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Incorporating Healthcare Requirements in the Design Brief

to Enable Sustainable Facilities Management

Prepared by:

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GBI Facilitator

Reg. Energy Manager (REM)

Panel CIDB F01 & F02

MSQH Surveyor & Committee

Master Trainer CIDB

22+	RM 500M+	3+	RM 2B	10
Hospitals Led	Projects Value	Countries	Construction Managed	Hospitals Maintained

EDUCATION

PhD, Health Science

Universiti Teknologi Malaysia

MSc, Engineering Business Engineering

University of Warwick

BEng, Civil Engineering

University of Nottingham

CAREER HIGHLIGHTS

Former COO

KPJ Berhad

Managing Director

HTS Engineering & Consultancy Sdn Bhd

Former Managing Director

Damansara Berhad

CHFM Module Lecturer — UIA & EPI
Panel & Module Developer CIDB F01 & F02

EXPERIENCE

- Managed commercial & office building maintenance — value of works RM 100M
- Project management & maintenance across all KPJ Hospitals
- Managed 22+ hospital projects in Malaysia, Indonesia & Bangladesh — worth RM 500M
- Manages facilities & maintenance of 10 hospitals under KPJ Group
- Managing hospital construction projects worth RM 2 billion

LEARNING OBJECTIVES

By the end of this session, participants will be able to:

1. **Understand the Importance**

   Recognize how a Design Brief serves as the foundation for healthcare facility planning, design, construction, and asset management.

2. **Identify Critical Requirements**

   Understand the clinical, operational, engineering, biomedical, safety, and environmental requirements for the Design Brief.

3. **Appreciate FM's Role**

   Recognize the importance of involving FM personnel during planning and design stages.

4. **Apply Sustainable FM Principles**

   Integrate sustainability considerations to improve energy efficiency, maintainability, reliability, and lifecycle performance.

5. **Support Better Decision-Making**

   Promote a lifecycle approach balancing capital expenditure, operational costs, patient outcomes, and environmental sustainability.

Definition of Healthcare Facility

What is a Healthcare Facility?

Definition 1 — Private Healthcare Facilities and Services Act 1998 (Act 586)

"Any premises or conveyance used or intended to be used for the reception, lodging, treatment, or care of persons requiring or seeking medical, surgical, maternity, dental, nursing or paramedical services, including diagnosis, investigation and therapy."

Definition 2 — Ir. Ts. Dr Yahaya bin Hassan (Healthcare Facility Engineering Expert)

"To design, construct, equip and maintain a controlled environment that meets clinical standard for healthcare service providers to perform procedures and surgeries without compromising staff and patient safety."

Ir. Ts. Dr Yahaya bin Hassan

Design & Construct
Built environment engineered to clinical specifications from the ground up

Equip & Maintain
Lifecycle management of medical equipment and facility systems

Controlled Environment
HVAC, air quality, infection control, pressure differentials

Clinical Standards
Meets MOH, MSQH, JCI, and relevant codes and regulations

Staff & Patient Safety
Non-negotiable outcome — zero compromise on safety

Healthcare Facilities: A Unique Building Environment

Healthcare facilities differ significantly from conventional buildings — they support critical services and must remain operational under all circumstances.

1

24-Hour Operations

Hospitals operate continuously without interruption, requiring highly reliable infrastructure systems.

2

Critical Care Functions

Patients' lives depend on the availability and reliability of healthcare services and supporting infrastructure.

3

Complex Engineering Systems

HVAC, Medical Gas, Electrical Power, Nurse Call, BAS, and Biomedical Equipment.

4

Strict Regulatory Requirements

Healthcare facilities must comply with numerous standards, regulations, and accreditation requirements.

5

Rapid Technological Changes

Medical technologies evolve continuously, requiring facilities to accommodate future upgrades and expansion.

What is a Design Brief?

A Design Brief is a comprehensive document that outlines the objectives, functional requirements, operational needs, technical specifications, and performance expectations of a healthcare facility project. It serves as the primary reference document for architects, engineers, planners, consultants, and contractors throughout the project lifecycle.

The Design Brief Provides Guidance On:

- Healthcare service delivery requirements
- Clinical operational requirements
- Facilities Management requirements
- Engineering system requirements
- Biomedical equipment requirements
- Sustainability objectives
- Safety and compliance requirements
- Future expansion plans

Why the Design Brief is Critical for Sustainable FM

70–80%

of a facility's lifecycle costs are determined during the planning and design stages. Poor Design Brief development leads to costly operational challenges.

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Operational Inefficiencies

Poor patient flow

Increased staff travel distances

Workflow disruptions

!

Maintenance Challenges

Difficult equipment access

Unsafe maintenance conditions

Increased downtime

!

Increased Operational Costs

High energy consumption

Excessive water usage

Excessive maintenance costs

!

Compliance Risks

Regulatory non-compliance

Accreditation deficiencies

Patient safety risks

The Link Between Design Decisions and Lifecycle Performance

Strategic Planning → **Design Brief Development** → Concept Design → Detailed Design → Construction → Testing & Commissioning → Operation & Maintenance → Asset Renewal

The ability to influence cost and performance is HIGHEST during early planning and design. The cost of changes increases significantly once construction begins.

High Influence Zone

Planning & Design

Cost influence: ~70-80%

Locked-In Zone

Construction & Operations

Change cost: Very high

CORE CONCEPTS

Understanding Sustainable Facilities Management

Sustainable FM involves managing healthcare facilities in a manner that supports long-term economic, environmental, and social sustainability while ensuring safe and effective healthcare delivery.

1

Economic Sustainability

- Lower maintenance costs
- Reduced utility expenses
- Improved asset lifespan
- Optimized operational efficiency

2

Environmental Sustainability

- Energy-efficient building systems
- Water conservation measures
- Waste reduction initiatives
- Carbon footprint reduction

3

Social Sustainability

- Patient safety assurance
- Staff wellbeing & comfort
- Indoor environmental quality
- Accessible design for all

GBI Hospital Assessment Areas

EE **Energy Efficiency**

High-performance HVAC, BMS, LED lighting systems

IEQ **Indoor Environmental Quality**

IAQ monitoring, daylighting, thermal comfort, acoustics

SSPM **Sustainable Site Planning & Management**

Green landscape, stormwater, transport, EV facilities

MR **Materials & Resources**

Durable, recycled, low-maintenance materials

WE **Water Efficiency**

Rainwater harvesting, low-flow fixtures, leak detection

IN **Innovation**

Smart hospital tech, green innovations beyond baseline

Why GBI Matters:

- ✓ Reduces lifecycle operating cost
- ✓ Improves patient comfort & wellbeing
- ✓ Supports ESG & carbon reduction goals
- ✓ Enhances asset value and resilience

Sustainable Healthcare Design Through GBI Principles

Each GBI category translates directly into Design Brief requirements and measurable FM benefits.

GBI Category	Design Brief Consideration	FM Benefit
Energy Efficiency	High-efficiency chillers, BMS, LED lighting	▸ **Lower utility costs**
Water Efficiency	Rainwater harvesting, low-flow fixtures	▸ **Reduced water bills**
Indoor Env. Quality	IAQ monitoring, daylighting, thermal comfort	▸ **Better patient outcomes**
Materials & Resources	Durable, low-maintenance, recyclable materials	▸ **Lower maintenance cost**
Site Planning	Green landscape, EV facilities, stormwater mgmt	▸ **Improved sustainability**
Innovation	Smart hospital technologies & green innovations	▸ **Better operational efficiency**

The Role of Facilities Management in Healthcare Design

Traditional Approach

- FM involvement begins after project completion
- Issues discovered post-handover
- Costly retrofits and modifications
- Reduced operational performance
- Higher lifecycle costs

Sustainable FM Approach

- FM involved during strategic planning
- Input during Design Brief development
- Participates in design reviews
- Conducts construction inspections
- Active in commissioning activities

FM Teams Understand:

- Maintenance requirements
- Equipment accessibility needs
- Asset replacement challenges
- Energy management opportunities
- Safety risks & operational constraints

COLLABORATION

Key Stakeholders in Design Brief Development

The Design Brief should be developed through collaboration among multiple stakeholders.

1 Hospital Management

Defines organizational goals, service strategies, and future growth plans.

2 Clinical Users

Define healthcare delivery and patient care requirements.

3 Nursing Team

Provides workflow and operational perspectives.

4 Facilities Management

Provides maintainability, reliability, and lifecycle requirements.

5 Biomedical Engineering

Defines medical equipment requirements and infrastructure needs.

6 Infection Prevention & Control

Provides infection control requirements.

7 Safety & Health Team

Ensures occupational and environmental safety considerations.

8 Design Consultants

Translate operational requirements into technical solutions.

Incorporating Healthcare Operational Requirements into the Design Brief

The Design Brief must accurately capture how the healthcare facility will operate throughout its lifespan.

Patient Flow	Movement of patients between departments should be efficient and safe.
Staff Workflow	Layouts should support productivity and reduce unnecessary movement.
Emergency Response	Critical care areas must be easily accessible during emergencies.
Service Logistics	Movement of supplies, medications, food, linen, and waste must be properly planned.
Future Expansion	The facility should accommodate future healthcare demands and technological advancements.

Healthcare Demand and Capacity Planning

The objective is not to maximize the number of hospital beds, but to optimize healthcare delivery by ensuring inpatient beds are used only when clinically necessary.

Key Planning Considerations:

- Population growth projections
- Ageing population trends
- Disease epidemiology
- Healthcare utilization patterns
- Ambulatory care opportunities
- Community healthcare services
- Telemedicine capability
- Future service expansion plans

A well-developed Design Brief should focus on optimizing healthcare capacity rather than simply increasing physical infrastructure.

Hospital Bed Capacity Planning

Hospital Bed Requirement Formula

$$N\_bed = (DLOS \times N\_op \times C\_op{\rightarrow}ip) \div (OR \times 365)$$

Parameter Definitions:

N_bed	Number of beds required
DLOS	Average Length of Stay (days)
N_op	Annual outpatient volume
C_op→ip	Conversion rate from outpatient to inpatient
OR	Bed Occupancy Rate

This formula demonstrates that bed requirements are influenced by healthcare delivery efficiency, patient flow, and service models — not just population size.

Optimising Bed Capacity Through Sustainable Healthcare Design

The goal is not to reduce beds arbitrarily, but to reduce the demand for inpatient beds through better healthcare delivery models.

1

Reduce Average Length of Stay

- Enhanced Recovery After Surgery (ERAS)
- Early discharge planning
- Faster diagnostic turnaround
- Multidisciplinary care coordination

2

Reduce Outpatient Demand

- Community health centres
- Primary healthcare strengthening
- Teleconsultation services
- Chronic disease management programmes

3

Reduce Inpatient Conversion

- Observation wards
- Ambulatory care centres
- Day surgery services
- Short-stay units

WORKED EXAMPLE

Example: Impact of Reducing Average Length of Stay

Current Scenario

- Annual outpatient volume = 100,000 patients
- Average Length of Stay (ALOS) = 5 days
- Outpatient-to-Inpatient Conversion = 5%
- Occupancy Rate = 80%

86 Beds

N = (5 × 100,000 × 0.05) / (0.80 × 365)

Improved Scenario

- Annual outpatient volume = 100,000 patients
- Average Length of Stay (ALOS) = 4 days
- Outpatient-to-Inpatient Conversion = 5%
- Occupancy Rate = 80%

69 Beds

N = (4 × 100,000 × 0.05) / (0.80 × 365)

Outcome: Bed requirement reduced by 86 – 69 = 17 beds. Operational improvements reduce infrastructure without compromising patient care.

STRATEGIC INITIATIVES

Sustainable Strategies to Optimise Bed Capacity

1 Expand Ambulatory & Day-Care Services

Examples:

- Day Surgery Centres
- Ambulatory Chemotherapy Units
- One-Day Diagnostic Centres

FM Benefits:

- Smaller inpatient wards
- Lower energy consumption
- Reduced housekeeping workload

2 Strengthen Community & Home-Based Care

Examples:

- Home Nursing Services
- Telemedicine Follow-Up
- Hospital-at-Home Programmes

FM Benefits:

- Reduced hospital occupancy
- Lower facility operating costs
- Reduced transportation emissions

3 Improve Preventive Healthcare

Examples:

- Vaccination Programmes
- Early Screening Initiatives
- Chronic Disease Management

FM Benefits:

- Reduced avoidable admissions
- Better healthcare resource utilisation
- Improved population health outcomes

Bed Occupancy Optimisation Through Smart Hospital Design

Increasing efficiency is often more sustainable than building additional wards.

Design Brief Requirements:

- Real-Time Bed Management Systems — Monitor bed status and patient flow
- Predictive Analytics — Forecast admissions and discharge trends
- Digital Command Centres — Coordinate hospital operations in real time
- Integrated Hospital Information Systems — Improve patient throughput and resource allocation

Environmental Benefits

- Reduced energy demand
- Reduced water consumption
- Reduced waste generation

Economic Benefits

- Lower operating costs
- Reduced expansion requirements
- Better asset utilisation

Social Benefits

- Reduced waiting times
- Improved patient experience
- Better quality of care

From Smart Hospital to Green Hospital

Smart + Sustainable = Future Healthcare Facility

Smart & Green Examples:

- ★ Digital Energy Monitoring
- ★ Smart Chiller Optimisation
- ★ Predictive Maintenance
- ★ Solar PV Integration
- ★ Water Leak Detection
- ★ Carbon Footprint Dashboard

Alignment With:

- ✓ GBI Hospital Rating Tool
- ✓ MS1525 — Energy Efficiency
- ✓ National Energy Transition Roadmap (NETR)
- ✓ ESG Reporting Requirements

Sustainable FM Success Indicators

Environmental

Energy Intensity
$kWh/m^2/year$

Water Consumption
$m^3/bed/year$

Carbon Emissions
$tCO_2e/year$

Economic

Maintenance Cost
per m^2

Utility Cost Reduction
% savings

Asset Life Extension
years beyond design life

Social

Patient Satisfaction
survey score

Staff Comfort
IEQ index

Indoor Air Quality
performance rating

Target Outcome:

Design Brief → Sustainable Design → Efficient Operations → GBI Performance → Better Patient Care

Thank You

Sustainable Facilities Management Begins at the Design Stage.

Ir. Ts. Dr. Yahaya Hassan

Questions & Discussion Welcome