



**CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS  
& DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL  
CENTRE AT PAREL, MUMBAI**

**Request for Proposal – Volume IV  
(Design Requirements and Specifications for buildings & services)**

**Tender no. HLL/ID/15/22**

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## **INTRODUCTION**

This Specification defines the service and accommodation outputs that HLL Lifecare Limited requires the Design and Build EPC Developer to provide in respect of the construction of residential quarters & dharamshala for TATA Memorial Centre at Parel, Mumbai. The details provided are only indicative and the Design and Build EPC Developer shall be responsible for the suitability and adequacy of the design and specifications to ensure that on completion the facilities are fully functional. Detailed design and specifications along with the price bid are sought from Tenderers for implementation of the Project.

### **Project Objectives**

The overall project objective is for new development of the following – The three options shall be as mentioned under scope of work in Volume I.

- Construction of residential quarters for doctors
- Construction of dharamshala for patients
- Adequate parking area suitable for 300 cars or as per prevailing norms, whichever is higher.

### **Required Outcome**

- A design that will inspire all who use it day to day and will make a positive statement to the Community and which confirms to the environment and energy efficiency norms.
- Building design, fabric, materials, systems and services that are consistent with the current architectural style and quality of similar facilities from both the public and private sectors.
- A design and use of materials consistent with the government's policies on environment, sustainability and the urban Design Brief.
- The facilities shall have clear signage giving name and directional details enabling visitors, service users, staff and the emergency services to easily locate the required destinations (internally and externally).

### **Specification Requirements**

The Employer's requirements are shown in the following volumes of the RFP documents:

**Volume I** – Building requirements that sets out the spatial requirements and scope of work.

**Volume III** – Concept Plans that define the internal planning of the buildings

## **Volume IV – BUILDING AND SERVICES DESIGN SPECIFICATION**

This Volume (Volume IV) sets out the key outputs required for the building design and its services under the following heads

- Civil & Architectural
- Structural
  - Electrical
  - Backup power
  - Lift
  - Fire protection and alarm systems
- Basement ventilation
- Water Supply, Plumbing & Sanitary Installation
  - Roads, footpaths & Landscaping including street lighting
  - PA system & EPABX
  - STP/ETP, WTP, RWH & Solar water heating system.
  - External lighting & signages

For each of the headings, outcomes, scope and standards are set out.

### **Design**

The Design Specification is intended to provide a clear understanding of the building design standards that the Employer wishes to be achieved. Whilst the employer is keen to see innovation, it is conscious there are basic standards of design that must be achieved.

EPC Developer s shall outline the means by which they will ensure design quality and the design objectives, which have influenced their scheme. This shall include details of how the Employer's objectives are to be achieved.

### **General Standards**

The new facilities shall be completed to high standards of construction and specification.

The facilities shall be technically and functionally suitable to meet the Employer's objectives:

- i. The Architectural finishes shall be of such quality that will ensure better hygienic conditions.
- ii. The design of building shall ensure control of noise due to walking, movement of trolleys and banging of doors etc.
- iii. The architectural design should take in to account the requirements of physically challenged persons.

- iv. All the material procured or to be used should be to the satisfaction of the Engineer before being used for the works intended to.
- v. All sanitary/ water supply fixture and fittings shall be of approved make confirming to IS specifications.
- vi. There should be separate inlets for hot and cold water in all the buildings. The buildings should have sufficient number of water coolers and filters to cater to the needs of different users.
- vii. The design should provide for underground overhead water tank with necessary pumping arrangement for both portable and fire fighting requirements.
- viii. The design should incorporate fire fighting system with electrical and diesel pumps, hydrants, sprinklers, fire extinguishers and fire alarm system in accordance with the rules and regulations of the local fire authority and that of the Tariff Advisory Committee (TAC) of the Insurance Association of India, as amended up to date.
- ix. Lighting should confirm to NBC for Lighting. All electrical system, fixtures, fittings etc. should confirm to CPWD specifications, latest IS code etc.
- x. The planning should include landscaping and horticulture to increase the comfort conditions inside the building. The EPC Developer shall create parking, approach roads and other requirements for the building.
- xi. Provision should be made for internal and external signages, display boards, public address system in the required area.
- xii. Furnishings in the room should be complete in all respects including, communication networking for Hospital Information Management System, telephone connection, power points etc.
- xiii. The residential buildings & dharamshala constructed should have power back up systems for emergency services
- xiv. Mechanical services shall be designed and installed with provisions to contain noise and the transmission of vibration generated by moving plant and equipment schedules to achieve acceptable noise and vibration with respect to human beings specified by ISO standards 13.140 and 13.160.
- xv. All moving plant, machinery and apparatus be statically and dynamically balanced at manufactures work and certificate issued.

xvi. All aspects including Bio Medical Waste (Management & Handling) Rules 1998 with Subsequent amendments, if any, issued by the Ministry of Environment and Forest, Government of India should be addressed in the provision for waste Management.

### **Statutory, Industry and Local Standards**

The following standards shall apply unless otherwise stated:

- the standards set out in National Building Code of India 2005
- the relevant Development Control Rules/Planning Act/Development Act/Municipal Act/any other applicable statutes and local by-laws
- the National Electrical Code, 1985
- the Indian Electricity Act 2003
- Requirements of the local Water Supply Company, Electricity Supply Company/Department
  - Requirements of the Pollution Control Board, Environment clearances, NOC from Fire department, Forest Department for tree cutting, Lift license, Explosive department, Seigniorage and Aviation authorities if applicable
  - Any other statutory requirement for execution of work and to occupy the buildings and run the services in all respects.
  - EPC Developer shall organise all inspections of concerned authorities & obtain the NOC's within the time for completion.
  - The EPC Developer is required to submit the relevant drawings like completion Drawings and any other statutory documentary requirements of local bodies in copies as per requirement to obtain the above etc. at their own cost.

### **Unacceptable Materials and Processes**

The materials and processes given below must not be used in the New Facilities or in connection with the New Facilities.

- High alumina cement in structural elements
- Calcium chloride as a concrete additive
- Sea dredged aggregates or aggregates for use in reinforced concrete
- Asbestos cement products; or asbestos in any other form including vermiculite containing asbestiform fibrous dust
- Lead or any products containing lead for use in connection with drinking water

- Materials which are generally composed of mineral fibres either man made or naturally occurring which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not scaled or otherwise stabilised to ensure that fibre migration is prevented
- Urea formaldehyde forma and cellulose fibre
- Plastics for water storage and delivery that release toxic materials
- Materials containing vinyl chloride unless risk form carcinogen is shown to be negligible
- Vermiculite containing asbestiform fibrous dust
- Cellulose fibre
- Polyurethane foam or polyisocyanurate foam unless the risk is shown to be negligible
- Plywood with glues, resins and surface treatments that produce irritant volatiles
- Decorative finishes containing lead or asbestos
- Materials containing chlorofluorocarbons (CFCs)
- Paints and wood preservatives containing pentachlorophenois (PCPs) tributyl tin oxide (TBTO) or Lindane
- Any treatment of materials either before or after installation which give rise to toxic or hazardous emissions or particles
- Any other substances generally known at the time of use to be deleterious to health and safety or to the durability of the works in the particular circumstances they are used.

## **1. GENERAL SPECIFICATION**

### **Reinforced Cement Concrete**

- **All RCC work shall be governed by provisions of Section 3 of this document**

### **1.2 Brick work(burnt clay)/Block work**

- Bricks of minimum compressive strength of 50 kg/sq.cm shall be used
- 230mm/115mm thick Brick work in C.M 1:5/1:4.
- 230mm/115mm (200/100mm) thick Solid concrete block work in C.M 1:5/1:4.

### **1.3 Plastering**

- All internal walls plastered with 12mm thick C.M 1:5 with smooth finish.

- External walls water proof plastered with 18mm thick, C.M 1:4 with double coat and smooth finish.
- Ceiling Surfaces to be plastered with 6mm thick C.M 1:3.

#### **1.4 Painting**

- All external surfaces are painted with two coats of superior grade external emulsion paint over a coat of primer of approved make and colour.
- All internal surfaces are painted with two coats of superior grade acrylic emulsion over a coat of primer of approved make and colour. The surface preparation must be done properly and with cement based putty only.
- Ceiling surfaces shall be painted with Oil bound distemper in areas without false ceiling.
- All service areas / Rooms shall be painted with Oil bound distemper/enamel paint as instructed by Engineer-in-charge.

#### **1.5 Flooring (Refer architectural material finishes.)**

##### **1.6 Skirting & Dado:**

- 100mm high skirting in all areas with respective floor finishes.
- The corridors of Dharamshala shall have dado to a height of 1.20 meters.
- All toilet areas shall have 2100mm high Glazed ceramic tile Dado.
- Toilet flooring shall be anti skid ceramic tiles.
- All pantry, KItchen, Dirty Utility, BPW, areas shall have dado 600mm high from counter top.
- Main staircase Treads and Risers shall be finished with Granite / Marble. Fire escape staircase shall be finished with Kotah Stone.

##### **1.7 DOORS & WINDOWS:**

1.7.1 The hostel blocks & dharamshala shall have windows of hollow pressed steel sections. The door frames shall be of secondary grade timber (teak wood), kiln seasoned and chemically treated. Door shutters shall be of panelled shutters with marine ply panels/ flush shutters of approved thickness and make.

##### **Aluminium Joinery**

- Aluminum framed glazed door.

- Aluminium framed partly glazed and partly panelled with prelaminated particle board panels.
- Aluminium framed fully panelled door with prelaminated particle board panels.
- Aluminium framed glazed side hung windows with glass.
- Aluminium framed louvered ventilators with 4mm thk.ground glass.
- All prelaminated particle boards shall be of BWR grade.

**Glazing shall be 4mm thick up to an area of 0.50 sqm and 5.5 mm for areas beyond.  
Maximum unsupported length of glass shall not exceed 120 cm**

## **2. SPECIFICATION FOR ARCHITECTURAL FINISHES**

<b>SN</b>	<b>Location</b>	<b>Floor Finish</b>	<b>Wall Finish</b>	<b>Ceiling Finish</b>
<b>RESIDENTIAL QUARTERS</b>				
1	Lounge/Administrative Area/Community Centre Cafeteria/Kitchen	Kotah Stone	Skirting of flooring material. Around lift opening dado of Granite up to ceiling.  Wall surface: Oil Bound Distemper (OBD)	OBD
2	Corridors	Vitrified tiles	Oil Bound Distemper (OBD) / Enamel Paint	OBD
3	Rooms	Vitrified Tiles	Oil Bound Distemper (OBD)	OBD
4	Toilet block	Anti skid Ceramic tiles	Ceramic tile dado up to lintel ht. & OBD above	OBD
5	Main Staircase (With MS Handrail)	Granite / Marble	Oil Bound Distemper (OBD) / Enamel paint	OBD
6	Fire Exit/Emergency stairs (MS Handrail)	Kotah Stone	OBD / Enamel Paint	OBD
7	Community Kitchen	Kotah stone	Ceramic tile dado up to lintel & OBD/Enamel Paint	OBD
8	Store	Kotah stone	OBD / Enamel Paint	OBD
9	Dining	Kotah stone	Old Bound Distemper (OBD) / Enamel paint	OBD

10	Service rooms	Kotah stone	OBD / Enamel Paint	OBD
11	Portico	Kotah Stone / anti skid ceramic tiles		
<b>DHARAMSHALA</b>				
1	Community Centre/ Admin/Entrance	Kotah Stone	Ceramic tile dado up to lintel ht. & OBD above	OBD
2	Store/Community Kitchen Cafeteria/Kitchen	Kotah Stone		
3	Rooms	Ceramic tiles	Ceramic tile dado up to lintel ht. & OBD above	OBD
4	Toilet	Anti skid Ceramic tiles	Ceramic tile dado up to lintel ht. & OBD above	OBD
5	Main Staircase (With MS Handrail)	Granite / Marble	Oil Bound Distemper (OBD) / Enamel Paint	OBD
6	Fire Exit/Emergency stairs (MS Handrail)	Kotah Stone	OBD / Enamel Paint	OBD

### **3. STRUCTURAL SYSTEM**

#### **3.1 DESIGN PHILOSOPHY**

- The proposed Project at Parel, Mumbai for TMC consists of construction of residential quarters & dharamshala along with other service buildings.
- 3-D Analysis of all the building structures will be carried out using latest versions of modern software packages such as STAAD Pro and the results of the analysis shall be used for designing the various elements. All designs shall strictly conform to the standards specified in National Building Code 2005.
- The employer / EPC Consultant reserves the right to conduct third party design validation and the successful bidder shall provide all data and carry out all modifications

that may be suggested by the third party so appointed. The proof checking will be done by HLL from IIT and if it is advised by IIT to do the redesign, the additional cost for proof checking if any for the revised design has to be borne by the EPC developer.

- The intending bidders shall conduct soil investigations on their own, and shall be responsible for the adequacy of the design.
- Overhead tank for domestic and fire fighting purposes shall be located at terrace level.

### 3.2 DESIGN LOADS (The loading and standards mentioned below should also be considered while designing)

#### 3.2.1 Imposed Loads

The imposed loads that are envisaged to act permanently (wherever applicable) are as following:

Items	Intensity in kN/m <sup>2</sup> of plan area
Weatherproof course <sup>Note 1</sup>	Depends on the thickness, slope and kind of material to be used for weatherproofing.
Partitions <sup>Note 2</sup>	1.0
False ceiling + M&E Services (including supporting system)	0.5
Floor Finish + Floor Screed	2.0
5 <sup>th</sup> Floor screed in Sunken portion of toilets	1.2

**Note 1:** The loading due to weatherproof course consists of the following

- 150 average the Brick Bat Cuba laid to the required slope
- 25 thick Bedding mortar
- Weight of pressed clay tiles.

**Note 2:** In toilet area the actual partition loads shall be calculated and maximum value considered partitions are not considered in lobby and AHU areas.

The superimposed load or otherwise live load assessed based on the occupancy classifications as per IS: 875 (Part 2) – 1987 is listed as follows:

Location	Occupancy Classification	UDL Kn/m <sup>2</sup>	Conc. # Load KN
Residential Quarters & Dharamshala	Cafeteria	4.0	2.7
	Store	5.0	4.5
	Kitchen	3.0	4.5
	Administrative Room	2.5	2.7
	Bed Rooms & Lounges	2.0	1.8
	Toilets & Bathrooms	2.0	-
	Kitchen	3.0	4.5
	Corridors, Passages, staircases including fire escapes, lobbies	3.0	4.5

### 3.2.2 Wind Loads

The wind pressure shall be calculated based on the data furnished below and other provisions laid in IS: 875 (Part 3) – 1987.

Basic wind speed = 44 m/sec

Risk coefficient = 1.08 (Mean Probable Design Life of Structure 100 years for Women & Children Hospital and Teaching Block)

Risk coefficient = 1.00 (Mean Probable Design Life of Structure 50 years for all other structures)

Terrain Category = 2

Structure class = Class C for structures and/or their components such as cladding, glazing, roofing, etc., having maximum dimension (greatest horizontal or vertical dimension) above 50 m. (For residential quarters & dharamshala).

Topography Factor = 1.0

### 3.2.3 Earthquake Load

- The loading due to earthquake shall be assessed based on the provisions of IS: 1893-2002. Should there be any revision in codal provisions before the physical commencement of work, the structural design should be modified.
- Structural analysis shall be done using Response Spectrum Method by giving input for different Time Periods and Acceleration
- For the proposed building, Importance factor of 1.0 shall be considered.
- All other Structures, Importance factor of 1.0 may be considered.

### 3.2.4 Load Combinations

The various loads shall be combined in accordance with the stipulations in IS: 875 (Part 5) – 1987. Whichever combination produces the most unfavorable effect in the building, foundation or structural member concerned shall be adopted.

- Wind load and earthquake load shall be considered for both x & y directions.
- The above load combinations shall be considered and effect of worst combinations shall be taken for design of various building elements.
- Whenever imposed load is combined with earthquake load the appropriate part of imposed load as specified in IS: 1893 – 2002 shall be used both for evaluating earthquake effect and for combined load effects used in such combination.
- Safe Bearing Capacity will be suitably increased as per IS 1904-1986 for combination with WL and as per IS 1893 (Part 1) – 2002 for combination with EL

## 3.3 ANALYSIS METHODS

The analysis of the structure shall be carried out using the software package STAAD Pro-2006 or similar software. The static analysis of entire superstructure shall be carried out modeling them as 3 Dimensional space frames using stiffness method. The analysis shall be carried out for Dead Load (DL), Live Load (LL), Wind Load (WL) and Earth quake Load (EL) and their combinations as given in the table above.

**Dead Load:**

**Self weight:** This load case shall comprise of self weight of all the frame and shell elements modeled into the structure as well as self weight of slabs applied as trapezoidal/triangular/uniform loads as applicable on the beams based on the yield line pattern.

**Finishes:** This case shall comprise of floor finishes, partitions, ceiling hung loads, waterproofing, brick jely lime concrete and PCC in the toilet areas, machinery weights in the plant room.

**Wall Load:** All the external and internal walls shall be 230mm solid brick / 200mm thick solid block work or 115mm thick solid brick / 100mm thick solid block work walls respectively. Loads shall be calculated and applied at appropriate locations as uniformly distributed load on the beams. Parapet loads shall also be included.

**Live Load:** Live Loads in the floor areas shall be considered as per table in para 3.2 above.

**Wind Load:** Wind loads and pressures shall be calculated based on the static design wind pressure. This pressure shall be considered for the load analysis and applied to the model. Joint loads for all other floors shall be calculated based on the contributory areas and applied in the respective diaphragms.

**Seismic Load:** Response Spectrum Method shall be used to carry out dynamic analysis for earthquake forces in both the directions. Response Spectrum values are calculated based on the  $T$  vs  $S_a/g$  equations as per clause no 6.45 of IS 1893-2002. Base shears of the analysis are raised to a factor of  $(V_B/V_B)$  as per clause no 7.8.2. The effect of torsion has been taken into effect by giving the eccentricity overrides in tabs itself.

### 3.4 DESIGN METHODOLOGY

All R.C.C. structures shall be designed according to the Limit State Method as specified in IS: 456 – 2000.

### 3.5 MATERIALS

**3.5.1 Concrete shall be used as indicated below and minimum cement content shall be as specified in IS: 456**

Normal weight aggregates shall be considered for all concrete works.

Maximum free Water-Cement Ratio of 0.55 for mild condition as per Table 5 of IS: 456-2000.

### **3.5.2 Reinforcement**

Steel reinforcement shall be of Grade Fe 500 conforming to IS: 1786-1985.

Ductile detailing of reinforcement shall be provided for all RCC structural components to take care of earthquake forces as per IS: 13920 - 1993

### **3.6 NOMINAL COVER TO REINFORCEMENT**

#### **3.6.1 Reinforcement**

From Durability requirement, exposure condition is assumed as mild for both external and internal structural elements.

The Nominal cover to main reinforcement to meet Durability requirement shall be as follows:

Mild - 30 mm

The Nominal cover to main reinforcement shall be as follows:

Columns - 40 mm or dia of longitudinal reinforcement whichever is greater.

Footings - 50 mm (minimum)

For Two-hour fire resistance requirement, The Nominal cover to reinforcement shall be as follows:

Slab - 35 mm for simply supported

25 mm for continuous

Top cover shall be maintained at 20 mm.

Beams - 40 mm for simply supported

30mm for continuous

Columns - 40 mm or diameter of largest bar whichever is greater

For any other elements not specified above, clear cover shall be as per the clause 26.04 of IS: 456 – 2000.

### **3.7 DESIGN STANDARDS**

The relevant Indian Standard Codes, as given below, shall be followed for structural design:

<b>S.No.</b>	<b>Code</b>	<b>Description</b>
1.	IS-875 (Part 1) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Unit weights of buildings and stored material.
2.	IS-875 (Part 2) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Imposed loads.
3.	IS-875 (Part 3) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Wind Loads.
4.	IS-875 (Part 4) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Snow loads.
5.	IS-875 (Part 5) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Special loads and load combinations.
6.	IS: 456 – 2000	Code of Practice for Plain and Reinforced Concrete.
7.	IS: 1786 – 1985	Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement
8.	IS: 432 (Part 2) – 1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement – Hard Drawn Steel Wire.
9.	IS: 2062 – 1999	Steel for General Structural Purposes. Specification.
10.	IS: 1161 – 1998	Specification for Steel tubes for Structural Purposes.
11.	IS: 800 – 1984	Code of Practice for General Construction in Steel.
12.	IS: 1893 – 2002	Criteria for Earthquake resistant design of structures.
13.	IS: 13820 – 1993	Code of Practice for Ductile Detailing of Reinforced Concrete structures subjected to Seismic Forces
14.	IS: 4326 – 1993	Code of Practice for Earthquake Resistant Design and Construction of Buildings
15.	IS: 3370 – 1965	Code of Practice for concrete structures for storage of liquids

#### **4. ELECTRICAL SYSTEM**

##### **4.1. INTRODUCTION**

The following design requirements of Electrical systems and LV systems for the Construction of Dharamshala and Staff quarters at Tata Memorial Center are tentative. The bidder shall carry out detailed engineering design and provide systems capable of meeting the ultimate functional requirements.

The design and execution shall be carried out in conformity with the CPWD “General

Specifications for Electrical Works” Part-I (Internal), Part-IV (Sub-Stations) and Part-VII (DG Sets) with the latest amendments.

It is incumbent on the bidder to demonstrate that the system design is energy efficient and guidelines for energy conservation are adopted for the entire work.

The electrical system is proposed to be designed on the basis of National Building Code (NBC) for such projects and with due considerations to aspects of safety and reliability, and no interruption in the function of essential services in the hospital areas being allowable. As the load will be of the order of 1500 KVA.

#### 4.2 ELECTRICAL SUPPLY SYSTEM

A tentative estimate of the total electrical load is indicated below. However, it is incumbent upon the EPC developer to make a more accurate assessment on the detailed design bearing in mind the future loads.

#### NORMAL LOAD REQUIREMENT

<b>ELECTRICAL LOAD</b>						
<b>SI No.</b>	<b>Load Type</b>	<b>Area</b>	<b>No.</b>	<b>Load</b>	<b>Load</b>	<b>Remarks</b>
		<b>Sqm</b>		<b>Per floor Kw</b>	<b>KW</b>	
1	Basement floor	968.5	1	10	10	
2	Ground floor	916.18	1	20	20	
3	1st floor to 6th floor	916.96	6	16	96	
4	7th floor refuge area	950.98	1	18	18	
5	8th to 11th floor	916.96	4	18	72	
6	12th floor refuge area	950.98	1	12	12	
7	13th to 15th floor	916.96	3	12	36	
8	Gymnasium	80	1	10	10	
	Sub total	15787.1			274	
	Bed passenger lift		1	25	25	
	10 passenger lift		4	20	80	
	Kitchen equipment	lumpsum		100	100	
	Split AC point for double room quarters		160	2	320	

	Split AC point for single room quarters		80	1.5	120	
	External pumps		1	75	75	
	Fire		1	150	150	
	External light	8154.7		0.002	16.3	
	Sub total				1160.3	
	Future loads 20 %				232.1	
	<b>Total load</b>				1392.4	<b>Apprx 1500 KW</b>

The system shall be designed considering a Diversity Factor of 80% and Power Factor of 0.8.

### EMERGENCY LOAD REQUIREMENT

Partial DG back up power is proposed for the building considering 50 % of transformer capacity.

- Partial DG back up power is proposed for Lifts, Power circuits, Air-conditioning and lighting in certain areas. On this basis, 380 KVA 2 nos DG is required with synchronizing panel.
- Silent type, water cooled, radiator type, four stroke, electric start D.G Set with acoustic enclosure and standard AMF control panel. The engine shall be capable of taking 10% overload for one hour after 12 hours of continuous operation. The DG shall be suitable for AMF operation. The alternator shall be brushless, self excited, self regulated, brushless, SPDP enclosure, class F/H insulation, suitable for continuous operation at 1500 rpm, generating 415 V +/- 5% at 0.8 p.f, 50Hz, 0.85 load factor, 3 phase, 4 wire system generally conforming to BS: 2613 & IS: 4722.

### HT POWER DISTRIBUTION SYSTEM

- HT power distribution system is not needed since TMC is a special consumer of BEST, EPC Developer should apply for LV power from BEST.

### 4.3 LT POWER DISTRIBUTION

The LT power distribution starts from the secondary of the transformers which has been provided by BEST and shall be connected to LT switch gear panels through bus ducts / cables for further distribution to various loads centers through underground / tray cable network.

#### 4.4 POWER CAPACITORS

For power factor improvement suitable capacity of capacitors shall be introduced.

#### 4.5 INTERNAL ELECTRIFICATION

LED light fitting have been considered in general areas, office areas, Quarter room etc. Light and power outlets on emergency supply wherever required shall be on separate emergency circuit connected to the generator supply. In Single room and Double room quarters AC power points has to be provided. This should be connected to the normal power circuit.

Convenient power socket outlets shall be provided as per the requirement of different facilities in respective areas. This should be connected to the normal power circuit.

Wiring installation conforming to CPWD/IS specifications would be carried out through medium gauge concealed PVC conduits. The wiring shall be done with FRLS PVC insulated copper conductor wires of suitable size as per IS 694.

From	To	Size of Cu wires	Size of Conduit
Lighting MCB DB	Lighting switch boxes in the circuit	2R-2.5 + 1R 2.5 sq mm (P, N & 2E)	20 mm dia
Lighting MCB DB	Light Points directly controlled by MCBs	3R-1.5 sq mm (P, N & 2E)	20 mm dia
Lighting switch box	Light points	3R-1.5 sq mm (P, N & 2E)	20 mm dia
Power / UPS MCB DB	20A / 16A sockets in the circuit	2R-4 + 1R-4 sq mm (P, N & 2E)	25 mm dia
Power / UPS MCB DB	6A sockets in the circuit	2R-2.5 + 1R-2.5 sq mm (P, N & 2E)	20 mm dia

Illumination level in different areas is proposed to be as per IS 3646 or NEC or ECBC including special illumination system for wards. Special care will be taken in the design to avoid possibility of fire hazard due to electrical short circuiting. Lighting protection system as per IS 2309 will be provided.

Internal wiring will be provided with PVC insulated FRLS Copper conductors. Surface conduit wiring with PVC conduits is proposed above the false ceiling and concealed conduit wiring with PVC conduits is proposed in wall / ceiling in non false ceiling areas. 5star rated fans with fan hum free regulators are to provided at each room and kitchen.

## 4.6.EARTHING

Earthing system shall be in accordance with IS 3043.

Transformer Neutral	-	50 mm x 6 mm Cu Flat
Transformer Body	-	50 mm x 6 mm GI Flat
DG Neutral	-	50 mm x 6 mm GI Flat
DG Body	-	50 mm x 6 mm GI Flat
LT Bus Duct	-	50 mm x 6 mm GI Flat
Main LT Panel/HVAC MAC	-	50 mm x 6 mm GI Flat
UPS	-	50 mm x 6 mm GI Flat
Floor UPS panels	-	25 mm x 6 mm Cu Flat
Lighting/Power/Power panels	-	25 mm c 6 mm Cu Flat
Lighting/Power/UPS MCBDB	-	6 / 10 sqmm Cu wire
Lift/Plumbing/Fire Panel	-	25 mm x 6 mm GI Flat
20A/16A power sockets	-	2.5 sqmm Cu wire
Light points/6A sockets	-	1.5 sqmm Cu wire
Motors < 5kW	-	8 SWG G.I. wire
Motors > 5kW	-	25 mm x 6 mm GI Flat
Lifts	-	8 SWG GI wire

For all the body earthing 65mm dia. 3m long GI pipe electrode is proposed for UPS and Neutral 600 x 600 x 8 mm CU plate earthing is proposed.



#### **4.7 EXTERNAL LIGHTING**

External lighting for landscape shall be provided along the passages / road with suitable LED fixtures

Post top lanterns, Low-level bollards & under water lights wherever necessary. Building façade and canopy lighting also shall be provided. The external lighting shall be controlled automatically using Timer.

#### **4.8 EMERGENCY LIGHTING SYSTEM**

Emergency lighting shall be provided in common areas like corridors Lobbies, staircase etc., and using battery pack units. Certain no. of luminaries in these areas will be online i.e. When grid power is available these luminaries will be ON with grid power and when the grid power is not available these luminaries will continue to be in operation with the help of battery packs, so that the entire building will not become dark.

#### **4.9 LIGHTNING PROTECTION SYSTEM**

Lightning protection system with 20m x 10m grid pattern using 25 x 6 mm GI strip along with required no. of test links, earth pits, 25 x 6 mm GI strip down conductor at regular interval and 40 x 6mm GI strip connecting test link and earth pits shall be provided for all the buildings.

#### **EXTRA LOW VOLTAGE SYSTEMS**

This section deals with tentative requirements of ELV system for the construction of Dharmasala and Doctors' quarters at Tata Memorial Center at Parel, Mumbai. The bidder shall carry out detailed engineering design and provide systems capable of meeting the ultimate functional requirements and to the satisfaction of the client.

The bidder shall prepare quantity take off sheets, develop design drawings& riser diagrams, devise system description/function, prepare rate analysis for non scheduled items based on offers from leading suppliers/vendors, and prepare bill of quantities and technical specifications of all items/equipments.

Bidder has to consider following systems in the scope of work for this project:

1. Telephone system

2. CATV system
3. Public address system

## **Building Management System – Dharamshala & Residential quarters**

### **Standards and Codes**

Following standards and codes are to be considered while designing the BMS for the project.

BIS IEC 60364 -7 – 710 : Wiring in Hospital & Health care Premises  
Published by National Electric Code 2011

IEC 60364 -5 -523 : Installation method of electrical Conductors/ cables

Sec 54, Electricity Act 2003 & R36 : Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### **Manufacturing standards**

- Cables : Cat 6 UTP cable – ISO/IEC 11801
- Control cable – DIN-VDE 0815/ BS 5308, IS:5608
- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Cable trays/trunking : IS 4759, 2629, 2633

### **Technical specification**

Building management system shall be provided in the Dharmasala & Residential quarters in view of power monitoring and to monitor other electrical equipments.

Following Equipment in electrical system must be connected to BMS.

- LV panel
- Capacitor panel
- DG set
- Lifts
- Fire alarm system

The system consists of field devices, sensors, DDC panels, server with monitoring and printing options, BMS software, 3<sup>rd</sup> party soft points to establish connection to BMS etc.

The connectivity of BMS will be established by providing necessary hard points(Eg:- volt free, milli ampere contacts) or soft points(Eg:- Backnet)

Following parameters from LV panel may be monitored in BMS:

- Connected load status ; kVA/kVAR/kW
- Maximum demand
- Instantaneous energy consumption
- Load power factor
- Breaker ON/OFF/TRIP status
- Voltage & Load current

Provision must be provided in the electrical panels and breakers to capture above mentioned parameters.

Following parameters from DG set may be monitored in BMS:

- DG set status, ON/OFF/TRIP
- Voltage & Load current
- Fuel level in Diesel tank
- Daily running hours/Total running Hours
- Connected load status ; kVA/kVAR/kW
- Maximum demand
- Instantaneous energy consumption

Generator control panel must be equipped to provide above mentioned status to BMS.

Level indicators and necessary wiring from Diesel tank may be provided to monitor fuel level.

Following parameters from Lift may be monitored in BMS:

- Lift car position(floor nos)
- Power supply ON/OFF status

Lift manufacturer may provide provision to incorporate above mentioned details.

All events stored in fire alarm system control panel must be monitored in BMS also.

Fire alarm system supplier must incorporate necessary soft points in the control panel to achieve BMS connectivity.

DDC panel shall have input & output terminal (Both analogue & digital) to connect field devices and to transmit control signals to 3<sup>rd</sup> party equipment.

DDC panel shall have an intelligent logical process control unit and relay units. The panel should process the inputs and send appropriate signals to 3<sup>rd</sup> party equipment.

DDC panels must be inter connected via LAN.

DDC panel must be programmable type.

Wiring may be done using 2 core 1.5 sq mm GI armoured ATC conductor multi stranded unscreened FRLS cable between field devices and DDC panel.

A server (PC & printer) loaded with BMS software shall be provided in the control room and all DDC panels may be connected through LAN to the server.

## **Telephone system**

### **Standards and Codes**

Following standards and codes are to be considered while designing the telephone system for the project.

IEC 60364 -5 -523 : Installation method of electrical  
conductors/ cables

Sec54, Electricity Act 2003 & R36 : Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### **Manufacturing standards**

- **Cables– CAT 5 cable**
- GWIR06/02 C-DOT/VDE:0815,0816/IEC189/IS5608

- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Telephone sockets : BS 6305, 6312
- Cable trays/trunking : IS 4759, 2629, 2633
- PVC Ducts : ASTM D1785 & D2665

### **Technical specification**

Scope of work include telephone outlets, telephone wires, containment system (conduits & trays), should be terminated with patch panel and rack.

Telephone sets etc are excluded from present scope of work.

Telephone wires to be used must be of CAT 5 provided the proposed voice system is IP based

Following criteria shall be adopted to finalize the quantity of outlets:

- Provide one no of outlet in each quarters
- Provide one no of outlet in cafeteria/community center- one each

When a bunch of PVC conduits are to be routed to the service room, cable containment system of appropriate size must be installed. GI back boxes of suitable size must be concealed in the block/RCC wall to accommodate telephone sockets. Telephone sockets must be RJ45 type and back box must be from manufacturer of wiring accessories. Telephone socket must be modular type matching with other electrical wiring devices. Cable tags must be provided at both ends to identify the cable.

CAT 5 cable must be terminated in patch panel installed in racks located in the main telephone room within the building. CAT 5 cable must be laid in a suitable sized containment system (cable tray/cable trunking). Tray/Trunking shall be hot dipped galvanised perforated type and installed on wall or hanged from RCC slab using proper support system/ anchor fasteners at regular intervals. Cable laid in the tray shall be neatly dressed using heavy gauge cable tie at regular intervals.

Provide opening in the slab of service rooms to accommodate the cable trays.

PVC duct of 100 dia min. must be provided for service provider's cable entry from main telephone room to a manhole outside compound wall including sufficient no of manholes & draw wires for hassle free cable pulling.

## Public Address system

### Standards and Codes

Following standards and codes are to be considered while designing the Public address system for the project.

IEC 60364 -5 -523 : Installation method of electrical Conductors/ cables

Sec 54, Electricity Act 2003 & R36 : Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### Manufacturing standards

- Cables : FRLS communication cable – BS:5308-I & II, IEC-189, VDE 0815, IEC: 60227BS:7846
- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Cable trays/trunking : IS 4759, 2629, 2633
- PVC Ducts : ASTM D1785 & D2665
- Speaker/Amplifier/Microphone : EN 60065  
BS 5839-8  
EN 60849  
EN 60529-IP32  
EN 54-24

### Technical specification

A comprehensive public address cum voice evacuation system may be considered in the hospital building. The purpose of the system is to give an alert message to occupants against fire event as well as for general broadcasting.

The system must include following devices/equipments:

- Ceiling mounted one way speakers, wherever false ceiling is available(provided height from FFL is less than 5 mtrs)
- Wall mounted one way speakers for locations without false ceiling.
- 2 way speakers for talk back facility
- Amplifiers & Boosters (if required)
- Call station with zone selector switch, paging and gooseneck microphone
- Suitable metal racks & control console

One way Speakers are loop wired and 2 core 1.5 sq mm FRLS, AL Mylar insulated, shielded, armoured, communication cable must be used for loop wiring of ceiling/wall mounted one way speakers.

For 2 way speakers, 6 core 1.5 sq mm FRLS, AL Mylar insulated, shielded, armoured communication cable must be used.

Ceiling and wall mounted speakers must be installed in following locations:

- Cafeteria
- Community center
- Corridors

Talk back (2 way) speakers must be installed in emergency staircases at each floor level.

Quantity of speakers must be decided in such a way that the audio alert through the speaker is very clear to the occupants in the corresponding locations.

Speakers must be connected to the amplifiers located in the nearest service room by using above mentioned cable.

No of speakers to be connected in a single loop must be selected considering the voltage drop and zoning facility.

Cables run above false ceiling may be installed below RCC slab or on block wall by using proper sized GI saddles.

Cable may be concealed in the wall intend to run below false ceiling.

UPS power points must be provided in the service room where the amplifiers are placed in metal racks.

Booster amplifiers may be used if the console & paging station is too far and audio signal gets weakened.

A back ground music system may also be included which consists of MP3player which can be integrated with the console. Under idle situation, light music can be played via this MP3 player in the entire building.

The control console, paging device, microphone and Zone selector must be located in the main security room.

The facility of connecting an analogue input from Fire alarm system or BMS must be provided.

If a bunch of cables have to be taken to the control room, suitably sized GI cable tray must be employed above false ceiling. Tray shall be hot dipped galvanised perforated type and installed on wall or hanged from RCC slab using proper support system/ anchor fasteners at regular intervals. Cable laid in the tray shall be neatly dressed using heavy gauge cable tie at regular intervals.

## **CATV system**

### **Standards and Codes**

Following standards and codes are to be considered while designing the CATV system for the project.

IEC 60364 -5 -523 : Installation method of electrical  
Conductors/cables

Sec 54, Electricity Act 2003 & R36 : Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### **Manufacturing standards**

- Cables : Coaxial cable – DIN-VDE 0815/ BS 5308, IS:5608
- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Cable trays/trunking : IS 4759, 2629, 2633

### **Technical specifications**

CATV system for the project consists of TV sockets, coaxial cable, Splitters, Tap off box and cable containment system.

Following locations are identified to install TV screens:

Provide one TV socket each

G& F/Floors - community center/cafeteria/single & double rooms

Other floors - single & double rooms

TV sockets must be placed at suitable location in above mentioned areas.

25 mm dia very heavy gauge pvc conduit must be used to draw the coaxial cable from TV socket to the junction box in the service room. Conduit may be embedded in RCC slab and block walls.

Junction boxes must be placed inside service room at each floor.

Cable tray of suitable size must be used to take cables from service room to roof (head room) or to ground floor (main equipment room).

Provide opening in the slab of service rooms to accommodate the cable trays.

From roof service room, conduits must be laid for cable entry from dish antenna on roof top.

Cables must be provided with identification tags at both ends.

## **CCTV system**

### **Standards and Codes**

Following standards and codes are to be considered while designing the CCTV system for the project.

BIS IEC 60364 -7 – 710 :Wiring in Hospital & Health care Premises

Published by National Electric Code 2011

IEC 60364 -5 -523 : Installation method of electrical Conductors/ cables

Sec 54, Electricity Act 2003 & R36 :Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### **Manufacturing standards**

- Cables : Cat 6 UTP cable – ISO/IEC 11801
- Coaxial cable –DIN-VDE 0815/ BS 5308, IS:5608
- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Cable trays/trunking : IS 4759, 2629, 2633
- PVC Ducts : ASTM D1785 & D2665
- Camera/DVR/LED monitor : UL 60950-1, Emission EN 55022 class B FCC part 15 Class B

## **Technical specification**

CCTV shall be provided at the location to be specified.

The system shall be analogue type and wiring shall be done with coaxial cable.

Minimum viewing distance without compensating picture quality shall be 15 mtrs.

Corridors must be monitored at every 15 mtrs intervals.

Usage of coaxial cable:

RG6 - upto 500m

RG11 - from 500m to 750m

OFC - above 750m

PTZ control shall be achieved by using cat5e cable

16 channel DVR shall have V 264 video compression technology, high resolution and high definition picture quality for viewing, recording and playback, integrated software for web based applications for viewing in I phones, video management solution, 4TB hard disk etc. Storage facility of DVRS must be 30 days minimum without overwriting.

LED monitor shall have high resolution and high definition & aspect ratio must be 16: 9

Images to be connected to one no of LED monitor must be limited to 12.

The quantity of DVR & LED monitor must be estimated from above information.

DVRs and LED monitors shall be located in the main security room.

Coaxial cable from camera shall be drawn through 25 mm dia very heavy gauge PVC conduit either concealed in block wall or embedded in RCC slab.

If a bunch of conduits are to be taken to main security room, suitably sized GI cable tray must be employed above false ceiling. Tray shall be hot dipped galvanised perforated type and installed on wall or hanged from RCC slab using proper support system/ anchor fasteners at regular intervals. Cable laid in the tray shall be neatly dressed using heavy gauge cable tie at regular intervals.

If coaxial cable has to be laid externally, it must be drawn through PVC ducts. Heavy gauge PVC ducts of suitable size must be laid at specified depth in the excavated trench to contain externally laid coaxial cable. Minimum size of PVC duct must be 100 mm. Inspection chambers at regular intervals must be

provided in this route. Draw wires/Plastic rope must be provided to achieve hassle free cable pulling.

## **Access control system**

### **Standards and Codes**

Following standards and codes are to be considered while designing the access control system for the project.

BIS IEC 60364 -7 – 710 : Wiring in Hospital & Health care Premises  
Published by National Electric Code 2011

IEC 60364 -5 -523 : Installation method of electrical Conductors/ cables

Sec 54, Electricity Act 2003 & R36 : Wiring in high rise buildings

IEC 732, IS 4648-1968(reaffirmed 1997) : Electrical wiring

### **Manufacturing standards**

- Cables : Cat 6 UTP cable – ISO/IEC 11801  
Control cable - DIN-VDE 0815/ BS 5308, IS:5608
- PVC conduits : BIS CODE : 4985 – 2000, IS 9537 part-3, FRLS category
- Cable trays/trunking : IS 4759, 2629, 2633

### **Technical specification**

Access control shall be provided at the location to be specified

The purpose of the system is to control human traffic in restricted areas.

The system can be either card reader or bio metric type.

The persons entering above mentioned locations must use magnetic card or use finger to open the electromagnetic door locks fitted on the doors at the entry.

Exit from the room may be achieved by pressing push button fitted inside the room beside the door.

Doors shall be fitted with door closers of reputed make.

There must be close coordination between carpentry work or aluminium door supplier and access control system personnel. Master Key lock concept for

quarters and dharmashala is required. (One single key for entire building in addition to individual keys for each lock).

Access control system consists of following devices:

- Proximity or swipe type card readers or bio metric type
- Electromagnetic lock
- Control panel
- Push button
- Card printer
- Server PC & printer
- Access control software
- Control & communication cables

## **FIRE PROTECTION SYSTEM**

### SCOPE

The basic system requirement shall be as per National Building Code of India 2005 -Part 4 Type of Building Occupancy-Residential Buildings-C) Dormitories (A-3) Apartment Houses (A-4)- Above 60 m in height(To provide common pumping system for the fire fighting system of the both building (Dharmasala & Doctors' quarters) the highest building-Doctor's quarters(66.5mtrs) should be considered for design, also in consultation with the local fire department).

### CODES AND STANDARDS

NBC: National Building Code 2005, Part 4, Fire and Life Safety

Maharashtra Fire Prevention and Life Safety Measures Act, 2006.

TAC: TAC Protection Manual / 1998 (Guidance only)

### Engineering Practices

IS-1239 / IS-3589: Specifications for GI Pipes

IS-778/14846: Specifications for Gun Metal gate, globe, and check Values for water supply.

IS-814: Specifications for covered electrodes for metal arc welding of structural steel. BS-5155: Specifications for C.I. butterfly valve.

IS-1641: Specifications for C.I. screwed fittings.

IS-903: Specifications for Branch pipes (long Pattern)

IS-3844: Code of practice for installation of internal Fire Hydrant in Multi storied

building IS-IS 5290: Specifications for hydrant landing valves.

IS-903: Specifications for coupling double male double female instantaneous pattern for firefighting.

IS-1879: Malleable iron fittings (Parts I to X)

IS-4853: Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes.

IS-636: Synthetic, jacketed hose pipes.

IS-1520: Electrically operated multistage / multi outlet pump.

IS : 5 Specification for painting



## BUILDING DETAILS

The types of fire protection systems for the buildings and premises shall be as per National Building Code considering the height of the proposed buildings.

## PUMPING SYSTEM

SI No	Pump Details
1	Hydrant pump Near underground Static Water storage water tank .Fire Pump with minimum pressure of 3.5 kg/cm square at terrace level (electrical of capacity 2280 l/min)
2	Sprinkler pump Near underground Static Water storage water tank .Fire Pump with minimum pressure of 3.5 kg/cm square at terrace level (electrical of capacity 2280 l/min)
3	Stand by pump diesel pump Near underground Static Water storage water tank. Fire Pump with minimum pressure of 3.5 kg/cm square at terrace level of 2280 l/min
4	Jockey pump Near underground Static Water storage water tank. Fire Pump with minimum pressure of 3.5 kg/cm square at terrace level(electrical capacity 180 l/min)

Positive suction arrangement is considered for firefighting pump sets.

## DESIGN PARAMETERS

- The yard hydrants will be fixed on the stand post at 45 m intervals around the proposed buildings.
- In each floor, in each riser, tapping will be taken for connecting a Single headed hydrant valve and a hose reel drum having 19mm dia rubber hose of 30m long with nozzle at one end.
- Each single headed hydrant valve will be provided with 2 Nos. of 15 m hose and 1 No. of branch pipe.
- Pipes will be laid in ring form around the area protected. Isolating valves will be provided from maintenance point of view as will be provided from maintenance point of view as well as fire service requirements.

- The ring main around the building will be laid 1m below ground level, 2m away, within 15Mtr from the face of the building.
- The wet riser cum down comer system piping will be as per relevant IS standards.
- The hydrant mains will be sized for the entire aggregate pumping capacity considering velocity of 5 m/s.
- Minimum pressure of 3.5 kg/cm<sup>2</sup> will be ensured at the remotest hydrant point.
- All the hydrants will be used oblique type with the outlet angle towards ground.
- All the outdoor hydrants will be provided with two (2) Nos. RRL hoses (63 mm size x15m long with couplings) and one (1) no. branch pipe with nozzle (20mm bore).
- At every internal hydrant location, one (1) no. of hose reel arrangement will be provided except for terrace level.
- The system will be automatic in operation.
- The power supply to MCC & control panel of the firewater pumps will be directly from the sub-station without any tapping.

### **AUTOMATIC SPRINKLER SYSTEM**

Automatic sprinkler system shall be provided as per requirements of NBC 2005.

One separate main pump is used for the sprinkler system. Sprinkler system will have installation control valve (Alarm valve), Sprinklers, flow switch, associated piping, etc. The sprinkler riser mains will be charged with water to the system design pressure. The operation system will be automatic through the pressure switches installed in the system. When the sprinkler bulb breaks due to fire breaks-out, the pressure will drop down in the pipe line. The drop in pressure is being sensed by the pressure switch. The pressure switch is connected to the MCC. The MCC will trigger the prime movers to run when it get signal from the pressure switch.

## DESIGN PARAMETERS

- At least one number sprinkler is to be provided per 12 sq.m of coverage area.
- One Alarm valve is considered for each sprinkler riser
- Tapping is taken from the sprinkler riser for all the sprinklers at the respective floors.
- Isolating valve is considered at the tap off points, from maintenance point of view.
- One number flow switch is also provided near the tap-off point from the individual vertical riser of each floor to get the fire indication in the main fire panel.
- The Automatic sprinkler system piping will be GI heavy grade as per relevant IS standards.
- The Sprinkler mains will be sized based on the number of sprinklers.
- Minimum pressure of 0.35 bar will be ensured at the remotest sprinkler point.
- The sprinklers used will be of Pendant type with rosette plate.
- One cabin will be housed near the riser to house the spare sprinklers, spanner, first-aid box, etc.
- The system will be automatic in operation.
- The power supply to the MCC & control panel of the firewater pumps will be independent and taken directly from the substation.

## PIPE AND FITTINGS

- Pipe for firefighting will be MS pipe conforming to IS : 1239 / IS : 3589 (Havey grade for wet riser / hydrant system and sprinkler system) including all fittings like bends, elbows, tees anchor fasteners, couplings etc., and will be of reputed make.
- Pipes 150 mm dia and below will conform to IS : 1239. Pipes 200 mm dia and above will be rolled and welded conforming to IS : 3589
- For pipes 40mm dia and below, socket welded joints, will be used and fittings will be of forged steel. For pipes above 40 mm dia, But welded joints will be used.

- Flanges will have appropriate number of holes as per the relevant IS Standard fastened with nuts, bolts and 3mm thick compressed rubber gasket.
- Shock absorbers for absorbing and to sustain water hammering in the fire fighting and supply water pipe line to be provided at regular distance.

#### **PIPE PROTECTION**

- All pipes above ground and in exposed locations will be painted with one coat of red oxide primer and two coats of synthetic enamel paint as per IS : 5 (Shade 536).
- All pipes under floors or below ground will be protected against soil corrosion by wrapping and coating material “Pypkote” as per IS:10221.

#### **PIPE SUPPORT**

All pipes will be adequately supported from ceiling or walls from existing inserts by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats or by using anchor fasteners type as per site conditions. All clamps will be painted with one coat of red oxide and two coats of black enamel paint.

#### **Intelligent Fire Alarm System (IFAS)**

Intelligent Fire Alarm System (IFAS) shall be provided to effect total control over the life safety services required in the building. The IFAS shall be of the digital, distributed processing, real time, multi-tasking, multi-user and multi-location type.

The IFAS provided shall be able to tie-up the following Mechanical, Electrical & Low Voltage Services into an integrated system.

- a. Air Handling Units
- b. Public address system.
- c. Lifts
- d. Toilet Exhaust Fan
- e. Smoke evacuation system
- f. Firefighting system

The system shall be provided with Addressable and Analog fire alarm initiating,

annunciating and control devices.

The addressable and intelligent system shall be such that smoke sensors, thermal sensors, manual call points, etc., can be identified with point address. The system shall be capable of :

- a. Setting smoke sensor sensitivity remotely (from the Fire Work Station) to either high sensitivity manually or on a pre-programmed sequence e.g. occupied/unoccupied period. The FAS shall be able to recognize normal and alarm conditions, below normal sensor values that reveal trouble condition, and above normal values that indicate either a pre alarm condition or the need of maintenance.
- b. Read-out or address an actual space temperature at thermal detector points. The operator shall also be able to adjust alarm and pre alarm thresholds and other parameters for the smoke sensors.
- c. Provide a maintenance/pre-alert alarm capability at smoke sensors to prevent the detectors from indicating a false alarm due to dust, dirt etc.
- d. Provide alarm verification of individual smoke sensors. System that performs alarm verification on a zone basis shall not be acceptable. Alarm verification shall be printed on the printer at the Control Station's printer to enhance system maintenance and identify possible problem areas.
- e. Provide local numeric point address and LED display of device and current condition of the point. Local annunciation shall not interfere with annunciation from the Fire Control System.
- f. Provide outputs that are addressable, i.e. outputs shall have point address. The operator shall be able to command such points manually or assign the points to Logical Point Groups (Software Zones) for pre-programmed operation.

In the event of a fire alarm, but not in a fault condition, the following action shall be performed automatically.

- a. The System Alarm LED on the main fire alarm control panel shall flash.
- b. A local piezo-electric sounder in the control panel shall be sounded.
- c. The LCD display on the main fire alarm control panel shall indicate all information associated with Fire Alarm condition including the type of alarm point and its location within the premises.
- d. Printing and history storage equipment shall log the information associated with

the Fire Alarm Control Panel condition, along with the time and date of occurrence.

- e. All system output programs assigned via control-by-event programs that are to be activated by a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
- f. The audio portion of the system shall direct the proper signal (tone or voice) to the appropriate speaker circuit.
- g. All lifts initiated through the systems will automatically be returned to Ground Floor.
- h. Toilet exhaust fans on affected floors shall be put off.
- i. Pre-recorded alarm messages shall be played through interface with Public Address system.

### **FIRE ALARM CONTROL PANEL (FACP)**

- a. The distributed Intelligent Fire Alarm Control Panel (FACP) shall function as fully stand-alone panel as well as providing a communication interface to the central station. FACP shall have its own microprocessor, software and memory and should be listed under UL864. In the event of failure of the central or communication breakdown between the central station and the FACP, the FACP shall automatically operate on stand-alone mode without sacrificing any functions.
- b. The memory data for panel configuration and operation shall reside in non-volatile memory (EEPROM). Removal of the board shall not cause loss of memory. If such removal can cause loss of memory, then the card containing the memory shall have battery back-up for up to 100 hours on the board itself.
- c. FACPs shall supervise detection circuits and shall generate an alarm in case of abnormal condition.
- d. FACPs shall provide general purpose inputs for monitoring such functions as low battery or AC power failure. FACPs shall provide tamper protection and commendable outputs, which can operate relays or logic level devices. Output commands shall take any of, but not limited to, maintained command, Momentary Command, Alarm Follow, or Alarm latch as required. Any relay in the FACP which is intended to be removable shall be supervised against removal.
- e. Smoke detectors shall be powered using the FACP-based smoke detection circuits. FACPs shall provide for resetting smoke detectors, fault-isolation and sensor loop operation. It shall be possible to mix different fire devices within the same FACP to optimize field wiring.
- f. FACPs shall provide indication for communication with the central console and alarm/trouble conditions in each sensor loops.

- g. FACP's shall provide monitoring and control of one floor or area or for multiple floors or areas. FACP's shall meet the following requirements to assure the integrity and reliability of the system :
- i. The FACP shall be UL listed independently as a fire alarm control panel.
  - ii. FACP electronics shall be contained in an enclosure made of minimum 16 gauge steel. Access to FACP switches and electronics shall be by key-lock. Usage of no other tools should be required. Visual indicators of FSP status for each zone shall be visible without opening the key-locked cover.
- h. All hardware and software to allow the FACP configuration and operation to be changed shall be provided. Memory data shall be contained in non-volatile memory (EPROM).
- i. Alarm verification with field-adjustable time from 0 to 60 seconds for individual smoke detector shall be provided. During the alarm verification, the panel shall retard the alarm until the end of the period. If the alarm is only a transient smoke alarm, the panel shall automatically reset the alarm. Only a verified alarm shall initiate the alarm sequence for the software zone (Logical Point Group) or point. Final time setting shall be as per approval of the fire authorities. When alarm verification is being performed on a smoke detector, the action shall be printed on the listed printer(s).
- j. Digital numeric display at the FACP shall be provided to indicate point in alarm or trouble. In such systems, means for manually scanning the points in trouble shall be provided and a trouble and alarm LED shall be used to indicate that there are points in alarm/trouble. The alarm/trouble LED shall only extinguish when all alarm/troubles are cleared from the loop.
- k. It shall be possible to command test, reset and alarm silence from both the FACP and the central console.
- l. FACP switches shall allow authorized personnel to accomplish the following, independent of the central console :
- i. Initiate a general alarm condition.
  - ii. Silence the local audible alarm.
  - iii. It shall be possible to acknowledge (Silence the local FACP audible without silencing the alarm indicating devices (hooters).
  - iv. Reset all zones (Logical Point Group) / points, after all initiating devices have returned to normal.
  - v. Perform a complete operational test of the microprocessor and memory with a visual indication with each board.
  - vi. Test all panel LEDs for proper operation without causing a change in the condition of any zone (Logical Point Group)
  - vii. Walk Test

- m. Software zones/loops shall be circuited and protected by Fault Isolation Modules such that in the event of a zone/loop short-circuit, not more than twenty (20) devices shall be left non-functional.
- n. Intelligent Smoke and thermal sensors shall be located as shown and shall report sensed levels in analog form.
- o. Monitor modules shall be provided to monitor and address contact-type input devices. The monitor module shall be supervised by FACP.
- p. The FACP shall process the true continuous analog signal from the sensors. System using step setting to represent analog signal will not be accepted. The FACP shall be able to set dual alarms threshold for occupied and unoccupied periods. During unoccupied period, the alarm threshold shall automatically be lowered to facilitate quicker response. In addition, the FACP shall further process all analog values for pre-alarm limits to prompt the operator for early maintenance. If a sensor value increases to an above normal level or a pre-alarm limit for an extended duration, the FACP shall communicate a maintenance pre-alarm.
- i. Any time sensor value transitions beyond the secondary and higher limit value, an alarm initiation and report shall be issued.
- ii. Limits and sensor values shall be displayed, modifiable, and reported in decimal values.
- iii. The FACP shall have Drift Compensation facility to compensate for environment. The FACP shall have the ability to recalibrate Pre-alarm and Alarm limits if required, after comparing each sensor's operating characteristics with the set sensitivity. This should be carried out at least once in every 24 hours. FACP should annunciate trouble conditions when sensor(s) is beyond compensation range (excessively dirty sensor).
- iv. The FACP should be UL listed or EN 54 approved to provide the sensitivity measurement and documentation required by NFPA72E.
- q. FACP shall be backed up with its built in UPS power and shall also be connected to central DG Power available in the building.
- r. FACP shall be provided with following features :
  - Charger Rate Control
  - Control-by-Time
  - Day/Night Sensitivity
  - Device Blink Control
  - Drift Compensation
  - NFPA 72 Sensitivity Test
  - System Status Reports
  - Non-Alarm Module Reporting
  - Periodic Detector Test
  - Remote Page
  - Trouble Reminder
  - Verification Counters
  - Walk Test

Security Monitor Points	Maintenance Alert
Alarm Verification	System Configuration Report
Printer Interface	System Point Report
Event Historical log	Programmable Automatic Timed and Manual Signal Silence
Programmable Manual Signal	Control-By-Event with Boolean Logic
Silence Inhibit Timer	and Timer Control

- s. FACP shall have real-time clock to prevent loss of time and date in case of failure of power supplies.
- t. The display on FACP shall provide indication for AC Power, System Alarm, System Trouble/ Security Alarm, Display Trouble and Signal Silence.
- u. Minimum two different password levels will be provided to prevent unauthorized System control or programming.
- v. Operator control switches for Signal Silence, lamp Test, Reset, System Test and Acknowledge shall be provided.
- w. Power supply unit of FACP shall have following characters:
  - i. The main power supply shall be 230 VAC±10%, 50 Hz±1% and shall in turn provide all necessary power of the FACP.
  - ii. It shall provide a battery charger for 24 hours for standby power using dual-rate charging technique for fast battery recharge.
  - iii. It shall provide a very low frequency sweep earth fault detect circuit, capable of detecting earth faults on sensitive addressable modules.
  - iv. It shall be power-limiting using Positive Temperature Coefficient (PTC) resistor.
  - v. It shall provide indication for battery voltage and charging current.
- x. For ease of service, all wiring terminal blocks shall be plug-in type and shall have sufficient capacity for 18 to 12 AWG wire termination. Fixed terminal blocks shall not be acceptable.

## **DETECTORS & ADDRESSABLE DEVICES**

### **GENERAL FEATURES COMMON TO ALL DETECTORS :**

- a. Compatibility : All automatic fire detectors shall be inter changeable without requiring different mounting bases or alterations in the signal panel.

- b. Response Spectrum : Combustion gas detectors shall respond to both visible and invisible aerosols; size and colour of the aerosols shall not have a decisive influence on the response of the detector.
  
- c. Sensitivity: On average 30 mgs of burned material per cu.m. (as measured in a 1cum chamber) shall release an alarm sensitivity which shall be adjustable according to the use of the space.
  
- d. Power Consumption : Each detector shall use the minimum of power, for economic circuits, so that it shall have capacity to connect atleast 150 detectors, 50 modules and 20 fault isolator modules in one loop.
  
- e. Built-in-response indicator : Each detector shall incorporate indicator “LED” at the detector which shall blink during normal condition and light up on actuation of the detector to locate the detector which is operated. The detector shall not be affected by the failure of the response indicator lamp.
  
- f. Maintenance : All detectors shall be fitted either with plug-in system or bayonet type connections only, from the maintenance and compatibility point of view.
  
- g. Construction : The detector shall be vibration and shock proof. When disassembling for cleaning purposes, its components must not be damaged by static over voltage.
  
- h. Atmospheric and Thermal Disturbance : The detector shall so designed as to be practically immune to environmental criteria such as air currents, humidity, temperature fluctuations, pressure and shall not trigger false alarm, due to the above conditions.
  
- i. Continuous Operation : An alarm release shall not effect a detector’s functioning. After resetting the alarm, the detector shall resume operation without any readjustment.
  
- j. Adaptability to ambient conditions : Detectors shall be designed for adaptability to humid locations. No performance deterioration shall be acceptable.

### **ADDRESSABLE PHOTOELECTRIC SMOKE DETECTORS**

Smoke detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. Minimum to 120 intelligent

detectors should connect to one loop. The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog value for smoke density. The detectors shall be ceiling mounted type and shall include a twist-lock base.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be activated remotely on command from the control panel.

The detectors shall provide address-setting means on the detector head using rotary decimal switches. Systems which use binary jumpers or DIP switches to set the detector address shall not be acceptable. The detectors shall also store an internal identifying code, which the control panel shall use to identify the type of detector. Detectors providing address setting through hand held programmers shall also be accepted.

The detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the FACP, the detectors shall compensate for dust accumulation and other slow environmental changes which may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.

The area covered by each smoke detector shall be as per NFPA 72 and /or IS-2189.

## **ADDRESSABLE ADJUSTABLE THERMAL DETECTORS**

Thermal detectors shall be intelligent, adjustable and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. Minimum

120 intelligent thermal detectors may connect to one loop.

The detectors shall use an electronic detector to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements. The detectors shall be ceiling-mounted type and shall include a twist-lock base.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated remotely on command from the control panel.

The detectors shall provide address-setting means on the detector head using rotary decimal switches. Systems which use binary jumpers or DIP switches to set the address shall not be acceptable. Detectors providing address setting through hand held programmers shall also be accepted.

The detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions. In certain applications, LEDs may be selected to be polled without flashing through system programming. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

An output connection shall be provided in the base to connect an external remote alarm LED.

### **ADDRESSABLE MULTI CRITERIA DETECTOR**

The intelligent multi criteria detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).

The intelligent multi criteria detection device shall include the ability to combine the

signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

An output connection shall be provided in the base to connect an external remote alarm LED.

## **ANALOGUE ADDRESSABLE FIRE DETECTION AND ALARM SYSTEM**

### **AREAS COVERED**

Analogue addressable fire detection and alarm system shall be provided in the TMC - Proposed Women and Children Hospital with Hadron treatment facility at Parel, Mumbai.

- Fire Detection & Alarm System is a key element of the fire protection system. It is designed to detect the presence of fire to initiate action. The type of fire alarm system considered for the above buildings is analogue Addressable Fire Detection & Alarm System.
  - Microprocessor based Analogue Addressable Fire Detection and Alarm System complete with addressable heat, duct detector and smoke sensors & addressable Manual call point and Hooters (addressable loop powered sounders).
  - The Analogue Addressable Fire Alarm Control Panel (FACP) will function as fully stand-alone panel. FACP will have its own microprocessor, software and memory complying with the BS : 5839 Part 4

### **SYSTEM COMPONENTS**

- Each detector will incorporate indicator “LED” and light up on actuation of the detector.
- The detector will not be affected by a failure of the response indicator lamp.
- All detectors will be fitted with plug-in system type connections only, from the maintenance and compatibility point of view.

- The detector will be vibration and shock proof. When disassembling for cleaning purposes, its components must not be damaged by static over voltage.
- The detector will so designed as to be resistant to environmental criteria such as air currents, humidity, temperature fluctuations, and pressure and will not cause false alarm due to the above conditions in normal working atmosphere.
- An alarm release will not affect a defector's good functioning. After resetting the alarm, the detector will resume operations without readjustment of any kind.
- Intelligent smoke sensors will be photoelectric type. Smoke sensors will be of the solid state type addressable and capable of sensing smoke density of particles of combustion. Smoke sensor's sensitivity will be capable of being adjusted at the central console, to work in conjunction with the fire Alarm control panel, for the appropriate purpose. Sensor delay, pre-alarm maintenance condition and alarm condition can also be set at the Fire Alarm Control panel.
- Devices, which take their address from their position of the circuit, are unacceptable because if devices are later added, existing address descriptors and commands must be reprogrammed.
- Photoelectric smoke sensors will contain an optical sensing chamber.
- Under fire condition, presence of smoke will trigger the circuit of the detector and will send a signal to the control panel.
- All fire sensors will be mounted on a common base to facilitate the changing of sensor type if building conditions change. The base will be incompatible with conventional detectors to preclude the mounting of a non-intelligent device.
- Each sensor will be capable of being tested for alarm via command from the fire Alarm control panel (FACP). Each sensor will respond to FACP scan for information for its type identification.

- Temperature sensor will provide temperature measurement when it reaches pre-alarm in normal course. However the operator has the option of calling up the temperature measured by the specific detector as and when required.
- The Duct detector is normally used for detecting the presence of smoke or combustion products in extract ventilation ducting systems. The detector operates on the principle of differential air pressure.
- The detector includes a sampling probe or tube of different lengths, works on the differential air pressure, which is inserted in to the duct airflow. This tube will pass the air in to the detector sampling chamber. The probe is flow direction sensitive and must be fitted accordingly.

### **Manual Call Point:**

- Under normal conditions push button will be in the depressed condition. IN the case of fire when the glass cover is broken, the push button will be released by the spring action and will actuate an alarm at the control panel through its switching contacts. IN addition to this, there will be an LED indicator on the monitor module for visual indication to locate the call point easily.
- The manual stations will be non-code re-settable key type general alarm devices, painted red and suitable for surface or flush mounting. Manual stations will be capable of being interfaced to a monitor module that is addressable. The manual station will have normally open fire alarm and annunciator contacts and these contacts will close on activation. Contacts will remain closed until station is manually reset.

### **DESIGN PARAMETERS**

- One number Analogue Addressable fire alarm panel will be located at the ground floor of each building as mentioned above near the main entrance.
- The spacing between detectors will be as per IS : 2189.
- The panel will have a battery (SMF) back up of 48 hrs.

- The fire alarm panel loop will accommodate maximum 125 detectors and 125 devices.
- The number of loop for respective fire alarm panels will be decided as per the number of floors and number of detector devices.
- All the hooters will be loop powered.
- The panel will have provision for interfacing with Building Management System (BMS).

## **PORTABLE FIRST-AID FIRE EXTINGUISHERS**

The portable first-aid fire extinguishers shall be provided for all the buildings as per requirements of NBC 2005.

### **SYSTEM DESCRIPTION**

The extinguishers are used to put-off small fires. The extinguishers will be used in the incipient stage of fire. Fire extinguishers are easy to handle. This is useful to put off the fire in the initial stage itself and thus avoiding major losses.

## **PHOTOLUMINESCENT SAFETY SIGNGES**

Photo luminescent safety signage shall be provided for exits & fire escape route.

### **DESIGN PARAMETERS**

- Photo luminescent signages are provided in the exit staircases, lift lobby, extinguisher location, fire escape hydrant & hose reel, alarm valve and main fire alarm panel, etc.
- Auto glow fire exit route maps will be provided at each floor for safe evacuation during emergencies.

### **SYSTEM DESCRIPTION**

The photo luminescent safety signage glows in darkness. This will guide the safe escape of occupants even in case of the power supply failure. This can also useful to find the location of the fire fighting appliances in case of emergency even darkness.

## **STATUTORY AUTHORITIES' TESTS AND INSPECTIONS**

The Tenderer shall be responsible for the submission of all necessary forms and drawings to the Statutory Authorities which shall conform to the latest architectural plans submitted to and kept by this Authorities. Tenderer shall be responsible for obtaining initial and final NOC from Statutory Authorities.

## **FINAL ACCEPTANCE TESTS**

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Tenderer shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Tenderer shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained.

Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Tenderer prior to the issue of Completion Certificate to the acceptance of the Authorities.

## **REJECTION OF INSTALLATION / PLANT**

Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect / Consultant/ Client/ Project Manager so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Tenderer at his own expense and to the satisfaction of the Authority/Architect/Consultant.

After works have been accepted, the Tenderer may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Client/Consultant/ Project Manager.

### **WARRANTY AND HANDOVER**

The Tenderer shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

### **HANDING OVER OF DOCUMENTS**

All testing and commissioning shall be done by the Tenderer to the entire satisfaction of the /Services Consultant and all testing and commissioning documents shall be handed over to the Services Consultant / Client/ Project Manager.

The Tenderer shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Services Consultant /Client/ Project Manager.

**11.1 LIST OF APPROVED MAKES / AGENCIES FOR CIVIL & PLUMBING MATERIALS**

<b>S. N</b>	<b>Materials</b>	<b>Manufacturers / Agencies</b>
1	Ready mixed Concrete	L&T/RMC/RAMCO/ACC/Birla/ Ultratech/
2	Ordinary Portland Cement (Minimum 43 Grade)	ACC/UltraTech/India Cement/ Birla/ Ramco
3	Reinforcement/Structural Steel (Each LOT shall accompany manufacturer's Test Certificate)	SAIL/ TISCO/ RINL /VSP / JINDAL
4	Stainless Steel	Salem Steel
5	White Cement	JK Cement/ Birla White
6	Sand	Only River sand after approval of the sample
7	Bricks, Stones slabs, Lime, Neeru Stone aggregate	Sample to be got approved before use
8	Vitrified Tiles	Johnson, Asian, Naveen, Somany, Nitco, Euro, Kajaria /RAK
9	Flush doors	Samrat, Kanchan Prima, Swastik (Kitply), Century/Kutty/ Greenply/ Uniply/ Archid
10	Fire check steel doors	Godrej/ Shakti Hormann / Signum / Dortech
11	FRP Doors	Fibrevent / Techno skills
12	Aluminium Fittings	Everite, Garnish,Crown Classic
13	Hydraulic floor Spring	Dorma / Everite // Hardwyn
14	Aluminium Extruded Sections	Jindal/ Hindalco/ Indalco/Bhoruka

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

15	Aluminium Doors/Windows	As approved by E-IN-C
16	Paints, Distempers	Jenson & Nicholson, Asian, ICI, Nerolac / Berger
17	Glazing	Modiguard / Saint Gobain / Asahi
18	Water proofing Works	FOSROC/ SIKA / Pidilite / CICO/Penetron / Polyplus
19	Hydraulic Door Closers	Hardwyn, Everite, Garnish
20	Water Proofing Cement Paint	Snowcem India/ ICI/ Nerolac/ Berger/ asian
21	Ceramic / Glazed Floor Tiles	Nitco, Johnson/ Orient, Kajaria, Somany, Naveen/ Rustic / asian/ Euro
22	Super plasticizer	CICO, , Roff / Pidilite
23	PVC Flooring	Armstrong
24	False Ceiling (a) Fibre (b) Galvanized Steel (c) Calcium Silicate	Armstrong / AMF Armstrong/Hunter Douglass Aerolite / Promat
25	Cast Iron Pipe and Fittings (Soil Pipes)	BIC, HEP, NECO, Ajmera
26	RCC Pipes	Indian Hume Pipe Co, Spun Pipe Co., Sementia, CH Patel & Co
27	Stoneware Pipes & Fittings	Dalmia, Parry
28	Cast Iron Pressure Pipes & Fittings	Tisco, BRM, KESORM
29	GI Pipes (ISI marked)	TATA, Zenith, Jindal, Gujarat Steel, ITC
30	GI Fittings (ISI marked)	'R' Brand KS/UNIK

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

31	Gunmetal Valves & Fittings	Premier/Leader/Zoloto/Sant/
32	CI Sluice Valves, Check valves	IVC (Calcutta) Kirloskar/ Upadyaya
33	CP Brass Sanitary and water supply Fittings	Jaguar/Metro/ /SOMA/Kingston
34	Vitreous China Sanitary ware	Hindware/, Parryware/Cera/Neycer/Orient
35	WC Seats & Covers	Commander/Diplomat/Admiral
36	Polyethylene/Polypropylene CISTERN	EVERLAST/FLUSHFLO/ESYFLO/ CHALLENGER/CHAMPION/COMMANDER, MARVEL
37	CI Fixtures	Ashok Iron Works/Bombay Iron Works/A Husainji / Ismaelji
38	Stainless Steel Works	SP Fabricators, JINDAL ER Manda & Co or as approved by E-In-C
39	Curtain/Wall/Structural Glazing	Specialist Agency to be employed with Prior Approval of E-In-C
40	Plywood Products, Particle Boards & Veneers	Duroply (Green Marked, BWR Century Plywood, Green Plywood Kitply, Mysore Boards
41	Adhesive	Pidilite, Araldite
42	Plastic Laminates	Formica, Greenlam, Bakelite HYLAM
43	Powder Coatings	Berger/Nerocoat/Jenson & Nicholson
44	Tile Joint Filler	Bal Adhesives & Grouts, "ROFFE" Rainbow Tile Mate, Silicon Sealnet of GE Bayer Silicon/"Zentrival FM" of MC-Bauchemie

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

		(India) P Ltd
45	Resin Bonded Glass Wool	Crown Fibre Glass/Rock lloyd
46	MS Tubes	TATA / Lloyd/NSL
47	Roof Water Proofing	India Water Proofing, CICO, SIKA/Pidilite/Fosroc/ Structural water proofing / Penetron/
48	Silicon Sealant	Dow Corning / GE Bayer
49	Anchor Fastener	Hilti, Bosch
50	Formwork Release Agent	Fosroc, MBT, MC Baucheme CICO, ADO Conmat
51	EPOXY	FOSROC. SIKA Qualcrete, Aradlite MBT
52	Water proofing System	CICO, FOSROC, SIKA, Pidilite/ Penertron
53	Stainless Steel Sinks	Prestige/AMC/Jayna/Kingston/Neelkanth/Butterfly / Hindware
54	CP Waste, Spreaders for Urinals	Jaguar / Orient / Parko
55	Sensor based Auto Flushing System for Urinals	AOS Systems/Angash
56	SFRC Manhole Covers	KK/SK & Precast Concrete
57	UPVC Pipes/Fittings	Supreme/Prince/ Finolex
58	Mirror	Atul / Modifloat/Saint Gobain/Golden Fish

**11.2 LIST OF APPROVED MAKES FOR ELECTRICAL AND SUBSTATION ITEMS**

<b>S. No</b>	<b>Materials</b>	<b>Manufacturers / Agencies</b>
1	DG Engine	Caterpillar/Cummins/Kirloskar
2	Alternator	Stamford/Caterpillar/Kirloskar
3	Bus trucking/Rising mains	(Along with all accessories) L&T /Schneider/Legrand Control & Switchgear)
4	LT Panels	L&T/SIEMENS/SCHNEIDER/ ABB/ARROW
5	APFC Panels	L&T/Sprague/EPCOS/GB control /Datar switch gears
6	ACBs	L&T/SIEMENS/SCHNEIDER/ ABB
7	MCCBs	L&T/SIEMENS/SCHNEIDER/ LEGRAND
8	MCBs with DBs	Legrand/Schnider/Siemens/ Havells
9	Accessories of LT Panels	As per manufacturer's specified make
10	LT UG cables	Torrent/Gloster/Havells/Polycab
11	Wiring cables	Polycab/Havells/RR Cables/Finolex
12	Switches (SFU)	ABB/L&T/Siemens/Schneider
13	Modular Switches (SFU)	Legrand/Carbtree/Panasonic/MK
14	Piano Type switches and	Anchor/Leader/Legrand

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

	Boxes	
15	Cubicle Type Fuse Unit	Siemens /GE/L&T/Schneider
16	SFUs/Isolators	Siemens/GE/L&T/ABB/ SCHNEIDER
17	Starters / Contactor/Bi metal Relay	Siemens/L&T/ABB/Schneider
18	Push Button/Indicating Lamps (LED type)	Siemens/L&T/ABB/Schneider
19	CTs	Kappa/PGR power/Indus/Kapco
20	Control Fuse Base with HRC fuse	GE/L&T/Siemens/Schneider
21	Cable trays	Profab/ Elcon/OBO Bettermann/Copper B line
22	Measuring Instruments	AE/Conserv/Rishab/ L&T
23	MS Conduit	Supreme /BEC/NIL /or any Other ISI marked
24	PVC Conduit	Precision/Avon Plast/Clipsal/Balco
25	Light Fittings	Philips/Wipro/Crompton/Havells/Bajaj
26	Capacitors	Siemens/L&T / Schnedider/EPCOS
27	Relays	GE/L&T/Siemens/Schneider
28	Digital Meters	Enercon/Alacrity/L&T
29	Jointing Kits	Rey Chem/3 Birla

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA  
FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

<b>APPROVED MANUFACTURERS LIST - ELV SYSTEM</b>					
<b>Public Address system</b>					
Arm. shielded multi pair communication copper cable	Polycab	Finolex		Varsha	
Ceiling mounted speaker	Bosch	Philips		Toa	
Wall mounted speaker	Bosch	Philips		Toa	
Amplifier	Bosch	Philips		Toa	
Goose neck microphone	Bosch	Philips		Toa	
Table top micro phone	Bosch	Philips		Toa	
Call station cum voice alarm router	Bosch	Philips		Toa	
Rack	Rittal	Netrack		APW	
<b>Voice and Data system</b>					
PVC rigid/flexible conduits	Avone	Emjay		Precision	
GI Back boxes	MK	Legrand		Eqt	
6 core optic fiber cable	Legrand	Digi link		AMP	
UTP Cat 5 / Cat 6 copper cable	Legrand	Digi link		AMP	
Twisted pair multi core unarm. copper cable	RR cable	Finolex		Varsha	Delton
RJ 11 socket	Legrand	Digi link		AMP	
Face plate	Legrand	Digi link		AMP	
Patch cord - 1 mtr	Legrand	Digi link		AMP	
Patch cord - 2 mtr	Legrand	Digi link		AMP	
Terminal block for telephone	Krone	Connectwell		Eqt	
Patch panel	Legrand	Digi link		AMP	Cisco
Ethernet switch	Legrand	Digi link		AMP	Cisco
Rack	Legrand	Rittal		APW	president
EPABX	Nortel	Avaya		Alcatel	

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA  
FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

<b>Audio Video System</b>					
Projector	Panasonic	Sanyo		Casio	
Speakers	Bosch	Philips		Toa	
Amplifiers	Bosch	Philips		Toa	
Projector screen	Draper	Liberty		Eq	
Rack	Rittal	Netrack		APW	
Cables	Polycab	Finolex		Varsha	

<b>APPROVED MANUFACTURERS LIST - ELV SYSTEM</b>					
<b>CCTV system</b>					
Coaxial cable - CCTV system	RR cable	Finolex	Varsha		
Indoor fixed type camera	Panasonic	LG	Honeywell	Hikvision	
PTZ camera	Panasonic	LG	Honeywell	Hikvision	
Digital Video Recorder	Panasonic	LG	Honeywell	Hikvision	
Hard Disk	Thoshiba	Samsung	Seagate		
LED monitor	Panasonic	LG	Samsung		
PTZ controller	Panasonic	LG	Honeywell	Hikvision	
Power supply unit(SMPS)	MK	Eq	Eq		
Rack	Rittal	Netrack	APW		
Projector screen	Draper	Liberty	Eq		
Rack	Rittal	Netrack	APW	President	
Cables	Polycab	Finolex	Varsha		
<b>Access System</b>					
Cables	Polycab	Finolex	Varsha		
Equipments	Cardkey	Honeywell	Eq		

**LIST OF APPROVED MAKES OF FIRE FIGHTING SYSTEM INSTALLATION**

<b>S. No.</b>	<b>Details of Materials / Equipment</b>	<b>Manufacturer's Name</b>
1.	Fire / Sprinkler Main Pump / Jockey	Kirloskar KSB Wilo - Mather & Platt
2.	Diesel Engine	Cummins Greaves KOEL
3.	Motor	ABB Bharat Bijlee Kirloskar Siemens
4.	G.I. / M.S. Pipes (IS : 1239 / IS : 3589)	Jindal Prakash Tata Steel
5.	Standard M.S. Fittings	Seamless Fittings Pipeline Products
6.	DI / CI / Forged Steel Fittings	Jainsons Industries VS SS Fittings BM Fittings
7.	C.I. (Class L.A.) Pipes	Electro Steel Calcutta IISCO NECO Kesoram Calcutta

**RFP TO EPC DEVELOPERS FOR THE CONSTRUCTION OF RESIDENTIAL QUARTERS FOR DOCTORS & DHARAMSHALA FOR PATIENTS FOR TATA MEMORIAL CENTRE IN PAREL, MUMBAI – VOLUME IV**

8.	RCC Pipe	K K Pranali Local ISI Approved
9.	DI MH Cover & Frame	Kartar Pipe and fittings NECO Raj Iron Foundry, Agra

10.	Paints	Asian Paints Berger ICI Shalimar Paints
11.	Double / Single Headed Landing Valve	New Age Safeguard Minimax
12.	Fire Hose	CRC Jayashree New Age Padmini Safeguard

13.	First Aid Hose Reel (LPCB Approved)	New Age Padmini Safeguard Minimax
14.	Branch Pipe	New Age Safeguard Minimax
15.	Fireman Axe	New Age Safeguard

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		Minimax
16.	Installation Control Valve	Tyco Viking Victaulic
17.	Sprinkler Heads	Reliable Tyco Victaulic Viking Newage
18.	Fire Extinguishers	Alert - Tyco Minimax Safefire Safeguard

19.	Water Flow Switch	Honeywell Rapid Control System Sensor Spray Safe
20.	Pipe Protection Wrapping	IWL - Pypkote Rustech - Coatek
21.	Pipe clamp & supports	Chilly Euroclamp Kanwal
22.	GM / Forged Brass Valves	Danfoss RB Honeywell Zoloto
23.	Sluice Valves	Indian Valve Company

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		Kirloskar Kalpana
24.	Butterfly Valve	Audco Danfoss Honeywell
25.	Check Valve – Wafer Type	Advance Danfoss Kirloskar Honeywell
26.	Check Valve – Dual Plate	Advance Audco Honeywell
27.	Air Release Valve	Arco OR RB Zoloto
28.	Mechanical Seal	Burgmann Sealol
29.	Y Strainer	Emerald Sant SKS Zoloto
30.	Couplings	Lovejoy
31.	Anti-Vibration Mounting & Flexible Connections	Cori Dunlop Flexionics

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		Kanwal Industrial Corporation Resistoflex
32.	Pressure Gauge	Emerald Fiebig H Guru Wika
33.	Paints	Asian Paints Berger ICI Shalimar Paints
34.	Welding Rods	ADOR Esab
35.	Fastener	Fisher Hilti
36	Flexible hose for sprinkler	New Age
		Tyco

**LIST OF APPROVED MAKES OF FIRE DETECTION AND ALARM SYSTEM  
INSTALLATION**

S. No.	Details of Materials / Equipment	Manufacturer's Name
1.	Smoke / Multi criteria/Detectors	Notifier Edwards Honeywell (XLS-3000)
2.	Heat Detectors	Notifier Edwards Honeywell (XLS-3000)
3.	Control Modules / Monitor Modules / Fault Isolators	Notifier Edwards Honeywell (XLS-3000)
4.	Main Control Panel	Notifier Edwards Honeywell (XLS-3000)
5.	Manual Call Stations / Hooters /Speakers	Notifier Edwards Honeywell (XLS-3000)
6.	Sealed Maintenance free Batteries	Exide GS Batteries (Japan Storage Co. Ltd.) Hitachi
7.	PA System	Notifier BOSCH Ates Honeywell
8.	PVC insulated copper conductor FRLS cable	National Polycab Skytone RR Kabel

**LIST OF APPROVED MAKES FOR NETWORK ITEMS**

<b>Sl. No</b>	<b>Item</b>	<b>Model</b>
1	Floor Mountable Rack with at least 3 Nos of PDUs with a minimum 5 Nos of 5/6 A Sockets and 4 Nos of Cooling Fans	APW/Walrack/Rittal
2	Wall Mountable Rack with at least one PDU (Minimum 5 Nos of 5/6 A Socket) and 2 Nos of Cooling Fans	APW/Walrack/Rittal
3	Cat 6 500 MHz UTP Cable	Systemax/AMP/Panduit
4	24 Port Fully Loaded Patch panel with Cable Manger	Systemax/AMP/Panduit
5	IO with Surface Mount Box with Shutter Facility	Systemax/AMP/Panduit
6	Cat 6 1 M Patch Cord	Systemax/AMP/Panduit
7	Cat 6 2 M patch Cord	Systemax/AMP/Panduit
8	Single Mode Exterior 6 Core OFC	Systemax/AMP/Panduit
9	12 Port LIU	Systemax/AMP/Panduit
10	SC Duplex Adaptor	Systemax/AMP/Panduit
11	SC Pigtail	Systemax/AMP/Panduit
12	SC-LC Patch cord	Systemax/AMP/Panduit
13	SM Adaptor	Systemax/AMP/Panduit
14	Blank Panel	Systemax/AMP/Panduit
15	24 Port 1G Manageable switch with sufficient OFC Connectivity ports with 1G/10 G Uplink	CISCO/JUNIPER
16	48 Port 1 G manageable Switch with Sufficient OFC Connectivity ports with 1G/10G Uplink	CISCO/JUNIPER