SUB DIVISION 2

PORT SHEPSTONE HOSPITAL

NEW PSYCHIATRIC WARD

STANDBY SET INSTALLATION

SPECIFICATION & BILLS OF QUANTITIES
FOR THE
STANDBY GENERATOR SET INSTALLATION
PSYCHIATRIC WARD
PORT SHEPSTONE HOSPITAL

TABLE OF CONTENTS
SUBDIVISION 2

The documentation for the Standby Generator Set Installations for the project consists of the following:

CONTENT OF DOCUMENTATION
PAGES

SCHEDULE OF DRAWINGS

PE 231 - SB1 SITE LAYOUT DRAWING - STANDBY SETS LOCATION (A1 size)

PART 1

DESCRIPTION OF THE WORKS

1.1 GENERAL INFORMATION

The Standby Set Installations generally implies the Replacement of the existing Emergency Standby Generator, associated Control Panel, replacement of existing cables and Conductors and Alterations specified for the Existing West sub Station

The Contractor must take into account all the information described in the preliminary documentation.

It must be noted that both diesel generator sets at the Hospital must be provided with sufficient diesel fuel, to ensure that Emergency Standby Power from both Generator Sets, will be available on a 24hr basis, for the duration of the contract period, during the time allocated to upgrade and alter the standby set generator equipment and associated building alterations.

The Standby Set Installations applies to all the Works and associated equipment for the upgrading and alterations to the existing equipment and buildings, all forming part of the generation of Essential Power Plant at the existing Port Shepstone Hospital.

The entire Works specified must include delivery, installation, connections, testing, commissioning, guarantees and final handover being in complete and perfect working order for the benefit of the User Department.

1.2 SPECIFICATION OF CONTRACT

The specification for the Standby Generator Set contract shall consist of the following:

- Part 1 - General Description of the Works
- Part 2 - General Technical Specification
- Part 3 - Detail Specification

It must be noted that the complete installation shall comply with the relevant information stated in the General Technical Specification.

The Detail Specification being specific in terms of direct information for the Sub-Contract.

1.3 SCOPE OF CONTRACT

The scope of the works shall generally be as follows, although not limited as the list of items is in an abbreviated format.

The list is also generally divided in three sections, i.e. New 500kVA Standby Set, Alterations in respect of the existing 345kVA Standby Set, the associated Control Panel and New Bulk Diesel Storage Tank and installation and repositioning of the existing exhaust pipework runs.

1.3.1 NEW 630 KVA STANDBY SET

Supply and installation of a New 630kVA at 0,8 power factor Diesel Standby Generator Set complete with associated control panel.

Removal of the existing 345 kVA Standby Set including associated control panels.

Supply and Installation of New External access louvre for the Standby Set.

New Noise Silencers for the intake cooling air.

New Noise Silencers for the return air from Plant Room to outside.

New Diesel Fuel Day Tank of sufficient size to run the Standby Set for a period of 12 hours at full load, with the associated pipework for supply and overflow from/to New Bulk Tanks.

All the interconnecting supply and control cables between generator set and central cable and making off of the main supply feeder cables.

The provisions to be made for a standby mode signal to the Lift Control panel to be installed in the New Psychiatric Hospital.

1.3.2 ALTERATIONS TO EXISTING 345 KVA STANDBY SET PLANT ROOM

- Supply and Install a New 90° Cowl in place of the existing.
- Remove the existing louvre on the North Wall and Supply and Install a New Louvred opening in the new position on the East Wall.
- Supply and Install a New Noise Silencer to suite the cowl.
- Remove the existing Day Tank allow for the new Tank and the associated pipe work for supply and overflow from/to New Bulk Tanks.

1.4 EXISTING EQUIPMENT TO BE REMOVED

All the equipment to be removed shall remain the property of the Hospital.

In all cases once removed the equipment must be handed over directly to an appointed Department Representative.

The Contractor is to ensure that a signed and dated receipt fully and accurately describing the equipment handed over is to be obtained, and a copy submitted to the Consulting Engineer as soon as possible thereafter.

The value of any equipment shown as existing and not duly signed and dated for in this manner will be recovered accordingly.

Note: The existing 345 kVA Standby Set and Control Panel is to be removed, loaded onto a Road Transporter and delivered in perfect working order to a venue in Durban. The equipment is to be unloaded on arrival in Durban into storage as indicated. Once unloaded a delivery note is to be obtained and a copy submitted to the Engineer as soon as possible thereafter.

1.5 BUILDERS WORK

All Builders Work, which is to be measured elsewhere, in order to accommodate the new equipment, is to be submitted to the Engineer as soon as possible after commencement of the project.

Exact information of all the equipment on offer is to be made available so that any deviations to the provisions made in the tender documentation can be incorporated timeously.

1.6 SUPERVISION

The Standby Generator Set installations must be carried out under the direct supervision of experienced personnel who have the required competence in the specialised standby generator set environment.

The experienced personnel shall also be responsible for the final testing, commissioning and hand over procedure, all for the benefit of the project.

1.7 THE WORKS

The entire Standby Set Installations shall be carried out by a single appointed contractor and no part of the contract shall be sub-let for the completion by others.

1.8 WEATHER CONDITIONS

Material and Equipment used will be of high quality and suitable for the conditions on site.

he contractor must allow to protect all material and equipment against weather damage.

The weather conditions at the site can be expected as typically coastal - the site being adjacent to the beach front.

1.9 STANDARDS

Each Standby Generator Set must comply with SANS 8528 Parts 1 to 7 as applicable.

1.10 MATERIALS AND EQUIPMENT

All the fittings, materials and equipment used or/and installed on site must be new, of a high standard, quality and conform to the relevant standards and if requested on demand approved by the Departments Representative prior to their installation on site.

The Contractor is to submit samples of materials and equipment prior to the installations on site if requested by the Engineer.

The Engineer holds the right to request the Contractor to submit samples and retain the samples until after the completion of the Works.

The Contractor must arrange to take delivery and provide storage for all material or equipment forming part of this contract including some supplied by others including the Department to the Contractor for installation as part of the project

Standby Set Installation

Part 2 GENERAL TECHNICAL SPECIFICATION

PART 2

GENERAL TECHNICAL SPECIFICATION

2.1 All the equipment, plant and materials shall be (if applicable) to either SABS or other internationally recognised and acceptable standard.

2.2 DELIVERY TO SITE

Delivery to site shall be the responsibility of the Contractor.

Time of delivery, in order to fit in with storage and installation of the equipment, must be co-ordinated with the Main Building Contractor.

The information shall be provided for inclusion onto the Main Project Programme at the commencement stage of the Contract.

2.3 PLANT ROOM FACILITIES

The Plant Rooms shall be inspected at the commencement stage of the project and a set of drawings prepared in order to accommodate the equipment to be supplied and installed.

The drawings shall contain all the vital dimensions of the Plant Rooms and Equipment to be installed so that any modifications, that may differ from the space allocations made in the tender drawings for specific manufactured equipment, can be made timeously.

2.4 GENERAL SITE CONDITIONS

Tenders are advised to acquaint themselves with the general site conditions and no claim on the grounds of want of knowledge will be entertained.

2.5 PLANT DUTIES

Plant duties, unless otherwise stated, will be limited for diesel generating plant and ancillary equipment to operate under automatic mains failure conditions. The equipment shall be capable of delivering its full rated load at any time under the varying ambient conditions likely to prevail on the site.

2.6 RATINGS

The ratings of the diesel generating sets shall be based on operation of the sets when equipped with all necessary accessories such as radiator fans, air cleaners, lubricating oil pumps, fuel transfer pumps, fuel injection pumps, water circulating pumps, and battery charging alternators.

The generator sets shall be capable of delivering the specified output continuously under the site conditions without overheating. The engines shall be capable of delivering outputs of 110% of the specified outputs for one hour in any period of 12 hours consecutive running in accordance with BS 5514.

2.7 DIESEL ENGINE

2.7.1 Type of Engines

The engines shall be of the multi cylinder, four stroke cycle, cold starting, direct injection, compression ignition types, suitable for operation on diesel fuel.

2.7.2 Cooling Systems

Capacity to cool the engines when the sets are delivering their full rated load in the ambient conditions.

The engines shall be equipped with heavy duty type radiators complete with engine driven fans and centrifugal water circulating pumps, and thermostats to maintain the engines at the makers recommended temperature level.

Thermostatically controlled immersion heaters shall be provided and fitted in the engine cooling circuits to ensure easy starting of the engines at any ambient temperature.

The heaters shall be so fitted that they can easily be withdrawn without having to drain the systems. The heaters shall be suitable for a 230 volt 50 Hz supply.

2.7.3. Speeds

The engines speeds shall not exceed 1 500 R.P.M. at normal full load conditions.

2.7.4. Fuel

The engines shall be capable of satisfactory performance on a commercial grade of distilled petroleum fuel oil such as No. 2 fuel oil. (commercial grade diesel fuel).

2.7.5. Engine Ratings

The engines shall be suitable for continuous running at the specified speed, delivering their rated output at the specified site conditions.

In addition the engines shall be capable of delivering 110 % load for one hour, after the sets have been running at full load for a period of six hours and shall, after the overload period of one hour be capable of maintaining the rated output continuously without any undue mechanical strain, overheating, incomplete fuel combustion or other ill effects.

The engines shall have sufficient capacity to start up and shall within 15 seconds from mains failure, supply the full rated load at the specified voltages and frequency.

2.7.6 Governors

The engines shall be controlled by governors to maintain governed speed for 50 Hz operation. Class A0 governing in accordance with BS 5514 as amended is required.

2.8 FUEL SYSTEMS

The Fuel Systems shall be installed in accordance with the rated fuel requirements for the plant to be installed on site.

Where possible all pipework runs shall be installed underground or concealed on the inside of plant rooms or ducts where possible.

2.8.1 Bulk Diesel Storage

The Bulk Storage Installations shall comply with the relevant regulations contained in SANS 10089 Parts 1 to 3, which include regulations for the distribution to the various outlets.

The positioning and elevations are all to be taken into account in respect of location and size of Day Tanks, in relation to the Main Bulk Diesel Storage facilities.

2.8.2 Day Tank

The Generator Set shall be equipped with a dedicated Day Tank.

The Day Tank shall be incorporated into the base of the Diesel Engine Set with the main fuel supply direct to the injection pump.

The automatic filling of the Day Tank from the Bulk Tanks, shall be controlled by means of Level Switches situated in the Day Tank. The switches shall *start and stop* electrically driven from self priming pumps.

2.9 LUBRICATING

The engine shall be provided with forced feed lubricating system with gear type lubricated oil pump for supplying oil under pressure to the main bearings, crank pin bearings, pistons, piston pins, timing gear, camshaft bearings, valve rocker mechanisms and all other moving parts.

Full flow replaceable element type oil filters, conveniently located for servicing, shall be provided. Filters shall be provided with spring loaded by-pass valves to ensure circulation of oil if the filters become clogged.

2.10 CYLINDER LINERS

The engines shall be provided with removable wet or dry type cylinder liners of close grained alloy iron.

2.11 AIR CLEANERS

The engine shall be provided with one or more dry type air cleaners which shall provide positive air filtration.

2.12 EXHAUST SYSTEM

The engine shall be fitted with an efficient **Stainless Steel** exhaust system. Flexible bellows shall be fitted between the exhaust outlet and the silencer. The flexible piping must on no account be used to form a bend or compensate for misalignment. The silencers shall be located in the plant room and the discharge pipe runs from the silencers out through the wall and up to the roof.

The silencers and discharge piping shall be suitably supported with stainless steel brackets.

The exhaust silencers shall be suitably lagged then clad in polished stainless steel sheet.

Openings through the wall are to be neatly drilled by the Standby Plant Contractor and stainless steel flashing plates must be fitted both sides.

22.13. FLYWHEELS

The flywheels shall be designed to limit the cyclic irregularities to within the limits laid down in B.S.5514 as amended.

2.14. ENGINE STARTING

The engines shall be equipped with a 24 volt starting system of sufficient capacity to crank the engines at a speed, which will allow starting of the engines.

The starting equipment shall include a 24 volt D.C. starter motor engaging directly on the flywheel ring gear. A heavy duty battery charging alternator and maintenance free batteries of the Delco/Deltec type shall be supplied. The batteries shall be mounted in a battery box including Padlock and Lock..

The batteries shall be connected to the engine with suitably rated P.V.C. insulated flexible leads.

The batteries shall have sufficient capacity to provide three automatic attempts to start immediately followed by three manual attempts without any appreciable drop in voltage. The automatic attempts to start shall each be of not less than 10 seconds duration with 10 second intervals between and the manual attempts shall be based on the same cranking period.

A device shall be provided to limit the cranking time of each automatic attempt to start, to the10 seconds specified above and to provide three automatic attempts after which the automatic starting mechanism will cut out until manually reset and at the same time sound an audible alarm and illuminate the L.E.D. on the AMF 120 controller. (or alternative Electronic Controller)

The engine driven battery charging alternator shall have sufficient capacity to recharge the batteries back to normal starting requirements in not more than six hours.

Battery charging units of the trickle charge type shall be provided to maintain the batteries at full capacity. The charging equipment shall be connected so that the batteries are normally charged from the mains, but are also charged under mains failure conditions from the diesel generating plants and if required via an inhibitor relay to prevent dual charging. The units shall be complete with voltmeter, push button test, D.C. and A.C. protective gear. The charging units shall be incorporated in the diesel generator control cabinets.

2.15. ENGINE INSTRUMENTS

The following instruments with suitable limit markings shall be provided on the generator panels:-

a) Water temperature gauge. The gauge shall be calibrated at the lower part of the temperature range, so that when the engine is inoperative the temperature of the water is readable when heated by the immersion heater only. The temperature range shall extend beyond the operating range of the engine.

b) Lubricating oil pressure gauge.

2.16 SAFETY CONTROLS

The engines shall be equipped with the safety controls as specified in the detailed specification.

2.17 ENGINES/ALTERNATOR COUPLINGS AND BASES

The engines and alternators shall be direct coupled and arranged for operation at 400/230 volt, 50Hz & 1500 RPM.

A steel fabricated base-frame with anti-vibration mounts between the engines / alternators combination and bases shall be provided and must be able to be placed directly on the plant-room floors.

2.18 RADIATOR EXTRACT DUCTING

A galvanised duct shall be provided and installed between the radiator face and outlet attenuator, to positively duct the hot expelled air out of the plant rooms.

2.19 A.C. GENERATORS

2.19.1 Ratings

The generators shall be a 400/230 volt, 3 phase, 4 wire 50 Hz rated as stated in the Detail Specification. The generator rating shall be applicable for continuous service application.

2.19.2 Construction and Manufacture

The generators shall be a revolving field type, coupled directly to the engine flywheel through a flexible disc for positive alignment. The generator housing shall bolt directly to the engine flywheel housing and shall be equipped with a heavy duty ball bearing support for the rotor. The motor shall be dynamically balanced up to 25% over-speed.

The generators shall be of heavy duty compact design. Insulation shall be Class H as recognised by BS 5514.

The generator field excitation shall be performed by a rotating exciter mounted on the generator motor shaft through a brush-less rotating diode system. The voltage regulator shall be of the static-magnetic type with silicon diode control. It shall be mounted on the top or side of the generator and enclosed in a drip proof enclosure. A built in voltage adjusting rheostat shall provide 10 % voltage adjustment.

2.19.3 Performance

The generator shall be capable of continuously delivering the full rated load and of providing a 10 % overload for the period specified for the engine.

2.19.4 Wave Form

The shape for the voltage and current wave shall be within the limits laid down by BS 5000.

2.19.5 Voltage Regulation and Response

The alternator shall be self-regulated and shall incorporate an automatic voltage regulator.

The voltage regulation shall not exceed 2%, from no load to full load, including cold to hot variations at any power factor between 0,8 lagging and unity and inclusive of speed variations within the limits stated.

Upon application of full load at a power factor of 0,8 lagging the alternator voltage shall recover to within 2% of the steady state value within approximately 300 milliseconds.

Upon application of any load specified in transient, maximum voltage dip shall not exceed 20% of the nominal voltage when measured at the alternator terminals.

2.19.6 Windings

The generator stator windings shall be star connected with the star point brought out and connected to the neutral terminal in the terminal box on the generator to provide a 400/230 volt supply.

2.19.7 Terminal Box

The terminal box shall be fitted to suit the cable route as indicated in the accompanying Detail Specification. The terminal boxes shall be large enough to allow for glanding and connecting the cables specified.

2.19.8 Radio and T.V. Interference

The generating sets shall be suitably suppressed within the limits of B.S. 800 against radio and television interference.

2.20 DIESEL GENERATOR CONTROL PANELS

2.20.1 Type and Construction

The panel shall be designed for the control of the diesel generating set with instrumentation and protective devices to meet both manual and automatic mode requirements.

The control panel shall be of robust construction, floor mounted, totally enclosed and dust proof.

It shall be of folded 1,6 mm thick cold rolled sheet steel construction suitable for front entry through hinged doors. Internal chassis plates, circuit breaker pans and gland plates shall be provided. Special attention shall be given to vermin proofing and dust sealing.

Prior to painting all steelwork must be thoroughly de-greased and de-rusted and then primed with a zinc chromate primer. All internal steel chassis plates, gland plates and switchgear brackets shall be painted with white powder epoxy paint and all exterior steel surfaces finished with orange powder epoxy paint.

2.20.2 Bus-bars, Wiring, Switchgear, Etc.

All bus-bars and wiring shall be adequately rated and suitably supported, and control wiring shall be neatly laced and numbered with durable plastic ferrules, for easy tracing. Suitable terminals are to be provided for incoming and outgoing cables. Suitably sized holes shall be punched in the gland plates for the required number of cable terminations for both incoming and outgoing cables. The cables shall be secured to the gland plate by means of cable glands as Pratley, C.C.G. or other approved. The gland plate shall be suitably braced to prevent distortion after the cables are glanded thereto.

Circuit breakers are to be of moulded case construction.

All instrumentation shall be of 1,5 % accuracy and their performance shall comply with B.S. 89. The instruments shall be flush mounted and the dial dimensions shall be 96 mm x 96 mm.

Tenderers must give an assurance with their tender that replacements for the equipment, switchgear and instruments used in the construction of the panel are readily available from stock held in the Republic of South Africa.

2.21 CONTROL PANEL

The change over control panel is to be situated in the stand-by plant rooms in the position indicated on the accompanying drawings.

The Contractor is to supply and install all interconnecting cables between the alternators and control panels.

2.21.1 Control Panel Components for each Standby Generator Set Installation:

2.21.1.1 Change-Over Board Components

Fault current level shall be as specified in the Detail Specification.

Allow to supply and install the equipment specified in the Detail Specification.

2.21.1.2 Control Section

Provision of equipment for the control section.

Allow to supply and install control equipment as specified in the Detail Specification.

2.21.1.3 Door Mounted Components

All to supply and install the instrumentation as specified in the Detail Specification.

The instrumentation shall be installed on the door in suitable cut outs

2.21.1.4 Control Equipment Requirement

The Control Equipment requirement shall be as specified in the Detail Specification.

2.22 ELECTRICAL

2.22.1 Cable Feeders

All cables will be supplied and installed by the Contractor.

The cables are to be laid overhead or in the floor ducts specially provided for this purpose. They are to be installed in accordance with the requirements of the S.A.B.S. Code of Practice for the Wiring of Premises (S.A.B.S. 0142 - including the most recent updates) and the OHS Act 55/1993.

2.22.2 Terminations

The cables are to be made off with suitable cable glands as C.C.G., Pratley or other approved. The cable glands at the control panel shall be secured to the gland plate in the base section of the panel and at the generator end to the terminal box.

The cable conductors shall be terminated with suitably rated pressure crimped cable lugs.

2.22.3 Earthing

The neutral point of the generator shall be solidly connected, by means of an appropriate size of insulated earth conductor, to the earthbar in alternator and in the panel. All plant, ancillary equipment and steel work in the stand-by plant room shall be suitably bonded together with an appropriate size of bare copper tape which shall also be connected to the earthbar.

2.22.4 Phase Rotation

The Contractor shall ensure that the mains and generator phase rotations are identical.

2.23 PAINTING

The engine and generator shall be painted with best quality grey "Twin Pack" epoxy paint.

The control panel shall be painted with best quality red "Twin Pack" epoxy paint.

2.24 TESTING

2.24.1 Testing At Contractor's Premises

An acceptance test shall be carried out at the Contractor's works to establish that the diesel generating plant and its ancillary equipment meets with the requirements of the specification. The Contractor shall ensure that the Consulting Engineers are invited to witness the tests. The Contractor shall give the Consulting Engineers at least seven days notice prior to testing the plant. In the event of the plant failing the test and having to be re-tested, at some future date, all expenses (including travelling) incurred by the Consulting Engineers in attending the second test will be to the Contractor's account.

a) Simulate a mains failure to automatically start the plant from cold to test its ability to attain full rated speed and voltage and assume the full load in the specified time of ten seconds.

b) Test run the plant at full load for a period of one hour.

c) Immediately after the above specified run, without stopping the plant, run it for a further hour at 110 % load.

d) Test the plant with regards to voltage dip, voltage and frequency recovery, with a sudden application of various loads.

e) Test the plant for its ability to assume full rated load immediately on failure of the normal supply.

f) Test and demonstrate (by simulation only where actual Conditions could damage the plant and its ancillary equipment) the correct operation of the engine safety controls and alarms together with other alarms as specified.

g) Any other tests the Consulting Engineers may consider necessary to establish that the diesel generator and its ancillary equipment as a whole is functioning correctly and in accordance with the specification.

NB The Contractor shall provide necessary instruments and equipment for carrying out the tests. The test equipment shall be capable of producing 100% load for one hour and 110 % load for a further hour continuously without interruption. The test load shall be adjustable and balanced over three phases.

The instrumentation shall be capable of recording and producing printed data pertaining to transient voltage dips, recovery time, applied load, etc.

2.24.2 Tests on Site

On completion of the installation of the plant, the following test shall be carried out.

a) Automatic starting and stopping with load change over. The load in this instance will be provided by the client.

b) Test by simulation only of the operation of the engine protection and alarm devices.

c) Any other tests which the consultant may require on site.

2.25 NOTICES

2.25.1 Warning Notice

The Contractor shall provide and install in a conspicuous position in the plant room a clearly legible and indelible notice 450 x 450mm made from non-deteriorating material, preferably plastic with red letters on a white background worded to read as follows:

DANGER
THIS ENGINE WILL START WITHOUT NOTICE. TURN STATUS SELECTOR SWITCH ON CONTROL PANEL TO "OFF" POSITION BEFORE WORKING ON THE PLANT.

2.26 SOUND SILENCERS

2.26.1 General

The Sound Silencers shall be selected from reputable manufacturers experienced in the fields of sound reduction equipment for high noise generating plant.

The Sound Silencers shall be selected from a standard range of a manufacturer in order to affect future ease of replacement if necessary.

The Sound Silencers shall match the size of the equipment to be installed or other installation criteria as the case may be.

2.26.2 Performance

The Sound Silencers shall be effective to reduce sound for a wide range of frequencies of noise generated by the plant in question.

The Sound Silencers performance shall be determined by means of the standard method, measuring the sound energy generated by the plant from a given point when a plain duct is inserted in place of the silencing equipment, compared with sound energy with the silencing equipment in place.

The above sound silencing performance tests shall be carried out whenever the maximum air velocity is being forced through the air passages of the equipment.

2.26.2 Materials and Manufacture

The Sound Silencers shall be of the rectangular height and width splitter type with vertically arranged air passages, and length to be determined depending on the level of noise reduction required.

The Sound Silencers are to be made from pre-galvanised steel casings with galvanised external flanges of rectangular cross section.

The flange sizes are to be co-ordinated to match the dimensions of components of equipment to be used in association.

The splitters and side wall linings are to consist of resin bonded mineral wool faced with woven glass fibre material to prevent the sound suppressing medium from being eroded into the air stream.

The splitters shall be held in galvanised steel frames and shall be both vermin and fire proof.

Standby Set Installation

Part 3 DETAIL SPECIFICATION

PART 3

DETAIL SPECIFICATION

3.1 GENERAL

Allow to supply, install, manufacture, assemble, delivery to site and handing over in first class working order the material, equipment and plant including all the ancillary components necessary in order to comply with the requirements of the specification.

The contractor is to ensure that access to the diesel tanks and other equipment in the plant room is maintained at all times during the entire construction programme so that the hospital personnel can carry out ongoing maintenance of the existing hospital plant.

The Detail Specification covers the installations to be carried out on site in the same sequence as the works to be carried out in the Scope of Contract described in the Description of the Works Part 1, i.e. as follows:

1. **The New 630 kVA Standby Set**
2. **Alterations to the Existing West Sub Station**
3. **Connecting Pipe Lines from the existing Bulk Diesel Storage Tank**
4. **Connecting to the existing Exhaust Pipe Run**

It must be noted however that the actual sequence of installation will not necessary follow the same order.

The sequence to be followed in respect of installation must be appropriately included and form part of the Main Project Programme.

In all cases the relevant information in the General Technical Specification is directly applicable to this Contract and must be read in conjunction with this Detail Specification.

Note Well: It must be noted that the Emergency Power Supply Generation from both diesel sets must be available on a 24hr basis and in order to ensure that this condition is fulfilled, a temporary diesel Standby Generator Set supply must be made available during the period in the programme when critical works are being undertaken, i.e. when the existing standby set is removed and replaced with the new standby set, as specified.

3.2 DRAWINGS

The drawing forming part of this Standby Diesel Set Generator installations is SL 231-SB1.

3.3 POWER SUPPLY

The Low Voltage power on the site for which all the equipment in this Contract is to be designed for is 400 volt three phase and 230 volt phase 10% to neutral at a frequency of 50 Hz.

The distribution of power on site is generally 4-wire for 3 phase supplies and 2-wire for phase and neutral supplies.

3.4 THE EXISTING EXHAUST PIPE WORK RUNS

The existing vertically installed exhaust pipe work is to be re-used. The pipe runs consist of 250mm diameter Stainless Steel. The pipe runs at present extend from the existing standby sets and up to the roof of the existing multi-storey hospital block.

Note well: The Pipe Work Runs are to be removed and re-installed in the position shown on the drawing.

The adaption of the existing pipe runs within the Plant Rooms are to be carried out as part of the installation of the New Standby Set.

The Standby Set new pipe sections shall consist of similar to existing stainless steel and diameter, dimensions taken on site

3.5 THE NEW 630 KVA STANDBY SET

3.5.1 Supply and Installation of Generator Plant

Allow to supply and install a New 500 kVA at 0,8 power factor 3-phase diesel-driven Standby Generator Set complete with all the ancillary equipment and including the accompanying Control Panel.

The new set shall consist of the Primary Mover (Engine) a Volvo TAD 1642GE and/or the latest model in the range, coupled to a matching Marelli Alternator, or equal and approved

Both Engine and Alternator to be Rated in excess of 500kVA

The New Standby Set is to be installed into the position presently occupied by the existing 345 kVA Cummins Standby Set.

The New Control Panel shall be positioned against the West Wall of the Plant Room as shown in order to provide sufficient space for the installation of the larger set.

The position of the set in relation to the Air Intake wall to the South shall take into account the size of the New Sound Silencer to be installed between the In Take Grille and the Cooling Radiator of the Generator Set.

3.5.1.1 The accompanying Control Panel shall be equipped as follows:

Note: Generally all the requirements described in the Technical Specification in respect of the type and construction, bus-bars, wiring and switchgear, etc., shall be taken into account and incorporated into the manufacture and design of the Control Panel.

- ONE: 1000 Amp Triple Pole 35 kVA Isolator as the Main Switch.
- THREE: Mechanical cable glands suitable for 150mm² 4-core PVC SWA PVC ECC supply cables.
- ONE: 800 Amp Triple Pole 35 kVA Air Circuit Breaker for supply for the Generator set with both adjustable thermal and instantaneous overload elements.
- ONE: (SET OF TWO) 1000 Amp Three Phase 35 kVA Automatic Change-over Contactors with motor operated mechanisms, suitably rated and with appropriate auxiliary and control contacts - complete with mechanical interlocking mechanisms. The contactors shall also be electrically interlocked.
- ONE: 1000 Amp On-Load hand operated Three Way By Pass Switch. The three positions consisting of *NORMAL, OFF* and *BY PASS* modes, to enable the changeover equipment and central circuitry to be bi-passed for maintenance purposes.
- THREE: Current Transformers ratio 1000/5 Amp 10 VA burden class CM accuracy.
- THREE: 5 Amp HRC fuses in fuse cartridge holders for supply to meters.
- FULL SET 4 X 1000 Amp Rated Bus Bars each mounted on two colour coded fibre glass insulators.

3.5.1.2 The Control Section of the Standby Set shall include the following:

- ONE Automatic constant voltage Battery Charger.
- ONE Set of Electronic Generator Controls.
- ONE 5 Amp Control Circuit Breaker for supply to instruments.

- ONE SET Control relays for the change over contactors.
- ONE SET 24 Volt fuel supply relays.
- ONE SET Terminal Strip

3.5.1.3 Door Mounted Equipment

Allow to supply and install the following flush mounted instruments and controls protruding from the front door of the Control Panel:

- ONE Voltmeter scaled 0-415 Volts *ELIMA* or *PCI* or other approved make and type measuring 100x100mm complete with protection fuses.
- ONE Voltmeter selector switch enabling the selection of each phase to neutral and between phases, and off.
- THREE Maximum demand and instantaneous indicating ammeters, scaled 0-800 Amp, *ELIMA* or *PCI* or other approved make and type measuring 100x100mm (20 per cent overrun to 1000 Amps)
- ONE Frequency Meter, scaled to 50 Hz and indicating from 45 Hz to 55 Hz measuring a minimum of 100x100mm
- ONE Voltmeter scaled 0 to 30 Volts DC measuring starter battery voltage and measuring a minimum of 75x75mm complete with *AON≅* and *AOFF≅* selection switch.
- ONE Running Hour Meter, non-resettable type measuring a minimum of 100mm wide and 50mm high.
- ONE SET Manual *ASTART≅* and *ASTOP≅* Pushbuttons - *AGREEN≅* and *ARED≅* respectively.
- ONE Emergency Stop Push Button
- ONE Engine Alternator Charge Indicator.

3.5.1.4 Control Equipment Required

Control systems may not consist of the electromagnetic relay type. Only the AMF120 Mk3 or equivalent solid state programmable systems complying with the following specification will be accepted.

The solid state control systems shall be of South African Manufacture, be available off the shelf and shall have a proven local operating history of at least five years. Imported or specially made solid state control systems or engine control and/or management systems will not be acceptable under any circumstances. The control system shall consist of a single unit including all indicators/switches and allow for quick installation using locking connectors.

The solid state controller and associated systems wiring shall be to the control system manufacturers guidelines and shall be adequately protected against transient over voltages arising from lightning effects, switching surges, power system surges or mains and alternator borne noise/interference. Full details of the suppression systems are to be provided at tender. Wiring to and from the solid state programmable controller is to be screened as necessary to prevent electrostatic and magnetic interference from adjacent wiring/systems.

3.5.1.5 Specification For Front Panel Indicators

CONDITION	ALARM	SHUTDOWN
HIGH TEMPERATURE	X	X
LOW OIL PRESSURE	X	X
OVERSPEED	X	X
UNDERSPEED	X	X
MANUAL/TEST MODE		
HEATER FAULT	X	
LOW FUEL	X	
NO FUEL	X	X
LOW WATER	X	X
LOW BULK TANK/SPARE2	X	
MODEM REMOTE START		
START FAIL	X	X
MANUAL START		
EMERGENCY STOP	X	X
MAINS PHASE ROTATION FAULT		
HIGH MAINS VOLTS		
LOW MAINS VOLTS		
MAINS ON		
MAINS ON LOAD		
ALTERNATOR ON		
ALTERNATOR ON LOAD		
ALTERNATOR PHASE ROTATION FAULT	X	X
HIGH ALTERNATOR VOLTS	X	X
LOW ALTERNATOR VOLTS	X	X
BATTERY VOLTS FAULT	X	X
ALTERNATOR CHARGE FAULT		
CONTROL SYSTEM ON		

3.5.2 The New Sound Silencers

Allow to supply and install new Sound Silencers for both the OUTLET and INTAKE Air Grilles.

The OUTLET Air Silencer shall be selected to match the size of the intake grille and radiator.

Generally the outlet air grille, the outlet air silencer and the outlet air radiator shall all be of similar height and width dimension.

The Sound Silencers selected shall offer the least possible noise restriction with the least reduction in air flow.

The Sound Silencer equipment shall be selected to restrict noise frequency levels between 63 and 8 000 Hz to a maximum sound silencer of 50 dB.

The provisional size of the outlet air silencer shall be 1600mm in length, 1500mm width and 1500mm high.

The provisional size of the intake air silencer shall be 1600mm in length, 1800mm in width and 1200mm in height.

3.5.3 The Existing 345 kVA Diesel Standby Set

The existing 345 kVA Cummins Set and Control Panel complete including battery sets are to be disconnected, removed from site, transported and moved into storage, Ethekweni (Durban).to be advised.

The Standby Set and associated equipment is to be inspected and a signed and dated delivery document obtained from a responsible person at the venue. The document is to be submitted to the Consulting Engineer as soon as possible after delivery.

3.5.4 New Cooling Air Grille

Allow to supply and install a New Cooling Air Grille as indicated on the drawing for the New 500 kVA Standby Set.

The Grille shall be dimensionally large enough so that the Standby Set can be installed and removed via the opening.

The complete Grille shall consist of the outer door frame and removable external louvre section.

The louvre section shall butt on to the frame work by means of suitable lugs positioned two at the top and four down each side. The bolts shall be 16mm in diameter complete with spring washers.

The grille dimensions shall match the dimensions of the cooling air sound silencer baffles. Flutes shall be installed if necessary to prevent cooling air being recycled back into the Plant Room.

The grille section shall consist of low loss louvres, angled to prevent direct vision through the aperture, designed for free air flow of a minimum of 60%.

The complete Cooling Air Grille including the frame, louvers, lugs, nuts, spring washers and nuts shall all be of the fully hot dipped double galvanised after manufacture.

3.6 THE ALTERATIONS TO THE EXISTING WEST SUB STATION

3.6.1 General

It must be noted that due to the installation of the New Cooling Air Cowling section, New Sound Silencer and New Grille, it will be necessary to move the complete Generator set in order to accommodate the changes.

3.6.2 Existing 90° Cowl

Allow to adapt to the existing 90° Cooling Air Cowl in place of the existing cowl.

The Generator is to be positioned in order to take into account the installation of the cowl.

The cowl adaptions to be fabricated from 1,6mm sheet steel on an angle iron frame work.

The complete cowl adaptions to be hot dipped galvanised after manufacture.

3.6.3 New Cooling Air Grille

It must be taken into account that the existing external face brick wall serves as an enclosure to a vertical service direct for Pipe Runs.

The existing pipe runs are to be re-installed to the South of the duct in order to make space for the Grille.

The Grille frame shall be 650mm in depth in order to close off the entire opening of the duct.

The Grille to fit towards the front of the frame work. The front face of the Grille in line with the front external face brickwork of the building.

The entire Grille shall be double dipped galvanised after manufacture.

The Grille is to be manufactured in size to fit the dimensions of the New Sound

Silencer.

3.6.4 New Sound Silencer

Allow to supply and install a new Sound Silencer.

The Sound Silencer is to be selected to match the frame work size of the New 90° Cowl and the New Cooling Air Grille.
The Sound Silencer selected shall offer the best possible noise reduction with the least restriction in air flow.

The Sound Silencer equipment shall be selected to restrict noise frequency levels between 63 and 8 000 Hz to a maximum sound silencer of 50 dB

The provisional size of the Sound Silencer shall be 1600mm in length, 1500mm in width and 1500mm in height.

Note: The intake air sound silencer is to remain unaffected by the alterations.

3.7 NEW DAY TANK

Allow to supply and install the New Diesel Storage Day Tank of 1000 litre capacity.

The Day Tanks are to be provided at the base of the New Standby Set.

The Day Tanks are to be fitted with two 90° Isolating Ball Valves for both the supply and feeder pipe work runs, a Sight Glass in order to monitor the level, Level Control in order to refill on demand for the Main Bulk Storage Tank and including Ball Valve (depending on method employed to refill from Bulk Tank).

The Day Tank must also be installed on suitable galvanised metal stands of manufacture and design taking into account the tank size and mass to be accommodated.

Allow to appropriately connect the pipe work runs to the Day Tanks consisting of the supply and overflow pipe runs from the Bulk Storage Tank and the feeder pipe runs to the Standby Diesel Sets

3.8 SUPPLY AND CONTROL CABLES

Allow to make off and connect the Supply and Control Cables terminating on the Main Control Panel and Standby Set equipment.

The Supply Cables consist of a duplicate set of 3 x 150mm² PVC SWA PVC ECC Cable for both supply and return cables from the New Main LT Switchboard.

Control cables include the five signal cables to the lift control panels. The

cables consisting of 4mm² 4-core PVC SWA PVC cables.

Note: The cables to be installed between the alternator and the Standby Set Control Panel are to be supplied and installed as part of the Standby Set Installation. The cables shall be 3 x 240mm² PVC SWA PVC cables in parallel and a 240mm² Insulated Earth Conductor.

Allow to make off three cables with the appropriately sized mechanical cable glands complete with shrouds and terminate ends by means of crimped lugs, suitably covered with solution compound and phase coloured insulation tape.

3.9 REGULATIONS

All works carried out as part of this sub contract shall comply with the relevant regulations, Code of Practice and all statutory and local authority requirements for Standby Generator Set installations.

The installations shall comply fully with the following; although not limited where various regulations for specific items and or equipment may have to apply:

a) The Code of Practice for the Wiring of Premises SANS 10142, with the latest amendments, issued by the SABS - South African Bureau of Standards.

The applicable regulations of the Electricity Supply Commission (ESKOM)

The applicable regulations of Telkom.

The stipulation of the Occupational Health and Safety Act No.85 of 1993 and as amended.

The local Fire Department Regulations, and

The Regulations and By-Laws of the Local Supply Authority.

3.10 OPERATING AND MAINTENANCE MANUALS, ETC.

The Contractor shall supply three complete comprehensive sets of operating and maintenance manuals, complete with schematic control diagrams and complete spare parts list for both engine and generator.

The above manuals are to be handed to the authorised representative on completion of the installation.
In addition a complete schematic sepia diagram of the power and control circuitry is to be mounted in a glass fronted wooden or non-ferrous metal frame and fixed to the plant room wall alongside the control cubicle.

The Contractor is to provide a schedule containing particulars and part numbers of all major components e.g. relays,timers etc. of the control circuitry to facilitate the ordering of spares.

Under no circumstances will first delivery be taken of the plant unless these requirements have been completed.

3.11 DRAWINGS

Within one month of the receipt of order the successful Tenderer shall submit prints of each of the following drawings for approval:-

a) General arrangement of the stand-by plant switchboard front panel.

b) Schematic of the complete electrical systems, including starter motor, battery and automatic battery charger.

c) Dimensioned layout of all plant in the stand-by room.

3.12 SPARE PARTS

Tenderers must give with their tender an assurance that spare parts for the plant offered by them as a whole are readily available within the Republic of South Africa and to state where these are available.

3.13 GUARANTEE AND MAINTENANCE

3.13.1 General

The Contractor shall guarantee and maintain the Contract Works for a period of twelve months after first delivery of the plant. During the maintenance period the Contract Works shall be maintained as specified in Clause 3.13 by the Contractor and any defective material, equipment or workmanship (excepting proven, wilful or accidental damage, or fair wear and tear) shall be made good with all possible speed at the Contractor's expense and to the satisfaction of the client.

3.13.2 Making Good

When called upon by the client the Contractor shall make good on site and shall bear all expense incidental thereto including making good of work by others, arising out of removal or reinstallation of equipment. All work arising from the implementation of the guarantee or maintenance of equipment shall be carried out at times which will not result in any undue inconvenience to users of the equipment or occupants of premises.

If any defects are not remedied within a reasonable time the client may proceed to do the work at the Contractor's risk and expense, but without prejudice to any other rights which the client may have against the Contractor.

3.13.3 Latent Defects and Failure to Comply with Specification

The client reserves the right to demand the replacement or making good by the Contractor at his own expense of any part of the Contract which is shown to have any latent defects or not to have complied with the Specification, notwithstanding that such work has been taken over or that the guarantee period has expired.

3.13.4 Qualification by Tenderer

Should any specified materials or equipment in the Tenderer's opinion be of inferior quality, or be unsuitably employed, rated or loaded, the Tenderer shall prior to the submission of his tender advise the consultant accordingly. His failure to do so shall mean that he guarantees the work including all materials or equipment as specified.

3.14 MAINTENANCE

At quarterly intervals during the guarantee period of twelve months the Contractor shall adjust and maintain the standby plant and its ancillary equipment in proper working order. As a minimum requirement he shall:

a) Check and top-up if necessary, the fluid levels in the radiator, engine sump, fuel oil tank and batteries.

b) Test run the standby plant and ancillary equipment for a period of 15 minutes.

c) Wipe down the standby plant and its ancillary equipment and report on any evidence of any fluid leaks or other defects.

d) Fill in the standby plant logbook.

The cost of such inspections, maintenance, adjustments, repairs, etc., shall be included in the tender price, but the cost of renewing any part which may become worn through fair wear and tear, or damaged beyond the control of the Contractor (provided this is not due to unsuitable design) shall be excluded.

If during the guarantee and maintenance period the standby plant is not in working order for any reason for which the Contractor can be held responsible, then the Contractor will be notified and immediate steps shall be taken by him to remedy the defects. Should the standby plant defects be so frequent as to become objectionable or should the equipment otherwise prove unsatisfactory during the guarantee period of twelve months, the Contractor shall, if called upon by the client, at his own expense replace the whole or such parts thereof as the client may deem necessary with equipment to be specified by the client. Approval - tacit or otherwise - of the equipment installed shall be considered as provisional only and shall not invalidate the clients right as indicated above.