Memorandum

To:	**Donna Ward, DEPOT FINANCIAL SERVICES SUPERVISOR**
From:	**Dan Toon, EXECUTIVE MANAGER – COMMERCIAL SERVICES**
cc:	
Date:	15 August 2007 (Supersedes the 06 March 2007 issue)
Re:	**Purchase Specification – Switchboard & Electrical Connections for Sewage Pump Station – Submersible, Wet Well Type, Rev G.**
File Reference:	pm:kb 50/001/0028

SWITCHBOARD & ELECTRICAL CONNECTIONS FOR SEWAGE PUMP STATION – SUBMERSIBLE, WET WELL TYPE.

PURCHASE SPECIFICATION.

1.0 This specification is for the supply and installation of a switchboard and electrical connections for operation of a sewage pump station – submersible, wet well type. General reference may be made to Sewage Pumping Station Code of Australia WSA-04.

2.0 Council will advise the following at the time of the purchase: pump station name, pump station location, electrical sizes of the submersible sewage pumps, primary and secondary electrical power sources, radio telemetry RTU frequencies, radio telemetry antenna size, antenna orientation and alignment direction, RTU wiring input & output Weiland plug arrangement. Refer to attached Schedule.

3.0 All electrical work shall be in compliance with the electricity supply authority's requirements, relevant legislation and Australian Standards. Drawings and specifications to be Registered Professional Engineer Qld (Electrical) certified.

4.0 Cabinet.

4.1 Cabinet to be a self-contained, plinth mounted, free-standing, IP56 weatherproof type, with sun-hood to comply with AS3439.

4.2 Constructed from either minimum 1.5mm stainless steel grade 316, including the frame (painting is not required) or minimum 3mm marine grade aluminium, powder coated colorbond mist green.

4.3 A 'duplex' or double-sided type configuration with front and rear compartments and overall dimensions at least: 900mm wide, 900mm deep, and 2000mm high.

4.4 Front side to be in two separate compartments being, bottom part (normally) for pump cable plug and sockets (minimum 350mm high), and top part (normally) for main pump controls. A separate door is required for each compartment.

4.5 Rear side to be in three separate compartments being, bottom part for the plug-in mobile generator switchgear, middle part for telemetry equipment and top part for electricity supply authority meters, switches and equipment. A separate door is required for each compartment.

4.6 Concealed removable hinges, doors to open at least 130 deg.

4.7 Locking system to be 'locking bar' type with 3 point locking on large doors and all handles to be a metal type, 8mm hole dia, which accepts Council's standard sewage pump station switchboard padlock. Refer to Council Purchase Specification – Padlocks for Commercial Services Dept. Facilities.

4.8 Red flashing light warning light on top of cabinet to have a stainless steel or aluminium security mesh cover.

4.9 The electricity supply authority meter compartment door shall have **no** viewing window.

4.10 The pump cable plug and socket compartment to be gas sealed from the remainder of the cabinet compartments and the wet well conduits. The sealing and gland/grommet arrangement to be capable of being resealed after a pump and cable removal event.

4.11 Cabinet to be installed on a concrete slab cantilevered off the side of the pump station. Stainless steel fixings and appropriate dissimilar metals insulation required.

4.12 Cabinet to have at least 1500mm clearance in front of doors, to any obstructions.

4.13 Cabinet to be suitable for the connection of the primary and secondary electricity power sources. The primary and secondary electricity power sources will be specified at the time of purchase.

4.14 Cabinet to have appropriate ventilation for heat dispersion.

5.0 Primary Electrical Power Source.

5.1 The pump station shall have provision for the supply of electrical power from at least two independent sources. Normally the primary electricity supply being a permanently connected low voltage power supply from electricity authority mains and the secondary supply being from a plug-in mobile generator.

5.2 The primary electrical supply to the switchboard shall be underground. The primary electrical supply cable conduit shall be above ground as short a distance as possible and designed to afford maximum mechanical protection to the cable.

5.3 The primary electrical supply to the switchboard shall enter through the base of the switchboard via minimum 100mm dia. conduit with long radius bends.

5.3 When the pump station requires its own transformer substation, ground level substations are required. Council shall not approve pole mounted substations.

6.0 Secondary Electrical Power Source.

6.1 Either a duplicate electrical power supply from the electricity authority separate grid or an on-site electrical generator or facility for a plug-in mobile generator may be specified at the time of purchase.

6.2 If a plug-in mobile generator is specified, then a socket and switchgear is required to be installed which is compatible with Council's mobile generator plug-in cabling as follows:

.For two pump motors each 0 – 5.5 kW, (Pump Station Size A), then the one inclined socket will be: externally mounted, appliance inlet, 3 phase + neutral and earth, 5 pin Marechal DS6 disconnector type, for 8mm padlock.

.For two pump motors each 7.5 – 18.5 kW, (Pump Station Size B), then the one inclined socket will be: externally mounted, appliance inlet, 3 phase + neutral and earth, 5 pin Marechal DS9 disconnector type, for 8mm padlock.

.For two pump motors each 22 – 45 kW, (Pump Station Size C), then the one inclined socket will be: externally mounted, appliance inlet, 3 phase + neutral and earth, 5 pin Marechal DS2 disconnector type, for 8mm padlocks.

6.3 The sockets detailed above are general Marechal brand series part numbers. Contractor to ensure the correct detailed Marechal part number for the required configuration. Alternative brand equipment is not acceptable for safety reasons for padlocking, fitting clearances and securing clips.

6.4 Switchgear to isolate the primary electrical power supply to enable the secondary electrical power supply is to be located in the rear side bottom compartment.

7.0 Pump Cable Connection.

7.1 A three phase plug and socket combination switched connection arrangement shall be provided for each submersible pump in the pump cable plug and socket compartment of the switchboard.

7.2 The pins shall be connected as follows:

Pin 1 – Phase A
Pin 2 – Phase B
Pin 3 – Phase C
Pin 4 – Spare
Pin 5 – Earth
Pilot Pin 1 – Thermistor
Pilot Pin 2 - Thermistor

7.3 The plug and socket combination switched arrangement shall be as follows:

.For motors 0 – 5.5 kW (Pump Station Size A), then each pump will have a socket and plug combination to be 7 pin 'Marechal 32A DS1 type'.

.For motors 7.5 – 18.5 kW (Pump Station Size B), then each pump will have a socket and plug combination to be 7 pin 'Marechal 50A DS3 type'.

.For motors 22 – 45 kW (Pump Station Size C), then each pump will have a socket and plug combination to be 7 pin 'Marechal 90A DS6 type'.

7.4 The sockets detailed above are general Marechal brand series part numbers. Contractor to ensure the correct detailed Marechal part number for the required configuration. Alternative brand equipment is not acceptable for safety reasons for padlocking, fitting clearances and securing clips.

7.5 Each pump cable shall have a separate conduit between the wet well and the switchboard. For pump motors upto 18.5 kW, each conduit shall be 100mm dia. and have long radius bends. For pump motors greater than 18.5 kW, each conduit shall be 150mm dia. and have long radius bends.

7.6 Each pump cable conduit shall be completely sealed to prevent pump well gasses entering the switchboard cubicle. The sealing arrangement shall be capable of being resealed after pump removal.

8.0 Switchgear.

8.1 Electrical equipment in the pump main control compartment shall include: main switch 415VAC, primary power lightning protection, primary power surge protection, secondary power connection plug and switches, circuit breakers, relays and timers, voltmeter with each phase selector switch, ammeter for each pump with each phase selector switch, hour meter with 5 digits for each pump, manual pump duty selector switch, manual-off-auto switch each pump, start push button each pump, stop push button each pump, green run light each pump, red stop light each pump, yellow fault light each pump, reset push button each pump, yellow water void fault light each pump, wet well washer timer, 'MultiTrode MTIC' indicator/relay, double 15A GPO on front panel, RCD's, red flashing light on top of cabinet, RFI & EMI protection, 20% additional spare space.

8.2 All manual reset buttons to be accessed on front panel;

8.3 Common fault reset also via remote Telemetry pulse signal;

8.4 Wet well washer timer to be mounted on front panel;

8.5 Fault lights on the front panel include: thermal, overcurrent, phase fail, Water void (low flow), high water.

8.6 Fault lights to be LED type.

8.7 '24VDC MultiTrode MTIC' indicator/relay to be mounted in the front panel.

8.8 PLC pump controllers are not acceptable for pump control. PLC may be fitted for pump monitoring only.

8.9 Electrical protection equipment shall include: water void (low flow) switch on each reflux valve, thermal overload, phase failure relays for each phase with time delay automatic resets.

8.10 All wiring, and equipment to be numbered and marked. All switches and operation controls to be labelled with screw attached (not glued) word name plates.

8.11 Allowable starting current to comply with the electricity supply authority rules and directions.

8.12 Soft starters to be 'heavy duty rated' type.

8.13 Variable speed drives to be 'standard duty rated' type.

8.14 Switches to suit safety lockout tags.

8.15 Ammeters to suit full normal load current at approx 60% scale.

8.16 Automatic operation of the pumps will be from signals from the primary water level measurement using multi-level 'MultiTrode 10 sensor' electrode and 24VDC Multitrode MTIC' indicator/relay. However operation inhibit of the pumps via telemetry signals is required to prevent the pumps from operating under downstream sewerage system emergencies.

8.17 Voltage free contacts are to be wired to the 24 pin Weiland multi-pin socket in the telemetry compartment for the following: pump start/stop, pump 1 running, pump 1 fail, pump 2 running, pump 2 fail, phase failure, high well water level, overflow water level, pump 1 reset, pump 2 reset. The Weiland plug connection arrangement must be confirmed with Council's Technical Officer Assets and Compliance at time of installation.

8.18 Red flashing light on top of cabinet and fault light on front panel, to operate when water level is at high well water level or greater. Lights to operate until

water level drops to the 'all pumps stop level'. Red flashing light able to be manually isolated.

8.19 Internal fluorescent lighting to be provided in the switchboard compartment and the telemetry compartment. Automatic switching when each cabinet door is opened and closed.

8.20 All wiring and equipment is required to prevent Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI).

9.0 Water Level Measurements.

9.1 The pump station shall be fitted with primary and secondary water level measurement. Primary water level measurement shall using multi-level 'MultiTrode' brand 10 sensor electrode and '24VDC MultiTrode MTIC' indicator/relay. Secondary water level measurement shall use voltage free independent float switches.

9.2 The primary water level measurement using a multi-level 'MultiTrode' 10 sensor electrode (2m set length) and '24VDC MultiTrode MTIS' indicator/relay is the normal pump operation signal source and requires the following measurement levels: all pumps stop, duty pump start, standby pump(s) start(s), high well, overflow.

9.3 The secondary water level measurement using voltage free independent float switches is the alarm signal source direct to the telemetry system, and requires the following measurement levels: high well, overflow.

9.4 The 4 -20 mA analogue output for primary water level measurement using the '24VDC MultiTrode MTIS' indicator/relay and a loop isolator is to input to an analogue input of the radio telemetry.

10.0 Telemetry.

10.1 The pump station shall be fitted with radio telemetry monitoring equipment compliant with Council's existing system 'RAD-TEL' brand. Specification for the telemetry equipment shall be in accordance with Council's Purchase Specification for Radio Telemetry Units which will be made available upon request to Council.

10.2 The telemetry equipment includes a: RTU, antenna, antenna cabling and Weiland plug and socket connections.

10.3 The RTU shall be a 'size 1, RAD-TEL, 8000 Series RTU' with 16 Digital inputs, 8 digital outputs, 8 Analogue inputs, 240VAC 3 pin 10A plug on a 1 meter lead, and 24 pin Weiland multi-pole plug on a 1 meter lead. The RTU radio frequencies will be specified at time of purchase. The RTU wiring input & output

arrangement for the Weiland plug & socket will be specified at the time of purchase.

10.4 The RTU shall be installed in the telemetry compartment of the switchboard. A 240VAC double 10A GPO is required in the telemetry compartment. A 24 pin Weiland multi-pole socket is required in the telemetry compartment. The RTU wiring input & output arrangement for the Weiland plug & socket will be specified at the time of purchase.

10.5 The antenna shall be a stainless steel Yagi type. The size of the antenna (number of elements), orientation (vertical or horizontal) and alignment direction (magnetic compass) will be specified at the time of purchase.

10.6 The antenna and cabling shall be installed on either a pole attached to the switchboard cabinet or the pump station vent pole. The antenna shall be at least 2 m above the top of the cabinet.

11.0 Electrical Circuit Drawings.

11.1 Three (3) sets of 'As Constructed' drawings of the cabinet and circuits are required, being 1 set stored in the switchboard and 2 sets for office asset records.

11.2 The 'As Constructed' copy of the electrical circuit drawings shall be stored in the cabinet door of the switchboard compartment. The drawings shall be stored in a plastic cover.

11.3 Drawings and specifications to be Registered Professional Engineer Qld (Electrical) certified.

12.0 Testing and Commissioning. Contact Council's Technical Officer Assets and Compliance to arrange inspections.

LIVINGSTONE SHIRE COUNCIL

SWITCHBOARD & ELECTRICAL CONNECTIONS FOR SEWAGE PUMP STATION – SUBMERSIBLE, WET WELL TYPE.

SCHEDULE.

1. Pump Station Name ……
2. Pump Station Location ……
3. Pump No.1 Motor Size ……
4. Pump No. 2 Motor Size ……
5. Primary Electrical Power Source ……
6. Secondary Electrical Power Source ……
7. Sec Power Source Socket Size (A) ……
8. Radio Telemetry Frequency Tx ……
   Rx ……
9. Radio Antenna Size (elements) ……
10. Radio Antenna Orientation (V or H) ……
11. Radio Antenna Direction (magnetic) ……
12. RTU Weiland Plug Arrangement:

Weiland Pins	**Device**	**RTU Input**	**RTU Output**
1 & 13	High Well Alarm	7	
2 & 14	Pump 1 Run	1	
3 & 15	Pump 1 Fail Alarm	2	
4 & 16	Pump 2 Run	3	
5 & 17	Pump 2 Fail	4	
6 & 18	Inhibit / Reset		5
7 & 19	Spare		
8 & 20	Spare		
9 & 21	Phase Fail Alarm	13	
10 & 22	Spare		
11 & 23	Spare		
12 & 24	Overflow Alarm	16	

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