TENDER DOCUMENTS

FOR

CONSTRUCTION OF L 2 & L 3 TRAUMA CENTRES AND SUPPLY AND INSTALLATION OF MEDICAL EQUIPMENT IN THE STATE OF BIHAR

Notice no. TCIL/05/ 527/301/2011/ACD/ PACKAGE-2
Dated 01.12.2011

(VOLUME- II)- Revised

[SPECIAL CONDITIONS OF CONTRACT (SCC)
&
TECHNICAL SPECIFICATION]

PACKAGE - 2

Telecommunications Consultants India Ltd.
TCIL Bhawan, Greater Kailash-I
New Delhi – 110048
Phone : 91-11-26202020 / Fax No. : 91-11-26242266/26241776
www.tcil-india.com

INDEX

S.NO.	DESCRIPTION	PAGE
1	SPECIAL CONDITIONS OF CONTRACT(SCC)	3-6
2	PARTICULAR SPECIFICATIONS	7
3	TECHNICAL SPECIFICATIONS	8-150
4	LIST OF APPROVED MAKES	150-154

SPECIAL CONDITIONS OF CONTRACT(SCC)

PART I (GENERAL /CIVIL WORKS)

1.0 INTRODUCTION

The Bihar State Health Society (BSHS), Govt of Bihar, intends to establish 9 Trauma Centres for Bihar State Health Society in Different District in Bihar. BSHS has entrusted the work to TCIL Ltd, as Project management consultant. The work broadly involves construction of Trauma centres building and other facilities like medical equipments etc.

9 Trauma Centre's are as under-

LEVEL II

1. Distt Hospital (Level – II), Purnia
2. Darbhanga Medical College(Level – II), Darbhanga
3. SK Medical College (Level – II), Muzaffarpur
4. AN Magadh Medical College Hospital (Level – II), Gaya

LEVEL III

5. Trauma Centre (Level – III) at Civil Hospital, Kishanganj
6. Civil Hospital (Level – III), Gopalganj
7. Civil Hospital (Level – III), Jhanjarpur
8. SH – Sasaram, Distt (Level – III), Rohtas
9. Civil Hospital (Level – II), Madhepura

The work of 9 Trauma Centres is to be executed in **TWO PACKAGES** according to the geographical location in the state.

PACKAGE I

Package I Contains 4 No's of Trauma Centres in which 1 No Trauma centre (LVL II) is located in Gaya & Other 3 No Trauma centres (LVL III) are located in Gopalganj, Sasaram (Rohtas) & Madhepura in Bihar.

PACKAGE II

Package II Contains 5 No's of Trauma Centres in which 3 Nos Trauma centres (LVL II) are located in Muzaffarpur , Purnia , Darbhanga & Other 2 No Trauma centres (LVL III) are located in Kishanganj & Jhanjarpur in Bihar.

2.0 GENERAL

2.1 The work in general shall be carried out as per the latest CPWD / BSR 2011 specifications with upto date correction slips, unless otherwise specified in the nomenclature of the individual item or as per specifications provided with this tender. Any item not covered under these specifications shall be carried out as per approved specifications. In case any item is not covered in any of these documents, the same shall be carried out as per the latest BIS Code in practice or as per approval of Engineer in Charge of TCIL.

2.1 Where any portion of special conditions of contract is repugnant to or at variance with any provision of the with Instructions to Tenderer and General Conditions of contract and/or the other documents forming part of the contract then unless a different intention appears the provision of the Special Conditions of Contract shall be deemed

to override the provisions of the general conditions of contract and / or the other documents forming part of the contract only to the extent such repugnant/variations in the special conditions of contract as are not possible of being reconciled with the provision with Instructions to Tenderer or General Conditions of contract and/or the other documents forming part of the contract.

2.2 All electrical work shall be carried out as per CPWD specification for Electrical Works Part-1 Internal Works 2005, Part – II External Work 1995 & BSR 2011. The installation shall comply with the requirement of India Electricity Rules 1956 as amended up to date.

3 NATURE OF CONTRACT

3.1 The Contract shall be on percentage rate for all the items for the finished work as per the Contract Documents.

3.2 The rates quoted by the Contractor shall be deemed to cover for all the minor details / requirement of construction, which may not have been specifically shown on the drawings or given in particular specifications, BOQ, but are required as per established engineering practice.

4 SET OF CONTRACT DOCUMENTS

Tender document shall be read as under:

"The following documents will complete a set of tender documents:

Volume-I

General Conditions of Contract
Instruction to Tenderers

Volume-II

Notice Inviting Tenders
Special Conditions of Contract
Technical Specifications
List of Approved makes

Volume-III

Tender drawings

Volume-IV

Schedule of Rate / Bill of Quantities

5 ACCESS TO SITE

The proposed sites are located in different district/location in Bihar. All the sites are well connected to the road/rail network. The contractor shall make sure that while carrying out his responsibilities in connection with this project he will not disrupt traffic movement along public road or any other approach to the site.

6 DEFINITIONS

Definitions as per General Conditions of Contract (GCC) shall be amended or the following definitions appended as under

6.1 The word “Site” in various clauses of General Conditions of Contract (GCC) and other documents of this Tender shall mean either part or all of “Trauma Centers for Bihar State Health Society (BSHS) at Bihar”.

6.2 Wherever in General Conditions of Contract, approval of TCIL / Executing Agency is mentioned, it shall also include the approval from the Owner / Owner’s representative also.

7 DRAWINGS

7.1 The drawings duly signed by Architect / Consultants are diagrammatic but shall be followed as closely as actual construction permits. Any deviation made shall be with prior approval of and in conformity with the directions of the Engineer-in-Charge of TCIL.

7.2 Architectural drawings shall take precedence over structural drawings and structural drawings, in turn, shall take precedence over engineering services drawings if any conflict arises regarding dimensions.

7.3 The contractor shall verify all dimensions at site and bring discrepancies, if any, to the notice of the Engineer-in-Charge of TCIL before commencing any construction work. Decision of the Engineer-in-Charge of TCIL will be final and binding on the contractor.

8 SCOPE OF WORK

8.1 The scope of work comprises execution of various items as per BOQ along with General Conditions of Contract (GCC), Instruction to Tenderers (ITT), Special Conditions of Contract (SCC), Particular Specifications, and Drawings etc.

8.2 The contractor shall draw up an implementation schedule in consultation with Engineer-in-Charge of TCIL and BSHS authorities.

8.3 The contractor shall seek and obtain necessary prior permission from BSHS /TCIL authorities before commencement of work in any area in accordance with the implementation schedule. Agreement to an implementation schedule does not provide the contractor permission to commence work in any area without seeking immediately prior necessary permission to work in that area.

8.4 The contractor shall notify the Engineer-in-Charge of TCIL regarding disruption of work if and when so happens. Any claim for delay in works on account of such disruptions or otherwise will not be admissible.

8.5 The contractor shall coordinate with all other sub-contractors or vendors selected by the client for other works in relation to this job and extend all support to the other vendors as far as practicable.

8.6 The contractor shall make his own arrangement for storage of materials outside the site of work. However, if any space is available within the site of work the contractor shall seek and obtain necessary permission from the BSHS authorities regarding the same. Nevertheless, security of the material shall be the contractor’s responsibility.

8.7 The contractor shall, at all times, maintain at site one clean set of all drawings issued to him for reference of the client, consultant or any of their representative.

8.8 Manufacturer’s drawings, catalogues, pamphlets, equipment characteristics data, performance charts and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labeled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.

8.9 The contractor shall maintain a site order book at the site office. All instructions received from the Engineer-in-Charge of TCIL relating to the work shall be retained in the file.

8.10 The contractor shall establish an effective quality control system at the site and implement the same to enforce quality control on all items of the work and the project at all stages.

8.11 The contractor shall take all precautions and preventive measures against fire hazards at the site and shall assume full responsibility for the same.

8.12 All cutting and drilling of walls or other elements of the building for the proper entry/installation of inserts, boxes, equipment, etc. shall be carried out using electrically operated tools only. Manual drilling, cutting, chiseling, etc. shall not be permitted.

8.13 The contractor shall provide luminous painted warning / caution notice boards with flickering light arrangements around the area of working place on all sides as applicable where the work is in progress. Any cut-out on floor shall be duly cordoned off with ribbonned barricades for safety of workers as well as for passersby. Safety to contractor's personnel as well as all visitors in and around the area of work shall be the contractor's responsibility.

8.14 Before taking up the work of excavation, the contractor shall provide proper barricading of the trenches as per approved design and as per specifications so as to avoid access of unauthorized traffic (pedestrians and vehicular) to the place of work.

8.15 The contractor shall not disturb/damage or pull down any hedge, tree, building etc within the site or his area of operation without the written permission of the Engineer-in-Charge of TCIL or concerned local authorities.

8.16 The contractor shall at all the times during the progress of work take all requisite precautions and use his best endeavors for preventing any riotous or unlawful behavior by or among the workers and other employees at the work and shall preserve peace and protection of the inhabitants and the security of property in the neighborhood of the work.

9 SITE DOCUMENTS

The following site documents shall be maintained by the contractor at site

a) Copy of contract documents and drawings
b) Computerized bill format
c) Site Order Book
d) Material testing registers/ Quality Inspection Reports
e) Measurement books on computerized format
f) Progress bar chart
g) Sample approval register
h) Visitors register
i) Any other detail and specific requirement as deemed necessary
j) Hindrance Register
k) Work Diary
l) Stage passing Register

In case the above are not provided at site within 10 days of placement of LOI, TCIL shall procure the same at the risk and cost of the contractor and the expenditure so incurred shall be recovered from the contractors.

10. VIDEO CONFRENCING:

The contractor shall make provisions of video conferencing at project site. For monitoring progress by Corporate office, TCIL or other offices as directed by Engineer-in –charge, TCIL.

PARTICULAR SPECIFICATIONS

CIVIL WORKS

1. General: The work shall be carried out strictly in accordance with particular specifications and drawings. The drawings, specifications BOQ etc. shall be taken complementary and also supplementary to each other and shall form part of this contract. Any work or material shown on drawings and not specifically included in BOQ/specification or vice versa shall be executed and deemed to be included in the scope of work for lump sum rate. However, the steel for reinforcement work shall be TMT-BARS of Fe-415.

2. In case there are no specifications for items shown on the drawings or where items are not exclusively described, the general specifications of CPWD shall be followed for which nothing extra shall be paid. In case, no details are available even in CPWD specification, then decision of Engineer-In-charge is final & binding on the contractor.

3. Scope of works : The scope of work for buildings under this contract includes for full & final and entire completion of all works including all internal and external services in all respects described in particular specification Part-I and as shown on drawings forming part of the contract.

4. Although all the details of construction have been covered in these documents, any item or details of construction not specifically covered but obviously implied and essential to consider Civil works and all internal and external services complete and functional, shall be deemed to have been covered in the lump sum quoted. The cost of external development works pertaining to a particular contract shall also be carried out on a final lump sum price based on the rates quoted for each item. The tenderer may however, consider a minimum level of specifications conforming to IS code or National Building Code to cover any missing details.

5. Sample of Materials: The Contractor shall produce samples of all materials and shall obtain approval of these in writing from Architect/ Project Engineer before he places bulk order for the materials for incorporation in the works. The samples must be produced atleast six week before they are to be incorporated in sample dwelling units. Materials to be incorporated in the work shall conform to latest relevant ISI. The items should be ISI marked where manufactured.

6. Slopes : Adequate slope shall be provided in areas where there is likelihood of excess of water such as toilets, balconies, verandah, kitchens, terraces, top of chajjas, window cills, plinth protections etc. though these may not be expressly shown in drawings.

7. Curing: Exposed surfaces of all cement works viz. cement concrete, brick work, flooring, plastering, pointing and the like shall be cured by keeping the surface adequately and continuously wet as directed by Architect and Project Engineer for at least seven days where ordinary portland cement has been used. Approved curing compound may be used in lieu of moist curing with the permission of Architect and Project Engineer. Such compound shall be applied to all exposed surface of cement works as soon as possible after the initial setting of cement. This shall be without extra cost.

TECHNICAL SPECIFICATIONS

CIVIL WORKS- NON-SCHEDULED ITEMS

1. CHICKEN WIRE MESH

Chicken Wire Mesh shall be of galvanized mild steel wire cloth conforming to IS 1568-1970. Wire Cloth shall be regularly woven wire with a number of equally spaced parallel wire in both warp and weft direction to produce uniformly openings. The wire cloth shall be properly selvedge by one or more wires in each edge.

2. STAINLESS STEEL RAILING

1. All Pipes to be Stainless as per SS 304 Grade with tube thickness of 1.6 mm having tolerance level as per ASTM A554
2. All components in railing including baluster, pipes, caps etc. to be in Gritt Satin finish
3. Balusters
   a. The balusters to have a standard height of 856 mm
   b. All components used in the baluster to be manufactured using SS 304 grade material turned and finished on CNC and other automatic Machines.
   c. The base plate of the Baluster to be solid Stainless Steel of size 103 mm dia and 6 mm in thickness.
   d. All connectors to be fixed to the Baluster using Allen Bolts. The baluster to have Zero welding except on the bottom plate.
   e. Balusters to be fixed using Stainless Steel M8 Fasteners with SS 304 grade Stainless Steel Caps
   f. The Baluster neck to be modular and can be tilted as per the handrail. The neck plate to be 2 mm thick in Stainless Steel 304.
   g. Handrails to be connected to the neck plate using Stainless Steel CSK M5*10 mm Screw only
4. Balusters to be installed with a centre to centre distance of 1 mt. However this distance can vary as per site conditions

3. POWDER COATED ANODISED ALUMINIUM FRAME

Powder Coated Anodised aluminium frame for windows, ventilators only with one or more rebates and shutters party fixed type without sash bars and partly with glazed shutters sliding type without sash bars, aluminium sections weighting 1.30 kg//m for frames and 0.55 Kg/m for shutters respectively, 10.00 Kg/Sqm (4mm thick) glass panes including necessary joining cleats glazing clips, rubber packing, anodised aluminuium snap beading, CP Brass/stainless screws anodised aluminium fitting such as tower bolts 200/150mm handles 125/100mm for doors windows respectively and aluminium anodised sliding bolt 300/250mm/ long floor door stopper 150mm over all length of cover plate all as per schedule of fitting complete all as specified.

4. ACID PROOF TILES
FLOOR APPLICATION

Substrate Preparation

1. The ground should be compacted properly by ramming and applying water on it as per the standard practice to create a firm base. Ensure that there is no settlement of base.
2. For Medium Traffic Floor, make 3" thick PCC (plain cement concrete) in 1:4:8.

Laying Method

a. Prepare base mortar by mixing sand and cement in 1:4 proportions.
b. Lay the mortar on the substrate prepared as mentioned above in required line and level. It should be noted that in any case the bed mortar thickness should not be more than 1" thickness.
c. Mark the centerline and fix the tiles on all the corners and center in the required level. Preferably, start fixing tiles parallel to longer span.
d. Prepare thick cement paste by mixing water & cement. Apply this paste on the backside of the tile to fix kit.
e. Lay the tiles on this firm base and ram lightly with the help of rubber hammer OR trowel from top. See that the tile top surface is laid in required line and level with proper joint gap.
f. Utmost care should be taken while fixing other tiles in terms of matching lines and keeping exact joint width between tiles. (For maintaining joint width spacers are recommended of required joint thickness).
g. Fill the joint gaps after 24 hours when the tiles are properly set and cured with any well-known joint filler. Prepare the consistent paste as per the method instructed by the joint filler manufacturer. Fill the joint with the help of rubber trowel. Before grouting all the joints should be free from any dust and impurities.
h. For filling the joints, keep the filler paste on the tiles and fill the gaps by spreading it in the space between the tiles with the help of rubber trowel in such a way that the entire area of joint gaps are filled with the joint filler paste. Apply light pressure of finger in such a way that it creates 'U' shape between two consecutive tiles and works as a small channel to pass water through it.
i. Remove the excess joint filler from the setting time as recommended by the supplier with the help of rubber trowel.
j. Clean the tile surface with the help of a wet sponge or clean cloth immediately before setting time of joint filters. Ensure that the joint filler is protected properly after the mild acid wash as recommended by the joint filler supplier, by immediately removing the excess acid from the floored area

5. ANTI STATIC AND ELECTROCONDUCTIVE VINYL FLOORING

Anti-static and electroconductive – Vinyl flooring permanently static conductive pressed homogeneous vinyl flooring tested as per EN 649. The vinyl flooring should be classified as per EN 685 as commercial: 43 & Industrial: 43 with a wear layer of 2mm abrasion thickness loss as per EN 660: Part 1 group ≤0.15mm & volume loss EN660: Part 2 ≤4.0mm^3. Electrical resistance as per ESD-Approval. SP-method 2472 EN 1081 is R ≤10^8Ohms & R_1 5 X10^4 ≤ R ≤10^6Ohms, R_2 5 X10^4 ≤ R ≤10^6Ohms. Sound reduction as per EN ISO 717/2 should be Approx. + 4db, Clean room test as per ASTM F51/00 should be Class A. Light fastness as per EN ISO 105-B02 should be ≥ level 6.The slip resistance as per DIN 51130 EN 13893 should be R97 ≥ 0.3.

Wall Guard - Vinyl Homogeneous

The wear layer covering as per EN 429 should be 1.3mm and surface treatment should be PU- shield. The total thickness as EN 428 is 1.3mm. The dimensional stability as per EN 434 is ≤0.40% & Wetroom should be approved by test as per GBR Class VT. Reaction to fire as per EN 13501-1 is class Ns2 d0, BS 476:part 7is class 1, As/NZS 3837 is Class B, UNI 8457 is class 1 & ASM E84 is class B. The light fastness as per EN ISO 105-B02 ≥ 6.The chemical resistance as per EN 423 is good resistance. The clean room test as per ASTM F26/65 is satisfactory & ASTM F51/00 is Class A.

6. ALUMINIUM WORK

A) **ALUMINIUM DOORS, WINDOWS AND VENTILATORS:**

Aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular and other sections of approved make conforming to IS: 733 and IS : 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold fastners including necessary filling up of gaps at junctions, at top, bottom and sides with

required PVC/neoprene felt etc. Aluminium sections shall be smooth, rust free, straight, mitered and jointed mechanically wherever required including cleat angle. Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing and panelling to be paid for separately.
Powder coated aluminium (minimum thickness of powder coating 50 micron).

All Sections of Aluminium work being used in the work will be Powder coated minimum thickness of powder coating 50 micron

Codes and Standards:

The Codes and standards generally applicable to the work of this section are listed herein under:

IS: 733 Wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purpose).

IS: 1285 Wrought aluminium and aluminium alloy extruded round tube and hollow sections (for general engineering purpose).

IS: 1362 Dimension for screw thread for general purpose.
IS: 1761 Transparent sheet glass for glazing and framing purposes.
IS: 1948 Aluminium doors, window and ventilators.
IS: 1949 Aluminium windows for industrial buildings.

The following clauses are intended to amplify the requirements of the references/ documents listed above and the contractor shall comply with these clauses.

SAMPLES AND SHOP DRAWINGS

All aluminium doors, windows and ventilators shall be furnished by an approved manufacturer and shall be conforming to IS:1948. Before placing their order, the contractor shall submit shop drawings and samples for the approval of the Engineer. If required, the contractor shall also submit the necessary engineering calculations. Shop drawings shall clearly show all work including mechanical systems, the arrangement of components, the sequence and details of fabrications, assembly and erection. These drawings shall also give full size details, all dimensions and thickness anchoring devices and accessories.

7. FLUSH SHUTTERS FOR DOORS & CUPBOARDS

Flush shutter for doors & cupboards shutters shall be solid core types with block board core as indicated in Bill of Quantity and shall conform to IS-2202 and ISI marked with blockboard (conforming to the requirements as per IS-1659 -1969 with frame of 1st class Hardwood and well matched commercial 3 ply veneering with vertical grains or cross bands and both faces decorative lamination 1mm thick.

8. FLOAT GLASS

Float Glass Sheet of nominal thickness 4mm (weight not less than 10 kg/sqm) and 5mm (weight not less than 13.5Kg/Sq.M. Sheet glass shall be flat, transparent and clear as judged by the naked eye. It may, however, possess a light line when viewed edgewise. It shall be free from any cracks and other defects. Float Glass make “SAINT GOBAIN” or other make equivalent to “SAINT GOBAIN” may be used as per approval of Engineer-in-charge, TCIL.

9. ULTRATECH SURFACE TEXTURE FINISH

10. EARTH FOR FILLING

The earth used for filling shall be free from salts, organic or other deterious matter. Highly expensive soils like black cotton soil shall not be used, unless so specified. All clods of earth exceeding 50mm shall be broken or removed. Earth obtained from borrow pits and surplus earth from excavation, if any, shall be directed by used for filling and double handling avoided.

TECHNICAL SPECIFICATIONS

CIVIL WORKS- NON-SCHEDULED ITEMS

2. CHICKEN WIRE MESH

Chicken Wire Mesh shall be of galvanized mild steel wire cloth conforming to IS 1568-1970. Wire Cloth shall be regularly woven wire with a number of equally spaced parallel wire in both warp and weft direction to produce uniformly openings. The wire cloth shall be properly selvedge by one or more wires in each edge.

2. STAINLESS STEEL RAILING

5. All Pipes to be Stainless as per SS 304 Grade with tube thickness of 1.6 mm having tolerance level as per ASTM A554
6. All components in railing including baluster, pipes, caps etc. to be in Gritt Satin finish
7. Balusters
   a. The balusters to have a standard height of 856 mm
   b. All components used in the baluster to be manufactured using SS 304 grade material turned and finished on CNC and other automatic Machines.
   c. The base plate of the Baluster to be solid Stainless Steel of size 103 mm dia and 6 mm in thickness.
   d. All connectors to be fixed to the Baluster using Allen Bolts. The baluster to have Zero welding except on the bottom plate.
   e. Balusters to be fixed using Stainless Steel M8 Fasteners with SS 304 grade Stainless Steel Caps
   f. The Baluster neck to be modular and can be tilted as per the handrail. The neck plate to be 2 mm thick in Stainless Steel 304.
   g. Handrails to be connected to the neck plate using Stainless Steel CSK M5*10 mm Screw only
8. Balusters to be installed with a centre to centre distance of 1 mt. However this distance can vary as per site conditions

3. POWDER COATED ANODISED ALUMINIUM FRAME

Powder Coated Anodised aluminium frame for windows, ventilators only with one or more rebates and shutters party fixed type without sash bars and partly with glazed shutters sliding type without sash bars, aluminium sections weighting 1.30 kg//m for frames and 0.55 Kg/m for shutters respectively, 10.00 Kg/Sqm (4mm thick) glass panes including necessary joining cleats glazing clips, rubber packing, anodised aluminuium snap beading, CP Brass/stainless screws anodised aluminium fitting such as tower bolts 200/150mm handles 125/100mm for doors windows respectively and aluminium anodised sliding bolt 300/250mm/ long floor door stopper 150mm over all length of cover plate all as per schedule of fitting complete all as specified.

4. ACID PROOF TILES
FLOOR APPLICATION

Substrate Preparation

3. The ground should be compacted properly by ramming and applying water on it as per the standard practice to create a firm base. Ensure that there is no settlement of base.
4. For Medium Traffic Floor, make 3" thick PCC (plain cement concrete) in 1:4:8.

Laying Method

k. Prepare base mortar by mixing sand and cement in 1:4 proportions.
l. Lay the mortar on the substrate prepared as mentioned above in required line and level. It should be noted that in any case the bed mortar thickness should not be more than 1" thickness.

m. Mark the centerline and fix the tiles on all the corners and center in the required level. Preferably, start fixing tiles parallel to longer span.
n. Prepare thick cement paste by mixing water & cement. Apply this paste on the backside of the tile to fix kit.
o. Lay the tiles on this firm base and ram lightly with the help of rubber hammer OR trowel from top. See that the tile top surface is laid in required line and level with proper joint gap.
p. Utmost care should be taken while fixing other tiles in terms of matching lines and keeping exact joint width between tiles. (For maintaining joint width spacers are recommended of required joint thickness).
q. Fill the joint gaps after 24 hours when the tiles are properly set and cured with any well-known joint filler. Prepare the consistent paste as per the method instructed by the joint filler manufacturer. Fill the joint with the help of rubber trowel. Before grouting all the joints should be free from any dust and impurities.
r. For filling the joints, keep the filler paste on the tiles and fill the gaps by spreading it in the space between the tiles with the help of rubber trowel in such a way that the entire area of joint gaps are filled with the joint filler paste. Apply light pressure of finger in such a way that it creates 'U' shape between two consecutive tiles and works as a small channel to pass water through it.
s. Remove the excess joint filler from the setting time as recommended by the supplier with the help of rubber trowel.
t. Clean the tile surface with the help of a wet sponge or clean cloth immediately before setting time of joint filters. Ensure that the joint filler is protected properly after the mild acid wash as recommended by the joint filler supplier, by immediately removing the excess acid from the floored area

5. ANTI STATIC AND ELECTROCONDUCTIVE VINYL FLOORING

Anti-static and electroconductive – Vinyl flooring permanently static conductive pressed homogeneous vinyl flooring tested as per EN 649. The vinyl flooring should be classified as per EN 685 as commercial: 43 & Industrial: 43 with a wear layer of 2mm abrasion thickness loss as per EN 660: Part 1 group ≤0.15mm & volume loss EN660: Part 2 ≤4.0mm^3. Electrical resistance as per ESD-Approval. SP-method 2472 EN 1081 is R ≤10^8Ohms & R_1 5 $X10^4$ ≤ R ≤10^6Ohms, R_2 5 $X10^4$ ≤ R ≤10^6Ohms. Sound reduction as per EN ISO 717/2 should be Approx. + 4db, Clean room test as per ASTM F51/00 should be Class A. Light fastness as per EN ISO 105-B02 should be ≥ level 6.The slip resistance as per DIN 51130 EN 13893 should be R97 ≥ 0.3.

Wall Guard - Vinyl Homogeneous

The wear layer covering as per EN 429 should be 1.3mm and surface treatment should be PU- shield. The total thickness as EN 428 is 1.3mm. The dimensional stability as per EN 434 is ≤0.40% & Wetroom should be approved by test as per GBR Class VT. Reaction to fire as per EN 13501-1 is class Ns2 d0, BS 476:part 7is class 1, As/NZS 3837 is Class B, UNI 8457 is class 1 & ASM E84 is class B. The light fastness as per EN ISO 105-B02 ≥ 6.The chemical resistance as per EN 423 is good resistance. The clean room test as per ASTM F26/65 is satisfactory & ASTM F51/00 is Class A.

6. ALUMINIUM WORK

B) **ALUMINIUM DOORS, WINDOWS AND VENTILATORS:**

Aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular and other sections of approved make conforming to IS: 733 and IS : 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold fastners including necessary filling up of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt etc. Aluminium sections shall be smooth, rust free, straight, mitered and jointed mechanically wherever required including cleat angle. Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as

per architectural drawings and the directions of Engineer-in-charge. (Glazing and panelling to be paid for separately.
Powder coated aluminium (minimum thickness of powder coating 50 micron).

All Sections of Aluminium work being used in the work will be Powder coated minimum thickness of powder coating 50 micron

Codes and Standards:

The Codes and standards generally applicable to the work of this section are listed herein under:

IS: 733 Wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purpose).

IS: 1285 Wrought aluminium and aluminium alloy extruded round tube and hollow sections (for general engineering purpose).

IS: 1362 Dimension for screw thread for general purpose.
IS:1761 Transparent sheet glass for glazing and framing purposes.
IS:1948 Aluminium doors, window and ventilators.
IS:1949 Aluminium windows for industrial buildings.

The following clauses are intended to amplify the requirements of the references/ documents listed above and the contractor shall comply with these clauses.

SAMPLES AND SHOP DRAWINGS

All aluminium doors, windows and ventilators shall be furnished by an approved manufacturer and shall be conforming to IS:1948. Before placing their order, the contractor shall submit shop drawings and samples for the approval of the Engineer. If required, the contractor shall also submit the necessary engineering calculations. Shop drawings shall clearly show all work including mechanical systems, the arrangement of components, the sequence and details of fabrications, assembly and erection. These drawings shall also give full size details, all dimensions and thickness anchoring devices and accessories.

7. FLUSH SHUTTERS FOR DOORS & CUPBOARDS

Flush shutter for doors & cupboards shutters shall be solid core types with block board core as indicated in Bill of Quantity and shall conform to IS-2202 and ISI marked with blockboard (conforming to the requirements as per IS-1659 -1969 with frame of 1st class Hardwood and well matched commercial 3 ply veneering with vertical grains or cross bands and both faces decorative lamination 1mm thick.

8. FLOAT GLASS

Float Glass Sheet of nominal thickness 4mm (weight not less than 10 kg/sqm) and 5mm (weight not less than 13.5Kg/Sq.M. Sheet glass shall be flat, transparent and clear as judged by the naked eye. It may, however, possess a light line when viewed edgewise. It shall be free from any cracks and other defects. Float Glass make “SAINT GOBAIN” or other make equivalent to “SAINT GOBAIN” may be used as per approval of Engineer-in-charge, TCIL.

9. ULTRATECH SURFACE TEXTURE FINISH

10. EARTH FOR FILLING

The earth used for filling shall be free from salts, organic or other deterious matter. Highly expensive soils like black cotton soil shall not be used, unless so specified. All clods of earth exceeding 50mm shall be broken or removed. Earth obtained from borrow pits and surplus earth from excavation, if any, shall be directed by used for filling and double handling avoided.

TECHNICAL SPECIFICATIONS

PLUMBING WORKS- NON-SCHEDULED ITEMS

A) SANITARY FIXTURES :

1.0 SCOPE OF WORK :

1.1 Work under this section shall consist of furnishing all material and labour necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories as required by the drawings specified hereinafter and given in the Schedule of Quantities based on DSR items and as per the specifications given in the CPWD. The items that are given as per NSR/MR(Non-Scheduled Rate / Market Rate) item shall be provided as per the technical specification given hereinafter.

1.2 Without restricting to the generality of the foregoing the sanitary fixtures & C.P. fittings shall include the following:

a) Sanitary fixtures
b) Chromium plated fittings
c) Stainless steel sinks
d) Accessories e.g toilet paper holders, coat hook, dispenser etc.
e) Mirror

1.3 Whether specifically mentioned or not all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

1.4 All exposed pipes within toilets and near fixtures shall be chromium plated brass or copper unless otherwise specified.

2.0 GENERAL REQUIREMENTS:

2.1 All materials shall be new and of best quality confirming to specification and subject to the approval of the Architect/Consultants. Wherever particular makes are mentioned, the choice of selection shall remain with the Owner/Architect.

2.2 Sanitary fixtures shall be of the best quality approved by the Owner/Architect. Wherever particular makes are mentioned, the choice of selection shall remain with the Owner/Architect.

2.3 All Appliances, fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, specifications, drawings. Accessories shall include proper fixing arrangement, brackets, nuts, bolts, screws and required connection pieces.

2.4 Fixing screws shall be half round head chromium plated brass screws with C.P. washers where necessary.

2.5 Porcelain sanitary ware shall be glazed vitreous china of first quality free from warps, cracks and glazing defects confirming to I.S. 2556.

2.6 Sinks for pantry or kitchen shall be stainless steel or as specified in the schedule of quantities.

2.7 Chromium plated fittings shall be cast brass chromium plated of the best quality approved by the Owner/Architects.

2.8 All Appliances, fittings and fixtures shall be fixed in a neat workmanlike manner true to level and heights shown on the drawings and in accordance with the manufacturers recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, Filing Plaster, Paint, insulation or terrace shall be made good by the Contractor at his own cost.

2.9 Sanitary appliances, subject to the type of appliance and specific requirements, shall be fixed in accordance with the relevant standards and the following :

a) Contractor shall, during the entire period of installation and afterwards protect the appliances by providing suitable cover or any other protection so as to absolutely prevent any damage to the appliances until handing over. (The original protective wrapping shall be left in position for as long as possible).

b) The appliance shall be fixed in a manner such that it will facilitate subsequent removal if necessary.

c) All appliances shall be securely fixed. Manufacturers' brackets and fixing methods shall be used wherever possible. Compatible rust-proofed fixings shall be used. Fixing shall be done in a manner that minimizes noise transmission.

d) Pipe connections shall be made with demountable unions. Pipe work shall not be fixed in a manner that it supports or partially supports an appliance.

e) Appliances shall be fixed so that water falls to the outlet.

f) Appliances shall be fixed true to level firmly fixed to anchor or supports provided by the manufacturer and additional anchors or supports where necessary.

2.10 Sizes of Sanitary fixtures given in the Specifications or in the Schedule of Quantities are for identification with reference to the catalogues of makes considered. Dimensions of similar models of other makes may vary within $\pm$ 10% and the same shall be provided and no claim for extra payment shall be entertained nor shall any payment be deducted on this account.

3.0 EUROPEAN WATER CLOSET:

a) WC shall be single or double siphonic wash down type floor/ wall mounted set, as shown in the drawings, flushed by means of a flushing cistern.

b) Each W.C. set shall be provided with a solid plastic seat of colour given in the schedule of quantities, rubber buffers and chromium plated hinges. Plastic seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C.

c) Flush pipe/bend shall be connected to the Water Closet by means of suitable rubber adapter.

d) Wall hung/mounted Water Closet if provided shall be supported by C.I. chair.

4.0 Oval / Counter top WASH HAND BASIN :

4.1.1 Wash basins shall be coloured or white glazed vitreous china of best quality, size, shape and type specified in the Schedule of Quantities.

4.1.2 Each basin shall be provided with painted MS angle or CI brackets and clips and the basin securely fixed to wall. Placing of basins over the brackets without secure fixing shall not be accepted. The MS angle shall be provided with two coats of red oxide primer and two coats of synthetic enamel paint of make, brand and colour as approved by the Architect/Consultants.

4.1.3 Each basin shall be provided with 32 mm dia C.P. waste of standard pattern with pop-up waste or rubber plug and chain as specified in the Schedule of Quantities, 32 mm dia C.P. brass bottle trap and angle valve with C.P.pipe to wall and flange as given in the schedule of quantities.

4.1.4 Each basin shall be provided with single hole mixing fitting or as specified in the Schedule of Quantities.

4.1.5 Basins shall be fixed at proper heights as shown on drawings. If height is not specified, the rim level shall be 80 cms or as directed by Architect/Consultants.

5.0 HAND DRIER (IF PROVIDED IN THE DWGS/BOQ):

5.1 The hand drier shall be no touch operating type with solid state time delay to allow user to keep hand in any position.

5.2 The hand drier shall be fully hygienic, rated for continuous repeat use (CRU).

5.3 The rating of hand drier shall be such that time required to dry a pair of hands up to wrists is approximately 30 seconds.

5.4 The hand drier shall be of wall mounting type suitable for 230V, single phase, 50 Hz, AC power supply.

6.0 TOILETS FOR DISABLED (IF PROVIDED IN THE DWGS):

6.1 Where specified in washroom facilities designed to accommodate physically handicapped, accessories should be provided as directed by the Project Manager.

6.2 Stainless steel grab bars of required size suitable for concealed or exposed mounting and non-slip gripping surface shall be provided in all washrooms to be used by physically handicapped as directed by the Project Manager.

7.0 ACCESSORIES:

7.1 All C.P. bib taps and Angle valves shall be quarter turn-type washerless fittings. The angle valve shall be provided with stainless steel mesh filter.

7.2 Contractor shall install all chromium plated stainless steel and powder coated accessories as shown on the drawings or directed by Architect/Consultants and given in the Schedule of Quantities.

7.3 All C.P. accessories shall be fixed with C.P. brass half round head screws and cut washers in wall with rawl plugs or nylon sleeves and shall include cutting and making good as required or directed by Architect/Consultants.

7.4 Joints/ gaps between all sanitary appliances/fixtures and the floor/ walls shall be caulked with an approved mildew resistant sealant, having anti-fungal properties, of colour and shade to match that of the appliance/ fixture and the floor/ wall to the extent possible.

8.0 TESTING :

All appliances, fixtures and fittings shall be tested before and after installation. Water seals of all appliances shall be tested. The Contractor shall block the ends of waste and ventilation pipes and shall conduct an air test with a pressure of 38mm water gauge for minimum of 3 minutes in accordance with BS:5572.

B) SOIL, WASTE, VENT & RAIN WATER PIPES/BASEMENT DRAINAGE / PLANTER DRAINAGE:

1.0 SCOPE OF WORK :

1.5 1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install all soil, waste, vent, Rain water pipes, drainage sump riser and fittings as required by the drawings and given in the Schedule of Quantities based on DSR items and as per the specifications given in the CPWD. The items that are given as per NSR/MR(Non-Scheduled Rate / Market Rate) item shall be provided as per the technical specification given hereinafter.

1.2 Without restricting to the generality of the foregoing, the soil, waste, vent pipe rain water system shall include the following :-

a) Horizontal and Vertical C.I. soil, waste and vent pipes, and fittings, Drip seal joint, clamps and connection to fixtures.

b) Floor and Urinal traps, Floor Drain, Cleanout plugs, G.I. inlet fittings and CP brass/stainless steel grating.

c) Waste pipe connection from all fixtures e.g wash basins, sinks, urinals, kitchen equipments and plant room equipment.

d) uPVC/CI Rain water pipes/CI(LA) Drainage/Sewage Sump Pump Riser.

2.0 SOIL, WASTE, VENT & RAIN WATER PIPES AND FITTINGS:

2.1 CENTRIFUGAL CAST (SPUN) IRON PIPE

Soil, waste, vent and anti-siphonage pipes, fittings and accessories shall be centrifugal cast (spun) iron pipes conforming to IS: 3989-1984 or as given in Schedule of quantities and as per CPWD Specifications.

3.0 TRAPS :

3.1 Floor Trap:

Floor trap shall be cast iron 'P' Trap with or without vent horn (deep seal with an effective seal of 50 mm). In case of Sunken slab in the Toilets, the trap and waste pipes shall be set in cement concrete blocks of size 300mm x 300mm and of required depth, firmly supported on the structural floor. The blocks shall be in 1 :2 :4 mix (1 cement : 2 coarse : 4 stone aggregate 20mm nominal size) and extended to 40mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks at no extra cost.). In case of flat slab instead sunken slab in the Toilets, Contractor shall provide all sleeves, openings, hangers, inserts during the construction for fixing the floor traps and etc.

3.2 Urinal Trap:

Urinal traps shall be cast iron P or S traps with or without vent horn and set in cement concrete block specified under Clause 7.1 Floor Trap without extra charge.

3.3 Floor Trap Inlet/GI Inlet Fitting:

Traps and connections shall ensure free and silent flow of discharging water. Where specified, Contractor shall provide a special type cast iron or G.I. inlet hopper without or with one or two or three inlet sockets to receive the waste pipe. Joint between G.I. waste pipe and hopper inlet socket shall be Drip seal joint. Hopper shall be connected to a CI 'P' or 'S' trap with at least 50mm seal (hopper and traps shall be paid for separately). Floor trap inlet hoppers and the traps shall be set in cement concrete blocks/and supports as specified under clause 7.1 Floor trap above without extra charge.

4.0 CP/S.S. GRATING :

Floor and Urinal Traps, Floor drain shall be provided with 80-125 mm square or round C.P./stainless steel grating with rim of approved design and shape. Minimum thickness shall be 4 mm or as specified in the Schedule of Quantities.

5.0 CI (LA&B) PIPE AND FITTING:

5.1 Sump Pump discharge Pipe/Rain Water horizontal header/soil waste header running at Basement ceiling/Rain Water Pipe running underground shall be centrifugally cast [spun] iron pressure pipe {class LA&B] conforming to IS 1536:2001 or as given in Schedule of quantities and as per CPWD Specifications.

5.2 Fitting for CI (LA) & B Pipe shall confirm to IS : 1538 – 1967 where possible junction from branch pipe shall be made by a 'Y' Tee.

6.0 CLEAN OUT PLUGS :

6.1 Contractor shall provide cast brass clean out plugs as required. Clean out plugs shall be threaded and provided with key holes for opening. Clean out plugs shall be fixed to the pipe by a GI socket and lead caulked joint.

7.0 WASTE PIPE FROM APPLIANCES :

7.1 Waste pipe from appliances e.g. washbasins, sinks and urinals etc. shall be of Galvanised-iron (GI) heavy duty (class 'c') conforming to IS : 1239 Part I or as given in the Schedule of Quantities/dwgs..

7.2 All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps as directed by the Architect/Consultants. Spacing for the clamps shall be 3000mm for vertical runs and 2400mm for horizontal runs.

7.3 Pipes shall be galvanized steel tubes conforming to IS : 1239 (Heavy Class) and quality certificates shall be furnished. Pipes shall be provided with all required malleable fittings conforming to IS : 1879 e.g. tees, couplings, bends, elbows, unions, reducers, nipples, plugs etc. All GI waste pipes shall be terminated at the point of connection with the appliance with an outlet of suitable diameter. Pipes in chase shall be painted with two coats of black bitumestic paint and exposed pipes with one coat of red oxide primer and two or more coats of synthetic enamel paint or as given in the Schedule of Quantities.

8.0 TECHNICAL SPECIFICATION OF WC PAN CONNECTOR:

8.1 The WC pan connector shall be flexible/soft and shall be made of single body construction with integral fins, made from EVA (Ethgl vingl Acetate). The pan connector must confirm to BS 5627: 1984. The pan connector must be supplied with one seal made of TPE (Thermo plastic Elastomeric). The pan connector must be supplied with factory fitted spring loaded seal guard.

8.2 The connector shall not be allowed to come in contact with mineral oil, grease, putty or any compound containing mineral oil or grease.

8.3 The pan connector must be stared away from direct sun light and flames.

9.0 uPVC SOIL / WASTE, RAIN WATER PIPES & FITTINGS:

9.1.1 Rain water pipe shall be uPVC SWR Type A conforming to IS : 13592-1992. Jointing with
seal ring conforming to IS : 5382 or as given in Schedule of quantities and as per CPWD Specifications.

9.1.2 Dimension of SWR Pipe Fittings shall be as per DIN 19531 and DIN 19534 and conforms to IS : 14735-1999.

C) WATER SUPPLY SYSTEM :

1.0 SCOPE OF WORK

1.1 Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required to completely install for water supply system (Cold Water Supply + Hot Water Supply) as required by the drawings, specified hereinafter and given in the Schedule of Quantities or as given in Schedule of quantities and as per CPWD Specifications.

.

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following :-

a) Water supply works inside the building etc. including connection to vertical stack / main line.

b) Pipe protection and painting.
c) Connections to all fixtures etc.
d) Ball valve/butterfly valve/Non Return valve.

2.0 GENERAL REQUIREMENTS :

2.1 All materials shall be new and of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Project Manager.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections. As far as possible all bend shall be formed by means of a hydraulic pipe bending machine for pipe up to 65 mm dia.

2.4 Pipes shall be laid in a manner as to provide as far as possible easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passage etc.

2.5 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

2.6 Pipe shall be securely fixed to wall and ceiling by suitable clamps at intervals specified.

3.0 CPVC PIPES & FITTINGS

All pipes inside the buildings and where specified, outside the building shall be CPVC (Chlorinated Polyvinyl Chloride) pipes and fittings of Class specified and jointing shall be followed as per manufacturer recommendation or as given in Schedule of quantities and as per CPWD Specifications.

.

4.0 GI PIPES, FITTINGS AND VALVES :

4.1 All pipes where specified, inside/outside the building shall be galvanized steel tubes conforming to IS: 1239 of Class specified, Installation & Jointing shall be followed as per manufacturer recommendation or as given in Schedule of quantities and as per CPWD Specifications.

5.0 BALL VALVES:

All ball valves shall be heavy duty of approved make. Valves shall have suitable for test pressure of 25 Kg/Sqcm. Ball valves shall conform to the following specifications.

Size	Construction	Ends
15 to 50 mm	Bronz body S.S. Working Part stainless steel balls, spindle, t eflon seating and gland packing	Screwed

6.0 BUTTERFLY VALVE:

All butterfly valves shall be heavy duty cast steel/iron of approved make. The valves shall be suitable for 15-20 Kg/Sqcm test pressure & shall conform to the following specifications Butterfly valve shall be of best quality conforming to IS: 13095:

Size	Construction	Ends
65 mm and above	Cast steel/iron	Flanged

6.1.1 NON-RETURN VALVES:

All non-return valves shall be provided as shown in the drawings conforming to relevant Indian Standards and in accordance with the following specifications.

Size	Construction	Ends
Upto 50 mm.	Gun metal	Screwed
65 mm and above	cast steel/iron	Flanged

Non-return valves shall be of approved make.

7.0 STERILIZATION OF INSTALLATION:

7.1 The water supply installation shall be sterilized as per standards and as follows :-

a) Tanks and pipes shall be filled and flushed out.

b) All bib cocks (taps) shall be closed.

c) Tanks and pipes shall be re-filled while adding a sterilizing admixture containing 50 parts chlorine to one million parts water.

d) When the installation is filled all bib cocks (taps) shall be opened progressively and each allowed to run until the water smells of chlorine.

e) The installation shall be topped up and more sterilizer added.

f) The installation shall then be left for three hours and shall then be tested for residual chlorine, if none is found, the installation shall be drained and the process repeated.

g) The installation shall be finally drained and flushed with potable water before use.

D) EXTERNAL SEWERAGE & STORM WATER DRAINAGE :

1.0 Scope of Work:

1.1 Without restricting to the generality of the foregoing, the drainage system shall interalia include:

a) Sewerage/Storm water drainage system including, earth works for excavation, disposal, backfilling and compaction, pipe lines, manholes, catch basins and connections to Rain water Harvesting or connected as indicated by the Architect/Consultants.

b) Overflow from Rain Water Harvesting Pit shall be discharged to existing Storm Water drain either by gravity or by submersible drainage pump.

c) All pipes, fittings, excavation, concreting, brick masonry Installation & Jointing shall be followed as per manufacturer recommendation or as given in Schedule of quantities and as per CPWD Specifications.

E) PUMPS & WATER TREATMENT SYSTEM:

1.0 Raw/Domestic Water Supply Pumps

1.1 Water supply pumps shall be suitable for clean filtered water. Pumps shall be single/multi stage, monobloc vertical/horizontal, centrifugal pumps with C.I body and bronze impeller, stainless steel shaft, mechanical seal and coupled to a TEFC electric motor. Each pump should be operate to a curve required by the operating conditions.

All parts in contact with water shall be corrosion resistant stainless steel DIN-Nr.1.4401.

Each pump shall be provided with a totally enclosed fan cooled induction motor of suitable H.P. The motors shall be suitable for 415 volts, 3 phase, 50 cycles A.C. power supply and shall conform to IS 325 operating at 2900 RPM nominal speed.

Each pumping set shall be provided with 100-mm dia/150 mm dia gunmetal "Bourdon" type pressure gauge with gunmetal ball valve and connected piping.

Pump or the whole set shall be stable on rubber vibration eliminating pads appropriate for each pump as recommended by the manufacturer and accepted by the Project Managers.

1.2 Headers & Accessories :

The suction and discharge manifolds shall be stainless steel fabricated of Hot Dipped Galvanized MS. Both manifolds shall be designed to attach to the system piping at either end of the manifold. Delivery manifold shall include a pressure gauge. The discharge manifold shall include a socket to install a pressure transducer with a 4-20mA output. The pressure transducer shall be factory installed and wired.

Isolation valves shall be installed on the suction and discharge of each pump. A check valve shall be installed on the discharge of each pump (optional on the suction side for suction lift applications). Base frame should also be made of galvanized sheet.

4.0 SUBMERSIBLE PUMPS:

2.1 Submersible pumps for sewage/drainage shall be single stage, single entry pump. Pump shall be with dynamically balanced impeller connected to a common shaft to the motor. The vane for sewage pump will be open type, while for drainage pump, etc. It will be of semi open type.

2.2 Stuffing box shall be provided with mechanical seals.

2.3 Each pump shall be provided with water cooled squirrel cage induction motor suitable for 415 volts, 3 phase, 50 cycles A.C. power supply.

2.4 Each pump shall be provided with liquid level controller for operating the pump between predetermined levels.

2.5 The pumping set shall be for stationary application and shall be provided with pump connector in it. The delivery pipe shall be joined to the pump through a rubber diaphragm, and bend and guide pipe for easy installation, without disturbing delivery pipe the pump unit shall have a back pull out design. A rust proof chain shall be provided for each pump.

2.6 Pump shall be provided with all accessories and devices necessary and required for the pump to make a complete working system.

3.0 CHEMICAL DOSING PUMP :

3.1 Chemical dosing system comprising of metering pump, 100 lts. Capacity HDPE solution tank with level gauge and lid on top.

3.2 Motor driven metering pump with mechanically activated diaphragm with oil lubricated gear mechanism. The output of the plug should be adjustable operation from 10-100%. Pump construction shall be corrosion resistant polypropylene or similar material dosing pump.

3.3 Each pump shall be provided with an injector assembly with suction and delivery piping complete in all respects.

4.0 LEVEL CONTROLLERS:

4.1 Level controllers shall be electronic low voltage type using required number of stainless steel type probes, shrouded in PVC sheath or encapsulated in a stainless steel pipe.

5.0 MULTIGRADE SAND FILTER /ACTIVATED CARBON FILTER :

5.1 Filter shall be designed in accordance with the code of unfired pressure vessel conforming to I.S. 2825.

5.2 Filter shall be multigrade sand filter/activated carbon filter may be altered to suite contractor's own design of the most efficient performance.

5.3 Filters shall be vertical type of required diameter. The shell and dished ends shall be fabricated from M.S. sheet. Tank suitable to with stand a working pressure given in Bill of Quantities.

5.4 Each filter shall have at least one pressure tight manhole cover for inspection and repairs.

5.5 Each filter shall be provided with screwed or flanged connections for inlet, outlet individual drain connections and all face piping, diaphragm valves and all other connections necessary and required.

5.6 Face piping shall be MS / GI. (Heavy Duty).

6.0 PIPE & FLANGE JOINTING

6.1 The piping system and components shall be capable of with standing 150 % of the working pressure including water hammer effects.

6.2 Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points to facilitate erection and subsequent maintenance work.

6.3 Flange thickness shall be as per table below IS : 6392 – 1971. Table – 17/18.

250 mm dia	:	26 mm ;
200 mm dia	:	24 mm ;
150 mm dia	:	22 mm ;
125 mm dia	:	22 mm ;
100 mm dia	:	20 mm ;
80 mm dia	:	20 mm ;
65 mm dia	:	18 mm .

6.4 <u>Pipe Protection</u> :

6.4.1 All pipes above ground and in exposed locations shall be painted with epoxy paint/anti corrosive paint.

6.5 **<u>Welding</u>:**

6.5.1 Joints between M.S. Pipes and fittings shall be made with the pipes and fittings having “V” groove and welded with electrical resistance welding in an approved manner.

6.5.2 Weld Electrodes shall be of approved make, of grade and type as suitable for the job and meeting the approval of the engineer.

6.5.3 Joints shall be given a first weld in full width without burrs on the full dia of the pipe. Welding shall be carried out vertically from the surface to be welded. Weld fluxes shall not be so plastic such as to fall or drip down.

6.5.4 After application of first coat the weld shall be ground and then another layer of welding shall take place. The weld shall also be cleaned by grinding.

6.5.5 All pipe cutting shall be by oxy acetylene gas welding only. The cut surface shall be cleaned and ground by a electric grinder before further welding.

6.5.6 Pipe cutting or welding in inaccessible areas shall be avoided. Pipes shall not welded in trenches unless the bottom edge of the pipe does not have clear space for working with electrode.

6.5.7 For supports, angle pieces shall be cut by oxy acetylene gas and cleaned by electric grinder. All cutting for bolt inserts shall be by electric drill.

7.0 GI PIPES AND FITTINGS :

7.1 All pipes inside the buildings and where specified, outside the building shall be galvanized steel tubes conforming to IS: 1239 of Class specified. When Class is not specified they shall be Heavy Class.

8.0 INSTALLATION AND OPERATING INSTRUCTIONS:

The contractor shall provide detailed operating and installation instructions. Each set of books shall be prepared especially for the type of equipment delivered and all operating instructions shall refer only to that particular equipment. The contractor shall provide a minimum of two bound sets of installation drawings.

9.0 TECHNICAL DATA SHEET :

Contractor to furnish complete technical data & detail on the format Contractor furnish the performance curves, dimension detail, installation detail, pump & motor detail catalogue while submitting the tender.

12.0 ELECTRICAL INSTALLATIONS:

12.1 GENERAL:

This section covers the general requirements for electrical work to be installed under this specification.

The Contractor shall supply and install all electric wiring, switchgear etc., necessary for the complete, safe and satisfactory operation of the plant covered by the Specification. All electrical wiring and cables shall be properly tagged to the satisfaction of the Owner.

All equipment provided shall be designed for use in conditions up to 50^{o}C ambient air temperature and 100% relative humidity.

All equipment, materials, workmanship and fittings shall comply with the appropriate Indian Standard Specifications or Code of Practice as listed in the relevant paragraphs of this Section, or applicable international standards.

12.2 ELECTRICAL SUPPLY :

The electricity supply shall be 415/240 Volts, 50 Hz, 3 phase, 4 wire. All equipment shall be designed to operated with a $\pm$ 10% voltage tolerance without a loss of rated output.

All cables, equipments shall be so connected as to ensure that the load on phases are balanced and as per specification given in CPWD-Electrical works

ANNEXURE- A : APPLICABLE CODES, STANDARDS AND PUBLICATIONS

1.0 All material, equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practices. All equipment and material being supplied by the Contractor shall meet the requirements of IS. Tariff advisory committee's regulation (fire insurance), electrical inspectorate and Indian Electricity rules and other Codes/Publications as given below.

A) General :

SP : 6 (1)	Structural steel sections
IS : 27	Pig lead
IS : 325	Three phase induction motors
IS : 554	Dimensions for pipe threads where pressure tight joints are required on the threads.
IS : 694	PVC insulated cables for working voltages up to and including 1100 V.
IS : 779	Specification for water meters (domestic type)
IS : 782	Specification for caulking lead
IS : 800	Code of Practice for general construction in steel
IS : 1068	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium
IS : 1172	Code of basic requirements for water supply drainage and sanitation
IS : 1367 (Part- 1)	Technical supply conditions for threaded steel fasteners : Part 1 introduction and general information.
IS : 1367 (Part- 2)	Technical supply conditions for threaded steel fasteners : Part 2 product grades and tolerances.
IS : 1554 (Part- 1)	PVC insulated (heavy duty) electric cables : Part 1 for working voltages up to and including 1100V.
IS : 1554 (Part- 2)	PVC insulated (heavy duty) electric cables : Part 2 for working voltages from 3.3 kV up to and including 11 kV.
IS : 1726	Specification for cast iron manhole covers and frames
IS : 1742	Code of practice for building drainage.
IS : 2064	Selection, installation and maintenance of sanitary appliances -

	Code of practice.
IS : 2065	Code of practice for water supply in buildings.
IS : 2104	Specification for water meter boxes (domestic type)
IS : 2373	Specification for water meters (bulk type)
IS : 2379	Colour code for identification of pipe lines
IS : 2527	Code of practice for fixing rainwater gutters and down pipes for roof drainage.
IS : 2629	Recommended practice for hot dip galvanizing on iron and steel
IS : 3114	Code of practice for laying of cast iron pipes
IS : 4111 (Part 1)	Code of practice for ancillary structures in sewerage system : Part 1 manholes
IS : 4127	Code of practice for laying glazed stoneware pipes.
IS : 4853	Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes
IS : 5329	Code of practice for sanitary pipe work above ground for buildings.
IS : 5455	Cast iron steps for manholes.
IS : 6159	Recommended practice for design and fabrication of material prior to galvanizing
IS : 7558	Code of practice for domestic hot water installations
IS : 8321	Glossary of terms applicable to plumbing work
IS : 9668	Code of practice for provision and maintenance of water supplies and fire fighting.
IS : 9842	Preformed fibrous pipe insulation
IS : 9912	Coal tar based coating materials and suitable primers for protecting iron and steel pipe lines.
IS : 10221	Code of practice for coating and wrapping of underground mild steel pipelines
IS : 10234	Recommendations for general pipeline welding.
IS : 10446	Glossary of terms relating to water supply and sanitation.
IS : 11149	Rubber Gaskets
IS : 11790	Code of practice for preparation of butt-welding ends for pipes,

valves, flanges and fittings.

IS : 12183 (Part1)	Code of practice for plumbing in multistoreyed buildings : Part 1 Water supply
IS : 12251	Code of practice for drainage of building basements
IS : 5572	Code of practice for sanitary pipe work
IS : 6700	Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.
IS : 8301	Code of practice for building drainage
BSEN : 274	Sanitary hardware, waste fittings for basins, bidets and baths. General technical specifications.

B) PIPES AND FITTINGS :

IS : 458	Specification for precast concrete pipes (with and without reinforcement)
IS : 651	Salt glazed stone-ware pipes and fittings
IS : 1239 (Part 1)	Mild steel tubes, tubulars and other wrought steel fittings Part 1 Mild Steel tubes
IS : 1239 (Part 2)	Mild steel tubes, tubulars and other wrought steel fittings : Part 2 Mild steel tubulars and other wrought steel pipe fittings.
IS : 1536	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage
IS : 1537	Vertically cast iron pressure pipes for water, gas and sewage.
IS : 1538	Cast iron fittings for pressure pipes for water, gas and sewage
IS : 1729	Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
IS : 1879	Malleable cast iron pipe fittings
IS : 1978	Line pipe
IS : 1979	High test line pipe
IS : 2501	Copper tubes for general engineering purposes
IS : 2643 (Part 1)	Dimensions for pipe threads for fastening purposes : Part 1 Basic profile and dimensions.
IS : 2643 (Part 2)	Dimensions for pipe threads for fastening purposes : Part 2 Tolerances

IS : 2643 (Part 3)	Dimensions for pipe threads for fastening purposes : Part 3 Limits of sizes.
IS : 3468	Pipe nuts
IS : 3589	Seamless or electrically welded steel pipes for water, gas and sewage (168.3 mm to 2032 mm outside diameter)
IS : 3989	Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
IS : 4346	Specifications for washers for use with fittings for water services.
IS : 4711	Methods for sampling steel pipes, tubes and fittings
IS : 6392	Steel pipe flanges
IS : 6418	Cast iron and malleable cast iron flanges for general engineering purposes.
IS : 7181	Specification for horizontally cast iron double flanged pipe for water, gas and sewage.

C) VALVES :

IS : 778	Specification for copper alloy gate, globe and check valves for water works purposes
IS : 780	Specification for sluice valves for water works purposes (50 mm to 300 mm size)
IS : 1703	Specification copper alloy float valves (horizontal plunger type) for water supply fittings
IS : 2906	Specification for sluice valves for water works purposes (350 mm to 1200 mm size)
IS : 3950	Specification for surface boxes for sluice valves
IS : 5312 (Part 1)	Specification for swing check type reflux (non return) valves : Part 1 Single door pattern
IS : 5312 (Part 2)	Specification for swing check type reflux (non return) valves : Part 2 Multi door pattern
IS : 12992 (Part 1)	Safety relief valves, spring loaded : Part 1 – Design
IS : 13095	Butterfly valves for general purposes.

D) WATER QUALITY TOLERANCE :

IS : 3025 (Part 1 to 44)	Method of sampling and test (physical and chemical) for water and waste water

IS : 4764	Tolerance limits for sewage effluents discharged into inland surface waters
IS : 10500	Drinking water

E) PUMPS AND VESSELS :

IS : 1520	Specification for horizontal centrifugal pumps for clear cold fresh water
IS : 2002	Steel plates for pressure vessels for intermediate and high temperature service including boilers
IS : 2825	Code for unfired pressure vessels
IS : 4682 (Part 1)	Code of practice for lining of vessels and equipment for chemical processes Part 1 : Rubber lining
IS : 5600	Specification for sewage and drainage pumps
IS : 8034	Specification for submersible pump sets for clear, cold, fresh water
IS : 8418	Specification for horizontal centrifugal self priming pumps

ANNEXURE – B: PIPE COLOUR CODE

S.No.	Pipe lines	Ground Colour	1st Colour Band	2nd Colour Band
1.	Filtered water (all cold water lines after filter)	Sea green	French blue	Signal red
2.	Drinking water (normal temperature)	Sea green	Light orange	
3.	Drinking water (chilled temperature)	Sea green	Light orange	Signal red
4.	Domestic hot water	Sea green	Light grey	
5.	Drainage	Black		
6.	LPG	Canary yellow		
7.	Fire Lines	Red		

This colour code is as per I.S. 2379-1983.

ANNEXURE – C: LISTING DEVIATIONS OF TENDER

Although deviations are generally not acceptable, but in case it becomes pertinent as per Manufacturer/Contractor, then he is requested to specifically give the details of deviations, if any on this sheet and continuation thereof in the below mentioned format only.

Deviation mentioned at any other place shall not be considered.

S.No.	Item Description As per Tender	Deviation by Tenderer

Signature & Seal of Contractor
Signature & Seal of TCIL

F) QUALITY ASSURANCE AND QUALITY CONTROL :

1.0 The work shall conform to high standards of design and workmanship, shall be structurally sound and aesthetically pleasing quality standards prescribed shall form the backbone for the quality assurance and quality control system.

2.0 At the site level the Contractor shall arrange the materials, their stacking/storage in appropriate manner to ensure the quality. Contractor shall provide equipment and manpower to test continuously the quality of materials, assemblies etc. as directed by the Engineer-in-Charge. The test shall be conducted continuously and the result of tests maintained. In addition the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of surface.

3.0 The Engineer- in-Charge shall be free to carry out tests as may be considered necessary by him at his sole discretion, from time to time, in addition to those specified in this document. The Contractor shall provide the samples and labour for collecting the samples nothing extra shall be payable to the Contractor for samples or for the collection of the samples.

4.0 The test shall be conducted at the site laboratory that may be established by Engineer-in-Charge or at any other standard Laboratory selected by Engineer- in-Charge.

5.0 The contractor shall transport the samples to the laboratory for which nothing extra shall be payable. In the event of Contractor failing to arrange transportation of the samples in proper time Engineer-in-Charge shall have them transported and recover two times the actual cost from the Contractor's bills.

6.0 Testing charges shall be borne by the Engineer-in-Charge.

7.0 Testing may be witnessed by the Contractor or his authorized representative. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.

TECHNICAL SPECIFICATIONS

INTERNAL ELECTRICAL WORKS

A - WIRING

1 - GENERAL

Technical Specifications in this section cover the Internal Wiring Installations comprising of:

- Wiring for lights and convenience socket outlets etc. in concealed/surface conduit/raceways.
- Wiring for telephone outlets.
- Sub main wiring.
- Conduiting for Low Voltage System

2 - STANDARDS AND CODES

Latest upto date Indian Standard (IS) and Code of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and / or IEC Standard shall be applicable.

3 - CONDUITS

3.1 STEEL CONDUITS (If Required) :

These shall be of mild steel 16 gauge upto 32mm and 14 gauge for sizes above 32mm, electric resistance welded (ERW), electric threaded type having perfectly circular tubing. Conduits shall be precession welded ERW and shall be fabricated from tested steel strips of thickness as per IS by high frequency induction weld process. Weld shall be smooth and of consistent of high quality to ensure crack proof bending. The conduits shall be black enamel painted inside and outside in its manufactured form. Wherever so specified, the conduit shall be galvanized. All conduits used in this work shall be ISI embossed.

3.2 MS CONDUITS (If Required) :

The electrical wiring shall be done in recessed MS Conduits, unless mentioned otherwise.

No conduit less than 25mm in diameter shall be used, unless otherwise specifically ask by Engineer-In-Charge.

3.3 PVC CONDUITS :

Wiring shall be carried out in recessed /surface PVC conduits. The PVC conduits conform to latest and shall be ISI embossed. The conduits shall be heavy gauge (minimum 2 mm wall thickness) and the interiors of the conduits shall be free from all obstructions. All joints in conduits shall be sealed / cemented with approved solvent cement. Damage conduits/fittings shall not be used. Cut ends of conduits shall not have sharp edges.

3.4 BENDS :

As far as possible, the conduit system shall be so laid out that it shall obviate use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two quarter bends from inlet to outlet.

3.5 CONDUIT ACCESSORIES :

3.5.1 STANDARD ACCESSORIES :

The conduit wiring system shall be complete in all respects, including their accessories. Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works. The accessories shall conform in all respects to the relevant IS. Samples shall be got approved by Engineer-In-Charge before use.

3.5.2 FABRICATED ACCESSORIES :

Wherever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 3 mm thick sheets. The outlet boxes shall be of approved quality, finish and manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes. The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

4 – WIRES :

Wiring shall be carried out with FRLS insulated 660/1100 volt grade unsheathed single core wires with electrolytic annealed stranded copper (unless otherwise stated) conductors conforming to latest IS Code. All wire rolls shall be ISI marked. All wires shall bear manufacturer's label and shall be brought to site in new and original packages. Manufacturer's certificate, certifying that wires brought to site are of their manufacture shall be furnished as required.

5 - COAXIAL CABLES :

The coaxial cables shall be of video band type with operation up to 300 MHz capability. Aging resistance shall comply with latest code i.e. maximum 5% increase in attenuation at 200 MHz measured by artificial aging (14 days at 80o C) cables shall meet all exceed following specifications

Center core Dia	0.8 mm
Diaelectric Dia	4.8 mm
Dielectric	PE
Outer Conductor Dia	5.4 mm
Outer Dia	7.0 mm
Bending radius	more than 30 mm
Impedance	75 ohms
DC Resistance	50 ohms/KM
Screening factor	more than 50
Attenuation	
50 MHz	6.5
100 MHz	9
200 MHz	13
300 MHz	16

6 - LAYING OF CONDUITS :

- Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required.
- Same rate shall apply for recessed and surface Conduiting in this contract.
- Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire
  Conduiting for loop earthing.

- GI wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of Conduiting.

6.2 SURFACE CONDUITING :

Wherever so desired, conduit shall be laid in surface over finished concrete and/or plastered brickwork. Suitable spacer saddles of approved make and finish shall be fixed to the finished structural surface along the conduit route at intervals not exceeding 600 mm. Holes in concrete or brick work for fixing the saddles shall be made neatly by electric drills using masonry drill bits. Conduits shall be fixed on the saddles by means of good quality heavy duty MS clamps screwed to the saddles by counter sunk screws. Neat appearance and good workmanship of surface Conduiting work is of particular importance. The entire conduit work shall be in absolute line and plumb.

6.3 FIXING OF CONDUIT FITTINGS AND ACCESSORIES :

For concealed Conduiting work, the fittings and accessories shall be completely embedded in walls/ceilings leaving top surface flush with finished wall/ceiling surface in a workman like manner.

Loop earthing wire shall be connected to a screwed earth stead inside outlet boxes to make an effective contact with the metal body.

6.4 PAINTING AND COLOUR CODING OF CONDUITS :

Before laying, conduits shall be painted specially at such places where paint has been damaged due to vice or wrench grip or any other reason.

If so specified, surface conduits shall be provided with 20 mm wide and 100 mm long colour coding strips as below

Use	**Code colour**
Low voltage	Grey
Telephone	Black
Earthing system	Green
Control system lighting	Purple

6.5 PROTECTION OF CONDUITS :

To safeguard against filling up with mortar/plaster etc. all the outlet and switch boxes shall be provided with temporary covers and plugs which shall be replaced by sheet/plate covers as required. All screwed and socket joints shall be made fully water tight with white lead paste.

6.6 CLEANING OF CONDUIT RUNS :

The entire conduit system including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing in of cables.

6.7 PROTECTION AGAINST DAMPNESS :

All outlets in conduit system shall be properly drain and ventilated to minimize chances of condensation/sweating.

6.8 EXPANSION JOINTS :

When crossing through expansion joints in buildings, the conduit sections across the joint shall be through approved quality heavy duty metal flexible conduits of the same size as

the rigid conduit. The expansion joint crossing shall be done as approved by Engineer-In-Charge.

6.9 LOOP EARTHING :

Loop earthing shall be provided by means of insulated stranded copper conductor wires of sizes as per Schedule of Quantity laid alongwith wiring inside conduits for all wiring outlets and sub-mains. Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw boxes etc.

7 - LAYING AND DRAWING OF WIRES :

7.1 BUNCHING OF WIRES :

Wires carrying current shall be so bunched in conduits that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

7.2 DRAWING OF WIRES :

The drawing of wires shall be done with due regard to the following precautions:-

No wire shall be drawn into any conduit, until all work of any nature, that may cause injury to wire is completed. Burrs in cut conduits shall be smoothen before erection of conduits. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Approved type bushes shall be provided at conduit terminations.

Before the wires are drawn into the conduits, conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduits if necessary.

While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors.

There shall be no sharp bends.

The Contractor shall, after wiring is completed, provide a blank metal/sunmica plate on all switch / outlet / junction boxes for security and to ensure that wires are not stolen till switches / outlets etc. are fixed at no extra cost the contractor shall be responsible to ensure that wires and loop earthing conductors are not broken and stolen. In the event of the wire been partly / fully stolen, the contractor shall replace the entire wiring alongwith loop earthing at no extra cost. No joint of any nature whatsoever shall be permitted in wiring and loop earthing.

7.3 TERMINATION /JOINTING OF WIRES :

Sub-circuit wiring shall be carried out in looping system. Joints shall be made only at distribution board terminals, switches/buzzers and at ceiling roses/connectors/lamp holders terminals for lights/fans/socket outlets. No joints shall be made inside conduits or junction/draw/inspection boxes.

Switches controlling lights, fans or socket outlets shall be connected in the phase wire of the final sub circuit only. Switches shall never be connected in the neutral wire.

Wiring conductors shall be continuous from outlet to outlet. Joints where unavoidable, due to any special reason shall be made by approved connectors. Specific prior permission from Engineer-In-Charge in writing shall be obtained before making such joint.

Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or wringing.

Strands of wires shall not be cut for connecting terminals. All strands of wires shall be twisted round at the end before connection.

Conductors having nominal cross sectional area exceeding 1.5 sq. mm shall always be provided with crimping sockets. Tinning of the strands shall be done wherever crimping sockets are not available as per instructions of the Engineer-In-Charge

All wiring shall be labeled with appropriate plastic ferrules for identification.

At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used.

Brass nuts and bolts shall be used for all connections.

The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

Switches controlling lights, fans, socket outlets etc. shall be connected to the phase wire of circuits only.

Only certified valid license holder wiremen shall be employed to do wiring / jointing work.

7.4 LOAD BALANCING :

The Contractor shall plan the load balancing of circuits in 3 phase installation and get the same approved by the Engineer-In-Charge before commencement of the work.

7.5 COLOUR CODE OF CONDUCTORS :

Colour code shall be maintained for the entire wiring installation - red, yellow, blue for three phases, black for neutral and green for earth.

8 - SWITCHES AND FIXTURES :

8.1 SWITCHES :

All 6 and 16 amps switches shall be of the modular enclosed type flush mounted 220 Volt AC of the best quality and standard or as approved by MEP/Architect/Engineer-In-Charge. The switch moving and fixed contacts shall be of silver nickel and silver graphite alloy and contact tips coated with silver. The housing of switches shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

8.2 FLUSH PLATES :

Switches, receptacles and telephone system outlets in wall shall be provided with molded cover plates of shape, size and colour approved by the Engineer-In-Charge made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material, and secured to the box with counter sunk round head chromium plated brass screws. Where two or more switches are installed together, they shall be provided with one common switch cover plate as described above with notches to accommodate all switches either in one, two or three rows.

One and two gang switch cover plate, telephone outlet cover plate, 6 and 16 amps switched/unswitched plates shall have the same shape and size. Three and four gang switch cover plates shall have the same shape and size. Six and eight gang switch cover plates shall have the same shape and size. Nine and twelve switch cover plates shall

have the same shape and size. Wherever five switches, seven switches, ten switches and eleven switches are to be fixed the next higher size of gang switch cover plate to be used and extra openings shall be provided with blank-off.

8.3 EXTERNALLY OPERATED SWITCHES :

Externally operated switches, shall be of general purpose type, 250 volts of the proper size and rating and shall be provided in weather proof enclosures, complete with weather proof gasketed covers. The MCB's for all externally operated switches shall be separate and of proper rating.

8.4 WALL SOCKET OUTLETS :

All 6/16 Amps wall socket outlets unless otherwise mentioned on the drawings shall be switched, five/six round pin and fitted with automatic linear safety shutters to ensure safety from prying fingers. Un-switched 6/16 amp wall socket outlets where called for in the drawings shall be of five/six round pin type. The socket outlets shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

The switch and sockets shall be located in the same plate. The plates for 6 amp switched/un-switched plugs and telephone outlets shall be of the same size and shape.

All the switched and un-switched outlets shall be of the best standard.

An earth wire shall be provided along the cables feeding socket outlets for electrical appliances. The earth wire shall be connected to the earthing terminal screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

8.5 LIGHTING FIXTURES :

The light fixtures and fittings shall be assembled and installed complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Engineer-In-Charge.

Wires brought out from junction boxes shall be encased in GI flexible pipes for connecting to fixtures concealed in suspended ceiling. The flexible pipes shall be provided with a check nut at the fixture end.

Pendant fixtures specified with overall lengths are subject to change and shall be checked with conditions of the job and installed as directed.

All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Engineer-In-Charge.

Fixtures shall be suspended true to alignment, plumb, level and capable of resisting all lateral and vertical forces and shall be fixed as required.

All suspended light fixtures etc. shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction.

All switch and outlet boxes shall be bonded to earth with insulated stranded copper wire as specified.

Wires shall be connected to all fixtures through connector blocks.

Flexible pipes, wherever used, shall be of make and quality approved by the Engineer-In-Charge.

9 - MEASUREMENT AND PAYMENT OF WIRING :

Wiring for lights, fans, convenience socket outlets and telephone outlets etc. shall be measured and paid for on POINT BASIS as itemized schedule of quantities and as elaborated as below unless otherwise stated.

9.1 PRIMARY AND SECONDARY LIGHT POINT WIRING :

In respect of group control of lights (more than one light controlled by one switch or MCB), wiring upto the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB.

The point wiring basis shall assume average wiring length and average conduiting length per point based on parameters stipulated in Para 9.2 below. The average wiring length and average conducting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.

9.2 PARAMETERS :

Wiring shall be carried out as per following parameters in recessed/ surface conduit system.

Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.

All accessories shall be flush type unless otherwise stated.

Lights, fans and 6 amp socket outlets shall be wired as per the item given in the Bill of Quantities.

Power circuits shall normally have maximum two/one 16 amps socket outlet unless otherwise stated. Separate circuit shall be run for each Geyser, Window/Split air conditioners and similar appliances.

Wiring rates shall include painting of conduits and other accessories as required.

Wiring rates shall include cleaning of dust, splashes of colour wash or paint from all fixtures, fans, and fittings etc. at the time of taking over of the installation.

Wiring rates shall include blanking of outlet boxes to prevent damage/pilferage of wires.

Wiring rates shall include circuit wiring from DB to first control switch & shall be done as per Bill of Quantities.

9.3 DEFINITIONS :

9.3.1 WIRING FOR LIGHTS :

PRIMARY LIGHT POINTS :

Wiring for primary light points, as defined in Para 9.1 above, shall commence at the Distribution Board terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights). Rates for primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of primary light point thus defined including:

Recessed / surface conduting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.

Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled points.

Loop earthing with insulated copper wire.

SECONDARY LIGHT POINTS :

Secondary light points, as defined in Para 9.1 above, shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the cost of entire materials and labour required for completion of the secondary light point thus defined including

Recessed / surface conduiting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.

Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

Loop earthing with insulated copper wire.

9.3.2 WIRING FOR CEILING FANS :

Wiring for ceiling fan points shall be same as for primary light points.

9.3.3 WIRING FOR EXHAUST FANS :

Wiring for exhaust fan points shall be same as for primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan alongwith plug top and a 6 amp control switch at convenient location near the room entry.

9.3.4 WIRING FOR CALL BELL POINTS :

Wiring for call bell points shall be the same as for primary light points. A call bell switch which include in lieu of the control switch at a convenient location as required.

9.3.5 WIRING FOR TELEPHONE OUTLETS :

Wiring for telephone outlets points shall include the entire wiring and conduiting from the telephone tag block to the telephone outlet including the telephone outlet complete as required and as itemized in the Schedule of Quantities

9.3.6 WIRING FOR TV OUTLETS(if Required) :

Wiring for TV outlet points shall include the entire wiring and conduiting from the Splitter Box to the TV outlet including the TV outlet complete as required and as itemized in the Schedule of Quantities.

9.3.7 WIRING FOR CONVENIENCE SOCKET OUTLETS :

3/5 pin 6 amps and 3/6 pin 16 amps single phase switched convenience socket outlets shall be provided in the building as indicated in the layout drawings.

9.3.8 SUB MAINS WIRING :

Sub mains wiring shall be measured from outer end of the boxes. Extra Loop length shall be left at each end as required.

10 - ROUTINE AND COMPLETION TESTS :

10.1 INSTALLATION COMPLETION TESTS :

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

10.2 WIRING CONTINUITY TEST :

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

10.3 INSULATION RESISTANCE TEST :

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 mega ohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one mega ohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between he two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a Mega ohm or when PVC insulated cables are used for wiring 12.5 Mega ohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Mega ohms is acceptable.

10.4 TESTING OF EARTH CONTINUITY PATH :

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

10.5 TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES :

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three of four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Engineer-In-Charge as well as the local authorities.

10.6 EARTH RESISTIVITY TEST :

Earth resistivity test shall be carried out in accordance with latest IS Code of Practice for earthing.

10.7 PERFORMANCE :

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

10.8 TESTS AND TEST REPORTS :

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Engineer-In-Charge for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Engineer-In-Charge prior to energizing of installation.

B - MEDIUM VOLTAGE DISTRIBUTION BOARDS :

1 – GENERAL :

This section covers specification of DBs.

2 - STANDARDS AND CODES :

The latest and amended upto date Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as

amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

3 - MINIATURE CIRCUIT BREAKERS :

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.

The MCB's shall have a rupturing capacity of 10 KA at 0.6 p.f.

The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with XLPE cable characteristic.

Type test certificates from independent authorities shall be submitted with the tender.

4 - FINAL DISTRIBUTION BOARDS :

Final distribution boards shall be prewired type flush mounting, totally enclosed, Double door, dust and vermin proof with built in loose wire box and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.

The distribution equipment forming a part of the Distribution Boards shall comply with the relevant Standards and Codes of the Bureau of Indian.

The board shall be fabricated from 16 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give an IP 43 (double door and four tier arrangement) degree of protection.

The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length. The minimum spacing between phases shall be 25 mm and between phase and earth 19 mm

Separate neutral link for each phase shall be provided.

Separate earth link for each phase shall be provided.

All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.

The equipment shall be mounted on a frame work for easy removal and maintenance.

The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.

All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Engineer-In-Charge.

A sample of the completed board is to be got approved by the Engineer-In-Charge before commencement of supply and erection.

Before commissioning, the distribution boards shall be megger tested for insulation and earth continuity.

5 - SHEET STEEL TREATMENT AND PAINTING :

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute

sulphuric acid and a recognized phosphating process. The steel work shall then receive two costs of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment be given powder coated finish painted with two coats of approved shade on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

6 - NAME PLATES AND LABELS :

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

C - TELEPHONE WIRING SYSTEM :

1 - SCOPE

This section relates to specification for the supply, installation, testing & commissioning of works included telephone system.

The scope of work included in this section is as follows:

a) Supply, installation and laying of telephone cables/ wires.

b) Providing & installing medium duty MS conduit.

c) Providing & installing G.I./MS moulded boxes including plug in type telephone outlets.

2 – CONDUITING :

All concealed /surface installation including the conduit run above the false ceiling space shall be black enameled MS Conduit (as specified in BOQ). The specification for materials & installation shall be same as described in electrical section. All relevant clauses are applicable for telephone system as well. The conduit for telephone system shall be installed minimum 20 cm away from the power conduit. Care shall be taken so that no telephone conduit is run in parallel to Electrical conduit in close proximity. Wherever telephone conduits cross power conduits, they shall be at right angle, to each other. All telephone conduits shall be earthed.

3 - TELEPHONE DISTRIBUTION BOARDS (TAG BLOCK) :

Telephone distribution network shall be provided with Main Telephone Distribution board for building located in Basement level. At each floor, Telephone distribution board tag block shall be provided in telephone shaft/cupboard. Telephone tag block shall be double jumpering type.

Tag block shall be mounted in MS box fabricated from 1.63mm thick sheet steel. Box shall undergo a rigorous metal treatment process i.e. degreasing, pickling, phosphating, pasivating in deoxalate solution, dry with compressed air in dust free atmosphere facility, and disconnection module shall be in multiple of 10 pairs. Disconnection unit shall be mounted on back mounting frame. Protection against over voltage through protection magazine shall be provided from rear of Disconnection Module.

Telephone distribution box shall have back mounting frame, disconnection module, lock & key arrangement. Contractor shall also provide one pair of wiring tools, test cord,

disconnection plug, wiring base. Cost of these items shall deemed to be included in quoted rates.

Main telephone distribution board shall be provided with protecting magazine with GD tubes for protection from over voltage. MTDB shall be complete with back mounting frame. Disconnection module, lock & key arrangement. MTDB box shall be fabricated from 2mm thick sheet steel.

D - MOULDED CASE CIRCUIT BREAKERS :

1 - GENERAL

Moulded case circuit breakers shall be incorporated in the switch board wherever specified. MCCB shall conform to IEC:947-II or IS:13947-II in all respects. MCCB shall be suitable for three phase 415 volts AC. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. All MCCBs will have earth fault module (if specifically asked) and front operated. All four pole MCCB shall be suitable for three phase four wire system, with the neutral clearly identified and capable of first make last break feature.

2 - CONSTRUCTION

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material, operating handle shall be quick make/quick break. The operating handle shall have suitable `ON' `OFF' and `TRIPPED' mechanical indicators notable from outside. All MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases. The MCCB should be suitable for disconnection and isolation with marking on front name plate.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic tripping device shall have IDMT characteristics for sustained over load and short circuits. All MCCBs above 250 Amps will also have short circuit magnetic pickup level adjustment.

3 - MCCBs

All MCCBs shall have variable thermal overload releases which can be adjusted at site.

Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances. All MCCBs of higher ratings above 250 Amps shall be provided with separate extended arcing contacts.

4 - INTERLOCKING

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switch board.

a) Handle interlock to prevent unnecessary manipulations of the breaker.

b) Door interlock to prevent the door being opened when the breaker is in ON or OFF position.

c) Defeat-interlocking device to open the door even if the breaker is in ON position.

5 - BREAKING CAPACITY

The moulded case circuit breaker shall have a rated service. Short circuit breaking capacity of not less than 25 KA rms at 415 volts AC. Wherever required, higher breaking capacity breakers to meet the system short circuit fault shall be used.

6 - ACCESSORIES

All the accessories like shunt, under voltage contact blocks shall be of snap fitting possible at site.

7 - TESTING

a) Original test certificate of the MCCB shall be furnished.
b) Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

TECHNICAL SPECIFICATIONS

EXTERNAL ELECTRICAL WORKS

A - MV CABLES

1 - STANDARDS OF CODES

This chapter covers the specifications for supply and laying of Medium Voltage XLPE cables.

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

2 - CABLES

Medium voltage cables shall be aluminium conductor FR XLPE insulated, PVC sheathed armoured conforming to latest IS. Cables shall be rated for 1100 Volts.

All Conductor cables shall be as per BOQ.

Conductors shall be insulated with high quality FR XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied below outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of PVC insulation.

1 Core	:	Red/Black/Yellow/Blue
2 Cores	:	Red and Black
3 Cores	:	Red, Yellow and Blue
3 ½ /4 Core	:	Red, Yellow, Blue and Black

3 - STORING, HANDLING, LAYING, JOINTING AND TERMINATION

3.1 STORING

All the cables shall be supplied in drums. On receipt of cables at site. It should be ensured that both ends of the cables are properly sealed to prevent ingress/absorption of moisture lay the insulation. The cables shall be inspected and stored in drums with flanges of the cable drum in vertical position. Whenever cable drums have to be moved over short distances, they should be rolled in the direction of the arrow, marked on the drum and while removing cables from the drums the drum shall be properly mounted on jacks or on a cable wheel or any other suitable means making sure the spindle, jack etc. are strong enough to take the weight of the drum.

3.2 LAYING

Cables shall be laid as per the specifications given below:

3.3 DUCT SYSTEM

Wherever specified such as road crossing, entry to building or in paved area etc. cables shall be laid in under ground ducts. The duct system shall consists of a required number of stone ware pipes, GI, CI or spun reinforced concrete pipe with simplex joints and all the jointing work shall be done according to the CPWD building specifications or as per the instructions of the Engineer-In-Charge as the case may be. The size of the pipe shall not be less than 100mm in diameter for a single cable and shall not be less than 150mm for more than one cable and so on. The pipe shall be laid directly in ground without making any special bed but wherever asbestos cement pipes are used, the pipes shall be encased in concrete of 75mm thick. The ducts shall be properly anchored to prevent any movement. The top surface of the cable ducts shall not be less than 60 cm. below the ground level. The ducts shall be laid a gradient of at least 1:300. The duct shall be provided manholes of adequate size at regular intervals for drawing the cables. The manhole cover and frame shall be of cast iron and machine finished to ensure a perfect joint. The manhole covers shall be installed flush with the ground or paved surfaces. The duct entry to the manholes shall be made leak proof with lead-wool joints. The ducts shall be properly plugged at the ends to prevent entry of water, rodents, etc. Suitable duct markers shall be placed along the run of the cable ducts. The duct markers shall at least be 15 cm. square embedded in concrete, indicating duct. Suitable cable supports made of angle iron shall be provided in the manholes for supporting the cables. Proper identification tags shall be provided for each cable in the manholes.

3.4 CABLES IN OUTDOOR TRENCHES:

Cable shall be laid in outdoor trenches wherever called for. The depth of the trenches shall not be less than 75cm from the final ground level. The width of the trenches shall not be less than 45 cm. However, where more than one cable is laid, an axial distance of not less than 15 cm. shall be allowed between the cables. The trenches shall be excavated in reasonably straight line with vertical side walls and with uniform depth. Wherever there is a change in direction suitable curvature shall be provided complying with the requirements. Suitable shoring and propping may be done to avoid caving in of trench walls. The bottom of the trench shall be level and free from stone brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 cm. in depth.

The cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire cable length shall as far as possible be paved of in one stretch. However where this is not possible the remainder of the cable may be removed by "Flaking" i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 meters. apart and drawn straight. The cable should then be taken off the rollers by additional helpers lifting the cable and then laid in a reasonably straight line.

For short cut runs and sizes upto 50 sq.mm of cables upto 1.1 KV grade any other suitable method of direct handling and laying can be adopted with the prior approval of the Engineer-in-charge.

When the cable has been properly straightened, the cores are tested for continuity and insulation resistance and the cable length then measured. The ends of all cables shall be sealed immediately. In case of PVC cables suitable moisture seal tape shall be used for this purpose.

Cable laid in trenches in a single tier formation shall have a covering of clean, dry sand of not less 17 cms above the base cushion of sand before the protective cover is laid. In the case of vertical multi tier formation after the first cable has been laid, a sand cushion of 30 cms shall be provided over the initial bed before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30 cms as

stated above. The top most cable shall have final sand covering not less than 17 cms before the protective cover is laid.

Unless otherwise specified, the cables shall be protected by the second class bricks of not less 20 cms x 10 cms x 10 cms (nominal size) protection covers placed on top of the sand (bricks to be laid breadth wise) for the full length of the cable. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and project at 5 cm. over the sides of the end cables. The trenches shall be taken back filled with excavated earth free from stones or other sharp edge debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 cm, unless otherwise specified.

3.5 ROUTE MARKER

Cable route marker marked "Cable" shall be provided alongwith the route of the cable and location of loops. The route markers shall be of tapered concrete slab of 60 x 60cm at bottom and 50 x 50cm at top having a thickness of 10cm. Cable marker shall be mounted parallel to and 50cm away from the edge of the trench.

3.6 CABLES IN INDOOR TRENCHES

Cables shall be laid in indoor trenches wherever specified. The trench shall be made of brick masonry with smooth cement mortar finish with suitable removable covers (i.e. precasted slabs or chequered plates). The dimensions of the trenches shall be determined depending upon the maximum number of cables that is expected to be accommodated and can be conveniently laid. Cables shall be arranged in tier formation in trenches and if necessary, cables may be fixed with clamps. Suitable clamps, hooks and saddles shall be used for securing the cables in position. Spacing between the cables shall not be less than 15 cm centre to centre. Wherever specified, trenches shall be filled with fine sand and covered with RCC or steel chequered trench covers.

B - EARTHING

1 - GENERAL

This section covers the general arrangement of the earthing, i.e. all non-current carrying metal parts of the electrical installation shall be earthed as per latest IS code and general specifications for electrical works (part-1, internal) of CPWD specifications. All metal conduits, trunkings, cable sheaths, switchgear, distribution boards, meters, light fixtures, fans and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall also be in conformity with the provisions of Rule 32, 61, 62, 67 and 88 of IER 1956. The earth electrode shall not be situated less than 1.5 meters.

2 - EARTHING SYSTEMS

It shall comprise of earth electrodes, earth strips, earth continuity conductor and all earthing conductors shall be of high conductivity copper, GI or aluminium and shall be protected against mechanical damage and corrosion. The size of earth conductors shall not be less than half that of the largest current carrying conductor. The connection of earth continuity conductors of earth bus and earth electrodes shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cable by using suitable clamps made of non ferrous metals.

3 - EARTHING ELECTRODES

Earthing electrodes shall be designed as per the requirement of latest IS codes. The number and size of earth electrodes shall be calculated so that under fault conditions no

electrode is loaded above its maximum permissible current density. The resistance of earth electrode shall be as low as possible, the maximum allowable value being one ohm.

Earthing electrodes of either plate type or pipe type may be adopted. The choice of plate or pipe electrode shall be decided according to the anticipated fault level of the network and local soil conditions. Generally, plate electrodes shall be used for substations and large medium voltage network and pipe electrodes for small medium voltage network and installations.

3.1 LOCATION OF EARTH ELECTRODES

Normally on earth electrode shall not be situated less than 1.5 mtr from any building. Care shall be taken that the excavation for earth electrode may not effect the column footings or foundation of the buildings. In such cases electrodes may be further away from the building.

The location of the earth electrode will be such where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements and road ways, are to be definitely avoided for locating earth electrode.

3.2 WATER ARRANGEMENT

Method of watering arrangement shall comply with CPWD General Specifications.

3.3 PLATE ELECTRODE

Plate electrodes shall be made of GI plate of 6 mm thick and 60x60 cm. size. The plate shall be buried vertically in ground at depth of not less than 3.5 meters to the top of the plate, the plate being encased in charcoal to a thickness of 15 cm. all round. It is preferable to bury the electrode to a depth where sub-soil water is present. Earth leads to the electrode shall be laid in a GI pipe and connected to the plate electrode with GI bolts, nuts and washers. A GI pipe of not less than 19 mm Dia shall be placed vertically over the plate and terminated in a funnel at 5 cm. above ground. The funnel shall be provided with a wire mesh. The funnel shall be enclosed in masonry chamber of 100 x 50 cm. dimensions. The chamber shall be provided with CI frame cover of 100 x 50 cm size. The earth station shall also be provided with a suitable permanent identification label/tag.

Note: If copper plate is used it shall be of 3mm thickness.

3.4 Pipe electrode shall comprise of a 2.5 Meter. long 40 mm Dia GI pipe buried vertically in a pit of 35 x 35 cm size and filled with alternate layers of charcoal, salt and river sand and connected at the top to a GI pipe of 19 mm, 1 Meter. long with a funnel at the other end, 5 cm above the ground. The earth lead shall be properly fixed to the pipe electrode with brass bolts, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of 30 x 30 x 30 cm. dimensions. The chamber shall be provided with a CI frame and CI cover. Proper permanent identification tag/label shall be provided for each electrode.

4 - INSTALLATION

All joints shall be reverted and sweated. Joints in the earth bar shall be bolted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to apparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection and special care taken to ensure a permanent low resistance contact to iron or steel. All steel bolts, nuts, washers, etc shall be cadmium plated. Main earth bars shall be spaced sufficiently away from the surface to which they are fixed, such as walls or the side of trenches to allow for easy connections. Copper earth bars shall not be fixed by ferrous fittings. The earthing shall be suitably protected from mechanical injury by galvanized iron within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to the plate or pipe as the case may be. In the

case of the plate, the lead shall be connected by means of cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts, nuts and washers shall be galvanized.

4.1 METHOD OF INSTALLATION OF WATERING ARRANGEMENT

In the case of plate earth electrode a watering pipe of 20 mm Dia of medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top for watering the pit. In case of pipe earth electrode a 40 mm x 20 mm reducer shall be used for accessing the funnel. The watering funnel attachment shall be housed in masonary enclosure of not less than 30 cm x 30 cm x 30 cm. A cast iron cover having locking arrangement shall be suitably embedded in the masonary enclosure.

5 - PRECAUTIONS

Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passages of fault currents.
Joints shall be soldered, tinned and double riveted. All the joints shall be mechanically and electrically continuous and effective. Joints shall be provided against corrosion.

The earthing lead from electrode onwards shall be suitably protected from mechanical injury by a 15 mm Dia GI pipe in case of wire and by 40 mm Dia medium class GI pipe in case of strips. Portion of this protection pipe within the ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floor to adequate depth.

6 - TESTING

On the completion of the entire installation, the following tests shall be conducted and no earth electrode shall have ohmic resistance of more than 2 ohm and in rocky soil not more than 3 ohms.

a) Earth resistance of electrodes

b) Impedance of earth continuity conductors as per IEE regulations.

c) Effectiveness of earthing as per IEE regulations.

All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in triplicate to the Architects for approval.

C - MEDIUM VOLTAGE PANELS:

1 - GENERAL

Medium voltage power control centres (generally termed as switchboard panels) shall be in sheet steel clad cubicle pattern, free floor standing, totally enclosed, compartmentalized design having multitier arrangement of the incomers and feeders as per details given in the schedule of quantities. All panels shall conform to the requirements of the latest addition of IS and shall be suitable for 415 V, 3 phase AC supply or 230 V single phase AC supply as required.

2 - CONSTRUCTIONAL FEATURES

The Switch Boards shall be totally enclosed, sheet steel cubicle pattern, extensible on either side, dead front, floor mounting type (wall mounting if specifically asked for in BOQ) and shall have a bus bar chamber at the top and the cable entry from the bottom. (For

panel requiring top cable entries if any, refer to BOQ). The cable terminations should be in side the feeder compartment only.
The Switch Boards shall be completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of ingress protection of IP 43. All doors and covers shall also be fully gasketed with synthetic rubber. All the live parts shall be properly shrouded with FRP sheets.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal. Base channel shall be fabricated from ISMC 75 and door shall be provided at the bottom with arrangement for fixing bolts in the foundation.

All panels and door covers shall be properly fitted and square with the frame. The cutouts in the panel shall be correctly positioned.

Lifting lugs of adequate strength shall be provided on each transport section of the panels.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

3 - SWITCHBOARD DIMENSIONAL LIMITATIONS

A base channel 75 mm x 5 mm thick shall be provided at the bottom.

The overall height of the Switch Board shall be limited to 2200 mm

The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1900 mm from finished floor level.

4 - BUS BARS

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate bus bar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral bus bars shall be provided). The interval between the two insulators will be designed after considering the following:

a) Strength and safe load rating of the insulator,
b) The vibrating force generated during a fault,
c) A Factor of safety of 1.25
d) A set of insulators at both ends of the bus.

Bus bars shall be sized considering maximum current density of 1 Amps/ cross section Sq.mm area. The size of the bus bar calculations must be approved by the consultants.

The bus bars shall be designed to withstand a temperature rise of $45^{O}C$ above the ambient. To limit the temperature rise in the bus bar chamber a set of louvers can be provided at strategical places considering the air circulation.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanized high tensile steel nuts, bolts, plain

or spring washers of suitable size will be used in connecting the various sections of the bus bars.

5 - SWITCH BOARD INTERCONNECTIONS

All connections between the bus bars/Breakers terminations shall be through solid Aluminium strips of adequate size to carry full rated current which shall be PVC/fiber glass insulated.

For switch unit ratings upto 63A PVC insulated copper conductor wires of adequate size to carry full load current can be used. The terminations of all such interconnections shall be properly crimped.

6 - CABLE TERMINATIONS

Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables. All cable entries shall be from bottom until & unless specifically asked for in the BOQ.

The cable terminations of the circuit breakers shall be brought out to terminal cable sockets suitably located in the panel.

All outgoing links for FSU\MCB feeders shall be in the feeder compartment only.

The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC cables.

7 - EARTHING

The panels shall be provided with an aluminium earth bus of suitable size running through out the length of the switchboard. Suitable earthling eyes/bolts (at min. two points) shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

8 - INTERLOCKING

The panels shall be provided with the following interlocking arrangement.

The door of the switch-fuse compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in `OFF' position. De-interlocking arrangement shall also be provided for occasional inspection.

It shall not be possible for the breaker to be withdrawn when in `ON' position.

It shall not be possible for the breakers to be switched on unless it is either in fully inserted positions or for testing purposes in fully isolated position.

The breaker shall be capable of being raked in to `testing' `isolated' and `maintenance' positions and kept locked in any of these position.

A safety latch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

9 - WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq.mm except for the circuits related to

current transformers or circuits with current carrying capacity more than 5 Amps (for which min. 2.5 Sq.mm copper conductor wires shall be used).

10 - SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulfuric acid and a recognized phosphating process. The steel work shall then receive two coats of oxide primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment shall be powder coated with shade RAL 7032 (Siemens Gray) on the outside of the panel and mounting plates shall be of orange shade. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns (shade of paint may be changed if the Engineer In charge so desires).

11 - NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

12 - INSTALLATION

Installation shall be done by erection Contractor.

13 - TESTING AND COMMISSIONING

Copies of type tests and routine test as per relevant specification, carried out at manufacturer’s work shall be submitted to the ENGINEER IN CHARGE as required.

Wiring and connections including earthing shall be checked for continuity and tightness.

Insulation shall be measured with a 500 V megger and insulation resistance shall not be less than 100 Mega ohms

Interlocking operation to be checked as per requirement.

Tests shall be performed in presence of authorized representative of the ENGINEER IN CHARGE for which the contractor shall give due prior notice.

14 - HIGH VOLTAGE TEST

A high voltage test with 2.5 KV for one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed, all units raked in position and the breakers closed. Original test certificate shall be submitted along with panel.

15 - PRE-COMMISSION TESTS:

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of Architect's/Consultant's or their representatives.

- All main and auxiliary bus bar connections shall be checked and tightened.
- All wiring termination and bus bar joints shall be checked and tightened.
- Wiring shall be checked to ensure that it is according to the drawing.

- All wiring shall be tested for insulation resistance by 1000 volts Meggar.

- Phase rotation tests shall be conducted

- All relays and protective devices shall be tested for correctness of settings and operation by
  introducing a current generator and an ammeter in the circuit.

16 - CLIMATIC CONDITIONS

The panels & switch gear components shall be suitable for following climatic conditions:

	Maximum	**Minimum**
DBT	$45^{O}C$	$3^{O}C$
RH	90%	20%

17 - HEATING ARRANGEMENT :

The panel shall be provided with a thermostatically controlled heating arrangement for monsoon (200 Watt) to take care of high humidity conditions. A 6/16A service socket outlet (single phase) shall be provided in one of the compartments in all the panels.

D - METERING, INSTRUMENTATION AND PROTECTION :

The specifications hereinafter laid down shall cover all the meters, instrumentation and pro
tective devises required for the electrical work. The ratings, type and quantity of meters, instruments and protective devices shall be as per the schedule of quantities and drawings.

1 - MEASURING INSTRUMENTS :

GENERAL :

Direct reading electrical instruments shall be in conformity with IEC-51, BS: 89 or IS: 1248. The accuracy of direct reading shall be 1.0 for voltmeters and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5. The error due to variations in temperature shall be limited to a minimum. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale marking. The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right. Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three phase supply.

a) Ammeters

Ammeters shall be moving iron type. The moving part assembly shall be with jewel bearings. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. The ammeters shall be manufactured and calibrated as per the latest edition of IS 1248 or BS 89. Ammeters shall be instrument transformer operated, and shall be suitable for 5 A. Secondary of instrument transformer. The scales shall be calibrated to indicate primary current, unless otherwise specified. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

b) Voltmeters

Voltmeter shall be of moving iron type. The range for 400 volts, 3 phase voltmeters shall be to 0 to 500 volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The voltmeter shall be provided with protection fuse of suitable capacity.

2 - INSTRUMENT TRANSFORMERS :

Current Transformers

Current transformers shall be in conformity with IS: 2705 (Part-I, II, & III) in all respects. All current transformers to be used in the L.T. Electrical panels shall be low tension, ring type resin cast current transformer with the requisite currents ratio having secondary of the current transformers selected will be based on the following;

1. For energy measuring: 1.0 class of accuracy.

2. For other metering: 1.5 class of accuracy.

3. For protects on: 3.0 class of accuracy. Where a common CT is used for different functions the CT accuracy class will be equal to the best class required by any of those function.

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 35 MVA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Current transformers shall be provided with earthing terminals for earthing chassis frame work and fixed part of the metal casing (if any). Each CT shall be provided with rating plate indicating the following:

1. Name and make
2. Serial Number
3. Transformation ratio
4. Rated burden
5. Rated voltage
6. Accuracy class

The current transformers to be selected for this panel will have at least 20% extra VA capacity available over the normal capacity based on the following details;

1. For ammeters: 3 VA.
2. For current coils of KW & KWHR, PF, and KVAR meters or for all recorders: 5 VA.
3. For normal wiring: 2 VA.
4. For current coil of protection relays: 10 VA under; no circumstances the VA rating of the CT's will be less than 15 VA.

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CT’s shall be copper conductor, PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

3 - CONTROL DEVICES

a) Push Buttons

The push buttons used in the panels will be rated for more than 415 volts and 2 amps. All the push buttons will be mounted on the front door and the assembly will be in two parts. All the push buttons will be mounted on the front door of the cubicle in regular

symmetrical fashion as per the general norms being practiced. Only one make of push buttons will be used in the assembly of all the panels. The selection of the colour of the push buttons will be as follows

Function	Colour
Starting/Switching ON	Green
Stopping/Switching OFF	Red
Resetting	Black
Forward ON	Yellow
Reverse ON	Blue
Emergency OFF	Red/Mushroom

b) Indicating Lights

The indicating lights used in the panel will be pleasant looking and round shape having the following features;

1. A separate front lens for it's easy replacement.
2. Facility to replace the bulb from the front.
3. Bayonet pin cap bulbs of standard size to be used.
4. The shape of the lens to allow viewing from sides.
5. Series resistance with use of low voltage bulb for longer life.
6. Clear and distinct indication for light ON and OFF with differences of brightness of the lens.

The selection of the colors of the indicating lamps will be as follows:

- Red for system in operation
- Amber for system ready for operation.
- Green for system being put off.
- Red, yellow and blue for incoming supply.

4 - TESTING

Instrument transformers shall be tested at factory as per IS: 2705 & IS: 3156. The test shall incorporate the following:

a) Type tests
b) Routine tests

Original test certificates in triplicate shall be provided.

Meters shall be tested as per IS: 1248. The tests shall include both type tests and routine tests. Original test certificate in triplicate shall be furnished.

a) Suitable injection tests shall be applied to the secondary circuit of every instrument to establish the correctness of calibration and working order.

b) All relays and protective devices shall be tested to establish correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

5.0 INSTRUMENT TRANSFORMER

5.1 Current Transformer

The current transformers shall be of epoxy encapsulated/cast resin type, mounted on stationary portion
of the switchgear and shall be easily accessible for maintenance and testing purpose.

The current transformers shall be capable of withstanding the short circuit stresses corresponding to a
fault level of the system.

The ratio and ratings of the current transformers shall be suitable to meet the requirements of metering
and protection of the corresponding feeder.

The current transformers shall conform to the latest edition of IS. Unless specified otherwise,
insulation, temperature rise and all other phases of manufacture and testing shall conform to that given
in the standards. A type test certificate of a CT of similar design for temperature rise test shall be
furnished along with the offer.

Facilities for shorting and grounding the terminals shall be provided at the terminal block.

5.2 Potential Transformers

The potential transformers shall be epoxy encapsulated /cast resin design and Star type on L.T. side.

A manually operated disconnecting device shall be mounted on the primary side of potential transformer. This device shall be designed to operate externally without access into the line portion of the switchgear.

The connections from main circuit to potential transformers shall be capable of withstanding short circuit stresses of the system.

The high voltage winding of the potential transformer shall be protected by current limiting fuses. Low voltage fuses, sized to prevent harmful overload, shall be installed.

The manufacture, testing, insulating and temperature rise of the potential transformer shall conform to the latest revision of the relevant IS.

The 110V bus in the switchboard shall be sectionalized.

6.0 INSTRUMENTS & METERS

The instruments shall be the flush type preferably with the square face of digital intelligent panel meter 96W x 96H as specified. They shall be fully tropicalised, dust tight and shall conform to the relevant standards.

Display shall be of backlit LCD with 10mm height digits.

The meter shall be capable of measuring power, current, and voltage simultaneously with accuracy of class 1.0.

The scale range of the AC ammeter shall generally be equal to 1.5 times the rated primary current of the C.T. feeding them. The scale range of the voltmeter shall be about 15% in excess of the normal circuit voltage.

7.0 AUXILIARY AND CONTROL POWER SUPPLY :

7.1 AC Power Supply for Space Heater and Cubicle Illumination Lamps:

Each carriage control panel including the breaker operating mechanism shall be provided with thermostatically controlled space heater. The thermostat shall have adjustable

range. The space heaters shall be rated for 230 volts, 1 phase, 50 Hz. For cubicle illumination, receptacle arrangement at suitable location of each control panel shall be provided so that hand lamp connection may be taken from this receptacle during inspection and maintenance.

Wiring for space heaters shall be suitably grouped so as to form a more or less balanced condition on 230 V, 1 phase, 50 Hz supply. Suitable number of space heaters alongwith thermostat may be provided.

Each space heater and hand lamp circuit shall be provided with ON/OFF switch and suitable protection.

7.2 Control Supply:

The power for breaker control and indication shall be taken from 24V DC supply.

In addition, each cubicle shall be provided with one double pole, single throw switch for its control circuit power supply.

7.3 Fuse:

All control and power fuses shall be link type "H.R.C." fuses. Plug fuses (screw-in type) shall not be accepted.

8.0 SECONDARY AND SMALL WIRING :

8.1 All wiring for the equipment and devices located on or within the switchgear shall be carried out. The wiring shall be complete in all respects so as to ensure proper functioning of control, indication, measurement, protection and interlocking scheme.

8.2 All the wiring shall be marked in accordance with the relevant standards. Numbered ferrules, reading from the terminals onward shall be provided at both ends of all the wiring for easy identification.

8.3 The internal wiring shall be of PVC insulated cable of 1100/650 grade of minimum size 2.5 Sq.mm copper.

9.0 ALARM ANNUNCIATION SYSTEM :

The annunciator shall be provided on each panel to indicate the various circuit conditions and shall be
placed at suitable height. The various functions shall be as follows:

- Circuit breaker closed
- Circuit breaker open
- Trip circuit healthy
- Alarm & Auto trip
- Transformer non trip (Buchholtz, etc.)
- C/B in test

Hooter/Buzzer shall be provided with a manually operated switch so that it can be silenced.

10.0 Control Cable :

All control cables shall enter the switchgear from top/bottom. Removable plates at the top/bottom of
the panel shall be furnished with compression type cable glands to make entry dust-tight and no weight
is transferred on the terminal. The glands shall be suitable for terminating cable armour.

All connections and accessories required to complete the whole installation shall be supplied by the
Contractor.

11.0 TERMINAL BLOCKS :

Terminal blocks shall be provided as specified and shall be clip-on type. They shall be shrouded preferably by a transparent acrylic sheet. The terminal block of different voltage classes shall be segregated.

12.0 ACCESSORIES :

Following accessories shall be provided for each switchgear:

- Channel base and foundation bolts
- Lifting lugs
- Maintenance closing handle for circuit breaker
- Draw handle for circuit breaker
- Hook stick, indoor use, 1.5 m long
- Test plug for draw out type relay

13.0 NAME PLATE :

Nameplates of approved design shall be furnished at the front of each compartment of the cubicles.

Rating plates for each circuit breaker and at each instrument, relay and auxiliary switches as mounted on the face or inside the cubicle shall also be furnished.

Instruments and devices mounted on the cubicle door of the switchgear shall be identified on the rear also with the respective numbers on or adjacent to the instrument or device case.

13.0 GROUND BUS :

A ground bus of 32 mm x 6 mm Copper flat shall be furnished along with the full length of the panel. Each stationary unit shall be connected directly to this ground bus.

Grounding terminals at two end of the ground bus shall be provided for connection to station ground grid.

The frame of each draw-out carriage containing circuit breaker shall be grounded through heavy multiple finger contacts at all times except when the unit primary disconnecting devices are separated by a safe distance.

15.0 TESTS :

The switchgear unit shall be completely assembled, wired, adjusted and tested for operation under similar conditions to ensure accuracy of wiring, correctness of control schemes and proper functioning of all equipment.

15.1 Routine Test :

Each of the following equipment shall be subjected to standard routine tests as per applicable clauses of relevant IS specifications:

- Circuit breakers
- Bus bar assembly
- Instrument transformers
- Auxiliary relays
- Control switches and indication lamps

15.2 Design Test (Type Test):

Typical type test report of the tests mentioned below conducted on similar equipments in the past shall be furnished alongwith the tender.

i) Short Time Current Test
ii) Short Circuit Test duties on Circuit Breaker
iii) Impulse withstand Test
iv) Power Frequency withstand Test
v) Temperature Rise Test
vi) Internal Arc Test
vii) Mechanical Endurance test on Circuit Breaker
viii) Test to prove Degree of Protection of enclosure

15.3 Test Certificates :

Test certificate shall be furnished in required number of copies.

The routine and type test certificates shall be furnished to the Engineer-in-charge for approval before dispatch of the equipment from the works. The approval in writing shall be required to effect the dispatch of the equipment.

The routine and type test certificates of the miscellaneous components shall also be furnished to the Engineer-in-charge for approval.

The report shall furnish complete identification of data including serial number of each equipment.

15.4 Performance Guarantee :

The performance guarantee figures quoted on the schedule of technical data shall be guaranteed within the tolerances permitted by standard and will become a part of successful Tenderer's Contract.

16.0 DRAWINGS, DATA AND MANUALS :

16.1 After award of contract, the successful Bidder shall submit the required number of copies of the following drawings for approval of the Engineer-in-charge :

Confirmed outline dimensional drawing of the various switchgears showing the general arrangement and indicating the following:

- Space required in the front for breaker withdrawal.

- Control cable entry points and termination arrangement.
- Power cable entry points and termination arrangement.
- Bus bar clearance phase to phase and phase to ground.
- Configuration of bus bar.
- Technical detail of supporting insulator and their spacing.
- Location of instrument transformers.
- Control panel details with equipment layout.
- Terminal block details.

16.2 Single and three line diagram of all switchgears showing instrument transformers control switches, instruments and indication, etc.

16.3 Control schematic diagram of each breaker showing all safety and operation interlocks, annunciation,etc.

16.4 Transport/shipping dimensions with weights.

16.5 Foundation and anchor bolt details including dead load and impact load.

16.6 Cross-section with parts list.

16.7 Cubicle wiring diagram with terminal board disposition.

16.8 Any other relevant data, drawing and information necessary for review of items whether specifically mentioned or not, shall be furnished by the Contractor along with those information.

16.9 The responsibility of correctness of wiring diagram shall be with Contractor. The Engineer-in-charge will check the final schematic after submission. If any modification, addition or alteration is considered necessary to comply with the approved schematic drawing as stated herein above, the said modification, addition or alteration shall be carried out by the Contractor either in their works if it is before delivery, or at Site after delivery at no cost to the Engineer In charge.

16.10 Before starting manufacture of the equipment, the Contractor shall have to take approval of these design drawings from the Engineer-in-charge in writing. Any manufacturing done prior to approval of drawings shall be rectified in accordance with the approved drawing by the Contractor at his own cost and the equipment shall be supplied within the stipulated period.
Oil level indicator.
Thermometers with thermometer sockets & leads.
Oil & winding temperature indicators with alarm & trip contacts with capillary.
Oil conservator Tank filter cap,drain valve and oil level gauge
Oil filling hole and cap.
Filter valve.
Bi-directional Rollers.
Explosion vent.
Air Release Valve.
H.V. Cable Box
L.V. Cable Box with copper bus bars
Marshalling Box
Buchholz Relay with alarm & trip contacts & two shut OFF valves
Radiators with shut off valves & air release plugs.
On Load Tap Changer and RTCC Panel.
Steel bolts and nuts exposed to the atmosphere shall be either galvanized or zinc passivated to make them as rust free.

TECHNICAL SPECIFICATIONS

FIRE DETECTION AND ALARM SYSTEM

CONVENTIONAL FIRE ALARM SYSTEM

The contractor shall supply, install, test and commission a modern Conventional Fire Detection and Alarm System of an approved manufacture and design, and in accordance with the civil defense requirements to protect the risk area set forth in the drawings.

The equipment shall form an integrated system of actuating devices laid in different areas and connected to a central control panel located at the main entrance of the building.

The contractor shall submit a complete proposal with schematic drawings, list of materials and original detailed catalogues of the equipment for consultant/client approval before starting the work.

The supplier and installer of the system shall be approved by the local civil defense authority.

Installation shall be to the British Standard BS5839 Part 1: 1988 Fire Detection and Alarm systems for buildings.

1. Control panel:

The control panel shall comply with the requirements of BS 5839 part 4 and EN 54-2 & 4, and with quality assurance requirements of ISO 9001-1994. The panel shall be LPCB approved.

The system equipment shall be CE tested and certified and the CE marking shall appear on the packaging and/or included in the operating instructions.

The control panel shall be housed in a steel enclosure with partially glazed door. All electronics within the panel shall be microprocessor controlled. The motherboard and the display electronics inside the control panel shall be fixed on to a detachable chassis.
The panel shall include an integral power supply unit and sealed lead acid batteries. A fire relay with two changeover contacts and a fault relay with changeover contact shall be supplied in the control panel. Facilities for remote evacuation, silence and reset of system shall be provided.

Twin LED's shall be provided for zone identification. They will flash intermittently when an alarm is received and change to steady when the alarm is acknowledged. A flashing amber fault led shall indicate the fault status of each zone. A separate zone isolation switch shall be provided for each zone. Upon operating the zone isolation switch, amber led shall flash steadily to indicate the fault.

All zones shall be monitored for both open and short circuit faults.

The control panel shall be provided with two 24 Volt DC alarm circuits, monitored for both open and short circuit faults. Flashing amber led shall operate with internal buzzer on fault conditions. Alarm circuits shall have the following minimum power rating:

2 at 500 mA each
2 at 750 mA each
2 at 1 Amp each
4 at 1 Amp each

When calculating the back-up battery requirement notice shall be taken of the quiescent load and time the system must be maintained operational in the event of mains failure.

The control panel shall have “Single Man" commissioning/test facility.

The following user controls shall be provided:

Silence alarm switch.
System reset switch.
Test alarms/evacuation switch.
Test display switch.
Silence fault buzzer switch/ Watchdog reset.
Zone isolate switch per zone.
Relay isolate switch.

The following primary visual indicators shall be visible at access levels 1&2:

Mains on - green
Fire (twin LED’s) - red
Zone fault/isolated - amber
System disabled - amber
Processor fault - amber
General fault - amber

The following engineer's function shall be available at access level 3 on the panel:

1. DIL switch 1

2. DIL switch 2

for panels with 2-4
for panels with 8-12
for panels with 16
for panels with 32

3. DIL switch 3
4. DIL switch 4

- off, causes continuous alarms.
- on, causes pulsed (intermittent) alarms.
- on, causes zone 1 only to become non-latching inhibits zone operation of fire relays.
- on, selects one-man test mode.
- inhibits the operation of fire relay on evacuate in panels with 2-4 zones.

5. Indication at access level -3

- enables processor fault counter in panels. with 8/6/32 zones.
- power supply fault.
- alarm circuit fault.
- display board removed.

2. Heat detectors:

The heat detectors shall be rate of rise type with a fixed upper temperature limit. They shall be solid state construction with a monitoring led and interchangeable plug in bases. The supply voltage shall be between 17-28 V DC and nominal operating temperature –

20 C to +90 C. The wiring shall be polarity insensitive. The detector shall be rated to IP 54.

The detector shall comply with EN 54 (BS 5445) as well as UL standards.

The detector shall be manufactured to comply with the quality assurance standards of BS EN ISO 9002 1994. It shall also be approved by the LPCB.

4. Alarm bell:

Alarm bells shall be a 6" diameter gong type and be suitable for mounting either directly on to a wall or to a conduit box. The bell gong shall be constructed of steel with molded glass filled polypropylene bases housing the motor/solenoid and terminal blocks. The bell shall be polarized.

5.Combined Sounder Strobes:

The design of sounder/strobe shall be an efficient combination of audible and visual warning, in a package taking up no more surface area than a standard sounder. The unit

shall have 103 dB (A) sound output at 1m at 800 Hz, 24V. The lens area shall be large enough to allow maximum visibility.

6.Break glass unit:

Break glass units shall be standard model that fit on switch/socket box for flush installation. Testing shall be carried out by inserting a test key to move the glass, and operate the switch.

7.Remote indicator:

The remote indicator shall have a led fixed on a square/circular self-extinguishing white plastic box for remote indication of the detectors. Remote indicator lamps shall be provided for closed rooms etc. where in normal operation physical viewing of the fire sensor is not possible due to closed doors.

TECHNICAL SPECIFICATIONS

DG SETS

TECHNICAL SPECIFICATION FOR 40 KVA SILENT DG SET

A. DIESEL ENGINE :

Cummins make Diesel engine model S3 8 G5 developing 50 BHP at 1500RPM, water cooled, four stroke, electric start, six cylinder, turbo-charged & after cooled model, conforming to BS : 5514 with capacity of 10% over loading for one hour in twelve hours duration having following accessories as scope of supply :-

AIR INTAKE SYSTEM

- Air intake manifold.
- Dry type air cleaner
- Vacuum indicator.

EXHAUST SYSTEM

- Turbocharger.
- Flexible connection.
- Exhaust manifold.
- Exhaust silencer – Residential type.

COOLANT SYSTEM

- Engine water pump.
- Radiator.
- Coolant additive concentrate
- By Pass Thermostat

LUBRICATING SYSTEM

- Oil Sump
- Engine mounted lub oil pump .
- Full flow lub oil filter.
- Lube oil by pass filter
- Bypass Thermostat

FUEL SYSTEM

- PT Fuel pump with Electronic Governor
- PTD Injector
- 24V DC Solenoid Coil
- Replaceable fuel filer

STARTING SYSTEM

- 24V DC Electric Starter
- 24V DC battery charging alternator

SAFETY CONTROLS

- Low lube oil pressure trip
- High Water temperature trip.
- Overspeed stop

INTEGRATED CONTROL SYSTEM:

Powercom control is a microprocessor based generator set monitoring ,protection and electronic governing system .Powercom offers an advanced level of functions for reliability and optimum generator set performance .

Powercom is designed for the genset environment ,provides genset protection ,engine control and displays genset parameters (both engine & alternator),eliminating use of multiple conventional controls & metering.

Physical construction:

- 128x64 LCD alpha- numeric display with 8 membrane key interface
- Non metallic enclosure
- LED display- faults ,warnings and generator set status
- Key switch for OFF/RUNS/START.

Governor & Speed /Frequency regulation:

- Integrated electronic governing (adjustable up to 5%)

Operator Interface :

- Manual stop/start
- Remote start/stop
- Cyclic cranking
- Alpha numeric screen
- Alternator trim adjustment
- Model specific calibration
- Field trim adjustment

AC Instruments:

- 3-phase AC Amps
- 3-phase AC volts
- KW
- KVA
- Power factor
- Frequency

Measurements/Instrumentation:

- Lube oil pressure
- Coolant temperature
- Engine speed
- Hours run
- Battery voltage

Engine protection:

- High coolant temperature (warning & shutdown)
- Low lube oil pressure (warning & shutdown)
- Fail to crank (shut down)
- Fail to start (shut down)
- Over speed (shut down)
- Low /High battery voltage (warning)
- Low coolant level shutdown

AC protection:

- Over frequency (shutdown)
- Under frequency(warning)
- Over voltage (shutdown)
- Over current (shutdown)
- Under voltage(warning)

Miscellaneous:

- Operating temperature range 0-60 ºC
- Common fault alarm
- Common shutdown
- Date and time stamps for alarms
- Dimensions (in mm) are 267*378*157

Additional features:

- Speed bias or raise/lower inputs are provided for paralleling
- Remote monitoring capability through separate interface modules
- Engineering tool/manufacturing tool/service tool compatible with existing tools
- 6 configurable discrete outputs
- 2 configurable discrete inputs
- Fault indication on front panel display using fault LEDs
- Smooth transition to rated speed
- Programmable fault threshold
- Controlled ramping to restrict start up smoke

OTHERS :

Vibration damper.
Flywheel with housing.

A. ALTERNATOR :

Synchronous alternator of STAMFORD make of 40 KVA rating, suitable for continuous operation at 1500 RPM generating 415 volts at 0.8 p.f.(lag) 50 Hz, 3 phase, 4 wire system. The alternator shall be Brushless type, self excited & self regulated through an AVR. The alternator will be suitable for tropical climate and shall generally confirm to BS : 2613 / IS : 4722. The salient features of the alternator are: -

- ± 1% voltage regulation (max) in static conditions.
- IP : 23 protection with class 'H' insulation.
- Permanent lubricating bearing.
- Permissible overload of 10% for one hour in 12 hours of operation.

C. AMF PANEL :

The control panel is made from 14/16 gauge sheet steel. The panel is dust and vermin proof and is powder coated to give long lasting finish. The panel consists of two modules as under:-

1) **AUTO MODULE :** This module is mounted inside the enclosure on the base frame of the D.G. Set and is equipped with following :-

- Starting key with switch (for AMF relay override)
- Tube light ON/OFF switch
- Set of push button for manual operation of contactors
- Microprocessor based AMF controller having 20 programmable parameter with :

- Master selector switch for auto/manual/test/reset/program
- Push button for engine start

- Push button for engine stop
- Indicating lamps for “set running” and “ set fails to start”
- Continuous sensing of mains voltage
- Three attempts starting
- Auto start and changeover in case of mains failure
- Auto stop and changeover in case of main resumption
- Indication lamps for “Mains ON” and “Generator ON”
- Indication with engine shutdown for LLOP, HWT, Overspeed, Overload, canopy temperature high, “Emergency Stop” pressed
- Digital display of generator voltage, current, frequency, battery voltage Engine instrumentation cluster consisting of
- Lub Oil Pressure gauge
- Coolant temperature gauge
- Lub Oil temperature gauge
- Hour meter
- Indicating lamp for “Engine charging failure”
- Automatic battery charger with indicating lamp for “Charger ON”
- One no. DC Ammeter.

D. BASE FRAME

Engine and alternator are mounted, coupled and aligned on a common channel iron fabricated Base Frame with pre-drilled holes.

E. FUEL TANK

Daily service INBUILT fuel tank of 120 lts. Capacity fabricated for 14 SWG sheet metal complete with drain valve, air vent, inlet and outlet connection.

F. BATTERIES

Two nos. CUMMINS PULSE make batteries of suitable capacity in dry and uncharged condition with its leads.

G. ACOUSTIC ENCLOSURE – 1 NO. (CPCB APPROVED)

H. DOCUMENTATION

1 set of following documents shall be provided with each set

- O & M Manual of Diesel Engine
- Spare parts list of diesel engine
- Test Certificate of diesel engine
- Test certificate of Alternator
- Test Certificate of D.G. Set

TECHNICAL SPECIFICATIONS

EXTERNAL LIGHTING

A - EXTERNAL LIGHTING

The specifications covers the supply, installation, testing and commissioning of the following items (as specified in BOQ):

i) Street/Boundary lighting poles complete with all accessories e.g. looping box, clamps MCBs and required hardware etc.

ii) Street/boundary lighting fixtures complete with all accessories e.g. lamps, holders, choke, upto terminal box etc.

iii) Wiring of street light fixtures.

iv) Cable laying, earthing and inter connection. G.I. pipes for cable entry to looping box.

v) Foundation of poles and erection.

vi) All the items should be tested and installed as per the latest Indian standards specifications and all the sundry items such as clamps, bolts, nuts, racks, support miscellaneous wiring etc., required to make the installation complete shall be taken care while quoting the major items.

1 - STEEL TUBULAR POLE

The poles for street lighting purpose shall be complete in all respects and shall confirm to Latest IS unless otherwise specified. All poles shall be complete with base plate of 400 mm x 400 mm x 10 mm thick welded to bottom. The poles shall be provided terminal box for looping in and looping out of cables and shall consists MCB as specified. The looping box shall be suitable for outdoor installation and complete with all hardware such as clamp, bolts, earthing studs, lockable door etc. and shall be paint also in the same manner as specified for poles.
The poles shall be provided with two numbers of GI pipes of suitable Dia for cable entry as shown in drawing. The poles shall be painted with two coats of red oxide primer on both outside and the portion of the pole below the ground before erection and two coats of aluminium paint of approved shade after erection over the exposed portion.

2 - ERECTION OF POLE

While loading, transporting, unloading and erecting the poles care shall be taken so that the poles do not get bent. Out of shape and where necessary such defects shall be rectified before the poles are erected in position. The poles shall be erected in plumb line and correct level as indicated in the drawing and to the satisfaction of the Engineer-in-charge. They shall be kept in this position with the help of manila ropes until the foundation are constructed (for a minimum period of 10 days) and the back filling is complete. Foundation shall be made with reinforced cement concrete (1:2:4) and not less than 200 mm thick all round. The pole base plate shall be
fixed over 150 mm thick concrete bed. Foundation shall be continued upto 300 mm or more above ground level as per location of the pole to avoid ingress of water logging etc. The foundation shall be tapered suitably into a collar. The excavated portion shall be filled back with earth and consolidated. The cement concrete foundations shall be cured properly by covering the same with water soaked or moist gunny bags at least two weeks before loading the pole.

3 - ERECTION OF LIGHT FIXTURES

Each light fixture shall be connected to the supply through MCB of a suitable rating mounted in the looping box. The fitting shall be fixed to the pole properly and securely.

4 - WIRING OF LIGHT FIXTURES

The wiring of lighting fixtures from terminal block by means of 2.5 Sq.mm PVC insulated two
core copper conductor through a suitable rated MCB and neutral. Cost of two core connecting
cable from junction box to lighting fixture and earth wire complete with connections are included in the quoted rate.

5 - CABLING WORKS

All cable installation work shall be done as per relevant clauses of section cable work.

6 - TESTS

Before handing over the installation, tests on all fittings and cables shall be carried out as per
IS specification.

The tests shall include:

- Meggar test
- Continuity test
- Polarity test and phase sequence test

7 – LIGHTING FITTINGS :

Out door Fittings :

Fittings for external use and for use on roads shall be of a design, which shall prevent the entry of moisture and insects into the fittings.

Height of Fitting :

Unless desired otherwise, all wall mountings and pendent fittings inside the building shall be kept at a height 2.5 m above the floor level all fittings outside the building and on roads shall be fixed at the height as directed by an engineer in charge.

High Pressure Mercury / Sodium Vapour Lamps :

These fittings shall be complete with necessary vapour lamp, lamp holder, fittings with reflector, condenser, choke and starter etc of appropriate size and quality complete in all respects with electronic connections.

Lamp Holder :

All lamp holders shall be bayonet cap type and shall be provided with shade carrier.

B - MEDIUM VOLTAGE PANELS:

1 - GENERAL

Medium voltage power control centres (generally termed as switchboard panels) shall be in sheet steel clad cubicle pattern, free floor standing, totally enclosed, compartmentalized design having multitier arrangement of the incomers and feeders as per details given in the schedule of quantities. All panels shall conform to the requirements of the latest addition of IS and shall be suitable for 415 V, 3 phase AC supply or 230 V single phase AC supply as required.

C - CONSTRUCTIONAL FEATURES

The Switch Boards shall be totally enclosed, sheet steel cubicle pattern, extensible on either side, dead front, floor mounting type (wall mounting if specifically asked for in BOQ) and shall have a bus bar chamber at the top and the cable entry from the bottom. (For panel requiring top cable entries if any, refer to BOQ). The cable terminations should be in side the feeder compartment only.
The Switch Boards shall be completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of ingress protection of IP 43. All doors and covers shall also be fully gasketed with synthetic rubber. All the live parts shall be properly shrouded with FRP sheets.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal. Base channel shall be fabricated from ISMC 75 and door shall be provided at the bottom with arrangement for fixing bolts in the foundation.

All panels and door covers shall be properly fitted and square with the frame. The cutouts in the panel shall be correctly positioned.

Lifting lugs of adequate strength shall be provided on each transport section of the panels.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

D - SWITCHBOARD DIMENSIONAL LIMITATIONS

A base channel 75 mm x 5 mm thick shall be provided at the bottom.

The overall height of the Switch Board shall be limited to 2200 mm

The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1900 mm from finished floor level.

E - BUS BARS

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate bus bar chamber using bus insulators made of non-deteriorating, vermin proof, non

hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral bus bars shall be provided). The interval between the two insulators will be designed after considering the following:

e) Strength and safe load rating of the insulator,
f) The vibrating force generated during a fault,
g) A Factor of safety of 1.25
h) A set of insulators at both ends of the bus.

Bus bars shall be sized considering maximum current density of 1 Amps/ cross section Sq.mm area. The size of the bus bar calculations must be approved by the consultants.

The bus bars shall be designed to withstand a temperature rise of $45^{O}C$ above the ambient. To limit the temperature rise in the bus bar chamber a set of louvers can be provided at strategical places considering the air circulation.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanized high tensile steel nuts, bolts, plain or spring washers of suitable size will be used in connecting the various sections of the bus bars.

F - SWITCH BOARD INTERCONNECTIONS

All connections between the bus bars/Breakers terminations shall be through solid Aluminium strips of adequate size to carry full rated current which shall be PVC/fiber glass insulated.

For switch unit ratings upto 63A PVC insulated copper conductor wires of adequate size to carry full load current can be used. The terminations of all such interconnections shall be properly crimped.

G - CABLE TERMINATIONS

Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables. All cable entries shall be from bottom until & unless specifically asked for in the BOQ.

The cable terminations of the circuit breakers shall be brought out to terminal cable sockets suitably located in the panel.

All outgoing links for FSU\MCB feeders shall be in the feeder compartment only.

The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC cables.

H - EARTHING

The panels shall be provided with an aluminium earth bus of suitable size running through out the length of the switchboard. Suitable earthling eyes/bolts (at min. two points) shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

I - INTERLOCKING

The panels shall be provided with the following interlocking arrangement.

The door of the switch-fuse compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in `OFF' position. De-interlocking arrangement shall also be provided for occasional inspection.

It shall not be possible for the breaker to be withdrawn when in `ON' position.

It shall not be possible for the breakers to be switched on unless it is either in fully inserted positions or for testing purposes in fully isolated position.

The breaker shall be capable of being raked in to `testing' `isolated' and `maintenance' positions and kept locked in any of these position.

A safety latch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

J - WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq.mm except for the circuits related to current transformers or circuits with current carrying capacity more than 5 Amps (for which min. 2.5 Sq.mm copper conductor wires shall be used).

K - SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulfuric acid and a recognized phosphating process. The steel work shall then receive two coats of oxide primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment shall be powder coated with shade RAL 7032 (Siemens Gray) on the outside of the panel and mounting plates shall be of orange shade. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns (shade of paint may be changed if the Engineer In charge so desires).

L - NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

M - INSTALLATION

Installation shall be done by erection Contractor.

N - TESTING AND COMMISSIONING

Copies of type tests and routine test as per relevant specification, carried out at manufacturer’s work shall be submitted to the ENGINEER IN CHARGE as required.

Wiring and connections including earthing shall be checked for continuity and tightness.

Insulation shall be measured with a 500 V megger and insulation resistance shall not be less than 100 Mega ohms

Interlocking operation to be checked as per requirement.

Tests shall be performed in presence of authorized representative of the ENGINEER IN CHARGE for which the contractor shall give due prior notice.

O - HIGH VOLTAGE TEST

A high voltage test with 2.5 KV for one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed, all units raked in position and the breakers closed. Original test certificate shall be submitted along with panel.

P - PRE-COMMISSION TESTS:

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of Architect's/Consultant's or their representatives.

- All main and auxiliary bus bar connections shall be checked and tightened.
- All wiring termination and bus bar joints shall be checked and tightened.
- Wiring shall be checked to ensure that it is according to the drawing.
- All wiring shall be tested for insulation resistance by 1000 volts Meggar.
- Phase rotation tests shall be conducted
- All relays and protective devices shall be tested for correctness of settings and operation by
introducing a current generator and an ammeter in the circuit.

Q - CLIMATIC CONDITIONS :

The panels & switch gear components shall be suitable for following climatic conditions:

	Maximum	**Minimum**
DBT	$45^{O}C$	$3^{O}C$
RH	90%	20%

R - HEATING ARRANGEMENT :

The panel shall be provided with a thermostatically controlled heating arrangement for monsoon (200 Watt) to take care of high humidity conditions. A 6/16A service socket outlet (single phase) shall be provided in one of the compartments in all the panels.

TECHNICAL SPECIFICATIONS
TECHNICAL SPECIFICATIONS LEVEL II
MEDICAL EQUIPMENT (PART 1)

1. Ventilator – High End - Imported

- **THE REQUIREMENT IS OF A MODERN MICROPROCESSOR CONTROLLED INTENSIVE CARE VENTILATOR.**

- **MODES:**
  IT WILLHAVE AT LEAST THE FOLLOWING MODES -
  - **IPPV/CMV, SIMV, CPAP/PEEP, BIPAP,PRESSURE SUPPORT VENTILATION, NON-INVASIVE VENTILATION**

- **PARAMETER SETTINGS:**
  - **TIDAL VOLUME – 50 – 1000 ML, FREQUENCY – 5 – 60 PER MINUTE, FLOW – UP TO 180 LPM, PEEP/PRESSURE SUPPORT – 0 – 30 MBAR, I/E – 3:1 TO 1:3**
  - **TRIGGER SENSITIVITY – 1 – 10 LMP, INSPIRED OXYGEN – 21% - 100%**

- **ALARMS:**
  - **AUDIO-VISUAL ALARMS FOR LIMIT VIOLATIONS**
  - **USER DEFINED; INDEPENDENT FOR ALL PARAMETERS**
  - **CONTEXT DEFINED; AS PER SETTINGS**
  - **PREFERABLY THE ALARMS WILLBE PRIORITY CODED E.G. LIFE-THREATENING, SERIOUS, AND ADVICE ONLY.**

- **SPECIAL FUNCTIONAL MODES:**
  - **INSPIRATION HOLD**
  - **BRONCHIAL SUCTION – AUTOMATIC PRE-OXYGENATION & DETECTION OF DISCONNECTION AND RECONNECTION**
  - **STANDBY – IN USER DEFINED PARAMETER SETTINGS**

- **MONITORING & DISPLAY OF MONITORED FUNCTIONS:**
  - **ALL MEASURED & CALCULATED VALUES**
  - **AIR WAY PRESSURE – PEEK, MEAN, PEEP, PLATEAU; TIDAL VOLUME (EXPIRED); MINUTE VOLUME – TOTAL & SPONTANEOUS;**
  - **I:E RATIO; RATE – TOTAL & SPONTANEOUS;**
  - **INSPIRED OXYGEN & TEMPERATURE**
  - **CURVES – PRESSURE VS. TIME; FLOW VS. TIME AND LOOPS – PV; FV**
  - **TRENDS**
  - **ON A LARGE COLOUR SCREEN OF SIZE NOT LESS THAN 12" DIAGONAL.**

- **OXYGEN ENRICHMENT:**

IN CASE HIGH PRESSURE OXYGEN SOURCE IS NOT AVAILABLE IT WILLBE POSSIBLE TO ENRICH THE INSPIRED GAS MIXTURE WITH AN OXYGEN SOURCE AT LOW PRESSURE OF 40 – 60 CM OF WATER E.G. FROM ORDINARY OXYGEN CONCENTRATOR.

- **HUMIDIFIER & NEBULISER:**

- **POWER REQUIREMENTS:**
  - **IT WILLRUN ON THE COMMONLY AVAILABLE 220/240 V AC SUPPLY.**
  - **HIGH PRESSURE DRIVING GAS IF REQUIRED WILLBE INTEGRATED WITH THE VENTILATOR.**
  - **THERE WILLBE A BATTERY BACKUP OF AT LEAST 45 MINUTES (VENTILATOR WILLFUNCTION WITH OUT ANY CHANGE IN SET PARAMETERS FOR THIS DURATION)**

- **FAIL SAFE:**

- **IN CASE OF OXYGEN FAILURE IT WILLCONTINUE TO VENTILATE THE PATIENT WITH AIR.**
- **IN CASE OF POWER FAILURE IT WILLCONTINUE TO VENTILATE THE PATIENT ON INTERNAL BACKUP BATTERY.**
- **IT WILLCONTINUE TO VENTILATE IF BOTH THE ABOVE FAILURES OCCUR SIMULTANEOUSLY.**

- **GENERAL**
  - **ITEM WILLBE FDA APPROVED**
  - **ALL THE COMPONENTS OF THE SYSTEM WILLBE FROM THE SAME MANUFACTURER. THE MACHINES WILLBE SUPPLIED COMPLETE WITH ALL THE REQUIRED POWER CORDS, PATIENT CIRCUITS FOR ALL USES WITH APPROPRIATE MASKS AND CONNECTORS, USER MANUAL ETC IN READY TO USE CONDITION.**
  - **THE SCOPE OF SUPPLY INCLUDES SUPPLY, INSTALLATION AND COMMISSIONING OF THE MACHINE.**

2 ICU Beds with side rack cum Over Bed Table - Imported

ICU Bed having following standard features.

1 Electrically operated ICU bed to include**:**

1.1 Sleep Surface - four-part, area measuring 35-1/2" x 78 3/4" or 39” x 78-3/4” constructed of removable pressure reducing butterfly spring and strut suspension system (standard) or lightweight non-corrosive HPL surface (optional), stainless steel, and chrome components. (optional 35-1/2 x 82-1/2 or 38” x 82-1/2” sleep surface area available).

1.2 Weight Capacity - maximum safe working load 550 lbs.

1.3 Casters - four (4) 6” (other sizes optional) easy roll ball bearing precision swivel casters with polyurethane wheels - each caster has a rolling load capacity of 330 lbs (four caster total load capacity of 1,320 lbs). Self grounding (electrically conductive to the ground optional) and non-marking.

1.4 Brakes/straight steering – engaged by color coded foot levers on both sides of the bed, straight steering on foot end (head end straight steering optional at no charge)

1.5 Two-Part Assist Rails - integrated into the bed side so as not to be seen and not to project below the bed side when not in use. Each assist rail has three non-restraint positions including hideaway position, raised assist in the low position, and raised assist in the high position HPL side rail spacer (optional) to fill opening between assist rails.

1.6 Bed Operation Controls - pendant with lockout key that positions on assist rails, bedsides, or flexible control holder (control holder optional). Horizontal control that mounts on assist rails (optional) as alternate. Nurse control console at foot end of the bed, provides:

- All bed functions, plus Trendelenberg, global lock-out and battery indicator (standard)
- All bed functions, plus Trendelenberg, Comfort Positioning, Cardiac Chair, individual function lock-out and battery indicator.
- All bed functions, plus Trendelenberg, Comfort Positioning, Cardiac Chair, One Touch positioning buttons individual function lock-out and battery indicator

1.7 Emergency operation - such that all standard electricly operated functions are powered by a built in back-up battery in case of main power outage.

1.8 Open Base Design – undercarriage with four post telescoping design 16.5”- 31.5” (7.25” clearance underneath).

1.9 Mattress Compensation - moves head section toward head of bed while being raised to reduce mid-section compression and body movement toward footboard. Match existing decor.

2.0 Positioning – Adjustable height, head and leg section adjustment, trendelenberg/reverse trendelenberg, comfort position, cardiac chair, shock.

2.1 CPR Quick Release – single lever operation on both sides of the bed quickly but smoothly lowers the head section of the bed. Automatically resets after each use.

2.2 Removable head and footboard – lift off for quick access to patient.
2.2 Accessory Mounting – IV and accessory mounting points on all four corners of bed, track mounting system in bed sides, mounting points along top middle of bed sides, trapeze mount outside middle of headboard. Traction systems (custom) available to customers requirements.
2.3 UL & FDA - will meet requirements. Independently tested to UL-2601-1 standards.
2.4 Warranty - 10 years on aluminum extrusions, 2 years on mechanical components.
2.5 Bed extension – integrated sliding bed extension and mattress retainer.
2.6 Should have colors available to match existing decor.

Over Bed Table

It should have one top drawer
It should have one open compartment

It should have height adjustable and tilting bedside table.
It should have 5 castors (the fifth is for stabilization, two castors should be lockable.
It should have tiered top and integrated bottle holder.
It should have A practical patient-friendly towel holder, accessible from the bed.
It should have facility to install Nurse Call systems.
It should have Practical inserts bring order into drawer.
It should have Phone and TV mountings to bring these pieces of equipment close to the patient.
Bedpans should easily be stored in mountings underneath the bedside cabinet.
It should have following technical specification

Width	**: 60 cm**
Depth	**: 48 cm**
Height	**: 57 cm resp. 73 cm**
Tray/extracted (B x T)	**: 55 cm x 35 cm**
Adjustment tray (H)	**: 62 cm –96 cm**
Weight in kg. approx.	**: 30**

3 Recovery Trolley Stretcher – Imported

The adjustable height and the several available accessories make quicker and easier to move the patient from every diagnostic equipment and to meet any first aid intervention. Important features of quality and efficiency are the lightness and the balancing in the movements. Moreover cleaning and sanitization operations can be rapidly and easily performed.

Safety for patients and operators is ensured by the side rails, with complete disappearence or dismountable as compass, both with semiautomatic locking device, safety belts as standard equipment. The wheels can be locked at the same time for a better stability. The lying surface is divided into four sections and made of plastic radiotranslucent laminate, with external frame made of thick tubular steel, varnished with epoxy powders. Epoxy powders are particularly suitable to this product for their resistance to mechanical stress, corrosion and chemical agents used in hospital for sanitization and maintenance operations.

The laying surface is provided with ergonomic push handles and arrangements for accessories. The external frame is equipped with a bumper made of no trace soft plastic material. On the head side the stretcher is equipped with supports for drainage bagsand. The stretchers is also predisposed for oxygen bottle holder (capacity: 3/7 liter). The backrest and the pelvis section are moved by bilateral levers with pneumatic spring, while the legrest section can be adjusted with a rack device. The height is regulated by a pedal lever on the foot side through oil pressure pump and steel compasses. The basement is covered by a carter made of plastic material for easy cleaning with two basins for patient objects, documents or case history. The Trendelenburg and reverse Trendelenburg movements are made by a lever on the foot side and balanced through a pneumatic spring. The stretcher is equipped also with no trace wheels on balls bearing, Ø 200 mm with big dimensions to allow easier and more comfortable movements. The brake pedal has three positions: directional, totally free and totally locked.

4. Crash Cart & Instrument Trolley - Imported
Crash Cart

- **OVERALL SIZE: 940MM X 500MM X 1540MM (H)**
- **MILD STEEL TUBULAR FRAMEWORK.**
- **SIX COLOURED REMOVABLE BINS AND TWO POLYSTYRENE LOCKABLE STORAGE UNITS WITH THREE DRAWERS EACH.**
- **FOUR SWIVELING CASTORS OF 125MM DIA, TWO WITH BRAKES CORNER RUBBER BUFFERS.**
- **OXYGEN CYLINDER HOLDER.**
- **COMPLETE STAINLESS STEEL.**
- **ELECTRIC EXAMINATION LAMP.**
- **CARDIAC MASSAGE BOARD.**
- **STAINLESS STEEL I.V. ROD.**
- **WOODEN LAMINATED SHELVES.**
- **KNOCK DOWN CONSTRUCTION.**

Instrument Trolley

- **OVERALL SIZE : 1000MM(L) X 510MM (W) X 900 MM (H)**
- **COMPLETE STAINLESS STEEL**
- **STAINLESS STEEL SHELVES**
- **TOP SHELVE WITH THREE/ FOUR SIDES GUARD RAIL**
- **STAINLESS STEEL /MILD STEEL WITH EPOXY POWDER**
- **COATED TUBULAR FRAME WORK**
- **MOUNTED ON 750MM SWIVELING CASTORS**

5. Blood Gas Analyser - Imported

- **FULLY AUTOMATIC, FAST AND ECONOMICAL BLOOD GAS & ELECTROLYTE ANALYZER**
- **IT SHOULD MEASURE THE FOLLOWING PARAMETERS - pH, pO2, pCO2, Na+, K+, Ca++, Cl-, Glucose, tHB, SO2%, O2Hb, CoHb & MetHb, from whole blood with main calculated parameters like Hct, HCO3, TCO2, O2 sat, BE ecf, BE Blood, A–aDO2, P50, Anion gap, ctO2, cCa++(7.40), pO2(A-a), RI and temperature corrected values.**
- **IT SHOULD CALCULATE THE FOLLOWING PARAMETERS '- ACTUAL BICARBONATE (HCO3-A), STANDARD BICARBONATE (HCO3-S), BASE EXCESS (BE), STANDARD BASE EXCESS (SBE), TOTAL CO2 (TCO2), BUFFER BASE, O2 SATURATION, O2 CONTENT, ALVEOLAR TO ARTERIAL OXYGEN-TENSION GRADE (AADO2) PARTIAL O2-PRESS. AT 50% O2-SAT (P50),ACID BASE STATUS.**
- **IT SHOULD NEED INPUT OF THE FOLLOWING PARAMETERS - PATIENTS TEMPERATURE, PATIENTS ID, HB, FRACTION OF INSPIRED OXYGEN (FIO2) AND RESPIRATORY QUOTIENT (RQ) FOR CALCULATION OF AADO2.**
- **IT SHOULD HAVE LIQUID CALIBRATION WITH GAS-EQUILIBRATED CALIBRATION SOLUTION AND THERE SHOULD BE NO NEED FOR BULKY GAS CYLINDERS**
- **IT SHOULD HAVE ECONOMY MODE WITH EXTENDED CALIBRATION INTERVALS ADDITIONALLY TO REDUCE THE CONSUMPTION OF REAGENTS WHILE THE SYSTEM REMAINS IN "STAND BY".**
- **IT SHOULD HAVE PRE-SELECTION PROGRAMS FOR START-UP.**
- **IT SHOULD HAVE RELEVANT PATIENT DIAGNOSIS RECORDED ON PRINTER.**
- **All parameters should be available in single aspiration of sample.**
- **Instrument should have Window based operation with large colored touch screen.**
- **Instrument should have built-in bar code reader.**
- **Instrument should store patient results, automatic on board calibration reports.**
- **Instrument should have different test cartridges from 50 tests to 300 tests.**
- **Instrument should have built in battery back-up & the sample measurement should be possible in battery mode.**
- **System should have air in detection system bubble detection.**
- **Consumables should have minimum onboard life of 30 days**
- **Measuring time upto 100 seconds**

- **Sample value should not be more than 200µl with co-oximetry**
- **Instrument should have simple wet-section, with minimum number of tubings and valves to avoid break downs.**
- **Analyzer should be able to measure capillary samples.**
- **Instrument should have HIS/LIS connectivity.**
- **Instrument should have maximum uptime.**
- **Should be FDA approved and to enclose certificates.**

6. Bio Chemistry Analyser - Imported

- **It should have a throughput of minimum 400 tests/hr of photometric reagents and 640 Test/Hour Throughput with ISE.**
- **It should have a holographic grating with a Photo diode array which minimizes the step through time loss due to filter selection in Grating/Non-grating machines.**
- **It should have at least 75 online tests and 200 analyzing parameters, and 50 calculation tests programmable.**
- **All the positions in the reagent tray should be refrigerated.**
- **It should have 90 sample positions, including Calibrators, controls, and dedicated minimum 10 STAT position.**
- **It should have Minimum 80 permanent glass cuvettes having less than 250 µL reading volume.**
- **It should have 8-step washing system using acid, alkaline, warm water to avoid carry over.**
- **It should have two different probes for different reagents thereby minimizing carryover and contamination.**
- **It should have the capability to run 4 reagent chemistries.**
- **The software should be advanced preferably based on Windows XP to enable easy user machine interaction.**
- **It should have primary tube bar coded sampling.**
- **It should have programmable QC With LJ charts ,Westgard Rules.**
- **It should have permanent Glass cuvettes, very high quality Cuvettes, thereby minimizing the maintenance protocol.**

7. O T Table - Imported

- **Table is 5 section with split leg section, cut out and is C arm compatible.**
- **Table is Electro Hydraulic having remote and an Electronic override**
- **Remote controls Height adjustment, side tilt and Trend/rev Trend positions, Back adj. Flex, Reflex & Neutral position and Table lock.**
- **Head and Leg sections are manually adjustable by Gas springs.**
- **Table has 3 large swiveling double castors that are electrically conductive**
- **Table has Accentric column which allows use of C-Arm without longitudinal shift.**
- **Base of table is made of high grade rust resistant Stainless Steel.**
- **Table is equipped with two redundantly operating systems for Fail Safe operation.**
- **Table Length is 1790-2020 mm with Head and Leg plates.**
- **It should have special head section with dual telescopic extension, calvarias and chest section**
- **It should have maintenance-free micro hydraulics for safe functionality, even under high load lifting cylinder made of stainless steel for long-lasting performance and load-bearing corrosion-free modules, easily replaceable.**
- **It should have slender profiled frame with following features.**

- solid, made of stainless steel
- stable attachment of accessories
- easy to clean
- guide rail for precision mounting brackets
- parts can be attached all round

- **It should have wireless power supply.**
- **it should have dual telescopic column guidance which allows a wide range of working heights to be set**

Features

- **Table width is 520mm without side rails.**
- **It should have memory function with 8 programmes**
- **It should have telescopic head section with head calvarias**
- **It should have back section extension for length adjustment**
- **It should have longitudinal axis tilting**
- **it should have 24v dc battery pack operation**
- **Diameter of Castors is 100mm**
- **Height adj is 610 mm to 1040mm**
- **Trend/ Rev Trend is 28 deg.**
- **Lateral tilt is 18 deg.**
- **Back section adjustment is +80 deg/- 40 deg.**
- **Leg plate adjustment is + 15 deg/- 95 deg with 90 deg spread.**
- **Head plate adjustment is +30 deg/ - 30 deg.**

it should supply with following accessories.

1. **microsurgery ring**
2. **horseshoe shaped face rest**
3. **horseshoe shaped headrest**
4. **head plate**
5. **armrest**
6. **arm support**
7. **leg holder**
8. **side arm support**
9. **microsurgery wrist support**
10. **anesthesiology screen rod**
11. **anesthesiology tube holder**
12. **side positioning support:**
13. **side positioning support dorsal**
14. **calf support**
15. **half castor large and small**
16. **instrument tray on table**
17. **push handles**
18. **infusion stand**
19. **remote control holder**
20. **lying cover cloth**
21. **mounting brackets**
22. **grab handle, adjustable**
23. **hand table**
24. **back section extension for shoulder arthroscopy**
25. **hair transplant support**
26. **external mounting with head section**
27. **side positioning support**
28. **transport handles foldaway**
29. **mounting brackets**

8. O.T Light (Double Dome) - Imported

<u>Description:</u> Operating Room Surgical Lighting System should provide an ideal combination of brightness, maneuverability, and shadow resolution without sacrificing color accuracy through a consistent, homogeneous LED technology. It should have green light for endoscopic illumination

Such Lighting System should have the following technical specifications:

Number of Lightheads	**:**	**Two per suspension**
Color Temperature	**:**	**3800 Kelvin, 4300Kelvin, 4800 Kelvin**
Color Rendering Index	**:**	**> 95**
Field Size Diameter Depth	**:**	**7in (17.8cm)-11in (27.9cm)**
Depth of Field	**:**	**800mm**
Illumination Level	**:**	**160,000 Lux**
Controls	**:**	**Wall Control, Voice Capable, Touch - Panel**
Rotation	**:**	**360 degrees**
Vertical Adjustment Range	**:**	**+ 22in (55.9cm), -25in (63.6cm)**
Task Lights	**:**	**Yes (Perilite)**

Sterilizable Handle	**:**	**Yes**
Lighthead Diameter	**:**	**26.7in (67.7cm)**
Mounting Type	**:**	**Ceiling**
Supply Voltage	**:**	**100-230VAC 50/60Hz**
Power (without camera)	**:**	**< 100 Watts**
Bulb Type	**:**	**LED**
Total Irradiance at 160klux	**:**	**≤ 400W/m2.**
Rated Input	**:**	**100-230V~50-60Hz; 6A**
Power per Lighhead	**:**	**140W (With Camera); 95W (With Camera).**
Lamp service life	**:**	**>40000hours**

9. Suction Machine – IMPORTED

It should be a full automatic surgical suction unit. When the first jar is full, system selects the second jar automatically. After filling the second jar, system stops itself and prevents the leakage of waste liquid.

It should have following technical specification.

- **60 L/min flow rate**
- **Automatic jar selecting system**
- **Two collecting jars**
- **Overfilling system for preventing liquid leakage**
- **Oil free, maintanace free vacuum pump**
- **Alluminium main body**
- **Different jar options**
- **Dimensions (WxLxH): 430x460x820 mm**

10 Anaesthesia Work Station - Imported

The Anaesthesia work station system (PENDANT/ BOOM ARM MOUNTABLE MODEL), duly CE marked, will Integrated with ventilator, vaporizer and Monitor. The work station will be CE marked as per Medical Device directive and with FDA.

Anaesthesia Machine with vaporizers:-

1. **Rigid construction and design with standard frame.**
2. **Integrated suction (venture operated), auxiliary Oxygen flowmeter for mask O2 delivery without going through the main rotameter, integrated active AGS system and integrated LED light will be supplied.**
3. **Gas specific (pin indexed) Yokes-Two for oxygen, and one for nitrous oxide to accommodate 5-liter water capacity cylinders.**
4. **Provision to connect oxygen, air & nitrous oxide directly to system with pipeline supply for each gas.**
5. **Gas mixer/ Flow meter assembly with 5 tube, with possibility of enabling or disability air or N2O and Activating as per requirement.**
6. **Automatic Cutoff of Nitrous by Oxygen Pressure failure along with hypoxic guard for linear regulation of minimum O2 concentration at 25% volume and a base flow of 200ml.**
7. **Oxygen flush, which is able to deliver at least 30-70 liters per minute of oxygen.**
8. **Single canister integrated circle absorber with unidirectional and airway pressure relief valves, integrated sensing mechanism. It will have facility for changing the soda-lime intra-operatively with soda-lime capacity of about 900 gms.**
9. **Fully integrated Circle absorber system for adult as well as pediatric patient category. It will have an autoclavable block.**
10. **It will have a spirometery sensor position able at Y or at the distal end, for measurement of I/E Tidal vol, Minvolume, loops and scalars etc..**
11. **Integrated LED light.**
12. **It will have an integrated colour TFT screen of at least 8"size for display of ventilation parameters etc.**
13. **Vaporizer:-provision to connect two vaporizers at a time with interlocking facility. One Isoflurane/ Halothane/ Sevoflurane/vaporizer will be supplied with the machine. Vaporizers flow will be temperature, and pressure compensated and maintenance free for a in of 07 years.**

14 Active Scavenging System: Will have integrated active scavenging system.

<u>Integrated Anaesthesia Ventilator</u>

1. **Microprocessor based, Electronically controlled and electrically/ pneumatically driven will not require change of bellows for adult and infants.**

2. It will have following features.

a) Modes-VCV, PCV, PSV, Manual, Spontaneous modes so that reversal complications can be handled in the OR itself.

b) Tidal volume range 20 ml to 1500 ml.

c) Facility for Sigh

d) Integrated PEEP variable electronically up to a minimum of 20 mbar.

e) Adjustable breath rate 5-80 bpm.

f) Inspiratory pause

g) Will automatically display and compensate for compliance of breathing circuit.

3. Alarms will have audiovisual display of alarm messages for:- Airway pressure, minute volume, inspiratory O2 concentration, audio power supply fail alarm, fails to cycle warming, airway pressure alarms for high and low pressures.

4. In built battery backup facility for up to a min. of one hour.

5. Self-diagnostic facility to check the overall system including ventilator for leakage.

Integrated Monitor

1. **Will have the facility of monitoring ECG, RR, SpO2, NIBP, Temp, Dual IBP and Microstream Capnography for Adult, Paediatric & Neonatal applications.**
1. **Will have integrated colour TFT display of at least 12" or more.**
2. **Will have facility of viewing at least 8 waveforms simultaneously.**
3. **Will have detection facility for advanced arrhythmias and ST segment analysis.**
4. **Must use Nellcor/ Masimo branded pulse oximetry module with facility for display of Plethysmograph, Pulse strength & SpO2 values.**
5. **Will have IBP waveform overlapping facility.**
6. **Will have Graphical & Tabular trend facility for at least 72 hrs.**
7. **Will have facility of downloading data on a USB port and SD card.**
8. **Will have alarm limits with alarm levels and alarm indication (visual as well as audio)**
9. **Simultaneous 3 lead ECG measurement and simultaneous monitoring of temperature.**
10. **Will have built in Capnography facility to measure End tidal and Fractional Inspired values of CO2 along with calculation of respiration rate.**
11. **Unit will be supplied with following accessories:**

1. 5 lead ECG cable
2. 3 lead ECG cables X2
3. NIBP CUFF- Adult X2
4. Temp probe Rectal & Skin
5. SpO2 PROBE- Two no. for adult use and one Paediatric
6. Accessory kit for Capnography

12. **Monitor will have built in Electro Surgical Unit & Defibrillator protection.**
13. **Monitor will have an facility for Anaesthesia Gas Monitoring (AGM) with auto gas identification along with**

display of MAC value, Dual IBP & optional facility for Cardiac Output (CO) with Thermodilution method (To quote separately for optional items).

14. **Will submit relevant evidence of compliance to IEC 60601 series Safety standards and US FDA approval.**
15. **Reusable IBP Transducer with cables, Disposable IBP Transducer with cables, and upgrade kit for & Co.**

11 Emergency Kit (advanced) - Imported

Emergency Kit contain the following items in a compact carry case.
Standard Accessories:

- **Three sizes face masks with tubing**
- **Small oxygen cylinder**
- **Single stage single gauge regulator**
- **Cylinder Key**
- **Provision for using cylinder with Tubing filled with metal end**
- **Refilling for Reffilling the cylinder**

Manual Resuscitator:
Manually Operated resuscitator with double inlet valves for air and oxygen attachments
Suction Pump
Manually operated Suction Pump to aspirate the mucus, blood or other secretion from the entire airways of Adult, Child or Infants. It can also be operated from Gases by simply turning the suction knob. Supplied with suitable suction Catheter.
Intubation Set:

- **Laryngoscope with Three blades and Handle**
- **Endotracheal Tubes with cuff and plain four sizes sterilized**
- **Endotracheal connection Set of 12**
- **Magill's introducing forcep**
- **Mouth bite**

12. Surgical Instruments Kit - Imported

* **S.S. mosquito artery forceps curved 5 inches longwith sharp tip**
* **S.S. mosquito artery forceps straight 5 inches long with sharp tip**
* **S.S. needle holder fine tip 8 inches long to handle suture of 3-0 , 4-0, & 5-0**
* **S.S. skin hooks sharp tip 8 inches long**
* **S.S. B.P. handle no.**
* **S.S. B.P. handle no. 3**
* **S.S. allies's forceps 8 inches long 2: 1 tooth**
* **S.S. adsan's dissecting non-tooth forceps 5 inches long**
* **S.S. adsan's dissecting tooth forceps 5 inches long**
* **S.S. fine langenbach's retractor with 5mm blade**
* **S.S. fine langenbach's rectrator with 1cm. blade**
* **S.S. fine tip right angle (mister) forceps 6 inches long with tungstan tip**
* **S.S. fine metzenbaum curved scissors 6 inches long tungstan carbide tip and golden grip**
* **S.S. fine mitzenbaum straight scissors 8 inches long tungstan carbide tip and golden grip**
* **S.S. fine eye retractor c-shaped 6 inches long**
* **S.S. littlewood's tissue holding forceps 8 inches long**
* **S.S. lane's tissue holding forceps 8inches long**
* **S.S. suction tip 12 inches long**
* **S.S. suction tip 9 inches long fine tip with proximal hole**
* **S.S. cheatle's forceps 12 inches long with ss holder**
* **S.S. towel clips for drapping & sponge holder 12 inches long**
* **S.S. hook retractor 8 inches long**
* **S.S. langenback's retractor with 2cm. wide blade**
* **Humpy's knife**
* **Mesher**
* **Travers self retaining retractor 2cm jaw**
* **Travers self retaining retractor 3cm jaw**
* **customized zeiss eye loupe**

13. Cautery Machine - Imported

SHOULD BE MICROCONTROLLER, PROGRAMMABLE, WHERE 20 DIFFERENT PROGRAMMES WITH ISOLATED OUTPUTS COMPACT, DIGITAL DISPLAYED, RESOLUTION ONE WATT DOCTORS CAN PROGRAMME IN INDIVIDUAL MODE.

- THE MONOPOLAR GENERATOR PROVIDES CUT/BLEND CUT OF DIFFERENT TYPES AND COAG FACILITIES WITH SPRAY FORCE SOFT.
- BIPOLAR GENERATOR SHOULD HAVE AUTO FORCEPS ACTIVATION AND DUAL PADEL FOOTSWITCH CONTROL FOR CUTTING AND COAG SEPARATELY.
- OPERATIVE MODES SHOULD HAVE IDENTIFICATION BY DIFFERENT AUDIO TONES AND DIFFERENT PANEL LIGHTS.
- LATEST PROGRAMMES SHOULD BE RESTORED.

- PROVISION FOR CONTROL BY PENCIL SWITCH OR FOOT SWITCH WITH PROTECTION TO RECOGNIZE COAG COMMAND TO CUTTING
- PATIENT PLATE LEADS SUPERVISED DURING MONOPOLAR OPERATION
- DISCONNECTED PATIENT PLATE WITH DISREGARD HAND OR FOOT SWITCH COMMAND.
- AUDIO-VISUAL INDICATION FOR PATIENT PLATE DISCONNECTION.
- NATURAL CONVECTION COOLING WITH SILENT OPERATION.
- SEPARATE OUTPUT SOCKET FOR BIPOLAR COAGULATION AND CUTTING WITH INDEPENDENT GENERATOR.
- PROVISION FOR ACCESSORIES BIPOLAR FORCEPS, MONOPOLAR FORCEPS WITH DIFFERENT SHAPES, PAEDIATRIC PATIENT PLATE, FLEXIBLE RUBBER PLATE, LAPAROSCOPY CORD, CAUTRY TIPS OF VARIOUS TYPES, LOOP ELECTRODES WITH POWER BACKUP FACILITY.
- OUTPUT MODE SHOULD BE CUT 300 WATTS, COAG 120 WATTS AND BIPOLAR 80 WATTS.
- SHOULD BE SUITABLE FOR UNDERWATER PROCEDURE PLASTIC/COSMETICS ORTHOPAEDICS/
ARTHROSCOPY, PAEDIATRIC, E.N.T. UROLOGY, NEURO OPHTHALMIC.
- TROLLEY WITH PROVISION TO KEEP ACCESSORIES.
- AFTER SALES SERVICE WITHIN WARRANTY AND ANNUAL MAINTENANCE CONTRACT TERMS SHOULD BE CLEARLY INDICATED.

14. Transport Ventilator - Imported

FUNCTION MODES::CMV + CMVSIG
AUTO - Controlled /Assisted
AMV + PCM + MVM
CPAP
O_2: > 40% if Air Mix = ON and > 90% if Air Mix = OFF
FREQUENCY: from 5 to 40 Bpm
FLOW: from 2 to 20 lpm
PEEP: from 0 to 15 mbar
I/E RATIO: 1/2 (0.5) 1/1(1) in auto mode and trigger = Ombar
PRESSURE LIMIT: from 5 to 60 mbar
TRIGGER: from 0 to -10 mbar
INHALER FLOW: from 0 to 15 lpm
ALARMS: pressure max (>55 mbar adults, >30 mbar children)
pressure min (<10 mbar)
apnoea (spontaneous breathe stopped)
oxygen source failure
battery low
SNC hazardous selection (acoustic only)
DIMENSIONS: 240x128x140 mm
WEIGHT: 2.5 kg
POWER SUPPLY: 12 V DC/1.2 A
AUTONOMY: >6h

- **PREFERABLY SHOULD HAVE BOTH NON INVASIVE AS WELL AS INVASIVE CAPABILITIES. AND HAVE BOTH PRESSURE AS WELL AS VOLUME CONTROL MODES.**
- **SHOULD HAVE WIDE RANGE OF APPLICATIONS FROM CHILDREN ABOVE 5 KG TO ADULTS.**
- **SHOULD PROVIDE AUTOMATIC TRIGGERING & ADVANCE LEAK COMPENSATION FOR EFFECTIVE VENTILATORY SUPPORT.**
- **SHOULD HAVE A DATA CARD NOT LESS THAN 1 GB FOR STORING ALL NECESSARY VENTILATION DATA. DATA TO PROVIDE VENTILATION THERAPY FOR EFFECTIVE TREATMENT.**
- **TECHNICAL SPECIFICATIONS :**

FUNCTION MODES ::CMV + CMVSIG, AUTO - Controlled /Assisted, AMV + PCM + MVM, CPAP
O_2 : > 40% if Air Mix = ON and > 90% if Air Mix = OFF
FLOW : from 2 to 20 lpm
PEEP : from 0 to 15 mbar
I/E RATIO : 1/2 (0.5) 1/1(1) in auto mode and trigger = Ombar
PRESSURE LIMIT : from 5 to 60 mbar
TRIGGER : from 0 to -10 mbar
INHALER FLOW : from 0 to 15 lpm
DIMENSIONS : 240x128x140 mm
POWER SUPPLY : 12 V DC/1.2 A

- **ALARMS – BOTH AUDIO AS WELL AS VISUAL - APNEA, LOW/HIGH VOLUME, LOW/HIGH MINUTE VENTILATION, LOW/HIGH RESPIRATORY RATE, LOW/HIGH INSPIRATORY PRESSURE (IN VOLUME MODES).**
- **SHOULD BE ABLE TO MONITOR – EXHALED TIDAL VOLUME, EXHALES MINUTE VENTILATION, LEAK RATE, RESPIRATORY RATE, PEAK INSPIRATORY FLOW, PEAK INSPIRATORY PRESSURE I:E RATIO, MEAN AIRWAY PRESSURE.**
- **BATTERY BACKUP OF NOT LESS THAN 6 HOURS**
- **SHOULD BE LIGHT WEIGHT NOT MORE THAN 5 KG FOR EASY TRANSFERS.**
- **ALL THE COMPONENTS OF THE SYSTEM SHOULD BE FROM THE SAME MANUFACTURER. THE MACHINES SHOULD BE SUPPLIED COMPLETE WITH ALL THE REQUIRED POWER CORDS, PATIENT CIRCUITS FOR ALL USES WITH APPROPRIATE MASKS AND CONNECTORS, USER MANUAL ETC IN READY TO USE CONDITION.**
- **THE SCOPE OF SUPPLY INCLUDES SUPPLY, INSTALLATION AND COMMISSIONING OF THE MACHINE.**
- **ITEM SHOULD BE CE APPROVED**

15. <u>Medical Gases Pipeline System</u>

<u>Oxygen Manifold</u>

Supply, Installation, Testing and Commissioning of Oxygen Manifold Supply System (Cylinder Manifold Unit) 2 x4size.

It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

- **It shall be CE marked with the notified body number specified.**
- **It shall be provided with a copy of the certificate of origin.**
- **10cylinder manifold bank as left side and 10 cylinder manifold bank as right side complete with 20 nos.pig tail pipes and 20nos. non-return valves.**
- **It should have all regulators which should be adiabatic certified.**
- **It should have EMC certificate in compliance with section 3.55 in HTM 02-01**
- **Compliant with C11 model engineering specification**
- **The oxygen manifold supply system shall consist of an automatic changeover manifold control panel, hereinafter referred to as manifold control panel, complete with cylinder header racks and tailpipes with capacity and sizes as mentioned in schedule of quantities for high pressure gas cylinders.**
- **An emergency reserve manifold complete with cylinder header racks and tailpipes with capacity and sizes as mentioned in schedule of quantities for high pressure gas cylinders.**
- **The permanently connected emergency reserve supply shall be brought into operation automatically via a non-return valve and shall be designed, where practicable, to provide the same flow rate as the primary system.**
- **There shall be sufficient cylinder capacity within the emergency reserve supply to supply the average anticipated demand for a minimum of four hours.**

<u>Fully Automatic Control Panel (for Oxygen)</u>

It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

- **The manifold control panel shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.**
- **It shall be CE marked with the notified body number specified.**
- **It shall be provided with a copy of the certificate of origin.**
- **It should have all regulators which should be adiabatic certified.**
- **It should have EMC certificate in compliance with section 3.55 in HTM 02-01**
- **Compliant with C11 model engineering specification**
- **The manifold control panel shall be designed and certified for use with oxygen at 200 bar and 60°C. Auto-ignition testing shall be carried out and a copy of the test report shall be shall be provided for review.**

- **The manifold control system shall provide an uninterrupted supply of medical oxygen from equally sized high pressure cylinder banks via a suitable arrangement of pressure regulators, providing a constant downstream nominal pipeline gauge pressure of 400 kPa.**
- **The manifold control panel shall provide a minimum flow of 1500 l/min to the nominal 400 kPa medical oxygen pipeline system.**
- **The manifold control panel shall be no wider than 500 mm to ensure optimal use of wall space within the facility.**
- **Automatic changeover of duty bank shall occur at a cylinder gauge pressure of 14 bar, actuated by bourdon tube pressure gauges with integral alarm contact connected directly to a port within the first stage pressure regulators. Piston or diaphragm type pressure switches are not acceptable.**
- **Line pressure shall be continuously monitored by an electronic pressure switch; mechanically actuated pressure switches are not acceptable.**
- **There shall be two separate stages of pressure regulation to enable high peak flow rates without a reduction in line pressure. Multistage regulators combined into a single unit are not acceptable.**
- **Pressure regulators shall comply with BS EN ISO 10524-2.**
- **The system shall be duplexed such that component failure will not affect the integrity of the medical gas supply.**
- **The manifold shall employ be a fail-safe system in the event of power failure so that both bank isolation solenoid valves open and continuity of supply is assured. Upon restoration of the electrical supply, the original running bank shall return on line.**
- **All pressure regulators shall be protected from over-pressurisation by relief valves that are vented to atmosphere.**
- **The line pressure relief valve shall be provided with easing gear.**
- **Two non-return valves, one for each bank, shall be provided within a line pressure manifold block and shall provide gas tight isolation and continuity of service in the event of any upstream component failure.**
- **The control panel shall be powered by an internal 24 V d.c. power supply.**
- **There shall be manual changeover button to provide simple selection of duty bank.**
- **The manifold control panel shall be provided with a lockable isolation valve to enable positive tamperproof isolation for maintenance.**
- **The automatic control panel shall be supplied fully assembled and tested.**

<u>Oxygen Single Cylinders Emergency System</u>.

Supply, Installation, Testing and Commissioning of Oxygen Emergency Reserve Manifold 1x2size

- **It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.**
- **The emergency reserve manifold shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.**
- **The emergency reserve manifold shall be designed and certified for use with oxygen at 200 bar and 60°C. Auto-ignition testing shall be carried out and a copy of the test report shall be shall be provided for review.**
- **The emergency reserve manifold shall provide an uninterrupted supply of medical oxygen from equally sized high pressure cylinder banks via a suitable arrangement of pressure regulators, providing a constant downstream nominal pipeline gauge pressure of 400 kPa.**
- **It shall be CE marked with the notified body number specified.**
- **It shall be provided with a copy of the certificate of origin.**
- **It should have all regulators which should be adiabatic certified.**
- **It should have EMC certificate in compliance with section 3.55 in HTM 02-01**
- **Compliant with C11 model engineering specification**
- **Each cylinder bank shall be fitted with an isolation valve to enable continuity of supply through temporary manual operation in the vent of primary supply failure.**
- **The manifold control panel shall provide a minimum flow of 1500 l/min to the nominal 400 kPa medical oxygen pipeline system.**
- **An emergency reserve alarm of 68 bar falling pressure shall be provided for each cylinder bank, actuated by bourdon tube pressure gauges with integral alarm contact connected upstream of the bank isolation valves. Piston or diaphragm type pressure switches are not acceptable.**

- **There shall be two separate stages of pressure regulation to enable high peak flow rates without a reduction in line pressure. Multistage regulators combined into a single unit are not acceptable.**
- **Pressure regulators shall comply with BS EN ISO 10524-2.**
- **All pressure regulators shall be protected from over-pressurization by relief valves that are vented to atmosphere.**
- **The line pressure relief valve shall be provided with easing gear.**
- **A non-return valve shall be provided within a line pressure manifold block and shall provide gas tight isolation in the event of any upstream component failure. The non-return valve shall automatically bring the emergency reserve manifold into service should the primary supply fail. The emergency reserve manifold shall be provided with a lockable isolation valve to enable positive tamperproof isolation for maintenance.**
- **The emergency reserve manifold shall be supplied fully assembled and tested.**

Terminal Units (Gas Outlets) with probes/Adaptors **- Imported**

Supply, Installation, Testing and Commissioning of Medical Gas Terminal Units (Gas Outlet Points)

- **It shall fully complies & meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01)**
- **It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.**
- **Medical gas terminal units shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.**
- **Terminal units shall have gas indexing geometry to BS 5682:1998. Other gas specific indexing geometries are not acceptable. It should have antimicrobial coating.**
- **Gas specific components comprising the terminal unit second fix shall be manufactured from die-cast zinc alloy or similar hard wearing metal. Plastic components are not acceptable. It should be 100% metal.**
- **Terminal units socket castings shall be permanently coated with a low friction fluoropolymer for maximum reliability and service life. The terminal unit socket die-casting shall incorporate a gas indexing pin to overcome the risk of loosening due to rough handling or abuse. The second fix socket shall incorporate a sheer-plane to safeguard the first fix and pipeline in the event of accidental damage or bed jacking. Gas specific components shall incorporate the gas identity marking permanently stamped or cast into the component surface. The first fix shall be all metal construction, with a brass base block and copper stub pipe. The first fix shall incorporate an integral check valve to enable servicing of the second fix and valve seals without isolation of the gas supply. Probe roller pins shall be manufactured from stainless steel.**
- **Wall mounted terminal units shall be provided with white ABS mounting box with matching fascia. The mounting box shall have smooth rounded corners to avoid the possibility of injury. A bezel shall be available to cover the plaster edge, provide a neat and easily to clean finish.**

Oxygen Flow meter & Humidifier Bottle

Supply, Installation, Testing and Commissioning of Oxygen Flow Meter with Humidifier Bottle

- **It should be duly CE marked and comply with 93/42/EEC Medical Devices: General and should have CE no. from a notified body. Certificate of Origin must be given.**
- **Pressure compensated to prevent back pressure build up on flow indicator.**
- **Durable polycarbonate flow tube with cover.**
- **It should be made up of anodized aluminum body and control knob.**
- **Flow meter should have twin graduated scale which must provides precision control permanent scale graduations.**
- **Flow meter should be placed in the vertical position.**
- **It should be light weight of 200g.**
- **It should have +/-4% gauge accuracy.**
- **Inlet pressure - 50-60 psi.**
- **The flow meters should be of 1-15 LPM range for oxygen and with inlet pressure 50-60psi.**
- **Polysulphone Humidifier bottle should be unbreakable, reusable to disinfectants and complements.**

Theatre Vacuum Unit

- **It should fully meet and complies as per EC Directive 93/42/EEC Annex II, article 3. full quality assurance system medical devices.**
- **It should be duly CE marked and CE no. to be specified.**

- **Certificate of Origin must be given.**
- **It must consist of the following: - 1no. Suction Regulator and 2nos. 4000ml polysulphone collection jar and both to be mounted on a trolley.**
- **Suction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti overflow safety device. Should have wide membrane continuous suction controller**
- **Should have vacuum levels: 0-1000mbar/hPa.**
- **Should have vacuum gauge fitted with a protective bumper device.**
- **Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.**
- **Must have central adjustment knob with a color coded for 0-1000 mbar/hPa. Should have polycarbonate 150cc safety jar, autoclavable at 121º C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.**
- **Suction regulator must have a unique serial number stamped on the body of each suction regulator , thereby allowing for identification and trace ability.**
- **Polysulphone collection Jar of 4litres with lid: it should be unbreakable and autoclavable upto 134º C must be fitted with an extremely simple anti overflow safety device, thereby ensuring easy maintenance.**
- **Should be totally transparent, they ensure perfect sucked liquid visibility.**

Ward Vacuum Unit

- **It should fully meet and complies as per EC Directive 93/42/EEC Annex II, article 3. full quality assurance system medical devices.**
- **It should be duly CE marked and CE no. to be specified.**
- **Certificate of Origin must be given.**
- **It must consist of the following: - 1no. Suction Regulator and 1no. 2000 ml polysulphone collection jar**
- **Suction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti overflow safety device. Should have wide membrane continuous suction controller**
- **Should have vacuum levels: 0-1000mbar/hPa.**
- **Should have vacuum gauge fitted with a protective bumper device.**
- **Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.**
- **Must have central adjustment knob with a color coded for 0-1000 mbar/hPa. Should have polycarbonate 150cc safety jar, autoclavable at 121º C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.**
- **Suction regulator must have a unique serial number stamped on the body of each suction regulator, thereby allowing for identification and trace ability.**
- **Polysulphone collection jar of 2 liters with lid: it should be unbreakable and autoclavable upto 134º C must be fitted with an extremely simple anti overflow safety device, thereby ensuring easy maintenance.**

Should be totally transparent, they ensure perfect sucked liquid.

Valve box

Lockable Line Valve Assemblies

- **To comply and fully meets with the latest standard HTM02-01 and C11.**
- **It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.**
- **Lockable line valves and should comprise full-bore ball valve complete with copper stub pipes for ease of installation.**
- **Valve - connected to the copper stub pipes by means of flat faced unions fitted with nitrile O-ring seals, allowing removal of the valve without the need to distort the pipe work.**
- **Stub pipes for valve up to 54 mm will be connected to the valve body using screwed connectors, while valve above this size will use flanged connectors.**
- **Valve - Brass body, end cap and stem, with a full – bore chrome plated brass ball.**
- **Valve - Operate from fully closed to fully open with a quarter turn of the handle.**
- **All line values - Supplied with a mechanism to enable the unit to be locked in the fully closed or fully open position.**
- **Supplied with copper stub pipes for ease of installation using inert gas jointing procedures.**

- **O-Ring Seals on the valve stub allow gas tight capping at a spur for further expression.**
- **Available with gas specific NIST connectors including check valves one or both stub pipes.**

Area Valve Unit Module

- **Area Valve Service unit Modules shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01).**
- **Area Valve Service unit Modules shall be CE marked to the Medical Device Directive 93/43/EC as a class IIb medical devices. A copy of the certificate authorizing the manufacturer to apply CE marking under the aforementioned directive and a Certificate of Origin must be provided for review.**
- **Area Valve Service unit Modules shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.**
- **Area Valve Service unit Modules shall be supplied pre-wired and tested complete with pressure switches and medical gas area alarms.**
- **The chassis and cover shall be manufactured from powder coated 16 swg steel.**
- **Each area valve service unit shall be fitted with an emergency access mechanism on each door.**
- **The area valve service unit modules shall be configured for one to five gases services depending on the hospital area served, with the option of an inbuilt medical gas area alarm panel.**
- **Incorporate a valve with NIST connection at either side of the AVSU valve.**
- **AVSU ball valves shall be manufactured from die-cast nickel plated brass alloy with flanged connections.**
- **AVSU ball valves shall benefit from low torque operation and shall be serviceable from the front by a removable cap providing access to the valve stem, chrome plated brass ball and a single piece molded nit rile seal.**
- **Through spades shall be provided either side of the valve and each valve shall be provided with a blanking spade for deployment during installation or modification of the system without interruption of the main supply.**
- **The NIST connectors forming part of the stub pipes shall incorporate a check valve with metal seat thus avoiding the possibility of degradation over time.**

Approved makes: Penlon/SHJ Hospital Pipelines/Technologie Medicale.

<u>Medical Gas Alarm (Main & Area)</u>

- **To comply and fully meets with the latest standard HTM02-01 and C11.**
- **It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.**
- **Master Alarm Panel (MAP) shall monitor the central gases, vacuum and compressed air and work or indicate abnormal conditions as per specified herein.**
- **MAP - Located in the gas manifold room in the basement of the APC Building.**
- **Designed to monitor piped gas pressure (high and low pressure on up to six services) Via Pressure Switches in Theatres, Intensive Care Units, Recoveries, Private Rooms, and Wards etc.**
- **To act as a slave to another alarm within 250 meters, using a three core screened cable (four cores if signals are to be returned to the master unit).**
- **Local Area Alarms should provide indication of the condition of gas (Normal, High or Low Pressure) at the point of use, by monitoring the internal pressure of the pipeline.**
- **The Method of Monitoring - Individual pressure switches for high pressure**

Low Pressure and Low Vacuum and each switch should be fitted with an end of line monitoring resistance

- **Matched to the alarm panel**
- **Enable the alarm panel to detect any faults on the system wiring or signal transmission.**
- **Alarm Panel - Display up to six services each with normal & two fault conditions.**
- **Alarm Panel - Battery Back Up will be provided within the system to enable the alarm panel to function normally in the event of mains power failure.**
- **The internal battery must be used to keep alarm panels operational in the event of mains power failure.**
- **Designed to monitor high and low pressure from local pressure switches.**
- **Surface or flush format.**

<u>Vacuum System</u>

Supply, Installation, Testing and Commissioning of Medical Vacuum Plant

- **The medical vacuum plant shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.**
- **The medical vacuum plant shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.**
- **2 x 5.5KW each rotary vane vacuum pump vessel mounted.**
- **2 x 1500 liters capacity horizontal/vertical vacuum receiver tanks.**
- **54mm OD pipe work.**
- **It should have digital display.**
- **It shall be CE marked with the notified body number specified.**
- **It shall be provided with a copy of the certificate of origin.**
- **It should have all regulators which should be adiabatic certified.**
- **It should have EMC certificate in compliance with section 3.55 in HTM 02-01**
- **Compliant with C11 model engineering specification**
- **Vacuum pump inlets shall include a wire mesh filter and integral non-return valve to prevent oil suck back and pressure increases in the vacuum system. Each vacuum pump shall be fitted with anti-vibration pads between the pump foot and mounting frame. The plant shall be fitted with four equally sized bacteria filters arranged in two sets of two.**
- **Each individual filter shall have the capacity of deliver half the design flow such that one set is designated duty and the other standby.**
- **Bacteria filters shall have efficiency at least 99.999% when tested by the sodium flame method in accordance with BS 3928:1969 utilising particles in the 0.02 to 2 micron size range.**
- **The pressure drop across each clean filter at 50% of the system design flow should not exceed 25 mm Hg (3 kPa) at a vacuum of 475mm of mmHg (63 kPa).**
- **Bacteria filters shall be marked with the legend 'Bio-Hazard'.**
- **Each bacteria filter shall be provided with a transparent sterliseable collection jar to collect condensate.**
- **The total water capacity of the pressure vessels shall be at least 100% of the design flow rate of the plant in 1 minute in terms of free air aspired.**
- **The plant control and power management system shall monitor the safe operation of the plant, providing signaling into the alarm system as per the requirements of HTM 02-01. Vacuum pump exhaust shall be piped out of the plant room and discharged outside the building at high level away from windows and any other air intakes.**

<u>Copper Piping</u>

Supply, Installation, Testing and Commissioning of Medical Grade Copper Tube and Fittings

- **The piped distribution system shall use copper pipes manufactured from phosphorous de-oxidised non-arsenical copper to BS EN 1412:1996 grade CW024A (Cu-DHP), manufactured to metric outside diameters and having mechanical properties in accordance with BS EN 13348:2008 in either R250 (half hard) or R290 (hard).**
- **Copper pipes shall be carry the officially licensed BSi kitemark and certification shall be provided for review.**
- **Degreasing of pipe shall be such that there is less than 20mg/m2 (0.002mg/cm2) of hydrocarbons on the degreased surface when tested by the method specified BS EN 13348:2008.**
- **Copper fittings shall be end feed type, manufactured from the same grade of copper as the pipes and be in accordance with the requirements of BS EN 1254-1:1998 Part 1. Fittings shall be degreased suitable for oxygen use and be supplied individually sealed in protective polythene bags.**

<u>Horizontal Bed Head Panel</u>

- **Must fully comply with HTM2022, HTM 2025, HTM02-01 and C11 standards.**
- **Duly CE marked with CE no. Stamped on it.**
- **It should be wall mounted, exposed to wall and should supply all necessary requirements to the patients.**
- **It should have extruded aluminum profiles made in one piece, double track wall mounted approx four feet length. Light metal front panels duly powder coated color.**
- **The bed head panel should be set up with different individual profiles for variable system solutions to realize double track variants as horizontal, wall-mounted supply system.**
- **The duct should be sufficient for mounting of electrical, adapt sockets and for gas terminal units.**

- **It also have medical rail 25 x 10 mm below the lower duct to which accessories like I V. pole Infusion pump/ Syringe pump can be attached. For maintenance purposes, lighting components of the bed units must be exchangeable without interrupting the supply of adjacent bed units.**
- **Each Bed Head Panel should be Pre Piped and Pre-fitted with 6nos. Gas Outlets Oxygen 2, Air 4 Bar 2 and Vacuum 2 - HTM02-01, C11 complies UK standard Gas Outlet Points.**
- **Each Bed Head Panel should also be Pre-fitted and Pre – wired**

8nos. Multipin electrical switch and sockets 6/16amp,
1no. RJ45 data socket,
1no.Nurse call switch also be incorporated in panel.
Bed head Panel must also have tubular T5 Fluorescent lamps with electronic control gear for reading/ examination lighting. Segregation of services i.e. Low voltage supplies, High Voltage supply and Medical gases shall be maintained through out.

N2O Cylinder Emergency System.

- **The emergency reserve manifold shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01).**
- **The emergency reserve manifold shall be CE marked and copy of the certificate of Origin must be provided for review.**
- **The nitrous oxide manifold supply system shall consist of:**
  - **An automatic changeover manifold control panel, hereinafter referred to as manifold control panel, complete with cylinder header racks and tailpipes with capacity for high pressure gas cylinders.**
  - **An emergency reserve manifold complete with cylinder header racks and tailpipes with capacity for high pressure gas cylinders.**
- **The permanently connected emergency reserve supply shall be brought into operation automatically via a non-return valve and shall be designed, where practicable, to provide the same flow rate as the primary system.**
- **There shall be sufficient cylinder capacity within the emergency reserve supply to supply the average anticipated demand for a minimum of four hours.**

Single Arm Moveable Pendant for Operation Theatre

- **To comply and fully meets with the latest standard HTM02-01/NFPA 99C UL listed or any other international standard which meets the specification.**
- **It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.**
- **Pendant should provide a convenient overhead supply of electrical services and medical gases.**
- **Vacuum and electrical services thus eliminating the majority of trailing hoses and cables.**
- **It should also provide all the features of the Rigid Pendant with the additional facility of being 'height adjustable' by theatre staff using the hand held control.**
- **Should have universal first fix – accepts retractable second fix pendants.**
- **The pendant which should be adjustable in length must have upper and lower casings of powder coated steel with a stainless steel fascia plate.**
- **Should have standard telescopic adjustment 300 mm adjustments.**
- **Each pendant should have 4nos. 6/16amp multipin electrical sockets.**

Each pendant should have provision only for maximum 6-8nos. gas outlets points

16. All Articles - Indigenous

Stools with S.S Top

- **COMPLETE STAINLESS STEEL**
- **SS TOP**
- **HEIGHT ADJUSTABLE FROM 450MM TO 680 MM**
- **FOUR LEGGED MADE OF 25MM STEEL TUBE MOUNTED ON RUBBER SHOES**
- **STAINLESS STEEL RING FITTED WITH LEGS FOR FOOTREST**
- **ISO / CE marked**

Chair Supreme

OVERALL DURABLE PLASTIC FRAME OF BLACK COLOUR WITH CUSHION OVER SEAT AND BACK

SUPREME MAKE OR EQUIVALENT OR BETTER

PREFERABLY ISI/ CE CERTIFIED

Attendents Bench S.S Three Seater

- **3 SEATER CHAIR, MADE OF PERFORATED SHEET**
- **GALVANIZED ARM REST**
- **ISI CERTIFIED, 2 YEAR WARRANTY**
- **3 SEATER CHAIR, MADE OF PERFORATED SHEET**
- **GALVANIZED ARM REST, ISI CERTIFIED**
- **2 YEAR WARRANTY**

Intra Venous Infusion Stand

- **STAINLESS STEEL I.V. STAND WITH FOUR LOCATION.**
- **FIVE PRONGED TUBULAR RECTANGULAR STABLE BASE**
- **WITH CASTOR**
- **VARIABLE HEIGHT ADJUSTABLE 1600MM TO 2400 MM**

Steel Almihra 4 F x 3 F x 20 inches deep

IT SHOULD HAVE :- SIZE 4 F x 3 F x 20 INCHES;
20 GAUZE SS SHEET, 5 SS SHELVES WITH LOCK ;
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS ;
AFTER SALES SERVICE WILL BE REQUIRED,
IT SHOULD PREFERABLY BE ISI CERTIFIED.

Dressing Drums S.S 15 In. High X 15 In Diameter

ISI CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH OF THE FOLLOWING SIZES-

(i) **275 X 240 MM** **275 X 132 MM**
(ii) **350 X240 MM** **350 X 130 MM**
(iii) **380 X 300 MM**

S.S Instrument Tray with Cover 15 INX 10 INX IN

ISI/ CE CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH SIZE

a. **200X 150 MM**
b. **250 X 200 MM**
c. **300 X250 MM**
d. **350 X 250 MM**
e. **450 X 300 MM**

Waste Disposal Plastic Drums

SIZE - ~100 LITRE CAPACITY .
IT SHOULD BE ISI/ CE CERTIFIED.
SHOULD BE COLOUR CODED AS PER POLLUTION CONTROL GUIDELINES

S.S Kidney Tray 500 ml capacity

ISI/ CE CERTIFIED;
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
25% OF EACH OF THE FOLLOWING SIZES

(iv) **150 X 70 MM**
(v) **200 X 90 MM**
(vi) **250 X 100 MM**
(vii) **300 X 130 MM**

S.S Bowl 250 ML

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ;
ISI/ CE CERTIFIED
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
33% OF EACH OF THE FOLLOWING SIZES

(i) **125 X 57 (CAPACITY 500 ML) HALF CURL OPEN RIM**
(ii) **160 X 75 (CAPACITY 1200 ML) HALF CURL OPEN RIM**
(iii) **SMALL (CAPACITY 50-60ML)**

S.S Basin 2000 ML

- **MILD STEEL TUBULAR FRAME**
- **ON 3 SWIVEL TWIN WHEEL NON-RUSTING CASTORS 50 MM DIA**
- **2 SS BOWLS OF ~ 2000 ML CAPACITY/ 375 MM DIA**
- **PRE-TREATED AND POWDER COATED**
- **CE/ ISI CERTIFIED**

Bed Pan Plastic

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ;
ISI/ CE CERTIFIED
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
33% OF EACH OF THE FOLLOWING SIZES
125 X 57 (CAPACITY 500 ML) HALF CURL OPEN RIM
(iv) **160 X 75 (CAPACITY 1200 ML) HALF CURL OPEN RIM**
(v) **SMALL (CAPACITY 50-60ML)**

Urinal Maleplastic

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ; ISI/ CE CERTIFIED

S.S Dressing Tray 9 IN X 6 IN X 3 IN with Cover

ISI/ CE CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH SIZE

f. **200X 150 MM**
g. **250 X 200 MM**
h. **300 X250 MM**
i. **350 X 250 MM**
j. **450 X 300 MM**

ECG Machine

1. **IT SHOULD BE LIGHT WEIGHT AND PORTABLE.**
2. **IT SHOULD RUN ON 230 VOLT AC MAINS AND RECHARGEABLE BUILT IN BATTERY.**
3. **IT SHOULD USE 50 MM WIDTH, 20 METER LENGTH, AND GRID THERMAL PAPER FOR RECORDING.**
4. **PRINTER SHOULD HAVE 8 DOTS/MM THERMAL RECORDING SYSTEM, WITH PRINT WIDTH OF 40 MM FOR RECORDING OF SINGLE CHANNEL OF ECG.**
5. **ECG RECORDING SHOULD BE DONE IN DIGITAL FORMAT AT SELECTABLE 25 MM AND 50 MM SPEED.**
6. **IT SHOULD HAVE BUILT IN FILTERS FOR FILTERING OUT AC AND MUSCLE ARTIFACTS.**
7. **ECG ACQUISITIONS SHOULD NOT BE LESS THAN 12 BITS, 800 SAMPLES/SEC.**
8. **ECG RECORDING SHOULD BE REAL TIME WITH PRINTING OF SELECTABLE LEADS.**
9. **IT SHOULD BE USER FRIENDLY AND EASY TO OPERATE WITH MINIMAL ORIENTATION.**
10. **IT SHOULD BE SUPPLIED WITH ALL STANDARD ACCESSORIES, AND TWO SETS OF PATIENT CABLES, CLAMPS AND BULBS.**
11. **IT SHOULD COME MOUNTED ON A SUITABLE TROLLEY, POWDER COATED, 3" HIGH WITH A LOCKABLE DRAWER AND ONE PARTITION GIVING RISE TO TWO OPEN COMPARTMENTS. IT SHOULD MOVE ON 4 GOOD QUALITY CASTORS. THERE SHOULD BE A GUARD RAIL ON THE TOP AND HANDLE RAIL ON THE SIDES**
12. **IT SHOULD CARRY A WARRANTY OF 24 MONTHS, INCLUDING BUILT IN RECHARGEABLE BATTERY.**

Emergency Lights

- **RECHARGABLE EMERGENCY LIGHT**
- **STANDBY MODE – AUTOMATICALLY TURN ON IN CASE OF POWER FAILURE**
- **18 INCHES – 24 INCHES LONG FLUOROSCENT TUBES PREFERABLE ISI CERTIFIED**

Torch Four Cell

LED EVEREADY OR EQUIVALENT RECHARGEABLE PREFERABLY ISI CERIFIED

MicroWave 30 Liters

IT SHOULD BE OF: - GOOD QUALITY, BRANDED, ISI CERTIFIED WITH 5 STAR RATING WARRANTY 2 YEARS; SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED.

Heat Convector 1000 wt

- **IT SHOULD BE OF: - 1000 WATTS,**
- **GOOD QUALITY, BRANDED, ISI CERTIFIED WITH 5 STAR RATING;**
- **SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;**
- **AFTER SALES SERVICE WILL BE REQUIRED. TO QUOTE CMC FOR 5 YEARS AFTER EXPIRY OF WARRANTY**
- **CE CERTIFIED**

Curtain Screen

- **TUBULAR STEEL FRAME, EPOXY POWDER COATED.**
- **MOUNTED ON CASTORS.**
- **WASHABLE PLASTIC CURTAINS.**
- **KNOCK DOWN CONSTRUCTION.**
- **CE CERTIFIED**

Wall Clock

IT SHOULD BE OF: - GOOD QUALITY, BRANDED, ROUND, ELETRONIC WITH 1 FEET DIAMETER, SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED, IT SHOULD BE ISI CERTIFIED

GEYSER

- **35 LTR CAPACITY**
- **ISI MARK**
- **FIT FOR USE WITH HARD WATER**
- **5 YR WARRANTY**

RO SYSTEM

ISI CERTIFIED. LIKE KENT RO OR EQUIVALENT THERE SHOULD BE MINIMUM WARRANTY PERIOD OF TWO YEARS AND CONDITIONS FOR FREE INSTALLATION.

THE COMPANY MUST HAVE SERVICE BACK UP IN DELHI TO PROVIDE SERVICE SUPPORT WITH IN 24 HOURS OF THE NOTIFICATION OF THE COMPLAINT

COMPANY SHOULD QUOTE THE RATES OF ACCESSORIES AND CONSUMABLES FOR FUTURE REFERENCE COMPANY MUST AGREE TO ENTER AMC FOR 5 YEARS AFTER THE EXPIRY OF THE WARRANTY PERIOD AND SHOULD QUOTE THE RATES FOR COMPREHENSIVE AND NON-COMPREHENSIVE AMC.

S.S Bucket for OT 10 Litres

- **COMPLETE STAINLESS STEEL**
- **CAPACITY 10 LITRES (APPROX.)**
- **SEAMLESS AND WITH STEEL HANDLE**
- **ISI/ CE CERTIFIED**

Plastic Bucket 15 litres

- **STANDARD QUALITY. PREFERABLY ISI CERTIFIED.**
- **WITH HANDLE**
- **COLOUR OF USER'S CHOICE**

Plastic Mugs 500 ML

- **STANDARD QUALITY. PREFERABLY ISI CERTIFIED.**
- **WITH HANDLE**
- **COLOUR OF USER'S CHOICE**

Extension Boards 15 V

- **WITH SPIKE BUSTER**
- **ISI & AT LEAST 3 MULTI-PLUGS ON STRIP.**
- **ALL SOCKETS 5/ 15 AMP & PREFERABLY COMPATIBLE WITH INDIAN AND AMERICAN TYPE PLUGS 5 EXTRA FUSE TO BE PROVIDED**
- **WARRANTY OF 2 YEARS**

Blankets

- **SHOULD HAVE OVER ALL SIZE OF 90 X 60 INCHES;**
- **ISI CERTIFIED/ WOOLMARK**

Bed Sheets

- **IT SHOULD HAVE OVER ALL SIZE 100 X 60 INCHES,**

100% COTTON OF HIGH QUALITY;
PREFERABLY ISI CERTIFIED ; BRANDED
Pillow (Sky Blue)

- **IT SHOULD HAVE OVER ALL SIZE 15 X 25 POLYFIBER**

PREFERABLY ISI CERTIFIED ; BRANDED
Pillow Covers (Sky Blue)

- **IT SHOULD HAVE OVER ALL SIZE 17 X 27; 100%**
- **COTTON OF HIGH QUALITY;**
- **PREFERABLY ISI CERTIFIED ; BRANDED**

Draw Sheets

- **IT SHOULD HAVE OVER ALL SIZE 50 X 60 INCHES,**
- **100% COTTON OF HIGH QUALITY;**
- **PREFERABLY ISI CERTIFIED ; BRANDED**

Data Management System – Recorder, PC Printer

PATIENT RECORD ARCHIVING SYSTEM (REPUTED BRAND TO BE SUPPLIED FROM INDIAN MARKET.).

OP: CORE 2 DUO 2.93GHZ/ 4GB(2X2) DDR3 RAM/ 820GB ATA HDD/ DVD RW/ 18.5" TFT/ DOS/ 3YEAR WARRANTY. 3090 OR BETTER)	**1**
500 GB EXTERNAL HDD	**2**
4 GB, 8 GB, 16 GB AND 32 GB USB FLASH DRIVE	**2 EACH**
MS OFFICE HOME & BUSINESS	**1**
WINDOW 7 PROFESSIONAL OEM PACK	**1**
QUICK HEAL TOTAL SECURITY ANTI VIRUS-3 USER	**1**
ADOBE ACROBAT PROFESSIONAL- PAPER LICENSE	**1**
UPS 0.5 KV	**1**
ICEJET 4500 DESKTOP ALL-IN-ONE(COLOUR & B/W PR COPY, FAX) BLK/CLR WITH ADF (WILL REQUIRE QUAR SERVICING WITH CHANGE OF CARTRIDGES THROUG WARRANTY AND CMC)	**1**

Foot Operated Covered Plastic Dustbin

SIZE - ~20 LITRE CAPACITY .
IT SHOULD BE ISI/ CE CERTIFIED

BP Instrument Mercury
ISI MARK & STANDARD QUALITY
INTERCHANGABLE BP CUFF OF 3 SIZES – FOR PAEDIATRIC, ADULT AND OBESE PATIENTS 2 YEAR WARRANTY.

BP Instrument Digital

- **INFLATES SMARTLY JUST ABOVE SYSTROLIC BLOOD PRESSURE**
- **TO KEEP A RECORD OF YOUR BLOOD PRESSURE.**
- **TO STORE THE MEMORIES OF TWO PATIENTS SEPERATELY.**

- **DAILY 3 ALARMS TO REMIND TE PATIENT.**
- **TO DETECT IF THE PATIENT HAS IRREGULAR HEART BEAT.**
- **TO CLASSIFY THE BP INTO NORMAL, MILD, OR SEVERE HYPERTENSION.**
- **TO STORE THE CUFF UNDER LCD COMARTMENT WHEN NOT IN USE.**
- **OPTIONAL ACCESSORY AVAILABLE (AGAINST EXTRA COST)**
- **MONITOR TYPE: AUTOMATIC INFLATE & MEASUREMENT METHOD: OSCILLOMETRIC DISPLAY: LIQUID CRYSTAL DIGITAL DISPLAY**
- **MEASUREMENT RANGE: 0-280 MM/HG & BATTERY: 4X 1.5V AA ALKALINE BATTERIES WEIGHT: 400 GM WITHOUT CUFFS & BATTERIES**
- **CUFF FITS: 22 TO 32 CM**

White Background X-Ray Viewer 2 X-Ray Panel

- **PURE UNIFORM WHITE BACKLIT DISPLAY**
- **SLIM**
- **WALL MONTABLE**
- **220V/ 5 A**
- **CE CERTIFIED**
- **2 YEARS WARRANTY**
- **SIZE FOR ONE FULL LENGTH X-RAY/ CT/ MRI FILMS WITH ON/ OFF SWITCH**

17 Mortuary Cabinet High End - Imported

The standard type of Mortuary Cabinet is Three-body freezer cabinets

Any other type of cabinet or walk-in type mortuary cold room can be manufactured to suit the client's requirements.

Construction
The top, sides and bottom of these cabinets are constructed with metal cladded insulated panels, the door frames and rear of the cabinets are reinforced with selected clear SA pine frames, rendered waterproof with a bituminous solution.

All internal and external surfaces of the cabinets can be covered with a variety of materials, such as stainless steel, chromadek or galvanised steel.

The three- and six-body cabinets have a 100 mm thick polystyrene insulation core with a density of 24 kg/m³. The three- and six tier body freezer cabinets have a 100 mm thick polyurethane insulation core with a density of 40 kg/m³.

The front doors are hung onto robust chromium plated hinges and are fitted with chrome-plated latches and strikes. The reveals of the door openings are fitted with floss black perspex breaker strips. The freezer cabinet doors are provided with heater elements. All doors are fitted with air-right rubber gaskets.

The service panel on the rear of the cabinet is reinforced with timber in order to carry the air-cooling and condensing units. Each cabinet is mounted on four adjustable feet and is fitted with a drain point.

Body trays
Each body compartment is provided with a dished body tray which is welded onto a tubular frame. Both tray and frame are manufactured from stainless steel or galvanised mild steel.

Refrigeration system
The condensing and air-cooling units are mounted on the service panel so that it forms a complete, self-contained unit.

A neat instrument panel on which an isolator and pressure switches are mounted, is provided and fixed to the service panel.

The refrigerant tubing, instrument panel, electrical wiring, and all other parts are factory mounted on the service panel. A thermometer is mounted above the doors on the front of the cabinet.

The refrigeration unit undergoes a thorough test before it leaves the factory.
All refrigeration systems are ozone friendly.

18. Scrub Station for OT - Indigenous

Compact Surgical Scrub sink will be designed for use in Operation theatre complex providing surgeons with a convenient sink for pre op scrub up. Each fixture will be fabricated from heavy gauge type 304stainless steel & will be seamless welded construction polished to a satin finish. The scrub sink will be provided with a front access panel, which will be easily removed for access to the water control valve, waste connections, stoppers & strainers. Hands free Operation will include infrared sensor with built in range of adjustment.

Thermostatic Mixing Valve control will be located behind the access panel & maintain constant water temperature. User defined settings of 1,3,5,10 min are available. This timing will be adjustable to meet individual application requirement, provided with infrared sensor thermostatic controlled taps with fail-safe temperature controls. All units will have reduced anti splash fronts. Knee operated switch will be offered as an option.

MEDICAL EQUIPMENT (PART II) (LEVEL–II)

TECHNICAL SPECIFICATIONS

1. RAPID AUTO CLAVE

State of the Art fully automatic Trauma use autoclave with dry cycle having following features :

- **Fully Automatic table top type front loading autoclave of min 22 litres or more Capacity with facility of triple vacuum cycle**
- **At least 2 or 3 Separators (trays) to hold different type of instruments / Materials with one removable tray.**
- **Digital display (LED or LCD) of temperature, time and pressure (to show curve & words)**
- **The pressure and temperature of the autoclave should range form 15 PSI at 121degC to 30 PSI at 134degC**
- **The body and trays of the autoclave should be made from corrosion resistant stainless steel.**
- **Provided with Micro bacterial filter.**
- **For safety the equipment messaging and warning system should be present.**
- **Fully microprocessor controlled management for constant monitoring of parameters and control of the autoclave functions with 4 cycles as under:-**

A. **2 Cycles for unwrapped loads-134degC -4min.**
121degC- 20min

B. **2 Cycles for wrapped loads-134degC -4min.**
121degC- 30min

- **Separate tanks to prevent recycling of water.**
- Auto shut off & stand –by mode
- One water filling tank together with one pipe connection.
- Automatic Functioning with automatic self cleaning of pipe steam generator, pipe and other parts after every 100 or 150 cycles of use.
- Thermodynamic initial vacuum.
- Top design reservoir for convenient watering and cleaning.
- Automatic drying system.
- Micro switch to confirm door closure.

- Safety valve & Safety thermostat.
- The system should be easy to use (User friendly).
- The unit should preferably be CE marked.
- The same unit should have facility to upgrade in future for connectivity to External Thermal printer or Inbuilt thermal printer facility (to keep record of every cycle during use)

2. ***VIDEO OTOSCOPE, BRONCOSCOPE & LYRANGOSCOPE***

a) VIDEO OTOSCOPE

- **Should be integrated unit with Direction of View: 0° and Field of View: 60°**
- **Should have Depth of Focus from 5 - 50 mm with Tip Diameter Ø 4,0 mm**
- **Should be provided with disposable Ear Funnel size 2,0 mm and 4,0 mm**
- **Should have CMOS Image Sensor, with Resolution 320 x 240 Pixel**
- **The Illumination should be by an integrated White light LED**
- **The Interface should be USB 2.0 and Composite Video (Cinch), and the Power Supply may be by USB 2.0 or 5V Medical AC Adapter**
- **Should connect to a PC via USB**
- **The dimensions of Hand piece should be within 130 mm x 40mm x 40mm and should be light weight up to 60 gr , with Hub dimensions max 170 mm x 70 mm x 130mm , weighing not more than 400 gr**
- **Should be provided with 1.8 m Supply Cable Hub to USB Port as well as 1.8 m Supply Cable Hub to Hand piece**

Should be CE marked

b) SPECIFICATIONS FOR FLEXIBLE LARYNGOSCOPE

FIBER OPTIC LARYNGOSCOPE

Outer diameter of insertion tube	**:**	**5.0 mm**
Direction of view	**:**	**0 deg.**
Depth of field	**:**	**3-50 mm**
Angle of view	**:**	**80 deg. Or more**
Working channel diameter	**:**	**2.0 mm Or more**
Working length	**:**	**410 mm Or more**
Total length	**:**	**650 mm Or more**
BENDING SECTION		
Up/Down	**:**	**>130/>100 deg.**

STANDARD SET OF ACCESSORIES

- **Biopsy forceps : 1 no.**
- **Channel cleaning brush : 1 no.**
- **Cytology brush : 1 no.**
- **Mouthpiece : 2 nos.**
- **Suction tube : 1 no.**
- **HALOGEN COLD LIGHT SOURCE 15V/150W: 1 no.**

Adapt 15V/150W halogen lamp and humanized designed to provide optimal operability.
Contains built in pump for automatic leakage test.

c) RIGID BRONCHOSCOPE:

BRONCHOSCOPY SET: Telescope 0^0, 30^0 Straight

Bronchoscope Tube

i.	**4mm-WL.215mm.**
ii.	**5mm-WL 245mm**
iii.	**5.5mm-WL.265mm**
iv.	**6.0mm-WL265 mm**
v.	**7.0mm-WL 365mm**

Forceps

I FB forceps alligator.

II Grasping forceps for soft FB

III Peanut forceps

Accessories
Dilator, Foreign body basket, graspers, optical forceps
Adaptor with sliding glass window plug, sealing cap, notched lens and keyhole opening, movable
Plug for ventilation Attachment of Bronchoscopes
Adaptor from Bronchoscope to any type of pediatric respiration equipment
Atomizer with bulb working length 50cm (2)
Laryngeal Atomizer with bulb (2)
Suction Tube, Length 50 cm, diameter 2.2.5 & 3 cm(2 each)
Monitor Specification
19" Flat Screen Monitor, Desktop Version, Color System PAL/NTSC Resolution max. 1280 x 1024 SDI, Composite, S-Video RGB, DVI and S-XGA Input Brightness: 450cd/m2 Contrast: 650:1 Power Supply: 100-240 VAC, 50/60 Hz consisting of: 9419NG 19" TFT Flat Screen 9419 PS Power Supply 9419SF Stand
Endoscopic Camera system
Camera head unit consisting with following spec: image sensor: 1x 1/3 " CCD chip
Pixel 752 (h) x 582 (v) pixel per chip
AGC: Microprocessor controlled

3. LAPAROSCOPY SET OPERATING
MAJOR WITH ACCESSORIES

Laparoscope Telescope, Fully autoclavable with working length 30 to 33 cm
Wide angled distortion free view and light transmission incorporated
0 deg, 10mm x 1 No
30 deg. 10mm x 1 No
Instrument set
Laparoscopic hand instrument dismentable 5mm size (Reusable) with 33-36cm working length, take apart locking /unlocking mechanism, rotatable with interchangeable handle with cleaning port, mono molar diathermy attachment consisting of:
Veress needle 12 cm length x 2 Nos
Veress needle 15 cm length x 2 Nos
Trocars with pyramidal tip, and cannula with multifunction valve size 11mm x 2 Nos.
Reducer 11 / 5mm x 2 Nos
Trocars with pyramidal tip, cannula with multifunction valve size 6mm x 3 nos, Cannula washer 5mm ------50 Nos
Cannula washer 10mm--------25 Nos
Laparoscopic biopsy forceps 5mm x 1 Nos
Maryland Kelley dissector 5mm with unipolar diathermy x 1 nos
Atraumatic grasper, 5mm x 1 Nos.
Atraumatic grasper with fenestrated jaw slightly curves, 1 Nos
Metzenbaum scissor (5 cm) with unipolar x 1 Nos
Laproscopic cautery lead unipolar x 1 Nos
Suction irrigation cannula with two way valve x 1 Nos
L, shaped hook electrode 5mm x 1 Nos
Blunt spatula electrode 5mm x 1 Nos
Laparoscopic bowel grasper 5mm x 1 Nos
Laparoscopic spoon forceps 10 min x 1 Nos
Needle holder with tungsten carbide tip 5mm x 1 Nos
Clip applicator medium large, 10mm , 1 Nos
Claw forceps 10mm- 1 Nos
Biplar forceps with wire teeth, completely detachable – 5mm dia, working length 36cm- 1 Nos
Monopolar high frequency cable, 3 meters- 1 Nos
Bipolar connecting cable to standard electrosurgical unit- 1 Nos.
ENDOSCOPIC CAMERA SYSTEM
Camera head unit consisting with following spec: image sensor: 1x 1/3 " CCD chip
Pixel 752 (h) x 582 (v) pixel per chip
AGC: Microprocessor controlled

Camera control unit with followign specs- maximum resolution of 440,000 pixel, progressive scan CCD sensing chip should optimum image quality for maximizing hi – fidelity image transmission optimizes to any size: the system should have optical zoom to quality of image

size and cross specialty window standardization of the camera system regardless of the telescope used

The system should automatically optimize all settings. The system should be ready to use as soon as it is connected to the camera control unit

HIGH RESOLUTION MEDICAL GRADE COLOUR MONITOR

15" should have composite video, SVHS & RGB output, colour monitor TFT, compatible with above camera system resolution

CO2 Electronic Automatic Insufflators

Electronic automatic insufflators with pin index connection

Should have an adjustable flow rate of 0.5 to 20 litre per minute and a pressure range adjustable 0-30mmHg. Preset and actual value for pressure and flow should be displayed together for better monitoring of both values

Pressure and flow rate should be displayed on the frontal panel. Should be able to select either central suply (4.5 kg/cm2) input pressure from central supply as well as direct connection to high pressure CO2 cylinder. Should have internal heater inbuilt for waming up the cold CO2 gas

Provided with silicon autoclavable tubing 4 sets, with luer attachment. Instrument should work on a universal AC supply between 110-240 V, with a frequency of 50 Hz single phase. Electrical safety certification- IEC-601-1 and CE acc to MDD Secuvent safety system for constant monitoring of intraabdominal pressure and checking overpressure with automatic back release of CO2 gas within 5 second with acoustic alarm

Should be supplied with 2 nos high pressure hose pin index minimum length 1.0 meter

Xenon light source with 300 watts lamp power required 220 V AC. Manual illumination intensity control life of the lamp should be displayed on the Qty. 01 No

Formalin Chamber

Formalin chamber made of Virgin Acrylic 6mm thickness: Size: 26" x 8"x8" (LxBxH) with three tray, for sterilizing the laparoscope, preferably with three tray x 2 Nos

CO2 cylinder

CO2 cylinder to accept 4.5 kg liquid CO2 capacity bottle with pin index connection x 2 Nos

Disinfection tray

Disinfection SS tray of steel grade 304 with sieve tray to life, size : 27" x 7" x 5" (LxBxD) x 2 Nos

UPS System

UPS- 2.0 KVS off line with one hour backup time (at 1200 watts real load) with inbuilt SMF batteries. Should be able to work on wide input range between 160-270 VAC at frequency between 50 hz – 5 Hz should use PWM technology with power conversion with single transformer arrangement with an output of 2300 VAC protection of overload, short circuit and low battery. Should have indication on front panel for mains load/battery load/battery overload- low and MCB protection in case of short circuit. Should be supplied with separate battery rack, ISI/CE approved good quality Indian makes

Laparoscopy trolley

Mobile unit tower with 4 shelves, 1 drawer, 1 compartment for unit connection cable, 1 cable channel,1 winding bracket, 8 power socket, 1 isolating transformer & power cable 240V, 50 Hz

Camera head holder Device connecting cable, 150 cm long

Device connecting cable, 250 cm long Universal CO2 bottle holder Should have arm for TFT monitor Should have antistatric castor wheels at least two lockable

4. CENTRAL MONITORING STATION

1. **Branded PC , Printer With 17 " TFT screen.**
2. **Up to 64 Waveforms of 32 Bed Side Monitors.**
3. **6.25, 12.5,25,50 mm/Sec Selectable Sweep Speed.**
4. **4 Hours of dynamic Trend Display of All Parameters.**
5. **Remote Monitor Control Bidirectional Communication.**
6. **240 Hours Trend for Each Monitor.**
7. **720 Items Parameters Alarm review for each Monitor.**
8. **720 CO Measurement Review.**
9. **Display of Parameters Like, ECG,NIBP,SpO2,Resp, Temp., IBP, Respiration, CO, Et Co2,Etc.**
10. **Bed to bed View Facility.**
11. **Should have wireless CNS connectivity**

5. **HIGH END MULTI PARAMETER MONITOR (MODULAR)**

1. **The modular monitor should measure 3/5/12 Lead ECG, Resp, 2-Channel Temperature, SpO2, NIBP, 2-Channel Invasive Blood Pressure,ETCO2. (7 PARA MONITOR)**
2. **It should have bright, highly visible with minimum12.1" color TFT display for easy viewing from a distance.**
3. **The monitor should display at least 8 waveforms traces on a single screen which is integrated with the main unit.**
4. **It should have atleast following features in respect of monitoring:**

96 hours graphical trends
96 hours tabular trends

5. **The monitor should have option of 12 slots for modules for flexible configuration.**
6. **The monitor should have changeable screen layout for various monitoring settings.**
7. **Data management software based on PC**
8. **Patient data transmission via flash disk**
9. **Configuration setting should be transferred between monitors**
10. **Should be capable of onsite upgradation - C.O. (Cardiac Output), PICCO and SCVO2, AG (Anesthesia Gas), BIS (Bispectral Index), RM (Respiratory Mechanics), ICG (Impedance Cardiography).**
11. **There should be provision for using wireless LAN card & memory card.**
12. **There should be external ports for Keyboard, Mouse, Slave display, Emergency Nurse Call & 4 USB ports.**
13. **The monitor should be capable to support Wireless Networking and compatibility to use with Central Monitoring System.**
14. **There should be mass alarm setup**
15. **It should have priority color coded audio – visual alarm system with bright prompt message on the screen. There should be a separate color coded audio – visual alarm when patient data deviates from normal limits and machine failure, improper function.**
16. **There should be auto identification of ECG lead set, complete ST analysis with ST template and multi-channel Arrhythmia analysis**
17. **The monitor should have OxyCRG screen.**
18. **There should be various calculations like Drug dose, Oxygenation, Ventilation, Renal, and Hemodynamics.**
19. **It should come with dual exchangeable Li–Ion batteries with more than 2 hours battery backup.**
20. **There should be a provision for built-in 3 channel thermal recorder.**
21. **The monitor should have a provision for auto alarm printing i.e. alarms triggers an auto printing.**
22. **There should be hot keys & Icons on buttons and Iconic symbols on touch screen as well.**
23. **The monitor system should be US-FDA and CE Marked for all standard and optional parameter configurations.**

6. MULTIPARAMETER MONITOR

Should not be less then 10.4" screen.
Should be colourTFT
Should have the good resolution minimum (800 * 600 dots)
Should have the option for real time ecg wave forms and episode.
Should have the standard facility to monitor ECG , NIBP, Spo2 for low perfusion , temp, resp.
Tender is submitted with proper CE certificate for quality assurance.
Trend parameters: Heart rate (or pulse rate), respiration rate, VPC rate, ST level, Event (arrhythmia), apnea (time), apnea (frequency), SpO2, NIBP (systolic,diastolic,mean), Temp.
Trend time: 1, 2, 4, 8 or 24 h
Data storage time: 1 min for 1, 2, 4, 8 hours, 3 min for 24 hour.
Vital Signs List
Parameters: Heart rate (or pulse rate), VPC rate, ST level, NIBP (systolic, diastolic, mean), SpO2, respiration rate, temperature.
Number of files in list: 120 for periodic list, 120 for NIBP list
List interval: 1, 5, 15, 30 or 60 min for periodic list, at NIBP measurement for NIBP list.
Should have the facility of OCRG screen.

Should have the facility to store alarm up to 200 and displayed on the alarm history.
Should have the battery backup of 2 hr,
Should be able to store 16 arrhythmia episodes which can be edited for arrhythmia analysis.
Should have the facility to enlarge the numeric display.
Should have the faculty to freeze the wave forms.

7. <u>30 KW MOBILE DIGITAL X-RAY WITH AUTOMATIC FILM PROCESSOR</u>

- **The High Frequency Mobile X-Ray Unit should be capable of all Standard radiographic procedures in Wards, OT, Trauma centre, Emergency and Other rooms & The System should be able to moved into a lift and all patient access areas**
- **The unit should use Hi-Frequency X-ray Generator Technology of 100KHz or more**
- **Required Ratings:**
  - **HF Generator Minimum 30 KW or Higher**
  - **400 mA or better**
  - **125 kVp or better**
  - **200 mAs or better**
- **The unit should have easy manual movements and must be easy to maneuver within the Hospital areas: surgical rooms, intensive care, emergency, wards etc.**
- **Should be a fully integrated light weight mobile unit with a easy to use X-Ray System**
- **Should have excellent movements and easy to turn**

GENERATOR:

- **High Frequency generator with microprocessor control**
- **Tube overload protection with continuous Monitoring X-Ray Tube Heat Units**
- **Programmed anatomical technique with storage of program**
- **Safety features for overload, tube current, KV, tube rotation etc and auto test for unit.**
- **30 KW or higher X-ray generator with a max of 125 KVp or more that should be able to work on 12 amps current. (230v supply 15 amps power plug available at trauma center)**
- mA range 50 to 400 mA or more
- KV range 40 to 125 KV or more.
- Time range from 1.1 ms. to 4 sec or more

CONTROL UNIT:

- **Feather touch control panel with LCD display for Data and massage.**
- **Anatomical technical selection and KV & MAS increase and decrease facility**

MOBILE UNIT & TUBE STAND COLUMN:

- The unit should have easy manual movement with break
- **Unit should have a multi-leaf collimator**
- **The tube stand column should have a articulated arm for easy reach to patient**
- **-15 to +100 "Z" axis frontal tube rotation**
- **Front telescopic crane type & easy to use tube arm**
- **Maximum Focal Distance should be higher than 180 cm to the floor and minimum of 60 cm to the floor.**
- **Should have 180 deg roation of cross arm from its vertical axis +90 deg and – 90 deg better reach**

To patient.

- **The un it should have a safe and secure cassette housing**

X-RAY TUBE - Ratings:

6. **Maximum KVp: 125 KVp.**
- **It should be Dual focal spot rotating anode with small focal spot 0.6 mm or better and a large focal spot 1.3 mm or better and Low speed rotor drives 3,000 r.p.m.**
- **Single Phase 230 VAC 50 / 60 Hz. ±10%.**

Accessories:

- **2 light weight 0.5mm lead aprons to be included in the offer**
- **Gonad shield for boys and girls – One each**

Others:

- **The x-ray unit should meet CE or FDA standards**
- **The system offered should have AERB Type approval/ NOC for installation and**

use in India

AUTOMATIC FILM PROCESSOR(fully indigenous) FEATURES REQUIRED :

- **Automatic X-ray Film Processor table top model for processing all standard size x-ray and imaging films upto 14" x 17" size**
- **It should have capability to process a minimum film size of 4" x 4" and above**
- **The processor should have high quality rollers of plastic / rubber as needed and they should be made of long lasting material**
- **The transport system should be controlled by a micro processor - built in to the system and should be able to provide uniform and smooth transportation**
- **There should be provision to set up the processor for output times of 90/105/118/135 or 167 secs, depending on the requirement of the user - at the time of installation or during service - based on the customers request**
- **The processor should have capacity to process atleast 140 films per hour (12" x 10" size) or over 80 films of 14" x 17"**
- **Developer and Fixer temperatures should be adjustable - in steps by the user**
- **Drier temperature should be adjustable, if needed &**
- **The minimum capacity of the developing / fixing and water tanks should be 5ltrs or more**
- **There should be a reservoir provided where fresh chemicals of 20ltrs can be stored**
- **There should be a provision for replenishment of fresh chemicals from the reservoirs - automatically, based on the films processed**
- **The amount of chemicals replenished should be adjustable, depending on users request**
- **Fresh water for rinsing the films should be circulated into the wash tank. This should be controlled automatically - mention liters per hour**
- **The processor should be controlled by a micro processor with display of Bath temperature**
- **Should have provision to put the machine on standby mode automatically when not in use**
- **The processor should be in a ready state and respond immediately upon insertion of a film - to process. All bath temperatures should be automatically maintained even during standby mode**
- **The bath dryer should have jets / venturies that ensure uniform drying of films across the entire area. Please provide technical documents and explain how to avoid wet patches / non-uniform drying**
- **The processor tanks should be made of non-rust material. Special plastic with monocoque shell construction of the tank area would be preferred. Shell : 2 part body shell is must for easy serviceability**
- **The processor should be designed to provide easy access to the electrical and micro processors for service and settings - without the need to tilt the processor or drain the chemicals - saving time and ensuring no wastage of chemicals**
- **The processor should have a small foot print - not more than 0.5 sq mtrs**
- **The manufacturer should be ISO registered**
- **Mention if product is compliant to any international standards such as CE,ISO 13485**
- **The manufacturer should have easy availability of spares - locally in India**
- **The manufacturer should have fully trained engineers in the field to service the processors and ensure maximum uptime**

8. <u>MOBILE C-ARM IMAGE INTENSIFIER UNIT</u>

<u>HIGH FREQUENCY C-ARM</u>

- **The unit should be high quality unit having the below mentioned specifications:**

GENERATOR:

- **It should be digital with feather touch controls.**
- **It should be of high frequency with output of 5 KW and frequency of min 40 KHz.**
- **The KV range should be from 40 to 120KV in steps of 1 KV**
- **The fluoroscopic mA should be upto 4.0 mA or more**
- **The radiographic mAs range should be upto 200mAs or more**
- **Radiographic mA up to 70 mA or more**
- **Pulsed fluoroscopy should be possible**
- **The x- ray tube should be dual focus rotating anode. The focal spot of the tube should be 0.3mm and 0.6mm and anode heat storage capacity of 200 KHU or more**
- **The digital display of fluoro mA, KV, timer & radiography mAs should be provided and the display should be micro- controller based LCD Display**

- **There should be independent selection of KV & mAs.**
- **The control should have indicator for power on,**
- **The control should show error with proper written massage on LCD display for any overload, X-ray Tube heating or any fault in machine.**

I.I.T.V. SYSTEMS & MONITORS:

- **The image intensifier should be of latest series.**
- **It should be of 9" triple field (i.e 9"/6"/4") with CCD Camera**
- **The circular grid (108 lines) should be fixed on the I.I to improve the image quality.**
- **2 nos. 17" TFT monitor should be supplied**
- **The monitor trolley should be provided for mounting 2 monitors and should have 2 shelf for keeping memory and stabilizer & isolation transformer.**

C-ARM STAND:

- **It should be ruggedly built and should be of good designed.**
- **It should have steering for controlling back and front wheel movements**
- **It should also have the below mentioned movements**
  - **Horizontal travel should be 210mm or more**
  - **Orbital movement should be 90 + 25 degrees**
  - **Panning movement should be +/- 12 degrees**
  - **Focus to I.I distance should be 920mm or more**
  - **Vertical movement should be motorized of 450mm or more**
  - **Focus to I.I clearance should be 800mm**
  - **C- Arm rotation should be +/- 270 degrees**

IMAGE MEMORY & ESSENTIAL ACCESSORIES:

- **Image memory of 100 frames permanent storage or better.**
- **7 KVA stabilizer & isolation transformer to be provided**
- **It should run on single phase 230 volts, 15 Amps.**
- **3 nos quality approved lead aprons to be provided**

The quoted model should have AERB NOC or AERB Type approval. And International CE/FDA

9. **3D COLOR DOPPLAR UNIT FOR GENERAL & CARDIAC USE**

Latest generation Color Doppler Ultrasound Unit capable of performing Obs/Gyn, abdominal, Small Parts, musculoskeletal, Urology, Pediatrics and Cardiology cases with following specifications :

1. **System should be offered with following Broad Band width transducers:**

a) Multi Frequency Convex Array Transducer (frequency range of 3 to 7 Mhz) for Abdominal, Ob/Gyn applications.
b) Multi Frequency Linear Array Transducer (frequency range 5 to 12 Mhz) for vascular & small parts applications
c) Multi frequency Endocavitory Transducer (frequency range 4 to 9 Mhz) for TV/TR applications.

2. System should have following modes:

a) 2D, M Mode, Color M Mode, Color Doppler Imaging, Power Doppler Imaging, PW, Tissue Harmonic Imaging, Trapezoidal Imaging & 3D Imaging.

3. Digital Processing Channels 1100 or more. Please specify through technical data sheet.
4. Grey Scale (min 256 or more) please specify.
5. System should have integrated 3D Imaging Package. Please specify through technical data sheet.
6. System should have scanning depth of 2 to 30 CM. Please specify through technical data sheet.
7. Broad bandwidth beam former technology transducers for extreme high resolution 2D image should be available.
8. Should have High Dynamic Range of 170 db or more. Please specify through technical data sheet.
9. System should have a very high frame rate of 160 frames per second or more. Please specify through technical data sheet.
10. System should have facility for gain adjustments using slide pot controls for excellent image quality or equivalent.
11. Should have minimum 3 active ports with direct switching from console.
12. System should have a high resolution articulating non interlaced flicker free, antiglare flat panel display of 15 inches or more, with tilt and swivel facility.
13. System should have built in Image Management software.
14. Image storage capacity through Hard Disc Drive should be 80 GB or more.
15. Image Archival: Inbuilt DVD Drive with the facility to transfer images.

16. System should have direct connectivity to color paper printer for printing images & report.
17. System should have extensive calculation software package for General Imaging, Obs/Gyn & abdominal Imaging.
18. The quoted model should be European CE/ US FDA approved.

- **BIPAP**

Mode :
Spontaneous (S), CPAP
Pressure range (measured at the mask) :
IPAP 4–25 cm H2O (hPa) incriment of 0.2
ePAP 2–25 cm H2O (hPa) incriment of 0.2
cPAP 4–20 cm H2O (hPa)
Respiratory rate : Optional On (10BPM) / OFF
Ti control (S mode)
Ti max range 0.1–4.0 sec
Ti min range 0.1–Ti Max sec
Rise time range Min, 150–900
Trigger and cycle sensitivities 5 levels
Maximum flow capacity at 20 cm H2o 170 L/min
Data display on LCD

Treatment screen:
Mode and pressure, leak, respiratory rate, Vt, trigger and cycle indicators, SpO2 and heart rate when ResLink and oximeter are connected results screen Usage and efficacy data (leak, Vt, respiratory rate, minute ventilation, spontaneous trigger and cycle %, AHI, pressure)

- **BIPHASIC DEFIBRILLATOR MONITOR**
- **The Defibrillator Monitor Should have Manual and AED Mode of Defibrillation.**
- **It Should have Latest Bi Phasic Technology with Energy Selection from 1 Jule to 360 Jules.**
- **It should have 8.4" Colour TFT Display.**
- **It should have 5 Lead ECG Display.**
- **It Should have Compact Design Weight should be Less Than 10 KG .**
- **It Should have Powerful battery Backup (200 Shocks of 360 Jules) on Fully Charge battery.**
- **It should have Shock proof for Transport use.**
- **It Should have Thermal Recorder for ECG Recording.**
- **It Should have 72 hours of Trend Memory and up to 1000 Event Storage for a Patient.**
- **It should have Less Than 5 second for Charging 200 Jules for Quick Shock.**
- **It Should have AED with Default configuration Meets 2005 AHA Guidelines.**
- **It Should Record for Marked Events , Charge ,Shock and Alarm.**

It Should be Upgradeable for NON INVASING PACING,MASSIMO SPO2,IBP,ETCO2,NIBP

Price for upgradeable Items should be quoted separately.

- **SYRINGE INFUSION PUMP**

- **Syringe Pump front loading should accept 10, 20, 30, 50 ml syringes of known brands as well as CUSTOM programmable syringe.**
- **Flow rate range should be 0.1-990.0ml/hr .**
- **Time limit should be 00:01 to 23:59 (hrs:min).**
- **Volume limit should be 0.1ml to capacity of syringe.**
- **Unit should be PCA upgradeable.**
- **Unit should have facility for time locked BOLUS / PCA facility & administration counter and display for the same.**
- **Unit should have minimum six stage programming of target time and target volume.**
- **Occlusion should be of three levels low, medium and high.**
- **KVO (Keep Vain Open) rate should be programmable from 0.1ml/hr to 10 ml/hr.**
- **Unit should have LED display of flow rate & LCD display for infused volume and elapsed time.**
- **Unit shout have Display of Drug name on LCD**
- **Unit should have minimum 25 drug library with choice of personalized library.**
- **Unit should have automatic rate calculation with volume and time limit.**

- **Unit should have body weight based rate calculation programming.**
- **Unit should have stacking facility with normal or optional power cord.**
- **Battery back up should be 4-5 Hrs @ 5 ml/hr.**
- **Unit should have audio visual alarms for occlusion, end of syringe, Syringe displaced, No Syringe, Wrong Syringe, Pre alarm for end, Invalid rate, Invalid target volume, Invalid target time.**
- **Accuracy should be +/ -2% for volume and time.**
- **SHOULD have ISO- 13485 certification**
- **UNIT Should be CE CERTIFIED**

- **<u>100 MA X-RAY MACHINE</u>**

- **X- ray machine : 100 mA X - ray Machine counter balance mobile stand.**
- **X- ray machine : 100mA -100 KVP full wave multipulse rectified generator with BEL DSA - 3/DSA-2 X-Ray tube or AERB approved fine focal spot tube**
- **Output : 8 Kw or less**
- **KVP range 45 to 100 KVP in steps of 5 KVP step**
- **Control: complete with voltmeter ,mA meter .Quick trip, overload circuit breaker, voltage compensator,**
- **Tube head : Having BEL DSA-3/DSA-2 and high voltage transformer.**
- **Machine safety device- Electronic sensor to protect X-Ray tube and high voltage transformer from overloading. Quick tripoverload circuit breaker.**
- **Collimeter : Light beam cum shutter diaphragm.**
- **Power supply requirement : 230V, 50 Hz , single phase,15 Amps.**
- **Stand : Mobile stand with counter balanced, Articulated tube carriage allowing movements of the tube head in vertical and horizontal plane lead lined cassette strong box.**
- **<u>CAUTRY UNIT (RADIO FREQUENCY SURGICAL UNIT FOR MULTIPLE APPLICATIONS IN SURGERY) (Fully Imported</u>**

- **Radio frequency Cautery with 4 MHz frequency provided with Monopolar and integrated Bipolar operation. Output Power up to 100 watts.**

- **There should be digital display for power output.**

- **Monopolar should have cut, blend and coagulation modes.**

- **Unit should be provided with Smoke Evacuator with double filtration (HEPA and charcoal) 99.99995% efficiency, with safety against HPV and other virus.**

- **Smoke evacuator should have exclusive dual mode activation for remote or manual activation.**

- **Should be provided with three bendable electrodes, water proof foot switch**

- **Should be provided with following electrodes for various surgical application:**

o **3 electrodes for skin/plastic surgery (straight ball dia 3 mm, round loop dia 5 mm for biopsy & lesions excision, cut electrode for incisions)**

o **2 electrodes for general surgery**

o **2 loop electrodes for Gynae cervical surgery, with autoclavable vaginal speculum**

o **One 360 degree rotating conisation electrode**

o **2 electrodes for laryngeal surgery, one for turbinoplasty, one for UUUP, two for endo nasal**

- **Unit should be provided with autoclavable bipolar forceps and cable.**

- **Optionally quote for various monopolar electrodes for various application**

Unit should be CE Marked.

MEDICAL EQUIPMENT (PART 1)
LEVEL III

1. Ventilator – High End - Imported

- THE REQUIREMENT IS OF A MODERN MICROPROCESSOR CONTROLLED INTENSIVE CARE VENTILATOR.

- **MODES:**
  IT WILLHAVE AT LEAST THE FOLLOWING MODES -
  - IPPV/CMV, SIMV, CPAP/PEEP, BIPAP,PRESSURE SUPPORT VENTILATION, NON-INVASIVE VENTILATION

- **PARAMETER SETTINGS:**
  - TIDAL VOLUME – 50 – 1000 ML, FREQUENCY – 5 – 60 PER MINUTE, FLOW – UP TO 180 LPM, PEEP/PRESSURE SUPPORT – 0 – 30 MBAR, I/E – 3:1 TO 1:3
  - TRIGGER SENSITIVITY – 1 – 10 LMP, INSPIRED OXYGEN – 21% - 100%

- **ALARMS:**
  - AUDIO-VISUAL ALARMS FOR LIMIT VIOLATIONS
  - USER DEFINED; INDEPENDENT FOR ALL PARAMETERS
  - CONTEXT DEFINED; AS PER SETTINGS
  - PREFERABLY THE ALARMS WILLBE PRIORITY CODED E.G. LIFE-THREATENING, SERIOUS, AND ADVICE ONLY.

- **SPECIAL FUNCTIONAL MODES:**
  - INSPIRATION HOLD
  - BRONCHIAL SUCTION – AUTOMATIC PRE-OXYGENATION & DETECTION OF DISCONNECTION AND RECONNECTION
  - STANDBY – IN USER DEFINED PARAMETER SETTINGS

- **MONITORING & DISPLAY OF MONITORED FUNCTIONS:**
  - ALL MEASURED & CALCULATED VALUES
  - AIR WAY PRESSURE – PEEK, MEAN, PEEP, PLATEAU; TIDAL VOLUME (EXPIRED); MINUTE VOLUME – TOTAL & SPONTANEOUS;
  - I:E RATIO; RATE – TOTAL & SPONTANEOUS;
  - INSPIRED OXYGEN & TEMPERATURE
  - CURVES – PRESSURE VS. TIME; FLOW VS. TIME AND LOOPS – PV; FV
  - TRENDS
  - ON A LARGE COLOUR SCREEN OF SIZE NOT LESS THAN 10” DIAGONAL.

- **OXYGEN ENRICHMENT:**
  IN CASE HIGH PRESSURE OXYGEN SOURCE IS NOT AVAILABLE IT WILLBE POSSIBLE TO ENRICH THE INSPIRED GAS MIXTURE WITH AN OXYGEN SOURCE AT LOW PRESSURE OF 40 – 60 CM OF WATER E.G. FROM ORDINARY OXYGEN CONCENTRATOR.

- **HUMIDIFIER & NEBULISER:**

- **POWER REQUIREMENTS:**
  - IT WILLRUN ON THE COMMONLY AVAILABLE 220/240 V AC SUPPLY.
  - HIGH PRESSURE DRIVING GAS IF REQUIRED WILLBE INTEGRATED WITH THE VENTILATOR.
  - THERE WILLBE A BATTERY BACKUP OF AT LEAST 45 MINUTES (VENTILATOR WILLFUNCTION WITH OUT ANY CHANGE IN SET PARAMETERS FOR THIS DURATION)

- **FAIL SAFE:**

- IN CASE OF OXYGEN FAILURE IT WILLCONTINUE TO VENTILATE THE PATIENT WITH AIR.
- IN CASE OF POWER FAILURE IT WILLCONTINUE TO VENTILATE THE PATIENT ON INTERNAL BACKUP BATTERY.
- IT WILLCONTINUE TO VENTILATE IF BOTH THE ABOVE FAILURES OCCUR SIMULTANEOUSLY.

- **GENERAL**
  - ITEM WILLBE FDA APPROVED
  - ALL THE COMPONENTS OF THE SYSTEM WILLBE FROM THE SAME MANUFACTURER. THE MACHINES WILLBE SUPPLIED COMPLETE WITH ALL THE REQUIRED POWER CORDS, PATIENT CIRCUITS FOR ALL USES WITH APPROPRIATE MASKS AND CONNECTORS, USER MANUAL ETC IN READY TO USE CONDITION.
  - THE SCOPE OF SUPPLY INCLUDES SUPPLY, INSTALLATION AND COMMISSIONING OF THE MACHINE.

2 ICU Beds with side rack cum Over Bed Table - Imported

ICU Bed having following standard features.

1 Electrically operated ICU bed to include**:**

1.1 Sleep Surface - four-part, area measuring 35-1/2" x 78 3/4" or 39” x 78-3/4” constructed of removable pressure reducing butterfly spring and strut suspension system (standard) or lightweight non-corrosive HPL surface (optional), stainless steel, and chrome components. (optional 35-1/2 x 82-1/2 or 38” x 82-1/2” sleep surface area available).

1.2 Weight Capacity - maximum safe working load 550 lbs.

1.3 Casters - four (4) 6” (other sizes optional) easy roll ball bearing precision swivel casters with polyurethane wheels - each caster has a rolling load capacity of 330 lbs (four caster total load capacity of 1,320 lbs). Self grounding (electrically conductive to the ground optional) and non-marking.

1.4 Brakes/straight steering – engaged by color coded foot levers on both sides of the bed, straight steering on foot end (head end straight steering optional at no charge)

1.5 Two-Part Assist Rails - integrated into the bed side so as not to be seen and not to project below the bed side when not in use. Each assist rail has three non-restraint positions including hideaway position, raised assist in the low position, and raised assist in the high position HPL side rail spacer (optional) to fill opening between assist rails.

1.6 Bed Operation Controls - pendant with lockout key that positions on assist rails, bedsides, or flexible control holder (control holder optional). Horizontal control that mounts on assist rails (optional) as alternate. Nurse control console at foot end of the bed, provides:

- All bed functions, plus Trendelenberg, global lock-out and battery indicator (standard)
- All bed functions, plus Trendelenberg, Comfort Positioning, Cardiac Chair, individual function lock-out and battery indicator.
- All bed functions, plus Trendelenberg, Comfort Positioning, Cardiac Chair, One Touch positioning buttons individual function lock-out and battery indicator

1.7 Emergency operation - such that all standard electricly operated functions are powered by a built in back-up battery in case of main power outage.

1.8 Open Base Design – undercarriage with four post telescoping design 16.5”- 31.5” (7.25” clearance underneath).

1.9 Mattress Compensation - moves head section toward head of bed while being raised to reduce mid-section compression and body movement toward footboard. Match existing decor.
2.0 Positioning – Adjustable height, head and leg section adjustment, trendelenberg/reverse trendelenberg, comfort position, cardiac chair, shock.
2.1 CPR Quick Release – single lever operation on both sides of the bed quickly but smoothly lowers the head section of the bed. Automatically resets after each use.
2.2 Removable head and footboard – lift off for quick access to patient.
2.2 Accessory Mounting – IV and accessory mounting points on all four corners of bed, track mounting system in bed sides, mounting points along top middle of bed sides, trapeze mount outside middle of headboard. Traction systems (custom) available to customers requirements.
2.3 UL & FDA - will meet requirements. Independently tested to UL-2601-1 standards.
2.4 Warranty - 10 years on aluminum extrusions, 2 years on mechanical components.
2.5 Bed extension – integrated sliding bed extension and mattress retainer.
2.6 Should have colors available to match existing decor.

Over Bed Table

It should have one top drawer
It should have one open compartment
It should have height adjustable and tilting bedside table.
It should have 5 castors (the fifth is for stabilization, two castors should be lockable.
It should have tiered top and integrated bottle holder.
It should have A practical patient-friendly towel holder, accessible from the bed.
It should have facility to install Nurse Call systems.
It should have Practical inserts bring order into drawer.
It should have Phone and TV mountings to bring these pieces of equipment close to the patient.
Bedpans should easily be stored in mountings underneath the bedside cabinet.
It should have following technical specification

Width	: 60 cm
Depth	: 48 cm
Height	: 57 cm resp. 73 cm
Tray/extracted (B x T)	: 55 cm x 35 cm
Adjustment tray (H)	: 62 cm –96 cm
Weight in kg. approx.	: 30

3 Recovery Trolley Stretcher – Imported

The adjustable height and the several available accessories make quicker and easier to move the patient from every diagnostic equipment and to meet any first aid intervention. Important features of quality and efficiency are the lightness and the balancing in the movements. Moreover cleaning and sanitization operations can be rapidly and easily performed.

Safety for patients and operators is ensured by the side rails, with complete disappearence or dismountable as compass, both with semiautomatic locking device, safety belts as standard equipment. The wheels can be locked at the same time for a better stability. The lying surface is divided into four sections and made of plastic radiotranslucent laminate, with external frame made of thick tubular steel, varnished with epoxy powders. Epoxy powders are particularly suitable to this product for their resistance to mechanical stress, corrosion and chemical agents used in hospital for sanitization and maintenance operations.

The laying surface is provided with ergonomic push handles and arrangements for accessories. The external frame is equipped with a bumper made of no trace soft plastic material. On the head side the stretcher is equipped with supports for drainage bagsand. The stretchers is also predisposed for oxygen bottle holder (capacity: 3/7 liter). The backrest and the pelvis section are moved by bilateral levers with pneumatic spring, while the legrest section can be adjusted with a rack device. The height is regulated by a pedal lever on the foot side through oil pressure pump and

steel compasses. The basement is covered by a carter made of plastic material for easy cleaning with two basins for patient objects, documents or case history. The Trendelenburg and reverse Trendelenburg movements are made by a lever on the foot side and balanced through a pneumatic spring. The stretcher is equipped also with no trace wheels on balls bearing, Ø 200 mm with big dimensions to allow easier and more comfortable movements. The brake pedal has three positions: directional, totally free and totally locked.

4. **Crash Cart & Instrument Trolley - Imported**

Crash Cart

- OVERALL SIZE: 940MM X 500MM X 1540MM (H)
- MILD STEEL TUBULAR FRAMEWORK.
- SIX COLOURED REMOVABLE BINS AND TWO POLYSTYRENE LOCKABLE STORAGE UNITS WITH THREE DRAWERS EACH.
- FOUR SWIVELING CASTORS OF 125MM DIA, TWO WITH BRAKES CORNER RUBBER BUFFERS.
- OXYGEN CYLINDER HOLDER.
- COMPLETE STAINLESS STEEL.
- ELECTRIC EXAMINATION LAMP.
- CARDIAC MASSAGE BOARD.
- STAINLESS STEEL I.V. ROD.
- WOODEN LAMINATED SHELVES.
- KNOCK DOWN CONSTRUCTION.

Instrument Trolley

- OVERALL SIZE : 1000MM(L) X 510MM (W) X 900 MM (H)
- COMPLETE STAINLESS STEEL
- STAINLESS STEEL SHELVES
- TOP SHELVE WITH THREE/ FOUR SIDES GUARD RAIL
- STAINLESS STEEL /MILD STEEL WITH EPOXY POWDER
- COATED TUBULAR FRAME WORK
- MOUNTED ON 750MM SWIVELING CASTORS

5. Blood Gas Analyser - Imported

- FULLY AUTOMATIC, FAST AND ECONOMICAL BLOOD GAS & ELECTROLYTE ANALYZER
- IT SHOULD MEASURE THE FOLLOWING PARAMETERS - pH, pO2, pCO2, Na+, K+, Ca++, Cl-, Glucose, tHB, SO2%, O2Hb, CoHb & MetHb, from whole blood with main calculated parameters like Hct, HCO3, TCO2, O2 sat, BE ecf, BE Blood, A–aDO2, P50, Anion gap, ctO2, cCa++(7.40), pO2(A-a), RI and temperature corrected values.
- IT SHOULD CALCULATE THE FOLLOWING PARAMETERS '- ACTUAL BICARBONATE (HCO3-A), STANDARD BICARBONATE (HCO3-S), BASE EXCESS (BE), STANDARD BASE EXCESS (SBE), TOTAL CO2 (TCO2), BUFFER BASE, O2 SATURATION, O2 CONTENT, ALVEOLAR TO ARTERIAL OXYGEN-TENSION GRADE (AADO2) PARTIAL O2-PRESS. AT 50% O2-SAT (P50),ACID BASE STATUS.
- IT SHOULD NEED INPUT OF THE FOLLOWING PARAMETERS - PATIENTS TEMPERATURE, PATIENTS ID, HB, FRACTION OF INSPIRED OXYGEN (FIO2) AND RESPIRATORY QUOTIENT (RQ) FOR CALCULATION OF AADO2.
- IT SHOULD HAVE LIQUID CALIBRATION WITH GAS-EQUILIBRATED CALIBRATION SOLUTION AND THERE SHOULD BE NO NEED FOR BULKY GAS CYLINDERS
- IT SHOULD HAVE ECONOMY MODE WITH EXTENDED CALIBRATION INTERVALS ADDITIONALLY TO REDUCE THE CONSUMPTION OF REAGENTS WHILE THE SYSTEM REMAINS IN "STAND BY".
- IT SHOULD HAVE PRE-SELECTION PROGRAMS FOR START-UP.

- IT SHOULD HAVE RELEVANT PATIENT DIAGNOSIS RECORDED ON PRINTER.
- All parameters should be available in single aspiration of sample.
- Instrument should have Window based operation with large colored touch screen.
- Instrument should have built-in bar code reader.
- Instrument should store patient results, automatic on board calibration reports.
- Instrument should have different test cartridges from 50 tests to 300 tests.
- Instrument should have built in battery back-up & the sample measurement should be possible in battery mode.
- System should have air in detection system bubble detection.
- Consumables should have minimum onboard life of 30 days
- Measuring time upto 100 seconds
- Sample value should not be more than 200µl with co-oximetry
- Instrument should have simple wet-section, with minimum number of tubings and valves to avoid break downs.
- Analyzer should be able to measure capillary samples.
- Instrument should have HIS/LIS connectivity.
- Instrument should have maximum uptime.
- Should be FDA approved and to enclose certificates.

6. Bio Chemistry Analyser - Imported

- It should have a throughput of minimum 400 tests/hr of photometric reagents and 640 Test/Hour Throughput with ISE.
- It should have a holographic grating with a Photo diode array which minimizes the step through time loss due to filter selection in Grating/Non-grating machines.
- It should have at least 75 online tests and 200 analyzing parameters, and 50 calculation tests programmable.
- All the positions in the reagent tray should be refrigerated.
- It should have 90 sample positions, including Calibrators, controls, and dedicated minimum 10 STAT position.
- It should have Minimum 80 permanent glass cuvettes having less than 250 µL reading volume.
- It should have 8-step washing system using acid, alkaline, warm water to avoid carry over.
- It should have two different probes for different reagents thereby minimizing carryover and contamination.
- It should have the capability to run 4 reagent chemistries.
- The software should be advanced preferably based on Windows XP to enable easy user machine interaction.
- It should have primary tube bar coded sampling.
- It should have programmable QC With LJ charts ,Westgard Rules.
- It should have permanent Glass cuvettes, very high quality Cuvettes, thereby minimizing the maintenance protocol.

7. O T Table - Imported

- Table is 5 section with split leg section, cut out and is C arm compatible.
- Table is Electro Hydraulic having remote and an Electronic override
- Remote controls Height adjustment, side tilt and Trend/rev Trend positions, Back adj. Flex, Reflex & Neutral position and Table lock.
- Head and Leg sections are manually adjustable by Gas springs.
- Table has 3 large swiveling double castors that are electrically conductive
- Table has Accentric column which allows use of C-Arm without longitudinal shift.
- Base of table is made of high grade rust resistant Stainless Steel.
- Table is equipped with two redundantly operating systems for Fail Safe operation.
- Table Length is 1790-2020 mm with Head and Leg plates.
- It should have special head section with dual telescopic extension, calvarias and chest section
- It should have maintenance-free micro hydraulics for safe functionality, even under high load lifting cylinder made of stainless steel for long-lasting performance and load-bearing corrosion-free modules, easily replaceable.

- It should have slender profiled frame with following features.
  - solid, made of stainless steel
  - stable attachment of accessories
  - easy to clean
  - guide rail for precision mounting brackets
  - parts can be attached all round
- It should have wireless power supply.
- it should have dual telescopic column guidance which allows a wide range of working heights to be set

Features

- Table width is 520mm without side rails.
- It should have memory function with 8 programmes
- It should have telescopic head section with head calvarias
- It should have back section extension for length adjustment
- It should have longitudinal axis tilting
- it should have 24v dc battery pack operation
- Diameter of Castors is 100mm
- Height adj is 610 mm to 1040mm
- Trend/ Rev Trend is 28 deg.
- Lateral tilt is 18 deg.
- Back section adjustment is +80 deg/- 40 deg.
- Leg plate adjustment is + 15 deg/- 95 deg with 90 deg spread.
- Head plate adjustment is +30 deg/ - 30 deg.

it should supply with following accessories.

30. microsurgery ring
31. horseshoe shaped face rest
32. horseshoe shaped headrest
33. head plate
34. armrest
35. arm support
36. leg holder
37. side arm support
38. microsurgery wrist support
39. anesthesiology screen rod
40. anesthesiology tube holder
41. side positioning support:
42. side positioning support dorsal
43. calf support
44. half castor large and small
45. instrument tray on table
46. push handles
47. infusion stand
48. remote control holder
49. lying cover cloth
50. mounting brackets
51. grab handle, adjustable
52. hand table
53. back section extension for shoulder arthroscopy
54. hair transplant support
55. external mounting with head section
56. side positioning support
57. transport handles foldaway
58. mounting brackets

8. O.T Light (Double Dome) - Imported

Description: Operating Room Surgical Lighting System should provide an ideal combination of brightness, maneuverability, and shadow resolution without sacrificing color accuracy through a consistent, homogeneous LED technology. It should have green light for endoscopic illumination

Such Lighting System should have the following technical specifications:

Number of Lightheads	:	Two per suspension
Color Temperature	:	3800 Kelvin, 4300Kelvin, 4800 Kelvin
Color Rendering Index	:	> 95
Field Size Diameter Depth	:	7in (17.8cm)-11in (27.9cm)
Depth of Field	:	800mm
Illumination Level	:	160,000 Lux
Controls	:	Wall Control, Voice Capable, Touch - Panel
Rotation	:	360 degrees
Vertical Adjustment Range	:	+ 22in (55.9cm), -25in (63.6cm)
Task Lights	:	Yes (Perilite)
Sterilizable Handle	:	Yes
Lighthead Diameter	:	26.7in (67.7cm)
Mounting Type	:	Ceiling
Supply Voltage	:	100-230VAC 50/60Hz
Power (without camera)	:	< 100 Watts
Bulb Type	:	LED
Total Irradiance at 160klux	:	≤ 400W/m2.
Rated Input	:	100-230V~50-60Hz; 6A
Power per Lighhead	:	140W (With Camera); 95W (With Camera).
Lamp service life	:	>40000hours

9. Suction Machine – IMPORTED

It should be a full automatic surgical suction unit. When the first jar is full, system selects the second jar automatically. After filling the second jar, system stops itself and prevents the leakage of waste liquid. It should have following technical specification.

- 60 L/min flow rate
- Automatic jar selecting system
- Two collecting jars
- Overfilling system for preventing liquid leakage
- Oil free, maintanace free vacuum pump
- Alluminium main body
- Different jar options
- Dimensions (WxLxH): 430x460x820 mm

10 Anaesthesia Work Station - Imported

The Anaesthesia work station system (PENDANT/ BOOM ARM MOUNTABLE MODEL), duly CE marked, will Integrated with ventilator, vaporizer and Monitor. The work station will be CE marked as per Medical Device directive and with FDA.

Anaesthesia Machine with vaporizers:-

3. Rigid construction and design with standard frame.
4. Integrated suction (venture operated), auxiliary Oxygen flowmeter for mask O2 delivery without going through the main rotameter, integrated active AGS system and integrated LED light will be supplied.

3. Gas specific (pin indexed) Yokes-Two for oxygen, and one for nitrous oxide to accommodate 5-liter water capacity cylinders.

4. Provision to connect oxygen, air & nitrous oxide directly to system with pipeline supply for each gas.

5. Gas mixer/ Flow meter assembly with 5 tube, with possibility of enabling or disability air or N2O and Activating as per requirement.

6 Automatic Cutoff of Nitrous by Oxygen Pressure failure along with hypoxic guard for linear regulation of minimum O2 concentration at 25% volume and a base flow of 200ml.

7 Oxygen flush, which is able to deliver at least 30-70 liters per minute of oxygen.

8. Single canister integrated circle absorber with unidirectional and airway pressure relief valves, integrated sensing mechanism. It will have facility for changing the soda-lime intra-operatively with soda-lime capacity of about 900 gms.
9. Fully integrated Circle absorber system for adult as well as pediatric patient category. It will

have an autoclavable block.

10. It will have a spirometery sensor position able at Y or at the distal end, for measurement of I/E Tidal vol,
    Minvolume, loops and scalars etc..
11. Integrated LED light.
12. It will have an integrated colour TFT screen of at least 8"size for display of ventilation parameters etc.
13. Vaporizer:-provision to connect two vaporizers at a time with interlocking facility.
    One Isoflurane/ Halothane/ Sevoflurane/vaporizer will be supplied with the machine.
    Vaporizers flow will be temperature, and pressure compensated and maintenance free for a in of 07 years.
14 Active Scavenging System: Will have integrated active scavenging system.

Integrated Anaesthesia Ventilator

1. Microprocessor based, Electronically controlled and electrically/ pneumatically driven will not require
   change of bellows for adult and infants.
2. It will have following features.
   a) Modes-VCV, PCV, PSV, Manual, Spontaneous modes so that reversal complications can be handled in the OR itself.
   b) Tidal volume range 20 ml to 1500 ml.
   c) Facility for Sigh
   d) Integrated PEEP variable electronically up to a minimum of 20 mbar.
   e) Adjustable breath rate 5-80 bpm.
   f) Inspiratory pause
   g) Will automatically display and compensate for compliance of breathing circuit.
3. Alarms will have audiovisual display of alarm messages for:- Airway pressure, minute volume, inspiratory O2 concentration, audio power supply fail alarm, fails to cycle warming, airway pressure alarms for high and low pressures.
4. In built battery backup facility for up to a min. of one hour.
5. Self-diagnostic facility to check the overall system including ventilator for leakage.

Integrated Monitor

2. Will have the facility of monitoring ECG, RR, SpO2, NIBP, Temp, Dual IBP and Microstream Capnography for Adult, Paediatric & Neonatal applications.
16. Will have integrated colour TFT display of at least 12" or more.
17. Will have facility of viewing at least 8 waveforms simultaneously.
18. Will have detection facility for advanced arrhythmias and ST segment analysis.
19. Must use Nellcor/ Masimo branded pulse oximetry module with facility for display of Plethysmograph, Pulse strength & SpO2 values.
20. Will have IBP waveform overlapping facility.
21. Will have Graphical & Tabular trend facility for at least 72 hrs.
22. Will have facility of downloading data on a USB port and SD card.
23. Will have alarm limits with alarm levels and alarm indication (visual as well as audio)
24. Simultaneous 3 lead ECG measurement and simultaneous monitoring of temperature.
25. Will have built in Capnography facility to measure End tidal and Fractional Inspired values of CO2 along with calculation of respiration rate.
26. Unit will be supplied with following accessories:

    1. 5 lead ECG cable
    2. 3 lead ECG cables X2
    3. NIBP CUFF- Adult X2
    4. Temp probe Rectal & Skin
    5. SpO2 PROBE- Two no. for adult use and one Paediatric
    6. Accessory kit for Capnography

27. Monitor will have built in Electro Surgical Unit & Defibrillator protection.
28. Monitor will have an facility for Anaesthesia Gas Monitoring (AGM) with auto gas identification along with
    display of MAC value, Dual IBP & optional facility for Cardiac Output (CO) with Thermodilution

method (To
quote separately for optional items).

29. Will submit relevant evidence of compliance to IEC 60601 series Safety standards and US FDA approval.
30. Reusable IBP Transducer with cables, Disposable IBP Transducer with cables, and upgrade kit for & Co.

11 Emergency Kit (advanced) - Imported

Emergency Kit contain the following items in a compact carry case.

Standard Accessories:

- Three sizes face masks with tubing
- Small oxygen cylinder
- Single stage single gauge regulator
- Cylinder Key
- Provision for using cylinder with Tubing filled with metal end
- Refilling for Reffilling the cylinder

Manual Resuscitator:

Manually Operated resuscitator with double inlet valves for air and oxygen attachments

Suction Pump

Manually operated Suction Pump to aspirate the mucus, blood or other secretion from the entire airways of Adult, Child or Infants. It can also be operated from Gases by simply turning the suction knob. Supplied with suitable suction Catheter.

Intubation Set:

- Laryngoscope with Three blades and Handle
- Endotracheal Tubes with cuff and plain four sizes sterilized
- Endotracheal connection Set of 12
- Magill's introducing forcep
- Mouth bite

12. Surgical Instruments Kit - Imported

* S.S. mosquito artery forceps curved 5 inches longwith sharp tip
* S.S. mosquito artery forceps straight 5 inches long with sharp tip
* S.S. needle holder fine tip 8 inches long to handle suture of 3-0 , 4-0, & 5-0
* S.S. skin hooks sharp tip 8 inches long
* S.S. B.P. handle no.
* S.S. B.P. handle no. 3
* S.S. allies's forceps 8 inches long 2: 1 tooth
* S.S. adsan's dissecting non-tooth forceps 5 inches long
* S.S. adsan's dissecting tooth forceps 5 inches long
* S.S. fine langenbach's retractor with 5mm blade
* S.S. fine langenbach's rectrator with 1cm. blade
* S.S. fine tip right angle (mister) forceps 6 inches long with tungstan tip
* S.S. fine metzenbaum curved scissors 6 inches long tungstan carbide tip and golden grip
* S.S. fine mitzenbaum straight scissors 8 inches long tungstan carbide tip and golden grip
* S.S. fine eye retractor c-shaped 6 inches long
* S.S. littlewood's tissue holding forceps 8 inches long
* S.S. lane's tissue holding forceps 8inches long
* S.S. suction tip 12 inches long
* S.S. suction tip 9 inches long fine tip with proximal hole
* S.S. cheatle's forceps 12 inches long with ss holder
* S.S. towel clips for drapping & sponge holder 12 inches long
* S.S. hook retractor 8 inches long
* S.S. langenback's retractor with 2cm. wide blade
* Humpy's knife

* Mesher
* Travers self retaining retractor 2cm jaw
* Travers self retaining retractor 3cm jaw
* customized zeiss eye loupe

13. Cautery Machine - Imported

SHOULD BE MICROCONTROLLER, PROGRAMMABLE, WHERE 20 DIFFERENT PROGRAMMES WITH ISOLATED OUTPUTS COMPACT, DIGITAL DISPLAYED, RESOLUTION ONE WATT DOCTORS CAN PROGRAMME IN INDIVIDUAL MODE.

- THE MONOPOLAR GENERATOR PROVIDES CUT/BLEND CUT OF DIFFERENT TYPES AND COAG FACILITIES WITH SPRAY FORCE SOFT.
- BIPOLAR GENERATOR SHOULD HAVE AUTO FORCEPS ACTIVATION AND DUAL PADEL FOOTSWITCH CONTROL FOR CUTTING AND COAG SEPARATELY.
- OPERATIVE MODES SHOULD HAVE IDENTIFICATION BY DIFFERENT AUDIO TONES AND DIFFERENT PANEL LIGHTS.
- LATEST PROGRAMMES SHOULD BE RESTORED.
- PROVISION FOR CONTROL BY PENCIL SWITCH OR FOOT SWITCH WITH PROTECTION TO RECOGNIZE COAG COMMAND TO CUTTING
- PATIENT PLATE LEADS SUPERVISED DURING MONOPOLAR OPERATION
- DISCONNECTED PATIENT PLATE WITH DISREGARD HAND OR FOOT SWITCH COMMAND.
- AUDIO-VISUAL INDICATION FOR PATIENT PLATE DISCONNECTION.
- NATURAL CONVECTION COOLING WITH SILENT OPERATION.
- SEPARATE OUTPUT SOCKET FOR BIPOLAR COAGULATION AND CUTTING WITH INDEPENDENT GENERATOR.
- PROVISION FOR ACCESSORIES BIPOLAR FORCEPS, MONOPOLAR FORCEPS WITH DIFFERENT SHAPES, PAEDIATRIC PATIENT PLATE, FLEXIBLE RUBBER PLATE, LAPAROSCOPY CORD, CAUTRY TIPS OF VARIOUS TYPES, LOOP ELECTRODES WITH POWER BACKUP FACILITY.
- OUTPUT MODE SHOULD BE CUT 300 WATTS, COAG 120 WATTS AND BIPOLAR 80 WATTS.
- SHOULD BE SUITABLE FOR UNDERWATER PROCEDURE PLASTIC/COSMETICS ORTHOPAEDICS/ ARTHROSCOPY, PAEDIATRIC, E.N.T. UROLOGY, NEURO OPHTHALMIC.
- TROLLEY WITH PROVISION TO KEEP ACCESSORIES.
- AFTER SALES SERVICE WITHIN WARRANTY AND ANNUAL MAINTENANCE CONTRACT TERMS SHOULD BE CLEARLY INDICATED.

14. Transport Ventilator - Imported

FUNCTION MODES::CMV + CMVSIG
AUTO - Controlled /Assisted
AMV + PCM + MVM
CPAP
O_2: > 40% if Air Mix = ON and > 90% if Air Mix = OFF
FREQUENCY: from 5 to 40 Bpm
FLOW: from 2 to 20 lpm
PEEP: from 0 to 15 mbar
I/E RATIO: 1/2 (0.5) 1/1(1) in auto mode and trigger = Ombar
PRESSURE LIMIT: from 5 to 60 mbar
TRIGGER: from 0 to -10 mbar
INHALER FLOW: from 0 to 15 lpm
ALARMS: pressure max (>55 mbar adults, >30 mbar children)
pressure min (<10 mbar)
apnoea (spontaneous breathe stopped)
oxygen source failure
battery low
SNC hazardous selection (acoustic only)
DIMENSIONS: 240x128x140 mm
WEIGHT: 2.5 kg
POWER SUPPLY: 12 V DC/1.2 A
AUTONOMY: >6h

- PREFERABLY SHOULD HAVE BOTH NON INVASIVE AS WELL AS INVASIVE CAPABILITIES. AND HAVE BOTH PRESSURE AS WELL AS VOLUME CONTROL MODES.
- SHOULD HAVE WIDE RANGE OF APPLICATIONS FROM CHILDREN ABOVE 5 KG TO ADULTS.
- SHOULD PROVIDE AUTOMATIC TRIGGERING & ADVANCE LEAK COMPENSATION FOR EFFECTIVE VENTILATORY SUPPORT.
- SHOULD HAVE A DATA CARD NOT LESS THAN 1 GB FOR STORING ALL NECESSARY VENTILATION DATA. DATA TO PROVIDE VENTILATION THERAPY FOR EFFECTIVE TREATMENT.
- TECHNICAL SPECIFICATIONS :

FUNCTION MODES	**:**CMV + CMVSIG, AUTO - Controlled /Assisted, AMV + PCM + MVM, CPAP
O_2	**:** > 40% if Air Mix = ON and > 90% if Air Mix = OFF
FLOW	**:** from 2 to 20 lpm
PEEP	**:** from 0 to 15 mbar
I/E RATIO	**:** 1/2 (0.5) 1/1(1) in auto mode and trigger = Ombar
PRESSURE LIMIT	**:** from 5 to 60 mbar
TRIGGER	**:** from 0 to -10 mbar
INHALER FLOW	**:** from 0 to 15 lpm
DIMENSIONS	**:** 240x128x140 mm
POWER SUPPLY	**:** 12 V DC/1.2 A

- ALARMS – BOTH AUDIO AS WELL AS VISUAL - APNEA, LOW/HIGH VOLUME, LOW/HIGH MINUTE VENTILATION, LOW/HIGH RESPIRATORY RATE, LOW/HIGH INSPIRATORY PRESSURE (IN VOLUME MODES).
- SHOULD BE ABLE TO MONITOR – EXHALED TIDAL VOLUME, EXHALES MINUTE VENTILATION, LEAK RATE, RESPIRATORY RATE, PEAK INSPIRATORY FLOW, PEAK INSPIRATORY PRESSURE I:E RATIO, MEAN AIRWAY PRESSURE.
- BATTERY BACKUP OF NOT LESS THAN 6 HOURS
- SHOULD BE LIGHT WEIGHT NOT MORE THAN 5 KG FOR EASY TRANSFERS.
- ALL THE COMPONENTS OF THE SYSTEM SHOULD BE FROM THE SAME MANUFACTURER. THE MACHINES SHOULD BE SUPPLIED COMPLETE WITH ALL THE REQUIRED POWER CORDS, PATIENT CIRCUITS FOR ALL USES WITH APPROPRIATE MASKS AND CONNECTORS, USER MANUAL ETC IN READY TO USE CONDITION.
- THE SCOPE OF SUPPLY INCLUDES SUPPLY, INSTALLATION AND COMMISSIONING OF THE MACHINE.
- ITEM SHOULD BE CE APPROVED

15. <u>Medical Gases Pipeline System</u>

<u>Oxygen Manifold</u>

Supply, Installation, Testing and Commissioning of Oxygen Manifold Supply System (Cylinder Manifold Unit) 2 x4size.

It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

- It shall be CE marked with the notified body number specified.
- It shall be provided with a copy of the certificate of origin.
- 10cylinder manifold bank as left side and 10_cylinder manifold bank as right side complete with 20 nos.pig tail-pipes and 20nos. non--return valves.
- It should have all regulators which should be adiabatic certified.
- It should have EMC certificate in compliance with section 3.55 in HTM 02-01
- Compliant with C11 model engineering specification
- The oxygen manifold supply system shall consist of an automatic changeover manifold control panel, hereinafter referred to as manifold control panel, complete with cylinder header racks and tailpipes with capacity and sizes as mentioned in schedule of quantities for high pressure gas cylinders.
- An emergency reserve manifold complete with cylinder header racks and tailpipes with capacity and sizes as mentioned in schedule of quantities for high pressure gas cylinders.
- The permanently connected emergency reserve supply shall be brought into operation automatically via a non-return valve and shall be designed, where practicable, to provide the same flow rate as the primary system.

- There shall be sufficient cylinder capacity within the emergency reserve supply to supply the average anticipated demand for a minimum of four hours.

Fully Automatic Control Panel (for Oxygen)

It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

· The manifold control panel shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.

- It shall be CE marked with the notified body number specified.
- It shall be provided with a copy of the certificate of origin.
- It should have all regulators which should be adiabatic certified.
- It should have EMC certificate in compliance with section 3.55 in HTM 02-01
- Compliant with C11 model engineering specification
- The manifold control panel shall be designed and certified for use with oxygen at 200 bar and 60°C. Auto-ignition testing shall be carried out and a copy of the test report shall be shall be provided for review.
- The manifold control system shall provide an uninterrupted supply of medical oxygen from equally sized high pressure cylinder banks via a suitable arrangement of pressure regulators, providing a constant downstream nominal pipeline gauge pressure of 400 kPa.
- The manifold control panel shall provide a minimum flow of 1500 l/min to the nominal 400 kPa medical oxygen pipeline system.
- The manifold control panel shall be no wider than 500 mm to ensure optimal use of wall space within the facility.
- Automatic changeover of duty bank shall occur at a cylinder gauge pressure of 14 bar, actuated by bourdon tube pressure gauges with integral alarm contact connected directly to a port within the first stage pressure regulators. Piston or diaphragm type pressure switches are not acceptable.
- Line pressure shall be continuously monitored by an electronic pressure switch; mechanically actuated pressure switches are not acceptable.

  · There shall be two separate stages of pressure regulation to enable high peak flow rates without a reduction in line pressure. Multistage regulators combined into a single unit are not acceptable.

  · Pressure regulators shall comply with BS EN ISO 10524-2.

  · The system shall be duplexed such that component failure will not affect the integrity of the medical gas supply.

  · The manifold shall employ be a fail-safe system in the event of power failure so that both bank isolation solenoid valves open and continuity of supply is assured. Upon restoration of the electrical supply, the original running bank shall return on line.

  · All pressure regulators shall be protected from over-pressurisation by relief valves that are vented to atmosphere.

  · The line pressure relief valve shall be provided with easing gear.

  · Two non-return valves, one for each bank, shall be provided within a line pressure manifold block and shall provide gas tight isolation and continuity of service in the event of any upstream component failure.

  · The control panel shall be powered by an internal 24 V d.c. power supply.

  · There shall be manual changeover button to provide simple selection of duty bank.

  · The manifold control panel shall be provided with a lockable isolation valve to enable positive tamperproof isolation for maintenance.

  · The automatic control panel shall be supplied fully assembled and tested.

Oxygen Single Cylinders Emergency System.

Supply, Installation, Testing and Commissioning of Oxygen Emergency Reserve Manifold 1x2size

· It shall fully complies and meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

· The emergency reserve manifold shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.

· The emergency reserve manifold shall be designed and certified for use with oxygen at 200 bar and 60°C. Auto-ignition testing shall be carried out and a copy of the test report shall be shall be provided for review.

· The emergency reserve manifold shall provide an uninterrupted supply of medical oxygen from equally sized high pressure cylinder banks via a suitable arrangement of pressure regulators, providing a constant downstream nominal pipeline gauge pressure of 400 kPa.

- It shall be CE marked with the notified body number specified.
- It shall be provided with a copy of the certificate of origin.
- It should have all regulators which should be adiabatic certified.
- It should have EMC certificate in compliance with section 3.55 in HTM 02-01
- Compliant with C11 model engineering specification
- Each cylinder bank shall be fitted with an isolation valve to enable continuity of supply through temporary manual operation in the vent of primary supply failure.
- The manifold control panel shall provide a minimum flow of 1500 l/min to the nominal 400 kPa medical oxygen pipeline system.
- An emergency reserve alarm of 68 bar falling pressure shall be provided for each cylinder bank, actuated by bourdon tube pressure gauges with integral alarm contact connected upstream of the bank isolation valves. Piston or diaphragm type pressure switches are not acceptable.

  · There shall be two separate stages of pressure regulation to enable high peak flow rates without a reduction in line pressure. Multistage regulators combined into a single unit are not acceptable.

  · Pressure regulators shall comply with BS EN ISO 10524-2.

  · All pressure regulators shall be protected from over-pressurization by relief valves that are vented to atmosphere.

  · The line pressure relief valve shall be provided with easing gear.

  · A non-return valve shall be provided within a line pressure manifold block and shall provide gas tight isolation in the event of any upstream component failure. The non-return valve shall automatically bring the emergency reserve manifold into service should the primary supply fail. The emergency reserve manifold shall be provided with a lockable isolation valve to enable positive tamperproof isolation for maintenance.

  · The emergency reserve manifold shall be supplied fully assembled and tested.

Terminal Units (Gas Outlets) with probes/Adaptors **- Imported**

Supply, Installation, Testing and Commissioning of Medical Gas Terminal Units (Gas Outlet Points)

· It shall fully complies & meets with the requirements of the UK DOH Health Technical Memorandum 02-01 (HTM 02-01)

· It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

· Medical gas terminal units shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.

· Terminal units shall have gas indexing geometry to BS 5682:1998. Other gas specific indexing geometries are not acceptable. It should have antimicrobial coating.

· Gas specific components comprising the terminal unit second fix shall be manufactured from die-cast zinc alloy or similar hard wearing metal. Plastic components are not acceptable. It should be 100% metal.

· Terminal units socket castings shall be permanently coated with a low friction fluoropolymer for maximum reliability and service life. The terminal unit socket die-casting shall incorporate a gas indexing pin to overcome the risk of loosening due to rough handling or abuse. The second fix socket shall incorporate a sheer-plane to safeguard the first fix and pipeline in the event of accidental damage or bed jacking. Gas specific components shall incorporate the gas identity marking permanently stamped or cast into the component surface. The first fix shall be all metal construction, with a brass base block and copper stub pipe. The first fix shall incorporate an integral check valve to enable servicing of the second fix and valve

seals without isolation of the gas supply. Probe roller pins shall be manufactured from stainless steel.

· Wall mounted terminal units shall be provided with white ABS mounting box with matching fascia. The mounting box shall have smooth rounded corners to avoid the possibility of injury. A bezel shall be available to cover the plaster edge, provide a neat and easily to clean finish.

Oxygen Flow meter & Humidifier Bottle

Supply, Installation, Testing and Commissioning of Oxygen Flow Meter with Humidifier Bottle

· It should be duly CE marked and comply with 93/42/EEC Medical Devices: General and should have CE no. from a notified body. Certificate of Origin must be given.
· Pressure compensated to prevent back pressure build up on flow indicator.
· Durable polycarbonate flow tube with cover.
· It should be made up of anodized aluminum body and control knob.
· Flow meter should have twin graduated scale which must provides precision control permanent scale graduations.
· Flow meter should be placed in the vertical position.
· It should be light weight of 200g.
· It should have +/-4% gauge accuracy.
· Inlet pressure - 50-60 psi.
· The flow meters should be of 1-15 LPM range for oxygen and with inlet pressure 50-60psi.
· Polysulphone Humidifier bottle should be unbreakable, reusable to disinfectants and complements.

Theatre Vacuum Unit

- It should fully meet and complies as per EC Directive 93/42/EEC Annex II, article 3. full quality assurance system medical devices.
- It should be duly CE marked and CE no. to be specified.
- Certificate of Origin must be given.
- It must consist of the following: - 1no. Suction Regulator and 2nos. 4000ml polysulphone collection jar and both to be mounted on a trolley.
- Suction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti overflow safety device. Should have wide membrane continuous suction controller
- Should have vacuum levels: 0-1000mbar/hPa.
- Should have vacuum gauge fitted with a protective bumper device.
- Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
- Must have central adjustment knob with a color coded for 0-1000 mbar/hPa. Should have polycarbonate 150cc safety jar, autoclavable at 121º C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.
- Suction regulator must have a unique serial number stamped on the body of each suction regulator , thereby allowing for identification and trace ability.
- Polysulphone collection Jar of 4litres with lid: it should be unbreakable and autoclavable upto 134º C must be fitted with an extremely simple anti overflow safety device, thereby ensuring easy maintenance.
- Should be totally transparent, they ensure perfect sucked liquid visibility.

Ward Vacuum Unit

- It should fully meet and complies as per EC Directive 93/42/EEC Annex II, article 3. full quality assurance system medical devices.
- It should be duly CE marked and CE no. to be specified.
- Certificate of Origin must be given.
- It must consist of the following: - 1no. Suction Regulator and 1no. 2000 ml polysulphone collection jar

- Suction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti overflow safety device. Should have wide membrane continuous suction controller
- Should have vacuum levels: 0-1000mbar/hPa.
- Should have vacuum gauge fitted with a protective bumper device.
- Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
- Must have central adjustment knob with a color coded for 0-1000 mbar/hPa. Should have polycarbonate 150cc safety jar, autoclavable at 121º C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.
- Suction regulator must have a unique serial number stamped on the body of each suction regulator, thereby allowing for identification and trace ability.
- Polysulphone collection jar of 2 liters with lid: it should be unbreakable and autoclavable upto 134º C must be fitted with an extremely simple anti overflow safety device, thereby ensuring easy maintenance.

Should be totally transparent, they ensure perfect sucked liquid.

Valve box

Lockable Line Valve Assemblies

- To comply and fully meets with the latest standard HTM02-01 and C11.
- It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.
- Lockable line valves and should comprise full-bore ball valve complete with copper stub pipes for ease of installation.
- Valve - connected to the copper stub pipes by means of flat faced unions fitted with nitrile O-ring seals, allowing removal of the valve without the need to distort the pipe work.
- Stub pipes for valve up to 54 mm will be connected to the valve body using screwed connectors, while valve above this size will use flanged connectors.
- Valve - Brass body, end cap and stem, with a full – bore chrome plated brass ball.
- Valve - Operate from fully closed to fully open with a quarter turn of the handle.
- All line values - Supplied with a mechanism to enable the unit to be locked in the fully closed or fully open position.
- Supplied with copper stub pipes for ease of installation using inert gas jointing procedures.
- O-Ring Seals on the valve stub allow gas tight capping at a spur for further expression.
- Available with gas specific NIST connectors including check valves one or both stub pipes.

Area Valve Unit Module

- Area Valve Service unit Modules shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01).
- Area Valve Service unit Modules shall be CE marked to the Medical Device Directive 93/43/EC as a class IIb medical devices. A copy of the certificate authorizing the manufacturer to apply CE marking under the aforementioned directive and a Certificate of Origin must be provided for review.
- Area Valve Service unit Modules shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.
- Area Valve Service unit Modules shall be supplied pre-wired and tested complete with pressure switches and medical gas area alarms.
- The chassis and cover shall be manufactured from powder coated 16 swg steel.
- Each area valve service unit shall be fitted with an emergency access mechanism on each door.
- The area valve service unit modules shall be configured for one to five gases services depending on the hospital area served, with the option of an inbuilt medical gas area alarm panel.
- Incorporate a valve with NIST connection at either side of the AVSU valve.
- AVSU ball valves shall be manufactured from die-cast nickel plated brass alloy with flanged connections.

- AVSU ball valves shall benefit from low torque operation and shall be serviceable from the front by a removable cap providing access to the valve stem, chrome plated brass ball and a single piece molded nit rile seal.
- Through spades shall be provided either side of the valve and each valve shall be provided with a blanking spade for deployment during installation or modification of the system without interruption of the main supply.
- The NIST connectors forming part of the stub pipes shall incorporate a check valve with metal seat thus avoiding the possibility of degradation over time.
  Approved makes: Penlon/SHJ Hospital Pipelines/Technologie Medicale.

Medical Gas Alarm (Main & Area)

- To comply and fully meets with the latest standard HTM02-01 and C11.
- It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.
- Master Alarm Panel (MAP) shall monitor the central gases, vacuum and compressed air and work or indicate abnormal conditions as per specified herein.
- MAP - Located in the gas manifold room in the basement of the APC Building.
- Designed to monitor piped gas pressure (high and low pressure on up to six services) Via Pressure Switches in Theatres, Intensive Care Units, Recoveries, Private Rooms, and Wards etc.
- To act as a slave to another alarm within 250 meters, using a three core screened cable (four cores if signals are to be returned to the master unit).
- Local Area Alarms should provide indication of the condition of gas (Normal, High or Low Pressure) at the point of use, by monitoring the internal pressure of the pipeline.
- The Method of Monitoring - Individual pressure switches for high pressure
  Low Pressure and Low Vacuum and each switch should be fitted with an end of line monitoring resistance
  - Matched to the alarm panel
  - Enable the alarm panel to detect any faults on the system wiring or signal transmission.
- Alarm Panel - Display up to six services each with normal & two fault conditions.
- Alarm Panel - Battery Back Up will be provided within the system to enable the alarm panel to function normally in the event of mains power failure.
- The internal battery must be used to keep alarm panels operational in the event of mains power failure.
- Designed to monitor high and low pressure from local pressure switches.
- Surface or flush format.

Vacuum System

Supply, Installation, Testing and Commissioning of Medical Vacuum Plant

· The medical vacuum plant shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01). It shall be CE marked with CE no. from a notified body and Certificate of Origin must be provided.

· The medical vacuum plant shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.

· 2 x 5.5KW each rotary vane vacuum pump vessel mounted.

· 2 x 1500 liters capacity horizontal/vertical vacuum receiver tanks.

· 54mm OD pipe work.

· It should have digital display.

- It shall be CE marked with the notified body number specified.
- It shall be provided with a copy of the certificate of origin.
- It should have all regulators which should be adiabatic certified.
- It should have EMC certificate in compliance with section 3.55 in HTM 02-01
- Compliant with C11 model engineering specification
- Vacuum pump inlets shall include a wire mesh filter and integral non-return valve to prevent oil suck back and pressure increases in the vacuum system. Each vacuum pump shall be fitted with anti-vibration pads between the pump foot and mounting frame. The plant shall be fitted with four equally sized bacteria filters arranged in two sets of two.

- Each individual filter shall have the capacity of deliver half the design flow such that one set is designated duty and the other standby.
- Bacteria filters shall have efficiency at least 99.999% when tested by the sodium flame method in accordance with BS 3928:1969 utilising particles in the 0.02 to 2 micron size range.
- The pressure drop across each clean filter at 50% of the system design flow should not exceed 25 mm Hg (3 kPa) at a vacuum of 475mm of mmHg (63 kPa).
- Bacteria filters shall be marked with the legend 'Bio-Hazard'.
- Each bacteria filter shall be provided with a transparent sterliseable collection jar to collect condensate.
- The total water capacity of the pressure vessels shall be at least 100% of the design flow rate of the plant in 1 minute in terms of free air aspired.
- The plant control and power management system shall monitor the safe operation of the plant, providing signaling into the alarm system as per the requirements of HTM 02-01. Vacuum pump exhaust shall be piped out of the plant room and discharged outside the building at high level away from windows and any other air intakes.

Copper Piping

Supply, Installation, Testing and Commissioning of Medical Grade Copper Tube and Fittings

· The piped distribution system shall use copper pipes manufactured from phosphorous de-oxidised non-arsenical copper to BS EN 1412:1996 grade CW024A (Cu-DHP), manufactured to metric outside diameters and having mechanical properties in accordance with BS EN 13348:2008 in either R250 (half hard) or R290 (hard).

· Copper pipes shall be carry the officially licensed BSi kitemark and certification shall be provided for review.

· Degreasing of pipe shall be such that there is less than 20mg/m2 (0.002mg/cm2) of hydrocarbons on the degreased surface when tested by the method specified BS EN 13348:2008.

· Copper fittings shall be end feed type, manufactured from the same grade of copper as the pipes and be in accordance with the requirements of BS EN 1254-1:1998 Part 1. Fittings shall be degreased suitable for oxygen use and be supplied individually sealed in protective polythene bags.

Horizontal Bed Head Panel

- Must fully comply with HTM2022, HTM 2025, HTM02-01 and C11 standards.
- Duly CE marked with CE no. Stamped on it.
- It should be wall mounted, exposed to wall and should supply all necessary requirements to the patients.
- It should have extruded aluminum profiles made in one piece, double track wall mounted approx four feet length. Light metal front panels duly powder coated color.
- The bed head panel should be set up with different individual profiles for variable system solutions to realize double track variants as horizontal, wall-mounted supply system.
- The duct should be sufficient for mounting of electrical, adapt sockets and for gas terminal units.
- It also have medical rail 25 x 10 mm below the lower duct to which accessories like I V. pole Infusion pump/ Syringe pump can be attached. For maintenance purposes, lighting components of the bed units must be exchangeable without interrupting the supply of adjacent bed units.
- Each Bed Head Panel should be Pre Piped and Pre-fitted with 6nos. Gas Outlets Oxygen 2, Air 4 Bar 2 and Vacuum 2 - HTM02-01, C11 complies UK standard Gas Outlet Points.
- Each Bed Head Panel should also be Pre-fitted and Pre – wired
  8nos. Multipin electrical switch and sockets 6/16amp,
  1no. RJ45 data socket,
  1no.Nurse call switch also be incorporated in panel.
  Bed head Panel must also have tubular T5 Fluorescent lamps with electronic control gear for reading/ examination lighting. Segregation of services i.e. Low voltage supplies, High Voltage supply and Medical gases shall be maintained through out.

N2O Cylinder Emergency System.

- The emergency reserve manifold shall fully comply with the requirements of the UK DoH Health Technical Memorandum 02-01 (HTM 02-01).
- The emergency reserve manifold shall be CE marked and copy of the certificate of Origin must be provided for review.
- The nitrous oxide manifold supply system shall consist of:
    - An automatic changeover manifold control panel, hereinafter referred to as manifold control panel, complete with cylinder header racks and tailpipes with capacity for high pressure gas cylinders.
    - An emergency reserve manifold complete with cylinder header racks and tailpipes with capacity for high pressure gas cylinders.
- The permanently connected emergency reserve supply shall be brought into operation automatically via a non-return valve and shall be designed, where practicable, to provide the same flow rate as the primary system.
- There shall be sufficient cylinder capacity within the emergency reserve supply to supply the average anticipated demand for a minimum of four hours.

Single Arm Moveable Pendant for Operation Theatre

- To comply and fully meets with the latest standard HTM02-01/NFPA 99C UL listed or any other international standard which meets the specification.
- It should be duly CE marked with CE no. and Copy of CE certificate from notified body must be submitted. Certificate of Origin must be given.
- Pendant should provide a convenient overhead supply of electrical services and medical gases.
- Vacuum and electrical services thus eliminating the majority of trailing hoses and cables.
- It should also provide all the features of the Rigid Pendant with the additional facility of being 'height adjustable' by theatre staff using the hand held control.
- Should have universal first fix – accepts retractable second fix pendants.
- The pendant which should be adjustable in length must have upper and lower casings of powder coated steel with a stainless steel fascia plate.
- Should have standard telescopic adjustment 300 mm adjustments.
- Each pendant should have 4nos. 6/16amp multipin electrical sockets.

Each pendant should have provision only for maximum 6-8nos. gas outlets points

16. All Articles - Indigenous

Stools with S.S Top

- COMPLETE STAINLESS STEEL
- SS TOP
- HEIGHT ADJUSTABLE FROM 450MM TO 680 MM
- FOUR LEGGED MADE OF 25MM STEEL TUBE MOUNTED ON RUBBER SHOES
- STAINLESS STEEL RING FITTED WITH LEGS FOR FOOTREST
- ISO / CE marked

Chair Supreme

OVERALL DURABLE PLASTIC FRAME OF BLACK COLOUR WITH CUSHION OVER SEAT AND BACK

SUPREME MAKE OR EQUIVALENT OR BETTER

PREFERABLY ISI/ CE CERTIFIED

Attendents Bench S.S Three Seater

- 3 SEATER CHAIR, MADE OF PERFORATED SHEET
- GALVANIZED ARM REST
- ISI CERTIFIED, 2 YEAR WARRANTY
- 3 SEATER CHAIR, MADE OF PERFORATED SHEET
- GALVANIZED ARM REST, ISI CERTIFIED
- 2 YEAR WARRANTY

Intra Venous Infusion Stand

- STAINLESS STEEL I.V. STAND WITH FOUR LOCATION.
- FIVE PRONGED TUBULAR RECTANGULAR STABLE BASE

- WITH CASTOR
- VARIABLE HEIGHT ADJUSTABLE 1600MM TO 2400 MM

Steel Almihra 4 F x 3 F x 20 inches deep

IT SHOULD HAVE :- SIZE 4 F x 3 F x 20 INCHES;
20 GAUZE SS SHEET, 5 SS SHELVES WITH LOCK ;
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS ;
AFTER SALES SERVICE WILL BE REQUIRED,
IT SHOULD PREFERABLY BE ISI CERTIFIED.

Dressing Drums S.S 15 In. High X 15 In Diameter

ISI CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH OF THE FOLLOWING SIZES-

(viii) 275 X 240 MM 275 X 132 MM
(ix) 350 X240 MM 350 X 130 MM
(x) 380 X 300 MM

S.S Instrument Tray with Cover 15 INX 10 INX IN

ISI/ CE CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH SIZE

k. 200X 150 MM
l. 250 X 200 MM
m. 300 X250 MM
n. 350 X 250 MM
o. 450 X 300 MM

Waste Disposal Plastic Drums

SIZE - ~100 LITRE CAPACITY .
IT SHOULD BE ISI/ CE CERTIFIED.
SHOULD BE COLOUR CODED AS PER POLLUTION CONTROL GUIDELINES

S.S Kidney Tray 500 ml capacity

ISI/ CE CERTIFIED;
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
25% OF EACH OF THE FOLLOWING SIZES
(xi) 150 X 70 MM
(xii) 200 X 90 MM
(xiii) 250 X 100 MM
(xiv) 300 X 130 MM

S.S Bowl 250 ML

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ;
ISI/ CE CERTIFIED
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
33% OF EACH OF THE FOLLOWING SIZES
(vi) 125 X 57 (CAPACITY 500 ML) HALF CURL OPEN RIM
(vii) 160 X 75 (CAPACITY 1200 ML) HALF CURL OPEN RIM
(viii) SMALL (CAPACITY 50-60ML)

S.S Basin 2000 ML

- MILD STEEL TUBULAR FRAME
- ON 3 SWIVEL TWIN WHEEL NON-RUSTING CASTORS 50 MM DIA
- 2 SS BOWLS OF ~ 2000 ML CAPACITY/ 375 MM DIA
- PRE-TREATED AND POWDER COATED
- CE/ ISI CERTIFIED

Bed Pan Plastic

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ;
ISI/ CE CERTIFIED
SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
33% OF EACH OF THE FOLLOWING SIZES

125 X 57 (CAPACITY 500 ML) HALF CURL OPEN RIM
(ix) 160 X 75 (CAPACITY 1200 ML) HALF CURL OPEN RIM
(x) SMALL (CAPACITY 50-60ML)

Urinal Maleplastic

IT SHOULD BE OF: - GOOD QUALITY, BRANDED ; ISI/ CE CERTIFIED

S.S Dressing Tray 9 IN X 6 IN X 3 IN with Cover

ISI/ CE CERTIFIED SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED. 20% OF EACH SIZE

p. 200X 150 MM
q. 250 X 200 MM
r. 300 X250 MM
s. 350 X 250 MM
t. 450 X 300 MM

ECG Machine

13. IT SHOULD BE LIGHT WEIGHT AND PORTABLE.
14. IT SHOULD RUN ON 230 VOLT AC MAINS AND RECHARGEABLE BUILT IN BATTERY.
15. IT SHOULD USE 50 MM WIDTH, 20 METER LENGTH, AND GRID THERMAL PAPER FOR RECORDING.
16. PRINTER SHOULD HAVE 8 DOTS/MM THERMAL RECORDING SYSTEM, WITH PRINT WIDTH OF 40 MM FOR RECORDING OF SINGLE CHANNEL OF ECG.
17. ECG RECORDING SHOULD BE DONE IN DIGITAL FORMAT AT SELECTABLE 25 MM AND 50 MM SPEED.
18. IT SHOULD HAVE BUILT IN FILTERS FOR FILTERING OUT AC AND MUSCLE ARTIFACTS.
19. ECG ACQUISITIONS SHOULD NOT BE LESS THAN 12 BITS, 800 SAMPLES/SEC.
20. ECG RECORDING SHOULD BE REAL TIME WITH PRINTING OF SELECTABLE LEADS.
21. IT SHOULD BE USER FRIENDLY AND EASY TO OPERATE WITH MINIMAL ORIENTATION.
22. IT SHOULD BE SUPPLIED WITH ALL STANDARD ACCESSORIES, AND TWO SETS OF PATIENT CABLES, CLAMPS AND BULBS.
23. IT SHOULD COME MOUNTED ON A SUITABLE TROLLEY, POWDER COATED, 3" HIGH WITH A LOCKABLE DRAWER AND ONE PARTITION GIVING RISE TO TWO OPEN COMPARTMENTS. IT SHOULD MOVE ON 4 GOOD QUALITY CASTORS. THERE SHOULD BE A GUARD RAIL ON THE TOP AND HANDLE RAIL ON THE SIDES
24. IT SHOULD CARRY A WARRANTY OF 24 MONTHS, INCLUDING BUILT IN RECHARGEABLE BATTERY.

Emergency Lights

- RECHARGABLE EMERGENCY LIGHT
- STANDBY MODE – AUTOMATICALLY TURN ON IN CASE OF POWER FAILURE
- 18 INCHES – 24 INCHES LONG FLUOROSCENT TUBES PREFERABLE ISI CERTIFIED

Torch Four Cell

LED EVEREADY OR EQUIVALENT RECHARGEABLE PREFERABLY ISI CERIFIED

MicroWave 30 Liters

IT SHOULD BE OF: - GOOD QUALITY, BRANDED, ISI CERTIFIED WITH 5 STAR RATING WARRANTY 2 YEARS; SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED.

Heat Convector 1000 wt

- IT SHOULD BE OF: - 1000 WATTS,
- GOOD QUALITY, BRANDED, ISI CERTIFIED WITH 5 STAR RATING;
- SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS;
- AFTER SALES SERVICE WILL BE REQUIRED. TO QUOTE CMC FOR 5 YEARS AFTER EXPIRY OF WARRANTY
- CE CERTIFIED

Curtain Screen

- TUBULAR STEEL FRAME, EPOXY POWDER COATED.

- MOUNTED ON CASTORS.
- WASHABLE PLASTIC CURTAINS.
- KNOCK DOWN CONSTRUCTION.
- CE CERTIFIED

Wall Clock

IT SHOULD BE OF: - GOOD QUALITY, BRANDED, ROUND, ELETRONIC WITH 1 FEET DIAMETER, SUPPLIER SHOULD GIVE THE WARRANTY FOR 2 YEARS; AFTER SALES SERVICE WILL BE REQUIRED, IT SHOULD BE ISI CERTIFIED

GEYSER

- 35 LTR CAPACITY
- ISI MARK
- FIT FOR USE WITH HARD WATER
- 5 YR WARRANTY

RO SYSTEM

ISI CERTIFIED. LIKE KENT RO OR EQUIVALENT THERE SHOULD BE MINIMUM WARRANTY PERIOD OF TWO YEARS AND CONDITIONS FOR FREE INSTALLATION.
THE COMPANY MUST HAVE SERVICE BACK UP IN DELHI TO PROVIDE SERVICE SUPPORT WITH IN 24 HOURS OF THE NOTIFICATION OF THE COMPLAINT
COMPANY SHOULD QUOTE THE RATES OF ACCESSORIES AND CONSUMABLES FOR FUTURE REFERENCE COMPANY MUST AGREE TO ENTER AMC FOR 5 YEARS AFTER THE EXPIRY OF THE WARRANTY PERIOD AND SHOULD QUOTE THE RATES FOR COMPREHENSIVE AND NON-COMPREHENSIVE AMC.

S.S Bucket for OT 10 Litres

- COMPLETE STAINLESS STEEL
- CAPACITY 10 LITRES (APPROX.)
- SEAMLESS AND WITH STEEL HANDLE
- ISI/ CE CERTIFIED

Plastic Bucket 15 litres

- STANDARD QUALITY. PREFERABLY ISI CERTIFIED.
- WITH HANDLE
- COLOUR OF USER'S CHOICE

Plastic Mugs 500 ML

- STANDARD QUALITY. PREFERABLY ISI CERTIFIED.
- WITH HANDLE
- COLOUR OF USER'S CHOICE

Extension Boards 15 V

- WITH SPIKE BUSTER
- ISI & AT LEAST 3 MULTI-PLUGS ON STRIP.
- ALL SOCKETS 5/ 15 AMP & PREFERABLY COMPATIBLE WITH INDIAN AND AMERICAN TYPE PLUGS 5 EXTRA FUSE TO BE PROVIDED
- WARRANTY OF 2 YEARS

Blankets

- SHOULD HAVE OVER ALL SIZE OF 90 X 60 INCHES;
- ISI CERTIFIED/ WOOLMARK

Bed Sheets

- IT SHOULD HAVE OVER ALL SIZE 100 X 60 INCHES,
  100% COTTON OF HIGH QUALITY;
  PREFERABLY ISI CERTIFIED ; BRANDED

Pillow (Sky Blue)

- IT SHOULD HAVE OVER ALL SIZE 15 X 25 POLYFIBER
  PREFERABLY ISI CERTIFIED ; BRANDED

Pillow Covers (Sky Blue)

- IT SHOULD HAVE OVER ALL SIZE 17 X 27; 100%
- COTTON OF HIGH QUALITY;
- PREFERABLY ISI CERTIFIED ; BRANDED

Draw Sheets

- IT SHOULD HAVE OVER ALL SIZE 50 X 60 INCHES,
- 100% COTTON OF HIGH QUALITY;
- PREFERABLY ISI CERTIFIED ; BRANDED

Data Management System – Recorder, PC Printer

PATIENT RECORD ARCHIVING SYSTEM (REPUTED BRAND TO BE SUPPLIED FROM INDIAN MARKET.).

DESKTOP: CORE 2 DUO 2.93GHZ/ 4GB(2X2) DDR3 F 820GB(320+500) SATA HDD/ DVD RW/ 18.5" TFT/ DOS/ WARRANTY.(LIKE HP 3090 OR BETTER)	1
500 GB EXTERNAL HDD	2
4 GB, 8 GB, 16 GB AND 32 GB USB FLASH DRIVE	2 EAC
MS OFFICE HOME & BUSINESS	1
WINDOW 7 PROFESSIONAL OEM PACK	1
QUICK HEAL TOTAL SECURITY ANTI VIRUS-3 USE	1
ADOBE ACROBAT PROFESSIONAL- PAPER LICEN	1
UPS 0.5 KV	1
HP OFFICEJET 4500 DESKTOP ALL-IN-ONE(COLOUR PRINT,SCAN, COPY, FAX) BLK/CLR WITH ADF (WILL RE QUARTERLY SERVICING WITH CHANGE OF CARTRII THROUGHOUT WARRANTY AND CMC)	1

Foot Operated Covered Plastic Dustbin

SIZE - ~20 LITRE CAPACITY .
IT SHOULD BE ISI/ CE CERTIFIED

BP Instrument Mercury

ISI MARK & STANDARD QUALITY
INTERCHANGABLE BP CUFF OF 3 SIZES – FOR PAEDIATRIC, ADULT AND OBESE PATIENTS
2 YEAR WARRANTY.

BP Instrument Digital

- INFLATES SMARTLY JUST ABOVE SYSTROLIC BLOOD PRESSURE
- TO KEEP A RECORD OF YOUR BLOOD PRESSURE.
- TO STORE THE MEMORIES OF TWO PATIENTS SEPERATELY.
- DAILY 3 ALARMS TO REMIND TE PATIENT.
- TO DETECT IF THE PATIENT HAS IRREGULAR HEART BEAT.
- TO CLASSIFY THE BP INTO NORMAL, MILD, OR SEVERE HYPERTENSION.
- TO STORE THE CUFF UNDER LCD COMARTMENT WHEN NOT IN USE.
- OPTIONAL ACCESSORY AVAILABLE (AGAINST EXTRA COST)
- MONITOR TYPE: AUTOMATIC INFLATE & MEASUREMENT METHOD: OSCILLOMETRIC DISPLAY: LIQUID CRYSTAL DIGITAL DISPLAY
- MEASUREMENT RANGE: 0-280 MM/HG & BATTERY: 4X 1.5V AA ALKALINE BATTERIES WEIGHT: 400 GM WITHOUT CUFFS & BATTERIES
- CUFF FITS: 22 TO 32 CM

White Background X-Ray Viewer 2 X-Ray Panel

- PURE UNIFORM WHITE BACKLIT DISPLAY

- SLIM
- WALL MONTABLE
- 220V/ 5 A
- CE CERTIFIED
- 2 YEARS WARRANTY
- SIZE FOR ONE FULL LENGTH X-RAY/ CT/ MRI FILMS WITH ON/ OFF SWITCH

17 Mortuary Cabinet High End - Imported

The standard type of Mortuary Cabinet is Three-body freezer cabinets

Any other type of cabinet or walk-in type mortuary cold room can be manufactured to suit the client's requirements.

Construction
The top, sides and bottom of these cabinets are constructed with metal cladded insulated panels, the door frames and rear of the cabinets are reinforced with selected clear SA pine frames, rendered waterproof with a bituminous solution.

All internal and external surfaces of the cabinets can be covered with a variety of materials, such as stainless steel, chromadek or galvanised steel.

The three- and six-body cabinets have a 100 mm thick polystyrene insulation core with a density of 24 kg/m³. The three- and six tier body freezer cabinets have a 100 mm thick polyurethane insulation core with a density of 40 kg/m³.

The front doors are hung onto robust chromium plated hinges and are fitted with chrome-plated latches and strikes. The reveals of the door openings are fitted with floss black perspex breaker strips. The freezer cabinet doors are provided with heater elements. All doors are fitted with air-right rubber gaskets.

The service panel on the rear of the cabinet is reinforced with timber in order to carry the air-cooling and condensing units. Each cabinet is mounted on four adjustable feet and is fitted with a drain point.

Body trays
Each body compartment is provided with a dished body tray which is welded onto a tubular frame. Both tray and frame are manufactured from stainless steel or galvanised mild steel.

Refrigeration system
The condensing and air-cooling units are mounted on the service panel so that it forms a complete, self-contained unit.

A neat instrument panel on which an isolator and pressure switches are mounted, is provided and fixed to the service panel.

The refrigerant tubing, instrument panel, electrical wiring, and all other parts are factory mounted on the service panel. A thermometer is mounted above the doors on the front of the cabinet.

The refrigeration unit undergoes a thorough test before it leaves the factory.
All refrigeration systems are ozone friendly.

18. Scrub Station for OT - Indigenous

Compact Surgical Scrub sink will be designed for use in Operation theatre complex providing

surgeons with a convenient sink for pre op scrub up. Each fixture will be fabricated from heavy gauge type 304stainless steel & will be seamless welded construction polished to a satin finish. The scrub sink will be provided with a front access panel, which will be easily removed for access to the water control valve, waste connections, stoppers & strainers. Hands free Operation will include infrared sensor with built in range of adjustment.

Thermostatic Mixing Valve control will be located behind the access panel & maintain constant water temperature. User defined settings of 1,3,5,10 min are available. This timing will be adjustable to meet individual application requirement, provided with infrared sensor thermostatic controlled taps with fail-safe temperature controls. All units will have reduced anti splash fronts. Knee operated switch will be offered as an option.

MEDICAL EQUIPMENT (PART II)

TECHNICAL SPECIFICATIONS

10. RAPID AUTO CLAVE

State of the Art fully automatic Trauma use autoclave with dry cycle having following features :

- Fully Automatic table top type front loading autoclave of min 22 litres or more Capacity with facility of triple vacuum cycle
- At least 2 or 3 Separators (trays) to hold different type of instruments / Materials with one removable tray.
- Digital display (LED or LCD) of temperature, time and pressure (to show curve & words)
- The pressure and temperature of the autoclave should range form 15 PSI at 121degC to 30 PSI at 134degC
- The body and trays of the autoclave should be made from corrosion resistant stainless steel.
- Provided with Micro bacterial filter.
- For safety the equipment messaging and warning system should be present.
- Fully microprocessor controlled management for constant monitoring of parameters and control of the autoclave functions with 4 cycles as under:-

C. 2 Cycles for unwrapped loads-134degC -4min.
121degC- 20min

D. 2 Cycles for wrapped loads-134degC -4min.
121degC- 30min

- Separate tanks to prevent recycling of water.
- Auto shut off & stand –by mode
- One water filling tank together with one pipe connection.
- Automatic Functioning with automatic self cleaning of pipe steam generator, pipe and other parts after every 100 or 150 cycles of use.
- Thermodynamic initial vacuum.
- Top design reservoir for convenient watering and cleaning.
- Automatic drying system.
- Micro switch to confirm door closure.
- Safety valve & Safety thermostat.
- The system should be easy to use (User friendly).
- The unit should preferably be CE marked.
- The same unit should have facility to upgrade in future for connectivity to External Thermal printer or Inbuilt thermal printer facility (to keep record of every cycle during use)

*11. **VIDEO OTOSCOPE, BRONCOSCOPE & LYRANGOSCOPE***

a) VIDEO OTOSCOPE

- Should be integrated unit with Direction of View: 0° and Field of View: 60°
- Should have Depth of Focus from 5 - 50 mm with Tip Diameter Ø 4,0 mm
- Should be provided with disposable Ear Funnel size 2,0 mm and 4,0 mm
- Should have CMOS Image Sensor, with Resolution 320 x 240 Pixel

- The Illumination should be by an integrated White light LED
- The Interface should be USB 2.0 and Composite Video (Cinch), and the Power Supply may be by USB 2.0 or 5V Medical AC Adapter
- Should connect to a PC via USB
- The dimensions of Hand piece should be within 130 mm x 40mm x 40mm and should be light weight up to 60 gr , with Hub dimensions max 170 mm x 70 mm x 130mm , weighing not more than 400 gr
- Should be provided with 1.8 m Supply Cable Hub to USB Port as well as 1.8 m Supply Cable Hub to Hand piece

Should be CE marked

b) SPECIFICATIONS FOR FLEXIBLE LARYNGOSCOPE

FIBER OPTIC LARYNGOSCOPE

Outer diameter of insertion tube	:	5.0 mm
Direction of view	:	0 deg.
Depth of field	:	3-50 mm
Angle of view	:	80 deg. Or more
Working channel diameter	:	2.0 mm Or more
Working length	:	410 mm Or more
Total length	:	650 mm Or more
BENDING SECTION		
Up/Down	:	>130/>100 deg.

STANDARD SET OF ACCESSORIES

- Biopsy forceps : 1 no.
- Channel cleaning brush : 1 no.
- Cytology brush : 1 no.
- Mouthpiece : 2 nos.
- Suction tube : 1 no.
- HALOGEN COLD LIGHT SOURCE 15V/150W: 1 no.

Adapt 15V/150W halogen lamp and humanized designed to provide optimal operability. Contains built in pump for automatic leakage test.

c) RIGID BRONCHOSCOPE:

BRONCHOSCOPY SET: Telescope 0^0, 30^0 Straight

Bronchoscope Tube

vi. 4mm-WL.215mm.
vii. 5mm-WL 245mm
viii. 5.5mm-WL.265mm
ix. 6.0mm-WL265 mm
x. 7.0mm-WL 365mm

Forceps

I FB forceps alligator.
II Grasping forceps for soft FB
III Peanut forceps

Accessories

Dilator, Foreign body basket, graspers, optical forceps
Adaptor with sliding glass window plug, sealing cap, notched lens and keyhole opening, movable Plug for ventilation Attachment of Bronchoscopes
Adaptor from Bronchoscope to any type of pediatric respiration equipment
Atomizer with bulb working length 50cm (2)
Laryngeal Atomizer with bulb (2)
Suction Tube, Length 50 cm, diameter 2.2.5 & 3 cm(2 each)
Monitor Specification
19" Flat Screen Monitor, Desktop Version, Color System PAL/NTSC Resolution max. 1280 x 1024 SDI, Composite, S-Video RGB, DVI and S-XGA Input Brightness: 450cd/m2 Contrast: 650:1

Power Supply: 100-240 VAC, 50/60 Hz consisting of: 9419NG 19" TFT Flat Screen 9419 PS Power Supply 9419SF Stand
Endoscopic Camera system
Camera head unit consisting with following spec: image sensor: 1x 1/3 " CCD chip
Pixel 752 (h) x 582 (v) pixel per chip
AGC: Microprocessor controlled

12. LAPAROSCOPY SET OPERATING MAJOR WITH ACCESSORIES

Laparoscope Telescope, Fully autoclavable with working length 30 to 33 cm
Wide angled distortion free view and light transmission incorporated
0 deg, 10mm x 1 No
30 deg. 10mm x 1 No

Instrument set

Laparoscopic hand instrument dismentable 5mm size (Reusable) with 33-36cm working length, take apart locking /unlocking mechanism, rotatable with interchangeable handle with cleaning port, mono molar diathermy attachment consisting of:
Veress needle 12 cm length x 2 Nos
Veress needle 15 cm length x 2 Nos
Trocars with pyramidal tip, and cannula with multifunction valve size 11mm x 2 Nos.
Reducer 11 / 5mm x 2 Nos
Trocars with pyramidal tip, cannula with multifunction valve size 6mm x 3 nos, Cannula washer 5mm ------50 Nos
Cannula washer 10mm--------25 Nos
Laparoscopic biopsy forceps 5mm x 1 Nos
Maryland Kelley dissector 5mm with unipolar diathermy x 1 nos
Atraumatic grasper, 5mm x 1 Nos.
Atraumatic grasper with fenestrated jaw slightly curves, 1 Nos
Metzenbaum scissor (5 cm) with unipolar x 1 Nos
Laproscopic cautery lead unipolar x 1 Nos
Suction irrigation cannula with two way valve x 1 Nos
L, shaped hook electrode 5mm x 1 Nos
Blunt spatula electrode 5mm x 1 Nos
Laparoscopic bowel grasper 5mm x 1 Nos
Laparoscopic spoon forceps 10 min x 1 Nos
Needle holder with tungsten carbide tip 5mm x 1 Nos
Clip applicator medium large, 10mm , 1 Nos
Claw forceps 10mm- 1 Nos
Biplar forceps with wire teeth, completely detachable – 5mm dia, working length 36cm- 1 Nos
Monopolar high frequency cable, 3 meters- 1 Nos
Bipolar connecting cable to standard electrosurgical unit- 1 Nos.

ENDOSCOPIC CAMERA SYSTEM

Camera head unit consisting with following spec: image sensor: 1x 1/3 " CCD chip
Pixel 752 (h) x 582 (v) pixel per chip
AGC: Microprocessor controlled
Camera control unit with followign specs- maximum resolution of 440,000 pixel, progressive scan CCD sensing chip should optimum image quality for maximizing hi – fidelity image transmission optimizes to any size: the system should have optical zoom to quality of image size and cross specialty window standardization of the camera system regardless of the telescope used
The system should automatically optimize all settings. The system should be ready to use as soon as it is connected to the camera control unit

HIGH RESOLUTION MEDICAL GRADE COLOUR MONITOR

15" should have composite video, SVHS & RGB output, colour monitor TFT, compatible with above camera system resolution
CO2 Electronic Automatic Insufflators
Electronic automatic insufflators with pin index connection

Should have an adjustable flow rate of 0.5 to 20 litre per minute and a pressure range adjustable 0-30mmHg. Preset and actual value for pressure and flow should be displayed together for better monitoring of both values
Pressure and flow rate should be displayed on the frontal panel. Should be able to select either central suply (4.5 kg/cm2) input pressure from central supply as well as direct connection to high pressure CO2 cylinder. Should have internal heater inbuilt for waming up the cold CO2 gas
Provided with silicon autoclavable tubing 4 sets, with luer attachment. Instrument should work on a universal AC supply between 110-240 V, with a frequency of 50 Hz single phase.
Electrical safety certification- IEC-601-1 and CE acc to MDD Secuvent safety system for constant monitoring of intraabdominal pressure and checking overpressure with automatic back release of CO2 gas within 5 second with acoustic alarm
Should be supplied with 2 nos high pressure hose pin index minimum length 1.0 meter
Xenon light source with 300 watts lamp power required 220 V AC. Manual illumination intensity control life of the lamp should be displayed on the Qty. 01 No
Formalin Chamber
Formalin chamber made of Virgin Acrylic 6mm thickness: Size: 26" x 8"x8" (LxBxH) with three tray, for sterilizing the laparoscope, preferably with three tray x 2 Nos
CO2 cylinder
CO2 cylinder to accept 4.5 kg liquid CO2 capacity bottle with pin index connection x 2 Nos
Disinfection tray
Disinfection SS tray of steel grade 304 with sieve tray to life, size : 27" x 7" x 5" (LxBxD) x 2 Nos
UPS System
UPS- 2.0 KVS off line with one hour backup time (at 1200 watts real load) with inbuilt SMF batteries. Should be able to work on wide input range between 160-270 VAC at frequency between 50 hz – 5 Hz should use PWM technology with power conversion with single transformer arrangement with an output of 2300 VAC protection of overload, short circuit and low battery. Should have indication on front panel for mains load/battery load/battery overload-low and MCB protection in case of short circuit. Should be supplied with separate battery rack, ISI/CE approved good quality Indian makes
Laparoscopy trolley
Mobile unit tower with 4 shelves, 1 drawer, 1 compartment for unit connection cable, 1 cable channel,1 winding bracket, 8 power socket, 1 isolating transformer & power cable 240V, 50 Hz
Camera head holder Device connecting cable, 150 cm long
Device connecting cable, 250 cm long Universal CO2 bottle holder Should have arm for TFT monitor Should have antistatric castor wheels at least two lockable

13. <u>CENTRAL MONITORING STATION</u>

12. Branded PC , Printer With 17 " TFT screen.
13. Up to 64 Waveforms of 32 Bed Side Monitors.
14. 6.25, 12.5,25,50 mm/Sec Selectable Sweep Speed.
15. 4 Hours of dynamic Trend Display of All Parameters.
16. Remote Monitor Control Bidirectional Communication.
17. 240 Hours Trend for Each Monitor.
18. 720 Items Parameters Alarm review for each Monitor.
19. 720 CO Measurement Review.
20. Display of Parameters Like, ECG,NIBP,SpO2,Resp, Temp., IBP, Respiration, CO, Et Co2,Etc.
21. Bed to bed View Facility.
22. Should have wireless CNS connectivity

14. **<u>HIGH END MULTI PARAMETER MONITOR (MODULAR)</u>**

24. The modular monitor should measure 3/5/12 Lead ECG, Resp, 2-Channel Temperature, SpO2, NIBP, 2-Channel Invasive Blood Pressure,ETCO2. (7 PARA MONITOR)
25. It should have bright, highly visible with minimum12.1" color TFT display for easy viewing from a distance.

26. The monitor should display at least 8 waveforms traces on a single screen which is integrated with the main unit.
27. It should have atleast following features in respect of monitoring:
    96 hours graphical trends
    96 hours tabular trends
28. The monitor should have option of 12 slots for modules for flexible configuration.
29. The monitor should have changeable screen layout for various monitoring settings.
30. Data management software based on PC
31. Patient data transmission via flash disk
32. Configuration setting should be transferred between monitors
33. Should be capable of onsite upgradation - C.O. (Cardiac Output), PICCO and SCVO2, AG (Anesthesia Gas), BIS (Bispectral Index), RM (Respiratory Mechanics), ICG (Impedance Cardiography).
34. There should be provision for using wireless LAN card & memory card.
35. There should be external ports for Keyboard, Mouse, Slave display, Emergency Nurse Call & 4 USB ports.
36. The monitor should be capable to support Wireless Networking and compatibility to use with Central Monitoring System.
37. There should be mass alarm setup
38. It should have priority color coded audio – visual alarm system with bright prompt message on the screen. There should be a separate color coded audio – visual alarm when patient data deviates from normal limits and machine failure, improper function.
39. There should be auto identification of ECG lead set, complete ST analysis with ST template and multi-channel Arrhythmia analysis
40. The monitor should have OxyCRG screen.
41. There should be various calculations like Drug dose, Oxygenation, Ventilation, Renal, and Hemodynamics.
42. It should come with dual exchangeable Li–Ion batteries with more than 2 hours battery backup.
43. There should be a provision for built-in 3 channel thermal recorder.
44. The monitor should have a provision for auto alarm printing i.e. alarms triggers an auto printing.
45. There should be hot keys & Icons on buttons and Iconic symbols on touch screen as well.
46. The monitor system should be US-FDA and CE Marked for all standard and optional parameter configurations.

15. <u>MULTIPARAMETER MONITOR</u>

Should not be less then 10.4" screen.
Should be colourTFT
Should have the good resolution minimum (800 * 600 dots)
Should have the option for real time ecg wave forms and episode.
Should have the standard facility to monitor ECG , NIBP, Spo2 for low perfusion , temp, resp.
Tender is submitted with proper CE certificate for quality assurance.
Trend parameters: Heart rate (or pulse rate), respiration rate, VPC rate, ST level, Event (arrhythmia), apnea (time), apnea (frequency), SpO2, NIBP (systolic,diastolic,mean), Temp.
Trend time: 1, 2, 4, 8 or 24 h
Data storage time: 1 min for 1, 2, 4, 8 hours, 3 min for 24 hour.
Vital Signs List
Parameters: Heart rate (or pulse rate), VPC rate, ST level, NIBP (systolic, diastolic, mean), SpO2, respiration rate, temperature.
Number of files in list: 120 for periodic list, 120 for NIBP list
List interval: 1, 5, 15, 30 or 60 min for periodic list, at NIBP measurement for NIBP list.
Should have the facility of OCRG screen.
Should have the facility to store alarm up to 200 and displayed on the alarm history.
Should have the battery backup of 2 hr,
Should be able to store 16 arrhythmia episodes which can be edited for arrhythmia analysis.
Should have the facility to enlarge the numeric display.
Should have the faculty to freeze the wave forms.

16. 30 KW MOBILE DIGITAL X-RAY WITH AUTOMATIC FILM PROCESSOR

- The High Frequency Mobile X-Ray Unit should be capable of all Standard radiographic procedures in Wards, OT, Trauma centre, Emergency and Other rooms & The System should be able to moved into a lift and all patient access areas
- The unit should use Hi-Frequency X-ray Generator Technology of 100KHz or more
- Required Ratings:
  - HF Generator Minimum 30 KW or Higher
  - 400 mA or better
  - 125 kVp or better
  - 200 mAs or better
- The unit should have easy manual movements and must be easy to maneuver within the Hospital areas: surgical rooms, intensive care, emergency, wards etc.
- Should be a fully integrated light weight mobile unit with a easy to use X-Ray System
- Should have excellent movements and easy to turn

GENERATOR:

- High Frequency generator with microprocessor control
- Tube overload protection with continuous Monitoring X-Ray Tube Heat Units
- Programmed anatomical technique with storage of program
- Safety features for overload, tube current, KV, tube rotation etc and auto test for unit.
- 30 KW or higher X-ray generator with a max of 125 KVp or more that should be able to work on 12 amps current. (230v supply 15 amps power plug available at trauma center)
- mA range 50 to 400 mA or more
- KV range 40 to 125 KV or more.
- Time range from 1.1 ms. to 4 sec or more

CONTROL UNIT:

- Feather touch control panel with LCD display for Data and massage.
- Anatomical technical selection and KV & MAS increase and decrease facility

MOBILE UNIT & TUBE STAND COLUMN:

- The unit should have easy manual movement with break
- Unit should have a multi-leaf collimator
- The tube stand column should have a articulated arm for easy reach to patient
- -15 to +100 “Z” axis frontal tube rotation
- Front telescopic crane type & easy to use tube arm
- Maximum Focal Distance should be higher than 180 cm to the floor and minimum of 60 cm to the floor.
- Should have 180 deg roation of cross arm from its vertical axis +90 deg and – 90 deg better reach
  To patient.
- The un it should have a safe and secure cassette housing

X-RAY TUBE - Ratings:

13. Maximum KVp: 125 KVp.

- It should be Dual focal spot rotating anode with small focal spot 0.6 mm or better and a large focal spot 1.3 mm or better and Low speed rotor drives 3,000 r.p.m.
- Single Phase 230 VAC 50 / 60 Hz. ±10%.

Accessories:

- 2 light weight 0.5mm lead aprons to be included in the offer
- Gonad shield for boys and girls – One each

Others:

- The x-ray unit should meet CE or FDA standards
- The system offered should have AERB Type approval/ NOC for installation and use in India

AUTOMATIC FILM PROCESSOR(fully indigenous) FEATURES REQUIRED :

- Automatic X-ray Film Processor table top model for processing all standard size x-ray and imaging films upto 14" x 17" size
- It should have capability to process a minimum film size of 4" x 4" and above

- The processor should have high quality rollers of plastic / rubber as needed and they should be made of long lasting material
- The transport system should be controlled by a micro processor - built in to the system and should be able to provide uniform and smooth transportation
- There should be provision to set up the processor for output times of 90/105/118/135 or 167 secs, depending on the requirement of the user - at the time of installation or during service - based on the customers request
- The processor should have capacity to process atleast 140 films per hour (12" x 10" size) or over 80 films of 14" x 17"
- Developer and Fixer temperatures should be adjustable - in steps by the user
- Drier temperature should be adjustable, if needed &
- The minimum capacity of the developing / fixing and water tanks should be 5ltrs or more
- There should be a reservoir provided where fresh chemicals of 20ltrs can be stored
- There should be a provision for replenishment of fresh chemicals from the reservoirs - automatically, based on the films processed
- The amount of chemicals replenished should be adjustable, depending on users request
- Fresh water for rinsing the films should be circulated into the wash tank. This should be controlled automatically - mention liters per hour
- The processor should be controlled by a micro processor with display of Bath temperature
- Should have provision to put the machine on standby mode automatically when not in use
- The processor should be in a ready state and respond immediately upon insertion of a film - to process. All bath temperatures should be automatically maintained even during standby mode
- The bath dryer should have jets / venturies that ensure uniform drying of films across the entire area. Please provide technical documents and explain how to avoid wet patches / non-uniform drying
- The processor tanks should be made of non-rust material. Special plastic with monocoque shell construction of the tank area would be preferred. Shell : 2 part body shell is must for easy serviceability
- The processor should be designed to provide easy access to the electrical and micro processors for service and settings - without the need to tilt the processor or drain the chemicals - saving time and ensuring no wastage of chemicals
- The processor should have a small foot print - not more than 0.5 sq mtrs
- The manufacturer should be ISO registered
- Mention if product is compliant to any international standards such as CE,ISO 13485
- The manufacturer should have easy availability of spares - locally in India
- The manufacturer should have fully trained engineers in the field to service the processors and ensure maximum uptime

17. <u>MOBILE C-ARM IMAGE INTENSIFIER UNIT</u>
<u>HIGH FREQUENCY C-ARM</u>

- The unit should be high quality unit having the below mentioned specifications:
  GENERATOR:
- It should be digital with feather touch controls.
- It should be of high frequency with output of 5 KW and frequency of min 40 KHz.
- The KV range should be from 40 to 120KV in steps of 1 KV
- The fluoroscopic mA should be upto 4.0 mA or more
- The radiographic mAs range should be upto 200mAs or more
- Radiographic mA up to 70 mA or more
- Pulsed fluoroscopy should be possible
- The x- ray tube should be dual focus rotating anode. The focal spot of the tube should be 0.3mm and 0.6mm and anode heat storage capacity of 200 KHU or more
- The digital display of fluoro mA, KV, timer & radiography mAs should be provided and the display should be micro- controller based LCD Display
- There should be independent selection of KV & mAs.
- The control should have indicator for power on,
- The control should show error with proper written massage on LCD display for any overload, X-ray Tube heating or any fault in machine.

I.I.T.V. SYSTEMS & MONITORS:

- The image intensifier should be of latest series.
- It should be of 9" triple field (i.e 9"/6"/4") with CCD Camera
- The circular grid (108 lines) should be fixed on the I.I to improve the image quality.
- 2 nos. 17" TFT monitor should be supplied
- The monitor trolley should be provided for mounting 2 monitors and should have 2 shelf for keeping memory and stabilizer & isolation transformer.

C-ARM STAND:

- It should be ruggedly built and should be of good designed.
- It should have steering for controlling back and front wheel movements
- It should also have the below mentioned movements
  - Horizontal travel should be 210mm or more
  - Orbital movement should be 90 + 25 degrees
  - Panning movement should be +/- 12 degrees
  - Focus to I.I distance should be 920mm or more
  - Vertical movement should be motorized of 450mm or more
  - Focus to I.I clearance should be 800mm
  - C- Arm rotation should be +/- 270 degrees

IMAGE MEMORY & ESSENTIAL ACCESSORIES:

- Image memory of 100 frames permanent storage or better.
- 7 KVA stabilizer & isolation transformer to be provided
- It should run on single phase 230 volts, 15 Amps.

- 3 nos quality approved lead aprons to be provided

The quoted model should have AERB NOC or AERB Type approval. And International CE/FDA

18. **3D COLOR DOPPLAR UNIT FOR GENERAL & CARDIAC USE**

Latest generation Color Doppler Ultrasound Unit capable of performing Obs/Gyn, abdominal, Small Parts, musculoskeletal, Urology, Pediatrics and Cardiology cases with following specifications :

1. **System should be offered with following Broad Band width transducers:**
   a) Multi Frequency Convex Array Transducer (frequency range of 3 to 7 Mhz) for Abdominal, Ob/Gyn applications.
   b) Multi Frequency Linear Array Transducer (frequency range 5 to 12 Mhz) for vascular & small parts applications
   c) Multi frequency Endocavitory Transducer (frequency range 4 to 9 Mhz) for TV/TR applications.
2. System should have following modes:
   a) 2D, M Mode, Color M Mode, Color Doppler Imaging, Power Doppler Imaging, PW, Tissue Harmonic Imaging, Trapezoidal Imaging & 3D Imaging.
3. Digital Processing Channels 1100 or more. Please specify through technical data sheet.
4. Grey Scale (min 256 or more) please specify.
5. System should have integrated 3D Imaging Package. Please specify through technical data sheet.
6. System should have scanning depth of 2 to 30 CM. Please specify through technical data sheet.
7. Broad bandwidth beam former technology transducers for extreme high resolution 2D image should be available.
8. Should have High Dynamic Range of 170 db or more. Please specify through technical data sheet.
9. System should have a very high frame rate of 160 frames per second or more. Please specify through technical data sheet.
10. System should have facility for gain adjustments using slide pot controls for excellent image quality or equivalent.
11. Should have minimum 3 active ports with direct switching from console.
12. System should have a high resolution articulating non interlaced flicker free, antiglare flat panel display of 15 inches or more, with tilt and swivel facility.
13. System should have built in Image Management software.

14. Image storage capacity through Hard Disc Drive should be 80 GB or more.
15. Image Archival: Inbuilt DVD Drive with the facility to transfer images.
16. System should have direct connectivity to color paper printer for printing images & report.
17. System should have extensive calculation software package for General Imaging, Obs/Gyn & abdominal Imaging.
18. The quoted model should be European CE/ US FDA approved.

- **BIPAP**

  Mode :
  Spontaneous (S), CPAP
  Pressure range (measured at the mask) :
  IPAP 4–25 cm H2O (hPa) incriment of 0.2
  ePAP 2–25 cm H2O (hPa) incriment of 0.2
  cPAP 4–20 cm H2O (hPa)
  Respiratory rate : Optional On (10BPM) / OFF
  Ti control (S mode)
  Ti max range 0.1–4.0 sec
  Ti min range 0.1–Ti Max sec
  Rise time range Min, 150–900
  Trigger and cycle sensitivities 5 levels
  Maximum flow capacity at 20 cm H2o 170 L/min
  Data display on LCD

  Treatment screen:
  Mode and pressure, leak, respiratory rate, Vt, trigger and cycle indicators, SpO2 and heart rate when ResLink and oximeter are connected results screen Usage and efficacy data (leak, Vt, respiratory rate, minute ventilation, spontaneous trigger and cycle %, AHI, pressure)

- **BIPHASIC DEFIBRILLATOR MONITOR**
- The Defibrillator Monitor Should have Manual and AED Mode of Defibrillation.
- It Should have Latest Bi Phasic Technology with Energy Selection from 1 Jule to 360 Jules.
- It should have 8.4" Colour TFT Display.
- It should have 5 Lead ECG Display.
- It Should have Compact Design Weight should be Less Than 10 KG .
- It Should have Powerful battery Backup (200 Shocks of 360 Jules) on Fully Charge battery.
- It should have Shock proof for Transport use.
- It Should have Thermal Recorder for ECG Recording.
- It Should have 72 hours of Trend Memory and up to 1000 Event Storage for a Patient.
- It should have Less Than 5 second for Charging 200 Jules for Quick Shock.
- It Should have AED with Default configuration Meets 2005 AHA Guidelines.
- It Should Record for Marked Events , Charge ,Shock and Alarm.

  It Should be Upgradeable for NON INVASING PACING,MASSIMO SPO2,IBP,ETCO2,NIBP

  Price for upgradeable Items should be quoted separately.

- **SYRINGE INFUSION PUMP**

- Syringe Pump front loading should accept 10, 20, 30, 50 ml syringes of known brands as well as CUSTOM programmable syringe.
- Flow rate range should be 0.1-990.0ml/hr .
- Time limit should be 00:01 to 23:59 (hrs:min).
- Volume limit should be 0.1ml to capacity of syringe.
- Unit should be PCA upgradeable.
- Unit should have facility for time locked BOLUS / PCA facility & administration counter and display for the same.
- Unit should have minimum six stage programming of target time and target volume.
- Occlusion should be of three levels low, medium and high.
- KVO (Keep Vain Open) rate should be programmable from 0.1ml/hr to 10 ml/hr.

- Unit should have LED display of flow rate & LCD display for infused volume and elapsed time.
- Unit shout have Display of Drug name on LCD
- Unit should have minimum 25 drug library with choice of personalized library.
- Unit should have automatic rate calculation with volume and time limit.
- Unit should have body weight based rate calculation programming.
- Unit should have stacking facility with normal or optional power cord.
- Battery back up should be 4-5 Hrs @ 5 ml/hr.
- Unit should have audio visual alarms for occlusion, end of syringe, Syringe displaced, No Syringe, Wrong Syringe, Pre alarm for end, Invalid rate, Invalid target volume, Invalid target time.
- Accuracy should be +/ -2% for volume and time.
- SHOULD have ISO- 13485 certification
- UNIT Should be CE CERTIFIED

- **100 MA X-RAY MACHINE**

- X- ray machine : 100 mA X - ray Machine counter balance mobile stand.
- X- ray machine : 100mA -100 KVP full wave multipulse rectified generator with BEL DSA - 3/DSA-2 X-Ray tube or AERB approved fine focal spot tube
- Output : 8 Kw or less
- KVP range 45 to 100 KVP in steps of 5 KVP step
- Control: complete with voltmeter ,mA meter .Quick trip, overload circuit breaker, voltage compensator,
- Tube head : Having BEL DSA-3/DSA-2 and high voltage transformer.
- Machine safety device- Electronic sensor to protect X-Ray tube and high voltage transformer from overloading. Quick tripoverload circuit breaker.
- Collimeter : Light beam cum shutter diaphragm.
- Power supply requirement : 230V, 50 Hz , single phase,15 Amps.
- Stand : Mobile stand with counter balanced, Articulated tube carriage allowing movements of the tube head in vertical and horizontal plane lead lined cassette strong box.

- **CAUTRY UNIT (RADIO FREQUENCY SURGICAL UNIT FOR MULTIPLE APPLICATIONS IN SURGERY) (Fully Imported**

- Radio frequency Cautery with 4 MHz frequency provided with Monopolar and integrated Bipolar operation. Output Power up to 100 watts.

- There should be digital display for power output.

- Monopolar should have cut, blend and coagulation modes.

- Unit should be provided with Smoke Evacuator with double filtration (HEPA and charcoal) 99.99995% efficiency, with safety against HPV and other virus.

- Smoke evacuator should have exclusive dual mode activation for remote or manual activation.

- Should be provided with three bendable electrodes, water proof foot switch

- Should be provided with following electrodes for various surgical application:

    - 3 electrodes for skin/plastic surgery (straight ball dia 3 mm, round loop dia 5 mm for biopsy & lesions excision, cut electrode for incisions)

    - 2 electrodes for general surgery

    - 2 loop electrodes for Gynae cervical surgery, with autoclavable vaginal speculum

    - One 360 degree rotating conisation electrode

- 2 electrodes for laryngeal surgery, one for turbinoplasty, one for UUUP, two for endo nasal

- Unit should be provided with autoclavable bipolar forceps and cable.

- Optionally quote for various monopolar electrodes for various application

Unit should be CE Marked.

1. **RAPID AUTO CLAVE**

State of the Art fully automatic Trauma use autoclave with dry cycle having following features :

- Fully Automatic table top type front loading autoclave of min 22 litres or more Capacity with facility of triple vacuum cycle
- At least 2 or 3 Separators (trays) to hold different type of instruments / Materials with one removable tray.
- Digital display (LED or LCD) of temperature, time and pressure (to show curve & words)
- The pressure and temperature of the autoclave should range form 15 PSI at 121degC to 30 PSI at 134degC
- The body and trays of the autoclave should be made from corrosion resistant stainless steel.
- Provided with Micro bacterial filter.
- For safety the equipment messaging and warning system should be present.
- Fully microprocessor controlled management for constant monitoring of parameters and control of the autoclave functions with 4 cycles as under:-

E. 2 Cycles for unwrapped loads-134degC -4min.
121degC- 20min

F. 2 Cycles for wrapped loads-134degC -4min.
121degC- 30min

- Separate tanks to prevent recycling of water.
- Auto shut off & stand –by mode
- One water filling tank together with one pipe connection.
- Automatic Functioning with automatic self cleaning of pipe steam generator, pipe and other parts after every 100 or 150 cycles of use.
- Thermodynamic initial vacuum.
- Top design reservoir for convenient watering and cleaning.
- Automatic drying system.
- Micro switch to confirm door closure.
- Safety valve & Safety thermostat.
- The system should be easy to use (User friendly).
- The unit should preferably be CE marked.
- The same unit should have facility to upgrade in future for connectivity to External Thermal printer or Inbuilt thermal printer facility (to keep record of every cycle during use)

2. HIGH END MULTI PARAMETER MONITOR (MODULAR)

- The modular monitor should measure 3/5/12 Lead ECG, Resp, 2-Channel Temperature, SpO2, NIBP, 2-Channel Invasive Blood Pressure,ETCO2. (7 PARA MONITOR)
- It should have bright, highly visible with minimum12.1" color TFT display for easy viewing from a distance.
- The monitor should display at least 8 waveforms traces on a single screen which is integrated with the main unit.
- It should have atleast following features in respect of monitoring:
- 96 hours graphical trends
- 96 hours tabular trends
- The monitor should have option of 12 slots for modules for flexible configuration.
- The monitor should have changeable screen layout for various monitoring settings.
- Data management software based on PC
- Patient data transmission via flash disk
- Configuration setting should be transferred between monitors

- Should be capable of onsite upgradation - C.O. (Cardiac Output), PICCO and SCVO2, AG (Anesthesia Gas), BIS (Bispectral Index), RM (Respiratory Mechanics), ICG (Impedance Cardiography).
- There should be provision for using wireless LAN card & memory card.
- There should be external ports for Keyboard, Mouse, Slave display, Emergency Nurse Call & 4 USB ports.
- The monitor should be capable to support Wireless Networking and compatibility to use with Central Monitoring System.
- There should be mass alarm setup
- It should have priority color coded audio – visual alarm system with bright prompt message on the screen. There should be a separate color coded audio – visual alarm when patient data deviates from normal limits and machine failure, improper function.
- There should be auto identification of ECG lead set, complete ST analysis with ST template and multi-channel Arrhythmia analysis
- The monitor should have OxyCRG screen.
- There should be various calculations like Drug dose, Oxygenation, Ventilation, Renal, and Hemodynamics.
- It should come with dual exchangeable Li–Ion batteries with more than 2 hours battery backup.
- There should be a provision for built-in 3 channel thermal recorder.
- The monitor should have a provision for auto alarm printing i.e. alarms triggers an auto printing.
- There should be hot keys & Icons on buttons and Iconic symbols on touch screen as well.
- The monitor system should be US-FDA and CE Marked for all standard and optional parameter configurations.

3. **MULTIPARAMETER MONITOR**

Should not be less then 10.4" screen.
Should be colourTFT
Should have the good resolution minimum (800 * 600 dots)
Should have the option for real time ecg wave forms and episode.
Should have the standard facility to monitor ECG , NIBP, Spo2 for low perfusion , temp, resp.
Tender is submitted with proper CE certificate for quality assurance.
Trend parameters: Heart rate (or pulse rate), respiration rate, VPC rate, ST level, Event (arrhythmia),apnea (time), apnea (frequency), SpO2, NIBP (systolic,diastolic,mean), Temp.
Trend time: 1, 2, 4, 8 or 24 h
Data storage time: 1 min for 1, 2, 4, 8 hours, 3 min for 24 hour.
Vital Signs List
Parameters: Heart rate (or pulse rate), VPC rate, ST
level, NIBP (systolic, diastolic, mean), SpO2, respiration rate, temperature.
Number of files in list: 120 for periodic list, 120 for
NIBP list
List interval: 1, 5, 15, 30 or 60 min for periodic list, at
NIBP measurement for NIBP list.
Should have the facility of OCRG screen.
Should have the facility to store alarm up to 200 and displayed on the alarm history.
Should have the battery backup of 2 hr,
Should be able to store 16 arrhythmia episodes which can be edited for arrhythmia analysis.
Should have the facility to enlarge the numeric display.
Should have the faculty to freeze the wave forms.

4. **MOBILE C-ARM IMAGE INTENSIFIER UNIT**

HIGH FREQUENCY C-ARM

- The unit should be high quality unit having the below mentioned specifications:
GENERATOR:
- It should be digital with feather touch controls.
- It should be of high frequency with output of 5 KW and frequency of min 40 KHz.
- The KV range should be from 40 to 120KV in steps of 1 KV

- The fluoroscopic mA should be upto 4.0 mA or more
- The radiographic mAs range should be upto 200mAs or more
- Radiographic mA up to 70 mA or more
- Pulsed fluoroscopy should be possible
- The x- ray tube should be dual focus rotating anode. The focal spot of the tube should be 0.3mm and 0.6mm and anode heat storage capacity of 200 KHU or more
- The digital display of fluoro mA, KV, timer & radiography mAs should be provided and the display should be micro- controller based LCD Display
- There should be independent selection of KV & mAs.
- The control should have indicator for power on,
- The control should show error with proper written massage on LCD display for any overload, X-ray Tube heating or any fault in machine.

I.I.T.V. SYSTEMS & MONITORS:

- The image intensifier should be of latest series.
- It should be of 9" triple field (i.e 9"/6"/4") with CCD Camera
- The circular grid (108 lines) should be fixed on the I.I to improve the image quality.
- 2 nos. 17" TFT monitor should be supplied
- The monitor trolley should be provided for mounting 2 monitors and should have 2 shelf for keeping memory and stabilizer & isolation transformer.

C-ARM STAND:

- It should be ruggedly built and should be of good designed.
- It should have steering for controlling back and front wheel movements
- It should also have the below mentioned movements
  - Horizontal travel should be 210mm or more
  - Orbital movement should be 90 + 25 degrees
  - Panning movement should be +/- 12 degrees
  - Focus to I.I distance should be 920mm or more
  - Vertical movement should be motorized of 450mm or more
  - Focus to I.I clearance should be 800mm
  - C- Arm rotation should be +/- 270 degrees

IMAGE MEMORY & ESSENTIAL ACCESSORIES:

- Image memory of 100 frames permanent storage or better.
- 7 KVA stabilizer & isolation transformer to be provided
- It should run on single phase 230 volts, 15 Amps.

- 3 nos quality approved lead aprons to be provided

The quoted model should have AERB NOC or AERB Type approval.

5. <u>30 KW MOBILE DIGITAL X-RAY WITH AUTOMATIC FILM PROCESSOR</u>

- The High Frequency Mobile X-Ray Unit should be capable of all Standard radiographic procedures in Wards, OT, Trauma centre, Emergency and Other rooms & The System should be able to moved into a lift and all patient access areas
- The unit should use Hi-Frequency X-ray Generator Technology of 100KHz or more
- Required Ratings:
  - HF Generator Minimum 30 KW or Higher
  - 400 mA or better
  - 125 kVp or better
  - 200 mAs or better
- The unit should have easy manual movements and must be easy to maneuver within the Hospital areas: surgical rooms, intensive care, emergency, wards etc.
- Should be a fully integrated light weight mobile unit with a easy to use X-Ray System
- Should have excellent movements and easy to turn

GENERATOR:

- High Frequency generator with microprocessor control
- Tube overload protection with continuous Monitoring X-Ray Tube Heat Units
- Programmed anatomical technique with storage of program
- Safety features for overload, tube current, KV, tube rotation etc and auto test for unit.

- 30 KW or higher X-ray generator with a max of 125 KVp or more that should be able to work on 12 amps current. (230v supply 15 amps power plug available at trauma center)
- mA range 50 to 400 mA or more
- KV range 40 to 125 KV or more.
- Time range from 1.1 ms. to 4 sec or more

CONTROL UNIT:

- Feather touch control panel with LCD display for Data and massage.
- Anatomical technical selection and KV & MAS increase and decrease facility

MOBILE UNIT & TUBE STAND COLUMN:

- The unit should have easy manual movement with break
- Unit should have a multi-leaf collimator
- The tube stand column should have a articulated arm for easy reach to patient
- -15 to +100 "Z" axis frontal tube rotation
- Front telescopic crane type & easy to use tube arm
- Maximum Focal Distance should be higher than 180 cm to the floor and minimum of 60 cm to the floor.
- The unit should have a safe and secure cassette housing

X-RAY TUBE - Ratings:

- Maximum KVp: 125 KVp.
- It should be Dual focal spot rotating anode with small focal spot 0.6 mm or better and a large focal spot 1.3 mm or better and Low speed rotor drives 3,000 r.p.m.
- Single Phase 230 VAC 50 / 60 Hz. ±10%.

Accessories:

- 2 light weight 0.5mm lead aprons to be included in the offer
- Gonad shield for boys and girls – One each

Others:

- The x-ray unit should meet CE or FDA standards
- The system offered should have AERB Type approval/ NOC for installation and use in India

AUTOMATIC FILM PROCESSOR FEATURES REQUIRED :

- Automatic X-ray Film Processor table top model for processing all standard size x-ray and imaging films upto 14" x 17" size
- It should have capability to process a minimum film size of 4" x 4" and above
- The processor should have high quality rollers of plastic / rubber as needed and they should be made of long lasting material
- The transport system should be controlled by a micro processor - built in to the system and should be able to provide uniform and smooth transportation
- There should be provision to set up the processor for output times of 90/105/118/135 or 167 secs, depending on the requirement of the user - at the time of installation or during service - based on the customers request
- The processor should have capacity to process atleast 140 films per hour (12" x 10" size) or over 80 films of 14" x 17"
- Developer and Fixer temperatures should be adjustable - in steps by the user
- Drier temperature should be adjustable, if needed &
- The minimum capacity of the developing / fixing and water tanks should be 5ltrs or more
- There should be a reservoir provided where fresh chemicals of 20ltrs can be stored
- There should be a provision for replenishment of fresh chemicals from the reservoirs - automatically, based on the films processed
- The amount of chemicals replenished should be adjustable, depending on users request
- Fresh water for rinsing the films should be circulated into the wash tank. This should be controlled automatically - mention liters per hour
- The processor should be controlled by a micro processor with display of Bath temperature
- Should have provision to put the machine on standby mode automatically when not in use
- The processor should be in a ready state and respond immediately upon insertion of a film - to process. All bath temperatures should be automatically maintained even during standby mode

- The bath dryer should have jets / venturies that ensure uniform drying of films across the entire area. Please provide technical documents and explain how to avoid wet patches / non-uniform drying
- The processor tanks should be made of non-rust material. Special plastic with monocoque shell construction of the tank area would be preferred. Shell : 2 part body shell is must for easy serviceability
- The processor should be designed to provide easy access to the electrical and micro processors for service and settings - without the need to tilt the processor or drain the chemicals - saving time and ensuring no wastage of chemicals
- The processor should have a small foot print - not more than 0.5 sq mtrs
- The manufacturer should be ISO registered
- Mention if product is compliant to any international standards such as CE
- The manufacturer should have easy availability of spares - locally in India
- The manufacturer should have fully trained engineers in the field to service the processors and ensure maximum uptime

6. <u>DEFIBRILLATOR MONITOR</u>

General

Display : 320 x 240 pixels, Blue LCD with LED backlit
Display area : 120 mm x 90 mm
Dimensions : H180 x W 230 x D300 mm (Max) without Paddle
Weight : 4 Kgs. Max.

Power Supply

AC mains through adaptor
Input : 150 - 260 VAC, 50 Hz, 1 Ø
Output : 17 @ 4 A.
Battery : 12 V 3.8 Ah.
Back-up time : 2 hours min. on full charge in ECG mode
50 shock of 150 Joules deliveries (Full charge).
Power consumption : 30 Watts (max.) in ECG mode
Fuse : 5A/250V, Size-20mm glass, slow blow fuse

Environmental

Operating Temp. :-5ºC to +50 ºC
Humidity : up to 95 % non-condensing

Defib

Operating Mode : Manual
Waveform : Biphasic
Energy : 2 to 200 joules in 12 steps selection
Synchronous Cardio Version : Energy delivery begins within 60 ms of the QRS Peak
Charging Time : Less than 12 seconds
Paddle Assembly : External paddle assembly with coil retractable high voltage cable. Adults & Pediatric paddle integrated to same handle
Check Mode : Manual test mode
Operation : By front Panel keyboard

ECG

Frequency response : 0.5 Hz to 35 Hz
Patient isolation : Optical isolation
Lead selection : Lead I, II and III
Gain setting : 0.5, 1.0 and 2.0
CMRR : > 90 db
Sweep Speed : 12.5, 25.0, 50.0 mm/sec
Waveform 1 : ECG
Waveform 2 : 4sec delayed (cascaded)
Data Output : Analog output of ECG
Digital filter : Digital signal processing for good quality of ECG
Freeze mode : To freeze last 4 seconds ECG

Heart Rate

Range : 30 – 250 BPM

Accuracy : +/- 2 BPM
Resolution : 1 BPM
Tone : Beep on every QRS detected
Low alarm limit range : 30 – 240 (step of 5)
High alarm limit range : 40 – 250 (step of 5)

7. SYRINGE INFUSION PUMP

- Syringe Pump front loading should accept 10, 20, 30, 50 ml syringes of known brands as well as CUSTOM programmable syringe.
- Flow rate range should be 0.1-990.0ml/hr .
- Time limit should be 00:01 to 23:59 (hrs:min).
- Volume limit should be 0.1ml to capacity of syringe.
- Unit should be PCA upgradeable.
- Unit should have facility for time locked BOLUS / PCA facility & administration counter and display for the same.
- Unit should have minimum six stage programming of target time and target volume.
- Occlusion should be of three levels low, medium and high.
- KVO (Keep Vain Open) rate should be programmable from 0.1ml/hr to 10 ml/hr.
- Unit should have LED display of flow rate & LCD display for infused volume and elapsed time.
- Unit shout have Display of Drug name on LCD
- Unit should have minimum 25 drug library with choice of personalized library.
- Unit should have automatic rate calculation with volume and time limit.
- Unit should have body weight based rate calculation programming.
- Unit should have stacking facility with normal or optional power cord.
- Battery back up should be 4-5 Hrs @ 5 ml/hr.
- Unit should have audio visual alarms for occlusion, end of syringe, Syringe displaced, No Syringe, Wrong Syringe, Pre alarm for end, Invalid rate, Invalid target volume, Invalid target time.
- Accuracy should be +/ -2% for volume and time.
- SHOULD have ISO- 13485 certification
- UNIT Should be CE CERTIFIED

8. 100 MA X-RAY MACHINE

- X- ray machine : 100 mA X - ray Machine counter balance mobile stand.
- X- ray machine : 100mA -100 KVP full wave multipulse rectified generator with BEL DSA - 3/DSA-2 X-Ray tube or AERB approved fine focal spot tube
- Output : 8 Kw or less
- KVP range 45 to 100 KVP in steps of 5 KVP step
- Control: complete with voltmeter ,mA meter .Quick trip, overload circuit breaker, voltage compensator,
- Tube head : Having BEL DSA-3/DSA-2 and high voltage transformer.
- Machine safety device- Electronic sensor to protect X-Ray tube and high voltage transformer from overloading. Quick tripoverload circuit breaker.
- Collimeter : Light beam cum shutter diaphragm.
- Power supply requirement : 230V, 50 Hz , single phase,15 Amps.
- Stand : Mobile stand with counter balanced, Articulated tube carriage allowing movements of the tube head in vertical and horizontal plane lead lined cassette strong box.

9. ULTRASOUND UNIT

- Should be high quality full digital beam forming portable ultrasound unit with high quality Image acquisition system
- Minimum 10 inch screen with high contrast resolution
- Should have dedicated bakelite hot-keys on console to provide one-touch switching between imaging applications and user profiles for maximum efficiency and ease of use.
- Two probe simultaneous connectivity

- Facility to start rapid for high emergency trauma use
- Cine Memory of 365 frames or more
- Full measurement package for OB/gyne, abdominal, cardiac, urology etc.
- Data management facility with quick reviews & retrive of stored images
- USB connectivity facility
- Multi frequency Convex probe of 2-5 MHz with central frequency of 3.5 MHz
- B, 2B , 4B , B/M & M modes
- Should have advanced Imaging technology with powerful full Zoom
- Should have advanced tissue harmonic Imaging facility for dedicated high quality Images
- Should be provided with suitable UPS and thermal printer

10. **CAUTRY UNIT (RADIO FREQUENCY SURGICAL UNIT FOR MULTIPLE APPLICATIONS IN SURGERY)**

- Radio frequency Cautery with 4 MHz frequency provided with Monopolar and integrated Bipolar operation. Output Power up to 100 watts.
- There should be digital display for power output.
- Monopolar should have cut, blend and coagulation modes.
- Unit should be provided with Smoke Evacuator with double filtration (HEPA and charcoal) 99.99995% efficiency, with safety against HPV and other virus.
- Smoke evacuator should have exclusive dual mode activation for remote or manual activation.
- Should be provided with three bendable electrodes, water proof foot switch
- Should be provided with following electrodes for various surgical application:
    - 3 electrodes for skin/plastic surgery (straight ball dia 3 mm, round loop dia 5 mm for biopsy & lesions excision, cut electrode for incisions)
    - 2 electrodes for general surgery
    - 2 loop electrodes for Gynae cervical surgery, with autoclavable vaginal speculum
    - One 360 degree rotating conisation electrode
    - 2 electrodes for laryngeal surgery, one for turbinoplasty, one for UUUP, two for endo nasal
- Unit should be provided with autoclavable bipolar forceps and cable.
- Optionally quote for various monopolar electrodes for various application

Unit should be CE Marked.

LIST OF APPROVED MAKES MEDICAL EQUIPMENTS
LEVEL II (PART 1)

SL. NO.	ITEM	MAKE
	MEDICAL EQUIPMENT WORKS	
1	**Ventilator - High end – Imported** **Ventilator - Imported**	**TakaoKa/MAQUET./Drager/ Space lab/teema** **TakaoKa/MAQUET./Drager/ Spacelab/teema**
2	**ICU Beds with siderack cum Over Bed Table - Imported**	**Givas / Stryker / Merivaara/ Volker/Hill Rom/ Humtlegh**
3	**Recovery Trolley cum High End - Imported**	**Givas / Stryker / Merivaara/ Volker/HillRom/tarsus**
4	**Crash Cart & Instrument Trolley - Imported**	**Weinmann/ tiano/ Hanlim/ Metro**
5	**Blood Gas Analyser - Imported**	**IL / Opti / Eschweiler/ Radio meter/ roche**
6	**Bio Chemistry Analyser - Imported**	**IL / advia/ Roche/ Mindray/ Olympus**
7	**OT Table - Imported**	**MAQUET / Dr Mac/ Brumaba/ Strykar/ Berchtold**
8	**OT Light (Double Dome) - Imported**	**Stryker / MAQUET /Dr. Mac/ trilex/ Berchtold**
9	**Anesthesia Work Station - Imported**	**Penlon / Drager / G E/ Infinium/ Spece lab**
10	**Cautery Machine - Imported**	**VALLEY LAB / Eschman / Erbe/ Uzumcu/Zeiss**
11	**Surgical Instruments Kit**	
12	**Medical Gases Pipeline system Oxygen Manifold** • **Oxygen single Cylinders Emergency System** • **Terminal Units (Gas Outlets) with probes/Adaptors** • **Oxygen Flow meter & Humidifier Bottle** • **Ward Vacuum Unit** • **Suction Jas Will Have the following** • **Valve box** • **Medical Gas Alarm (Main & Area)** • **Vacuum System** • **Copper Piping** • **Horizontal Bed head Panel** • **N2O cylinder emergency system** • **Single Arm Moveable Pendant for Operatio Theatre**	**Ohio / Penlon / Allied/ Beacon medaes**

13	**Mortuary Cabinet - High End**	**Dalucon Refrig./Kugel Medical/metalarredinox**
14	**Scrub Station for OT**	**PES / SHD/ MDD/surgicoin**

Note:

1 **Wherever makes have not been specified for certain items the same shall be as per BIS and as per approved by Engineer- in-charge/Consultant.**
2 **Contractor shall be required to get the finishing items approved in respect of their make, specification, finish, texture, and colour etc.**

MEDICAL EQUIPMENT (PART II) (LEVEL–II)

S. NO.	ITEM	MAKE
1	RAPID AUTO CLAVE	Runeys
2	VIDEO OTOSCOPE, BRONCOSCOPE & LYRANGOSCOPE	Olympus,Pentex, Wolf, Carl Storz, Reema
3	LAPAROSCOPY SET OPERATING	Olympus,Pentex, Wolf, Carl Storz, Reema
4	CENTRAL MONITORING STATION	GE, PHILIPS, infinium, L&T, Progetti Medical
5	HIGH END MULTI PARAMETER MONITOR	GE, PHILIPS, infinium, L&T, Progetti Medical
6	MULTIPARAMETER MONITOR	GE, PHILIPS, infinium, L&T, Progetti Medical
7	30 KW MOBILE DIGITAL X-RAY WITH AUTOMATIC FILM PROCESSOR	GE, philips, siemens, intermedical, allengers
8	MOBILE C-ARM IMAGE INTENSIFIER UNIT	GE, philips, siemens, intermedical, allengers
9	3D COLOR DOPPLAR UNIT FOR GENERAL & CARDIAC USE	GE, philips, siemens, MEDISON, ALOKA
10	BIPAP	GE, PHILIPS,RESMED
11	BIPHASIC DEFIBRILLATOR MONITOR	Ge, Philips, Infinium, Schillar,Cu Medical
12	SYRINGE INFUSION PUMP	B BRAUN, SIMTEK, TOP
13	100 MA X-RAY MACHINE	GE, philips, siemens, intermedical, allengers
14	CAUTRY UNIT	VALLEY LAB / Eschman / Erbe/ Uzumcu/Zeiss

Note:

2 **Wherever makes have not been specified for certain items the same shall be as per BIS and as per approved by Engineer- in-charge/Consultant.**
2 **Contractor shall be required to get the finishing items approved in respect of their make, specification, finish, texture, and colour etc.**

LIST OF APPROVED MAKES MEDICAL EQUIPMENTS
Level III (PART-1)

SL	ITEM	MAKE
	MEDICAL EQUIPMENT WORKS	
1	Ventilator - High end – Imported	NEWTECH/TEEMA/AIRSYS/
2	ICU Beds with siderack cum Over Bed Table - Im	CGM/ JANAK/ SURGIDENT/
3	Recovery Trolley cum High End - Imported	CGM/ JANAK/ SURGIDENT/
4	Crash Cart & Instrument Trolley - Imported	tiano/ Hanlim/ Metro
5	Blood Gas Analyser - Imported	IL / Opti / Eschweiler/ Radio meter/ roche
6	Bio Chemistry Analyser - Imported	IL / advia/ Roche/ Mindray/ Olympus
7	OT Table - Imported	Brumaba/ SYSMATEC/ STERIS/
8	OT Light (Double Dome) - Imported	SURGIDENT/ HUIFENG/ ACME
9	Anesthesia Work Station - Imported	NEW TECH / Infinium/ AEONMED
10	Cautery Machine - Imported	Uzumcu/Zeiss/ALAN/
11	Surgical Instruments Kit	
12	**Medical Gases Pipeline system Oxygen Manif** • Oxygen single Cylinders Emergency Syst • Terminal Units (Gas Outlets) with probes/Adaptors • Oxygen Flow meter & Humidifier Bottle • Ward Vacuum Unit • Suction Jas Will Have the following • Valve box • Medical Gas Alarm (Main & Area) • Vacuum System • Copper Piping • Horizontal Bed head Panel • N2O cylinder emergency system • Single Arm Moveable Pendant for Operat Theatre	Ohio / Penlon / Allied/ Beacon medaes
13	Mortuary Cabinet - High End	Dalucon Refrig./Kugel Medical/metalarredir
14	Scrub Station for OT	PES / SHD/ MDD/surgicoin

Note:

3 Wherever makes have not been specified for certain items the same shall be as per BIS and as per approved by Engineer- in-charge/Consultant.

2 Contractor shall be required to get the finishing items approved in respect of their make, specification, finish, texture, and colour etc.

MEDICAL EQUIPMENT (PART II) (LEVEL–III)

S. NO.	ITEM	MAKE
1	RAPID AUTO CLAVE	Runeys
2	VIDEO OTOSCOPE, BRONCOSCOPE & LYRANGOSCOPE	TIANSONG/ SHOLLEY/Wolf, Carl Storz, Reema
3	LAPAROSCOPY SET OPERATING	TIANSONG/ SHOLLEY/Wolf, Carl Storz, Reema
4	CENTRAL MONITORING STATION	VOTEM, infinium, L&T, Progetti Medical
5	HIGH END MULTI PARAMETER MONITOR	VOTEM, infinium, L&T, Progetti Medical
6	MULTIPARAMETER MONITOR	VOTEM, infinium, L&T, Progetti Medical
7	30 KW MOBILE DIGITAL X-RAY WITH AUTO FILM PROCESSOR	Allengers,NARMUKH/ ADVANCE/ TRIVITRON
8	MOBILE C-ARM IMAGE INTENSIFIER UNIT	Allengers,NARMUKH/ ADVANCE/ TRIVITRON
9	3D COLOR DOPPLAR UNIT FOR GENERAL CARDIAC USE	LANDWIND/ MEDISON/MINDRAY
10	BIPAP	BMC/ HYGIA/
11	BIPHASIC DEFIBRILLATOR MONITOR	UNIVERSAL/BPL/Cu Medical/MINDRAY
12	SYRINGE INFUSION PUMP	B BRAUN, SIMTEK, TOP
13	100 MA X-RAY MACHINE	Allengers,NARMUKH/ ADVANCE/ TRIVITRON
14	CAUTRY UNIT	Uzumcu/Zeiss/ALAN/

Note:

4 Wherever makes have not been specified for certain items the same shall be as per BIS and as per approved by Engineer- in-charge/Consultant.

2 Contractor shall be required to get the finishing items approved in respect of their make, specification, finish, texture, and colour etc.