

Series 2 Switchboard Specifications



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1.00 Enclosure

1.01 General

(a) Design layout

Position equipment to provide safe and easy access for operation and maintenance.

Consider functional relationships between items of equipment in lay out of equipment on the assembly.

(b) Service conditions

Outdoor operation. Ambient temperature range -10°C to +55°C and relative humidity up to 100%.

(c) Degree of protection

Minimum: IP55

(d) Mounting

Switchboard to be mounted on a concrete plinth.

Fault levels

Rated short-circuit currents: maximum current values at rated operational voltage, at the incoming supply terminals, excluding effects of current limiting devices is nominally <10ka but should be confirmed on a site by site basis.

Segregation

Form 1.

The provision of a separate enclosure/compartment with a hinged door/escutcheon panel within the external enclosure is required for the control and indicating equipment and motor starter switchgear.

The switchgear and drives for the pumps should be suitably segregated within the switchboard.

Connection

Cable entries: bottom entry via gland plate and cable glands into the main (internal) switchboard enclosure.

1.02 Size

(a) Provide a robust and rigid enclosure giving the designated separation and degree of protection. The enclosure structure and mounting fixtures shall be rated for a design wind speed of 50m/s.

Switchboard to be 1200 H x 900 W x 500 D (B&R IP **/S or equiv.)

Door hinge on right hand side. With 300 H Galv. Steel plinth

1.03 Construction Materials

Material of construction shall be 1.2/1.5mm thick 316 stainless steel.
Surface finish N4. Protection rating IP66. Gasket to be Polyurethane

1.04 Colour

(a) External and internal metal surfaces shall be suitably prepared, primed and finished with a powder coat painted finish.

Dulux "Wilderness" #84224 G62 satin for external and internal of switchboard.

Dulux "Mist Blue" B33 for escutcheon panels and shelves.

1.05 Earthing

Effectively bond equipment and cabinet assembly metal frame (including doors and covers) to the protective earth conductor.

Strip painted surfaces and coat with corrosion resistant material immediately before bolting to the earth bar.

Provide serrated washers under bolt heads and nuts at painted, structural metal-to-metal joints.

1.06 Lifting

Where required, provide fixings in the supporting structure and removable attachments for lifting

1.07 Roof

Provide an all weather roof with a minimum over hang of 700mm

1.08 Doors and accessories

(a) Doors

Provide a suitable enclosure cover for the outdoor assembly. The covers shall provide effective protection from weather, vandals, etc. all doors and hinged covers (including the escutcheon panel) are to be suitably stiffened to prevent flexing or warping when in the open position.

The escutcheon panel door shall be hinged on the left hand side to provide optimum alignment of main switch and motor circuit breaker.

The door shall open min 115 degrees

'C' rails for adjustment of mounting pan and mounting of accessories shall be provided

Door stays

The main external door on the switchboard shall be fitted with a suitable rigid and robust door stay with the facility to latch the door in the open position (latched open at approximately 120°).

RTU/Relays viewing window

Provide a rigid, clear, polycarbonate window in the front escutcheon to enable viewing of RTU status indication LED'S without opening the panel. Window to be at least 3mm thick. Fix polycarbonate window with screws and double-sided tape.

Document holder

Provide a stainless steel document holder fixed to the rear of the main enclosure door. Provide suitable depth clearance or cut- outs to allow hand access to the bottom of the holder compartment.

Door hardware

All door hinges, latching and mounting hardware shall be constructed from stainless steel or other corrosion resistant material the main enclosure door shall be fitted with a robust three point latching mechanism.

1.09 Station light

Provide a blue flashing beacon mounted on the switchboard roof. The beacon is to be housed in a vandal proof fibreglass cover

2.00 Vermin control system

2.01 Vents

All vents are to use Termimesh Stainless Steel 316 Mesh on the inside of the cabinet these are to be bolted down with a 316 frame arrangement.

The mesh is to be applied to the frame with the use of marine grade Sikaflex then bolted to the cabinet. The frame is to be able to be removed with ease to clean or to replace damaged Termimesh.

The 316 Termimesh to be used is to be termite, ant proof and rust proof.

2.02 Cable Entry & Exits

Provide a 200mm high plinth with cable entry gland plate for incoming and outgoing power and control cabling. All cable exits and entries should be made using the correct size cable gland. Spare holes will also have a cable gland inserted and filled with silicone to block any vermin trying to enter the cabinet.

Provide a fully sealed panel between the cable plinth and the switchboard enclosure to achieve effective "vapour barrier" isolation to the switchgear and control gear.

2.03 Door Seals

The seal on the front door shall have Flat face sealing technology for a consistent seal and long seal life.

The seal shall have a IP66 protection rating and shall a be Foamed in place Polyurethane Gasket

3.00 Cooling Control System

3.01 Design & Control

The RTU shall be able to monitor via a RTU point the temperature within the cabinet in degrees C to allow for alarming and trending.

The cooling control system will have two cooling controls system provided.

1. Fan based

The fan mounting in the cabinet as per 3.02 shall be controlled by a high quality thermostats which will be settable between 0C - 60C. The thermostats shall be mounting above the3 heat generating devices but not directly in line with the rising heat.

2. Natural Ventilation

Natural Ventilation shall ensure the temperature rise within the cabinet does not exceed 8°C above ambient temperature at ant time.

3.02 Fans

A >600m³/h ventilation fan, mounted on the roof of the switchboard.

Air intakes are to be provided in the door and rear panel of the switchboard to provide at least > 600m³/h when fan operates.

3.03 VSD Venting

The Variable speed drives provided shall be supplied with an external rear mounting kit. The kit will enable the drives heat sink and fan to be mounted external to the cabinet thus allowing 98% of the heat generated from the variable speed drive to be vented externally.

The fan shall be connected to a surface mounted connector on the rear mounting kit to enable the fan to be replaced from the rear of the cabinet.

The venting kit shall have vermin control protection so no ants can travel into the cabinet through the rear mounting kit. The rear mounting kit will enable the drive to be easily removed from the front of the cabinet unless the drive is physically too big, in this case the drive can be removed from the rear of the cabinet.

4.00 Anti Vandalism System

4.01 Locking system

The cabinet will have a fully enclosed 3 point locking system on the door, preventing the door from being prised open from top or bottom as well as provided sufficient pressure on the door seal to provided IP66 sealing.

There shall be a Heavy duty 316 stainless steel construction, pad lockable door swing handle which is to be located half way on the door to provided a centralised locking point within the cabinet. This shall be integrated with the 3 point door locking system provided.

The rear cover system for the variable speed drives shall be provided with pad lockable points to prevent the rear cover from being removed.

4.02 Light Covers

The strobe light mounted on top of the roof shall be provided with a vandal proof light cover.

This cover shall be made from a multilayer translucent fibre glass construction. The cover shall have a flange with a 6 point mounting system using 316 stainless bolts and nuts. The cover shall be a minimum of 10mm thickness at any point.

The construction of this light cover shall be translucent enough to allow detection of the flashing strobe light during day light hours.

A UV proof and water proof EDM gasket shall be proved to mount the light cover.

The flange on the bottom of the light cover shall be machine so it provides a flat surface for mounting the gasket to be provided

4.03 Construction

Stiffening rails to sides of door - complete with mounting looming holes shall be provided to strength the front door.

4.04 Generator appliance inlet locking

A lockable PVC cover shall be provided for the generator appliance inlet. This is to suit the DS3/DS9

5.00 Backup Power Systems

5.01 Generator Facilities

A three phase generator inlet system shall be provided with the following specification

1. DS9 appliance inlet is to be provided for up to 150 amp units
2. DS3 appliance inlet is to be provided for up to 50 amp units
3. DS9 inclined sleeve of 30 degrees is to be provided
4. DS9 lockable cover to be provided
5. Generator change over switch is to be provided this is to be a clearly identified switch with the Mains/off/Generator to be displayed...

5.02 Batteries system

A backup battery system is to be provided for the 12VDC and 24VDC control system power supplies. An isolation DC breaker is to be provided, which is sized and capable of breaking DC current in the overload situation.

The battery backup system is to provide a certified charged and discharged system for the batteries to a long life battery backup system.

The battery back system is to be able provided power to the control system for a minimum period of 12 hours.

The battery backup system shall be in an accessible spot within the control cabinet to change and date the batteries being provided.

6.00 System compliance

6.01 ELECTRICAL STANDARDS

All plant equipment and installation works shall be supplied and set into operation in accordance With the following standards.

In addition to this specification all works shall comply with AS 3000 SAA Wiring Rules (current Edition), as well as ACIF S009 latest addition for data communication and extra low voltage signal wiring.

All supply authority regulations and any other relevant standard not mentioned herein.

Where more than one standard is quoted for the same item of equipment and the provisions of each standard are in conflict, the Clients decision upon which standard takes precedence, shall be final and binding.

Standards referred to in the body of the Specification shall also be complied with.

1. CABLES

Cable Type or Item Standard

- All copper and copper alloys AS 1574
- Overhead hard-drawn copper cables AS 1746
- Aluminium conductor cables AS 1125
- Rubber insulated cables AS C346
- AS 363
- PVC cables AS C347
- AS 3147
- AS C363
- Submersible motor cables AS 3116
- Neutral screened cables AS 3155
- M.I.M.S. cables AS 3187
- Flexible cables AS 3191
- Busways AS C151

2. CONDUITS

Conduit Type or Item Standard

- Rigid metallic conduit AS 2052
- Rigid PVC conduit AS 2053
- Category 4 conduit AS 2053
- Flexible PVC conduit AS 2053

3. INTERFERENCE STANDARDS

- Electro Magnetic Interference AS 2064
- Harmonics

4. SUB CIRCUITS

- All sub-circuits, which contain G.P.O.'s, shall be protected by an approved earth leakage type circuit breaker or 20mA sensitivity except the GPO for telemetry.

7.00 Lighting Protection System

7.01 Stage 1 Overall Switchboard protection

A three phase surge protection device is to be provided on the three phase main bus after the overall board isolation switch. This device is to provide Stage 1 protection for the variable speed drives and the control board.

This protection device shall provide clamp protection to earth for voltage above 275V for each phase.

The protection device shall provide a dry contact for when the surge protection is no longer provided surge protection to the main device.

7.02 Stage 2 Control board protection

An inline surge protection device shall be provided for the control board

7.03 Stage 3 I/O Protection

All Analogue I/O shall be protected by a suitable surge protection barrier clamping any voltage above 36 Volts.

All external digital inputs shall be protected via a interface relay

7.04 Earthing Systems

The earth conductor from the main switchboard shall be run as directly as possible to an earth stake which shall have a resistance of less than 0.5 ohms.

8.0 Standard Systems

8.01 Preferred Part listing

<i>Pump current ammeters</i>	<p>Make: IME Model: RQ72M-ADC</p> <ul style="list-style-type: none"> • 90 deg instruments • 72mm Sq.. • 4-20mA movement • DC moving coil instrument • Removable scales • Controlled by 4-20ma VSD output
<i>Incoming AC voltmeter</i>	<p>Make: IME Model: RQ72E-VAC 500V</p> <ul style="list-style-type: none"> • 90 deg.instrument • 72mm Sq. • 0-500V movement • Direct connection • AC moving iron instrument • Removable scales
<i>Phase to phase voltage switch</i>	<p>Make: Elektra Model: B2N V3-20P</p> <ul style="list-style-type: none"> • Elektra PH to PH & PH to N • 20A -500V • Panel mount
<i>Flow meter (optional)</i>	<p>Make: ABB Model: Magmaster</p> <ul style="list-style-type: none"> • ABB Magmaster • 240VAC supply
<i>Graphic display panels</i>	<p>Make: Schneider Model: VW3AIP65KIT3M</p> <ul style="list-style-type: none"> • Remote mounting kit for Altivar 61 drive • IP65 protection • 3m cable supplied
<i>Door switch</i>	<p>Make: Schneider Model: XCJ128</p> <ul style="list-style-type: none"> • Micro limit switch • 240V -10A • 1 C/O contact
<i>Pump 1 & 2 "auto-off-man" selector switches</i>	<p>Make: Schneider Model: ZB4-BD3</p> <ul style="list-style-type: none"> • Schneider Harmony style 4 22mm dia • Standard handle 3 position stayput • 2 N/O contact blocks

<i>Fault reset pushbutton</i>	<p>Make: Schneider Model: ZB4-BA26</p> <ul style="list-style-type: none"> • Schneider Harmony style 4 22mm dia • Recessed black spring return • 2 N/O contact blocks
<i>Pump 1 & 2 manual speed set "increase-decrease selector switches</i>	<p>Make: Schneider Model: ZB4-BD5</p> <ul style="list-style-type: none"> • Schneider Harmony style 4 22mm dia • Standard handle 3 position spring return to centre • 2 N/O contact blocks
<i>Pump 1 or 2 auto pump down selector switch (depending on client RTU program)</i>	<p>Make: Schneider Model: ZB4-BD5</p> <ul style="list-style-type: none"> • Schneider Harmony style 4 22mm dia • Standard handle 3 position spring return to centre • 2 N/O contact blocks
<i>Well washer & odour bed selector switches (optional)</i>	<p>Make: Schneider Model: ZB4-BD3</p> <ul style="list-style-type: none"> • Schneider Harmony style 4 22mm dia • Standard handle 3 position stayput • 2 N/O contact blocks
<i>Hand controller and on-site button/LED</i>	<ul style="list-style-type: none"> • Clipsal 30MBP pushbutton • Clipsal 30RJ88SMA5 RJ45 socket • WES LED108WH super bright LED
<i>Variable speed drives</i>	<p>Make: Schneider Model: ATV61HD**N4</p> <ul style="list-style-type: none"> • Schneider Altivar 61 • Up to 90kW • Remote graphic display panel fitted to front escutcheon • External vent kit fitted to drives up to 37kw
<i>Telemetry controller</i>	<p>Make: Serck controls</p> <ul style="list-style-type: none"> • Serck half or full I/O eNet
<i>Digital radio</i>	<p>Make: Trio Model: ER-450</p> <ul style="list-style-type: none"> • Digital data radio • 19.2kbs rate • 10-16VDC supply • 0.05-5W Tx power • 370-520mhz freq range
<i>DC Control relays</i>	<p>Make: Finder Model: 44.62 (2 C/O) 55.34 (4 C/O)</p> <ul style="list-style-type: none"> • 12VDC 10A 2C/O 40 series • 12VDC 7A 4C/O 50 series • Plug in LED and diode module
<i>Timer relay</i>	<p>Make: Schneider Model: RE11RMMW</p> <ul style="list-style-type: none"> • 12-240VAC/DC 1 C/O contact @ 8A
<i>Phase failure/phase reversal relay</i>	<p>Make: Schneider Mode: RM17tg20</p> <ul style="list-style-type: none"> • LED indication of correct phase sequence • 415V 3PH supply voltage • 2 C/O contacts 250VAC @ 5A

Pump seal failure relays	<p>Make: ATC Model: Series 78562</p> <ul style="list-style-type: none"> • Green LED indicates power on & seals ok • Red LED indicates water ingress into bearing housing • 240VAC-50Hz supply voltage • 1 N/O & 1 N/C contact 250VAC -5A40k ω sensitivity • 15V AC peak/peak electrode voltage
Signal protection (for analog signals)	<p>Make: Novaris Model: SL4DIN-36</p> <ul style="list-style-type: none"> • Multistage transient barrier 4 way • 7.5-200V working voltage • 350mA-2A max load current • 20kA peak surge handling
Surge filters (for PSU)	<p>Make: Novaris Model: SF105DIN</p> <ul style="list-style-type: none"> • Equipment surge protection • 200-280VAC RMS working voltage • 2A-20A max load current • 8-40kA peak surge handling
Surge diverter	<p>See section "Circuit breakers" Make: Critec Model: DSD380-TNS</p> <ul style="list-style-type: none"> • 3PH + N • 275V to 350V max voltage • 0-60Hz • 80kA max discharge • 1 C/O contacts • Visual indication of life status
Power supply dual voltage psu/battery charger	<p>Make: Omniflex Mode: PT-L50C-D</p> <ul style="list-style-type: none"> • 12VDC 1A and 24VDC 2A • Battery overcharge cutout
Transformer 24vac	<p>Make: Legrand Mode: 422-31</p> <ul style="list-style-type: none"> • Optional for solenoid valves • Pri 230-400V S24-48V 40vA
Backup batteries	<p>Make: Panasonic Mode: LC-R127R2P1</p> <ul style="list-style-type: none"> • 2 off 12VDC 7.5aH • Maintenance free sealed lead acid (SLA)
Earth link	<ul style="list-style-type: none"> • 12 tunnel 1 screw • Suit 16mm² cable 165A
Neutral link	<ul style="list-style-type: none"> • 11 hole to suit 25mm² cable • Cover to suit
Cable terminals	<p>Make: Legrand Model: Viking 3</p> <ul style="list-style-type: none"> • 2.5mm² and 4mm² type • 1 Single connection type • 3 level sensor type • To suit TS35 DIN rail

<i>Main switch</i>	See section "Circuit breakers"
<i>Isolators</i>	See section "Circuit breakers"

8.02 Drawings standards

Complete drawings shall be submitted to the Council for acceptance prior to manufacture of switchboards, motor load centres, distribution boards and the like.

Minimum level of drawing presentation shall be to current editions of AS 1000, AS 1100, AS 1101 and AS 1102.

These drawings, in a table format, shall show layouts, dimensions, construction details, Equipment electrical ratings, system and circuit diagrams, distribution system protective device co-ordination with sizes and settings of protective devices, maximum demand, cable types and sizes.

Complete equipment schedule information shall also be provided at that time. The submittal shall list the manufacturer, trade name and model (where applicable) and any other information which may be required by the Council in identifying the item and determining its acceptability.

9.00 Electrical Systems

9.01 Cabling and Wiring

All control wiring shall be 0.6/1kV PVC insulated. Conductors shall be multi- stranded copper with a minimum conductor cross sectional area of 0.75mm² All wires shall be terminated with a suitable crimp ferrule or lug.

All cables to be identified using the Legrand marking system or equiv.. All field cables shall be suitably labelled at their termination point in the switchboard.

Colours

LV

A phase – Red
B phase – White
C phase - Blue
Neutral – Black
Earth –Yellow/Green
Active – White

ELV

DC+ - Brown
DC- - Grey
Analog+ -White
Analog- -Black
Telemetry –Violet

9.02 Field equipment

1. Earthing

Supply and install a new earth electrode adjacent to the switchboard mounting Slab or in the slab. The earth electrode shall be a copper bonded rod (nominally 12mm Diameter x .5 m long) driven to a depth of not less than 1.2m.

The main earth conductor at sites shall be a green/yellow PVC Insulated, multi-stranded copper cable with a cross sectional area of 6 mm² .

Suitable mechanical protection shall be provided for the main earth conductor.

Outside the switchboard (and its connection to the earth electrode) to prevent possible damage from activity around the switchboard (eg. vandalism, mowers, weed trimmers, vehicles, etc.)

2. Analog level sensor

Supply and install a 4-20mA analog level transducer. The type and make/model of the required analog level sensing system will be Vegawell 72. Calibrated to 0-10 bar

The field cable from the transducer in the wet well is to be routed via a suitable cable gland in the switchboard gland plate.

Instrumentation installation and cabling is to be fully compliant with the manufacturer's recommendations.

In particular, the installation shall ensure suitable electromagnetic compatibility for instrumentation operation.

3. Float switches

Supply and install 1 only Nivafloat NL100 or equiv.float switches (N/O contacts) for critical well level

Suitable cable lengths and float installation depths are to be implemented by the contractor based on the wet well and operating level parameters to be advised for each site.

4. Switchboard mounting and conduit entries

In general, the switchboard is to be mounted on a concrete slab. The concrete slab area is to provide a clear, flat, stable work platform with a minimum dimension as shown on drawings attached.

Specific requirements for the switchboard mounting location and associated concrete works will be provided for each site

5. Switchboard fixing

As a minimum, each corner of the switchboard base shall be fitted with a 10mm stainless steel dynabolt or equivalent for fixing to the concrete slab. dynabolts shall be inserted to a minimum depth of 70mm in to the concrete Slab

6. Well washer and Odour bed solenoid valves

Supply and install a 24VAC water solenoid valve Asco SCD210D9 type or equiv.

9.03 Circuit breakers

1. Motor circuit breakers

Each motor/drive circuit shall be fitted with a dedicated motor circuit breaker. The motor circuit breaker shall be suitably sized for the motor rating.

Each motor circuit breaker shall incorporate short circuit and thermal overload protection with visible indication and differentiation of the "tripped" and "isolated" states (eg.Schneider NS series or equivalent).

Motor circuit breaker isolation and/or trip reset functions are to be accessible from the operator panel via a suitable, panel mounted, rotary handle and short extension rod as required. The front panel mounted motor circuit breaker actuators are to be lockable in the off position.

2. Load break switch

Provide a load break switch upstream from the motor breakers capable of breaking the full load current of both pumps and ancillary circuits

3. General circuit breakers

Provide miniature circuit breakers for each circuit. Minimum fault rating 10kA (Hager NC type or equiv.)

9.04 CT metering panel

1. General

Provide a suitable separate CT metering panel for over 100A per phase (B&R SMB1/15 or equiv.).

Design as per NSW service and installation rules. Provide Form 2 (630A max, 415v)

Fault level maximum 31.5kA for 1 second (CT chassis)

Metering panel to include the following items

- Double hinged Metering panel
- Generator changeover switch (Transfer switch)
- CT chamber with potential fuse
- Consumer section – M.E.N and earth bar
- Supply authority section – main neutral bar

Note: For under 100A per phase, the metering panel is integrated within the switchboard Complete with:

- Council service fuses (100A)
- 12 way sub-board,
- 4 pole Generator changeover switch
- Clipsal power outlet with RCD
- Consumer and council neutral links