WORKSHOP ON ARCHITECTURAL DESIGN OF EYE HOSPITAL
LIONS ARAVIND INSTITUTE OF COMMUNITY OPHTHALMOLOGY (LAICO)

COST BENCHMARK FOR VARIOUS CONSTRUCTION ELEMENTS
OVERVIEW

PROJECT PHASES
SPATIAL BUDGET
PRE CONSTRUCTION
CONSTRUCTION PHASE – DISCIPLINES INVOLVED
PHASE WISE BUDGET OVERVIEW
POST CONSTRUCTION ACTIVITIES
OPERATIONS AND PERIODIC MAINTENANCE
SUGGESTIONS FOR COST OPTIMISATION
SPATIAL BUDGET

- SPACE FOR HT YARD (40 sq.mt)
- MEDICAL GAS PLANT
- SPACE FOR TRANSFORMER
- SPACE FOR DIESEL GENERATOR SETS
- UPS / SERVER ROOM
- FIRE ALARM CONTROL / CCTV ROOM
- ELECTRICAL ROOM – GROUND FLOOR
- PLANT ROOM – BASEMENT / TERRACE

LAICO – OCTOBER SUMMIT - 2017
PRE - CONSTRUCTION

- LAND USE CLASSIFICATION
- BUILDING PLAN APPROVAL – NOC
- FIRE
- PCB - CTE
- OTHER STATUTORY CLEARANCES
- WATER TESTS / YIELD TESTS / SOURCE
TOTAL PROJECT COST

- CIVIL CONSTRUCTION
- ARCHITECTURAL FINISHES
- INTERIOR FINISHES
- MEP INFRASTRUCTURE
- MEP EQUIPMENT
- VERTICAL TRANSPORTATION
- MEDICAL EQUIPMENT
CONSTRUCTION - CIVIL

STRUCTURE

ARCHITECTURAL FINISHES – FLOORS / WALLS

JOINERY – WINDOWS / DOOR

CONSTRUCTION OF SUMPS, OVER HEAD TANKS

CIVIL WORKS ASSOCIATED WITH MEP SYSTEMS
INTERIOR WORKS

UTILITY FURNITURE – FIXED / LOOSE FURNITURE

FALSE CEILING – PREFERRED IN CONDITIONED SPACES / CORRIDORS – GRID CEILING
MEP WORKS

PLUMBING, SANITATION & DRAINAGE

ELECTRICAL SYSTEMS

AIR CONDITIONING AND MECHANICAL VENTILATION SYSTEMS

FIRE PROTECTION SYSTEM

EXTRA LOW VOLTAGE SYSTEMS
ELECTRICAL

HT / LT INFRASTRUCTURE – HT PANEL / LT PANEL, TRANSFORMERS

BACK UP POWER SYSTEMS – DG, UPS

DISTRIBUTION SYSTEM – DISTRIBUTION PANELS, DISTRIBUTION BOARDS, CABLES, SWITCHES & SOCKETS

EARTHING SYSTEM

LIGHTENING ARRESTER SYSTEM

LIGHT FIXTURES – CAN BE A CLIENT SUPPLY ITEM
EXTRA LOW VOLTAGE SYSTEM

NETWORK – INTERNAL / INTERNET

TELEPHONE NETWORK

CCTV SYSTEM

NURSE CALL SYSTEM
### Electrical Works

- **Infrastructure, 300, 68%**
- **High side equipment (DG, UPS), 60, 14%**
- **Light fixtures, 35, 8%**
- **ELV Works, 45, 10%**

### Electrical Works Rate / SFT

<table>
<thead>
<tr>
<th></th>
<th>Rate / SFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>300</td>
</tr>
<tr>
<td>High side Equipment (DG, UPS)</td>
<td>60</td>
</tr>
<tr>
<td>Light Fixtures (LED)</td>
<td>35</td>
</tr>
<tr>
<td>ELV Works</td>
<td>45</td>
</tr>
</tbody>
</table>
PLUMBING

PLUMBING INFRASTRUCTURE – WATER SUPPLY PIPES / DRAINAGE PIPES
RESTROOM NUMBERS AS PER NBC REGULATIONS
PLUMBING FIXTURES – CLIENT SUPPLY ITEM
HOT WATER GENERATION SYSTEM – ALTERNATE TO BOILER / ELECTRICAL HEATERS
WATER TREATMENT PLANT
REVERSE OSMOSIS PLANT – DIALYSIS / DRINKING
SEWAGE TREATMENT PLANT
EFFLUENT TREATMENT PLANT – LABS, CSSD, LAUNDRY
PUMPING SYSTEMS
RAIN WATER HARVESTING / STORM WATER MANAGEMENT
PLUMBING WORKS

<table>
<thead>
<tr>
<th>PLUMBING WORKS</th>
<th>RATE / SFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE</td>
<td>110</td>
</tr>
<tr>
<td>PLUMBING FIXTURES</td>
<td>30</td>
</tr>
<tr>
<td>HOT WATER SYSTEM</td>
<td>15</td>
</tr>
<tr>
<td>WATER TREATMENT PLANT</td>
<td>10</td>
</tr>
<tr>
<td>RO PLANT</td>
<td>10</td>
</tr>
<tr>
<td>SEWAGE &amp; EFFLUENT TREATMENT PLANT</td>
<td>30</td>
</tr>
<tr>
<td>PUMPS</td>
<td>10</td>
</tr>
</tbody>
</table>

PLUMBING SYSTEM WORKS

- Plumbing Infrastructure, 110, 51%
- Plumbing Fixtures, 30, 14%
- Hot water system, 15, 7%
- Water Treatment Plant, 10, 4%
- RO Plant, 10, 5%
- Sewage & Effluent Treatment Plant, 30, 14%
- Pumps, 10, 5%
HVAC WORKS

AIR CONDITIONING FOR GENERAL CIRCULATION / PATIENT SPACES
AIR CONDITIONING FOR SPECIAL WARDS
AIR CONDITIONING FOR OPERATION THEATRES / PROCEDURE ROOMS
MECHANICAL VENTILATION FOR BASEMENTS, SERVICE AREAS
HVAC SYSTEMS

CENTRALIZED CHILLED WATER PLANTS – CHILLERS / AHUs / FCUs
CENTRALIZED – VRV / VRF SYSTEMS
UNITARY SPLIT / DUCTABLE – DX SYSTEMS
5 MICRON FILTRATION SYSTEM
HEPA FILTRATION SYSTEMS
MAINTAINING PRESSURE DIFFERENCES
INDOOR AIR QUALITY
High side equipment 50%
Low side works 36%
OT AC - 2 Theatres with HEPA Filter 14%

<table>
<thead>
<tr>
<th>HVAC WORKS</th>
<th>RATE / SFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH SIDE EQUIPMENT</td>
<td>175</td>
</tr>
<tr>
<td>LOW SIDE WORKS</td>
<td>125</td>
</tr>
<tr>
<td>OT AC – 2 THEATRES WITH HEPA FILTER</td>
<td>50</td>
</tr>
</tbody>
</table>
FIRE PROTECTION SYSTEM

FIRE HYDRANT SYSTEM – INTERNAL / EXTERNAL
AUTOMATIC SPRINKLER SYSTEM
AUTOMATIC ADDRESSABLE FIRE DETECTION AND ALARM SYSTEMS
SPECIALISED SUPPRESSION SYSTEM – CRITICAL SPACES
PA SYSTEM FOR VOICE EVACUATION
HAND HELD FIRE EXTINGUISHERS
SIGNAGE
FIRE PROTECTION SYSTEM WORKS

- Hydrant System + Pumps, 45, 45%
- Sprinkler System, 25, 25%
- Passive Fire Protection, 5, 5%
- Fire Detection & Alarm System, 20, 20%
- Voice Evacuation System, 5, 5%

<table>
<thead>
<tr>
<th>FIRE PROTECTION SYSTEM WORKS</th>
<th>RATE / SFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDRANT SYSTEMS + PUMPS</td>
<td>45</td>
</tr>
<tr>
<td>SPRINKLER SYSTEM (IF WARRANTED)</td>
<td>25</td>
</tr>
<tr>
<td>PASSIVE FIRE PROTECTION</td>
<td>5</td>
</tr>
<tr>
<td>FIRE DETECTION &amp; ALARM</td>
<td>20</td>
</tr>
<tr>
<td>VOICE EVACUATION SYSTEM</td>
<td>5</td>
</tr>
</tbody>
</table>
### Hospital Construction – Base Building & Fit Out

#### Total Construction Rate / SFT

<table>
<thead>
<tr>
<th>Category</th>
<th>Rate / SFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Works</td>
<td>950</td>
</tr>
<tr>
<td>Architectural Finishes</td>
<td>500</td>
</tr>
<tr>
<td>Interior Finishes</td>
<td>450</td>
</tr>
<tr>
<td>MEP Infrastructure</td>
<td>850</td>
</tr>
<tr>
<td>MEP Equipment</td>
<td>250</td>
</tr>
</tbody>
</table>

#### Breakdown

- **Civil**: 950, 32%
- **Architectural Finishes**: 500, 17%
- **Interior Finishes**: 450, 15%
- **MEP - Infrastructure**: 850, 28%
- **MEP - Equipment**: 250, 8%
MEDICAL EQUIPMENT

OPERATION THEATRES

ICU EQUIPMENT

DIAGNOSTIC EQUIPMENT

MEDICAL FURNITURE

MEDICAL GAS SYSTEM
POST CONSTRUCTION - COMMISSIONING

APPROVALS
- CEIG
- TNPCB
- FIRE SAFETY
- BUILDING OCCUPANCY CERTIFICATE
OPERATIONS & MAINTENANCE

NEED FOR A TEAM OF ENGINEERS / TECHNICIANS – FACILITIES DEPARTMENT

HOSPITAL ENGINEERING SERVICE

Hospital Engineering Services and installations is a very important component considered to be life line for a smooth functioning hospital.

The engineering service can broadly be classified as under:

- CIVIL SERVICES
- ELECTRICAL SERVICES
- OTHER SERVICES
- BIO-MEDICAL SERVICES
OPERATIONS & MAINTENANCE

MAINTENANCE SCHEDULE

ADVANTAGES OF PREVENTIVE MAINTENANCE

- Increase longevity of the system
- Ensures safety and prevent hazards
- Prevent break in continuity of the system
- Prevent costly emergency repair

EQUIPMENT MAINTENANCE

- Daily maintenance
- Emergency maintenance
- Preventive maintenance
- Breakdown maintenance
- AMC CMC workshop
- Planned periodic maintenance
OPERATIONS & MAINTENANCE

UTILITY CHARGES – ELECTRICITY / WATER

FACTOR OF DESIGN / EFFICIENCY / JUDICIOUS USAGE

ANNUAL MAINTENANCE CONTRACTS – PREVENTIVE MAINTENANCE

FIRE SAFETY TRAINING / DRILLS
PROFESSIONAL RESOURCES

FEASIBILITY STUDY
ARCHITECT
STRUCTURAL CONSULTANT
MEP CONSULTANT
MEDICAL FACILITY PLANNER
PROJECT MANAGER / MANAGEMENT COMPANY
COST OPTIMISATION BY DESIGN

- Requirements to be framed – Specialities / Diagnostic
- Requirements should not be fluid – Need to be firmed up during design phase – Review existing usage and constraints
- Discuss the layouts with specialists to ensure requirements are met
- Avoid changes once construction commences – Cost / Time of change is high
- Provisioning - Load estimates / equipment CAPEX increase – sockets / spare equipment
- Over design / under utilisation – CAPEX high / operational inefficiency is there
- Cost of efficiency
- Standardisation of fittings / fixtures
COST OPTIMISATION - CONTRACTS

✓ HIGH LEVEL BUDGET
✓ CLARITY ON REQUIREMENTS
✓ CONTRACTS – DESIGN & BUILD / TOTAL CONTRACT / LABOUR CONTRACT – NOT A RESIDENCE!
✓ TENDERING – CONTRACTOR PRE-QUALIFICATION / LIST OF APPROVED MAKES (GRADE A)
✓ COST OF QUALITY – NOT FIT AND FORGET
✓ WATER TIGHT CONTRACTS
✓ WHERE TO USE SPECIALISED CONTRACTORS
✓ RANGE OF SYSTEMS AVAILABLE
COST OPTIMISATION - OPERATIONS

- AMC COSTS – LOCK DURING TENDERING – 2 YEARS DLP / 5 YEARS AMC
- GROUP METERING – ELECTRICAL / WATER / AC – USED FOR ANALYSIS AND OPTIMISATION
- INTELLIGENT - BUILDING MANAGEMENT SYSTEMS
- MAINTENANCE LOGS AND SCHEDULE – ANALYSIS OF USAGE PATTERN
You can contact me for your queries

PRINCELY SAMUEL
PRINCIPAL MEP CONSULTANT
CAPSTONE BUILDING SERVICES
prince@capstonebsc.com
+919884067750