1. Generating Sets

This specification covers the minimum technical requirements for the supply, testing and preparation for shipment of the diesel Generating Set and associated equipment for the Theodore Water Treatment Plant Generator Upgrade Project, Queensland, Australia.

The Generating Sets shall be enclosed or containerised, covered from direct sunlight and rain, suitable for resting on a concrete slab.

The Generating Set is required for the supply of standby power to the site. Equipment supplied under this Scope of Work shall be factory tested and delivered ready for installation. It is intended to purchase the Generator Set described in this document.

* 1. Design and Supply

The Supplier shall provide a safe and complete Diesel Generating Set fit for the purposes described, thoroughly tested, fully operational and ready for continuous reliable service at the intended installation site.

The Diesel Generating Sets shall be skid mounted packages including, but not limited to, the following:

* Diesel engine and alternator.
* Governor system.
* Exhaust system, including acoustic noise attenuation.
* Engine starting system.
* Engine cooling system.
* Generator excitation system.
* Battery and charger systems.
* Generating Set Circuit Breaker Switchboard, including circuit breaker for protection of the generator.
* Generator Control Panel.
* AC and DC power distribution and controls for Generating Set and auxiliary systems such as a load bank.
* Diesel Generating Set weatherproof and acoustic enclosure. Roof of enclosure to be designed to prevent pooling of water.

The Supplier shall make provision for supplying and incorporating all minor equipment, or small components, (that would otherwise be considered necessary by a competent Supplier) and may not be specifically referred to or specified in the tender requisition documents, but are necessary to make the systems complete, safe and functional in all respects.

The generator will be rated for prime operation outdoors under site conditions.

The generator shall conform to the minimum specifications nominated below.

* Generators and components shall be designed and supplied to provide continuous, long-term service under the ambient and environmental conditions that will prevail on the site.
* Generators shall be of the Vendors best quality and construction to ensure a minimum equipment design life of 20 years.
* Generators will be supplied new with full Original Equipment Manufacturers (OEM) warranty.
* Generators shall be supplied with climate appropriate radiators and alternators.
* Alternators shall have anti-condensation heaters fitted.
* Generators shall be housed in a corrosion resistant (stainless steel or power coated steel), sound attenuated enclosure for 85db at one metre with sufficient access for re-fuelling and maintenance.
* Generator sets shall have 5mm mesh covers fitted to all enclosure air inlet openings to prevent vermin ingress.
* Engines shall be the latest model genuine brands with service agents local to Banana Shire Council.
* Engine exhausts will have a whether flap or equivalent fitted to prevent water entering the engine.
* Generators shall be fitted with permanent magnet excitation system.
* Generators shall be capable of running with a minimum of 30% of rated load applied for extended periods to prevent glazing and engine damage.
* Generators shall have a control panel for monitoring, starting, and stopping the generator. Generators shall have current and voltage indication. The generator control system shall be capable of interfacing with a Telemetry and/or PLC based plant control system and provide remote operation and monitoring of the generator unit and transmission of alarms to the plant control system. The Deep-Sea Electronics DSE 7320MKII controller is preferred.
* Generators shall have an engine protection and indication including but not limited to:
* Low oil pressure shutdown
* High engine temperature shutdown
* Under speed shutdown
* Fuel level indication.
* Engine fault indication
* The generator shall be fitted with a lockable battery isolation switch.
* Batteries shall be high quality sealed Absorbent Glass Mat (AGM) style batteries for long life in stationary applications.
* The generator shall be fitted with a battery charger (240VAC supply) to ensure the generator start battery is fully charged at all times. As a minimum, the battery charger shall have integral fault indication voltage free contacts suitable for interfacing with the generator control unit (DSE 7320MKII) to deliver battery charger fault alarms to the telemetry and/or plant control system PLC.
* All generators shall have a main circuit breaker fitted to suit the prime rating of the generator. The main circuit breaker shall incorporate a captive lock-out device, lockable in the “OFF” position.
* Generators shall have the appropriate facilities to terminate out going mains cables.
* The alternator and engine will be fitted with a nameplate detailing ratings and primary specification data.
* Generators shall be independent units.
* Generator units shall have load rated, four-point lifting lugs fitted.
* Generator shall have an minimum 1000 Litres integral fuel tank capable of supporting 24 hours run time at 100% rated load. If additional external fuel storage is required it shall be approved by the Principal. External fuel storage tanks shall be bunded or self-contained allowing 110% of the volume of the fuel storage tank. The integral fuel tank will be fitted with level indication.
* The Vendor will supply all special tooling, software and software licenses, programming cables, etc that are required to perform routine maintenance, operation and fault finding on the generator.
* Vendor to provide vibration dampener/pads or confirm that no generator induced vibration will transfer to the foundation.
  1. Voltage levels

The power supply voltage levels are in accordance with AS60038. The applicable voltage levels are as follows.

* LV site distribution:
  + 3 phase, 4 wire, 400 Volt +10%, -6%, 50Hz, MEN system
  + 1 phase, 2 wire, 230 Volt +10%, -6%, 50Hz
* The low voltage power system will be solidly earthed

The equipment shall be suitable for connection to a three-phase electrical system having the following characteristics and be designed to operate under such conditions:

* Steady State Voltage: ± 5% nominal voltage
* Steady State Frequency: ± 2% nominal frequency
* Transient Voltage: ± 20% nominal voltage
* Transient Frequency: ± 5% nominal frequency
* Total harmonic distortion: < 5 %

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## 1.3 Performance and Sizing Requirements

## The generator set shall be suitable for handling the plant load as per scope of work.

## 1.4 Extent of the Work by the Supplier

The Supplier shall perform the following:

* Size the Diesel Generating Set and associated load bank.
* Supply of generator and load bank including factory testing, documentation, and warranty, on a purpose-built slab, if need.
* Testing and commissioning of the Diesel Generating Set and resistive load bank at Factory Acceptance Test (FAT), Extended FAT (EFAT) and Site Acceptance Test (SAT).

## 1.5 Design for Safety

All works designed, constructed and equipment supplied shall maximise personal safety to all persons during operation and maintenance of the equipment. Wherever possible systems shall be designed and constructed to protect against reasonably foreseeable misuse and damage to the facility and equipment. Due consideration shall be made in the design of the equipment to simplify installation and termination of field cables.

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## 1.6 Schedule of Non-Conformance

If there are significant technical reasons for not being able to conform to the Specification, Datasheets and/or Drawings, then the Supplier shall submit a schedule of non-conformance detailing the reason for and proposed alternative to that specified.

Any deviations from the standard specification, that are considered valid and acceptable, must be approved in writing by BSC prior to commencement of the Contract works.

**If the Supplier does not submit a schedule of non-conformance, the Supplier will be obliged to supply all goods, equipment, and services as specified.**

## 2 Statutory Regulation and Standards

## The Vendor shall supply all goods and services under the contract to meet all statutory requirements that apply to the installation concerned. The latest issue of the applicable national, state, and local regulations and mandatory Codes of Practice, together with any modifications or addenda in effect on the date of the Contract, shall be used.

Standards referenced in this Specification shall be applied in full as a minimum, together with any additional requirements of this Specification.

In the event of a conflict within this Specification (including reference documents) or a conflict that arises due to a change of a regulatory requirement after the date of the Contract, the Principal shall be notified immediately to resolve the matter and an approved dispensation or variation shall be obtained prior to starting the related work.

2.1 Statutory Authorities

Without limiting the Supplier’s obligations under the Contract, the work and equipment shall comply with the requirements of all statutory authorities, including, but not limited to the following:

* Queensland Electrical Safety Act.
* Queensland Electrical Safety Regulation.
* Queensland Work Health and Safety Act.
* Work Cover – Low Voltage Electrical Work Code of Practice 2001
* Environmental Protection Act 1994 (QLD).
* Dangerous Goods Safety Management Act 2001 (QLD).

2.2 Standards

The reference documents listed below form an integral part of this Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, shall be the latest revision published as of the date of the Contract.

| Standard Reference | Title |
| --- | --- |
| AS 1101 | Graphic Symbols for General Engineering |
| AS/NZS 1102 | Graphical Symbols for Electrotechnical Documentation |
| AS/NZS 1170.2 | Structural design actions – Wind actions |
| AS 1359.106 | Rotating electrical machines – General Requirements – Methods of cooling (IC Code) |
| AS 1375 | SAA Industrial Fuel-Fired Appliance Code |
| AS 1627 | Metal finishing – Preparation and pre-treatment of surfaces |
| AS 1692 | Steel tanks for flammable and combustible liquids |
| AS 1940 | The storage and handling of flammable and combustible liquids |
| AS/NZS 3000 | Electrical Installations (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 |
| AS4594 | Internal Combustion Engines |
| AS/NZS 61439 | * Low-voltage Switchgear and Control Gear Assemblies |
| AS 3570 | * Automotive Diesel Fuel |
| AS/NZS 5000.1 | * Electric Cables - Polymeric Insulated – For Working Voltages up to and Including 0.6/1 kV |
| AS 60038 | Standard Voltages |
| AS 60529 | * Degrees of Protection Provided by Enclosures (IP Code) |

Where equipment proposed by the Vendor, is certified to a standard other than an Australian Standard and its compliance with Australian standards is in doubt, the Vendor shall obtain written approval from the Principal before including that equipment in the design.

2.3 Standard Specifications

Design, materials and workmanship shall be in conformity with the requirements of the Standards listed, where applicable. If no Standard or other requirements are specified, it shall be assumed that the requirements of the most recent appropriate Australian Standard or in the absence of any such Australian Standard, the appropriate International Standard shall apply as if forming part of the Specification. If the specified requirements conflict with the Standard requirements, the specified requirements shall apply.

“Standard" shall mean and include a Standard Specification, Standard Code of Practice or other Standard current one month prior to the tender date, issued by a recognised association or body set up for the purpose.

Items not covered by Standards or Regulations shall be the best of their respective kinds and in accordance with the best trade practices.

1. Load Bank

The generator shall be supplied with a load bank suitable to meet the operating conditions of the site and to sustain the load on the generator at a level to prevent engine cylinder glazing and exhaust ‘wet stacking’.

2.1 Construction

The load bank enclosure shall be of a weatherproof construction and shall be constructed from materials suitable for the environmental conditions.

2.2 Sizing and Step Requirements

The load bank shall be sized to meet the sustain the generator load at a minimum of 60% under ‘no demand load’ conditions from the pump station.

The load bank shall be capable of auto switching in and out ‘step’ loads to maintain the loading on the generator when the jacking pumps are started and stopped.

2.3 Cooling

The load bank shall be equipped with a forced air cooling system sufficient to keep the equipment at safe operating temperatures under full load and the maximum local environmental conditions.

2.4 Anti-condensation Heater

A 230V 50 Hz anti-condensation heater shall be installed in the load bank to prevent build-up of condensation and moisture. The heater shall operate continuously when the load bank is not running but shall be automatically switched off when the generator set starts, and load bank operation is required.

2.5 Electrical and Control System

The load bank unit shall be provided with a complete control, instrumentation and protection system necessary for the safe and reliable operation of the unit.

The control system shall allow complete local operation of the unit and shall interface with external control equipment (Site SCADA system) via a communications link or hard wiring for the remote control and monitoring of the units operation parameters, alarm and trip conditions.

### 2.6 Load Bank Controls

The load bank shall have local controls to be able to start/stop and reset the load bank

At a minimum the following controls shall be provided on the load bank control panel:

* Start, stop, reset push buttons/controls
* Emergency stop mushroom headed pushbutton, suitably located and accessible externally without opening any enclosures/panels.

The control panel shall be mounted on the load bank enclosure. All controls shall be accessible from outside the enclosure.

Terminal strips shall be provided for all wiring between all devices internal and external to the control panel.

### 2.7 Alarm and Trip Conditions

All alarm and trip conditions shall be monitored by the load bank control system and shall be displayed at the control panel on a display or on discrete indicator lamps.

The alarm and trip conditions shall include but not limited to the following:

* Load Bank failure
* Load Bank Over-temperature
* Load Bank Fan Failure

All alarm shall result in the shutdown of the load bank and all conditions will be relayed to the site SCADA system.