



SPECIFICATION
FOR THE
SUPPLY, DELIVERY AND INSTALLATION OF 2 X 350kVA
EMERGENCY GENERATOR SETS
AT
CSIR DATA CENTRE
in Pretoria

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SECTION 1 – GENERAL

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SECTION 1 – GENERAL

1. **Intent of Document**

The specification is intended to cover the complete installation of the generator plant. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference shall apply to as many devices as are required to complete the installation.

2. **Standards and Codes**

All work and equipment shall be in accordance with the requirements of BS5514 and shall comply with the Occupational Health and Safety Act, No 85 of 1993 and current regulations of all other codes applicable to this work.

All equipment shall be Y2K compliant.

3. **Regulations**

The installation shall be erected and tested in accordance with the following Acts and regulations:

- a) The latest issue of SABS 0142: "Code of Practice for the Wiring of Premises",
- b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
- c) The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any special requirements of the local supply authority,
- d) The Fire Brigade services Act 1993 Act 99 of 1987 as amended,
- e) The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended,
- f) The Post Office Act 1958 (Act 44 of 1958) as amended,
- g) The Electricity Act 1984 (Act 41 of 1984) as amended and
- h) The Regulations of the local Gas Board where applicable.

4. **Scope of Work**

Supply, delivery and installation of the complete emergency generator set specified in this document.

There will be no plant room provided and the Generator will be installed on a plinth under a Canopy outside.

5. **Co-ordination**

The standby generator room will be provided under a separate contract. This will include for construction of all foundations, plinths, openings, rebates, etc., required by the Contractor for the installation of the plant and equipment. A detail of all such foundations, plinths, openings, rebates, etc. Must be supplied with his tender.

The Contractor shall co-ordinate his program with the Civil, Structural, Electrical and Building Contractor. His installation rates shall include for such "first fixing: of plant as may be required, and for returning at a later stage to complete the installation when the other Contractor's has completed their operations, were necessary.

Delays due to lack of co-ordination between the Contractor's shall not form a basis for claims be the Contractor of this Contract.

6. Test Certificates and Inspections

The following tests are to be carried out:

- (a) At the supplier's premises, before the generating set will be delivered to site Representatives of the Department may be present during the test to satisfy them that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with BSS 5514, Part 2 and 3. The Department must be timeously advised of the date for the test.
- (b) After completion of the works and before first delivery is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.
- (c) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
- (d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Department.

7. Guarantee and Maintenance

The Contractor shall guarantee the complete plant for a period of twelfth months after the first delivery has taken place.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, the Contractor will be notified and immediate steps shall be taken by him to rectify the defects and/or replace the affected parts on site at his own expense.

The Contractor shall maintain the plant in good working condition for the full twelfth month period to the final delivery of the installation. However, should the Contractor fail to hand over the plant in good working order on the expiry of the specified twelfth months, the Contractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the contractor will undertake to arrange that the plant be inspected at least once per month by a qualified member of his staff who shall: -

- (a) Report to the Officer-in-charge, keeping the maintenance records, and enter into a log book the date of the visit, the tests carried out, the adjustments made, and any further details that may be required.
- (b) Grease and oil moving parts, where necessary.
- (c) Check the air filter and, when necessary, clean the filter and replace filter oil.
- (d) Check the lubricating oil and top-up when necessary.
- (e) After the plant has run one oil change for the number of hours stipulated by the manufacturers, drain the sump and refill with fresh lubricating oil. The reading of the hour meter on the switchboard will be taken to establish the number of hours run by the plant.

Under this heading only the cost of the actual oil used, shall be charged as an extra on the monthly account.

- (f) Clean the lubricating oil filter and/or replace the filter element at intervals recommended by the engine manufacturer, the cost of a new filter element to be charged as an extra on the monthly account.
- (g) Check and when necessary adjust the valve settings and the fuel injection equipment.
- (h) Check the battery and top-up the electrolyte when necessary.
- (i) Test-run the plant for 0,5 hour and check the automatic starting with simulated faults on the mains, the proper working of all parts, including the electrical gear the protective devices with fault indicators, the changeover equipment and the battery charger. Make the necessary adjustments.
- (j) Report to the Department and to the Contractor on any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Contractor.

The Contractor on receiving the report, shall immediately submit a detailed quotation for the repair or replacement of such parts to the Department.
- (k) Advise the Department when it has become necessary to de-carbonise the engine and submit a quotation for this service.
- (l) Top up the water of the radiator, if applicable.
- (m) Clean the plant and its components.

8. Materials and Workmanship

- (a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Representative/Agent who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.
- (b) All work shall be executed in a first-class manner by qualified tradesman.
- (c) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
- (d) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.
- (e) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.
- (f) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.

- (g) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the public and the User Client.
- (h) The Contractor is to include for all scaffolding required to complete the work required.

9. Imported Content

This equipment will not be subject to fluctuations in the rate of exchange.

However, should the Contractor choose to be protected against fluctuations in the rate of exchange on imported equipment, the following conditions will apply:

- a) The Materials Offered Ex-Import (Annexure A), which forms part of this tender document, must be completed by the Contractor.
- b) Any fluctuations in the rate of exchange will be for the account of the Government and shall be calculated from a date seven (7) days prior to the date of the Contractor's tender to a date seven (7) days after receipt by the Contractor's bank of the negotiable bill of lading or the exporter's invoice, provided this latter date is not later than 30 days after the date of payment. Thereafter, fluctuations in the rate of exchange shall not be for the account of the Government.

10. Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

11. Submittals

The following information must accompany the tender documents

- (a) Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the Tender.
- (b) The design of the control system to comply with the requirements for automatic starting, stopping, interlocking and isolation as specified.
- (c) Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation **as** well as fuel consumption curves when the engine is used for electric generation

The successful Tenderer must, as soon as possible after receipt of the order, submit detailed drawings and wiring diagrams of the plant and the switchgear. One diagram shall be contained in a metal pouch on the side of the switchboard.

SPECIFICATION FOR THE SUPPLY DELIVERY AN INSTALLATION OF AN EMERGENCY GENERATOR SET

SECTION 2 – EQUIPMENT REQUIREMENTS

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SECTION 2 – EQUIPMENT REQUIREMENTS

1. Engine

1.1 General

The engine must comply with the requirements as laid down in BS 5514 and must be of the atomised injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply **rated** for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching-on until the taking over by the generating set, in one step, of a load equal to the **specified** site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Turbo-charged engines will only be accepted if the Tenderer submits a written guarantee that the engine can deliver full load within the specified starting period.

1.2 Rating

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

1.3 De-Rating

The engine must be de-rated for the site conditions as set out in the Technical Specification, Section 3 of this document.

The de-rating of the engine for site conditions shall be strictly in accordance with BS 5514 of 1977 as amended to date. Any other methods of de-rating must have the approval of the Department and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful Tenderer at the site test.

1.4 Starting and Stopping

The engine shall be fitted with an electric starter motor and be easily started from cold, without the use of any special ignition devices under summer as well as winter conditions.

Tenderers must state what arrangements are provided to ensure easy starting in cold weather. Full details of this equipment must be submitted. In the case of water cooled engines, any electrical heaters shall be thermostatically controlled. The electrical circuit for such heaters shall be taken from the control panel, and must be protected by a suitable circuit breaker.

1.5 Starter Battery

The set must be supplied a fully charged lead-acid type battery, complete with necessary electrolyte. The battery must have sufficient capacity to provide the starting torque stipulated by the engine makers. The battery capacity shall not be less than 120 Ah and shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy duty "low maintenance" type, housed in a suitable battery box.

1.6 Cooling

The engine may be either of the air or water cooled type. In the case of water-cooling, a built-on heavy duty, tropical type pressurised radiator must be fitted. Only stand-by sets that are water cooled shall have electric heaters.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator, to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-outs (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face to air outlet louvers in the plant room wall.

1.7 Lubrication

Lubrication of the main bearings and other important moving parts shall be by forced feed system. An automatic low oil pressure cut-out must be fitted, operating the stop solenoid on the engine and giving a visible and audible indication on the switchboard.

1.8 Fuel Pump

The fuel injection equipment is suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

1.9 Fuel Tank

The fuel tank will have to form part of the main Generator base to avoid separate plinths for the unit. The tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 12 hours.

The tank shall be fitted with a suitable filter, a full height gauge glass, "low fuel level" alarm, giving an audible and visible signal on the switchboard as well as a low-low fuel level cut-out.

An electrically operated pump with sufficient length of oil resistant hose to reach 2m beyond the door shall be supplied, for each set for filling the fuel tank/s from 200 litre drums.

The interconnection fuel piping shall consist of copper tubes and the connection to vibrating components shall be in flexible tubing with armoured covering.

1.10 Governor

The speed of the engine shall be controlled by a governor in accordance with class A2 of BS 5514 of 1977 if not otherwise specified in the Technical Specification.

The permanent speed variation between no load and full load shall not exceed 4,5% of the normal engine speed and the temporary speed variation shall not exceed 10% External facilities must be provided on the engine, to adjust the normal speed setting by $\pm 5\%$ at all loads zero and rated load.

1.11 Flywheel

A suitable flywheel must be fitted, so that lights fed from the set will be free from any visible flicker.

The cyclic irregularity of the set must be within the limit laid down in BS 5514 of 1977.

1.12 Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the residential type must be provided.

The exhaust pipe shall be installed in such a way that the expelled exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage. The exhaust piping and silencer shall be lagged to reduce the heat and noise transmission into the plant room and shall be protected against the ingress of driving rain at 45° to the horizontal. The exhaust pipe must extend 0,5m above the roof gutters. It must be secured by flanges both sides of the wall at the point of exit. These flanges must be clamped to the wall with bolts through the wall.

1.13 Accessories

The engine must be supplied complete with all accessories, air and oil filters, 3 instruction manuals, spare parts lists, the first fill of all lubricating oils, fuel, etc.

2. **Alternator**

2.1 General

The alternator shall be of the self excited brush less type, with enclosed ventilated drip proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in BS 5000 for rotor and stator windings.

The alternator shall be capable of delivering an output of 110% of the specified output, for one hour in any period of 12 hours consecutive running.

Both windings must be fully impregnated for tropical climate and must have an oil resisting finishing varnish.

2.2 Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,8 lagging and within the driving speed variations of 4,5% between no-load and full load.

2.3 Performance

The excitation system shall be designed to promote rapid voltage recovery following the sudden application of the load. The voltage shall recover to within 5% of the steady state within 300 milli-seconds following the application of full load and the transient voltage dip shall not exceed 18%.

2.4 Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, equal and similar to the "HOLSET" type.

3. **Switchboard**

3.1 General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging.

The switchboard must conform the specification as set out in the following paragraphs.

3.2 Construction

The switchboard shall be a totally enclosed, floor mounted unit, fabricated from steel panels, carried on and-substantial angle iron framework.

The board shall be flush fronted and all equipment to be mounted behind the front plate, on suitable supports.

All equipment, connections and terminals shall be easily accessible from the front. The front panels may be either hinged or removable and fixed with studs and chromium-plated cap nuts. Self tapping screws shall be used in the construction of the board.

All pushbuttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with the control wires in flexible looms.

The steelwork of the boards must be thoroughly de-rusted, primed with zinc chromate and finished with two coats of signal red quality enamel, or a baked powder epoxy coating.

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the cable strands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

For the control wiring, each wire shall be fitted with a cable or wire marker of approved type, and numbering of these markers must be shown on the wiring diagram on the switchboard. Control wiring shall be run in PVC trunking. The trunking shall be properly fixed to the switchboard steelwork. Adhesives shall not be acceptable for the fixing of trunking or looms.

The automatic control and protection equipment shall be mounted on a separate easily replaceable small panel with printed circuits. The equipment shall mainly be the "solid state" type. After mounting the equipment on the panel, the rear of this panel shall be sealed with epoxy-resin. However, other proven control systems may also be considered, but must be described in detail.

All equipment on the switchboard, such as contactors, isolators, busbars, etc., shall have ample current carrying capacity to handle at least 110% of the alternator full load current.

3.3 Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

Protection must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure, and low water level.

Individual relays with reset pushed are required, to give a visible signal and stop the engine when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indicators and re-set pushes must be marked in both official languages respectively.

"OVERLOAD"	"OORLAS"
"TEMPERATURE HIGH"	"TEMPERATUUR HOOG"
"OIL PRESSURE LOW"	"OLIEDRUK LAAG"
"OVER-SPEED"	"OORSPOED"
"START FAILURE"	"AANSITFOUT"
"LOW WATER LEVEL"	"LAE WATERVLAK"

In addition two relays with reset pushes must be fitted giving an audible and visible signal when:

- (a) The fuel level in the service tank is low. The reset push of this relay must be marked "FUEL LOW" - "BRANDSTOF LAAG".

In addition, a low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

- (b) The battery charger failed. The reset push of this relay must be marked "CHARGER FAIL" - "BATTERYLAAIER FOUTIEF".

This is also applicable to the engine driven generator/alternator.

All relays must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test pushbutton must be provided to test all indicator lamps.

3.4 Manual Starting

Each switchboard shall be equipped with two pushbuttons marked "START" and "STOP" for manual starting and stopping of the set.

3.5 Battery Staring Equipment

Each switchboard shall be equipped with battery charging equipment.

The charger shall operate automatically in accordance with the state of the battery and shall generally consist of an air-cooled transformer, a full wave solid state rectifier, and the necessary automatic control equipment of the constant voltage system.

The charger must be fed from the mains. An engine driven alternator must be also provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

3.6 Switchboard Instruments

Each generating set shall have a switchboard equipped as follows:

- (a) One flush square dial voltmeter, reading the alternator voltage, scaled as follows:
 - (i) 0-300V for single phase generators.
 - (ii) 0-500V for three phase generator. In this case a six position and off selector switch must be installed for reading all phase and phase to neutral voltages.
- (b) A flush square dial combination maximum demand and instantaneous ampere meter for each phase, with resettable pointer suitably scaled 20% higher than the alternator rating. A red arc stripe above scale markings from 0-20A and a red radial line through the scale at full-load current shall be provided. These instruments shall be supplied complete with the necessary current transformer.

- (c) One flush square dial vibrating type frequency meter, indicating the alternator frequency.
- (d) A six digit running hour meter with digital counter, reading the number of hours the plant has been operating. The smallest figure on this meter must read $\frac{1}{10}$ hour.
- (e) Fuses or m.c.b.'s for the potential voltage circuits of the meters.
- (f) One flush square dial ampere meter suitably scaled for the battery charging current.
- (g) One flush square dial voltmeter with a spring loaded pushbutton or switch for the battery voltage.

3.7 Marking

All labels, markings or instructions on the switchgear shall be in both official languages.

3.8 Earthing

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.

The neutral point of the alternator must be solidly connected this bar by means of a removable link labelled "EARTH" "AARD". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by others.

3.9 Operation Selector Switch

A four position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "TEST" and "OFF" - "AUTO", "HANDBEHEER" "TOETS" and "AF".

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply being available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the pushbuttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the pushbutton, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

3.10 Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

3.11 By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load by-pass switch, which shall either connect the incoming mains to the automatic control gear or directly to the outgoing feeder. In the latter position the automatic control gear, including the main contractors, shall be isolated for maintenance purposes. It shall not be possible to start the engine except with the selector switch in the "TEST" position.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment either on the side or in the lower

portion of the switchboard cubicle, and that the switches operated from the front of the compartment.

3.12 Start Delay

Starting shall be automatic in event of a mains failure. A 0-15 second adjustable start delay timer shall be provided to prevent start-up on power trips or very short interruptions.

3.13 Stop Delay

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

4. **Installation**

Except for the supply of the incoming mains cable and outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant in running order, including the connection of the incoming cable and outgoing feeder cables.

The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

5. **Warning Notices**

Notices, in both official languages, must be installed in the plant rooms.

The contents of these notices are summarised below.

- (a) Unauthorised entry prohibited.
- (b) Unauthorised handling of equipment prohibited.
- (c) Procedure in case of electric shock.
- (d) Procedure in case of fire.

The successful tenderer must consult the Occupational Health and Safety Act 83 of 1993 and get approval of the wording from the Department's representative, prior to ordering the notices.

Lettering must be black on a yellow background.

Notices (a) must be installed outside next to the entrance of the plant room and (b-d) inside the plant room.

In the plant room, a clearly legible and indelible warning notice must be mounted in a conspicuous position.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic, and must read as follows:

DANGER: This engine will start without notice. Turn selector switch on control board to "OFF" before working on the plant.

GEVAAR: Hierdie masjien sal sonder waarskuwing begin loop. Draai keuseskakelaar op beheerpaneel na "AF" voordat aan die masjien gewerk word.

6. Construction

The engine and alternator of the set shall be built together on a common frame, which must be mounted on a skid base on anti-vibration mountings. The set must be placed direct on the concrete of the generator room. A drip tray must be fitted under the engine. The tray must be large enough to catch a drip from any part of the engine.

The frame must be of the 'DUPLEX' type.

7. Operation

The set is required to supply the lighting and power requirements in the case of a mains power failure.

The set shall be fully automatic i.e. it shall start when any one phase of the main supply fails or get switched and shall shut down when the normal supply is re-established. In addition it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure relay on the switchboard must give a visible and audible indication of the fault.

To prevent the alternator being electrically connected to the mains supply when the mains supply is on and vice versa, a safe and fail proof system of suitably interlocked contactors shall be supplied and fitted to the changeover switchboard.

**SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF AN
EMERGENCY GENERATOR SET**

SECTION 3 – TECHNICAL SPECIFICATION

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SECTION 3 – TECHNICAL SPECIFICATION

1. General

Supply, deliver, install, commission, test and maintain an emergency generating set at CSIR DATA CENTRE.

This installation must comply fully with all the sections and drawings of this document. This technical specification is supplementary to the Equipment Requirements, Section 2, and must be read together where they are at variance the Technical Specification shall apply.

The Generator sets will be installed outside on plinths.

2. Site Information And Conditions

2.1 Location

The site is at CSIR Pretoria

2.2 Site Conditions

The following site conditions will be applicable and equipment shall be suitably rated to develop their assigned rating and duty at these conditions.

- a) Height above sea level : meter
- b) Maximum ambient temperature : °C
- c) Maximum ambient humidity at lowest temperature : %

3. Output And Voltage

After the de-rating factors for the engine and generator due to site conditions have been taken into account, the set must have a site output and voltage as follows: -

No load voltage	:	400/230 Volt
Rating	:	350kVA
Power at 0,95 power factor	:	333kW
Frequency	:	50Hz
Fault Level	:	5kA

The generating set is required to feed the following electrical load:

Data Centre UPS system
Aicons DB
Fire suppression system
Sunren DB
Cooling Fans

4. Switchboard/Control Panel Unit

All switch- and control gear shall be rated for a fault current level of 5kA.

The switchboard/control panel unit shall be a free standing floor mounted type, which shall be installed in the plant room.

or

The switchboard shall be surface wall mounting and shall be supplied in accordance with clause 3 of Section 2 of this specification, and shall incorporate the following additional switch gear, accessible through the front panel:

MAIN SWITCH
(Standby Power)

DISTRIBUTION BOARD

LOCAL CIRCUITS

LIGHT CIRCUIT

SOCKET OUTLET CIRCUIT

SPACE & MOUNTING FACILITIES

5. Cables

The contractor will be responsible for all electrical cable connections associated with the complete generating set installation.

The following cables will be supplied, installed and terminated at the Switchboard by the Contractor. Adequate provision shall be made for the termination of these cables at the Switchboard:

<u>DATA Centre Main DB fed</u>	<u>XLPE, PVC Insulated Cable</u>
.....	2 X 95mm ²

6. Engine

A sump drainpipe must be fitted with a shut-off valve placed in a convenient position outside the base frame to facilitate drainage.

Recommended oil types must be indicated on the engine, or base frames, by means of suitable labels.

All engine instruments shall have clear markings on the faceplates, indicating the normal operating zone(s), maximum and minimum allowable values/limits and danger zone(s).

The flywheel shall be covered by approved hoods.

7. Alternator

The Alternator shall be of the low harmonic type.

8. Load Acceptance

The generator set shall be capable of accepting 75% of the specified site electrical output 10 seconds after the starter motor is energised and the remaining 25%, 5 seconds thereafter, i.e. 100% load acceptance shall not exceed 15 seconds.

9. Generator Site

The size of the Generator Site will be12000 mm wide x13000. mm long.

10. Alarms

The successful tenderer must pay particular attention to the requirements of the alarms as described in the Equipment Requirements, Section 2.

One alarm hooter and red light shall be supplied and installed on the outside wall of the generator room in the position as shown on the drawing in this specification.

The hooter shall consist of an electronic unit similar and equal to a "Klaxon" - type SY2/725 hooter with a continuously rated output and 110 db at a distance of 2 metres, and shall be IP55 weatherproof rated.

The warning light shall consist of a 40W flashing red light, which shall be mounted on a galvanised steel frame together with the hooter.

The hooter and light shall be switched on or off simultaneously after initiation or cancellation of an alarm condition. The supply and installation of the wiring between the control board and the alarm unit forms part of this contract.

The successful tenderer must ensure that the hooter control circuit resets automatically after cancellation due to a low fuel condition or battery charger failure, but the visible fault indication must remain, i.e. should the operator continue to run the set, the hooter must sound, should any other condition develop.

A remote alarm panel shall be supplied and installed by the contractor in the control room. This shall be of surface mounting, enamelled sheet metal (colour to approval), minimum depth construction, and shall incorporate a flashing red pilot alarm light, adjustable electronic sounder, and a silence push button. The silence button shall not switch off the pilot light - this shall only be switched off when the alarm is reset at the Generator Panel.

A 2,5mm² x 4-core PVC SWA PVC cable will be supplied, installed and terminated by others between the Generator Panel and the Charge Office. The Contractor shall connect this cable at both ends and shall supply and install all switch gear relays, etc. to ensure satisfactory operation of the Remote Alarm Panel.

11. Remote Control Generator Switch

A Remote Control Generator "ON/OFF/AUTO" switch will be supplied and installed by the Contractor, and a 2,5mm² x 4-core PVC SWA PVC cable will be supplied and installed by the Contractor between the Plant room and the Generator Panel.

The contractor shall connect this cable at both ends, and shall supply and install all switch gear, relays, etc. to ensure satisfactory operation of the remote control switch.

12. Fuel Drip Tray

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank accessories. The drip tray shall be manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

13. Completion Time

The Generator Set is required to be commissioned in conjunction with the building contract.

14. Inform

The successful tenderer shall inform the Engineer when the set is ready for installation.

15. Fuel Supply Tank

The fuel tank shall be at the Base of the generator set, The tank shall have sufficient capacity for the generating set to run the engine on full load for a period of **12 hours**.

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank accessories. The drip shall be manufactured from black mild steel with a thickness of not less than 2mm.

**SPECIFICATION FOR THE SUPPLY DELIVERY AN INSTALLATION OF AN
EMERGENCY GENERATOR SET**

SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

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SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

1. Engine

NO	ITEM	REMARKS
1.	Manufacturer's Name	
2.	Country of Origin	
3.	Manufacturer's model No. and year of manufacture	
4.	Continuous sea level rating after allowing for ancillary equipment : a) In b.h.p. b) In kW	
5.	Percentage de-rating for site conditions, in accordance with BS 551.4 a) For altitude b) For temperature c) For humidity d) Total de-rating	
6.	Net output on site in kW	
7.	Nominal speed in r.p.m.	
8.	Number of cylinders	
9.	Strokes per working cycle	
10.	Stroke in mm	
11.	Cylinder bore in mm	
12.	Swept volume in cm ³	
13.	Mean piston speed in m/min	
14.	Compression ratio	
15.	Cyclic irregularity	
16.	Fuel consumption of the complete generating set on site in l/h of alternator output at : a) Full load b) ¾ load c) ½ load NOTE : A tolerance of 5% shall be allowed above the stated value of fuel consumption.	
17.	Make of fuel injection system.	
18.	Capacity of fuel tank in litres	
19.	Is gauge glass fitted to tank?	
20.	Is electric pump for filling the fuel tank included?	
21.	Method of starting	
22.	Voltage of starting system	

NO	ITEM	REMARKS
23.	Method of cooling	
24.	Type of radiator if water-cooled	
25.	Type of heater for warming cylinder heads	
26.	Capacity of heater in kW	
27.	Method of protection against high temperature	
28.	Method of protection against low oil pressure	
29.	Type of governor	
30.	Speed variation in % a. Temporary b. Permanent	
31.	Minimum time required for as assumption of full load in seconds	
32.	Recommended interval in running hours for : a. Lubricating oil change b. Oil filter element change c. Decarbonising	
33.	Type of base	
34.	Can plant be placed on solid concrete floor?	
35.	Are all accessories and ducts included?	
36.	Is engine naturally aspirated?	
37.	Are performance curves attached?	
38.	Diameter of exhaust pipe	
39.	Noise level in plant room in dBA	N/A
40.	Noise level at tail of exhaust pipe in dBA	
41.	BMEP (4 stroke) at continuous rating (kPa)	
42.	% Load acceptance to BS 5514, Part 4, with 10% transient speed drop	

2. Alternator

NO	ITEM	REMARKS
1.	Maker's name and model no.	
2.	Country of Origin and year of manufacture	
3.	Type of enclosure	
4.	Nominal speed in r.p.m.	
5.	Number of bearings	
6.	Terminal voltage	
7.	Sea level rating kVA at 0,95 power factor	
8.	De-rating for site conditions	
9.	Input required in kW	

NO	ITEM	REMARKS
10.	Method of excitation	
11.	Efficiency at 0,95 power factor and : a) Full load b) $\frac{3}{4}$ load c) $\frac{1}{2}$ load	
12.	Maximum permanent voltage variation in %	
13.	Transient voltage dip on full load	
14.	Voltage recovery on full load application in milli-seconds	
15.	Is alternator brushless?	
16.	Class of insulation of windings	
17.	Is alternator tropicalised?	
18.	Symmetrical short circuit current at terminals n Ampere	
19.	Type of Coupling	

3. Switchboard

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Is board floor mounted?	
4.	Finish of board	
5.	Make of volt, amp, and frequency meters	
6.	Dial size of meters in mm	
7.	Scale range of voltmeter	
8.	Scale range of ammeters	
9.	Ration of current transformers	
10.	Make of hour meter	
11.	Range of cyclometer counter	
12.	Smallest unit shown on counter (Item 11)	
13.	Make of circuit breaker	
14.	Type of circuit breaker	
15.	Rating of circuit breaker in Amp and fault level in kA	
16.	Setting range of overload trips	
17.	Setting range of instantaneous trips	
18.	Make of change-over equipment	
19.	Make of voltage relay	
20.	Is control and protection equipment mounted on a small removable panel?	
21.	Type of control equipment	

NO	ITEM	REMARKS
22.	Make of mains isolator	
23.	Type of indicators for protective devices	
24.	Make of rectifier	
25.	Type of rectifier	
26.	Is battery charging	
27.	Are volt- and ammeters provided for charging circuit?	
28.	Is the alarm hooter of the continuous duty type?	
29.	Rating in Amps of : a. Change-over equipment b. Mains on load isolator c. By-pass switch d. Circuit breaker to outgoing feed	
30.	Is manufacture of switchboard/control panel to be sub-let?	
31.	If yes, state name and address of specialist manufacturer	

4. Battery

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Type of battery	
4.	Voltage of battery	
5.	Number of cells	
6.	Capacity in cold crank amp	

5. Dimensions

NO	ITEM	REMARKS
1.	Overall dimensions of set in mm	
2.	Overall mass	
3.	Is the generator room adequate for the installation of the set	

6. Deviation from the Specification as An Alternative (State Briefly)

NO	DESCRIPTION

7. Spare Parts and Maintenance Facilities

NO	ITEM	REMARKS
1	Approximate value of spares carried in stock for this particular diesel engine and alternator	
2	Where are these spares held in stock	
3	What facilities exist for the servicing of the equipment offered	
4	Where are these facilities available	

**SPECIFICATION FOR THE SUPPLY DELIVERY AN INSTALLATION OF AN EMERGENCY
GENERATOR SET**

PART C

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SECTION 1

PRELIMINARIES

GENERAL

Should there be any discrepancy between these Preliminaries and the Conditions of Contract (PW677), the former shall take precedence

These Preliminaries are divided into Parts A, B and C

Part A lists the clauses of and refers directly to the Conditions of Contract (PW677). Some of the clauses have been expanded and the additional terms are set against each relevant clause

Part B contains standard preliminary items, some of which may have been marked NA (not applicable)

Part C contains specific preliminary items which apply to this contract except where marked NA (not applicable)

SCHEDULE OF SUPPLEMENTARY INFORMATION

A **Schedule of Supplementary Information** is included after the Collection of the Preliminaries, containing supplementary information to items A13, A20, A24, B1.2, B1.5, B1.6 etc

PRICING OF PRELIMINARIES

For the purpose of adjustment of the Preliminaries in terms of item A23 hereof the rate entered in the rate column for each item in the Preliminaries, must be divided into three categories, viz: Fixed, Value Related and Time Related, and the respective amounts entered in the spaces provided under each item

Where the rate entered in the rate column for any item in the Preliminaries is not divided into the three categories, the rate shall be deemed to be value related except for clauses A1, A2, A8, A14, A21, A24, A26 to A29, B1.1 to B1.9, B2.1 to B2.6, B4.1, B5.1, B5.5, B7.1 to B8.2, C2 to C7 which shall be fixed.

PART A

CONDITIONS OF CONTRACT

The conditions of contract shall be the Conditions of Contract (PW677) of the Department. The contractor is referred to the above mentioned document for the full intent and meaning of each clause referred to under the following headings

A1 **DEFINITIONS**

Clause 1

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A2 **DRAWINGS, SPECIFICATIONS AND BILLS OF QUANTITIES**

Clause 2

Priced Bills of Quantities

The contractor shall deposit his priced bills of quantities with the quantity surveyor stated on the front cover hereof

Rates

Imbalanced, unreasonable or unrealistic rates for any item, the inclusion of the cost of one item in the rate for another item, nil rates or no charge for items will not be allowed

Where appropriate, rates for similar items in the various sections of the bills of quantities should be the same

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

The Director-General shall be at liberty to make such adjustments to individual rates, whether they are subcontractors' rates or not, as will eliminate errors, discrepancies or which he considers to be imbalanced, unreasonable or unrealistic rates without altering the tender amount
 Schedule rates for all items shall be deemed to include all costs to the contractor other than Value-Added Tax (VAT) for the execution of the works in accordance with the Conditions of Contract (PW677)

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A3 CONTRACTOR'S OBLIGATIONS

Clause 3

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A4 CONTRACTOR'S REPRESENTATIVE

Clause 4

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A5 EMPLOYEES TO BE EFFICIENT

Clause 5

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A6 MATERIAL AND WORK TO CONFORM TO DESCRIPTION

Clause 6

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A7 LOCAL AND OTHER AUTHORITIES

Clause 7

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: Provisional sums covering such relevant items are included elsewhere in the bills of quantities

A8 SETTING OUT OF THE WORKS

Clause 8

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A9 NOTICE OF COVERING WORK

Clause 9

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A10 MATERIAL AND GOODS TO BE THE PROPERTY OF THE DIRECTOR-GENERAL

Clause 10

Ownership

Ownership of material and goods referred to in subclause 10(1) of the Conditions of Contract (PW677) shall be deemed to have duly passed to the Director-General by virtue of a constitutum possessorium

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A11 PLANT TO BE THE PROPERTY OF THE DIRECTOR-GENERAL

Clause 11

Ownership

Ownership of plant referred to in sub clause 11(1) of the Conditions of Contract (PW677), shall be deemed to have duly passed to the Director-General by virtue of a constitutum possessorium

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A12 INJURY TO THE WORKS

Clause 12

Excepted Risk

The contractor shall carry the risk of damage to or destruction of the works and material paid for by the Director-General that is the result, whether direct or indirect or proximate or remote of any risk or peril only insurable in the Republic of South Africa by means of a political riot insurance policy issued by or on behalf of the South African Special Risks Insurance Association

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A13 INJURY TO PERSONS OR PROPERTY

Clause 13

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note:

- 1) See the Schedule of Supplementary Information for amount of insurance to be obtained against removal of support to adjoining properties, in respect of any single occurrence (clause 13(4))
- 2) All the conditions of clause 13 will still be applicable should insurance against removal of support to adjoining properties not be specifically prescribed
- 3) Insurance against Removal of Support to adjoining Properties (Clause 13(4)): Before commencing the works the contractor shall arrange with the owners of adjoining buildings and properties, the Representative/Agent, representatives of local authorities and agents of an insurance company for an inspection of the adjoining buildings, structures, services, paving, channels, fences, roads, pavements, kerbs, etc and record all conditions particularly cracks, defects and levels in structures, roads, paving, kerbs, channels and fences which later could be claimed to have been caused or disturbed by the operations carried out under this contract

If so directed the contractor shall take levels and photographs and the cost thereof shall be for the Director-General's account. Written and photographic evidence shall be dated and witnessed in front of an attorney or notary, and the owners should sign the record as true evidence which shall be lodged with the Representative/Agent

The contractor shall insure as set out in clause 13(4) of the Conditions of Contract (PW677) and submit the insurance policy to the Representative/Agent for approval

Should the contractor fail to insure, the Director-General may insure in his own name with an insurance company, pay the premiums and recover such cost from the contractor

A14 CESSION OR ASSIGNMENT

Clause 14

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A15 PRIME COST ITEMS AND PROVISIONAL SUMS

Clause 15

Adjustment of Prime Cost Amounts

The contract sum will be adjusted by the omission of the prime cost amount and the addition of only the sum actually paid for the goods by the contractor

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: See items B7.1 and B7.2 hereof for definition and adjustment of attendance on nominated and/or selected subcontractors executing work allowed for under provisional sums

A16 NOMINATED SUBCONTRACTORS

Clause 16

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A17 FACILITIES TO OTHER CONTRACTORS

Clause 17

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: See items B7.1 and B7.2 hereof for definition and adjustment of attendance on other contractors executing work not provided for in this contract

A18 VARIATIONS

Clause 18

Variations

For purposes of this clause, variations shall include any additions, omissions and substitutions ordered by the Director-General

Calculation of the Value of Work for the Limit of 20%

The amount arising out of the Contract Price Adjustment Provisions, and any difference between provisional sums and accepted tender amounts for work to be executed as nominated and/or selected subcontractors, shall be excluded in calculating the value of work omitted or added in excess of the limit of 20%

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A19 DAYWORK

Clause 19

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A20 COMMENCEMENT AND COMPLETION

Clause 20

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

Inclement Weather

Replace the words **exceptionally inclement weather** in clause 20(4) with the words **inclement weather during which no work is possible**

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: The contract period shall be as stated in the Schedule of Supplementary Information

A21 FIRST AND FINAL DELIVERY

Clause 21

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: The contractor's attention is drawn to the fact that for certain portions of the works the Final Delivery Certificate may be issued twelve months (or some other period dependent on his liability for certain portions of the works) after the date of the First Delivery Certificate

A22 CONTRACTOR'S LIABILITY IN RESPECT OF DEFECTS

Clause 22

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: The contractor's attention is drawn to the fact that his liability for certain portions of the works, where so stated in the bills of quantities, may be for twelve months (or for other periods as may be stated) after the date of the First Delivery Certificate

A23 PAYMENT

Clause 23

Retention Money

Notwithstanding the provisions of clause 23(2) (e)(i) of the Conditions of Contract (PW677) retention money shall be calculated on the individual contract amounts (Value-Added Tax excluded) for the contractor, nominated and/or selected subcontractors and the maximum retention money shall in each case not exceed 5% of each individual contract amount (Value-Added Tax excluded)

THE FOLLOWING CONDITIONS REPLACE CLAUSE 23(2)(b)(ii):

Adjustment of Preliminaries

The items of Preliminaries shall be adjusted in the following categories and such adjustment shall preclude any further adjustment except where circumstances (other than those listed hereunder) in terms of clause 25 of the Conditions of Contract (PW677) affect any item specifically priced in the preliminaries:

- 1 Fixed i.e. an amount which shall not be varied
- 2. Value Related i.e. an amount which shall be varied in proportion to the final value of the Works as compared to the contract sum (both excluding amounts arising out of contract price adjustment provisions, preliminaries, provisional sums for nominated or selected subcontractors, credit for old materials and Value-Added Tax)
- 3. Time Related i.e. an amount which shall be varied in proportion to the extended contract period less 35 days as compared to the contract period less 35 days where such extension results from the following circumstances:
 - 3.1 Instructions which have not been occasioned by the default of the contractor
 - 3.2 Delay in issuing an instruction by the Representative/Agent if approved in terms of said clause 25

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

- 3.3 Delay caused by other contractors or workmen employed by the Director-General
- 3.4 Failure by the Director-General to grant possession of the site to the contractor: Provided that the proportional amount in respect of any such extension be multiplied by a factor of 50%

Payment of Preliminaries in Progress Payments

A proportional amount in respect of the preliminaries or the adjusted preliminaries, if any, shall be included in each progress payment taking into account the priced items within the preliminaries section of the bills of quantities, as well as:

- 1. In respect of Time Related amounts:
 - 1.1 The 35 day no charge period before handing over of the site
 - 1.2 A reduced charge for extensions given for periods before handing over of the site
 - 1.3 The construction period including any later anticipated completion date
 - 1.4 Any amounts already paid in previous payment certificates when the construction period changes
- 2. In respect of the Fixed value amounts:
 - 2.1 An initial or establishment charge, payment of which shall be made to the contractor on proof that the relevant expenditures have been made
 - 2.2 A monthly charge, if any
 - 2.3 A final or disestablishment charge
- 3. In respect of the Value Related amounts:
 - 3.1 The exclusions provided for in the **Adjustment of Preliminaries** above for the adjustment of Value Related amounts
 Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A24 DEFAULT BY CONTRACTOR

Clause 24

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Note: The penalty for default by the contractor shall be calculated as determined in the Schedule of Supplementary Information

A25 DELAYS BY DIRECTOR-GENERAL

Clause 25

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A26 SEQUESTRATION, LIQUIDATION, INSOLVENCY AND JUDICIAL MANAGEMENT

Clause 26

Cancellation of Contract

The contract shall be deemed to be cancelled upon the liquidator, or curator, waiving his right to proceed with and complete the contract

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

A27 DISPUTES

Clause 27

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A28 CANCELLATION BY DIRECTOR-GENERAL

Clause 28

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

A29 AMENDMENT OF CONDITIONS OF CONTRACT

Clause 29

Fixed: _____ Value Related: _____ Time Related: _____ **Item**

Each Item Carried to Collection

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

PART B

STANDARD PRELIMINARIES

The tenderer's attention is drawn to Part C hereof for specific preliminaries which apply to this contract

B1 DOCUMENTATION

B1.1 DOCUMENTS

The Conditions of Contract (PW677), Articles of Agreement (PW193) and Deed of Suretyship (PW159) and Guarantee for the Execution of a Contract (PW 822) are available for issue to or for inspection by the tenderer during office hours at the head office or the regional office of the Department. Copies of the State Tender Board General Conditions and Procedures (ST36) are available on application from the Chief Director: Procurement Administration, Private Bag X49, Pretoria, 0001

Fixed: _____ Value related: _____ Time related: _____ **Item**

B1.2 CONTRACT DRAWINGS

The drawings issued with the tender documents do not comprise the complete set but serve as a guide only for tendering purposes and for indicating the scope of the work to enable the tenderer to acquaint himself with the nature and extent of the works and the manner in which they are to be executed

Should any part of the drawings not be clearly intelligible to the tenderer he shall, before submitting his tender, obtain clarification in writing from the Representative/Agent

Fixed: _____ Value related: _____ Time related: _____ **Item**

Note: See the Schedule of Supplementary Information for the list of contract drawings

B1.3 BILLS OF QUANTITIES

The pages of these bills of quantities are numbered consecutively. The tenderer shall, before submitting his tender, check the numbers of the pages and should any be missing or duplicated, or the reproduction be indistinct, or if any doubt exists as to the full intent or meaning of any description, or these bills of quantities contain any obvious errors, the tenderer shall obtain a directive in writing from the Director-General

The text of these bills of quantities and other documents as prepared by the Representative/Agent will be adhered to and no alteration, erasure, omission or addition thereto by the tenderer will be recognised

Fixed: _____ Value related: _____ Time related: _____ **Item**

B1.4 PROVISIONAL BILLS OF QUANTITIES

Where reference is made in the documentation to bills of quantities it shall be taken as referring to these Provisional Bills of Quantities

All quantities are provisional, are an indication of the extent and type of work to be executed and have been inserted in order to obtain competitive tenders

All work carried out under this contract shall be measured and valued at schedule rates and in accordance with the Conditions of Contract

Fixed: _____ Value related: _____ Time related: _____ **Item**

B1.5 GENERAL PREAMBLES

The document **Specification of Materials and Methods to be Used (PW371)** is obtainable on request from the head office and all regional offices of the Department, and shall be read in conjunction with the bills of quantities and be referred to for the full descriptions of work to be done and materials to be used

Fixed: _____ Value related: _____ Time related: _____ **Item**

Note: See the Schedule of Supplementary Information for the edition which is applicable

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

- B1.6 STANDARD SYSTEM OF MEASURING BUILDING WORK**
 Except where stated otherwise or where it is clear from the contents of the measured items these bills of quantities have been compiled in accordance with the Standard System of Measuring Building Work issued by the Association of South African Quantity Surveyors
 Fixed: _____ Value related: _____ Time related: _____ **Item**

Note: See the Schedule of Supplementary Information for the edition which is applicable
- B1.7 DEFINITION OF APPROVED, DIRECTED OR SELECTED**
 The term "approved", "directed" or "selected" shall mean approved, directed or selected by the Representative/Agent
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B1.8 TRADE NAMES**
 Wherever a trade name for any product has been described in the bills of quantities, the tenderer's attention is drawn to the fact that any other product of equal quality may be used subject to the written approval of the Representative/Agent being obtained prior to the closing date for submission of tenders
 If prior written approval for an alternative product is not obtained, the product described shall be deemed to have been tendered for
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B1.9 PROVISIONAL ITEMS**
 Work described as Provisional in these bills of quantities shall be measured and valued at schedule rates and in accordance with the Conditions of Contract (PW677)
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B1.10 DETAILS**
 Upon receipt of detail drawings for any work the contractor shall, before putting that work in hand, ascertain that the dimensions given on the detail drawings correspond with the dimensions of any work already built. In the event of the detail drawings not agreeing with work already built, the drawings shall immediately be returned for alteration, as no claim for extra work will be entertained in this respect
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B2 THE SITE**
- B2.1 VIEWING THE SITE**
 The tenderer shall view the site and make himself thoroughly acquainted with the conditions under which the works are to be executed, the means of access to the site, the nature of the site, the condition of the roads and generally with all matters which may influence the pricing of the contract
 The contractor will not be allowed to extend his operations beyond the area indicated on the drawings
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B2.2 BOUNDARY BEACONS**
 The boundary beacons of the site will be pointed out by the Representative/Agent to the contractor who shall sign a written acknowledgement therefor before commencing operations. The contractor shall maintain the beacons and shall bear any cost of resurveying should they become disturbed or lost
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B2.3 ADJOINING PROPERTIES**
 The contractor shall make his own arrangements with owners of adjoining properties in order to execute the works
 Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

B2.4 UNKNOWN SERVICES

Should the contractor encounter any existing services such as underground cables, pipes or sewers during the execution of the works he shall notify the Representative/Agent immediately and suspend all affected work in the immediate vicinity until instruction to proceed has been given by the Representative/Agent

Fixed: _____ Value related: _____ Time related: _____ **Item**

B2.5 PROTECTION OF TREES AND SHRUBS

Only those trees and shrubs indicated as such on the drawings shall be removed or cut back. The remainder of the trees and shrubs shall be left undamaged

Fixed: _____ Value related: _____ Time related: _____ **Item**

B2.6 ARTICLES OF VALUE

Any relics, treasure or other articles of value found on the site, shall be handed over to and remain the property of the Director-General who will be the sole arbiter of what constitutes an article of value

Fixed: _____ Value related: _____ Time related: _____ **Item**

B3 MANAGEMENT OF THE CONTRACT

B3.1 PROGRAMMING OF THE WORKS

The contractor shall, within one month of the site being handed to him, submit to the Representative/Agent a detailed program and supporting documentation for the execution of the contract including the work of all nominated and/or selected subcontractors and other contractors engaged by the Director-General, representing the duration of categories of work in sufficient detail to enable the Representative/Agent to assess the progress of the works at all times in comparison with the program. The contractor shall, in compiling the program, consult with the nominated and/or selected subcontractors and other contractors and shall also take cognisance of any Procedure of Works (phasing) items, where applicable

The contractor shall implement the program and shall reprogram the works should the program not accurately reflect the progress or the extent of the works. Copies of each program and supporting documentation shall be provided for the use of the Representative/Agent, nominated and/or selected subcontractors and other contractors

The submission to the Representative/Agent of such programs will not relieve the contractor of his responsibility for ensuring timeous completion of the contract

Fixed: _____ Value related: _____ Time related: _____ **Item**

B3.2 MANAGEMENT OF THE WORKS

The contractor shall be responsible for managing the sequence of the works in such a manner that the subsequent cutting or patching of finished work is avoided. He shall obtain all necessary particulars of subcontractors' and other contractors' work timeously so that provision for recesses, chases, holes, etc may be made

Fixed: _____ Value related: _____ Time related: _____ **Item**

B3.3 PROGRESS MEETINGS

Regular progress meetings will be held either monthly or as may be necessary and shall be attended by the contractor. Parties other than the contractor shall not attend the meetings unless specifically requested by the Representative/Agent to do so. The Representative/Agent will keep and distribute minutes of the meetings

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

B4 MATERIAL AND WORKMANSHIP

B4.1 ORDERING OF MATERIALS

The contractor shall place orders timeously for materials or special articles that are required. Should the bills of quantities be used for ordering materials, this shall be entirely at the contractor's risk

Fixed: _____ Value related: _____ Time related: _____ **Item**

B4.2 SAMPLES OF MATERIALS AND WORKMANSHIP

The contractor shall furnish at his own cost such samples of materials, workmanship and specimens of colours as may be called for by the Representative/Agent for his approval who may reject all material, workmanship, etc not corresponding to the approved samples

Fixed: _____ Value related: _____ Time related: _____ **Item**

B5 TEMPORARY WORKS AND PLANT

B5.1 ENCLOSURE OF WORKS

The contractor shall provide, erect, alter as necessary, maintain, remove and make good on completion of the works suitable hoardings, complete with gantries, fans, safety screens, barriers, guard railing, access gates, covered gangways, steel sections at crane lifts, splayed corners, returned ends, etc as indicated on the drawings and as necessary for the enclosure of the works and the protection of the public, all to the satisfaction of the Representative/Agent and the Local Authority

Fixed: _____ Value related: _____ Time related: _____ **Item**

B5.2 SHEDS

The contractor shall provide, maintain and remove on completion of the works temporary sheds for the proper storage of materials

Fixed: _____ Value related: _____ Time related: _____ **Item**

B5.3 OFFICE FOR THE REPRESENTATIVE/AGENT

The contractor shall provide, maintain and remove on completion of the works an office for the exclusive use of the Representative/Agent, minimum size 4 x 3 x 3m high internally, suitably insulated and ventilated, provided with electric lighting and fitted with boarded floor, desk, chair, drawing stool, drawing board and lock-up drawers for drawings. The office shall be kept clean and fit for use at all times

Fixed: _____ Value related: _____ Time related: _____ **Item**

B5.4 NOTICE BOARD

The contractor shall provide, erect where directed, maintain and remove on completion of the works a notice board size 3 x 3m as type Drawing GEN 063, constructed of suitable boarding with flat smooth surface and with edging bead 19mm thick all round outer edges and projecting 12mm from face of boarding and rounded on front edge. The board shall be securely fixed to hoarding, where hoarding is provided, or fixed to and including a suitable supporting structure of timber or tubular posts and braces. The board is to be painted ivory white and the bead and 12mm wide dividing lines deep blue. All wording shall be inscribed in deep blue painted sans serif lettering

Subcontractor's individual boards will be allowed on the site subject to the written approval of the Representative/Agent

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

- B5.5 ADVERTISEMENTS**
 Advertisements on the hoarding or elsewhere on the site will be allowed subject to the written approval of the Representative/Agent
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B5.6 PLANT AND SCAFFOLDING**
 The contractor shall provide, maintain and remove if no longer required all plant and scaffolding necessary for the execution of the works

 Scaffolding will not be permitted to be erected from buildings on adjacent premises
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B6 TEMPORARY SERVICES**
- B6.1 PROVISION OF WATER FOR THE WORKS**
 The contractor shall provide all water necessary for the execution of the works, including all temporary plumbing, removing same and making good on completion of the works
 The contractor may use water free of charge from the existing supply if available. He shall obtain permission from the Representative/Agent before any connection to or extension of the existing supply is made, which shall be executed, removed and made good on completion of the works at the contractor's expense
 The contractor shall allow for the risk of failure of the water supply or of an insufficient supply, in which case he shall make his own arrangements and all costs that may arise shall be for his account
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B6.2 PROVISION OF ELECTRICITY AND LIGHTING**
 The contractor shall provide all electricity and artificial lighting necessary for the execution of the works, including all temporary installation work, removing same and making good on completion of the works
 The contractor may use the existing power supply free of charge if available. He shall obtain permission from the Representative/Agent before any connection to or extension of the existing supply is made, which shall be executed, removed and made good on completion of the works at the contractor's expense
 The contractor shall allow for the risk of failure of the electrical supply or of an insufficient supply, in which case he shall make his own arrangements and all costs that may arise shall be for his account
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B6.3 PROVISION OF TELEPHONE**
 The contractor shall provide, maintain and remove on completion of the works a telephone on site for use by all persons engaged upon the works, pay all costs related thereto and make his own arrangements regarding recovering the cost of outgoing calls from those making them
 Fixed: _____ Value related: _____ Time related: _____ **Item**
- B6.4 PROVISION OF TOILETS**
 The contractor shall provide, maintain in a thoroughly clean and tidy condition and remove on completion of the works proper toilets for the use of the workmen
 The contractor will be permitted the use of the existing toilet facilities if available unless such facilities are reserved for specific persons. The contractor shall maintain such facilities in a thoroughly clean condition and make good any damage at his own expense
 Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

B7 ATTENDANCE ON NOMINATED AND/OR SELECTED SUBCONTRACTORS AND OTHER CONTRACTORS

B7.1 DEFINITION OF ATTENDANCE

General Attendance shall, without in any way limiting the meaning and interpretation thereof, include the following services to be rendered by the contractor to nominated and/or selected subcontractors or other contractors engaged by the Director-General:

1. Access to the site and to places where the work is to be carried out, the use of ordinary scaffolding and the use of any temporary cranes and personnel hoists erected by the contractor for his own and his subcontractors' use
2. The provision of water and lighting and electrical power to the place where work is to be carried out excluding water, fuel and power for commissioning of installations
3. The provision of an area for office accommodation, temporary workshops, and for the storage of plant and materials
4. The use of erected scaffolding belonging to the contractor in common with others having the like right whilst it so remains erected upon the site
5. The use of toilet facilities
6. The use of the site telephone
7. Making good after nominated and/or selected subcontractors and other contractors
8. Co-ordinating the main contract work with that of the nominated and/or selected subcontractors and other contractors

Fixed: _____ Value related: _____ Time related: _____ **Item**

Note: Items are provided elsewhere for pricing attendance on nominated and/or selected subcontractors and other contractors

B7.2 ADJUSTMENT OF ATTENDANCE

The schedule rates providing for attendance on nominated and/or selected subcontractors and other contractors, will be adjusted only if the scope of the work has changed

Fixed: _____ Value related: _____ Time related: _____ **Item**

B8 FINANCIAL ASPECTS

B8.1 SECURITY

The contractor shall furnish one of the following forms of security:

1. Two approved sureties who shall be required to sign a deed of suretyship; or
2. A cash deposit of 10% of the contract sum; or
3. A bank guarantee for 10% of the contract sum; or
4. An insurance guarantee for 10% of the contract sum

The security will terminate upon issue of the First Delivery Certificate for the completed works referred to in clause 21(1) of the Conditions of Contract

When the work is to be executed in a single phase and a First Delivery Certificate is issued in respect of a completed portion of the works in terms of clause 21(3) of the Conditions of Contract, the security will neither be terminated nor reduced

When the works is defined to be executed in two or more phases, and a completed phase is handed over and a First Delivery Certificate is issued in respect of that phase, the contractor may apply to the Representative/Agent for a revision of the amount of the security

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

B8.2 VALUE-ADDED TAX (VAT)

The tendered price must include for Value-Added Tax (VAT). All rates, provisional sums, etc in these bills of quantities must however be net with VAT calculated and added to the total value thereof in the Final Summary

Fixed: _____ Value related: _____ Time related: _____ **Item**

B8.3 CONTRACT PRICE ADJUSTMENT PROVISIONS

The contract sum will be adjusted in accordance with the **Contract Price Adjustment Provisions (CPAP)** as set out in the CPAP Manual and Reference guide as prepared by the Joint Building Contracts Committee (JBCC) series 2000, Code 2105, dated May 1998 and any amendments thereto:

1. Glass etc measured in specialist section Metalwork, will be adjusted in terms of the index for that work group unless specifically stated otherwise in the tender enquiry documents
2. All electrical installations in buildings and power distribution systems shall be adjusted in terms of the index for Work Group 160 Electrical Installation. In case of uninterruptible power supplies, elevators, escalators and hoists, generating sets, motor-alternator sets and intercommunication systems shall be in accordance with Work Group 170.
3. With reference to Work Group 190 a proportion of the Value related Preliminaries pro rata to the amount of work excluded from adjustment, shall be excluded from Contract Price Adjustment Provisions.
4. Further to clause 3.4.4 of the Contract Price Adjustment Provisions Manual and Reference guide, the listing of additional items for exclusion by tenderers, will not be permitted. Should a tenderer list any additional items his tender will be regarded as being qualified and dealt with accordingly
5. Selected Sub-Contractors shall be dealt with the same manner as Nominated Sub-Contractors
6. Where V results in a negative amount after application of the formula in clause 9.3 the factor of 0,55 shall be substituted by 1.45

Fixed: _____ Value related: _____ Time related: _____ **Item**

B8.4 IMPORTED MATERIALS AND EQUIPMENT

Where imported items are listed in the Tender documents, the tenderer shall provide all the information called for, failing with the price of any such item, material or equipment shall be excluded from currency fluctuations.

Notwithstanding any provisions elsewhere regarding the adjustment of contract prices, the price of any item, material or equipment listed in terms of this clause shall be excluded from contract price adjustment or escalation.

Fixed: _____ Value related: _____ Time related: _____ **Item**

B9 GENERAL

B9.1 DISTURBANCE

The contractor shall execute the works with as little noise and disturbance as possible to adjoining premises and tenants thereof. He shall keep the site, structures, etc well watered during operations to prevent dust and shall provide and erect and remove on completion of the works all necessary temporary dust screens all to the satisfaction of the Representative/Agent
In the event of beneficial occupation of a portion of the work being taken the contractor shall take similar precautions as described above in respect of occupied premises

Fixed: _____ Value related: _____ Time related: _____ **Item**

B9.2 CLEANING

The contractor shall regularly remove or dispose of any rubbish and superfluous material that may accumulate on the site

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

B9.3 VERMIN

The contractor shall take all necessary precautions to keep the works and site free from vermin during construction and shall leave the works vermin free on completion

Fixed: _____ Value related: _____ Time related: _____ **Item**

B9.4 JOBBING

Each trade shall perform all necessary jobbing and attendance and shall make good after all other trades

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

**PART C
SPECIFIC PRELIMINARIES**

The following items will apply to this contract except where NA (not applicable) appears against an item

C1 EXISTING PREMISES OCCUPIED

The existing premises will be in use and occupied during the course of this contract
The contractor shall execute the works in such a manner as will least interfere with the general routine of the occupants of the premises and shall minimise any nuisance from dust, noise or other causes

Fixed: _____ Value related: _____ Time related: _____ **Item**

C2 INACCURATE AND DEFECTIVE WORK EXECUTED UNDER A PREVIOUS CONTRACT

The contractor shall, after taking possession of the site and before commencing the work, check the existing levels, lines, profiles and the like and satisfy himself as to the dimensional accuracy of all work executed under the previous contract which may affect his work
Should any inaccurate or defective work be found the contractor shall immediately notify the Representative/Agent in writing requesting his instructions with regard thereto and afford every facility to those rectifying such inaccurate or defective work

Fixed: _____ Value related: _____ Time related: _____ **Item**

C3 VIEWING THE SITE IN SECURITY AREAS

The site is situated in a security area and the tenderer must arrange with the unit commander or other responsible officer to obtain permission to enter the site for tendering purposes

Fixed: _____ Value related: _____ Time related: _____ **Item**

C4 COMMENCEMENT OF WORKS IN SECURITY AREAS

As the works falls within a security area the contractor must give the unit commander or other responsible officer notice before commencement of the works. Should the contractor fail to make such arrangements, admission to the site may be refused and any additional costs will be for the contractor's account

Fixed: _____ Value related: _____ Time related: _____ **Item**

C5 ENTRANCE PERMITS TO SECURITY AREAS

As the works falls within a security area the contractor shall obtain entrance permits for his personnel and workmen entering the area and shall comply with all regulations and instructions which may be issued from time to time regarding the protection of persons and property under the control of the Defence Force, Police or chief security officer

Fixed: _____ Value related: _____ Time related: _____ **Item**

C6 SECURITY CHECK OF PERSONNEL

The Representative/Agent may require the contractor to have his personnel and workmen, or a certain number of them, security classified
In the event of the Representative/Agent requesting the removal of a person or persons from the works for security reasons, the contractor shall do so forthwith and shall thereafter ensure that such person or persons are denied access to the works and the site and/or to any document or information relating to the works

Each Item Carried to Collection

SECTION 1: PRELIMINARIES (PART C)

Fixed: _____ Value related: _____ Time related: _____ **Item**

C7 PROHIBITION ON TAKING OF PHOTOGRAPHS

In terms of article 119 of the Defence Act, 44 of 1957, it is prohibited to sketch or to take photographs of any CSIR site or installation or any building or civil works thereon or to be in possession of a camera or other apparatus used for taking of photographs except when authorised thereto by or on behalf of the Minister

The same prohibition is also applicable to all correctional institutions in terms of article 44.1(e) of the Correctional Services Act 8 of 1959

Fixed: _____ Value related: _____ Time related: _____ **Item**

Each Item Carried to Collection

**SCHEDULE OF IMPORTED MATERIALS AND EQUIPMENT
TO BE COMPLETED BY TENDERER**

The Contractor shall list imported items, materials and/or equipment which shall be excluded from the Contact Price Adjustment Provisions and shall be adjusted in terms of currency fluctuations only. Copies of the supplier's quotations for the items, materials or equipment (not higher than the Contract rate as listed below) should be lodged with the Representative/Agent of the CSIR within 60 (sixty) days from the date of acceptance of the tenders. No adjustment of the contractor's profit, local VAT amount, discount, mark-up, handling costs, etc. shall be allowed.

ITEMS	MATERIAL / EQUIPMENT	RAND (R) EXCLUDING VAT
1		
2		
3		
4		
5		
6		

FORMULA:

The net amount to be added to or deducted from the contract sum:

$$A = V \times \frac{Z}{Y}$$

A = the amount (R) of adjustment

V = the net amount (R) (Supplier's Quotation) of the imported item
(Material or Equipment)

Y = exchange rate at the closing date of tender submission

Z = exchange rate on the date of payment