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Scope of the work

- **Entire work specified in this tender should be carried out on Turnkey basis.**

- Construct a Tier-III compatible level Data Center as per TIA 942 specifications for the proposed works mentioned in this tender and renovate the remaining space of the ITG first floor area as per the design shown in the Annexure-I. It is recommended and advised that the vendor should verify the design dimensions by his own technical group to ensure the accuracy and for appropriate corrections if any.

- Site Preparation in terms of the civil, electrical and mechanical work, supply of all necessary materials and to construct the proposed raised floor, ramp, false ceiling, partitions, doors, raceway design for data and power cabling of the Data Centre, electrical wiring with distribution panels, ducting, conduits for Power and Data cables and each units allied accessories related work. All construction materials including electrical cables to be used in the construction of Data Center server room should be of non-combustible, fire retardant quality. The scope also includes painting, thermal insulations and any other miscellaneous works as per site requirement.

- Supply, installation, testing and commissioning of the specified UPS, Precision Air-Conditioning Systems, Integrated Building Management System, Server Racks and allied accessories of each systems as specified in this tender.

- Supply and install all furniture: Workstations tables, Work table, Storage Units, Chairs as per design in the remaining area and as per technical specification specified in this tender.

- Shifting and rerouting of all the existing optical and network cables from the ground floor server room to the network racks installed in the renovated location with proper cable routing facility taking into consideration the future needs.

- For all supplied and installed systems, Vendor should submit the respective OEM’s acceptance letter to provide on-site service support during the initial three years warranty period and later under AMC for 4th and 5th year.

- As the contract is on Turnkey solution basis, any other miscellaneous requirements related to the above scope should be provided by the successful vendor even if those items are not mentioned explicitly in this tender.

The successful vendor should provide the following documents to NIO on completion of the work.

1. All Design Documents including Detailed Project Report with Initial, working and Final
2. Drawings for Electrical, Civil, UPS, HVAC and IBMS Infrastructure confined to the Data Centre Requirements.
6. Operations and Maintenance manuals of the equipments installed in the Data Centre, including Standard Operating Procedures, Equipment Handling and fault analysis techniques, AMC Scheduling, Data Centre Monitoring, Reporting and Escalation Matrix for all the areas, Preventive and Predictive Maintenance Scheduling Formats.
Design Layout of the Data Center and adjoining area:

The first floor internal design layout for the Data Centre and the adjoining area is as below. For all measurements refer the attached AutoCAD file “NIO data center layout.dwg”.

![Data Center Layout Diagram](image-url)
Site Preparation:

The Data Center area should be built as per the design layout with non-combustible material in server room area as per the given specification and should provide an aesthetic, lasting and technically superior infrastructure. **NFPA Guidelines and Standards** may be used for all the fire rated walls and partitions materials.

The scope of work shall include but not limited to the following:

1. Dismantling of existing partitions, other fixtures and allied items.
2. Removing of existing electrical fixtures and allied items.
3. Related Civil / Masonry works for filling cable trenches, Flooring, wall opening / closing, door fixing and repairs if any to prepare the site for renovating as per the design and specifications of this tender.
4. Thermal Insulation of the server room floor.
5. Raised flooring with suitable pedestal assembly.
6. Metal perforated false ceiling with suitable assembly.
7. Server room Partitioning, doors, visual glass windows (2 hour Fire rated)
8. Doors, Windows, Storage and Furniture as per the design
9. Structured Cable Tray arrangement in all areas
10. Fire rated Paint work inside the server room
11. Other miscellaneous civil work, hardware as per site requirement

Technical Description for Interior Works:

Dismantling:

a. Removing of existing wall paneling, partitions, false ceiling, electrical fixtures, any other unwanted items and carting away all debris from site and cleaning of site.

b. Removing existing selected Door frames with shutters from walls, including holdfasts and all other hardware and fittings and carting away all debris from site as directed.

c. Removing the two selected old Window frames with shutters from walls, including holdfasts and all other hardware and fittings and carting away all debris from site as directed.

d. Removing of all existing Electrical Fittings including the cabling, wiring, panels, distribution boards and carting away all debris form site to the identified location.

e. Any other unwanted old materials / fixtures in the first floor area.

Brick works

All the existing cable trenches in the structural floor of the first floor area should be filled with suitable plain cement concrete of 1:2:4 mix @ finished with cement mortar of 1:4 mix and surface should be made smooth finish. Brick work to cover all existing openings in the wall mainly used for the window air conditioner units and all windows of the wall behind the proposed PAC systems and fire suppression systems as per the given design. The bricks should be of class designation 40kg/sqm with cement mortar 1:4. This work involves supply of all required material and construction of proper wall by laying bricks of approved quality to make uniform surface of wall both internally and externally. Any other open space like old ducts in walls or floor trenches in first floor area needs to be closed and smoothly finished.

Plastering with cement mortar 1:5 (1 cement : 5 sand) of 12 mm thick in interior face of the walls and concrete columns including hacking the concrete surface brushing, scaffolding, curing and surface shall be smooth trowel finish as per standard specification. If required the walls shall be gently removed by using chisel and hammer without disturbing the existing infrastructure and structure.

Similarly as per the given design suitable civil works should be carried out for the proposed first floor main entrance door, general building emergency exit door and exit door from store room. The exit door from store room is proposed for easy and quick access to the AC outdoor units. All these three door work involves breaking of the existing external walls to a required door size and related brick works suitable to fix the proposed door frames and finishing with sand cement plaster. Accordingly, the existing first floor main entrance glass door should be replaced with brick wall with smooth finish matching to the existing old wall portion.
In addition after removing of existing old wall paneling, partitions, false ceiling, electrical fixtures, any other unwanted items the complete first floor interior walls, floor and ceiling should be checked and repaired suitably if required.

Server Room:

Server room infrastructure should be Tier-III compatible level as per TIA 942 specifications for the proposed works mentioned in this tender. All infrastructure materials used for server room site preparation and entire electrical / data cable works of the data center should be Non-combustible or Fire Retardant quality. In addition the server room partitioning walls from floor to ceiling and perimeter wall should be with the smooth surface finishing.

Thermal Insulator:

Thermal insulator should be laid on the structural floor to prevent heat gain inside the data center. The floor would be heat-insulated with a heat insulating material to avoid condensation on floor and to reduce the heat transfer in the server / network room area. All the existing cable trenches in the structural floor of this server room area and other areas should be filled with suitable tiles or cement mortar and surface should be made smooth finish before the thermal insulation. The floor insulation should be done with 13 mm thick self adhesive aluminum foil face Nitrile rubber. The junction between the insulator and fixtures has to be watertight and airtight.

Pedestal Assembly:

The server room raised floor tiles are supported on pedestals made of steel construction and yellow Zinc coated with exposed surface having a coating of special weather coating. The 25 mm dia pedestal with bottom plate of 100 x 100 x 2mm thick, top plate of 75 x 75 x 3mm thick with required threaded bolts and nuts for leveling adjustment should be provided. The stringer is of 1.10.mm thick rectangular pipe of 22 mm x 26mm x 573mm. Anti vibration rubber pad shall be provided below base plate. The entire system shall enable to provide 450 mm +/- 50 mm access flooring and including all the operation of fixing the pedestal to existing flooring with anchor bolts complete as per manufacturer's specifications. No sharp edges or corners shall be exposed from pedestal head when floor panel is removed. The raised floor pedestal arrangement should withstand the static load of the fully loaded rack weighing about 1500 Kg/sq.mts with additional 50% safety margin.

The stringer is of 1.10.mm thick rectangular pipe of 22 mm x 26mm x 573mm. Anti vibration rubber pad shall be provided below base plate. Stringer system is hot dipped galvanized sheet, construction having channel, with pre-punched counter and holes at both ends of the top face for securing the stringers on to the pedestal head to be fixed with screw ensuring maximum lateral stability in all directions. The grid formed by the pedestal and stringer assembly shall receive the floor panel. The stringer system would be earthed properly by using proper branded copper wire. This is required for some of the servers as transient grounding or signal reference.

Raised Floor:

The server room floor should be designed for standard load confirming to BIS 875-1987. The server room should have access flooring made of steel cement cavity flooring system having Heavy Duty point load capacity 675 kg and uniform distribution load (UDL) 2025 kg per sq. meter load bearing 18 gauge tile size of 600mm x 600mm, thickness 35 mm, treated for corrosion and coated epoxy conductive paint. The tile is covered on top with high pressure antistatic hot pressured laminated sheet in required shade and colour. The edges of the laminated are protected with black Conductive PVC edge trim 5mm wide on all sides and this edge trim is mechanically locked and sealed in place to avoid detachment. The floor panels must have conductive contact with the framing / the pedestals, or both for positive electrical grounding. The tile is made of steel sheet at top and bottom with cavity filled with epoxy mix cement, bottom surface powder coated with 64 round embossing. The interior of the panels will be filled with non-combustible cementious compound. The tile should have the Flame spread of 20 or less in class 1 as per ASTM E84 and Wear Resistance (g/cm²) < 0.08. The plenum area formed under the raised floor must be clean, sealed, dust free, fitted with a vapour barrier.

Perforated floor panels with dampers as per the design should be provided on the designated floor for air delivery for twelve racks. The placement of perforated panels and the number shall be decided as per the PAC / Server racks layout. Additional 4 numbers of spare perforated floor panels, two sets of Special tools and Tackles required for operation of false flooring shall be supplied.
**Ramp** is to be provided from true floor level to raised floor area at the entrance of Data Center as per the specified design. Ramp area should be designed and installed to building code requirements.

**False Ceiling:**
A modular and grid system, access False Ceiling at appropriate height should be installed which also supports the concealing all optical fiber cables, electrical power and lighting wiring with suitable cable tray in all areas. It also serves as a plenum for lighting fixtures and PAC units. All the ceiling lights will be mounted on the false ceiling and suitably supported from the true ceiling.

**For Server room:** The **metal false ceiling** should be powder coated 0.5mm thick hot dipped galvanized steel tiles of size 600mm x 600mm with regular edge (10mm) suitable for 25mm grid supported on powder coated galvanized steel grid. The false ceiling would be inclusive of cutouts for lightings, for PAC return air grills, Fire detectors and any other sensors as specified in this tender.

**For Auxiliary / Other areas:** Acoustical false ceiling of mineral fiber Board (600 x 600 x 15mm) of Armstrong or equivalent type laid on Grid system (Micro lock edge) with 15mm thick T section (White) having main runner 1200mm x 600mm, cross Tee at 295 HT. Mineral Fiber Board modular False Ceiling in Armstrong in Board edge Fissured ANF tiles of size 600mm x 600mm x 15mm having Noise reduction Co-efficient 0.5, light reflection over 75%, Relative Humidity 99%, fire performance class0/class1 (BS 476) 24XL - Hot Dipped Galvanized Steel Suspension System having rotary stitching on main runner, 1200 mm & 600 mm cross tees with 15mm wide flanges of white color with standard perforation of 2.5mm dia. (16% open space) fleece with NRC of 0.70 & CAC 36, fixed to the structural soffit by Butterfly clip hangers, suspension wires & anchor fasteners as per the manufacturer’s specification, Suspension wires to be provided at every 600mm c/c with two nos of ties on each anchor fastener, Perimeter trim of Trulok wall angle in white color secured to wall at 450mm maximum centers.

**Partitioning Walls:**
The internal partitions for server room shall be 2 hours fire rated, full height 122 mm thick fire line Gyp Board using 12.5 mm thick double fire line non-combustible gyp-board on both sides with GI sheet metal vertical stud frame of size 72 mm thick fixed in the floor and ceiling channels of 72 mm wide to provide a strong partition. Glass wool insulation inside shall be provided as required. Fixing shall be made by self tapping screw width vertical studs being at 610 mm intervals. The proposed area for the power distribution panels should be strengthened with Bison board of suitable size. The same should be inclusive of making cut-out for switchboards and sockets etc. It shall also include preparing the surface smoothly and finally finishing with one coat of approved brand of fire resistant coating.

All other partitions in the Support area should be only chest height ie partitions of 1400mm height to be made of Godrej make aluminum frame. The partitions close to the main door entry should be aesthetically designed with fabric tiles. The partitions in the working area should be with perforated metal tiles at the bottom and at top with fabric tiles and frosted glass tiles. (Refer Godrej Spacio catalogue for Office systems for all these partitions work)

**Server Room Structured Cabling:**
As per TIA -942 guidelines all cables (Power & Data) will be carried under the raised flooring in separate raceways. The power cables will be carried through raceway beneath cold aisle and the data cable will be extended in raceways under the Hot Aisle. In the false ceiling area a proper structured cable ducting should be provided for the electrical and networking cables which are separately placed with a minimum distance of 400 to 500 mm. Below the raised floor area, from UPS distribution panel electrical power cables to all racks and Network cables between servers, network racks and service provider interface box location should be laid through the suitable cable tray arrangement. Three number of 1.5 inch PVC pipes from raised floor to ceiling should be provided at the optical fiber interface units for routing all incoming fiber cables from service provider and outgoing fiber / Ethernet network cables to other buildings. As well as in the outside wall of the building for routing these external network cables, three numbers of 3” dia PVC pipes from the first floor ceiling level to building ground level should be fixed.
Bison Board:
Providing & fixing of 2 numbers of 12 mm thickness, 4’ x 2’ and one number of 12 mm thickness, 3’ x 2’ fire resistant bison board on the fire rated gypsum partition walls of the server room to provide sufficient strength and to mount electrical distribution panels, hand fire extinguishers, optical fiber interface box, Telephone junction box, etc as per the given design.

Doors:
Total seven doors, 2 hours fire rated are required as shown in the design layout.
1. Server room entry door - height as per partition.
2. Server room emergency exit door. - height as per partition
3. Ante room entrance door - height as per partition
4. Store room entrance door (existing height)
5. First floor main entrance door -height of door 2.1m
6. First floor Emergency exit door height of door 2.1m
7. Store room exit door to outdoor AC Units height of door 2.1m

Lintels of RCC of 1:11/2:3 mix & tor steel on all new doors (5,6 & 7 as above) in existing walls

Specification for Fire rated Doors (7 Nos):
Fire rating for 120 Minutes, Conforms to IS3614 (PART-2)1992, BS476 (PART 20 & 22) and ISO834.
Material: Door Frames and Leaves are made from Galvanized Steel
Door Leaves: Constructed from 1.0mm thick galvanized steel sheet formed to provide a 48mm thick fully flush, double skin door shell with seamless welding joint all around. The internal construction of the door shall be specially designed with infill to give 2 hours fire rating.
Infill: All the doors will have Honey Comb Crafted Paper or equivalent infill.
Door frame: Produced from 1.6mm galvanized steel sheet formed to single rebate profile of size 125mm x 57mm (+/- 0.3mm) with a maximum bending radius of 1.4mm. The necessary fixing arrangements should be provided to mount the doorframes to the gypsum partition.
Vision Glass: 2 hours Fire Rated Vision Glass with 6mm thick clear glass in rectangular shape dimensions of 200mm x 300mm to be fixed as per the given design.
Finish: The door frames and shutters are Zinc Phosphate with epoxy primer and finish with PU paint. All doors should have suitable locking mechanism with 3 keys each.

- Automatic door closures, Seals for Air Tightness and Automatic Door Bottoms should be provided to four doors (Server room doors – 2 Nos, Ante room entrance door – 1 No. and the first floor main entrance door – 1 No.).

Windows:
Vision Glass Window – in Server Room Partition walls:
All vision glass windows, fixed type proposed in the server room partition walls should be double glass panel with internal side having 2 hours fire rated wired mesh glass of 5 mm thickness or more and the outer side toughened glass of 6 mm thickness or more. Glasses should be properly fixed in the SS frame work suitable for 122mm thick server room partition wall. of size 1500mm(w) x 900mm(h).

Windows in other area:
Two numbers of existing fixed glass windows to be replaced with openable type with aluminium heavy section 14/16 swg with 6 mm thick toughened glass with reflective sun control film on window glasses of make Garware or equivalent including all fixture and fittings, like handle, tower bolt etc.

Vitrified Flooring:
Thick, full body vitrified tiles 600 x 600 size conforming to IS 15622:2006 with anti skid matt finish vitrified tiles should be provided for entire first floor area other than server room. All areas should have 6" skirting. Necessary edge, hole cutting and chamfering and miter joints shall be done wherever required. The finished material shall be protected against wear and tear and other works using heavy duty PVC sheets and 40mm thick Plaster of Paris. This shall be cleaned with suitable acid or by other cleaning solutions as soon as the place is ready for occupation or on completion of all planned interior works. The new tiles should be fixed over the existing floor by using suitable standard chemical adhesive bond and at the end the vitrified flooring should be finished as per the manufacturer’s recommended procedure.
- It should be ensured there is 100 % coverage of the adhesive behind the tiles.
- The adhesives layer should be approximately 10 to 15 mm thickness.
• While using adhesive it is very important to maintain level and flatness.

Fire resist putty:
3M™ Fire Barrier Moldable, 1/8" thick synthetic elastomer in tumescent fire-resist putty should be used for sealing against smoke, gases and flames at appropriate locations to restore the integrity of fire rated building construction.

Floor Slab concrete:
The existing floor slab opening should be closed by using appropriate steel & concrete as per standard slab construction methods to maintain the required strength. This work must be planned and carried out at the end after shifting all the servers in-use which are all located just below this area in the ground floor of the building. Due to this the finishing of this surface with vitrified tiles also should be planned accordingly.

POP Finishing and Painting

Anti-dust type fire retardant quality painting shall be used in all areas of the Data Center.

Gypsum / Plaster of Paris paste of thickness 10 -12mm punning over cement plaster shall be provided so as to ensure a level and smooth texture to the exposed walls and columns. The existing surfaces are to be scratched, cleaned and markers are kept before the application of punning material. After the material has dried upon application, it is to be smoothened by means of rubbing it with sandpaper. Over this smoothened surface one coat of primer and two coats of plastic emulsion paint of approved make & shade is to be applied. This will be applicable for all vertical plane surfaces and for fire line gyp-board ceiling. Server room shall additionally be applied with painting putty to level & plumb and later painting with 2 coats of fire retardant painting. Server room true ceiling to be painted with anti-dust type fire retardant paint.

All inside walls in the renovation area of the 1st floor should be finished & painted with acrylic plastic emulsion paint of approved make and shade to give an even shade over a primer coat and 2 finishing coats of plastic emulsion.

Furniture

Work Table as shown in the design for FM group, BMS area including in-built arrangement of computer keyboard tray, drawer with lock facility should be provided from Godrej make items described in their Spacio catalogue for Office systems. Also 8 numbers of 2 Drawer plus 1 file mobile pedestal with metal fronts storage unit for below work table - as per Godrej Spacio catalogue should be provided.

In addition, each person’s work table should have the following provisions.
Data Points: Intercom with RJ11 Socket – 1 No. and LAN port with RJ45 Socket -2 Nos. All the electrical, telephone and LAN cables should be neatly wired by using concealed wire management system provided by Godrej Interio Office Spacio tile based system.

Work table size:
• Partitions with 1400mm height, 3” thick partitions with 1” thk table top finished with laminate and with computer keyboard tray as per Godrej Spacio Catalogue
• Rectangular with straight edges - 1800(w) x 750(d)mm
• Rectangular with peninsular edge on one side - 1800(w) x 750(d)mm
• Rectangular with straight edges - 1700(w) x 750(d)mm
• Profile A type with peninsular edge on one side - 1800 x 1800 x 600(d)mm
• Profile A type with peninsular edge on one side - 1800 x 1800 x 750(d)mm
• Rectangular with straight edges - 1600(w) x 750(d)mm
• Rectangular with peninsular edge on one side - 1700(w) x 750(d)mm
• Connecting piece as per the layout
• 2 Drawer plus 1 file mobile pedestal with metal fronts Storages

Chairs
12 numbers of Multi task Revolving Chairs Godrej make Model number PCH-7031.

**Full Height Storage** (as per the design): Providing & fixing Storage cabinets made out of 25mm marine plywood laminated on both sides, duly laminated shutters and 5 numbers of internal shelves in each storage. Rate should be inclusive of necessary Hardware, SS D-shaped cabinet handle 150mm long, Lock sets, self-closing hinges and spring loaded shutter latch inside.

**Low height storage** (as per the design): Providing & fixing Storage cabinets of 1400mm height made out of 25mm marine plywood laminated on both sides including duly laminated shutters, 3 numbers of intermediated shelves, finished both sides with laminate. Rate should be inclusive of necessary Hardware, SS D-shaped cabinet handle 150mm long, Lock sets, self-closing hinges and spring loaded shutter latch inside.

**Electrical Infrastructure:**

Electrical work involves supply of all materials, fixing and wiring of all Distribution boards, Associated Cabling and Cable terminations, Lighting fixtures, Point wiring, Earthing System, Cable raceways, other and miscellaneous items as per the data center design. All power, communication, data cabling should be concealed and in suitable PVC conduit pipes in the false ceiling and raised floor area. Suitable capping and casing should be used in case of routing the cable in an exposed area.

**Earthing:**

Separate earthing should be installed to earth all IT equipment, server racks, UPS etc by making dedicated earth pits. Data Center earthing should be separate from building earth system mainly used for other Non-IT equipments, lighting etc. The understructure system in the raised floor of the data center also shall be properly connected to the building earth.

All earth pits shall be as per IS 3043 with latest amendments. Earthing stations should contain relevant grade of charcoal and salt packed around the earth plate / earth pipe. Earthing shall be done at indicted location. The minimum distance between the two earth station shall be 3 meters. An earth ring with relevant earth test terminal boxes shall to be provided at regular intervals. Adequate number of earth strips with proper sized holes shall be provided for extending earthing / looping earth connections at various floors shall be provided and executed as per the requirement.

The Contractor has to provide heavy duty Cover of size 450 x 450 x 8 mm thick to the Earthing Chamber. The cover is to be sand blasted and then Powder coated using Matt Jet Black Colour. The Cover is to be fabricated using 8 mm thick Chequered Plate. Other specifications are

- Earthing pits with 600 x 600 x 6mm Copper Plate earth upto 10 feet deep with all accessories (Dedi. for UPS)
- 6 sqmm braided copper tape for grid earthing
- 8 swg bare cu wire
- 25 x 3 copper Strip for Earthing of panel
- 1c x 50 sqmm cu flexible (Green Colour)
- Dedicated Earthing Box with 50mm x 10mm x 200mmLength.
- Tinned copper strip with 6mm holes
- 150x150x3mm Danger Notice Board & 415 Enameled Danger Board
- Shock Treatment chart with Frame In Local & English Language
- First Aid Medical Box
- 1000mm wide 20mm thick Rubber Matting suitable for 1100 Grade
- **Transient Voltage Surge Suppressor (TVSS)**

For 60kVA UPS system incoming feeder – 2 Nos.
For PAC system incoming feeder – 1 No.

TVSS is proposed for the critical and expensive electronic equipment protection from the transient over-voltages and shall be as per following specifications.

- Surge Current Capacity : 100 kA
• All Modes Protection : L-L, L-N, L-G, N-G
• Connection Type : Parallel
• Protection Level : < 1 kV
• MCOV : Min. 320 Volts
• Response Time : < 0.5 nanoseconds
• EMI/RFI Attenuation : 40 dB typical
• Status Indication : LED, Dry contacts
• Monitoring : Monitoring of All Modes, including N-E
• Fusing : Individual Fusing of MOV’s including N-G
• Certification : UL 1449-3
• Enclosure : NEMA Tested
• Mounting : Wall Mounting
• Warranty : 3 Years

TVSS Detailed Specifications -
The main incoming switchboard (MSB) and distribution boards (DB) shall be equipped with TVSS as defined in the IEEE standard 1100(1999).
1. The TVSS shall be constructed of Metal Oxide Varistor (MOV) technology and Internal surge capacitors.
3. The TVSS shall have a UL listing and labeled 1449-3 suppressed voltage rating of 1000V peak.
4. The unit shall have a maximum continuous operating voltage (MCOV) rating of minimum 320V RMS.
5. The Response time of TVSS shall be ≤ 0.5 nanoseconds.
6. The TVSS shall provide up to 40dB for RFI & EMI noise attenuation.
7. TVSS monitoring shall consist of indicator lamps and form C dry contacts. Monitoring of all modes, including N-E is required.
8. The TVSS warranty shall be 3 years minimum and cover all parts of the TVSS.

Input Electrical Feeder Power Source: NIO Goa will provide an independent RAW power feeders backed up by DG supply terminated on a suitable LT panels for two 60 KVA UPS, three PAC Systems (50 KVA) at Electrical / UPS room at ITG Ground Floor and LT panels at first floor for Lighting, comfort AC loads as described below.
At ground floor UPS Room:
1. 60 KVA (160 Amps) Raw power Feeder for UPS-1
2. 60 KVA (160 Amps) Raw power Feeder for UPS-2.
3. 10 KVA Raw power Feeder for BMS UPS-3
4. 50 KVA (160 Amps) Raw power Feeder for PAC Cooling
At first floor entrance area:
1. Panel for Lighting loads
2. Panel for Power load like comfort AC, etc.

From the NIO supplied LT feeder panels onwards all electrical input and output cables (Fire-retardant quality) and wiring for all UPS and PAC systems should be provided by the vendor as per the specifications mentioned in electrical SLD diagram shown in the respective portion of this tender. All UPS systems and its backup battery banks will be installed at identified ITG Ground Floor area.

Structured Cabling in other areas:
As per TIA -942 guidelines all power and data cables for other areas should be carried under the raised flooring in separate raceways. The power cables will be carried through raceway beneath cold aisle and the data cable will be extended in raceways under the Hot Aisle.

Main Power Cables as per SLD attached (Refer: NIO_SLD.dwg)
1. The interconnection cable for UPS input and output shall be single core copper to make easy termination.
2. Cables for PAC, Comfort AC shall be fire retardant type copper flexible conductor. The PAC interconnecting cables between indoor and outdoor units must be armoured cables.

3. All electrical load points in the first floor area, server and network racks load points shall be individually wired through Fire Retardant copper conductor cable as per the specifications mentioned in the respective area.

4. Separate trays should be provided for both Data and Electrical cables. Common trays are not allowed either above ceiling or below flooring. As per TIA-942 guidelines all cables (Power & Data) will be carried under the raised flooring in separate raceways. The power cables will be carried through raceway beneath cold aisle and the data cable will be extended in raceways under the Hot Aisle.
### Cable schedule:

#### Main Power cable:

<table>
<thead>
<tr>
<th>Main Cables</th>
<th>Sr No</th>
<th>From</th>
<th>To</th>
<th>No of Runs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C x 50 Sq.mm Cu flexible FRLS</td>
<td>1</td>
<td>NIO Raw Power Panel</td>
<td>UPS-1, 60 kVA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>NIO Raw Power Panel</td>
<td>UPS-2, 60 kVA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>NIO Raw Power Panel</td>
<td>PAC Main Panel</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>UPS-1, 60 kVA</td>
<td>UPS-1 PDU</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>UPS-2, 60 kVA</td>
<td>UPS-2 PDU</td>
<td>5</td>
</tr>
<tr>
<td>5C x 10 Sq mm Cu. flexible FRLS</td>
<td>1</td>
<td>NIO Raw Power Panel</td>
<td>UPS-3, 10 kVA</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>UPS-3, 10 kVA</td>
<td>BMS/ Emergency DB</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>PAC Main Panel</td>
<td>PAC-1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>PAC Main Panel</td>
<td>PAC-2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>PAC Main Panel</td>
<td>PAC-3</td>
<td>1</td>
</tr>
<tr>
<td>3C x 6 Sq mm Cu. flexible FRLS</td>
<td>1</td>
<td>UPS-1 PDU</td>
<td>Each Racks</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>UPS-2 PDU</td>
<td>Each Racks</td>
<td>12</td>
</tr>
<tr>
<td>5C x 10 Sq mm Cu. flexible FRLS</td>
<td>1</td>
<td>UPS-1 PDU</td>
<td>Storage Rack</td>
<td>2</td>
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<tr>
<td></td>
<td>2</td>
<td>UPS-2 PDU</td>
<td>Storage Rack</td>
<td>2</td>
</tr>
<tr>
<td>3C x 6 Sq mm Cu flexible FRLS</td>
<td>1</td>
<td>NIO Raw Power Panel</td>
<td>Comfort AC locations</td>
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<td></td>
<td>2</td>
<td>NIO Raw Lighting Panel</td>
<td>ON/OFF Lighting Panel</td>
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</table>

#### Data cable Fire resistant characteristics:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Flame Retardant:</td>
<td>IEC60332-3-24</td>
</tr>
<tr>
<td>2</td>
<td>Corrosivity:</td>
<td>IEC60754-1+2</td>
</tr>
<tr>
<td>3</td>
<td>Smoke Test:</td>
<td>IEC61034-1+2</td>
</tr>
<tr>
<td>4</td>
<td>Fire Resistant:</td>
<td>BS5839 Clause 26.2E &gt;2hrs @ 950°C</td>
</tr>
</tbody>
</table>

#### Distribution Panel Boards (Refer respective SLD):

Two 60 KVA UPS output Distribution Panels for servers should be installed inside the Data center as shown in the design for trouble free easy access and to provide a centralized control of the power supply to all equipment in server room. The distribution panel boards are located in an unobstructed and illuminated area in the server room. The DB’s shall be connected to separate paths of raceways laid below the access floor in the server room. Each UPS source distribution board should provide a separate circuit and miniature circuit breaker of rating 32Amps, DP MCB, 15 + 5 spare Nos to support all Server, and Network Racks. In addition both UPS distribution board should provide 63Amps, 4P MCB – 4Nos for the proposed two storage racks requirements. These panels should be installed with sufficient outgoing switchgears to feed Power to all the components of the Data center as well as with 20% of switchgears as spares in each capacity for future use.

The third BMS UPS distribution panel should be located near the Store room entry door and it should be fixed with suitable independent DP MCBs for each safety and security systems proposed in this tender.

The fourth PAC distribution panel should be supplied and installed inside the Data Centre as shown in the design for providing power to three PAC systems.

All these panels shall be made out of 14 and 16 SWG sheet steel with Powder coated finish and suitable for floor mounting / wall mounting type. All bus bars shall be of copper with tinning. Main Panels and Sub Panels will have standard meters and phase indicators.
Downstream cabling up to Rack level:

1. All downstream cabling should be taken through separate covered cable boxes / cable trays of minimum 200mm wide under the floor for power & data cables keeping a minimum distance of 1 feet apart to avoid any EMI interference between them.
2. Each row of server racks should have independent cable trays for power and data as mentioned above.
3. All these cables should be two hour fire retardant flexible copper cable and size suitable to the load requirements.
4. Each rack will have power cables from both 60KVA UPS units routed below the false flooring with Single Phase 32 / 63Amp mobile power socket type IEC 309 connectors. These sockets should have EN/BS standard with earth pin. This cabling provision should be done for all 12 racks and should reach the respective rack bottom area under the false flooring.
5. From both 60 KVA UPS source, 2 numbers of 3 Phase 63 Amp Industrial Mobile Power sockets should be brought to two storage racks location.

All the mobile sockets and straight plugs should be of IEC 309 type and of approved make.
32A DP+E Mobile Socket with plug
63A 4P+E Mobile Socket with plug

Wiring for BMS System, Integration, Normal Lighting and Comfort AC.

Scope: All points wiring, circuit wiring, sub mains wiring, signal cables and data cables for integration between systems should be with two hours fire resistant cables for both power and data using rigid PVC conduits of minimum 1.8 mm thickness and shall comply with IS 2509 of 1973 or amendments thereof of and FIA approval. All primary point from Raw power should be with 3 x 4sq.mm FR Copper wire and the individual load point power cable should be continuous 2.5 sq.mm approved make FR Copper conductor having Green colour Earth wire for earth continuity in 660/1100 volts grade.

All switch boards under the point wiring shall be the standard boxes manufactured by MK / ROMA / Legrand and the same shall be suitable for concealed work. The boxes should be Electro Plated as per the Manufactures standard practice and should be suitable to accommodate number of control switches, fan regulators, sockets. The entire wiring shall have continuous 2.5 sq.mm approved make FR Copper conductor having Green colour earth wire for earth continuity in 660/1100 volts grade. All primary point from Raw power should be with 3 x 4sq.mm FR Copper wire. The point wiring shall comply with IS 732. The point wiring shall include wiring of any length from respective distribution board via switch or to the point and including providing circuit wiring, in minimum 25 mm dia PVC Conduit of 1.8 mm thickness and using wires of approved make. The entire work has to be carried out under the direct supervision and final directions of Prime Contractor and as per the specifications laid down in this tender approved drawing.

For BMS System Equipments: All wiring related to Data Center safety and security systems equipments and integration of the same with BMS main control system should be done as per the manufacturers recommended procedure and as per the given design. The 10 KVA UPS system should be used for this purpose and this UPS distribution panel should be provided with necessary MCB for these requirements. From the distribution panel the required fire retardant grade electrical cable should reach the different BMS equipment location and suitably terminated with 3 pin 5/15Amp switch sockets. All cabling should be concealed in suitable PVC conduits either in the raised floor or false ceiling area. The necessary data cables from various equipments to BMS control panel should be separately wired as per respective systems manufactures recommended procedures.

Lighting and Comfort AC:
NIO would provide two raw electrical power distribution panels (Labeled as “for Lighting and for Power”) at the first floor entrance area wall with required number of MCBs. The respective panels are to be used for normal Lighting loads and Comfort AC loads of the first floor area. Vendor should use independent fire retardant grade cables from these panels MCB to lighting ON/OFF panel locations and comfort AC load points of the first floor area as per the given design. All wiring should be planned properly with phase segregation. All the independent comfort AC power cables will be terminated at desired wall locations near to the AC unit as per the given design with independent 20AMP DP MCB with metal clad industrial socket and plug top fixed in suitable size MS panel box.
Normal Lighting:
Evenly distributed lighting of 400 - 500 LUX illumination is proposed for the data center. It is necessary to align the distribution of lights as per cabinet / rack / equipment layouts to avoid shadow. Required wattage of Mirror Optics low glare light fittings should be provided to achieve desired illumination level. The lights are 2'x2' indirect light recess mounted type with tile ceiling. Energy efficient lighting with Electronic ballast is proposed and electronic chokes are recommended for light fittings (Ref: NIO data center lighting layout.dwg )
The rates for lighting fixtures and fans shall include all accessories and supply of all materials that may be required to make the fixture complete in all respects such as :-
- All the fixtures shall be suitable for single phase, 50 cycles, 230 Volts, AC supply system.
- All fixtures shall be factory wired with copper conductor wires.
- All fixtures shall be supplied with fluorescent lamps or any other special type bulbs
- All the fixtures shall be quoted of approved make only.
- 4 x 18 watts 2' x 2' Ceiling suspended light fixtures with Tubes and all accessories (Philips TBS 300/418 M5 HF or equivalent)

All wiring should be carried out only in PVC conduits. The modular switches and control panels with MS base manufactured by MK / ROMA / Legrand are recommended and should be located at identified positions shown in the design so as to divide the complete floor area to 4 zones. (nearby 1st floor main entrance door, Server room entrance door, emergency exit door and on the column near FM maintenance area).

Emergency Lighting:
The lighting inside data center is connected to raw power supply Distribution Board. 20% of the lighting would be on emergency power as shown in the design. The emergency lights should cover the server room, FM area and passages leading to the main entrance and emergency exit. All emergency lighting fixtures need to be powered from the 10KVA UPS distribution panel.

Service Loads wiring:
For the support & utilities area as shown in the design at 15 locations each with 4 Numbers of 3 Pin, 5/15 Amps combined AC switch sockets powered from the 10 KVA UPS unit distribution panel should be provided, wired and fixed at suitable locations as shown in the design. These power cables should be routed either below the raised floor or above the false ceiling depending upon the load points and
necessary capping and casing should be used in the exposed area. As per the design, except the power points of the work table close to server room partition wall, all other load points will require cable routing through the false ceiling. (Ref: NIO data center Service load and LAN layout 2004.dwg)

On each identified locations the required facilities are:
- Electrical Power Sockets: 3 Pin 5/15 A combined Power sockets with switch- 4 nos.
- Data Points: LAN port with RJ45 Socket -2 Nos.

All the electrical, telephone and LAN cables should be concealed. All cables to the work tables should be neatly wired by using concealed wire management system provided by Godrej Interio Office Spacio tile based system as recommended by the manufacturer.

Service area Data Cables:
Also for user requirements a minimum of 28 LAN points with CAT6 cable should be wired from network rack to reach the above identified locations (nearby workstation table, System Admin area, BMS control area and other areas) as per given design. Five numbers of intercom telephone wiring (total 50 meter cables) terminated on RJ11 connector also should be provided from the network rack area to the desired locations inside the first floor working area.

![Image](image.png)

Comfort Air Conditioners (5 Numbers):
Supply, installation, testing and commissioning of Five numbers of DX type 1.5 ton split A/C unit complete with filter, rotary/scroll Compressors, indoor unit evaporator with DIDW forward curved multi blower and motors, outdoor condenser unit along with first charge of R22 refrigerant & cordless remote. The unit shall be suitable for 230 ± 10% volts, 50 cycles / second, 1 phase AC supply. It shall be maximum star rated one. Each unit is to be supplied with V-Guard make 5 KVA voltage stabilizer (Step up/down and initial time delay features) suitably fixed close to AC units. The necessary MS stand for outdoor unit should be supplied and properly fixed at suitable location.

1. The air-conditioning equipment shall be a standard product of the manufacturer and of a design of proven reliability & satisfaction in the service intended.
2. The system shall be rated for continuous operation of 24 hours a day.
3. The condensing unit shall be air cooled type and shall be provided with hermetically sealed compressor meant to give a durable, trouble free and low noise performance. The compressor shall be capable of operating continuously at the maximum ambient temperature.
of 45°C. The condensing unit shall be suitable for outdoor installation in a weather exposed to sun and rain.

4. Cooling units of higher cubic meter per hour (CMH) and higher static pressure are to be provided to cover the depth of the room.

5. The refrigerant shall be non-inflammable, non-toxic and non-explosive and have the pressure and temperature characteristics suitable for this operation. It is proposed to provide FREON 22 being the safest.

6. All refrigerant pipe shall be of copper possessing sufficient strength and size suitable for service and shall be provided with thermal insulation of suitable material.

7. Air-conditioning system of each room shall be complete with condensing units, interconnecting refrigerant copper piping, PVC piping for condensed water drain, wiring between the outdoor condensing unit and indoor room unit, wiring between AC Distribution Board and outdoor condensing unit, protection devices, temperature control units and other accessories. All wiring shall be fire retardant. The inclination of the PVC piping for draining away of water shall be properly adjusted so that water leaked from the air-conditioning units is drained away from the room.

8. The equipment shall be suitable for operation on 230 V +/- 10% V, Single Phase AC, 50 Hz depending on the size of the machine. Necessary earthing arrangement shall be made.

9. If any equipment fails to meet the specified and guaranteed performance as found from test at site, then the equipment is liable to be rejected and to be replaced the same free of cost by the contractor.

Uninterrupted Power Supply (UPS) System
60KVA – 2 Nos. and UPS 10 KVA – 1 No.

General Description:
Supply, install, test and commissioning of three numbers of true online, double conversion, high efficiency, high power factor Uninterruptible Power Systems (UPS) rated at 60 KVA – 2 numbers and 10 KVA – 1 number with independent battery backup support for 30 minutes on full load. The backup batteries (100AH or more capacity) should be supplied with the necessary external open racks/cubicles and the same should be installed at ITG ground floor area UPS room. All UPS systems should be with inbuilt tuned galvanic isolation transformer and should be integrated with the proposed BMS through a suitable communication interface card.

Scope:
The scope shall include design, supply, installation, testing and commissioning of the complete UPS system and related accessories including:

- All Server racks will get power feed from two independent 60 KVA UPS systems to ensure redundancy.
- Supply of complete three numbers of UPS systems, Load and Battery sharing panels / Battery circuit breakers, sealed maintenance free Batteries with racks for minimum 30 minutes Backup as per specifications.
- All systems should be tested in factory as per the manufactures recommended procedure for all operating parameters and the test results should be provided during the installation. Delivery at site, unloading, handling, installation of complete system including interconnection from the UPS system to batteries and to input / output panels switches. All interconnections shall be done using multistrand Flexible Copper conductor cables of appropriate sizes. Outgoing neutral cables shall be of double capacity.
- UPS should be placed on a raised concrete /metal foundation of minimum 15” height from the floor level of the proposed ground floor area.
- Scope includes battery bank connections using Nyvin cables and providing safety barriers for all busbars and cable connection leads on battery racks.
- Energization of UPS and Battery bank commissioning.
- UPS control parameters setting and complete testing of system on load.
- Service backup by engineer till system is fully operational and subsequently training is to be provided to the concerned persons of the Institute.
- Any upgrade of the system hardware and associated other software during the warranty period should be supplied free of charge.
• Acceptance tests will be carried out after installation and the systems will be taken over only after successful completion of the acceptance tests.
• Operation and service manuals of the systems containing technical / Electronic drawings / circuit diagrams complete in all respects should be supplied.

Quality Tests: Entire system shall be completely checked & tested for Full load, Transient Analysis, Over voltage, Over Load, Power failure. Efficiency at 50% should be at least 93% and 94% at 75% load 95% at 100% loads and all other functions.

Specification / features of the Each UPS system are as follows:
• Widest input range.
• Double conversion and IGBT technology.
• Full IGBT Rectifier / Battery charger with power factor correction up to unity.
• IGBT based Inverter
• Inbuilt Tuned Galvanic Isolation Transformer at output.
• Batteries to support 30 minutes full load backup.
• Static Bypass switch
• Maintenance bypass switch
• Power distribution panels
• Lightning and Surge Protection
• Programmable Front Panel Interface and Front-access servicing
• Dual feed input
• Remote Emergency Power off
• Facility for integration with BMS
• N+X parallel redundancy to increase the reliability and flexibility.
• High input power factor (pf >0.99) and low harmonic distortion (iTHD: <3%)
• Overall high efficiency >94%, saving the operating cost.
• Parallel redundancy without extra hardware needed.
• Easy to expand in a cost effective way
• Built-in manual and static bypass switch for maintenance.
• Built-in SRAM, to record up to 500 real-time event logs or more.
• Redundant auxiliary power and control circuit.
• Scheduled battery test and battery replacement warning.
• Local and remote emergency power off function (LEPO and REPO).
• Compatible with generator installation.
• User-friendly LCD display and LED indicators.
• External battery pack available to extend the backup time.
• Load Bus Synchronization.
• MODBUS Compatible to integrate with BMS.

IGBT Rectifier / Battery charger:

The IGBT Rectifier/Battery charger will have an input isolating switch and a PWM digital vector control system (DSP based) which, in addition to normal functions (AC/DC conversion), will automatically correct the input power factor to a value > 0.99 and limit the harmonic rejection to the mains at a THD value < 3% at full output load, and a THDi value < 5% for any other condition.

For the battery charger function, this converter will include built-in fuses and a control circuit for the voltage and battery recharging current. The ripple current to the batteries will be less than 0.05 C10. A microprocessor control function will perform the following operations:
• Test the battery by automatically performing a partial battery discharge at weekly intervals or at intervals defined by the user
• Adjust battery float voltage as a function of ambient temperature
• Calculate the remaining battery autonomy time during discharge
• Automatically compensate battery shutdown voltage as a function of the time for prolonged discharges.
IGBT Inverter:
The IGBT inverter will have a PWM digital vector control system (DSP based), capable of converting DC voltage from the IGBT rectifier or battery into AC voltage. A rated output filter will create an output voltage sinusoidal envelope. The control circuit, in addition to normal functions, will automatically adjust nominal output power in accordance with ambient temperature. Inverter should be able to deliver full active power at Unity power factor (KVA=KW)

Static Bypass Switch:
The static bypass switch will feature a separate power input and will consist of the following:
• Static switches (SCR type), which can support overloads and short circuits downstream of the UPS
• A backfeed detection circuit as specified by IEC/EN 62040-1-1, clause 5.1.4
• A bypass and maintenance bypass input isolating switch with auxiliary indicator contact
• An output load switch.
The control logic will be handled by digital algorithms (using vector control techniques), similar to those used for the rectifier and the inverter. The static bypass shall be equipped with a backfeed protection device compliant with clause 5.1.4 of IEC/EN 62040-1-1; and a relay signal contact for the control of the external backfeed isolator to be installed on the bypass line upstream from the UPS.

Maintenance Bypass Switch
The UPS will be equipped with a bypass switch capable of transferring the load to the bypass supply without interruption so as to enable the UPS to be switched off and isolated for maintenance operations. The supply to the load will be maintained.

Batteries:
The VRLA, SMF batteries will feature an enclosure made of self-extinguishing material. The batteries will be housed in one or more racks/ cubicles and will be protected by fuses located on each pole and via a dedicated switch. Each UPS should have a set of 34 nos of 12V/100Ah batteries.

Isolation transformer:
The UPS should have inbuilt tuned Galvanic Isolation Transformer integrated to the inverter output.

Operating Modes:
This section describes the different operating modes of the Uninterruptible Power System.

The UPS, using the above-mentioned digital vector control (DSP system), will be able to operate both in double conversion and digital interactive modes. The operating mode may be factory set by the manufacturer during testing or by the customer using the appropriate diagnostic and control software.

The IGBT inverter will be synchronised with the bypass line so that the load can be transferred from the inverter (conditioned line) to the bypass supply (direct line) and vice versa without any break in the supply to the load. In all operating modes, the battery charger will provide the power necessary to keep the battery fully charged.

Double conversion operation
In this operating mode, under normal service conditions, the load will always be supplied from the inverter, guaranteeing maximum protection for the load. Upon failure or reduction of the primary AC source, the load will be supplied by the battery through the inverter. During this phase, power will be drawn from the battery. Visible and audible signals will alert the user to this operating state. The remaining autonomy time will be calculated by a diagnostic algorithm.

Upon return of the primary AC source to within tolerance limits, the Uninterruptible Power System will recommence operating in normal mode. In the event of an inverter overload, manual stop or failure or temporary overload downstream of the UPS, the load will be automatically transferred to the bypass supply source without interruption.

In the event of an overload with an unsuitable supply, the Uninterruptible Power System will not transfer the load but will continue to supply it from the inverter for a period of time dependent upon the extent of the overload and the characteristics of the UPS. The user will be alerted of these anomalous operating conditions via the alarm.
Digital interactive mode
In this operating mode, under normal service conditions, the load will always be supplied from the
direct line through the bypass static switch. The quality of the direct line will be monitored constantly
using algorithms operated in real time by the DSP control system. If the direct line is outside the
permitted tolerances, the load will be automatically transferred to the conditioned line (inverter)
without interruption.

In the absence of power supply to the direct and conditioned lines, the battery will supply power to the
loads through the inverter. During this phase, power will be drawn from the battery and the battery
charge will be reduced. Visible and audible signals will alert the user to this operating state. The
remaining autonomy time will be calculated by a diagnostic algorithm.

When the quality and reliability of the direct line return within permitted limits, the UPS will
automatically start supplying the load from the direct line. Operation and control of the UPS should be
provided through the use of microprocessor-controlled logic. Indications, measurements and alarms,
together with battery autonomy, will be shown on a graphic liquid crystal display (LCD). The
procedures for start up, shutdown and manual transfer of the load to and from bypass will be
explained in clear step-by-step sequences on the LCD display.

Controls and Diagnostics
The controls for the electronic power supply modules will guarantee the following:

- A three-phase power supply which is ideal for the load
- Controlled battery recharging
- Minimum harmonic rejection to the upstream mains power supply (THDi<3% at full load,
  THDi<5% in any other condition).

The UPS will feature a digital vector control based on a DSP (Digital Signal Processor). The special
DSP algorithms must be designed to ensure rapid and flexible processing of the detected data,
allowing rapid generation of controlled variables. It must also be possible to run the control for the
electronic inverter devices in real time to:

- Improve short-circuit behaviour (300% I, for 10 ms, 150% I, up to 5 s)
- Have a synchronised (precise phase) angle between UPS output and bypass network, in the
  event of mains voltage distortion
- Highly flexible parallel operation.

Warning/fault: this page contains information regarding various anomalies concerning power
converters such as the bypass, rectifier, inverter and booster/charger. In addition to this there is also
warning and fault information relating to the battery and the load.

Events log: displays the date and time of important UPS events, alarms and other warnings.

Measurements: This page holds the full set of measurements for each functional block (rectifier,
bypass, booster/charger, batteries, inverter and load). The UPS will provide the measurements
(voltage, current and frequency) for every single internal functional block and this information will be
directly accessible on the display, via the measurements button.

Battery: displays the battery status/values including temperature, cell voltage, capacity and run time
as well as commands for allowing the user to configure battery testing.

Tools: this page allows users to customize the settings of the LCD display and to select the desired
language, choosing between 15 languages.

Controls
The UPS will be provided with the following controls:

- Inverter start, Inverter stop, Reset faults and Buzzer/mute  alarm

Signals and alarms
The UPS must provide signals and alarms for every single functional block. These signals must be
directly accessible via the display, by clicking the warning and fault button. The UPS will also:

- Clearly display, upon mains failure, the remaining battery autonomy which will be a function of
  battery status and charge (discharge curve, degradation, operating temperature, etc)
- Have three serial RS232 ports for compatibility and communications with special peripheral
  units and for remote connections
- Be able to support remote graphic measurement and signaling software
- Be able to interface with a network monitoring system using SNMP slot-in cards
- Provide a tele monitoring function (see description under section 6.0 "Tele monitoring")

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A voltage-free input will also be provided to disable the static switches and all power converters (EPO) in case of emergency. Programmable I/O contacts (at least 4 voltage-free outputs and 2 inputs).

**Monitoring and control from service centre**

The system will be capable of analyzing UPS operation and electrical supply in order to identify faults and thus prevent the occurrence of conditions likely to damage the equipment protected by the UPS. The system will guarantee single or parallel UPS surveillance, 24 hours a day for 365 days a year by authorised technical personnel operating remotely. The system will provide a detailed, preventive analysis of connected UPS, without any of the disruption associated with an on-site visit.

The tele-monitoring system will offer the following main features:
- Continuous monitoring and control of the performance of end-user UPS
- Bi-directional communications between end-user UPS, Authorised Service Centre and its authorised field service engineers
- Automatic location of Service Engineers in the event of anomalous UPS functioning (even at night and during public holidays)
- Possibility of using graphic software for remote in-depth analysis and control
- Periodic reports on UPS performance with advice from Service Centre engineers.

### 60 KVA UPS other Technical Specification:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit of measure</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input characteristics</strong></td>
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<td></td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>(V)</td>
<td>Selectable 380 / 400 / 415 V Three Phase + N</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>(%)</td>
<td>± 20%</td>
</tr>
<tr>
<td>Input Connections</td>
<td></td>
<td>Hard Wire 4-wire (3PH + G)</td>
</tr>
<tr>
<td>Nominal frequency</td>
<td>(Hz)</td>
<td>50</td>
</tr>
<tr>
<td>Tolerance on frequency</td>
<td>(%)</td>
<td>± 10</td>
</tr>
<tr>
<td>Input power factor @ nominal voltage</td>
<td></td>
<td>&gt; 0.99</td>
</tr>
<tr>
<td>Total harmonic distortion (THDi) @ full load</td>
<td>(%)</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>Total harmonic distortion (THDi) in all other conditions</td>
<td>(%)</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Walk in /Soft start</td>
<td></td>
<td>Sec 10 (1 to 90 Selectable)</td>
</tr>
<tr>
<td>Rectifier Hold OFF (Sec)</td>
<td>(Sec)</td>
<td>10 (1 to 180 Selectable)</td>
</tr>
<tr>
<td><strong>Inverter output characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltage (380/415 selectable)</td>
<td>(V)</td>
<td>Selectable 380 / 400 / 415 V Three Phase + N</td>
</tr>
<tr>
<td>Nominal frequency</td>
<td>(Hz)</td>
<td>50 (60 Hz selectable)</td>
</tr>
<tr>
<td>Max Configurable Power @ 25°C</td>
<td>KW</td>
<td>60 KW / 60 KVA</td>
</tr>
<tr>
<td>Automatic adjustment of nominal output power as a function of temperature</td>
<td>(%)</td>
<td>@ 25°C = 110% @ 30°C = 105% @ 40°C = 100%</td>
</tr>
<tr>
<td>Output voltage stability in steady-state condition for input within permitted limits and load variations from 0 to 100%</td>
<td>(%)</td>
<td>± 1</td>
</tr>
<tr>
<td>Efficiency at Full Load</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>Output Voltage Distortion</td>
<td></td>
<td>Less than 2%</td>
</tr>
<tr>
<td>Output Frequency (sync to mains)</td>
<td></td>
<td>50 Hz - programmable +/-0.5 / 1 / 2 / 4 / 6 / 8%</td>
</tr>
<tr>
<td>Crest Factor</td>
<td></td>
<td>3 : 1</td>
</tr>
<tr>
<td>Waveform Type</td>
<td></td>
<td>Sine wave</td>
</tr>
<tr>
<td>Output Connections</td>
<td></td>
<td>(1) Hard Wire 4-wire (3PH + G)</td>
</tr>
<tr>
<td>Stability in dynamic conditions for 100% load step variations</td>
<td>(%)</td>
<td>Complies with IEC/EN 62040-3, Class 1 (VFI, SS, 111)</td>
</tr>
<tr>
<td>Load crest factor without derating</td>
<td></td>
<td>3:1</td>
</tr>
<tr>
<td>Output voltage distortion with 100% linear load</td>
<td>(%)</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Output voltage distortion with non-linear load as</td>
<td>(%)</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>Parameter</td>
<td>Unit of measure</td>
<td>Specification</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>specified by IEC/EN 62040-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output frequency stability in synchronization with mains (± 2 ± 3 ± 4 selectable)</td>
<td>(%)</td>
<td>± 1</td>
</tr>
<tr>
<td>Output frequency stability with internal clock (±)</td>
<td>(%)</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Frequency slew rate (Hz/sec)</td>
<td>(Hz/sec)</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Permitted overload:</td>
<td>(%)</td>
<td>110% for 60 minutes</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>125% for 10 minutes</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>150% for 60 seconds</td>
</tr>
<tr>
<td>Short circuit current:</td>
<td>(ms)</td>
<td>10 ms for 300% I_n</td>
</tr>
<tr>
<td></td>
<td>(s)</td>
<td>5 sec for 150% I_n</td>
</tr>
<tr>
<td>Characteristics of electronic static changeover switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltage (380/415 selectable) (V)</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Tolerance on voltage (± 5 ± 15 selectable) (%)</td>
<td>(%)</td>
<td>±10</td>
</tr>
<tr>
<td>Nominal frequency (Hz)</td>
<td>(Hz)</td>
<td>50 (60 Hz selectable)</td>
</tr>
<tr>
<td>Tolerance on frequency (± 2 ± 3 ± 4 selectable) (%)</td>
<td>(%)</td>
<td>±1</td>
</tr>
<tr>
<td>Permitted overload:</td>
<td>(%)</td>
<td>125</td>
</tr>
<tr>
<td>for 10 minute</td>
<td>(%)</td>
<td>150</td>
</tr>
<tr>
<td>. for 1 minute</td>
<td>(%)</td>
<td>70</td>
</tr>
<tr>
<td>. for 600 milliseconds</td>
<td>(%)</td>
<td>1000</td>
</tr>
<tr>
<td>. for 100 milliseconds</td>
<td>(%)</td>
<td></td>
</tr>
<tr>
<td>UPS characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum UPS cabinet dimensions W x H x D (mm)</td>
<td></td>
<td>Small foot print</td>
</tr>
<tr>
<td>Noise level measured @ 1 meter and @ 100% load according to ISO 3746 (dBA)</td>
<td></td>
<td>70-72 dBA</td>
</tr>
<tr>
<td>AC/AC efficiency – double conversion mode @ 100% load (%)</td>
<td>(%)</td>
<td>&gt;95</td>
</tr>
<tr>
<td>Efficiency in digital interactive mode @ 100% load (%)</td>
<td>(%)</td>
<td>98</td>
</tr>
<tr>
<td>Degree of protection</td>
<td></td>
<td>IP 20</td>
</tr>
<tr>
<td>Backup Battery parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td>SMF, VRLA</td>
</tr>
<tr>
<td>No. of batteries</td>
<td></td>
<td>34 numbers of same batch or more</td>
</tr>
<tr>
<td>Battery capacity</td>
<td>(V)</td>
<td>12V ; 120AH or more</td>
</tr>
<tr>
<td>Minimum Back up time at full load</td>
<td></td>
<td>30 minutes or more</td>
</tr>
<tr>
<td>Operating Environment</td>
<td></td>
<td>0 - 40 °C</td>
</tr>
<tr>
<td>Operating Relative Humidity</td>
<td></td>
<td>0 – 95%</td>
</tr>
<tr>
<td>Operating Elevation</td>
<td></td>
<td>0-999.9 meters</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td></td>
<td>-20 – 45 °C</td>
</tr>
<tr>
<td>Storage Relative Humidity</td>
<td></td>
<td>0 – 95%</td>
</tr>
<tr>
<td>Storage Elevation</td>
<td></td>
<td>0-12000 meters</td>
</tr>
<tr>
<td>Audible noise at 1 meter from surface of unit</td>
<td></td>
<td>66.00 dBA</td>
</tr>
<tr>
<td>Online Thermal Dissipation</td>
<td></td>
<td>13872.00 BTU/hr</td>
</tr>
<tr>
<td>Protection Class</td>
<td></td>
<td>NEMA 1, IP 20</td>
</tr>
<tr>
<td>Communication and Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control panel</td>
<td></td>
<td>Multi-function LCD status and control console</td>
</tr>
<tr>
<td>Emergency Power Off (EPO)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Communication Ports</td>
<td></td>
<td>SNMP &amp; BMS</td>
</tr>
</tbody>
</table>

10 KVA UPS other Technical Specification:

<table>
<thead>
<tr>
<th>Output parameter</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 KVA / 8KW</td>
</tr>
<tr>
<td><strong>Power Factor</strong></td>
<td>0.8 or better</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>Single phase, L, N + PE</td>
</tr>
<tr>
<td><strong>Nominal Voltage</strong></td>
<td>230 V AC</td>
</tr>
<tr>
<td><strong>Voltage Regulation</strong></td>
<td>+/- 1%</td>
</tr>
<tr>
<td><strong>Voltage THD</strong></td>
<td>&lt;=2% - Linear load &lt;=3% - Non linear load</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>50 HZ</td>
</tr>
<tr>
<td><strong>Frequency Regulation - Free run frequency (Unsynchronised with bypass)</strong></td>
<td>+/- 0.1 Hz</td>
</tr>
<tr>
<td><strong>Frequency Regulation (synchronised with bypass)</strong></td>
<td>+/- 1, 2, 3 Hz</td>
</tr>
<tr>
<td><strong>Slew Rate</strong></td>
<td>0.2/0.4 Hz / sec</td>
</tr>
<tr>
<td><strong>Crest Factor</strong></td>
<td>3:1 max.</td>
</tr>
<tr>
<td><strong>Transient response at 100% step load</strong></td>
<td>+/- 10%</td>
</tr>
<tr>
<td><strong>Recovery time</strong></td>
<td>&lt;10 millisecond</td>
</tr>
<tr>
<td><strong>Over load capacity</strong></td>
<td>150% - 60 seconds</td>
</tr>
<tr>
<td></td>
<td>125% - 10 minutes</td>
</tr>
<tr>
<td></td>
<td>110% - 60 minutes</td>
</tr>
<tr>
<td><strong>AC-AC Efficiency</strong></td>
<td>84% or better</td>
</tr>
<tr>
<td><strong>Transfer time - Mains to battery</strong></td>
<td>0 millisecond</td>
</tr>
<tr>
<td><strong>Transfer time - Inverter to bypass - Synchronisation mode</strong></td>
<td>0 millisecond</td>
</tr>
<tr>
<td><strong>Transfer time - Inverter to bypass - Unsynchronisation mode</strong></td>
<td>20 millisecond</td>
</tr>
<tr>
<td><strong>Isolation Transformer Required at output</strong></td>
<td>Required</td>
</tr>
<tr>
<td><strong>Parallel Redundancy</strong></td>
<td>1+1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Input parameter</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
</tr>
<tr>
<td><strong>Nominal Voltage</strong></td>
</tr>
<tr>
<td><strong>Voltage range</strong></td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
</tr>
<tr>
<td><strong>Frequency range- Hz</strong></td>
</tr>
<tr>
<td><strong>Power Factor</strong></td>
</tr>
<tr>
<td><strong>Current Distortion (I-THD)</strong></td>
</tr>
<tr>
<td><strong>Operation with reverse phase sequence</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Bypass</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage</strong></td>
</tr>
<tr>
<td><strong>Voltage Range</strong></td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
</tr>
<tr>
<td><strong>Frequency Range</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Inbuilt Battery Charger</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boost charging</strong></td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
</tr>
<tr>
<td><strong>Ripple</strong></td>
</tr>
<tr>
<td><strong>Temp. compensated battery Charger</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Battery parameters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>No. of batteries</strong></td>
</tr>
<tr>
<td><strong>Battery capacity</strong></td>
</tr>
<tr>
<td><strong>Minimum Back up time at full load</strong></td>
</tr>
</tbody>
</table>
### Environmental Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 45 deg. centigrade</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>0 to 70 deg. centigrade</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>95% RH</td>
</tr>
<tr>
<td>Temperature derating</td>
<td>1.5% per deg. c. between 40 to 50 deg. c.</td>
</tr>
<tr>
<td>Altitude derating</td>
<td>1% per 100m between 1000m to 2000m</td>
</tr>
<tr>
<td>Noise level</td>
<td>&lt;60db</td>
</tr>
</tbody>
</table>

### Mechanical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hight X width X Depth (MM)</td>
<td>Small foot-Print.</td>
</tr>
<tr>
<td>Weight</td>
<td>Maximum 200 kg.</td>
</tr>
<tr>
<td>Ventilation</td>
<td>Forced - Air cooled</td>
</tr>
<tr>
<td>Cable Entry</td>
<td>Front - Bottom</td>
</tr>
<tr>
<td>Colour / Panel finish</td>
<td>Structured dark Grey</td>
</tr>
<tr>
<td>Base castor wheels</td>
<td>YES</td>
</tr>
<tr>
<td>Protection</td>
<td>IP21 / IP20</td>
</tr>
</tbody>
</table>

### Other Features of the System

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring software and interface</td>
<td>BMS connectivity; Modbus</td>
</tr>
<tr>
<td>Type of UPS</td>
<td>ON Line</td>
</tr>
<tr>
<td>DSP/Micro processor based control</td>
<td>Required</td>
</tr>
<tr>
<td>Functional with reverse phase sequence</td>
<td>Required</td>
</tr>
<tr>
<td>Battery test facility</td>
<td>Required</td>
</tr>
<tr>
<td>Maximum Autonomy time</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Parallel Redundant</td>
<td>1+1 WITHOUT ANY EXTERNAL DEVICE</td>
</tr>
<tr>
<td>Low output V-THD</td>
<td>Required</td>
</tr>
<tr>
<td>Output isolation Transformer</td>
<td>Essential or quote external at Input side</td>
</tr>
<tr>
<td>LCD display</td>
<td>4 line LCD display</td>
</tr>
<tr>
<td>Standards</td>
<td>IEC62040</td>
</tr>
</tbody>
</table>

The constructional and functional characteristics of all UPS must be in line with the state-of-the-art technology in this field. The OEM of the UPS must be able to provide proof that it is ISO 9001-2000 and ISO 14001 certified for design and manufacturing and for the provision of services.

### Installation:

1. The entire system shall be installed as per manufacturer’s recommendations & instructions including all interconnections for supply & control circuits.
2. A minimum working space shall be maintained around the equipment as per shop drawings, Consultant’s reference drawings & relevant standards.
3. All components shall be clearly identified using labels including battery cells individually.
4. Services of authorized representative or manufacturer for supervision of installation, connections, testing, & adjustments shall be provided.
5. All cables shall be properly routed through cable trays and connected using proper lugs. All battery terminals need to be shrouded.

### Testing & Commissioning:

1. Under supervision of manufacturer’s representative all system functions, operations, protective features shall be checked & preset to ensure compliance or specifications.
2. Test the system as per recommendations & test listed below using pre-calibrated instruments preferably by third party inspection agency.
   1. Load simulation.
   2. Simulation of malfunctions to verify protective device operations.
3. Duration of supply on emergency. Low battery voltage alarm & shutdown, transfer & restoration of normal supply.
4. Harmonic contents of input & output current under all load conditions.
5. Remote status & alarm tests.

In case of test any shortfalls / faults, the same shall be rectified & test procedure shall be again repeated to establish satisfactory performance.

(iii) Record individual cell voltage & equalize the charging of the cells as per manufacture's recommendations.

Cleaning:
On completion of installation, testing of the system all components, cabinets etc. shall be cleaned & unwanted material, debris shall be removed from site. Scratches dents if any shall be cleaned & touched up to match the original finish.

Drawings & Manuals:
Following drawings & manuals / information shall be submitted in at least THREE copies at appropriate stages & for handing over the system.
   i. Manufacturer's data for product, features, components & performance along with the offer.
   ii. Operation & maintenance manual with;
      1. List of recommended spares & replacement components.
      2. Detail operating instructions covering operations in normal & abnormal conditions.
      3. Shop drawings showing detail fabrication, assembly of components, internal & interconnecting wiring, dimensions, plans & views, installation details access & clearance etc for approval.
      4. Product certificates for Brought out items.
      5. Factory test certificates & Inspection report.
      6. Field test reports.

After Sales Service:
(a) Round the clock Service shall be guaranteed by supplier during defect liability period / guarantee period. A certain minimum stock of spares shall be maintained by supplier at site.
(b) OEM of the UPS system shall also quote for 24 x 7 services through their authorized service engineer for a period of at least 3 years after guarantee period.
(c) OEM of the UPS system shall offer an unconditional guarantee / warranty of equipment for a Period of 36 months against any failure.
(d) The equipment must carry OEM’s on-site warranty for Three Years from the date of taking over of the equipment after the acceptance tests. Warranty period will stand extended for a period of total downtime of the UPS System.
(e) The batteries must carry on-site warranty for minimum period of 24 months from the date of installation.

Heat Ventilation Air Conditioning System (PAC):

A. Three numbers of Precision Air Conditioning of 8 TR sensible load capacity working in N+1 redundancy mode to maintain the selected Temperature, Humidity and Dust control in the server room.
B. Comfort Air Conditioners: Total 5 numbers of Split Air conditioners systems with individual V-Guard 5 KVA stabilizers. For auxiliary area / FM Group / BMS.

Precision Air Conditioning System (3 Nos):

General Description:
Supply, installation, testing and commissioning of bottom discharged DX Type Air-conditioning Units designed specifically for high sensible heat ratio with variable cooling technique to match the low latent loads of systems to be installed in Server Rooms for effective and uniform distribution of cooling. The hot air will be taken through the false ceiling area.

The units should be equipped with micro processor based programmable logic controller, high efficiency filter 95% down to 5 micron, evaporator, DX coils, variable speed EC fan motor,
humidification, heating arrangement, Scroll compressors, matching remote condensers, interconnected refrigerant piping, refrigerant charge, all necessary valves, fittings, fire controls, wet sensor and front display panel, controls etc. The unit offered shall be 8 TR sensible capacity or more with oil separators and other accessories & safety features for automatic operation of the system and should be compatible for integration to any open protocol BMS of any make. The precision unit shall be air cooled and shall be Eco friendly R-407C / R-410A refrigerant based system. The necessary outdoor units should be installed as per the procedure recommended by the manufacturer. Further the condensers should able to handle the ambient temperature of 45 degree Celsius and or up to 90% humidity level situations with out degrading the operational capacity.

The precision air-conditioners shall support continuous operation and capable of supplying high air flow and maintaining a temperature range of 20 degree Celsius with a maximum of +1 degree and relative humidity of 50% with a maximum variation of 5% on higher and lower side. A programmable sequential controller should be provided for the automatic operation of any single or combination of PACs based on the pre-programmed setting. The equipment shall be suitable to operate on 415 Volts 3 phase, 4 wires, 50 Hz. AC. supply with a variation of ±10% in Volts and ±5% in frequency respectively. The supply for illumination and single-phase equipment shall be 230 Volts A.C.

The PAC units control strategies shall be PID Logic Control with dew point compensation for accurate temperature and humidity control. A selection of return or supply air control shall be provided to suit the application. Access to the controller setting shall be protected with passwords to prevent against unauthorized access. In normal operating mode the main screen shall display unit number, temperature and relative humidity set points and actual, graphs, time, date and operating status. Dynamic icons shall identify the system operating mode. 48 hour real time log of temperature and humidity data shall be retained by the control system. All parameters and data shall be protected in memory by an onboard battery.

Each unit shall be capable of providing sensible cooling capacities at rated ambient temperatures with adequate airflow and should be meant for 24 hours/365 days operation. The individual unit shall have an inbuilt soft start arrangement to limit the starting current. The internal cooling design shall follow cold aisle and hot aisle. False Flooring shall be provided for all the areas where Precision Air Conditioning units shall be installed. Precision Air Conditioning units shall supply air through grilles placed with raised floor. Each unit should be provided with facility to fully integrate with the proposed BMS. Any other components required for fail-proof running of PACs should be included in the cost of the package.

The three units of Precision Air Conditioning System working in N+1 redundancy mode or sequential mode to maintain the selected Temperature, Humidity and Dust control in the server room. The supplied systems shall include all (but without limiting) equipments for this purpose, accessories matching to raised floor and false ceiling, pipes, refrigerant, input power cables from the ground floor distribution panel, communication cables, supports, Power distribution panel along with switchgear and accessories, suitable power outlet boxes with breakers for individual connections to the AHUs and integration to the proposed BMS. This shall also includes, but not be restricted to the following:

1. Precision Air Conditioning units (Indoor cooling unit & Air Cooled Outdoor Condensing unit) with motors and Drives etc.
2. Insulation for Refrigerant Piping.
3. Supply air grilles with dampers
4. Return air grilles
5. Return air plenum
6. Floor Insulation
7. Foundation bolts, Grouting, Vibration Isolators, Base Frames etc. for mounting the outdoor condensing unit, indoor Cooling Unit and other equipment.
8. Supply & Installation of Hard drawn Copper piping with suitable 13 mm thick Nitrile rubber insulation from indoor to outdoor units for suction line & Liquid Line Copper pipes.

Other specifications are as below.

<table>
<thead>
<tr>
<th>No.</th>
<th>DESCRIPTION</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flow Direction</td>
<td>Downward flow</td>
</tr>
<tr>
<td>2</td>
<td>Inside Condition</td>
<td>20 °C± 1 °C (DB) &amp; 50% ± 5% RH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3</td>
<td>Ambiant Condition</td>
<td>42°C DBT</td>
</tr>
<tr>
<td>4</td>
<td>Total Sensible capacity per unit.</td>
<td>8 TR.</td>
</tr>
<tr>
<td>5</td>
<td>Air Quantity per unit</td>
<td>4800 CFM (minimum)</td>
</tr>
<tr>
<td>6</td>
<td>Filters</td>
<td>Filter to be provided on the Package unit having 95% efficiency down to 5 Microns.</td>
</tr>
<tr>
<td>7</td>
<td>Face velocity across cooling coils</td>
<td>&lt; 2.5 Meters/sec</td>
</tr>
<tr>
<td>8</td>
<td>Type of load</td>
<td>High sensible heat load (sensible heat factor above 0.90)</td>
</tr>
<tr>
<td>9</td>
<td>Programmable sequential controller</td>
<td>For the automatic operation of any single or combination of PACs based on the pre-programmed setting</td>
</tr>
</tbody>
</table>

**Humidifier**

Precision air-conditioning must have built in humidifier and electric heater. Alternatively it may be infrared type consisting of high intensity quartz lamps mounted above and out of the water supply. The humidifier should be designed in such a way that the steam shall be distributed evenly into the bypass airstreams of the environment control system to ensure full integration of the water vapor into the supply air without condensation and not to disturb the air flow distribution in the server room. The capacity of the humidifier should be of adjustable from 30% to 100%. The unit shall be designed for a CFM in the range of 580 to 600. (Using re-heater for de-humidification is not allowed for better energy efficiency).

It is to be ensured that electrodes or quartz lamps will not function without water. It should prevent bacterial growth and eliminates the need for chemical treatment. Should be fully serviceable design ensures quick and cost effective maintenance.

The capacity of the humidifier should be of adjustable from 30% to 100%. The steam shall be distributed evenly into the bypass air stream of the environmental control system to ensure full integration of the water vapour into the supply air without condensation. It has to be inbuilt.

**Cabinet**

The frame shall be constructed of 2.5, 2.0 and 1.20 mm folded steel. The external panels shall be constructed of 1.2 mm zinc coated sheet steel. Front, rear and end panels shall be fitted with 25 mm Glass fiber insulation. The side panels are of double skinned construction to have low noise, vibration and enhance life span. The cabinet shall be powder coated. The hinged front panels shall be removable from front. The cabinet is completely assembled with pop rivets to have higher rigidity.

Coil & blower section should be insulated internally for both acoustics and thermal purpose with 25 mm thick resin bonded glass wool of 48-kg/cm³ density covered with glass nylon cloth of fire proof grade. The insulation should be fire retardant type.

**Refrigerant Circuit**

The refrigerant system shall be of the direct expansion type and incorporate hermetic scroll compressor complete with crankcase heaters.

**Compressor**

The compressor shall be of the high efficiency scroll design with variable cooling capability in stepless manner. Each compressor shall have rot lock valve for service purpose & have inbuilt overloads, HP & LP controllers and mounted on vibration isolators. Pressure gauge ports should be provided in each compressor. Adjustable time delay circuit should be provided to each compressor for restart in case of supply interruption. The refrigerant used shall be environment friendly HFC, R-407-C in view of long term usage of the data center equipments, availability of spares and refrigerant.

**Fan Motor Assembly**

Fan should be driven by a weatherproof electric motor suitable for operation 50 Hz Ac supply.

**Evaporative Coil**

1. The Evaporator coil shall preferably be constructed of rifled bore / inner grooved copper tubes of gauge 28-31 mm (rifled bore type) and louvered aluminum fins (0.10 mm & 11 fins per inch)
2. The frame and drip tray should be fabricated from heavy gauge aluminum. The drip tray must be doubling angled for condensate flow and easily removable for cleaning.
3. Hydrophilic treatment is preferred for evaporator for all units.

**Air Cooled Condenser**

Each condenser unit should incorporate the following:

1. A heat rejection coil block which should be constructed from suitable gauge copper tubes expanded on to straight aluminum fins (Approx 12 fins/inches).
2. The fan should be selected for quiet operation with noise level not exceeding 65 dba at 1 meter distance. The fan should be directly driven by a low speed motor and constructed from CRCA sheet and powder coated.
3. When compressor stops condenser fan should also stop.
4. The condenser should be suitable for horizontal / Vertical mounting type
5. The entire assembly should be supported by a corrosion treated frame having four legs
6. Each condenser should have speed control to automatically vary the speed of fan with the change in ambient temperature.

**Service Access**

No side access should be required for servicing and maintenance. All servicing should be possible from the front of the unit only.

**Microprocessor Controller:**

Each Air conditioner should have single microprocessor with following controls:

**Control Type**

The controls shall be a microprocessor based, **PID based programmable logic controller**. The controls shall have separate indication of operating modes (cooling, heating, humidifying and dehumidifying), alarm conditions (temperature high, loss of sensor, compressor HP & LP, wet floor, no air flow and low humidifier water). The display and indication shall be visible on the front without removing any external panels. Local and remote alarms will be triggered if an alarm condition is reached. There shall be a separator monitor of each unit which shall be placed outside the room. The control cable shall be laid between the two monitor.

The control system shall allow programming / setting the following conditions:

1. Temperature set point
2. Humidity Set point
3. High Temperature Alarm
4. Low temperature Alarm
5. High Humidity Alarm
6. Low Humidity Alarm
7. Unit identification number.
8. Startup Delay, Cold start Delay and Fan Run on timers
10. Remote shutdown & general Alarm management
11. Compressor Sequencing.
12. Return temperature control.
13. Choice of Modulating output types.

**Alarms**

The system should activate an audible, visual and general alarm in the event of any of the following conditions:

1. High / Low Temperature
2. High / Low Humidity
3. Loss of Air / No Air flow
4. High / Low Pressure
5. Low Humidifier Water
6. Wet Floor
7. Service Intervals
8. Any other required conditions
9. Spare Alarm 1 and 2 (Customized text)
Diagnostics:
An onboard blow-out detection circuit should protect the controller from abnormally low mains voltages and initiate a staged restart of the unit’s components when the mains returns to normal levels. The control should have an auto-restart feature which will return the unit to normal operation resumption of mains power.
The unit shall also incorporate the following protections:
1. Single / Reverse phasing
2. Phase imbalancing
3. Overload tripping
4. Proportional, Integral and Derivative (PID) & Dew point control strategies should be employed.

Teamwork mode of operation & cascading: To save energy by preventing operation of units in opposite modes multiple units. In case the condition is not achieved by two machines, the 3rd machine will be switched ‘ON’ & once condition is achieved, it will be switched ‘OFF’.

Display: In normal operating mode the screen should display unit number, temperature and relative humidity set points and actual, graphs, time, date and operating status. It should be able to record a real time 48 hour data log of temperature and humidity updated every minute.

Large LCD backlit graphic display for clear visibility of text and graphics indicating: Unit number, Time & Date, Temperature & Humidity value (actual and set point) and four hour history graph, Dynamic operating mode icons, any other essential parameters.

Other activities:
1. Balancing of the entire Precision Air Conditioning installation.
2. Providing Return air plenum made of powder coated GI sheet to connect the PAC unit to the false ceiling for the return air path. Color of the plenum should match with the color of the PAC unit
3. Providing return air grilles without damper on the ceiling.
4. All Minor Masonry, Carpentry and Civil works such as cutting opening in Masonry Walls, Internal Partitions, RCC Slabs etc. for Pipes and Cables and making them good the same to match existing works / décor shall be done by the Contractor, wherever asked for by the Engineer-in-Charge.
5. All other works associated with above items as per specifications, drawings and conditions of contract except those specifically excluded.
6. Cleaning of site & handing over the works.
7. Test reports, list of recommended spares, as-installed drawings, operation and maintenance manual for the entire Precision Air Conditioning installation.
8. Training of Owner’s Staff.

Server Racks
Six numbers of server racks size 19” 42U, 600 x 1000mm, Perforation up to 83% on front and rear doors, shall have fixed 19” installation on the front & rear for components as per IEC 297-3. Installation of chassis rails and 19” shelves possible. Racks to have min jumping space of 85.5 mm in the front, RAL 9011 black shade, 19” bracket extrusions, sheet steel zinc passivated, Doors shall be front and back perforated with Swing Handles and Locks. Opening Angle shall be 180 degrees and should be Left Right veritable, Frame shall be all Aluminium with Die Cast Corner Pieces, Rack frame shall be extruded aluminum and polished. Rack unit capacity with adjustable front and back rails. Front door comes standard with Plexiglas window. Rear door is perforated for maximum air circulation. Cutouts are provided for optional exhaust fan and cabling.

Two numbers of non-surge, vertical power strips with 15 numbers of single phase 3 Pin 5/15Amps sockets are to be supplied and fixed in each racks. The current capacity of each power strip shall not be less than 32 amps and the input cable should be fire resistant grade and fixed with suitable 32A DP+E mobile IEC 309 type plug. Vertical cable manager / loops, fans, castors, levelers, bolts, nuts and 2 no. of 2U Horizontal cable manager should be provided.
1. Six numbers of Racks size 42U, 600 x 1000 mm for Servers. Two Network racks will be provided by NIO. The remaining four server racks will be added in future by NIO.
2. The supplied Rack shall allow free air movement through the rack. Perforation up to 83% on front doors shall be provided for this purpose.
3. Racks shall have fixed 19” installation on the front & rear side for components as per IEC 297-3. Installation of chassis rails and 19” shelves possible. Racks to have min jumpiring space of 85.5 mm in the front. Four Post, Depth-Adjustable Rack Rails With Square Holes
4. Racks shall be EMC shielded & thermal management to design model
5. Racks shall have minimum static loading of 1000 Kgs.
6. Racks shall have a protective rating of IP 40
7. Racks shall conform to DIN standard 41494 for electronic enclosures,
8. Racks shall RAL 9011black shade, Heavy Duty Casters And Leveling Feet
9. Racks shall have multifunctional struts and 19” bracket extrusions, sheet steel zinc passivated.
10. Doors shall be front and back Perforated with Swing Handles and Locks. Opening Angle shall be 180 degrees and should be Left Right Convertible.
11. Rack frame shall be extruded aluminum and polished with Die Cast Corner Pieces
12. Each rack will have 2 nos. power strips mounted vertically along both sides of the rack, each capable of connecting 15 servers for supplying single phase power supply to the servers. The current capacity of each power strip shall not be less than 32 amps (see table below).

Rack PDU specification.

<table>
<thead>
<tr>
<th>Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Input Voltage</td>
<td>220-240 VAC Single Phase</td>
</tr>
<tr>
<td>Input Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Maximum Input Current</td>
<td>32A</td>
</tr>
<tr>
<td>Load Capacity</td>
<td>7 KVA</td>
</tr>
<tr>
<td>Input Connections</td>
<td>IEC 309 32A 2P+E</td>
</tr>
<tr>
<td>Cord Length</td>
<td>3.05 meters</td>
</tr>
<tr>
<td>Number of Power Cords</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Output Voltage</td>
<td>230V</td>
</tr>
<tr>
<td>Maximum Total Current</td>
<td>32A</td>
</tr>
<tr>
<td>Output Connections</td>
<td>BS546 Female 3 Pin 5/15A Indian Standard</td>
</tr>
<tr>
<td>Minimum Output Sockets</td>
<td>15 Nos.</td>
</tr>
</tbody>
</table>

Smart Card based Access Control

Microprocessor, TCP/IP based Main Controller directly on LAN in master slave configuration having 12 door Reader Capacity and controlling I/O or reader board modules as per system requirement. The system should also logs the entry and exit records for later auditing and also to be interfaced with proposed BMS. This system should assist in controlling any unauthorized movement within the restricted server and UPS room area. **Four units** of IP based electronic access control system at server room entry door, emergency door, ante room and UPS room entry door should be installed for restricted access based on preset access policy. Other requirements are as follows.

- Main entry door to UPS and Ante room should be Card based access control and the server room doors will have to be with biometric based Smart Card reader units.
- Exit from doors will be with push button also with Emergency exit switch / Break glass switch
- Electromagnetic Lock (600 Lbs) suitable for Single / Double Door with door position sensor & necessary accessories.
- All access records to be captured in software log.
- Enterprise Access Control System Software for 18 readers with 1 client user license with browser based GUI, support integration with Fire security and BMS system.
- Time & Attendance Module with capability to integrate with Main BMS Software on the same Platform
- Concealed Cabling with suitable fire retardant power and data cables as per manufacturer recommendation should be carried out in 25 mm dia PVC Conduit.
**General Description**

The work under this system shall consist of design, supply, installation, testing, training & handing over of all materials, equipment’s and appliances and labor necessary to commission the said system, complete with Door controller and smart card readers. It shall also include laying of cabling, necessary for installation of the system as indicated in the Specification. Any openings/chasing in the wall/ceiling required for the installation shall be made good in appropriate manner.

The IP based Access Control System shall be used to serve the objective of allowing entry and exit to and from the server / UPS room to authorized personnel only. Individual access cards shall be issued to all the authorised personnel. The system shall authorize entry only after the card read by the smart card reader is validated with respect to door, time & day of the week. The system deployed will be based on Proximity as well as Biometric Technology for the server room and Proximity technology for UPS room. These doors will be provided with additional electric locks, and will operate on fail-safe principle. The readers are connected to controllers, which in turn are connected to operator station. The operator station software provides an easy to use yet secure way to manage the movement of employees and visitors.

The system would be designed and implemented to provide following functionality:

- Configurable system for user defined access policy based on Day, Date, Time and duration based access rights would be user configurable for each access point and for each user.
- Built-in Real Time Clock (RTC), calendar; complete Database stored locally and shall be capable of operating offline on standalone mode.
- Record, report and archive each and every activity (permission granted and / or rejected) for each access point with user defined reporting and log formats.
- Fail safe operation in case of no-power condition and abnormal condition such as fire, theft, intrusion, loss of access control, etc.
- One user can have different policy / access rights for different access points.
- The same will be achieved by bio-technical equipments like fingerprint for specific high security server room entry.
- The card transactional database is processed for attendance purpose and other standard office process.
- On detection of fire the exit door can be unlocked automatically.
- The Access Control System is seamlessly integrated with Fire and BMS. In case of a fire alarm this ensures that the doors are unlocked Such Events and Logs generated in System.

At the server room entry the employee uses the smart card and immediately presents the finger to the biometric reader which is unique to each employee. The pattern is read and compared with stored data to grant / deny access. The system should provide all other standard features.

**Control unit functional specification:**

- Control Unit for the handling of mono-directional and bidirectional access doors. The unit shall be able to manage personnel identification readers based upon different and even combined technologies (proximity, biometric, etc.) as well as I/O modules.
- Enhanced decision making capability based upon its own data base and/or information coming from other Control Units connected to the same network in a peer-to-peer communication mode.
- Handling of pre-established paths personalized for each Card holder.
- Handling of the maximum number of Card holders that can be present in a given area.
- Complete stand alone gate logic handling: Access is denied for:
  - erroneous reading;
  - invalid system code;
  - card validity expired;
  - card validity blocked or suspended;
  - current time does not match with enabled time zones:
  - accessed zone does not match with enabled geographical zones;
  - Pin error
- Handling of transit under duress situation.
- Antipass back control, path control, control of the min/max number of cardholders present in an area using the peer-to-peer communication with other Control Units.
• Handling of passage reasons for T&A.
• Time programs to unconditionally block/unblock given gates during specified time periods.
• Directly connected to the Supervisory Control system via Ethernet LAN and TCP/IP protocol.
• Peer-to-peer direct communication via TCP-IP with other Control Units for enhanced decision making and full stand-alone operation.
• Low voltage power supply (12 V dc/ac) for maximum safety.

Access Software Features & Requirements

General Description:
• The Access Control System (ACS) software shall be a module in the integrated software. The Access Control System software shall be capable of integrating multiple functions including Access control, Time and Attendance Management of employees, Alarm Management, Database Partitioning, and external system database sharing of employee personal information (Import Utility).
• The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of control panels, card readers, software modules and sensors.

Software features: The software shall have a capacity to accommodate the following based on licensing
1. A central database on the server able to support up to unlimited badges
2. Unlimited number of card profiles.
3. Unlimited number of operators.
4. Central on-line data storage of historical transactions, expandable as system resources allow.
5. Multiple levels of alarm priority.
6. All other standard features

The ACS Software should be configured in the integrated BMS server. The ACS Software server shall operate on latest Windows / Linux platforms. The ACS Software shall be designed for unattended execution and should not have any user interface. The system software should support new card issue, monitoring and other administration activities.

Short Range Entry Card Readers: The card reader shall be of Open type based Smart Card technology. The card readers shall be of high reliability, consistent read range characters, low power consumption and easy to install. Card readers should be “single-package” type, combining electronics and antenna in one package, in the following configurations:
• The reader should be of potted, polycarbonate material, sealed to a rating of IP54.
• The reader should be UL/C 294 listed, and should be FCC and CE certified,
• Should conform to ISO 14443/15693 (Read only) Standard.
• Transmit Frequency: 13.56 MHz
• Should have a read range of 2” to 3” when used with the compatible access card.
• The reader should require that a card once read, must be removed from the RF field before it will be read again, to prevent multiple reads from a single card presentation and anti-pass back errors.
• The reader should operate under internal control for read-only access control applications.
• The reader shall compare the biometric template stored on the card and the live sample supplied by the card holder. In the case of a positive match of these samples, the reader shall communicate the successful match of the biometric sample to the access control system of the host data centre.
• A minimum of 100 cards should be supplied initially.

The reader shall be capable of two way communication with the controller and have bi colored LED indication to indicate access granted / denied status. The readers shall support user defined reader keys offering higher security. The reader keys shall be stored in encrypted format in non-volatile memory.

Finger Print Reader:
The finger print reader (FPR) shall be capable of reading a fingerprint utilizing an optic capacitance sensor comparing the same with a stored template. The FPR shall store the fingerprint templates of each cardholder indexed against the card number issued to the person. When a card is presented at the smart card reader, the card number shall be passed on to the FPR, which would then read the finger print (presented at the optic) and verify it against the templates stored against the same card
number. If the fingerprint is matched the facility code & card number shall be passed on by the FPR to the door controller. In case the fingerprint is not matched, the card data shall be rejected & access denied. The size of the template shall be such that it shall use only one sector of the card. The reader shall have a capacity to store at least 1,000 templates (i.e.) 500 users with 2 templates for every user.

- The FPR shall have at least 5 security levels with password protection.
- The FPR shall be user friendly and shall have audio visual indicators.
- The False Acceptance Rate (FAR) and False Rejection Rate shall be better than 0.01%.
- The Enrolment time shall not be more than 15 seconds while the Verification time shall be 1 second.

**The reader should meet the following environmental specifications:**
- Operating temperature: 10 to 50 degrees C
- Operating humidity: 5% to 95% relative humidity non-condensing.
- Weatherized design suitable to withstand harsh environments
- Finger print CUM SMART CARD reader
- Reading element False Acceptance Rate (FAR) less than 0.1%

## CCTV Surveillance and Security System with DVR

### System Requirement
The CCTV System shall be IP based system with **four monitoring camera units** coupled to a low-voltage weather-proof external Passive Infrared Red (PIR) motion detector designed to simultaneously or individually control CCTV switchers and video recorders. The PIR motion detector senses the movement and triggers the recording of the event. The critical area of the Data Center needs to be under constant video surveillance. The primary objective of implementing a CCTV system is to ensure effective surveillance of the server room area and also create a record for post event analysis. Two Monitoring cameras would be installed in proper location to cover the entire server room. The scope of work involves supply, installation, commissioning and testing of the Closed Circuit Television system integrated with proposed BMS of the Data Center.

Safety is of prime importance and to ensure that images of every person entering the Data Center or working within are recorded. This would help to identify known or unknown fiddle with any of the rack servers and that may result in system malfunction as well as disruption to intended functions. The CCTV system shall be configured in such a manner that on a single user workstation, information from multiple cameras shall be available.

### System Objective
- To enable sensitive areas to be scanned from pre-selected position.
- To enable the important areas of the premises to be remotely monitored.
- To enable automatic recording by Digital Multiplex Recorder on hard disk and to play back the recorded events on selected monitors.

### Indoor Dome Camera

<table>
<thead>
<tr>
<th>Imager</th>
<th>1/3” CCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal System</td>
<td>CCIR</td>
</tr>
<tr>
<td>Resolution</td>
<td>480(H) x 420(V)</td>
</tr>
<tr>
<td>Lens</td>
<td>Wide Angle lens f=3.8mm at F2.0 (H70° &amp; V52°)</td>
</tr>
<tr>
<td>Video output</td>
<td>1.0 V (P-P)75 Ohms</td>
</tr>
<tr>
<td>S/N ratio</td>
<td>47dB(AGC=Off)</td>
</tr>
<tr>
<td>Ambient</td>
<td>10°C to +50°C</td>
</tr>
<tr>
<td>Power</td>
<td>12VDC (10 – 15VDC)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Indoor (Ceiling &amp; Wall)</td>
</tr>
<tr>
<td>Appearance</td>
<td>Body = ABS resin(white), cover = acrylic resin</td>
</tr>
</tbody>
</table>

### CCTV General Descriptions:
The product specified shall be a high speed domed camera system available in pendant or suspended ceiling mounted versions designed for indoor surveillance applications.
- The camera shall have built-in multi protocol for easy interface with DVR or Matrix switcher systems having selectable address at least up to 8 cameras.
- The camera shall be compatible with the Switcher/ Controller variable speed keyboards.
• The camera shall be equipped with an optical zoom lens of 3.6mm to 126mm and 12x digital zoom facility. To ensure optimal zoom control, the camera shall provide a facility of variable speed panning and the panning speed should be 0.5deg to 90deg/sec and turbo speed of 360 deg/sec; for better tracking of the subject by the operator.
• The camera shall allow the storage of up to 240 preset scenes with each preset programmable for 16 character titles. Eight guard tours shall be available to consecutively display each of the preset scenes for a programmed dwell time. Also a facility of storing 4 user control patterns of 240secs each in the memory.
• The camera shall be offered in suspended ceiling or pendant mounted indoor use.

Camera Specifications:
• IP based camera with motion detector sensor
• Imager: 1/3" Super HAD color CCD (PAL: 752H x 582V)
• Horizontal Resolution: 470 TVL
• Lens: Wide angle (3.6 mm to 126 mm) with optical zoom and auto focus
• Digital Zoom: 12x

Electrical Specifications
• Power: 230 or 24 VAC Normal, 850mA, Built-in power line surge circuit
• Video output: 1.0Vp-p ± 0.1Vp-p, 75 ohms.
• Sensitivity: 1.0Ix (30IRE), 0.1Ix (IR Filter OFF), 0.001Ix (IR Filter ON, 256 Fields), 0.0001Ix (IR Filter OFF, 256 Fields)
• Signal to Noise Ratio: Greater than 50 dB.

Mechanical Specifications
• Weight: 1700g
• Pan: Turbo speed 360 /sec; 0 ~90 /sec variable speed pan;
• Tilt: Degree 0 ~90 , Speed 0 ~90 /sec according to zoom ratio
• Pre-position speed: 380 /sec.
• Video Co-Axial Cables (From Camera): Co-axial cable of the following minimum specification shall be used indoor in conduits, trunking and cable trays.

<table>
<thead>
<tr>
<th>Type:</th>
<th>RG 59/U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impedance:</td>
<td>75 Ohms</td>
</tr>
<tr>
<td>Conductor (dia):</td>
<td>20 AWG Solid Bare Copper</td>
</tr>
<tr>
<td>Insulation:</td>
<td>Cellular Polyethylene</td>
</tr>
<tr>
<td>Nominal O.D.:</td>
<td>0.242&quot;</td>
</tr>
<tr>
<td>Shielding:</td>
<td>95% Bare Copper Braid</td>
</tr>
<tr>
<td>Jacket:</td>
<td>Black Frame Retardant PVC</td>
</tr>
</tbody>
</table>

Color Monitor Features:
• Picture Tube: 21 inch (53 cm) flat square tube
• Resolution: Horizontal: 450 TV lines
• Phosphor: P22
• Dot Pitch: In-line 0.71 mm stripe
• Defection: 90° angle
• Convenient front panel push-button controls
• On-screen display/setup menus (OSD)Heavy-duty metal cabinet
• NTSC/PAL (auto-sensing)
• Video loop-through with automatic termination
• Supports two composite and one S-VHS video input (looping)
• Universal power supply
• Audio Input/Output: 2 channels
• Switchable over scan and under scan
• Available in black and cool grey cabinet colors

Electrical Specifications:
• Power Source: 90 to 254 VAC 50 Hz or 60 Hz
• Power Consumption: 80 Watts
• Scanning Frequency
• Horizontal: 15.75 KHz (NTSC); 15.625 KHz (PAL)

Digital Video Recorder
Digital Recording allows recording video on Computer hard disc, eliminating the use of VCR and tapes. Other required features are:

- Stand Alone Digital Video Recorder
- Recording on HDD and its expandable.
- Having Motion detection facility.
- Remote viewing of live and recorded files
- Less moving parts means less maintenance and higher reliability
- 8 analog video input channels
- 1 channel audio recording & playback
- Recording, Playback, Back-up, Network recording, and Network playback at the same time.
- Total 480/400 ips (NTSC/PAL) recording speed for recording speed
- Total 480/400 fps (NTSC/PAL) display speed
- Built-in splitter for split screen monitoring (1/4/ 9/13/16 split mode)
- Max. 4TB storage capacity (Through IEEE 1394 port for external HDD)
- Intelligent file system for managing event recording data
- Captured video data to be available on demand for a period of six months
- DVR supports 8 IP camera video channels. Video, Audio, and Text Event-Logs are digitized and stored on two internal hard-drives. Using a proprietary Wavelet Algorithm, average file size is 1 to 5KB while still maintaining clarity high enough for facial recognition. In addition, Wavelet-compressed images are impossible to manipulate. With our proprietary Wavelet Algorithm, DVRs process analog video into crisp, clear, and court admissible pictures that are up to 500% smaller than comparable to JPEG images. It also allows users to record and playback audio for one channel. With ‘Quick Setup’, DVR can be setup and begin recording in 5 minutes. It starts to record as soon as power is supplied and CCTV cameras are connected. The default settings offer qualified and efficient way without the hassle of confusing menus. Equipped with two IEEE 1394 ports (Fire-Wire), can expand its recording capacity up to 4TB easily. Windows’ FAT32 formatted HDD is compatible with DVR. The data can be simply backed up by connecting the HDD to the PC to review critical images, and with one USB port, user can copy small sized images.
- ATM/POS transaction text information recording and search with corresponding video
- 16 sensor inputs and 4 alarm outputs
- Built-in hardware motion detection (64- division comparison)
- Back-up with IEEE 1394(FiWi)
- PTZ Control (Preset support) via RS 232 or RS 485/RS422
- User-friendly 32bit True-color Graphic OSD Menu
- Dynamic IP (DHCP, Floating IP) support
- Optimized Wavelet compression: 1-5KB (Average file size with standard image quality)

Other Features

- Embedded Linux OS for excellent stability and reliability
- IR remote controller (User can control PTZ with remote controller)

**ANALOG ADDRESSABLE FIRE ALARM SYSTEM**

**Scope**

An automatic Fire Detection system with one loop capacity and its own addressable high sensitivity detector units is to be installed at **Server area and UPS room** for early detection of fire and automatic suppression of the fire if present and raise an Alarm so as to initiate action.

The scope of work under this head shall include design, supply, and installation of one Loop analogue addressable Fire Alarm Control System with suitably located high sensitivity Smoke and Heat detectors (30 numbers each), Main Control Panel, Monitor, Repeater Panel, Sounders cum Strobe (3 Nos), Manual Pull Stations (3 nos), Modules, relays, response indicators (15 Nos) etc and facility for interfacing with BMS. It shall also include laying of cabling, necessary for installation of the system as indicated in the specification and Schedule of work. All the detectors are to be connected to the Conventional Fire Alarm Panel for easy indication of the exact address of the Detector on Fire. The fire detection system is designed to detect a fire in its incipient stage and to automatically initiate pre-programmed control functions

- The Fire alarm system will be an automatic 4 zone single loop addressable fire detection and alarm system, utilizing conventional detection and alarm sounders.
• Detection will be by means of automatic heat and smoke detectors located throughout the Data Center (ceiling, false floor and other appropriate areas where fire can take place) with break glass units on escape routes and exits.

**Standards**
The System design shall meet the following design Standards as required by IS 2189 and CPWD specifications for Fire Alarm Systems /Underwriters Laboratories Inc. (UL) - USA:

- No. 268 Smoke Detectors for Fire Protective Signalling Systems
- No. 268A Smoke Detectors for Duct Applications
- No. 521 Heat Detectors for Fire Protective Signalling Systems
- No. 346 Water flow Indicators for Fire Protective Signalling Systems
- No. 464 Audible Signalling Appliances
- No. 864 Control Units for Fire Protective Signalling Systems
- No. 38 Manually Actuated Signaling Boxes
- No. 1971 Visual Notification Appliances

**Approvals**
The fire alarm control panel, display, detectors, other allied devices, sounder, strobes etc., shall be UL Underwriters Laboratories Inc approved components.

**Fire Detection & Alarm System**

**Solution Overview**

- The Fire Alarm System with addressable high sensitivity Optical thermal detectors and duct smoke detectors which are connected to an addressable Fire Alarm Control Panel. HVAC ducts are to be connected to the modular fire alarm control panel through a pair of wires. Manual call Points are provided to trigger the alarms manually in case of emergency situations and also strobes cum hooters are provided to give the alarms with sound as well as strobe indications.

- The system panels should be modular, customized to the specific requirement by selecting the suitable housing, rail and modules. The panels could be configured based on the specification and will be located as required. The Loop should capable of connecting minimum 127 devices / detectors. Facility for passive repeater panels connected to the main control panel so that indications on the fire alarm control panel can also be seen at a remote location. Also Mimic panels with LEDs can be programmed for certain important indications.

- The control panel communicates with each device on the loop, and if an alarm or fault condition is signaled, or if communications are lost with one or more detectors, the appropriate response is triggered. The loop can be powered from each end so that if the loop is broken at any point, no devices are lost. In order to give tolerance against short circuits on the loop, short circuit isolators are inbuilt in all the detectors and devices. If a short circuit occurs in the loop the isolators directly on either side of the fault will isolate that section. The panel will detect the loss of the devices, signal a fault and drive the loop from ends, thereby enabling the remainder of the loop to operate correctly and ensuring minimum loss of coverage.

- The Addressable Fire Alarm System consists of the following systems at different areas of the Data center as mentioned below:
  - Addressable Fire Alarm Control Panel
  - Addressable Smoke Detectors with base
  - Addressable Heat and other Detectors
  - Response Indicators located in false floor and ceiling.
  - Addressable Manual Call Point
  - Addressable Strobe Cum Sounder
  - Addressable Monitor Module
  - Passive Remote Repeater Panels

- These detectors / devices should be located at Server and UPS room as per manufacturer recommended procedure / standards and connected to the Fire Alarm Control Panel.

- In case of emergency, as soon as the Fire Alarm control Panel recognizes fire, control panel will initiate the alarm using the sounders, triggers the emergency evacuation of the occupants & releases all the access controlled doors.
Fire Alarm Control Panel
- Uniquely designed to meet the life safety needs of the data center area. The Panel networking should deliver a fast alarm response time, flexibility and survivability across its network. The network should be multi-priority peer to peer token ring protocol. All operating features should be software controlled using object oriented rules with great flexibility in integrating fire alarm system with BMS system into a single seamless design.
- Distributed technology with intelligent Signature series detectors operating on a “distributed intelligence” system having their integral microprocessor to perform important functions, should make alarm decisions on their own, and do not involve other system components in this important decision making process. In the event of CPU failure, the intelligent device controllers can still receive alarms and distribute the alarm information to all other modules in the panel.
  - Modular configuration allowing easy extension
  - Networking capability.
  - Supports Signature Series Detectors & Modules.
  - Minimum 127 devices per loop.
  - Large LCD display with screen
  - UL Listed.

Manual Call Point / Pull Station
Manual Pull Stations made from die-cast zinc and finished with red epoxy powder-coat paint complemented by aluminum colored stripes and markings.
- Single stage double action
- Intelligent device with integral microprocessor
- Non-volatile memory
- Automatic device mapping
- Electronic addressing
- Stand-alone operation
- Diagnostic LED
- Designed for high ambient temperature operation
- UL Listed

Strobe cum Sounder
This should be designed for broadcasting high quality, integrated, emergency voice communications, as well as alert and alarm tone signals. The sounder cum strobe shall be electronic type and shall give discontinuous / intermittent audible alarm from a command from the Addressable Bell relay modules whenever any detector or call box operates. The Sounder & Strobe shall have UL approval.

The sound output from the sounder should not be less than 85 decibels at the source point. It shall be capable of being directly mounted on the wall / ceiling. The sounder cum strobe shall be programmed to get activated in event of an alarm from a single detector / device or a group of detectors / devices. The strobes shall be an electronic visible warning signal device that flashes at least once every 1.5 Seconds, in an event of an alarm. The strobe light shall use Xenon flash tube with low current requirements. The outer cover of the Strobe shall have a printed fire signal warning. The electronic circuits inside the strobes shall be compatible with DC alarm supervision and meet the required safety standards. The strobes shall be mounted on the sounder or on the wall / ceiling and shall be UL Listed. The other features of the Synchronizing strobe are:
  - Exclusive low current draw technology.
  - Superior visibility.
  - Field changeable lens markings.
  - High dBA output.
  - Multiple output taps, 25V or 70V models

Addressable Control / Output Relay Module
Addressable points from the FACP with potential free contacts for tripping of AHUs, Operating Strobe lights, tripping power supply etc. should be provided as required. The system shall also be able to handle separate modules to interface the speakers of the Public Address System if required so. The Module shall have shall have UL approval.
• Intelligent module complete with integral microprocessor
• Self-diagnostics and History Log
• Automatic Device Mapping
• Provides one NO / NC contact
• Fast, Stable Communication
• Non-volatile memory
• Automatic device mapping
• Electronic addressing
• Designed for high ambient temperature operation
• Control Module for Tripping PAC, Unlock Access Door, Trigger Strobe cum Sounder and Gas release Panel.
• Fire Exit Signage and Glow Signage at all exit door and instruction while emergency.

Addressable Input Module
The input modules shall be suitable to all the proposed safety devices and to be used for interfacing all safety devices like Fire status of Gas release panel, Fault status of VESDA, Fire Door status monitoring with the proposed fire alarm system. The Module shall have UL approval

The modules should be intelligent, addressable devices to connect one or two Class B normally-open Alarm, Supervisory, or Monitor type dry contact Initiating device circuits (IDC). The modules apply to multiple applications including alarm, alarm with delayed (retarded) latching for water flow applications, supervisory and monitor. The input modules gather analog information from the connecting initiating devices and convert it into digital signals. An on-board microprocessor analyzes the signal and determines the correct message to send.

• Universal input / output (UIO).
• Multiple applications.
• Non-volatile memory.
• Integral microprocessor.
• Electronic addressing and device mapping.
• One red and one green status LED.
• UL Listed

GAS BASED FIRE SUPPRESSION SYSTEM

FM200 Fire Suppression System:
The scope shall include, design, supply, installation, testing and commissioning of an automatic Gas flooding fire suppression system. Design of the system shall be in accordance with NFPA 2001. Design calculation for the suppression system shall be done on UL listed, FM approved software. ASTM 106, Grade-B, Schedule-40 seamless pipes shall be used for this purpose.

The fire suppression system used shall be FM 200 gas based. The successful bidder shall make detailed working drawings and coordinate with other agencies at site. The critical area shall be divided into number of zones, whenever fire is detected or sensed in any of the zones, annunciation should be available on the FACP, and the suppression system in that particular zone shall be automatically activated. The flooding of the gas is considered in the complete Data Center Server Room area covering above false ceiling, rack area and false floor.

The Clean Agent Fire Suppression system should consists of 80 Liters seamless cylinders (2 Nos), discharge hose (9 Nos.), flexible discharge hose (2 Nos.), Electric, Pneumatic and manual actuator, panels, valve assembly, manifold with all standard fittings and all other mounting accessories required to provide a complete operational system meeting applicable requirements of NFPA 2001 Clean Agent Fire Extinguishing Systems, NFPA 70 National Electric Code, NFPA 72 National Fire Alarm Code or ISO standards. Microprocessor Based Gas Release Panel with 2 Release Circuits, Battery with charger should be provided. The system must ensure proper performance as per UL / FM approvals and installed in compliance with all applicable requirements of the local codes and standards.
The system design shall be based on the specifications contained herein, NFPA 2001 & in accordance with the requirements specified in the design manual of the agent. The bidder shall confirm compliance to the above along with their bid. The cylinder for storage of gas shall be high pressure, seamless steel gas cylinder, flat type, concave bottom as per IS 7285 complete with neck ring. Welded and non-CCE approved cylinders will not be accepted.

**Documentation**

The bidder should prepare & submit along with the bid documents, the piping isometric drawing and support the same with a hydraulic flow calculation generated by using the agent’s design software. The calculations shall validate the fill density assumed by the bidder. The bidder shall also submit calculations to evidence the quantity of agent considered for the system. The successful vendor must submit, along with the supply invoice, a certificate of authenticity, for the agent from the system engineering company duly checked and verified by Manufacturer. The bidder should provide, as part of handling over, all drawings, operation and maintenance manual. The as-built drawing shall exactly match the isometric drawing submitted with the flow calculation prior to commencement of work.

The bidder shall submit copies of the datasheets of the hardware used in the system. The bidder shall also submit copy of CCE approval letter for the cylinder proposed to be used. These documents shall be attached to the technical bid.

**FM200 Product Characteristics:**

FM-200 chemically known as Heptafluoropropane (CF3CHFCF3) and is a Hydrofluoro carbon belonging to the same class of compounds used in refrigerants, but with Zero Ozone depletion potential.

**Performance as a Fire Suppressant:**

FM200 systems should be engineered to reach minimum design concentrations in 10 seconds or less, thereby ensuring a very fast action. All quasi state Gas flow calculations are done on UL listed Softwares.

Ideal Features of FM200 gas suppression agent

- Extinguishing fire in minimum time.
- Zero Ozone Depletion Potential
- Negligible Global Warming Potential (GWP=1)
- Negligible Atmospheric Life Time (ALT=5 days)
- “Breathability” after agent discharge into room- 5 Mins
- Need not leave the room in case of accidental discharge for 5 Mins.
- Long holding time to avoid re-flash of fire.
- No damage to equipment in the protected area
- Easy Refilling, availability of the agent. Can be stored as liquid in drums.
- Should not pollute during room integrity test
- Alarming persons who are in danger.
- Calling the fire fighting forces and rescue teams.
- Activating devices for restricting smoke and fire propagation, for example, closing fire doors, fire dampers, and the like.
- Activating fixed extinguishing systems – FM 200 in this case.
- Activating smoke and heat venting systems, escape route pressurization
- De-energizing technical systems (installation)
- Controlling building services systems, particularly heating and ventilation systems and elevators.
- Activating the emergency lighting.
- Activating the evacuation systems and the like.

Additionally, the panic bars shall be installed at the “Fire Exit Doors” to ensure the smooth evacuation in case of fire.

Detectors shall be Cross-Zoned detection requiring two detectors to be in alarm before release. Automatic operation of each protected area shall be as follows:

1. Actuation of one (1) detector, within the system, shall:
a) Illuminate the "ALARM" lamp on the control panel face.
b) Energize an alarm bell.
c) Transfer auxiliary contacts, which can perform auxiliary system functions such as:
   Operate door holder / closures on access doors; Transmit a signal to a fire alarm system;
   Shutdown HVAC equipment.
d) Light an individual lamp on an optional annunciator.

2. Actuation of a 2nd detector, within the system, shall:
   a) Illuminate the "PRE-DISCHARGE" lamp on the control panel face.
   b) Energize a pre-discharge horn/strobe device.
   c) Shut down the HVAC system and/or close dampers.
   d) Start time-delay sequence (not to exceed 60 seconds).
   e) System abort sequence is enabled at this time.

3. After completion of the time-delay sequence, the FM 200 Clean Agent system shall discharge and the following shall occur:
   a) Illuminate a "SYSTEM FIRED" lamp on the control panel face.
   b) Shutdown of all power to high-voltage equipment.
   c) Energize a visual indicator(s) outside the hazard in which the discharge occurred.
   d) Energize a "System Fired" audible device.

4. The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above except that the time delays and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.

The system design will consider and address possible fire hazards within the protected volume at all three levels - (i) below raised floor, (ii) Server room, (iii) above false ceiling. The discharge of the FM200 gas based system shall provide the entire sequence of operation from the signal to gas release module, to the actual completion of the gas discharge within 10 seconds, and the fire is not allowed to propagate thus saving the critical assets housed in the protected area.

The discharge nozzle locations shall be such that the uniform design concentration will be established in all parts of the protected volumes. The final number of discharge nozzles shall be according to the OEM approved software. OEM product manual and OEM vetted programmable pressure loss & flow calculation for this particular project shall be submitted. System designed to accept gas discharge signal to the FM200 gas cylinder solenoid from fire alarm panel as well as manual gas release station. The FM-200 System is proposed for entire Data Center Area.

The extinguishing system shall include the following components having dated long life span.
- Storage container with valve
- FM 200 gas
- Solenoid actuator
- Manual actuator
- Pneumatic actuator
- Discharge hose
- Pilot hose
- Gas discharge nozzles
- Cylinder straps
- Manifold with check valves
- Discharge pressure switch and Supervisory pressure switch
- Microprocessor Based Gas Release Panel with 2 Release Circuits, Battery with charger
- Warning sign
- Suitable Mounting accessories
- Any other items as per the requirement

Manual lever actuator shall be provided with a face plate with clear instruction of how to mechanically actuate the system. The cylinder valve bodies shall be brass. The releasing device shall be easily removable from the cylinder without emptying the cylinder. Upon discharge of the gas, no mechanical / electrical parts shall require replacement except FM 200 gas.
One single manufacture under same brand name should supply major components of FM 200 system such as valves, releasing devices, nozzles etc.

Applicable Standard : NFPA 2001
Minimum conc. of agent as per (NFPA) 2001 : 7.0%
Max. Concentration of gas as per (NFPA) 2001 : 9.0%
Flooding Factor : 0.5483 Kg/m3
System pressure : 25 Bar
Min. pressure requirement at nozzle : Min. 6.034 Bar
Discharge time : 10 Sec. (Maximum)
Cylinder Size : 80 Litre
Minimum fill in cylinder : 38.5 Kg
Maximum fill in cylinder : 84.5 Kg
Nozzle coverage area : 180 deg : 10.2M radius (maximum)  
: 360 deg : 6.4M radius

Systems should be UL / FM approved.

ASPIRATING SMOKE DETECTION SYSTEM (VESDA / HSSD)

Scope of Work
This specification covers the requirements of design, supply of materials, installation, testing and commissioning of Aspirating Smoke Detection System. The system should protect server room false ceiling, return air vent, rack area and below the raised flow areas using highly sensitive LASER-based Smoke Detectors with aspirators connected to properly designed network of sampling pipes and Display control panel. The Bidder shall also make provision in the Aspirating Smoke Detectors to trip AHU and to shut fire dampers if required in the event of fire through the relay contacts. The system will provide an early warning of fire in its incipient stage, analyze the risk and provide alarm and actions appropriate to the risk. The system should be integrated with the proposed BMS and should be with the following functional Process

- Continually drawing air into a pipe network attached to a detector unit.
- Passing the air through a dual stage filter to remove dirt
- Sending the clean air to a laser detection chamber for smoke detection.
- Measuring the light scatter caused by any smoke
- Processing the detector signal and presenting the smoke level graphically
- Communicating the information to a fire alarm control panel thru relay/ input module, a software management system or a building management system.

Codes and standards
The entire installation shall be installed to comply one or more of the following codes and standards:
NFPA Standards, US / British Standards, BS 5839 part: 1

Approvals
All the equipments shall be tested, approved, and/or listed by:
LPCB (Loss Prevention Certification Board), UK
FM (Factory Mutual), US
UL (Underwriters Laboratories Inc.), US
ULC (Underwriters Laboratories Canada), Canada
Vds (Verband der Sachversicherer e.V), Germany

Design Requirements
The System shall consist of a highly sensitive LASER-based smoke detector, aspirator, and filter. It shall have a display featuring LEDs and Reset / Isolate button. The system shall be configured by a programmer that is either integral to the system, portable as well as PC based. The system shall allow programming of Multiple Smoke Threshold Alarm Levels, Time Delays and Faults including airflow, detector, power, filter block and network as well as an indication of the urgency of the fault. It should provide configurable relay outputs for remote indication of alarm and fault Conditions.

It shall consist of an air sampling pipe network covering the server room false ceiling, return air vent, rack area and below the raised flow areas to transport air to the detection system, supported by
calculations from a computer based design modeling tool. The system should be interfaced with the building fire alarm system / BMS with a dedicated System Management graphics package.

**Performance Requirements**

- Shall provide very early smoke detection and provide multiple output levels corresponding to Alert, Action, and Fire 1 & 2. These levels shall be programmable and shall be able to set sensitivities ranging from 0.005 – 20% obscuration / meter.
- Shall report any fault on the unit by using configurable fault output relays or via the graphics Software.
- Shall monitor for filter contamination.
- Shall incorporate a flow sensor in each pipe and provide staged airflow faults.
- Shall have a clean air supply to maintain Laser chamber clean all the time.

**Materials and Equipment**

Both Light Scattering and Particle Counting shall be utilized in the device as follows:

The Laser detection Chamber shall be of the mass Light Scattering type and capable of detecting a wide range of smoke particle types of varying size. A particle counting method shall be employed for the purposes of preventing large particles from affecting the true smoke reading. Monitoring contamination of the filter (dust & dirt etc.) will notify automatically when maintenance is required.

The Laser Detection Chamber shall incorporate a separate secondary clean air feed from the filter; providing clean air barriers across critical detector optics to eliminate internal detector contamination. The detector shall not use adaptive algorithms to adjust the sensitivity from the set during commissioning. A learning tool shall be provided to ensure the best selection of appropriate alarm thresholds during the commissioning process.

The Detector, Filter, Aspirator and Relay Outputs shall be housed in a mounting box and shall be arranged in such a way that air is drawn continuously from the fire risk area by the Aspirator and a sample passed through the Dual Stage Filter and then to the detector. The detector shall be LASER based and shall have an obscuration sensitivity range of 0.005 – 20% obscuration per meter. The detector shall have three or four independent field programmable smoke alarm thresholds across its sensitivity range.

The Detector shall also incorporate facilities to transmit the following minor and urgent faults

- Detector, Airflow, Filter, System, Zone, Network and Power
- Minor faults: Minor faults shall be considered as servicing or maintenance signals.
- Urgent fault shall indicate that the unit may not be able to detect smoke.
- The detector shall have four pipe inlets which must contain flow sensors.

The filter must be a two-stage disposable filter cartridge. The first stage shall be capable of filtering particles in excess of 20 microns from the air sample. The second stage shall be ultra-fine, removing more than 99% of contaminant particles of 0.3 microns or larger, to provide a clean air barrier around the detector’s optics to prevent contamination and increase service life. The aspirator shall be a purpose designed rotary vane air pump. It shall be capable of allowing/ supporting for a single pipe run / multiple sampling pipe runs with a transport time of less than 90 seconds.

The Assembly must contain relays for fire alarm and fault conditions. The relays shall be software programmable (latching or non-latching). The relays must be rated at 2 A at 30V DC. Remote relays shall be offered as an option and either configured to replicate those on the detector or programmed differently. The Assembly shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector (Zone) shall be capable of storing up to minimum 1000 events.

**Displays on the Detector Assembly**

The detector shall have a LED / LCD / Bar graph display for the multiple alarm threshold levels indicated and faults such as detector fault, airflow fault and indication for Isolate and Reset.
Sampling Pipe

- The sampling pipe shall be smooth bore with an internal diameter of 15 - 21mm and an outside diameter of 25mm should be used. The total length as per the manufacturer's recommendation.
- The pipe material should be suitable for the environment in which it is installed and should be the material as required by the specifying body.
- All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
- The pipe shall be identified as Aspirating Smoke Detector Pipe along its entire length at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
- All pipes should be supported at not less than 1.5m distance or that of the local codes or standards.
- The far end of each trunk or branch pipe shall be fitted an end cap and drilled with a hole appropriately sized to achieve the performance as specified and as calculated by the system design.
- Sampling Holes of 2mm, or otherwise appropriately sized holes, shall not be separated by more than the maximum distance allowable for conventional detectors as specified in the local codes & standards. Intervals may vary according to calculations.
- Each sampling point shall be identified in accordance with Codes or Standards.
- Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of Sampling Points and the distance of the Sampling Points from the ceiling and roof structure and forced ventilation systems.

Installation

The Contractor shall install the system in accordance with the manufacturer's recommendation. The sampling pipe shall be installed above the ceiling and Capillary Sampling Points installed on the ceiling are to be connected by means of a capillary tube.

- The minimum internal diameter of the Capillary tube shall be 5mm, the maximum length of the capillary tube shall be 2m unless the manufacturer in consultation with the engineer have specified otherwise.
- The Capillary tube shall terminate at a ceiling Sampling Point specifically approved by the Client. The performance characteristics of the sampling points shall be taken into account during the system design.
- Air Sampling Piping network shall be laid as per the approved pipe layout. Pipe work calculations shall be submitted with the proposed pipe layout design for approval.

Testing

- Commissioning of the entire installation shall be done in the presence of the owner and/or its representative.
- The installer shall provide evidence of flow / pressure calculations for the 'as installed' system to ensure optimum sampling performance. These calculations shall be done by computer aided design software depicting 3D isometric drawings of the pipe network.
- It shall be verified that all alarm and fault interconnections are fully operative by means of activation of the signals. In sensitive areas, such as food storage, the detector system shall be capable of generating test alarms automatically without the need for generation of smoke.
- All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor for this testing.
- The Contractor shall record all tests and system calibrations and a copy of these results shall be retained on site in the system Log Book.

Functional Test

- Introduce Smoke into the Detector Assembly to provide a basic functional test.
- Introduce smoke to the least favorable Sampling Point in each Sampling Pipe. Transport time is not to exceed 90Seconds.

Rodent Repellent System

Two numbers of compact, safe, environmentally friendly and non-irritating pest repeller Very High Frequency Oscillator (VHFO) units (each unit with one master control and 12 satellites) are to be
installed in Data Center and UPS room. The entry of Rodents and other unwanted pests should be controlled using non-chemical, non-toxic devices. Ultrasonic Frequency sound wave based repellant system has been proposed at Data Center. The rodent repellents will be provided in the false flooring and ceiling to repel the pests without killing them. The installed units must withstand high temperatures in false ceilings and low temperatures in cold storages and air locks.

The Pest Repellent System should consist of one master console & twelve satellites / transducers. The Master Console is installed in the control room and the satellites in the identified problem area. The successful bidder shall make detailed working drawings and coordinate with user and other agencies at site.

Satellites
The sound waves propagated by the satellites should be linear sine waves with constantly varying frequencies. Each Satellite should cover an open area of 300sq. ft. when the average height of the ceiling is 10 ft. When installed in false ceiling / false flooring it should cover an approximate area of 150 sq. ft.

- Each satellite should be compact size and could be mountable in any angle.
- They should be mono-polar and there should be no risk of sparking
- They should be able to withstand high temperatures in the false ceilings.
- They would not need a power connection.

Technical Specification
Configuration: One master Console with 12 transducers.
Satellites: Visible Hexagonal, Triangle exciter center damp horizontal line exciters. Frequency: Peak frequency responses of the satellites should be,

- 21.6 KHz +/- 3 KHz
- 31.6 KHz +/- 3 KHz
- 50.4 KHz +/- 3 KHz
- 60 KHz +/- 3 KHz

The satellites should operate in a temperature range of 10 Deg. C to 60 Deg. C, and can propagate sound waves in 100% humid conditions, and even when they are submerged under water.

Excitory Circuit: Signal Generator should have full wave rectification, regulated 12 V DC power supply to withstand power fluctuations ranging from 170 VAC to 270 VAC. Amplifier should have a preamplifier stage coupled with signal generator for dual transistor amplification having a push – pull configuration.

Sound Output: Uniform output of 80 dB to 110 dB with 360 Deg (built in control for steady output).
Transmission angle: Linear Propagation of mixed / variable frequencies detectable at, or about 40 ft. distance from the source (transducer / satellite) spatial average intensity 83 mW per sq. cm.

Power Supply: Provision for 230 VAC and 24 VDC

Water Leak Detection System

Water leak detection sensing tape shall be installed in the water prone areas of Data center and to be integrated with BMS. Water leak detection System shall be integrated with BMS and designed to protect the Air-conditioned premises and to alert the personnel about the leak in the AC systems. The system shall also be designed to trip the AC when the sensor is activated. Events are clearly reported on LCD/LED display with full English language description of the nature of the fault in the panel. The panels for water leak are located at the BMS room.

Components of water leak detection system
The Water leak detection system shall comprise of Tape Sensors, Water Leak detection modules, Condensation detectors, I/O modules and sounders all connected to a Control Panel.

Control Panel
The control panel shall be Computerized 8 zone multiplex controller with a facility to add on dialer and speech processor. The system shall be programmed, armed or disarmed through a control key pad. The control key pad shall have a 16 character LCD display for viewing various events. The code to arm or disarm the system shall be changed only by entering a master code.
The system shall have 8 zones and all the detectors shall be connected through a 2 core cable. Each area of the premises shall be divided into specific zones such that any zone shall be isolated by the user if required. The entire system shall be backed up by a maintenance free rechargeable battery to take care of system's power requirements whenever power fails. The system shall be totally tamper proof and shall activate an alarm if the control panel is opened, the sensors tampered with or if the system cables are cut even in the disarmed state. The system shall log 500 events and optionally printer shall be connected for generating reports.

The Detectors, I/O Modules, Remote Keypads and other Devices shall be connected to a system on a single 2/4/6 Core Cable Bus to avoid individual cabling of zones. The system shall have a Buffer memory of minimum 250 events and log each event with exact date and time. The controller shall have a Serial Port for connecting to a computer. The system shall be totally tamperproof and shall activate an alarm if the control panel is opened, the sensors tampered with or if the system cables are cut even in the disarmed state.

Tape Sensors
Tape sensors are to be used to detect water leaks under floors and the Tape sensors shall be covered with plastic netting to prevent short circuits when used in metal trays or conduits and enables the tape to be folded at right angles to allow easy routing.

Condensation detectors shall be able to provide early warning of the condensing conditions in chilled beam/ceiling systems to avoid the possibility of the indoor rain. The detector shall have relay output for direct connection to the controller.

Sounder
The sounder shall give audible alarm when any sensor operates. It shall be complete with electronic oscillations, magnetic coil (sound coil) and accessories ready for mounting (fixing). The sound output from the Hooter should not be less than 85 decibels at the source point.

Controller Technical Specifications

- No. of Zones 2 / 4 / 8
- Events 500 event log
- Control keypad 20 button illuminated keypad
- Display 16 Character LCD on control keypad
- Water leak Detector
- Response Time <1 Sec.
- Max sensor tape length 200 Mtr.
- Ambient Temperature 10° - 60°C
- Relative Humidity 0 - 90% RH

Condensation Detector

- Supply Voltage 24V AC/DC
- Output 10A @240V AC relay contacts
- Response Time <1 Sec.
- Input resistance 10 K ohm

Integrated Building Management System (BMS):

Scope and General Description
Supply, install, testing and commissioning of the industry standard, proven quality of integrated Building Management System (BMS) on the basis of truly distributed intelligence for a centralized overview, control and protect the Data Center area. This solution provides one central point through which various alerts can be monitored by the graphical user interface of the entire system and should able to generate reports. Dynamic colour graphics facility should be provided for monitoring and operation of the system without specialist computer skills. The systems should consists of “Command and Control” server and other allied accessories to integrate a wide range of critical infrastructure systems to protect from fire, unauthorized entry and surveillance in all areas. The BMS system should be supplied and installed with complete Sensors I/O modules, Direct Digital Controllers, Communication Controllers and Supervisory Software for interfacing with various safety and security systems proposed for the Data Center as per this tender. This shall include laying of cabling in duct, conduits and power supply etc., necessary for installation of the system with supply of appropriate
type products as indicated in the specification and scope of work. The necessary terminal blocks that are required for connection of field equipment cables to DDC cables are also in the scope of the vendor.

The Building Manager deals with a single viewing window which is a screen of PC monitor, known as operator workstation through which the health, status and data of various services are available continuously in the form of ‘Live graphic’. Automatic reporting take place through an online printer in various forms like Alarm summery, history trend or in any other form of reporting decided by the user.

The BMS shall perform the following general functions.
- Building Management & Control
- Serve as operator Man – Machine interface
- Data Collection & Historisation
- Alarm Event & Management
- Trending, Reports & MIS Generation
- Maintenance & Complaint Management
- Network Integration
- BMS system to have facility to send SMS & Email alert system for critical equipment’s events like failures in UPS Power, Cooling, Fire emergency, etc.
- BMS system to ensure that the power & cooling units are switched off when the fire breaks off & open the Access doors with siren & alert mechanism as mentioned above.

BMS system to integrate three UPS, three PAC systems, addressable Fire detection system, Fire suppression Gas release panel, VESDA, Access control system, CCTV surveillance system and Water Leakage Detector system as specified in this tender. Also should have facility to add additional temperature monitoring devices and options to integrate other devices like DG, etc.

All the above listed Systems communicate with the Integrated Building Management System on MODBUS RTU Protocol or by other protocol provided by each of the system or by hard wired points to establish the communication for the desired functions of BMS. The Integrated Building Management System should be based on advanced state of art of technology wherein the various sub-systems are seamlessly integrated on a single platform and the IBMS software remains the head-end for all the proposed safety and security system. The integration enables viewing of all the above systems through icons on the Building Automation System Software. Upon selection of each icon, the screen for the respective system appears on the Building Automation System Workstation. Seamless integration specifies that all these sub-systems of BMS has the same head-end and runs on the same application software from the same platform. This ensures that integration between the various sub-systems are independent cables and hardwire connections between the various sub-systems. The seamless integration ensures software signals performing the integration functions between various sub-systems.

The Screen would incorporate real time values of critical information that may be released by the respective systems. All critical alarms that may be available on the respective system shall pop-up on the Building Automation System Software Screen as and when they appear. The user can acknowledge the alarms and the information is stored in the Audit trail file of the Building Automation System.

The Control functions for each of the above systems depends on the information / data released by the respective system provider for the necessary controls from the Building Automation System. It is assumed that each of the Systems mentioned above, has their own Software & Hardware to communicate with the Building Automation System through suitable protocol. The necessary central server system will have the following hardware specification.

**System Configuration**
- The proposed BMS shall have 2 or 3 levels of intelligence namely:
  - DDC Controller
  - Communication Controller or Gateway or Router or I/O Module
  - BMS PC Control Station
Building Automation system details:

1. **Safety**
   - Intelligent Microprocessor based Fire Alarm & Detection System
   - Gas based Fire Suppression System- NOVEC1230- Hardware interface
   - Water Leakage Detector system
   - VESDA smoke detector system

2. **Security**
   - Biometric Smart card based Door Access Control
   - CCTV surveillance system

3. **Centralised Operation**
   - PC based Operator console.
   - Integration of all safety and security systems mentioned in this tender.
   - Main Server based station with BMS application Software.
   - Integrated user friendly Graphic Central Software
   - Report generation, Logging, trending and Print out.

**System Architecture:**

- The proposed system shall be based on Distributed Network-able intelligent system. The system shall be microprocessor based. Direct Digital Controllers (DDC) shall interface with relays, sensors, actuators and safety & utility systems.
- The BMS system architecture shall be modular, utilizing industry standard protocols.
- The system shall allow distribution of system functions such as monitoring and control and graphical user interface etc. through LAN, to allow maximum flexibility and performance. It shall also have a capability of remote monitoring through dial up modem or internet or through WEB Browser.
- The architecture shall support various third party systems using standard hardware and software to link various functional nodes into a single integrated system. The system shall be compatible to industrial standard protocols like MODBUS RTU, BACnet, LON works, etc., for any third party system integration so they can communicate on these open/universal protocols. In case of non-compatibility, gateways can be utilized. It is deemed that either open protocol software is included or the required gateway and necessary software are included for this purpose. Total coordination and compatibility between any third party system supplier and IBMS supplier and respective system is extremely important and deemed to have been taken care of and all related cost included for this.
- The BMS system shall also support communications with a wide variety of control devices and software systems. The BMS operator control station shall allow the user to monitor and control the entire system with various user definable access levels.
- System shall be capable of generating alarms, operator transactions and system reports. The system shall have provision for connecting to dedicated USB/Serial printer interface or through BMS control station. BMS shall have alarm transmission facility through mobiles & Land lines. Vendor shall quote for the required hardware & software for such integration. Vendor shall also clearly specify what interface they require the client to provide for such integration

**Monitoring and Control:**

- The BMS system shall be easily configurable to suit the user specific requirements. There shall be no restrictions on usage of the controllers to specific requirement. All controllers shall thus be seamlessly integrated to the network and systems that require software drivers to be developed for shall not be accepted.
- All configurations shall be permissible while the system is on-line without interruption to monitoring and control on other controllers. Systems that require going off line for programming/ configuration shall not be acceptable. Specifically, BMS nodes must not require "re-starting" to implement database changes.
- The communications driver for a controller type shall be configurable on-line by users with the appropriate security access. The parameters that can be modified based on Device /Controller Type, Communications Port, Baud rate, Device Name, User ID
Communications:

- The BMS system shall provide communications over a variety of physical media topologies like RS-232, RS-485, Bacnet.
- The system shall be capable of supporting many communications links to networks of control devices. Each connection shall operate independently of the others and facilities shall be provided by system displays to individually place the channels in service or out of service.
- For achieving better system availability & reliability, it shall be possible for all serial connections to the BMS system to be routed via the LAN instead of connecting directly to the host computer. The system shall be capable of supporting many network connected Operator Stations simultaneously.
- It shall be possible to efficiently monitor dynamic, real time data from any of the real time controllers connected to the network. It shall also be possible to configure hardware and software points from the BMS stations for each of these controller panels using a consistent configuration data format across all panel/controller types.
- It shall be possible to interface to different types of controllers/devices using an industry standard interface protocols such as MODBUS, BACNET etc. This shall allow simple interfaces to proprietary devices to be interfaced using a standard protocol.
- Given the sufficient level of system privilege through passwords, it shall be possible to view, manipulate and analyse all data in the system from any Operator Station in the system, including those operating remotely via dial-up modem links.
- Once a controller is configured and placed in service, the system shall automatically begin background diagnostic scanning of the controller to ensure that communications are monitored independently of any point monitoring / scanning.
- For ensuring data integrity, the system shall perform checks for integrity of all data acquired from the controllers. If an invalid or time out response be received, the data shall be ignored and the system records the transaction as an error. As a minimum, all these communications statistics shall be displayed on a standard system display and shall be available as part of the reporting system or custom displays. Systems in which the network communications are not transparent / reported for user displays shall not be accepted.

Direct Digital Controller (DDC)

DDC should be distributed processing type, with the direct digital control algorithms operating by micro controllers. Total number of controllers required shall be dependant on the I/O requirements & geographical distribution of the I/Os.

The controllers shall be connected to the various Sensors, Switches and Control panels by means of suitable cables as specified by the individual system manufacturer. The DDC shall be able to supervise individual sensors for proper performance as well as to give output to control various devices connected to it. There should be a minimum scan time of one second per input point. The DDC shall also have the facility for networking with other DDCs and communication controllers. Each DDC shall have a RS 232 serial port for communication with PC or Modem.

- Each DDC should consist of a DIN rail mounted unit, with detachable plug type screw clamp for the Input / Output wiring. Outstations should cater for terminals for screened cable. The DDC controller shall be with EPROM or EEPROM of required capacity with function blocks for performing required closed loop and open loop (interlocks) functions at the various locations shall be a part of the controller.
- DDC controllers are to be installed in lockable enclosures that shall also house the associated terminal blocks, power supply, relays (with change over type of contacts), etc. The controllers shall be completely wired and all interface relays required for interfacing to external system like MCC etc. should be provided.
- All the controllers offered shall be used for variety of application and shall be capable of monitoring & Control Digital, Analog Inputs & outputs. The DDC controllers shall be provided with I/O points as required in the enclosed I/O List.
- The controller shall be capable of accepting following type of inputs:
  1. NiCd1000, PT1000, Passive Detectors within the range 30 ohm to 4 M ohm.
  2. 0 - 10V @ 134K, 0 - 20 mA @ 120 W, Digital Volt Free Contact, Pulse up to 12 Hz
  3. Similarly the output can also be configured as follows:
  4. Triac - 24 V AC @500 mA
  5. Analogue: 0 - 10 V Dc (1 K ) at 10 mA max,
  6. Digital Volt free contact
- Parameters like various temperatures, RH, pressure and any other stipulated parameters should be possible for storing within each controller.
- All the functional requirements shall be programmed in the PC software and shall be downloaded to the Controller. Provision shall be available for connecting laptops or PC directly to DDC for any detailed evaluation locally for any exigency.
- It shall be possible to view/upload settable parameters to the DDCs from a Laptop even in the event central system is switched off or the communication network is under maintenance.
- It shall be possible for programming logic function modules in each controller.
- Each point in the controller shall be easily configurable across the network for complete access using global instructions and automatic time synchronization for faster engineering.
- To avoid loss of operational data in event of a bus fault, Local storage of events at the DDCs shall be required. VENDOR shall specify their event memory capacity of the DDC Controller. Local network speed shall be configurable at the DDC Controller.
- The controllers shall be of distributed type; hence enormous cabling required for hooking up the DDC with the control equipment will be reduced as compared to large controllers.
- The DDC controllers shall be necessarily listed under UL compliant. They shall be in conformity to European EMC standards, CENELEC EN50 082-2 & EN55 011 and should also be tested to I.E.C. 801-4 for electrical noise immunity.

**Communication Controllers (CC) or Gateway or Router:**
1. The communication controller or Gateway or Router shall be an interface between the DDC Controllers & the PC work Station. It shall take the data received from one DDC and transmits it to other DDCs over an RS485 sub-network.
2. The system involving DDCs that are capable of communicating with each other on a Peer to Peer Network with out the need for the communication controller or gateway need not quote for this item. But, the functions and features indicated in this section have to be met in total by the IBMS System.
3. The communication controller or gate way shall be able perform alarm and global handling for the DDCs as well as providing a hardware RTC. for the sub-network or DDCs themselves shall have a built in RTC and also shall have the ability to communicate alarms, events to other DDC on a Peer to Peer Network. Each communication controller shall be linked directly to a PC modem or printer.
4. One communication controller shall support atleast up to 1000 I/O point or the system.
5. The network shall be easily expandable by networking of controllers to monitor / control Input / Output points of the entire network.
6. Communication with the DDC shall be through RS485 network.
7. Integration with the third party Systems shall be either through the Communication controller/Gateway or through DDC Controllers on a industrial standard MODBUS RS232 / RS485, BACNET, LON Works or through OS Nodes protocols. The required hard ware such as router, terminal server, controllers, integrators etc., shall be considered by the IBMS vendor within the quoted price.
8. Baud rate of the RS485 Subnet shall be set on the site depending on the requirement.
9. Communication controllers shall contain Non rechargeable lithium cell which maintains data & time functions for 2 years. Data transfer from windows based data bases shall be possible through Dynamic data transfer.
10. The communication controllers shall be listed under UL compliant. In addition to these approvals. They shall also be in conformity to European EMC standards, CENELEC EN50 082-2 & EN55 011 and should also be tested to I.E.C. 801-4 for electrical noise immunity.

**Fail Safe**
The processor outstations should have battery backed RAM for greater than one year and all outstation parameters should be protection in the event of failures. In the event of power failure, all outputs should go to safe or default parameters. The battery life should be a minimum of ten years.

**Power Supply & Environment**
Power supply shall operate at 24 V AC using power supply for field devices. A suitable Single Phase 5 KVA UPS with 30 minutes backup support shall be provided by the vendor and installed in Ground floor UPS Room.
BMS PC Control Stations

1. The Control stations shall comprise of a Personal computers providing high level operator interface with the system. The terminals shall be capable of providing the operator with the facility for remote system interrogation, control, retrieval/storage of logged data, annunciation of alarms and reports, analysis of recorded data and the formatting of management reports.

2. The vendor shall quote in their offer the configuration of PC that is required by them for operation of their Master server & Client Soft wares.

3. The minimum suggested configuration of the control station shall be suitable for the power supply voltage of 230 V AC +/- 10% 50 HZ + 3%.

**Workstation / Server hardware details (2 Sets):**
- Intel(R) Core(TM) i5-2400 Processor (3.10GHz, 6MB)
- Intel(R) Q67 Express Chipset
- Integrated Intel(R) 82S79LM Gigabit Ethernet LAN 10/100/1000
- 4GB (2x2GB) Non-ECC DDR3 1333MHz SDRAM Memory
- 320GB 7200 RPM SATA Hard Drive
- 2TB, 7200 RPM SATA Hard Drive
- 8X Max Slimline DVD+/-RW
- 24 " Widescreen Flat Panel Monitor
- Intel(R) HD Graphics 2000 Integrated Graphics
- USB Optical Mouse
- USB Entry Business Keyboard (English)
- Genuine Windows(R) 7 Professional 64 bit (English)
- All other I/O interface cards as per the system requirement.
- Heavy duty Inkjet Printer
- 3Yrs NBD Onsite Service

BMS Management Station Software

The vendor shall quote for Master Server & one client software. The management station software must run on a networked environment such as Windows 7 Professional or later providing kernel level security for access to the network as well as the BMS database. As a minimum, the Management station software shall have the following packages. Plant Viewer / graphics viewer, Builder package to edit / alter graphics and schematics Log Viewer, Alarm Viewer, Trend Viewer, Object Viewer.

BMS Software Features

Applications software suitable to run on windows based server system should provide an integrated, cost-effective control of all building safety and security systems. The modular architecture, cost-effective, scalable system supporting configurations that range from standalone, single-building systems to campus or multi-location operations with several servers.

- Based around client-server architecture with a high-performance database for real-time information to local or network-based clients such as operator stations, or to enterprise applications, such as spreadsheets or relational databases.
- Networking solutions to support both local and remote operator stations and field controllers. The system also communicates with your enterprise’s PC network to provide a true window into total enterprise through the standard TCP/IP network topologies, ranging from local high-speed Ethernet LAN to Wide Area Networks.
- A single solution for monitoring, controlling and integrating all operations of a Data Center infrastructure and facilities to interface systems across our entire organization.
- A comprehensive range of pre-configured displays
- Standard toolbars for all key functions
- Pull-down menus
- Standard building reports
- Pre-engineered point structures
- A building-specific shape library
- Advanced point processing routines
- Most recent / highest priority alarm field on all displays
- Standard status bar on all displays
BMS Software should support:

**Building Manager:** For integrating and controlling the systems, products and subsystems of a building’s HVAC, lighting, hydraulics and energy usage.

**Security Manager:** For integrated control and monitoring of electronic access control, security management and closed circuit television systems.

**Life Safety Manager:** For providing primary monitoring and full control of a building's life safety functions, including smoke and fire detection, sprinkler supervision and emergency communications.

**Web Browser Operator Interface:** The operator interface shall also be fully available through the internet via an Internet Explorer browser. From Microsoft's Internet Explorer, an operator shall be able to perform all functions on the same standard and custom graphics as used in the standard operator interface. All custom graphics, alarm graphics and standard graphics shall be available without modification or reengineering through the Internet in an Internet Explorer browser user interface and shall be fully functional.

The browser interface shall provide login and security authentication in the same way as the standard operator interface. It shall be possible to operate the facility through the browser user interface in the same way as the standard user interface and perform all functions described in section. For example: acknowledge alarms, view graphics, control points, execute reports, modify configuration settings and the like. A large number of casual users shall be permitted without any additional licensing burden. Licensing shall be based on the number of simultaneous operator connections on a “First Come First Served” basis. Those users with casual access shall automatically disconnect from the FMS server after an idle timeout period.

**Third Party Interfaces license:**

Interfaces are customized for internationally recognized open protocols such as MODBUS RTU / BACnet / LON etc. This approach enables us to recognize 3rd party systems as if it were own system. Points pertaining to 3rd party sub-systems should be integrated into system graphics at the management station allowing free interaction between the BMS and 3rd party systems.

The PC must be able to participate as one of the network nodes permitting the PC to be moveable if such a need arises. When the system is configured for a multi-user environment, the system must be capable of working on a client-server mode.

The vendor shall consider master server software loaded at the BMS server and 3 client software which shall be loaded in any designated PCs in the LAN / WAN network. The levels of authentication shall be field programmable.

**DDC Programming Software:**

It shall be fully featured windows based supervisor for Integrated Building Management. It shall combine all the benefits of a graphic user interface, such as dynamic graphic displays for ease of use, with the practical advantages of dynamic data transfer. The system software shall be password protected in multi levels. The software shall be a graphically programming tool. It enables user to make the function diagrams, to parameter, commission all the automation stations and to change the parameters while the system is in operation. It shall preferably fulfill the requirements laid down in the IEC1131-3 standard concerning the configuration (programming) of

**DDC / PLC devices:**

Programs should be designed off-line by selecting modules and joining them together. By going on-line this Program should then be uploaded directly into the controllers. There should be a set of variables generated automatically, set-up by this engineering program which allows data to be shared between on one or several sub-networks. The user should be able to draw, edit, upload, download, view and debug a strategy to any combination of communication and control devices.

If a strategy (program) already exists on a controller, it should be possible to access it on-line, upload it to the p.c. and then go off-line and edit it. Once editing has been completed it should be possible to go on-line again and download the strategy to the controllers. It is imperative that the strategy be saved as a file and that this file may also create all of the necessary documentation in a graphical Windows environment. There should be a document or program used in association with the strategy file for a project so that all of the hand-over documentation may be automatically generated from a strategy file.
Strategy information on input / output points should be accepted into the programming software from a spreadsheet package working in a Windows environment, such as Excel, thus saving unnecessary duplicating of data entry. If any changes are made to the control strategies, the programming software should have the ability to automatically generate a new set of hand-over documentation, and the client should have access to such software so that they make any post-contract alterations themselves.

Programs & Routines:
The following user programs & routines must be processed by the Control station.

Analogue Closed Loop Control:
This should provide full closed loop control for analogue signals. It shall be possible to configure a loop to full proportional integral derivative (PID) control, if required. It shall be possible to cascade many loops for complex systems. Loops shall have auto / manual override and high & low deviation alarms. It shall be possible to use weather compensation on some PID control loops. The number of programmable modules should be specified as an average per field device (Input & Output).

Time Scheduling
Time program to control the process shall be processed and stored on process level to allow an autonomous, management station independent operation of the subsystems. Time Scheduling shall operate in accordance with a yearly calendar that contains automatic adjustment for leap year and daylight savings time. Following functions shall be available on the management stations to ensure a flexible and convenient operation of time program.

- Direct access from objects in the plant graphics to the associated time program.
- Simple, graphics-based programming and modification of time program / switching times.

7-Day Time program
1. Exception program / holiday schedules (local, building wise or system wise).
2. Graphics-based overview of a 7-day program overlaid with all exception program / holiday schedules.
3. Graphics-based overview of all plant points affected by a time program.
4. Automatic synchronization of all time program in a system.
5. Printed reports in various display formats. Direct display of time programs on the screen. The time scheduling programme shall enable the operator to select items of equipment to be switched on / off automatically at pre-set times and days, one calendar function should be provided to program upto 365 days ahead.

Alarms Program:
A complete log of all alarms with time of occurrence, time of acknowledgement, time of reset, description of the alarm (exceeds low limit / high limit with corresponding values) and priority level indication shall appear on the alarm viewer. Irrespective of whatever application software (EXCEL / WORD / PP) is being used on the PC, the alarm viewer must popup a window if any of the alarms in the BMS gets activated. This popup must also have an active icon to acknowledge the alarm and another icon to lead the user directly to the plant schematic of this particular equipment. A ‘sort’ feature must be able to group alarms either by the ‘priority’ or by ‘equipment’. Data thus sorted out shall be saved in easily identifiable .It shall be possible to transmit alarm through telephone or auto Page the concerned people for initiating necessary action. As a minimum, the system shall support the following features

(1) Operation and manipulation of alarms (based on user privileges).
(2) Automatic pop-up windows for immediate display and operation of alarms.
(3) Audible or multimedia alarm indication.
(4) Continuous overview of all active alarms from site (updated automatically, displayed in order of priority with the location details, option of personalized view).
(5) Comprehensive filter and search criteria (time, date, priority, utility, alarm status etc.,).
(6) Alarms for out of limit values (high, low), change of status, run time limits exceeded etc.,
(7) Listing of unacknowledged alarms.
(8) Alarm management services shall also report the system alarms such as Network failure.
(9) Multiple priority levels of alarm shall be made available. Priority levels shall be deemed Critical Alarms and Non-critical (general) Alarms. Normally, critical alarm shall take precedence over non-critical alarms and high priority over low priority.

(10) Each analog point shall have the following limits defined; wherever required.

(11) High priority critical alarm limit, Low priority critical alarm warning limit, Low priority warning limit, Low general alarm limit.

(12) When an analog point goes outside the low priority critical alarm limit or Low priority warning limit, a user defined warning message shall be directed to the printer at the control station.

The warning limits shall be used to monitor controllability, not comfort conditions. The alarm limits shall be used to monitor comfort conditions. When a set point is changed the

**Interface:**

1. It shall provide instantaneous confirmation to system operator of equipment status, graphic screen animation shall be provided. This shall allow full colour animated displays of equipment in site layouts, building floor plans, and other system configurations. All graphic displays shall be programmable via keyboard or mouse selection of graphic library stored symbols and system profiles. Fully implemented graphic displays / colour band / real time values are to be provided for all systems so identified in the Input/output section of this document.

2. It shall provide a consolidated building screen displaying critical parameters. The operator shall have provision to access any of the parameters / functions through the screens. The user shall have the flexibility to ‘jump’ into a schematic of his choice from a main screen (the top screen). Jump tags shall be available for jumps on the same level or between levels.

3. The software shall permit free import of AutoCAD drawings on which intelligent icons shall be placed for maneuverability. If the HVAC drawing shows a plant room with one or more AHU, the IBMS software must permit jump tags at this location, the clicking on which will lead to the particular AHU schematic. The schematic shall be fully dynamic and all objects animated. A fan should appear as running while it is on and a valve shall depict the percentage of opening. All control / monitor parameters shall be constantly updating their latest values without having to perform a ‘refresh’ operation. The software shall have the flexibility to switch over to any other point of the same utility from the current graphics screen.

4. Colour banding of screen displays shall be provided for display and differentiation of normal and abnormal signals. This shall allow operator instant recognition and response to critical building operation.

5. The operator shall have the ability to create new graphics on-site through graphic engineering tools. The system must permit the use of the “builder package” at any time without shutting off the IBMS. The IBMS software shall be capable of accepting pictures that could be animated for easy movement to various screens. It shall provide a graphical display of the site plan, building plan, floor / wing plan, the utility being monitored while viewing a particular parameter of that utility. If the user furnishes a digital picture of the building, the IBMS top screen must be able to present this picture on the monitor from where jump tags will provide access to the users to the various floors / plant rooms. While moving the mouse cursor on the screen all such “live” objects shall automatically get highlighted with suitable tool tips thus distinguishing them from inactive objects. Analogue Values that change in the field must be reflected instantaneously on the Graphics page, however infinitesimal the change. Software must not restrict updating of values only when such parameters exceed pre-programmed threshold levels or only after specified time intervals.

6. One look at the system topology schematic must convey to the user, discrepancies in the system such as Database mismatch, Data point bad trace, Communication failure to the sub systems.

7. Values that are constantly updating from the BMS must be easily exported to other MS packages such as MS EXCEL for evaluation purposes. Another procedure to use EXCEL as a support package is by way of creating customized reports to which values (analogue as well as digital) keep updating constantly (auto refresh). Digital values can be represented by ‘0’ for “off” and ‘1’ for “on”.

8. Historical data must be automatically transferred to the hard disk for retrieval at a later date as required. There shall be no limitations to the number of history files that the system can generate.
9. Commandable points shall be uniquely identified by colour and/or discrete symbol and shall be directly addressable and Commandable from the graphic display. It shall not be necessary for an operator to type in command request or point names. Direct entry of Commandable point address or clicking the cursor to the point shall cause a display of associated command states for digitals, the set point value and valid range for analogs. Cursor positioning shall be via a “mouse”.

10. Dynamic data such as temperature and humidity values, fans and motor status, alarm point condition etc. shall be embedded in the graphics as the sensing location. Points in alarm condition shall annunciate by colour changes and flashing/blinking icon, symbol, or value.

11. When changes occur in the measured parameters (temp / rh) or driven equipment such as valve position / commands / vfd speeds, the graphics package must reflect these changes instantaneously and must not be bound by threshold values in such a way that the change is reflected only when such threshold values are exceeded.

12. Vendor shall not cite number of licensed points as a limitation to the number of features that shall be made available to the user. For example, an RH set point / a minimum damper position set point value / a p-band value / an integral action time shall not add up as additional points. Any calculated analogue or digital value used in the algorithm should not warrant an additional tag. If vendor’s licensing policy is structured in such a way, then vendors shall take care of such requirement at the time of tendering.

Password Access:

1. None of the features of the Control Station shall be accessible without the user first being required to log on by entering a password.

2. Alpha numeric passwords of minimum 6 and at least up to 15 characters shall be available and definable by individual operators.

3. It shall be possible to grant or deny access to any group of screens for any individual user. The ability to use this feature itself shall also be definable.

4. It shall also be possible to grant or deny access to individual points or groups of points by function or type.

5. It shall also be possible to define a time out value for individual user. Automatic log-off of the operator shall occur if no keyboard or mouse activity is detected during this time out period. It shall also be possible to allocate an infinite time out.

6. A log of users shall be available at the control station. A record of the user’s name, the time and date of log ON and log OFF shall be available from this file.

7. The operator with highest access authority shall have the facility to add or delete the lower level operators.

8. Each User can have one or all the following parameters as defined by operator with highest access authority

Enclosures for Controllers and Electrical Panels:

1. All the controllers shall be housed in Lockable Vandal proof boxes which shall either be floor mounted or wall mounted. These shall be free standing, totally enclosed, dust and vermin proof and suitable for topical climatic conditions.

2. The panel shall be metal enclosed 14 SWG CRCA sheet steel cubicule with gaskets between all adjacent units and beneath all covers to render the joints dust proof. All doors and covers shall be removable type or hinged and latched and shall be folded and braced as necessary to provide a rigid support. Joints of any kind in sheet metal shall be seam welded with welding slag grounded off and welding pits wiped smooth with plumber metal.

3. All panels and covers shall be properly fitted and secured with the frame and holes in the panels correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with nuts. Self threading screws shall not be used in the construction of control panels. Knockout holes of approved size and number shall be provided in the panels in conformity with the location of incoming and outgoing conduits/cables, lamps shall be provided to support the weight of the cables. The dimension of the boxes shall depend on the requirement with the colour decided in consultation with the Architect/Consultant.
Cables

1. Cabling between UPS point to the controllers / devices shall be in the scope the BMS Vendor.
2. The 2 Core 1.0 Sq mm cable connecting the Field devices to DDCs shall be PVC insulated copper, multi strand, Shielded cables shall be 650V grades and shall generally confirm to IS –1554 – 1988 and meet the signal cabling requirement of the system manufacturer.
3. The 4 core 1 Sq mm networking cable connecting the DDCs to Communication Controller / Router / Gateway and for the RS 485 MODBUS Interface shall be PVC insulated copper, multi strand, Shielded (armoured & un armoured) cables shall be 650V grades and shall generally confirm to IS –1554 – 1988 and meet the signal cabling requirement of the system manufacturer.

Testing

The entire IBMS System will be tested in the following aspects

1. Proper cabling as per the approved shop drawings.
2. System design & Configuration check.
3. Sufficiency of I/O with the requisite spares I/O for each section.
5. Communication test between Communication Controllers & DDCs.
6. Testing of Software features.
7. Any other test that are required for checking the quality & performance of the system

Display details

- The project-specific graphical user interface for a complete overview of the entire system whenever required.
- Dynamic color graphics for monitoring and to operate the system without specialist computer skills.
- Interlinked graphics in a hierarchical structure, so that users can navigate easily through the system, moving from a picture or map of the building to floor plans and individual rooms, right down to the controllers, sensors or other devices within the system.
- Displaying various windows of different sizes at the same time.
- Large-scale graphics for floor plans etc. should be included without difficulty, while the freely definable page size provides scope for a clear layout. Items such as set points and alarms, for example, can be operated directly in the graphics.
- The user simply clicks on the relevant item to adjust a value or acknowledge an alarm.
- Measured values, operating states and alarms are continuously updated on the screen and displayed in real-time mode. Once an item changes its value or state, the associated symbol in the graphics is animated; this may involve a change in numerical value, color, shape or text, or the symbol itself may be animated. All the commonly used symbols are provided in a number of (2D and 3D) libraries.

Alarm details

- List all the active alarms from the site. The alarm display is updated continuously, so that it always reflects the current status.
- Options for sorting and display during critical situations, when all alarms need to be located and dealt with at speed, whatever the size of the system.
- Users should able to acknowledge or reset alarms, view detailed information in text form, or jump directly to the associated plant graphics. And the system topology in the System Browser pane makes locating alarms even easier.
- Remote management of a complete overview.
- The alarm view can be personalized; to suit the individual needs of each operator. So both the night security guard and the system engineer will only see the respective information they actually need.
- Password-controlled filtering of the information displayed, based on criteria such as alarm priority, plant type, alarm status (acknowledged, unacknowledged, disabled, etc.).
- The current number of active alarms with priority always displayed in the task bar.
Warranty and AMC
The bidder should provide three years warranty for all the works carried out as per this contract. For all equipments supplied and installed (UPS, PAC, BMS and its integrated systems, comfort AC) at NIO Goa, the respective OEM should provide Three years On-Site Comprehensive Warranty and subsequent 4th and 5th year Comprehensive annual maintenance contract (AMC). The respective OEM’s acceptance letter for providing comprehensive on-site warranty services to installed systems during the warranty period without demanding any additional cost from NIO should be enclosed. The AMC period charges on yearly basis will be paid to respective OEM as per the agreed AMC rate.

OEM Commitment for On-site Technical Support
The bidder shall submit along with technical bid, letters of on-site comprehensive warranty service commitment assured by the respective original equipment manufacturer(s) also confirming minimum Five-year maintenance support of the system offered and shall guarantee supply of all spares for the equipment during its service life.

General Conditions and Eligibility Criteria for Techno-commercial bid:
The vendors who had participated in the Expression of Interest pre-bid meeting and the site visit at NIO, Dona Paula, Goa on 22.06.2011 in response to our Expression of Interest notice (as per the advertisement No.:NIO/Indigenous/10-11/179 and Tender No.:IND/110/COM/2011) and responded with their technical proposal are eligible to participate in the following techno commercial tender processes and should fulfill the following “General conditions and Criteria” mentioned here.

The bidder must possess the requisite experience and capabilities in providing the services necessary to meet the requirements, as described in the tender documents. The bidder must also possess the technical expertise personnel that would be required for the Data Centre during the warranty and annual maintenance contract periods. The bids must be complete in all respects and should cover the entire scope of work as stipulated in the Tender document.

The bidders should provide appropriate industry standard systems, products & solutions for this proposed work and the similar solution should have been used recently in at least five major data centers. Bidders should attach the proof of the proposed systems installation and its usage in Tier II or higher level Data Center and its user’s acceptance certificate for consideration of their technical bid. All the system / products / equipment supplied should be quoted as a whole complete unit with all the required accessories and allied items to provide the intended operation.

1. Entire work specified in this tender should be carried out on Turnkey basis within 120days from the date of signing the contract. Before the submission of techno-commercial bid, the interested bidders should attend the pre-tender clarification meeting at NIO and visit the work site to make their own assessments for ensuring the actual measurements / requirements related to Civil, Electrical and other Data Center related equipments / systems mentioned in this tender and should clarify himself on all aspects of this tender with concerned NIO authorities. Such a visit should be on bidder’s own expenses / arrangements with prior appointment with NIO authorities.

2. As the entire contract is executed on turnkey solution basis, the bidder / contractor is fully responsible to provide any or all additional items free of cost if such item(s) is inadvertently not specified in tender or not quoted but those items are essential to provide the intended operational requirements and successful completion of the work as per the general scope of this tender. Also the contractor should execute all incidental related works including materials supply at site associated with this scope of work without any additional cost.

3. The bid can be submitted only by an established Information Technology Company / IT System Integrator or Solution provider / OEM or their representatives who has an experience in installation & commissioning of tier II level or higher Data Centers and should have been in the business during the recent three years or more as on 31.8.2011.

4. The bidder should have installed and commissioned a minimum of three or more Data Centers (other than their own internal use) for others / commercial purposes similar to this
tender specification capacity or better equipped (primarily consisting of Precision Air-conditioning, UPS System, Electrical Distribution and Lighting, Fire Detection and suppression, Access control and CCTV, Building Management System, VESDA, Rodent repellent System, Civil and Interiors etc and all the allied works). The technical bid should contain the relevant documents in support of this claim.

5. The bidder should not propose or quote for end of life products. The bidder shall submit letters of commitment or declaration issued by the original equipment manufacturer(s) confirming minimum Five-year support for the installed systems and shall guarantee supply of spares for the equipment during its service-life starting from the date of acceptance to confirm that the products quoted are not end of life products.

6. OEM will be responsible for all warranties, upgrades and guarantees etc. during the warranty and subsequent AMC periods. For each proposed system, the respective OEM acceptance letter to this effect should be attached along with technical bid.

7. All the relevant OEM technical brochures giving the complete details of the proposed systems should be provided along with technical bid.

8. Schematic Diagram of the proposed systems / equipments should be provided for better understanding of the integration, functional features and suggested solutions.

9. The technical bid shall be complete and include all accessories which are essential for the complete functioning of the system as per the scope of this tender.

10. The commercial quote should contain the each unit rate for all major, auxiliary and accessory units. The detailed “Bill of Quantity” (BOQ) should be provided along with technical and commercial quotes for this purpose so as to account the final contract amount in case of addition or removal of any items from the total contract on valid technical reasons. NIO reserves the right to add or delete any quoted items quantity during the execution of work.

11. The bidder shall be responsible for proper coordination in the planning, construction of the Data Center, supply, testing and commissioning of the equipment as a whole. The successful bidder shall be the single point of contact for NIO during the installation and shall be solely responsible till the completion of entire work and its acceptance. The bidder should provide the detailed work plan schedule along with technical bid.

12. The bidder must have sufficient number of technically qualified and experienced professionals for installation of the quoted systems, its integration with other systems, networking and Data Center related infrastructure maintenance services. The bidder shall depute well experienced personnel who had sufficiently involved in the similar implementations for the execution of this contract and that once assigned to the project will not be moved out of it except for reasons beyond the control of the bidder. Certificate from bidder’s HR Department giving the details of Technically Qualified professionals employed by the company should be provided along with technical bid.

13. The bidder should provide the Summary information of Proposed Equipments / Systems as shown in the Appendix -1 of this tender. (with out price in technical bid and with price in price-bid). In addition to the original authenticated print copy, the bidder also should provide the complete technical bid and other specification details in soft copy in MS Word format to support quicker evaluation of the technical details.

14. Payment will be based on the progress of the work as per the following five major stages of the Data Center work schedule.
   1. **Pre-Site preparation**: After completion of all dismantling old fixtures, brick works, supply Server Room Partitions and Raised Floor materials and the first floor is ready to start further work - 10 % of the contract value.
   2. **Equipment pre-Installation preparation**: After completion of all Electrical wiring, Fixing Partition Panels, Cable tray, Thermal insulation, Ramp, False Ceiling arrangement - 20 % contract value.
   3. **Equipment Installation**: After completion of supply, installation and testing of all UPS and PAC system - 30% contract value.
4. **Finishing phase**: After completion of Supply, Install, commission and testing of BMS, completion of all Interior works and Fixing of all items as per tender (Server racks, comfort AC, Lighting, doors, etc..) - 20% contract value.

5. **Testing and Acceptance**: Final acceptance test and handing over - 20% contract value after receiving the 10% bank guarantee.

The vendor must agree and fulfill all the above eligibility criteria / pre-qualification conditions. Only the Technical bids of vendors fulfilling the above pre-qualification conditions will be considered for further process. Technical bids of vendors not fulfilling the pre-qualification conditions given above will be summarily rejected. Undertaking for subsequent submission of any of the missing documents will not be entertained under any circumstances. NIO reserves the right to verify / confirm all original documentary evidence submitted by vendors in support of above mentioned clauses of eligibility criteria. For other General Terms and Conditions please refer to the file titled as “General instructions.pdf”

**Proposed Manufacturers / Suppliers**

(In general only Industry approved manufacturers / suppliers are acceptable)

**Proposed Manufacturers / Suppliers for PAC, UPS, Server Racks and BMS**

<table>
<thead>
<tr>
<th>Data Center Systems / Equipment</th>
<th>Manufacturers / Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision Air condition Units</td>
<td>Emerson / Rittal / APC / Uniflair</td>
</tr>
<tr>
<td>Hi-wall Split units</td>
<td>Bluestar / Carrier / Voltas / LG</td>
</tr>
<tr>
<td>UPS</td>
<td>Emerson / APC / Rittal / Schneider</td>
</tr>
<tr>
<td>Batteries UPS</td>
<td>Rocket, Fiamm, Panasonic, Suntech</td>
</tr>
<tr>
<td>Server Racks and Rack PDU</td>
<td>Emerson / APW President / Rittal</td>
</tr>
<tr>
<td>Grilles / Diffuser</td>
<td>Carryaire / Dynacraft / Ravistar</td>
</tr>
<tr>
<td>Switches / LT Panels / DBs</td>
<td>L &amp; T / Siemens / Roma / Legrand</td>
</tr>
<tr>
<td>Contactors</td>
<td>L &amp; T / Siemens / Schneider</td>
</tr>
<tr>
<td>Drain Piping</td>
<td>SAIL / GST / Jindal / Oriplast</td>
</tr>
<tr>
<td>Access Control System, Server Software &amp; Visitor Management System, Access Control Hub, Intelligent Door Manager</td>
<td>Honeywell / Siemens / GE</td>
</tr>
<tr>
<td>Card Readers</td>
<td>HID, IDESCO, KABA</td>
</tr>
<tr>
<td>Biometric Verification</td>
<td>BIOSCRYPT, HID, KABA, IDESCO</td>
</tr>
<tr>
<td>Smart card</td>
<td>HID Mifare DESFire LEGIC</td>
</tr>
<tr>
<td>Electro Magnetic Lock &amp; Magnetic Contact</td>
<td>Faraday, Insyn, Trimec, Bell</td>
</tr>
<tr>
<td>Door Contact</td>
<td>Ademco, Sentrol, Bell</td>
</tr>
<tr>
<td>Integrated IP Camera CCTV, Video Streamer &amp; Software</td>
<td>Honeywell / Sony / Bosch / Schneider / Bosch / GE</td>
</tr>
<tr>
<td>LCD Television for CCTV monitor</td>
<td>Sony / Samsung / LG / Hitachi</td>
</tr>
<tr>
<td>Fire Alarm / Suppression System (UL Listed Products)</td>
<td>Siemens / Honeywell / Bosch / Ravel</td>
</tr>
<tr>
<td>Seamless Pipes (Imported or Indian)</td>
<td>As Per IS Standard.</td>
</tr>
<tr>
<td>FM200 Gas</td>
<td>GLCC / DUPONT / BOC</td>
</tr>
<tr>
<td>Aspirated Smoke detection system</td>
<td>VESDA / Vision systems / Xtrails</td>
</tr>
<tr>
<td>Rodent Repellant</td>
<td>Star Electronics / Master / Jay Engineering</td>
</tr>
<tr>
<td>Water Leak Detector Systems</td>
<td>Sontay / Siemens / Honeywell / Star</td>
</tr>
<tr>
<td>BMS System Interface Unit / Controller</td>
<td>Siemens / Honeywell / Schneider / Sauter (Race) / Johnson Controls</td>
</tr>
<tr>
<td>BMS Software</td>
<td>Siemens / Honeywell / Schneider / Sauter (Race) / Johnson Controls</td>
</tr>
<tr>
<td>DDC Controllers</td>
<td>Siemens / Honeywell / Schneider / Sauter (Race) / Johnson Controls</td>
</tr>
<tr>
<td>Electrical / Data FR grade Cables</td>
<td>Finolex / Polycab / Neolex / Technoflex / RR Kable / Delton / KEI</td>
</tr>
<tr>
<td>PVC Pipes &amp; accessories for wiring</td>
<td>Precision / Approved make</td>
</tr>
</tbody>
</table>
## Proposed Manufacturers / Suppliers for Civil Interior work

<table>
<thead>
<tr>
<th>Sl.N0.</th>
<th>Item Name</th>
<th>Manufacturers / Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laminate (1.5 mm)</td>
<td>MERINO/GREENLAM</td>
</tr>
<tr>
<td>2</td>
<td>Hardware fittings</td>
<td>EBCO/HAFELE</td>
</tr>
<tr>
<td>3</td>
<td>Cylindrical locks/ Mortice Lock</td>
<td>GODREJ / EQUIVALENT</td>
</tr>
<tr>
<td>4</td>
<td>Door Closer</td>
<td>DORMA/EQUIVALENT</td>
</tr>
<tr>
<td>5</td>
<td>Floor Spring</td>
<td>DORMA/EQUIVALENT</td>
</tr>
<tr>
<td>6</td>
<td>Aluminium Sections</td>
<td>INDAL/HINDALCO</td>
</tr>
<tr>
<td>7</td>
<td>Float Glass (Toughened)</td>
<td>SAINT GOBAIN/INDO – ASAHI/MODIFLOAT</td>
</tr>
<tr>
<td>8</td>
<td>Partition Board</td>
<td>NUWUD / UNIWUD /</td>
</tr>
<tr>
<td>9</td>
<td>Veneer</td>
<td>JACKSONS//EQUIVALENT</td>
</tr>
<tr>
<td>10</td>
<td>Melamine</td>
<td>MRF/ASIAN</td>
</tr>
<tr>
<td>11</td>
<td>Water proof plywood paint</td>
<td>KITPLY/UNIPLY/ARCHIDPLY</td>
</tr>
<tr>
<td>12</td>
<td>Plastic Emulsion/ Texture paint</td>
<td>ASINPAINTS/BERGER/DULUX/UNITILE/HERITAGE</td>
</tr>
<tr>
<td>13</td>
<td>Enamel Paint</td>
<td>ASIAN PAINTS / BERGER / DULUX / Jenson &amp; Nicholson</td>
</tr>
<tr>
<td>14</td>
<td>Weather coat paint</td>
<td>ASIAN PAINTS/BERGER/DULUX</td>
</tr>
<tr>
<td>15</td>
<td>Vinyl Flooring Antistic / plain</td>
<td>ARMSTRONG. ISI, RIKVIN</td>
</tr>
<tr>
<td>16</td>
<td>Glass</td>
<td>SAINT GOBAIN / MODIFLOAT / INDO – ASAHI</td>
</tr>
<tr>
<td>17</td>
<td>Carpet tiles</td>
<td>SHWA – ISI/ MILKEN</td>
</tr>
<tr>
<td>18</td>
<td>Raised Access flooring</td>
<td>UNITED INSULATIONS / MICROTAC</td>
</tr>
<tr>
<td>19</td>
<td>Under deck Insulation</td>
<td>ARMADUCT / ARMAFLEX</td>
</tr>
<tr>
<td>20</td>
<td>Vitrified Ceramic tiles</td>
<td>NITCO/ JOHNSON / BELL / ASIAN</td>
</tr>
<tr>
<td>21</td>
<td>Venetian Blinds</td>
<td>VISTA LEVLOR/ MAC</td>
</tr>
<tr>
<td>22</td>
<td>Fire Rated door</td>
<td>MPP TECHNOLOGIES PVT. LTD., / GODREJ / SHAKTIMET</td>
</tr>
<tr>
<td>23</td>
<td>Steel door</td>
<td>MPP TECHNOLOGIES PVT. LTD., /GODREJ / SHAKTIMET</td>
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<tr>
<td>24</td>
<td>Fire Rated Glass</td>
<td>PROMAT/SAINT GOBAIN/TILKINGTONG/FIRELITE</td>
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<tr>
<td>25</td>
<td>Grid False Ceiling (Grid)</td>
<td>AMSTRONG/USG/ Luxalon (Hunter Douglas)</td>
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<tr>
<td>26</td>
<td>Metal False Ceiling (Grid)</td>
<td>AMSTRONG/USG/ Luxalon (Hunter Douglas)</td>
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<tr>
<td>27</td>
<td>Aluminium Composite panel</td>
<td>ALUSTRONG/ALUCOBOND/ALCOPLA/ALSTONE</td>
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<tr>
<td>28</td>
<td>Workstation Furniture</td>
<td>Godrej</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Equipment</td>
<td>Manufacturers / Suppliers</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Automatic Transfer Switch (ATS)</td>
<td>Schneider/ Legrand / ASCO</td>
</tr>
<tr>
<td>2</td>
<td>LT Power Distribution Panel</td>
<td>Panel manufacturer having certification</td>
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<tr>
<td>3</td>
<td>Air Circuit Breaker (ACB)</td>
<td>L&amp;T / SIEMENS / ABB</td>
</tr>
<tr>
<td>4</td>
<td>MCCB</td>
<td>ABB / L&amp;T / SIEMENS / SCHNEIDER</td>
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<tr>
<td>5</td>
<td>MCB / ELCB / RCCB</td>
<td>ABB / L&amp;T / SIEMENS / SCHNEIDER</td>
</tr>
<tr>
<td>6</td>
<td>DB</td>
<td>ABB / L&amp;T / C&amp;S / SCHNEIDER / BCH / SIEMENS / LEGRAND</td>
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<tr>
<td>7</td>
<td>HRC fuse</td>
<td>SIEMENS / L&amp;T / GE / AREVA</td>
</tr>
<tr>
<td>8</td>
<td>Power Contactor</td>
<td>ABB / SIEMENS / GE / SCHNEIDER</td>
</tr>
<tr>
<td>9</td>
<td>Aux. Contactor</td>
<td>SIEMENS / BCH / SCHNEIDER / ABB / GE / C&amp;S</td>
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<tr>
<td>10</td>
<td>Control Transformers</td>
<td>INDUSGREE / BHC / APOLLO / TRIL / INTRA VDVIYUT (INDCOIL) / PRECISION / TRANSRECT / Volt Amp (RAIPUR)</td>
</tr>
<tr>
<td>11</td>
<td>Electrical Actuators</td>
<td>ABB / ROTORK</td>
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<tr>
<td>12</td>
<td>Pneumatic Actuators</td>
<td>IL (P) / MASSONEILAN / FOURESS / FISHER / AUDCO / AIRMAX PNEUMATICS</td>
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<tr>
<td>13</td>
<td>Transducers</td>
<td>ABB / SIEMENS / SIETEX (SOUTHERN TRANSDUCERS) / PHOENIX / SCHNEIDER</td>
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<tr>
<td>14</td>
<td>Push Button</td>
<td>SIEMENS / BCH / L&amp;T / SCHNEIDER / C&amp;S</td>
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<tr>
<td>15</td>
<td>Signaling Lamp</td>
<td>ESSEN / BLUE BELL / VINAY / MICROTECH / BCH / GE / KHERAJ / EPCC / BEMCO / TECHNIC</td>
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<td>16</td>
<td>Overload Relay</td>
<td>SIEMENS / L&amp;T / BCH / SCHNEIDER / ABB / GE / C&amp;S / ANDREW YULE (AY)</td>
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<tr>
<td>17</td>
<td>Control/selector switches</td>
<td>SIEMENS / L&amp;T / BCH / SCHNEIDER / C&amp;S / ECC / KAYCEE</td>
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<tr>
<td>18</td>
<td>Isolator</td>
<td>SIEMENS / L&amp;T / ABB / GE</td>
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<tr>
<td>19</td>
<td>FRLS Wire</td>
<td>FINOLEX / RR / KEI / POLYCAB</td>
</tr>
<tr>
<td>20</td>
<td>Power &amp; Control Cable</td>
<td>Finolesx / Polycab / Neolex / Technoflex / RR Kable / Delton / KEI</td>
</tr>
<tr>
<td>21</td>
<td>UPS Output PDU</td>
<td>Emerson / APW President / Rittal</td>
</tr>
<tr>
<td>22</td>
<td>TVSS</td>
<td>Emerson / APW President / Rittal</td>
</tr>
<tr>
<td>23</td>
<td>PVC Pipes &amp; accessories for wiring</td>
<td>Precision / Approved make</td>
</tr>
</tbody>
</table>
### Summary information of Proposed Systems

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Equipment</th>
<th>Make</th>
<th>Model</th>
<th>Unit cost</th>
<th>Quantity</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UPS 60 KVA</td>
<td></td>
<td></td>
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<td>2</td>
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<tr>
<td>2</td>
<td>UPS 10 KVA</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PAC</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
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<tr>
<td>4</td>
<td>Server Racks (600 x 1000 mm)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>Access Control System</td>
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<td>4</td>
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<tr>
<td>6</td>
<td>CCTV</td>
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<td>4</td>
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</tr>
<tr>
<td>7</td>
<td>Fire Detection &amp; Gas based Suppression System</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>VESDA</td>
<td></td>
<td></td>
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<td>9</td>
<td>Water leakage Detector</td>
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<tr>
<td>10</td>
<td>Rodent Repellant</td>
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<tr>
<td>11</td>
<td>Integrated BMS</td>
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<tr>
<td>12</td>
<td>Site Preparation and Interior works</td>
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<td>15</td>
<td>Furniture</td>
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<td></td>
<td></td>
<td>1 set</td>
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</table>