

1 Introduction

This document hopes to provide the knowledge and understanding to existing healthcare design engineers and healthcare operators, to enable them to understand the benchmark for engineering systems in healthcare facilities.

This will also allow them to ensure that the design for any healthcare facility, is compliant, efficient and will be able to run for years to come.

This document is not meant as a replacement of international healthcare standards or codes, but the culmination of standards put into a single simplified design guide to help design engineers, maintenance engineers and hospital operators. It brings out the best and most practical design of MEPF systems for global practice.

Engineering Services in Health Facilities

Engineering services in health care facilities shall satisfy general comfort demands, health procedure and patient care relevant requirements.

An important role of engineering services is controlling specific risks characteristics within a Health Facility. Engineering services become part of the complex risk management environment which includes many other factors such as maintenance and management. The optimal solution is the structuring of risk management to suit the potential risks specifically for the facility and financial circumstances (that will vary among projects).

These guidelines cannot cover all engineering options or define the requirements of a risk management system for engineering services. These systems should be developed during the design phase of the project by specialist engineers having experience in designing health facilities.

As energy efficient solutions are becoming increasingly important, certain measures are mentioned in this guideline for the design of health facilities. Some energy efficient solutions based on good engineering and general project development approach do not necessarily increase capital costs.

The provision of most energy recovery equipment does increase capital costs of the project; therefore, life cycle cost analysis is recommended to justify additional expenditure and application of this equipment will depend on budget constraints.

It is not the intention of the Guideline to cover every aspect of public and private health facilities. Project specific issues that are expected to be covered in the project brief include:

- Involvement of affected stakeholders
- Nomination, listing of critical and sterile areas, including unacceptable risks
- Application of energy recovery systems, life cycle cost analysis and other financial requirements
- Provisions for foreseeable modifications
- Emergency power distribution
- Facility specific requirements
- Specific risks and risk management policy
- Trade wastes
- Service requirements for health care equipment
- Specific Management and Maintenance requirements
- Critical safety and performance parameters required being included into the maintenance regime.

Note: Healthcare procedure-specific equipment is excluded from the engineering services as the service contractors usually do not provide them. Engineering services shall be provided as necessary to suit equipment.

General Requirements

Engineering services shall comply with relevant, applicable legislations, municipality requirements and these guidelines.

Services, or their loss, shall not cause any unacceptable hazard. The particular risks involved with patients and healthcare procedures shall be considered. Where loss of service could cause unacceptable risk (including post disaster function), services shall be continuously available and provide reliable operation.

All services shall satisfy the facility specific healthcare procedure requirements, patients', and other occupants' needs. All services shall be designed and installed in a manner that will minimize the opportunities for patient self-harm.

All services shall satisfy comfort requirements as determined in the acceptable international guidelines.

All services shall be designed for safe usage and maintenance. Maintenance shall only cause acceptable minimal disruption to healthcare procedures and minimal disturbance to patients.

Access points are recommended to be located outside patient areas and thoroughfares to avoid patient disturbance and frequent traffic.

No services shall create a hazard to or damage the environment.
Services shall be designed for minimal dust collection and easy cleaning.

All services shall be energy and cost efficient within the budgetary limits of the project.

Operation, monitoring and control of services shall suit the specific patient and healthcare procedures needs of the area serviced. Controls generally shall be tamperproof.

As-built drawings and detailed Operation and Maintenance Manuals shall be supplied at the end of a project. The drawings shall be clearly marked "AS BUILT" in large lettering and submitted to the Local Health Authority as part of the final inspection.

At the completion of the works, or section of the works, testing shall be carried out to prove the suitability and operation of the works or section of the works and that the installation complies in full with the requirements specified.

All equipment shall be suitable for the environment where they are located and operate (including temperature and pressure) and for the material they handle.

Seismic restraints in healthcare services design have become increasingly important and many jurisdictions have standards governing the same. In absence of local AHJ requirement, it is recommended to hospital services be designed to minimum requirements of international building code and relevant SDC (seismic design category) determined by the structural engineer. For higher risk categories appropriate importance factors should be assigned based on life safety, explosive nature, business continuity risks and restraints provided accordingly.

Scope of this document

Engineering systems and services design for healthcare facilities shall ensure that the healthy, clean, and hygienic environment is maintained in hospitals as per the departmental strategy by healthcare planners. Patient care, visitor safety and efficient hospital operations by the hospital operator will heavily depend on these systems.

This document shall provide an engineering design guidance for the following building services systems:

- Section 2 - Mechanical (HVAC) Systems
- Section 3 – Electrical Systems
- Section 4 – ICT & ELV Systems
- Section 5 – Water Systems
- Section 6 – Drainage Systems
- Section 7 – Medical Gas Systems
- Section 8 – Fuel Systems
- Section 9 – Pneumatic Tube Systems
- Section 10 – Fire-Fighting Systems (Special Case Areas Only)
- Section 11- Vertical Transportation Systems

The key role of above-mentioned engineering services is controlling the environmental parameters within healthcare facilities. Also, this document provides operation and maintenance for healthcare operators to ensure that the system does not encounter any major faults or incidents with the main engineering plant that shall jeopardize patient and visitor safety.

Key Objectives

The following objectives are key for a well-designed healthcare facility as well as the intent of this document:

The engineering design guide is not a replacement of other international healthcare standards, but a simple, no jargon design guide for engineers, operators, and maintenance engineers.

The engineering design within this document shall compliment requirements needed by local authorities and other relevant authorities.

The engineering design shall meet the departmental requirements set out by healthcare planners and healthcare architects.

The engineering design shall ensure that any opportunities for patient self-harm are minimized or eliminated.

The engineering design benchmark outlined within this document ensures that the loss of engineering system or failure is minimized and, in some areas, can be eliminated if the system is well maintained.

The engineering design shall ensure that any scheduled operation and maintenance procedures carried out shall keep disruptions to the operation of the healthcare facility kept at a minimum, by having these at off-peak patient/visitor traffic.

The engineering design shall ensure that any access is kept out of any clinical and patient occupied areas, but if access is required in clinical areas, then the design shall indicate that area will need to be re-treated to ensure that a safe and hygienic environment is maintained.

The engineering system design shall ensure that in the event of failure of the system, the emergency engineering system, is able to support the hospital facilities for a dictated period (usually 24-48 Hours).

All equipment shall be suitable for the environment where they are located & operated (including temperature and pressure) and for the material they handle.

Engineering Briefing

Briefing in healthcare facilities is usually provided by healthcare planners and hospital operators. This type of briefing is usually referring to the following items:

- Air Conditioning
- Ventilation Provision
- Power Outlets, (Quantity & Type – Such as General, Essential, UPS etc.)
- Sanitary and other Fixtures
- Data and Voice Points
- Medical Gas (Number of Outlets and type of service)
- CCTV and MATV (Number of outlets and type)
- Nurse Call

The type and quantity of the above outlets is not regarded as an Engineering decision, proposal or brief, these are regarded as part of Health Facility Briefing and covered in Part B.

They represent the needs of patients, staff and visitors as determined by Health Facility Planners in consultation with the facility operators.

These minimum requirements are shown in Room Layout Sheets provided under Part B.

The engineers take the above briefing requirements as a starting point and determine the Engineering Systems from there.