EQUIPMENT PLANNING PROCESS FOR HOSPITAL / HEALTH CLINIC CONSTRUCTION PROJECTS

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Equipment Planning Process

1. Equipping health facilities need detailed planning and coordination, clinical needs and the equipment requirements are met with the design and function.

2. Medical equipment is a vital component in healthcare delivery.

3. Integration of clinical experience, design knowledge and experience with medical equipment.

4. Equipment is a major part of project planning process.

5. Usually **40% of total project cost**
   - i. 20% - M&E related equipment
   - ii. 20% - Medical equipment
Responsibility

1. Hospital / Clinic managers / End-users
   - To determine all the items of equipment necessary

2. Architects
   - built-in equipment

3. Engineers
   - M&E, ICT related equipment (fixed building equipment)

4. Equipment Planners
   - determine medical and non-medical equipment

5. Medical Planner
   - determine space required in clinical areas
Equipment Classification

Equipment shall include both loose medical and non-medical equipment, medical furniture, consumables, as well as vehicle

Shall be supplied complete with accessories, software necessary for the operation and use of supplied equipment
<table>
<thead>
<tr>
<th>Equipment Group</th>
<th>Definition</th>
</tr>
</thead>
</table>
| **Group I**     | Requires *major mechanical & electrical work related major medical equipment*, coordination within building contract.  
Supplied by contractor  
Eg: sterilizers, mortuary equipment, dental unit, diagnostic imaging, operating light, operating table. |
| **Group II**    | Requires major mechanical & electrical work related major medical equipment, coordination within building contract.  
Supplied by client  
Eg: salvageable items from existing facility. |
| **Group III**   | ‘*Plug and play*’ equipment with normal M&E requirements easily connected to standard electrical outlets and/or water source.  
Planned and/or supplied by contractor / procure by client  
Eg: ultrasound machine, ventilator, ECG machine, dialysis machine, endoscopy system, etc.  
Shall also include loose medical and non-medical equipment, medical furniture, surgical instruments. |
| **Group IV**    | Other loose items, consumables, storage implication.  
No M&E requirements within the building contract - vehicles. |
# Medical Equipment Classification – Terminology 2 (Simplified)

<table>
<thead>
<tr>
<th>Equipment Group</th>
<th>Definition</th>
</tr>
</thead>
</table>
| **Fixed Medical Equipment** | Requires major mechanical & electrical work related major medical equipment, coordination within building contract  
Eg : hydrotherapy pools, audiometry testing chambers, imaging equipment, dental chairs, OT light & table, etc |
| **Loose Medical Equipment** | ‘Plug and play’ equipment with normal M&E requirements easily connected to standard electrical outlets and/or water source, portable  
Eg : ultrasound machine, ventilator, ECG machine, dialysis machine, endoscopy system, etc  
Shall also include medical furniture, surgical instruments  
Medical furniture – pt beds, transfer trolley, dressing trolleys, |
Equipment Planning Process

**Equipment Scope Identification**
- Equipment Brief
  - MBOR
  - Fixed and Loose Equipment
  - Latest Technology
  - ICT
  - Estimated Cost

**Project Approval**
- Project Cost Include Equipment (Itemised)

**Pre-Implementation**
- Value Management
  - Align EQ Scope and EQ Cost

**Implementation**
- Contractor Proposal
- Evaluation
  - Fixed eq (M&E)
  - Loose eq
- Loose EQ
  - Bill of Quantity
  - Room by room listing
  - Specification
  - NCR report

**Construction**
- Pre-Procurement Process Before Eq Procurement
- TSA Approval

**Testing & Commissioning**
- T&C
- Inventory Counting
- Training

**Construction Project Hand-Over**
Equipment Planning Process (cont..)

- Testing & Commissioning
  - T&C
  - Inventory Counting
  - Training

- Handing Over
  - Equipment Inventory
  - Post Construction
    - Defect

- Construction
- Project Hand-Over
- Account Closings CMGD
Equipment Planning Process

1. EQUIPMENT SCOPE IDENTIFICATION

EQUIPMENT BRIEF
- MBOR
- FIXED AND LOOSE EQUIPMENT
- LATEST TECHNOLOGY
- ICT
- ESTIMATED COST

a) Preparation of equipment brief of requirement
b) Both fixed and loose equipment requirement
c) Equipment shall be latest technology
d) Equipment specification
e) Incorporation of ICT requirement
f) Determination of estimated cost
2. PROJECT APPROVAL

Approved project cost inclusive of loose equipment cost

Project cost = Building Cost + Loose Equipment Cost

3. PRE-IMPLEMENTATION

a) Value management conducted to match equipment scope and equipment costing

b) Adequate for function
Equipment Planning Process

4. IMPLEMENTATION

- CONTRACTOR PROPOSAL
  - EVALUATION
    - Fixed equipment (M&E)
    - Loose equipment
  - LOOSE EQ
    - Bill of Quantity
    - Room by room listing
    - specification
  - NCR report

a) Evaluation of contractor proposal
   - Fixed (M&E Documents)
   - Loose (Equipment Documents)

b) Analyzing both fixed and loose equipment proposal
   - Quantity
   - Distribution
   - Specification – latest technology
   - Brand (3 brands)
     Shall comply with scope - MBoR / equipment brief

c) Preparation of non-conformance report
Equipment Planning Process

5. IMPLEMENTATION / CONSTRUCTION

PRE-PROCUREMENT PROCESS BEFORE EQ PROCUREMENT

TSA approval

a) Room data interaction – equipment requirement inputs (fixed & loose equipment)

b) Receive of technical specification adherence (TSA) from PWD for procurement

c) Selecting the equipment
   i. TSA approval
   ii. Consultation (HOD, clinicians, medical staffs, technical staffs, etc)
   iii. Interaction between project team / contractor / supplier
   iv. Product presentation / factory visit

CONTRACTOR  ↔  PROJECT DIRECTOR  ↔  PLANNING DIV. MOH  ↔  END-USERS

Key Performance Indicators = 30 WORKING DAYS
Equipment Planning Process

6. IMPLEMENTATION / CONSTRUCTION

PROCUREMENT PROCESS

a) Procurement is carried out at 50 – 60% project progress

b) Building is ready to accommodate placement / storage of equipment

<table>
<thead>
<tr>
<th>Project method</th>
<th>Design &amp; Built</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turnkey</td>
<td>Non-turnkey</td>
</tr>
<tr>
<td>TSA</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Procurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Eq</td>
<td>PWD</td>
<td>PWD</td>
</tr>
<tr>
<td>Loose Eq</td>
<td>PWD</td>
<td>MOH</td>
</tr>
</tbody>
</table>
Equipment Planning Process

7. TESTING & COMMISSIONING
   a) Testing & commissioning of medical equipment (fixed & loose items)
   b) Inventory counting
   c) User training

8. HANDING OVER
   a) Assets registration - equipment inventory (KEW-PA)
   b) Equipment listing – Bill of quantity (room by room, departmental)
   c) Associated documents - warranty, manual, license
9. POST-CONSTRUCTION

a) Defect liability period is either 12 / 24 months (from the date of practical completion)
b) Defect identification and rectification
c) Schedule maintenance shall be performed
Flow Chart For Equipment Acquisitions

- **PWD**
  - Design, tender and construct

- **GROUP I**
  - Interactions

- **GROUP II**
  - Requests
  - Approves

- **STATE HEALTH DIRECTOR**
  - Submits

- **PLANNING DIV. MOH**
  - Coordinates, plans & approves

- **STATE HEALTH DIRECTOR**
  - Issues

- **ENGINEERING DIV. MOH**
  - Sets technical policies
  - Technical inputs
  - Evaluation

- **MEDICAL DEV. DIV. MOH**
  - Sets policies
  - Technical inputs
  - Evaluation

- **DEVELOPMENT DIV. MOH**
  - Issues warrants

- **OTHER DIVISIONS**

- **NEW FACILITY**
  - Transfer & reinstall

- **GROUP III**

- **GROUP IV**

- **GROUP I**
  - Interactions

- **GROUP II**
  - Interactions
Item Code: MLM-8002  
Quantity: 2

**Item Description:** Light OT Ceiling Main 110k + Sate 80k Lux 4300K Clr Temp C/W Cam Attachment Facility

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**This Proposal General Information:**

**Brand:** Trumpf Kruze

**Model:** TruLight S300 / S300 with camera preparation

**Country of Origin:** Germany

**Local Supplier:** Malaysian Healthcare Sdn Bhd

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**Brands proposal in Contract:**

**Brand No. 1:** Trumpf Kruze

**Model:** TruLight S300 / S300 with camera preparation

**Model:** 

**Country of Origin:** Germany

**Local Supplier:** Malaysian Healthcare Sdn Bhd

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### a) General Specification:

**TruLight LED Surgical Light complete with camera preparation**

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### b) Technical Specification:

<table>
<thead>
<tr>
<th><strong>Lighting Data</strong></th>
<th><strong>TruLight S300 (Main Light)</strong></th>
<th><strong>TruLight S300 (Satellite Light)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central illuminance at 1m distance</td>
<td>130,000 lux</td>
<td></td>
</tr>
<tr>
<td>Dimmable from 1 to 100 %</td>
<td>100 - 30 %</td>
<td></td>
</tr>
<tr>
<td>Focussable size of light at 1m (d10)</td>
<td>200 mm</td>
<td>7.5</td>
</tr>
<tr>
<td>D50 / D10 Ratio</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>110 mm (4.3)</td>
<td></td>
</tr>
<tr>
<td>Colour temperature</td>
<td>4500 K</td>
<td></td>
</tr>
<tr>
<td>Colour rendering index (CRI)</td>
<td>Ra 94</td>
<td></td>
</tr>
<tr>
<td>Total irradiance at 100 lux (max allowable 600Wm²)</td>
<td>366 Wm²</td>
<td></td>
</tr>
<tr>
<td>Irradiance intensity</td>
<td>6.48 mW/m²</td>
<td></td>
</tr>
<tr>
<td>Remaining illumination with 1 masks</td>
<td>7.500 lux / 65%</td>
<td></td>
</tr>
<tr>
<td>Remaining illumination with 2 masks</td>
<td>57.200 lux / 44%</td>
<td></td>
</tr>
<tr>
<td>Remaining illumination with tube</td>
<td>128,700 lux / 89%</td>
<td></td>
</tr>
<tr>
<td>Remaining illumination with tube and 1 mask</td>
<td>71,500 lux / 55%</td>
<td></td>
</tr>
<tr>
<td>Remaining illumination with tube and 2 masks</td>
<td>57,200 lux / 44%</td>
<td></td>
</tr>
<tr>
<td>Depth of Illumination L1 + L2</td>
<td>1,160 mm (45°)</td>
<td></td>
</tr>
</tbody>
</table>

**Electrical Data**

<table>
<thead>
<tr>
<th><strong>Voltage</strong></th>
<th><strong>100 - 240 V</strong></th>
<th><strong>56 Hz</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power pack supply voltage</strong></td>
<td>19 - 36 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Rated power per light head</strong></td>
<td>21.6 - 36.4 V AC</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption (total system)</strong></td>
<td>110 VA / 125 VA</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum power consumption (total system)</strong></td>
<td>140 VA / 155 VA</td>
<td></td>
</tr>
<tr>
<td><strong>Max. power input at 24 V AC/DC</strong></td>
<td>&lt; 0.0 A / 0.5 A</td>
<td></td>
</tr>
<tr>
<td><strong>Max. power input at 115 V AC</strong></td>
<td>&lt; 1.5 A</td>
<td></td>
</tr>
<tr>
<td><strong>Max. power input at 230 V AC</strong></td>
<td>&lt; 1.0 A</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage at ceiling mounting point</strong></td>
<td>48 V</td>
<td></td>
</tr>
<tr>
<td><strong>Effective life time of the light source</strong></td>
<td>&gt; 30,000 h</td>
<td></td>
</tr>
</tbody>
</table>

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### c) Design Features:

**Intelligent**

Constant illumination: Adaptive Light Control Plus technology, TruLight 5000 automatically ensures constant illumination at different working distances.

**User Comfort**

Intuitive operation: Sensors allow the user to adjust the lighting intensity with the sterile handles.

**Efficiency**

High level of efficiency: The used and unique positioning of innovative LEDs within the light head ensure minimal heat build-up and high light output.

**Environmental Friendly**

Making a contribution: Powerful LEDs and a highly efficient lighting system minimize energy consumption. In addition, the use of toxic elements during the manufacturing process is eliminated.

**Flexibility**

Can be used anywhere: The flat, compact light head enables the efficient use of space (critical in low ceiling height applications and hybrid rooms) and, thanks to an LAF-optimized design, ensures the highest level of hygiene during operation.

**Communication**

More than just light: The integration of video systems for high-definition digital transmission provides an optimum communication platform.

**Cutting-Edge Technology in the SpotLight**

Optical TruLight 5000 lighting system is based on extremely intensive research and many years of experience in LED technology, lens geometry, and LED elements positioning within the light head. The result is a highly sophisticated, multi-lens matrix that guarantees Extreme High Energy Efficiency:

With an illumination level of 160,000 lux, a power consumption of 65 watts, and a lighting system with an uninstalled light output, TruLight 5000 is one of the most efficient surgical lighting systems in the marketplace.
Light Where it’s Needed:
There is no need to make adjustments to the TnLight 5000 system during a surgical procedure. The Adaptive Light Control Plus technology measures the distance to the operative field and adjusts the illumination level in line with the current working distance.

A Flexible Combination:
Depending on the working distance, Adaptive Light Control activates certain groups of lenses in the multi-lens matrix. The activated lenses provide optimised illumination, thanks to their angle and position in the light head.

Focused Illuminating Power:
The positioning of the LEDs within the light head enables the precise direction of rays of light with minimal shadowing effects in the operative field area. This ensures the homogenous distribution of light throughout the different planes of illumination.

Optimum Light Output:
The intelligent, multi-lens matrix is based on individually embedded LEDs in TRUMP-designed convergent lenses. Because the LEDs are completely surrounded by the lens, all the light from each individual LED is directed to the surgical site.

d) Standard set consist of -

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Part no</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Central axis duo - consisting of central axis and extension arm (arm length = 850mm, 1,000mm)</td>
<td>1532379</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>TnLight 5300 - consisting of spring arm, cantilever and light head</td>
<td>1532468</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TnLight 5000 comfort Package</td>
<td>1613693</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Ceiling anchor plate LED, complete</td>
<td>6337603</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Ceiling tube, including flange plate - 250 - 1000mm</td>
<td>6337578</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Ceiling cover LED, height 100 / 200 / 300mm, including holding plate if needed</td>
<td>0337600</td>
<td>1</td>
</tr>
</tbody>
</table>

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<th>No</th>
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<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Interface plate, 230V, TnLight 2x (for mounting of the electrical accessories at the ceiling tube of the light)</td>
<td>1533017</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>TnVista preparation. TnLight 5 x 10 for TnVista SD/HDC, including upgrade of carrying system, light head adaption, weight dummy and wall plug/cable - for 1 light system only</td>
<td>1533356</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Sterilizable central handle, for camera, 3 pcs/set</td>
<td>0337643</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Sterilizable central handle ALC Plus, 3 pcs/set</td>
<td>1612082</td>
<td>1</td>
</tr>
</tbody>
</table>

e) Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
</tr>
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<tbody>
<tr>
<td></td>
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</table>
Issues & Challenges

1. Approvals – licenses (imaging, radiotherapy)
2. Policy – local brands / imported brands / preferred brands
3. Managing a comprehensive strategy to procure equipment within given budget
   ▪ Evolving technology
   ▪ Escalating cost medical equipment
4. Organization commitment, coordination, control and accountability
5. Identification, relocation and installation Group II equipment – timing, warranty, realistic – obsolete

Delay, Extension of time
Variation order
TERIMA KASIH