A.

If a switchroom is part of a larger structure, exterior lighting control to be approved from HWC Electrical Engineering during design.

For plant exterior lighting and control refer to STS 500.

8.5 HVAC, Ventilation and Cooling

All switchrooms must:

- Have an RTD for temperature monitoring mounted on the interior wall away from heat sources, integrated into the SCADA system for alarm at 30°C.
- The air conditioning and ventilation units must be fitted with H2S (Hydrogen Sulphide) scrubbers when installed at a wastewater pumping station or treatment plant.

- The air conditioning and ventilation units must not ventilate directly onto the switchboard, switchgear or equipment.

8.5.1 HVAC

All switchrooms must:

- Comply with AS 1668.
- Have air conditioning and consist of a minimum of two separate independent air conditioning units.
- Have the HVAC system capacity designed and selected considering the heat generated by the installed electrical equipment, building size, materials and building orientation.
- Have the HVAC system allow for deterioration in performance over time, the system must be sized at least 30% greater than combined ambient and internal heat load calculations for the project demand.

The indoor units must:

- The air conditioning system must automatically shut down on detection of fire within the building. This must apply to all units, including those which do not introduce fresh air to the room.
- Have two failsafe relay outputs integrated into the SCADA system for healthy and status (running).
- Must not be installed above electrical switchboards, hardware and ICT cabinets.
- Be capable of maintaining 25°C when all units are operational.
- Be capable of maintaining 35°C with one unit offline (N-1 redundancy).
- Be rated to achieve the above performance levels with an outside ambient temperature of 45°C and all duty and assist electrical equipment in the switchroom operating at full load.
- Retain temperature settings and automatically resume operation after a power supply interruption.
- Have condensation pipework connected to the stormwater system.
- Have a drip tray installed underneath, drained external to the building in a visible location.
- Be configured to “cool only” and not switch to heat cycle.
- Have an individual digital interface/controller installed on the wall adjacent to the main access door. Handheld remote-control devices are not accepted.

The outdoor compressor units must:

- Have an IP56 or greater isolator located adjacent the unit.
- Not be mounted underneath the building but must be located such that they are readily accessible for maintenance while protected from traffic and not exposed to direct sunlight (north or west wall).
- Not be mounted in flood zone.
- Be raised a minimum of 75mm from the concrete plinths to prevent corrosion of the unit feet.
- The compressor unit coils must be hermetically sealed.
- Have one protective cage per unit to prevent from vandalism. Protective cages must be easily removable for maintenance. The isolator must be installed within the cage.

8.5.2 Ventilation

All switchrooms must:

- The ventilation fan system must automatically shut down on detection of fire within the building.
- The ventilation fan system must have two failsafe relay outputs integrated into the SCADA system for healthy and status (running).
- Maintain a positive internal pressure of 25Pa to prevent the entry or dirt, gases or contaminants.
- The ventilations fans must be fitted with suitable filters to prevent introduction of coastal atmosphere or gases into the room (fine particle filters).
- Where a switchroom is within 5km of sea water coastlines or corrosive environments i.e.: Lake Macquarie or toxic gases are present outside the switchroom, provide suitable measures to prevent introduction of coastal atmosphere or gases into the room.
- Consider providing hot-air venting for large Variable Speed Drives (VSDs) and Active Harmonic Filters (AHFs) over 100kW to reduce HVAC load. (Approval from HWC Electrical Engineering is required if within 5km of sea water coastlines or corrosive environments i.e.: Lake Macquarie coastline).
- Have fire dampers provided in accordance with AS/NZS 1682 to allow walls to maintain 120/120/120 FRL. (If required)
- Where the switchroom contains HV switchgear, arc flash containment and expulsion shall be considered.

8.5.3 Liquid Cooling

Liquid cooled VSD’s or equipment must:

- Be fully self-contained (no plant fluids).
- Have secondary containment (e.g., bunding or tray) to 150% of coolant volume with a float switch high level integrated into the SCADA system.
- Have a clear method for isolating and removing equipment (e.g., pumps or pipework) without draining in the room.
- Have all system components be non-corrosive and chemically compatible.
- Have pipework routed clear of switchboards, VSDs, PLCs and cables.
- Have a leak response plan tailored to the switchroom.
- Where possible, install liquid-cooled equipment in dedicated, separated rooms adjacent to switchroom.

8.6 Fire Protection

All penetrations must be sealed using an appropriate fire sealant to maintain fire resistance level (FRL) 120/120/120.

All fire protection equipment (VESDA, FIP, etc) must be wall mounted adjacent the main access door.

8.6.1 All Switchrooms

All switchrooms must:

- Have a fire system that complies with AS 1670 and AS/NZS 2444.

- Have a Minimum of 2 mains-powered combined Carbon Monoxide (CO) and heat detectors with battery backup. All smoke detectors must have failsafe relay outputs wired in series and integrated into the SCADA system for alarm.
- Have a VESDA monitoring system with sampling pipework installed in the computer flooring subfloor and each tier or cable zone of the switchboard integrated into the SCADA system for warning, alarm and fault.
- Have 9kg wall mounted portable fire extinguishers suitable for electrical fires, installed adjacent to all access doors.
- On fire detection the system must:
    - Shutdown air conditioning units and ventilation fan(s)
    - Seal off all ventilation dampers

8.6.2 Treatment Site Switchrooms

In addition to the above, treatment site switchrooms must include:

- A Local Fire Indication Panel (FIP) that complies with AS 1670 and AS/NZS 2032.
- Local Fire Indication Panel (FIP) integrated into the SCADA system for warning, alarm and fault.
- Internal alarm siren connected to the FIP.
- External alarm siren/strobe connected to the FIP.
- All switchroom FIPs must be hardwired to the main site FIP (in admin building). All cables must have a minimum 2-hour fire rating.

8.6.3 Critical Site Switchrooms

The critical site switchroom fire systems apply to:

- All Water Treatment and Desalination Plants.
- Any site with a switchroom where the risk assessment has not established that loss of all functionality of the switchroom in a single event is within Hunter Water's risk appetite.

In addition to both the above points, critical switchrooms must include:

- A gaseous fire suppression system that complies with AS 4214 and AS 2030
- A combined break glass and gas isolate station wall mounted adjacent the main access door.
- In addition to AS 4214 requirements, an “Extinguishing System Inoperative” illuminated sign must be installed internal to the switchroom.
- Be designed for a “normally occupied area” as defined within AS 4214.
- The preferred suppressant gas is IG-541 (Inergen), however alternative gaseous agents may be considered subject to HWC approval.
- The system must be based on the "total flooding” concept, which must consist of a supply of fire extinguishing agent, arranged to discharge into and fill to a predetermined design concentration.
- Suppression systems must include pressure-relief vents, external gas cylinder storage, and integrated HVAC shutdown functionality.
- Gas and cylinders must be stored to a total pressure of 300 bar with a design concentration of 41.7%. Where an alternative agent has been accepted by HWC the design concentration must be amended as required by AS 4214.
- Gaseous suppression cylinders must be located outside the switchroom in a dedicated enclosure/cage. The cylinder enclosure/cage must:
    - Be enclosed on all sides and include a weatherproof roof.

  - Be constructed using HDG or stainless-steel (if within 5km of coastline) supports, welded mesh exterior (25 x 25 x 3.15) and pre-painted steel cladding roof.
  - Include 3-point hinged access doors with padlock facility.
  - Be sized to ensure ease of bottle installation & removal.
  - Include bolt down points suitable for positioning and fixing to a concrete slab or gantry.
  - Be positioned on a concrete slab or gantry.
- The mass of extinguishing agent required must be confirmed following agreement on the system design and gas calculations.
- The system must consist of cylinders and fixed pipe reticulation to nozzles suitably positioned to apply the agent to the risk area, including computer sub-floor areas where applicable. The pipe installation must be coordinated with the building structure.
- The system must operate automatically and include the facility for manual activation. Automatic operation of the system must be via two separate and concurrent alarm signals from a smoke detection system designed to AS 1670.5. Manual operation must be via the manual call points at the Fire Detection Control and Indication Equipment (FDCIE) or Local Control Stations (LCS).
- A weather resistant PRV.
- All necessary modifications to allow the system to interface with HVAC equipment in the event of a fire.

8.7 Earthing

All switchrooms must:

- The reinforcement must be connected to the site earthing system.
- Have a minimum of two diagonally opposite external earth connection points connected to the reinforced steel installed on the concrete structure for masonry / concrete switchrooms. The external earth connection points must be a proprietary commercial bonding system (Dulmison type C70, Sicame Wetcon or similar)
- Have a minimum of two diagonally opposite external earth connection points installed on the steel frame for prefabricated switchrooms.
- Install a dedicated earth bar in the switchroom in an accessible location, connected to the site's main earth grid.
- Ensure the earth bar is mounted in an accessible location for bonding all equipment.
- Bond all metallic structures, switchboards, cable ladders, equipment stands, and HVAC systems to the earth bar.

8.8 Solar

Where solar panels have been specified in the project scope or proposed for future, all switchrooms must:

- Be designed for the mounting and maintenance of solar panels on the entirety of the roof.
- Have the roof angled toward the north.
- Include roof access provisions such as anchor points in accordance with AS/NZS 1891.4
- **Networks sites only** – Allow for mounting of inverters inside switchroom.

8.9 ICT

8.9.1 All Switchrooms

ICT requirements for all switchrooms must be developed and implemented in accordance with STS 500 and HWC during design.

8.9.2 Treatment Site Switchrooms

In addition to the above, treatment site switchrooms must include:

- Two UPS-backed GPOs and two network outlets for the SCADA ViewX terminals. The GPOs must be red in colour with a label clearly identifying it is UPS backed.
- For desk locations, provide two network outlets per seat.
- Main switchrooms where the secondary SCADA server is located must include 1 x RFI-LTE-XPOL-002-5G RFI 5G Panel Antenna (external antenna mounting to be determined to suit building construction).

8.10 Security

8.10.1 All Switchrooms

Security requirements for all switchrooms must be developed and implemented in accordance with STS 105 and HWC during design.

8.10.2 Treatment Site Switchrooms

In addition to the above, treatment site switchrooms must include:

- A security panel, wall mounted adjacent the main access door. All switchroom security panels must be hardwired to the main site security panel (in admin building).
- Card readers, wall mounted adjacent all access doors.
- Magnetic door switches, attached to all access doors.
- PIR / motion sensors, covering all areas of the switchroom.

Warning – this document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

9 Signage

9.1 All signage

All signage must:

- Comply with AS/NZS 3000 and AS/NZS 1319
- Treatment switchroom doors must have a switchroom identification number and description. Network switchroom doors must have asset number.
- All switchroom doors must have labels fitted to indicate that the building is a restricted area.

9.2 Internal Signage

All switchrooms must display the following on internal walls/doors:

- CPR chart explaining treatment in the event of persons suffering an electric shock (minimum 500 x 500mm) on the internal of all access doors.
- First Aid chart explaining treatment in the event of persons suffering electrolyte burns (minimum 500 x 500mm) on the internal of all access doors.
- Room mounted portable fire extinguishers are to have appropriate operating instructions fixed to the wall adjacent to the units. This is in addition to the instruction of the extinguisher itself.
- laminated A3 single-line diagrams (SLDs) on internal wall within view of Main Switch.
- All underfloor equipment or features (earth bar, sump, etc.) must be clearly identified with traffolyte labels mounted 300mm above floor level.

9.3 External Signage

All external signage must be aluminium backing with PVC printing and UV resistant.

All switchrooms must display the following on all external doors:

- Danger – 400VAC or maximum voltage within Switchroom (200H x 300Wmm).

DANGER
400V

- Danger – Authorised Persons Only (200H x 300Wmm).

DANGER
AUTHORISED PERSONS ONLY

- **Treatment sites only** – Switchroom TAG number and description (200H x 300Wmm) (white background with black text)

SRxxxx (DESCRIPTION) SWITCHROOM

- **Network sites only** – Asset number (200H x 300Wmm) (white background with black text)

SS-SOL-001-PS1

- **For critical switchrooms** – with gaseous fire suppression (200H x 300Wmm)

THIS AREA IS FITTED WITH AN AUTOMATIC FIRE SUPPRESSION SYSTEM - EVACUATE AREA ON SOUNDING OF ALARM - DO NOT ENTER AFTER GAS DISCHARGE UNTIL AREA HAS BEEN THOROUGHLY VENTILATED AND TESTED

10 Miscellaneous

All switchrooms must be provided with:

- A three-drawer desk.
- A chair with five castors.

In addition to above, all treatment site switchrooms must be provided with:

- A filing cabinet for storing drawings.
- A Low Voltage rescue kit wall mounted adjacent the double access doors.
- A wall mounted combined yellow Lockout Station board for:
    - “Danger” tags (100 off)
    - “Out of Service” tags (100 off)
    - “Information” tags (100 off)

11 Quality Assurance

The Contractor must implement a quality system that complies with the requirements of ISO 9001 for all construction work of the switchroom.

The Contractor must submit for approval project-specific Inspection Test Checklists (ITCs), Inspection Test Reports (ITRs) and Inspection and Test Plans (ITPs) for the switchroom covering all activities i.e. engineering, design, construction, wiring, site testing, resolution of site defects/punch lists, handover, etc. The ITCs, ITRs and ITPs must identify the standards and/or procedures as well as the acceptance criteria that must apply for each stage in the ITCs, ITRs and ITPs. Unless approved otherwise, all standards, procedures and acceptance criteria included in the ITCs, ITRs and ITPs must comply with the requirements defined in this specification. Perform all design and construction work for the switchroom in accordance with the approved ITCs, ITRs and ITPs. HWC requires 10 business days to review all documentation.

11.1 Witness and Hold Points

Hunter Water may apply witness points and/or hold points on various stages of the ITPs. Hunter Water must be given the option of witnessing all inspections. Sufficient notice of ten calendar days must be given to Hunter Water to attend witness point/hold point inspections.

As a minimum, the below witness and hold points apply:

11.1.1 Masonry / Concrete Switchrooms

- Pre-pour inspection – conduits, earthing, subfloor and/or footings. (Hold Point)
- Post-pour inspection – conduits, earthing, subfloor and/or footings. (Hold Point)
- Post cable ladder and stand installation – pre-equipment installation. (Hold Point)

11.1.2 Prefabricated Switchrooms

- Post-weld inspection of frame, pre hot dipped galvanising. (Hold Point)
- Pre-wiring inspection after installation of switchboards and electrical equipment installed. (Hold Point)
- Pre-transport to site inspection. (Hold Point)

11.2 Testing Requirements

All works undertaken on any Hunter Water asset must be tested in accordance with but not limited to:

Structural

- NCC – National Construction Code
- STS 410 – HWC Building Works
- AS 4859 – Thermal Insulation Materials

Electrical

- STS 500 – HWC General Requirements for Electrical Installations
- STS 510 – HWC General Requirements for Switchrooms
- AS/NZS 3000 – Wiring Rules
- AS/NZS 3017 – Electrical Installations – Testing Guidelines
- AS/NZS ISO/IEC 14763.3 – Fibre Optic Testing (where applicable)
- AS/NZS 61439 – Low-Voltage Switchgear and Control gear Assemblies

Lighting

- AS 2293 Series – Emergency Escape Lighting and Exit Signs
- AS/NZS 1680 Series – Interior and Workplace Lighting

HVAC

- AS 1668 – The use of mechanical ventilation and air-conditioning in buildings
- AS 1324 – Air filters for use in general ventilation and air conditioning

Fire

- AS 1668.1 & AS 1668.2 – Mechanical Ventilation and Smoke Control
- AS 1670.1 – Fire Detection and Alarm System Commissioning
- AS 4214 – Gaseous Fire Suppression Systems (Non discharge test accepted) (where applicable)
- AS 2030 Series – Gas Cylinders (where applicable)

Security

- • AS/NZS 2201 Series – Intruder Alarm Systems
- • AS/NZS IEC 62676 Series – Video Surveillance Systems (where applicable)

Any works where testing has not been conducted or shown compliance will not be accepted until a repeat of the test confirms compliance.

11.3 Handover Documentation Requirements

Handover documentation requirements must be in accordance with STS 500 and STS 903.

As a minimum, the below documents must be supplied, but not limited to:

- Work as Constructed (WAC) design report.
- Unless stated otherwise, all works will be issued as Work as Constructed (WAC) drawings in accordance with STS 904.
- ITCs, ITRs and ITPs for all works.
- OEM documentation.
- Compliance to standards documentation.
- Equipment warranties
- Operating & Maintenance manuals.
- Training records.

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12 Document Control

Document Owner: Manager of Electrical Engineering

Document Approver: Executive Manager Customer Delivery

Document review is as per the Integrated Management System Document Management Standard HW2009-2368/2/54.002.

Version	Author	Details of change	Approval date	Approved by
1	M.Cribb	Document creation	May 2025	G.Robinson

Appendix A: Related Documents

For clarity, where a standard has several parts and/or amendments and/or supplements, the reference number is for the leading part of the standard and the title notes what additional elements are included.

Reference number	Title
AS/NZS ISO 9001	Quality Management Systems – Requirements
AS/CA S009	Installation Requirements for Customer Cabling
IEC 60364-5-54	Low Voltage Electrical Installations, Part 5-54 – Electrical installations of buildings
IEC 62305	Protection Against Lightning
IEC 62305	Protection against lightning electromagnetic impulse (LEMP)
	Service and Installation Rules of New South Wales
	Ausgrid network standards
	Australian Communications Association (AS/ACIF) Technical Standards for telecommunications including, but not limited to AS/NZS 4117 Surge protective devices for telecommunication applications
	Work health and safety regulations
	SafeWork Codes of Practice
AS/NZS 1319	Safety signs for the occupational environment
AS 1324	Air filters for use in general ventilation and air conditioning
AS 1670	Automatic fire detection and alarm systems
AS/NZS 1680	Interior and workplace lighting
AS 1668	The use of mechanical ventilation and air–conditioning in buildings
AS/NZS 1768	Lightning Protection
AS/NZS 1891.4	Industrial fall-arrest systems and devices
AS 2030	The verification, filling, inspection, testing and maintenance of cylinders for storage and transport of compressed gases
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 2293	Emergency escape lighting and exit signs
AS/NZS 2444	Portable fire extinguisher and fire blankets
AS 2700	Colour Standards for General Purposes
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3008.1.1	Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – Typical Australian installation conditions
AS/NZS 3010	Electrical Installations – Generating sets

Reference number	Title
AS/NZS 3017	Electrical installations – Verification guidelines
AS/NZS 3019	Electrical installations – Periodic verification
AS/NZS 3100	Approval and Test Specification – General requirements for electrical equipment
AS 3600	Concrete structures
AS 3999	Thermal insulation of dwellings— Bulk insulation—Installation requirements
AS 4024.1	Safety of Machinery
AS 4145	Locksets and hardware for doors and windows
AS 4214	Gaseous fire extinguishing systems
AS/NZS 4680	Hot dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4836	Safe Working on or Near Low-voltage Electrical Installations and Equipment
AS/NZS 4859	Materials for the thermal insulation of buildings
AS 60079	Explosive Atmospheres
AS/NZS 60245.4	Rubber Insulated Cables – Rated voltage up to and including 450/750V – Cords and flexible cables
AS 60204 series	Safety of Machinery – Electrical equipment of machines
AS 60529	Degrees of Protection Provided by Enclosures,
AS/NZS 60950.1	Information Technology Equipment – Safety – General requirements
AS/NZS 61439.1	Low-voltage switchgear and control gear assemblies – General rules
STS 101	Construction and Pipe Bedding Materials
STS 105	Security at Hunter Water Corporation Assets
STS 402	Construction of Submersible Sewage Pumping Stations
STS 404	Concrete Supply and Construction For General Purpose and Water Retaining Structures
STS 405	Construction of Water Booster Pumping Stations
STS 500	General Requirements for Electrical Installations
STS 501	Solar Photovoltaic PV Systems
STS 550	General Requirements for SCADA and Automation Systems
STS 600	General Mechanical Requirements
STS 640	Lifting Equipment
STS 903	Work As Constructed Information Standard
STS 904	Preparation of Electrical Engineering Drawings
STS 906	Operation and Maintenance Manual Requirements