SPECIFICATION FOR SURGICAL LIGHT FITTINGS

FOR PROCEDURE ROOM

1.0 Scope Of Specification.

This speciation applies to the design, manufacture, inspection, testing, delivery to site, unloading, complete installation, wiring, connections, final testing and putting into commission, handing over in approved working order and maintenance during defects liability period as stated in the condition of contract.

This specification should be read in conjunction with the Tender Forms, Schedule of Rates and Prices and Drawings which bear reference to this specification.

2.0 Scope Of Work

The work covers but should not be limited to the supply, delivery, installation, testing commissioning, handing over in approved working order and maintenance thereafter for the period stated in the condition of contract, the whole of the Surgical Lights Installation as detailed hereunder and on the drawings ion accompanying this Specification and also covers such minors works as are necessary for the proper carrying out of the installation of the system, whether or not, such works are specifically called for in the Specification and Drawings.

a) Surgical Light Fittings
b) Uninterruptable Power Supply Units
c) Electrical Works c/w wiring etc
d) Service and Maintenance
e) Associated works where necessary

f) Testing and Commissioning

3.0 Standards

All equipment supplied shall in all relevant respects conform with the current of all relevant Malaysian Standards, or, IEC 601 Standard, or British Standards or other approved National Standards as regards to design, construction, performance and test. A copy of standards in the English language shall be submitted with the tender.

4.0 Particulars & Guarantees.

Tenderers shall submit at the time of tendering detailed technical Particulars and Guarantees in respect of the equipment offered. Which shall be binding. No departure from this Particulars and Guarantees shall be permitted except with written approval of the Superintending officer. Not with standing any description. Drawings, illustrations or pamphlets which may be submitted with the Tender, all details others then those stated by the Tenderer in the Schedule of Departures from specification, at the time of tendering, will be deemed to be in full conformity with the specification. Should any deviation other then those stated in the Schedule of Departures from specification submitted by The Tenderer be found on the equipment during or after the true the installation, the Superintending Officer shall have the right to reject the equipment and the Tenderer shall bear the full cost of replacing new equipment complying with the specification and recommissioning of the installation.

The NSC shall guarantee the plant and equipment to be supplied under this Tender against faulty design, material and workmanship at the manufacturer's works for the period stated in the conditions of contract commencing from date

handing over in approved working order of the complete installation under the contract.

5.0 Arrangement & Setting Out

The arrangement various equipment and associated services shall follow closely that set out on the Drawings except where modification is required to suit the specific materials and equipment to be provided, to fit the latest available information on the building construction details. To meet the requirement of others services and equipment or to incorporate proposed by the Sub-Contractor, and such other modifications as approved by the S.O.

6.0 Coordination Requirements.

The NSC shall co-operate and co-ordinate with the Main Contractor and others Sub-Contractor to ensure that the requirement of the equipment and associated services are in the provision of the works by others set out the clause.

The NSC shall provide all necessary information regarding requirement to the Main Contractor and his Sub-Contractors to allow the requirement to be met. The NSC shall also make all necessary checks and inspections to ensure that the requirement have been properly met in good time to avoid delay to his works or the works of other. Any remedial work, by himself or others, required as a result of his failure to provide the necessary information in good time or to carry out inspection or checking shall be carried out at the NSC expense and without extension of time in respect or any delays so caused.

7.0 Units Of Measurement.

Throughout this Specification and the Drawing all units of measurement are in Metric Units of measurement unless otherwise indicated.

8.0 Metrication.

All gauges and indicators shall be provided with scales marked in S.I units as well the present conventional units.

9.0 Standardization

Each item of equipment shall generally be a standard proprietary design manufactured in quantity by an established manufacture of such equipment and shall incorporate all the features customarily service intended wherever such features are not inconsistent with the provisions of this specification.

9.1 Materials, equipment and fittings shall be standardized far as throughout the installation. In particular, attempt shall be made to achieve standardization in the following respects:

a) All major units of equipment shall be supplied by a single manufacturer and other equipment shall be supplied by the smallest possible number of manufactures.

b) All electrical motors not forming an integral part of the driven equipment shall be of the same make and have the maximum interchange-ability of components.

c) All item which are of a similar nature (e.g all valves, all pipe fittings, all switchgear) shall be obtained in each case from a single manufacturer or from smallest possible number of manufacturers.

d) All items for similar duties shall be the same make and model.

10.0 Ceiling Construction.

Details of the fixing of the light fittings to the ceilings shall be to the approval of the Superintending Officer.

For any further details and information of the operating theatres ceiling construction one set of the Architectural drawings will be available at S.O.'s office for inspection.

11.0 Tropicalisation and Vermin Proofing.

All equipment covered by this specification shall be fully tropicalised to make them suitable for continuous operation in the extremely humid and tropical climatic condition experienced in Malaysia.

11.1 The surgical light fittings will normally be operated under the following air Conditioned environment.

Temperature : 24 degrees Celsius (75 deg.F)
Humidity : 55%± 5%

Notwithstanding the above, it is required that the fittings shall not deteriorate under normal tropical conditions.

All other equipment supplied under this sub-Contract shall be capable of operating effectively and efficiently under the following conditions (open shade):-

Maximum temperature: (dry bulb) 35 deg.C (95 deg.F)
(wet bulb) 28 deg.C (82 deg.F)

11.2 The NSC shall provide, whether specifically called for in the specification Or not. All ancillary equipment, safe guard and sensing, indicating and proactive devices required to ensure that the proprietary equipment supplied will perfor satisfactory as specified or claimed under the above specified conditions.

11.2 The equipment shall also be designed to prevent ingress of vermin, accidental contact with live parts, and to minimize the ingress of dust and dirt. Materials which may be liable to attack by termites and other insects not to be used.

12.0 Earthing

The NSC shall supply, install and connect all earth wire for effective earthing of the whole installation, in accordance with IEE Regulation and requirement of the Electricity Supply Authority.

An approved earth wire of minimum size 2.5 sq.mm PVC sheathed copper conductor shall be run for all conduits and metallic frames and boxes.

13.0 Installation, Operating & Maintenance Instructions.

As soon as the general arrangement and details of the equipment to be supplied have been finalized and before the delivery of the equipment. The Electrical Contractor shall submit to the Superintending Officer 4 copies of detailed installation, operation and maintenance instructions in respect of the equipment to be supplied. The instructions in respect of the equipment to be supplied. The instructions shall cover the main as well as any associated equipment . For this purpose, manufactures standard brochures will be acceptable provided that they refer particularly to the equipment to be supplied and are free from extraneous matter.

13.1 The instructions shall include essential details, drawings and sketches of the equipment installation, operation and maintenance techniques, make mention of special materials where used and include schedules of recommended lubricant etc. All manuals submitted shall be properly bound with hard-covers and titles to the satisfaction of the Superintending Officer.

13.2 The contents shall be arranged in the following manner:-

a). Index

b). Cross reference guide for each group of equipment
(defining each group, listing the items in it and indicating the appropriate section of manual of each item).

c). Section for each major item of equipment (or set minor equipment) each including:-

i) General description, ‘name plate’ data, manufacturers and agents name, etc.
ii) Operating instructions.
iii) Emergency directions.
iv) Installation, servicing and maintenance instructions.
v) Arrangement drawings,
vi) Piping, Wiring and control diagrams.
vii) Parts list.
viii) Supplementary information, including standard leaflets, brochures, etc., for major components.

Miscellaneous supplementary information.

The cost of these manuals shall be deemed to be included in the Tender Price.

14.0 Tender Drawings

Detailed scaled drawings similar to tender drawings showing the dimensions and movement of the light fittings shall be submitted with the tender. The scale of such drawings shall not be smaller than 1 : 100.

15.0 Working Drawing

Within 3 weeks after award of the tender of the Tender, the NSC shall submit to the Superintending Officer for this approval dimension general arrangement and section drawings schematic/writing diagrams of the equipment ordered. These drawings are to submitted in quadruplicate. The drawing submitted are to be modified in necessary as requested by the Superintending Officer and re-submitted for final approval.

It is be understood, however, that approval of the drawings will not exonerate the NSC fro any responsibility in connection with the work.

16.0 Tool & Appliances

This Tender shall include the supply of the following tools and appliances whether they are specified in the Schedule of Rates & Price or not. The Tenderer is also required to give a full list with details when submitting his Tender:-

a). Sets as required of any special tools, gauges and handling appliances required for normal maintenance of equipment.

b). Sets as required of any special tools, gauges etc. required for the assembly, checking or adjustment of the equipment.

17.0 Spares.

The tender shall submit with his Tender separate Schedule of Spares recommended by him. This Schedule should contain the price and delivery period of each item of the spares recommended. The Tenderer shall also recommended the quantity of each item to be stored for purpose of maintenance. The prices for these shall not be include in the total Tender Price and the purchase of all or any of the spares listed shall be at the option of the superintending officer. These price shall be valid for acceptance during contract period (extended if applicable) of the project.

17.1 All spare part shall be fully interchangeable with the corresponding parts used in the main items of the plant and with each others without having to resort to machining or additional fittings at site. All spares shall be

finished, protected, packed and labeled in a suitable manner to prevent deterioration during prolonged storage in tropical climate.

18.0 Testing Equipment.

This Tender shall include the supply of the following testing equipment whether as specified in the Schedule of Rate & Price or not. The tenderer is required to give a full list with details when submitting his tenderer:-

a) Battery Capacity Mater
b) Hydrometer
c) International light Photometer with range of up to 150,000 Lux & accuracy ± 5%.

19.0 Surgical Light Fitting.

Unless otherwise specified the surgical light fitting shall be of ceiling suspended type.

19.1 Construction

The construction of the surgical light fitting shall be robust and workmanlike throughout, and materials used shall be non-corrodible or have a permanent finish protects then against corrosion in conditions to which they will be subjected during normal use.

The lamp housing shall be provided to allow convenient access to lamps for servicing purposes. Removable parts of the lamp housing shall be secured in such a manner that fastenings will remain secure after repeated use.

When a housing is fitted with a lamp of maximum wattage for which it is designed, the transparent front cover shall withstand the most adverse condition which likely to be met in practice without fracture or permanent deformation.

Gaskets which are fitted to joints which are required to opened for servicing purposes shall remain resilient and serviceable after repeated use.

Each lamp shall be provided with a centrally mounted detachable strerilizable handle to allow the surgeon to make personal adjustment of the illumination field. Each lamp shall be supplied with 4 **spare handles.**

19.2 Exterior Surfaces.

Exterior surfaces shall be smooth and free from unsealed formation which may harbor dirt and foreign matter all corners shall be rounded.

All recessors, edges and free hanging cables shall not be expose. All exterior fixing screws/bolts shall be flushed with the exterior surface these shall be limited in number to as few as possible.

19.3 Manoeuverability

The lamp fixture shall be move freely, smoothly and quietly throughout. Its range of the manoeuverability without drifting when positioned at any point.

They shall be so constructed that the lamp may be:-

a) Raised or lowered
b) Move horizontally
c) Tilted trough any angle on the horizontal and vertical plane

Within the limits as set out in the schedule of light fittings.
Mechanical means of preventing complete rotation shall be provided to prevent damage to the lamp housing or wiring by continuous rotation of the housing or support. However, provision should be made to permit continuous rotation of the housing and support about the central suspension axis.

19.4 Operating Voltage and Incoming Supply

The fitting shall operate with incoming supply at 240 Volts, A.C and shall be equipped with built-in step-down device to 24 Volts, A.C as the bulbs voltage required/specified. The incoming supply shall be provided an approved circuit protection system inclusive on-off switch, circuit breaker etc.

19.5 Built-in Step-Down Device.

The step-down device/transformer shall be adequately rated to provide the required output without over-heating and within acceptable harmonic distortion.

The performance characteristics to the step-down Transformer/Device or incoming supply system shall be set out below :-

i) Input : 240V A.C single phase ± 1% mains variation

50Hz ± 1% frequency variation

ii) Output: 24V ± 1% A.C single phase, 50Hz ± 1% nominal

19.6 Lighting System

The lighting system of each fitting shall provide the following:-

a) A convergent beam from light source focusing on the operation field. A number of bulbs, with their light output focused on the operation field OR a single lamp from which light output is reflected on a large reflector and produce multiple reflections effect would be acceptable.

b) Facilities for varying the field diameter of the light

c) Facilities for varying the intensity of the light output.

d) Non interruption of illumination in the event of mains failure.

19.7 The required illumination level for fitting is specified in the Schedule of Technical Requirement, Surgical Light Fitting. Appendix A.

The illumination levels specified shall be measured at the center of the illuminated field on the plane at right angles to the beam axis at a distance of 100cm (39 inches) from the face ot the transparent cover.

19.8 Light field control shall be provided with adjustment for varying the diameter of the illuminated field. The diameters of such fields shall be stated in the schedule of technical data.

19.9 The fitting shall have means of varying the lighting intensity. Lighting intensity control shall be provide with either continuous or step adjustment for varying the illumination intensity of the light. The adjustment controls shall be located outside of then lamp housing for quick and easy adjustment.

19.10 Colour of Lighting

The colour temperature of the light illuminating the operating field shall be within the range of **3,900 to 4,300 kelvin.**

19.11 Heat Limits

Each lamp reflector unit shall be provided with high efficiency, heat absorbing filters so as to ensure that the radiant heat energy in the light beam shall not exceed 25,000 microwatts per square centimeter at any point more that 7.6cm (3”) from the cover glass or lower edge of the reflector.

The fittings shall be provide with suitable means of heat control and dissipation, so that the exposed metal part will not exceed the permissible maximum operating temperature. Where the maximum operating temperature of exposed metal parts of the lamp housing exceeds 50 degrees C, a handle shall be provided to facilities its adjustment.

19.12 Internal cable

Electrical cables, or flexible cords used f internal wiring of fitting shall comply with BS 6004, BS 6007 or 6500 and where not fully shrouded by earthed metal or non-ignitable insulating material shall be sheathed with rubber, PVC or polychorprene.

The current carrying capacity of wiring connection shall comply with the Regulations for the Electrical Equipment of Building issued by the Institution of Electrical Engineers, except that no conductor smaller then 23/.0076" shall be Used.

All live conductors shall be completely shrouded by insulating material which shall be additional to the outer enclosure. The water absorption rigidity and non-flammability of all insulating materials shall be suitable for the particular purpose for which the materials are used.

19.13 The dimensions, illumination values movement etc., of the lamp shall follow those in that have been set out in Appendix A.

19.14 Each unit shall be complete with suspension mounting brackets lamp operation of the unit.

20.0 Uninterrupted Power Supply Unit

The Uninterrupted power supply (UPS) unit shall consist essentially or an isolator, transformer rectifier-charger, Inverter, sealed lead acid battery or equivalent, static transfer switch/ no break automatic chang-over, control and indicator etc., all en-closed in a metal cubicle. The UPS system shall operate satisfactory under the following condition:-

i) Ambient Temprature range : 22 deg.C to 40 deg.C

ii) Average maximum ambient temperature 40 deg.C

iii) Relative atmospheric humidity range : 30% to 65%

iv) Average macimum relative humidity: 90%

The UPS system shall be protected against the following environmental condition:-

i) Presence of water: Possibility of vertically falling drop..

ii) Presence of dust: Low but significant level.

iii) Presence of flora: Condition promote mould growth

iv) Presence of fauna: Insects and vermin's.

v) Vibration: Occasionally.

vi) Lightning: High level (about 140 thunder storm days/year)

vii) Altitude: Less than 100m above sea-level.

21.0 Method Of Operation.

The main power supply taken from the essential supply sub-switchboard is normally fed from the TNB services mains. However, in the event of TNB power failure, power supply is automatically fed from the standby Diesel Alternator Supply. Under normal condition, A.C mains supply shall be rectified into regulated D.C for charging the battery and powering the inverter. The inverter shall be inverted the D.C into A.C and provide power at 240V, 50Hz A.C to the load. The uninterrupted power supply units(ups), will supplied 240V, 50Hz A.C to the surgical light fitting and at the same tie maintaining charge to the batteries.

In the even of main and emergency power failure, the surgical light fitting will be continuously supplied at 240V A.C from the battery power source of the uninterrupted power supply unit **with no break**, as illustrated in the drawing.

The battery shall be capable of operating the light with no drop in illumination level for the period of 15 minutes without charging during that period. Tenderers shall quote a guaranteed maximum drop in illumination level after this period, starting from fully charged battery.

20.2 UPS Components

The transformers and referred shall have sufficient capacity to supply specified output to the light (as referred in the tender) and maintain a trickle charge to the battery at the same time.

The transformer core shall be manufacture fro laminated, high quality transformer steel substantially clamped by bolting or riveting to ensure minimum noise.

The winding shall be adequately sized and formed to prevent overheating under condition of continuous operating. They shall be adequately braced and insulated so as to ensure satisfactory operation in humid tropical climate.

The rectifier-charger shall be the full wave, SCR type. It shall be adequately rated to provided the required output without over-heating and within acceptable harmonic distortion.

The operation of the charger shall be fully automatic. The charger shall cut off once the required charge has been achieved and on again once the charge has been reduced.

The inverter shall be solid state type designed to supply 50Hz single phase 3 wire A.C power with the specified requirement when supplied with input D.C power from either rectifier or the battery. To protect from an external and internal fault the inverter shall be disconnected from D.C source by means of an electric device.

The static transfer switch shall consist of arrangement of thyristor connecting and the reserve mains to the load. During the inverter failure, the static switch shall transfer the load from the inverter to the reserve mains without interruption of the computer operation. Once the inverter has returned to normal. Automatic retransfer of load to inverter shall occur.
The output of the inverter shall be able to synchronized with the reserve mains and connected in parallel to effect an uninterrupted communication of the load to the mains from the inverter output and vise-versa.

20.3 Adequate filters shall be provides to maintain a smooth output. Solid state regulators by transistors or thyristors shall be incorporated to maintain a constant voltage charge irrespective, of load or supply voltage fluctuation. There shall be means to adjust the level of the output voltage. An automatic current unit device shall be incorporated to reduce the current under short circuit conditions.

The performance characteristics to the UPS shall be set out below:-

i)	Input	:	240 a,c, single phase ± 10% mains variation, 50Hz ± 5% frequency varation, Transient: 20% for switching surge.
ii)	Output	:	240V ± 1% A.C NOMINAL, FREQUENCY: 50Hz ± 0.5%, transient: +10% & -8%.

20.4 Battery.

The battery shall be the Sealed Lead Acid type of a proven or equivalent, reliable manufacture, cell connectors shall be rugged, readily removable an insulated.

The cell shall be housed in plastic container.

It shall be capable of delivering the rated power of the total lamp watts for 3 hours where at first an hour there is no drop in voltage while after one hour to an end voltage of 21.6V.

After a rated discharge, the charger shall be capable of charging the battery back to its fully charge state in 10 hours.

Batteries are to be housed in a following equipment shall be included :-

i). Two fate charger selector switch
   a). Float Charger
   b). Boost Charger

ii). An ammeter

iii). A voltmeter

iv). Indicating light, coloured green to indicate “A.C Mains ON”

v). Indicating light, coloured red to indicate “Main Failure”.

vi). Fuse for the incoming A.C supply.

vii). Fuse for the outgoing D.C supply, circuits are to be provided for supply to each of the surgical lights supplied under this contract.

viii). Warning device to indicate.

a). Charger fail condition.
b). Low voltage (below discharge voltage).
c). High voltage condition.
d). Earth fault condition of either poles of the battery.

20.5 UPS Housing.

Each complete uninterrupted power supply unit shall be enclosed in a free standing, ventilated, steel cabinet. The cabinet shall be constructed of sheet on a steel angle framework. All metal shall be adequate dimensions to prevent buckling or distortion under normal use. It shall be protected from rust by application of a 'phostatising process' followed by one coat of primer and 2 coats of enamel. Mounted brackets and supports shall be provided as required for some units.

A door (s) shall be provided to facilitate easy access to the battery for maintenance. The door shall have folded edges, concealed hinges and chrome plated, kickable handle.

The battery cells shall be mounted on a common tray within the cabinet and adequate ventilation (exhaust fan) shall be provided for the battery and the UPS panel.

20.6 Wiring.

The NSC shall wire from the A.C output protection (fuses) on the uninterrupted power supply units, to the theatre light fittings.

Wiring shall be carried out in PVC insulated cable run in Class B conduit. Wire size shall be 6mm² minimum but sized so as not to cause excessive voltage drop at the fitting.

Wiring shall be run via a wall mounted switch for each theatre. The switch shall be recessed in a suitable metal wall box, fitted behind a stainless steel flush plate and generally suitable for the application. The location of the switches shall generally be as shown on the drawings, but the exact location shall be as directed by the S.O.

All wiring shall be concealed, except within the battery room where it may be surface run. Conduits shall be run in a neat and work-manlike manner, generally run in the false ceiling space and adequately supported.

In addition to the switch controlling the surgical light fittings, wiring shall also be carried but for remote indication of “Mains ON” or “Main Failure”. The remote indication shall comprise of square shape green and red indicating light which shall illuminate to show the ‘main on’ or ‘main failure’ respectively. They shall be fitted to a stainless steel plate and mounted on a metal box for flush appearance to the general panel.

21.0 Manufacturer Inspection, Testing And Commissioning.

21.1 manufacturers Inspection.

The whole of the equipment to be supplied under the Tender shall be subjected to inspection and acceptance tests by the S.O.'s Representative and his officer in the factory prior to delivery. The approval by the S.O.'s representative of the result of any such inspection or test shall not prejudice the right of the Superintending Officer to reject the equipment if it fails to comply with the specification when erected or to give complete satisfaction in service within the Defects Liability period.

The cost required for the inspection and test, including the provision of all necessary equipment, facilities, expenses, allowances etc for the S.O.'s representative and his officers to inspect equipment and to verify the test, shall be deemed to be in included in the Tender Price.

Adequate notice shall be given when the equipment is ready for inspection or test and every facility shall be provided by the NSC to enable the S.O.'s Representative to carry the necessary inspection and test at the factory.

21.2 site testing.

On completion of the installation work on site, the NSC shall, at his own expense, arrange for all necessary test to be carried out on the equipment. The test to be carried out shall be as prescribed in the relevant British Standard Code of practice and other test deemed necessary by the S.O.s representative. In the event the installation fails to pass any of these tests, the NSC shall take such measures as are necessary to remedy the

defects and the installation shall not be considered as completed until such tests have been passed.

The S.O.'s representative reserves the right to be present at all test and the NSC shall give at least one week notice in writing to the S.O.'s representative for this purpose. In any case no test shall be carried out without prior approval of the S.O.'s Representative. Copies of all the tset certificates shall be submitted to the S.O's Representative within one week after the completion of the testing.

21.3 Commissioning.

On successful testing of the complete installation, the NSC shall arrange to commission the equipment in the presence of the S.O's Representative on a date to be decided by the S.O's Representative.

22.0 Rejection Of Plant.

Any item of plant or component which fails to comply with the requirements of this specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site within the Defects Liability Period of the Contract may be rejected by the Superintending Officer either in whole or in part as he considers necessary.

After adjustment or modification if so directed by the superintending officer, the NSC shall submit the item for further inspection and/or tests. Equipment or components with defects of such nature that, in the opinion of the superintending officer, the requirements of this specification cannot be fulfilled by adjustment or modification shall be replaced by the NSC at his own expense and to requirements.

23.0 Performance.

The NSC shall demonstrate the correct operation of all mechanical aspects of the equipment, the correct operation of all controls and generally prove the installation in complete. He shall measure and records the lighting values omitted by the fittings and other feature of the equipment and requirement.

23.1 Performance Under Power Failure Conditions.

The operation of the lamps shall be operated under simulated mains failure conditions. The capacity of the battery to operate the surgical lights for a period of 15 minutes without main supply shall be demonstrated. High meter reading shall be taken at certain time intervals at identical location each time. These readings shall be logged and shall not fall below the guaranteed level. Failure to meet this condition may. At the discretion of the S.O are grounds for rejection of the equipment.

23.2 Records.

A record shall be kept of the readings of all fixed and temporary instruments and Ganges immediately before and after each ‘running’ test and reasonable intervals (in proportion to its duration) during each test. The record of readings taken at intervals for a period after certain test shall be kept. The ambient temperatures and other relevant data shall also be recorded in each case. A record shall be kept of any evidence during testing of faulty operation of (or Usual occurrence in) either the equipment included in this Sub-Contract or any associated equipment.

23.3 Repeat Tests.

Should one or more of any series of tests results in the failure of the installation or any part or it to perform in accordance with the requirements of the specification or guarantees the installation shall be deemed to have failed in initial test in that respect. The NSC may than request the S.O to amend the testing programme to allow time than or latter for modifications or adjustment to the installation to overcome the defect.

The S.O will make such alternations to the testing programme as is reasonable for this purpose and the unsuccessful test series shall be re-performed after the modification and adjustments have been made. The S.O may at his discretion, require the re-performance of all or any of other test that were carried out prior to making of modification and adjustments.

Should the installation again fail to perform in accordance with the requirement of the Specification and guarantees during the first or any further re-performance of a series of test, the granting of permission to make further modifications and adjustment and to make further re-test shall be entirely at the discretion of the S.O.

The NSC shall bear the full cost of conducting such further re-test, including the re-imbursement to the S.O and other essential participants of their cost incurred in being present at, and/providing for such re-test.

24.0 SERVICE & MAINTENANCE

General

The Defects Liability Period shall be as stated in the Condition of contract.

24.1 Scope.

During the Defects Liability Period, the NSC shall make at least one inspection of the installation each month and at the time of such inspection shall perform routine maintenance including the following services listed:-

i) Inspect all the switchboards, control panels and distribution boards. Check and replace or make good where necessary the following.
   a). All the HRC fuses or MCCB(s).
   b). All control and protection relays and devices.
   c). All starters and contactors.
   d). All meters and indicating lights.
   e). All switches and push buttons.
   f). All loose and burnt wires and terminations.
   g). All mechanical linkage, safety link and locks.

ii) Inspect all lighting and power points.
   Replace and make good the following:-
   a). All ballasts and starters.
   b). All switches.
   c) All loose and burnt wires.
   d) All fixing and mechanical supports.
   e). All power outlets.

iii) To check battery condition, charger unit operation.

iv) Top up battery electrolyte as required.

v) Check condition of UPS panel and associated equipment.

vi) To lubricate all moving parts as recommended by the equipment manufacturers.

vii) To top up all hydraulic oil as recommended by the equipment manufacturers.

viii) To clean all parts that are inaccessible to the user.

ix) Make all other checks as recommended by the equipment supplier.

24.2 report.

The NSC shall submit to the S.O one month before the end of the defects Liability Period a full report with test and check list of the complete installation detailing the condition of each equipment. The NSC shall supply all labour, materials tool and parts necessary to rectify the defects.

24.3 Repairs.

The NSC shall, at the request or owner, send a competent person during the NSC normal working hours immediately in is available, at times other the those of the inspection and servicing herein before described, for the purpose of adjusting or rectifying any fault. The owner shall notify the NSC of any fault in the proper operation of the plant or equipment as early as possible after occurrence thereof. No extra payment shall be required for additional visits or servicing required under this clause.

24.4 Competent Person.

The NSC shall ensure that all servicing, maintenance and repairs carried this Contract are performed by competent person shall, if so required inform the Owner of the name of such person or persons.

The NSC shall ensure that the provision of the Electricity Regulations of any law relating to the installation for the time being in force are complied

with so far as they apply to the work to be executed under this Sub-Contract.

24.5 Spares.

Additional material and labour required shall furnished by the NSC at normal selling prices and rate at wages. The NSC shall carry sufficient spares at all time. These shall include all consumable item such as fuses, fluorescent tubes and bulbs.

24.6 Services Excluded.

Services excluded during the defects Liability Period are attendance to daily switching operation for normal running of power equipment's and plant.

24.7 Services Contracts.

The NSC shall quote the cost of subsequent service contracts for a period of 24 months from the date of expiry of the Defects Liability Period. This quotation shall include complete details of the work e.g. period of services, work schedules etc. The price of this quotation shall not be included in the total tender price but shall be binding in the NSC should his services are required by the Hospital Authorities during that period.

24.8 Record Drawings.

Within a month after practical completion of the project, the Electrical Contractor shall submit to the Superintending officer one set of true to scale negatives (155/165 gm/sq.m) and four set on prints of each of the approved working drawings with modifications as carried out during erection and other drawings deemed necessary by the Superintending Officer for record and maintenance purpose.

All drawing submitted by the Electrical Contractor shall have the following particulars at the lower right hand corner in addition to the manufacture's name, date, scale, drawing number and title:-

JABATAN KERJA RAYA
CAWANGAN ELEKTRIK
IBUPEJABAT JKR MALAYSIA
KUALA LUMPUR

Contract No:……

Tender:……

Appendix 'A'

Schedule of Technical Requirements of Surgical Light Fittings.

No	Technical Particulars	Requirements
1	Light source Asasasa aada	

Appendix `A'

Schedule of Technical Requirements of Surgical Light Fittings.

No	Technical Particulars	Requirements
1	Light source a) Voltage rating of each bulb (V/dc/ac) c). Type of bulb d). Minimum fife of bulb (at normal operating voltage)	24V Halogen 1000 hrs
2	Max. Intensity of light at a distance of lm - not less than	60,0001w
3	Adjustable range of light field intensity at a distance of 1m without moving position of lamp - not I s than.	45,000 to 60,000 lux
4	Adjustable range of light intensity at a distance of lm without moving position of lamp - not I s than	4 steps
5	Adjustable range of light field diameter at a distance of lm without moving position of lamp - not less than.	150 to 200 mm
6	Light field diameter at minimum focus a distance s f lm without moving position of lamp - not less than.	150 mm
7	Depth of field of constant light intensity - not less than	600 mm
8	Colour Temperature	3900 - 4000 Kelvin

Appendix `B'

Schedule of **Technical Particulars** & **Guarantees**

Surgical Light Fittings.

(Tenderer must fill in the following details)

No	Technical Particulars	Offered
1	Brand	
2	Country of Manufacture	
3	Model	
4	Light source a). No. of bulbs b). power rating of each bulb(watts) Voltage rating of each bulb (V/dc/ac) c). type of bulb d). Approximate life of bulb, hrs. (at normal operating voltage)	
5	Intensity of light a). at source, lux b). at a distance of 1 m, lux	
6	Adjustable range of light field diameter at a distance of 1m without moving position of lamp.	
7	Adjustable range of light intensity at a distance of lm without moving position of lamp.	

Appendix `B'
(cont'd)

Schedule of Technical Particulars & Guarantees

Surgical Light Fittings.

(Tenderer must fill in the following details)

NO	Technical Particulars	Offered
8	Continuous/no. of steps	
9	type of adjustments: transformer/resistance/electronic etc.	
10	Depth of field of constant light intensity	
11	Colour T e m p e r a t u r e	
12	Weight	
13	Filters a) Material of lamp filters b) Heat absorption efficiency (%) b) Light loss (%)	
14	Lamp a) Operating voltage of lamp, ac/dc V b) total power of lamp watts	
15	Step-down transformer and protection device a) transformer: VA/type b) MCB/circuit breaker: Amp/brand	

Appendix `C'

Schedule of Technical Particulars & Guarantees

Uninterrupted Power supply units

(Tenderer must fill in the following details)

Technical Particulars of UPS	**Offered**
a) Brand and model	
b) Country of manufacturer	
c) Local Agent	
d) Input voltage range	
e) Input frequency range	
f) Output power rating	
g) Output steady state voltage	
h) Output voltage regulation	
i) Output frequency	
j) Frequency regulation	
k) Output voltage transient and recovery time with load change 50% rating	
l) Total harmonic voltage	
m) Phase angle limit	
n) Overload capacity	
o) Overall power factor at no load	
p) Overall power factor at fill load	

Appendix `C'
(cont'd)

Schedule of Technical Particulars & Guarantees

Uninterrupted Power supply units

(Tenderer must fill in the following details)

Technical Particulars of Rectifier Charger	Offered
a) Input voltage	
b) System pulse-nos	
c) Starting system (sort start or others)	
d) System for constant current charging	
e) Voltage ripple at battery %	
f) Permissible a.c. mains voltage variation + %	
g) Permissible a.c. mains frequency variation + %	
h) Input power at 100% load on inverter and battery fully charged	
i) Output voltage in a trickle charger service. Output voltage in boost charger service.	
j) Output voltage tolerance with mains variation 10% and full load on rectifier	
k) Rated output	
l) Rated output current	
m) Overcurrent capacity, one hour	
n) Efficiency, mean value 1/41/1 load	
o) Recharging time from fully discharged batteries and full load on the inverter to:- i) 90% of battery capacity ii) 100% of battery rapacity	
p). Battery charging current limit	

Appendix `C'
(cont'd)

Schedule of Technical Particulars & Guarantees

Uninterrupted Power supply units

(Tenderer must fill in the following details)

Technical Particulars of Inverter	Offered
a) Input DC voltage range	
b) Input power at full load output	
c) Input current at lowest DC input V	
d) Rated continuous output power at PF~.9 valid within the entire input voltage range.	
e) Maximum output power at PF~.5 for 60 seconds valid the entire input DC voltage	
f) Output voltage	
g) Output voltage tolerance i) Steady state, at symmetrical load. ii) 100% unbalance load iii) Dynamic at 25% load change iv) Dynamic at mains failure and restoration	
h) Response time	
i) Output frequency	
j) Output frequency tolerance	
k) Output voltage waveform l) Maximum total harmonic restoration	
m) Phase displacement at symmetrical load	
n) Phase displacement at unbalance load	
o) Efficiency at full load i) at normal input voltage ii) at minimum DC-voltage	

Appendix `C'
(cont'd)

Schedule of Technical Particulars & Guarantees

Uninterrupted Power supply units

(Tenderer must fill in the following details)

Technical Particulars of Battery	Offered
a) Brand	
b) Type	
c) Model No.	
d) Capacity,(At 5 hour rate),AH	
e) Nominal volts per cell	
f) No. of cells	
g) End voltage after a 3hr. Discharge	
h) Charging time after a rated discharge	
i) Max. output current at end of discharge period	
j) Rated discharge time for converter operation at full load	
k) Cell voltage at float condition	
l) Cell voltage at end of discharge period	
m) Material of containers (plastic/ steel).	

Technical Particulars of Input Filters	Offered
a) Type	
b) Input harmonic feedback achieved	

Technical Particulars of Housing	Offered
a) Dimension	
b) Gauge of steel	

Schedule of Special Tools Gauges etc, For Normal Maintenance

Equipment Name:

NO	Description	Total Qty.

Attach additional sheets if required.

Signature: ……

Name of Tenderer: ……..

Official Stamp:

Date: ..... ……..

Schedule of Other Equipment Accessories And Works

No	Description Including Quantity	Price RM
	Total	

Attach additional sheets if required.

* This price must agree with the price stated in Item 4(d) of schedule of Rates and Prices.

Signature: .....……..

Name of Tenderer: .....……..

Official Stamp:

Date: ..... ……..

Statement Of Compliance With Specification & Drawing etc.

We declare that the equipment offered are in just conformity with the Specifications & Drawings except for the following details listed below:

No Item	Clause of Specification/Drawing No	Detail Of Compliance

Attach additional sheets if required.

Signature: .....……..

Name of Tenderer : ……

Official Stamp:

Date: .. ……

Statement Of Recommended Spares

The following are the recommended spare for the equipment and available from local stock or * from stock held elsewhere

The prices quoted are not delivered to site and shall be firm for period of two (2) years from the date of completion of the contract Defect Liability Period. (* State the Location).

Equipment Name:

Item	Description	Qty	Price Per Unit	Location

Attach additional sheets if required.

Signature: .....……..

Name of Tenderer: ……

Official Stamp:

Date: ……

Schedule of Testing Equipment

Internal Light Photometer

1. Brand :
2. Type/Model :
3. Country of Manufacture :
4. Measurement range :
5. Price/Unit :
6. Accuracy :
7. Description :

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.....
.....

Signature: ..... ……

Name of Tenderer: ..... …….

Official Stamp:

Date: ..... ……..

Schedule of Testing Equipment

Hydrometer

1. Brand :
2. Type/Model :
3. Country of Manufacture :
4. Measurement range :
5. Price/Unit :
6. Accuracy :
7. Description :

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Signature ……

Name of Tenderer: ..... ……

Official Stamp:

Date: .....……..

Schedule of Testing Equipment

Battery Capacity Meter

1. Brand :

2. Type/Model

3. Country of Manufacture :

4. Measurement range :

5. Price/unit :RM

6. Accuracy :

7. Description :

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Signature : .....……..

Name of Tenderer: ..……..

Official Stamp:

Date: .....……

Service & Maintenance.

Equipment: .....

Our Tender for the Contract works is accepted in part of in full if so desired to by the Government no shall enter into a contract with government to provide service and Maintenance as per details attached the equipment for a period of three (3) years at the fixed rate ……% of the full or part of an Tenders Prices.

The service and maintenance will commence on completion of the contract Defects Liability Period and will be provided in accordance with the specification any other requirements as per details attached for the particular type of plant and equipment installed.

The above prices include all costs except replacement parts which will be charge for separately at the rates nominated in the schedule of recommended spares.

Signature: ..... ……..

Name of Tenderer: . ……..

Official Stamp:

Date: ……