1. ENGINEERING SERVICES - GENERAL

Introduction

1.1.00 Engineering services account for approximately 35-40% of the capital costs in the construction of health care facilities. Given the significance of this investment, NSW Health is seeking to improve the delivery of these services by adopting a more innovative approach to engineering services design.

The requirement for all health care design is that it facilitates high quality patient care for the most cost effective capital and recurrent costs.

These Engineering Services and Sustainable Development Guidelines are intended as a handbook to be used during the briefing and design process.

The objectives of this document are:

- To allow the flexibility to facilitate creative/lateral thinking and innovation rather than adopting a prescriptive approach to design.
- To continually achieve better ways of delivering engineering services and sustainable development taking advantage of advances in technology.
- To drive cost efficiency in the provision of engineering services to achieve better value for money.
- To allow for the use of alternative/innovative materials and forms of service provision or designs, rather than being driven by the use of a prescriptive methodology. This then allow designs to be tailored to a particular building.

Overarching Objectives

1.2.00 INFECTION CONTROL

Handwashing:	Refer to Part D of the Australasian Health Facility Guidelines (HFG) - Infection Prevention and Control.
Traffic patterns:	The design of a building should ensure that work traffic flows in clinical, service and general areas take into account the clean and dirty flow patterns throughout the facility.
Cleaning:	Refer to Part D of the Australasian HFG - Infection Prevention and Control.
Ventilation:	Ventilation system designs should meet the appropriate Australian Standards and national and state requirements. Appropriate pressure differentials between rooms are to be used to ensure that air movement is from 'clean to dirty' areas. Refer to Mechanical Section - Infection Control for more details.

1.2.05 OCCUPATIONAL HEALTH & SAFETY (OHS)

Refer to Part C of the Australasian HFG.

1.2.10 WHOLE OF LIFE

In selecting a system/material, the long term service requirements/cost benefits (Whole of Life) are considered and not necessarily from a short term perspective.

For engineering services, ‘Whole of Life’ means to consider the capital cost of an installation together with operating, maintenance and component replacement costs during the life of the service or facility. (The initial capital expenditure is often quickly overtaken by recurrent costs; any additional installation costs are soon realised early in the life of the facility).

The key objective for 'Whole of Life' is that an optimum service installation for a specific facility, is identified and that facility managers have confidence in the system selected.

It should be noted however that 'Whole of Life' cost studies are part of a larger decision-making process. As well as the physical and economic aspects of engineering services, designers and operators will need to consider functionality, technological changes, health operational changes, together with social and legal implications.

The cost and energy performance of a facility must be able to be monitored and facility managers must be able to control energy usage and plan effective maintenance/replacement programs.

1.2.15 ACOUSTICS

Functional requirements of the health facility described in other documents may dictate the form and shape. The purpose of this document is to integrate the health facility's internal and environmental acoustic requirements in order to achieve an acceptable acoustic environment.

Due to noise-sensitive issues within new buildings, the requirements contained within this document will be the primary consideration when considering finishes and acoustic isolation.

1.2.20 STANDARD DOCUMENT FORMAT

In developing design solutions, the consultant is to ensure information can be transferred to systems established by NSW Health e.g. Health AMMS (Asset, maintenance and management system).

Structure of the Guidelines

1.3.00 This document contains a section entitled Design Process, generally covering all engineering disciplines, followed by sections for each individual discipline - Mechanical, Electrical, Communications, Lifts, Hydraulics and Fire Services.

The section for each discipline defines the provisions for the service and, in addition, the criteria and process for justifying departures.

Where a standard or code governs the design, the reference will be placed in a text box as below:

- Building Code of Australia (BCA)
- AS/NZS 3000 - Electrical Installations.

In addition, specific industry publications are referenced within the document. These references are given as additional guidance to designers.

Location Considerations

1.4.00 In providing engineering services for health care facilities, designers need to be cognisant of the following:

- The need to consider the ongoing servicing (including availability and the cost of parts) of equipment in rural/remote locations in selecting the type of equipment.
- Standardisation of equipment types across an Area Health Service or Health Service.

- Geographical/environmental variances across the State.
- The complexity or otherwise of equipment to meet the service need. This is linked to Point 1.

Uniform Reporting

1.5.00 These Guidelines provide NSW Health with a means of making useful comparisons between projects by providing a uniform format for:

- life cycle costing
- scheme design reporting
- elemental cost reporting.

The proposed Elemental Cost Breakdown, for example, isolates and quarantines what have been called 'special equipment items' (climatic location will vary the result). These are significant cost items such as sterilisers and operating room shadowless lights that may or may not appear in each project and thus skew the results of any cost analysis. By separately identifying these items, the remaining items - lights, power, air conditioning etc. - can be expected to be common to most projects and to therefore provide a realistic basis for comparison.

Project Definition Plan (PDP) Reporting

1.6.00 A specific Engineering Services and Sustainability Plan is submitted as part of the Project Definition Plan. It aims to identify the major decisions which will affect the engineering services budget in the final project, such as the inclusion of air conditioning or the need for a new substation or substantial upgrade of existing site services to suit the new conditions, etc.

Schematic Design Report

1.7.00 A Scheme Design Report further references Engineering and Sustainability parameters and sets the foundations for the whole project. This document requires a more in-depth analysis and comprehensive report.

The aim of the Scheme Design Report is to provide a concise summary of the decisions made so far, to identify areas where these decisions depart from the Guidelines, and document the reasons for such departures.

Considerable emphasis is given to reporting the consequences of those decisions imposed on the Services Engineers by others, e.g. inappropriate plant room placements, inadequate reticulation space, so as to provide an opportunity - and the necessary information - for reviewing those decisions at an early stage of the project.

Regulatory Control of Health Projects

1.8.00 The Building Code of Australia (BCA) and its accompanying set of administrative provisions describe the NSW Local Government requirements on buildings in the interests of safety, health, and amenity.

It is mandatory for all health building projects to obtain building approval from the local council or the minister of planning.

The Public Health Act 1991 for NSW requires that all projects that include the design, installation, commissioning and maintenance of air handling and water systems in building projects comply with the requirements of the Act and Regulations 1991. There

are no exemptions from these requirements under the Public Health Act.

Submissions to regulatory authorities are required for:

NEW BUILDINGS

- covers building designs incorporating either:
  - air handling systems and/or
  - cooling towers serving either air-conditioning plant or
  - cooling towers serving process cooling system plant.

EXISTING BUILDINGS

- involving mechanical upgrade/refurbishment projects where:
  - the footprint of the building/plant changes or
  - new air handling units are provided or
  - existing air handling units are relocated or
  - existing cooling towers are relocated or
  - new cooling towers are provided.

The following need to be submitted for:

AIR HANDLING SYSTEMS

Submission of the following plans to regulatory authorities (local councils) for approval:

- site survey including:
  - proposed locations for cooling towers, air intakes and exhaust outlets
  - existing locations for cooling towers, air intakes and natural ventilation openings of buildings adjacent to or facing the proposed new installation.

DRAINAGE AND WATER SYSTEMS

- The approval by the relevant public authorities for drainage or liquid discharge from any component of the system/s to be discharged into a waste water system or otherwise disposed.

Sustainable Development

1.9.00 GENERAL

The NSW Government aims to make buildings healthier and more affordable. It also aims to reduce the impact of buildings on the environment by reducing the demand on non-renewable resources such as energy and water, and reducing pollutants and greenhouse gas emissions.

NSW Health requires sustainable development principles and strategies to be applied to health facilities in accordance with Premier's Memorandum No 2003-2 High Environmental Performance for Buildings and the requirements of the Environmental Performance Guide for Buildings (EPGB).

The Government Energy Management Policy (GEMP) has set a target to reduce the State-wide total energy consumption of government buildings (both government-owned and leased) by 25% from 1995 to 2005. The policy requires new buildings and accommodation to be energy-efficient and cost-effective.

NSW Health is committed to achieving these targets.

All the sustainability issues and associated strategies described in the EPGB are to be addressed in the design, construction and operation of the works. The EPGB sustainability issues and associated strategies are available in detail on the website: http://asset.gov.com.au/environmentguide/

All the performance areas and associated strategies described in the EPGB are to be addressed in the Design of the Works.

NSW Health wishes to leverage its significant achievements in energy management to be a best practice energy management agency.

1.9.05 OBJECTIVES

The key sustainable development objectives are:

- comfortable and healthy indoor environment (in terms of thermal comfort, visual comfort and indoor air quality)
- minimised non-renewable resource consumption (e.g. energy, water) and environmental impacts (e.g. greenhouse, other air and water emissions, solid waste)
- cost-effectiveness over its whole life cycle.

1.9.10 SUSTAINABLE DEVELOPMENT DRIVERS

These objectives are underpinned by a number of sustainable development drivers including:

- Government Energy Management Policy (GEMP)
- objectives of the NSW Government's Sustainability Advisory Council
- NSW Water Conservation Strategy
- NSW Government's Waste Reduction and Purchasing Policy (WRAPP).

1.9.15 SUSTAINABLE BUILDING DESIGN

Some specific issues and requirements include:

- In conjunction with the functional requirements, the building form shall incorporate passive design considerations to minimise the intervention of engineering services, and to minimise energy use.
- The building's passive design and engineering services shall complement each other through an integrated design process involving all disciplines right from the beginning, to achieve the sustainable design outcomes for the whole building.
- The required sustainable design outcomes include thermal comfort, visual comfort and acoustic comfort for the building users, as well as ensuring good indoor air quality.
- The building form (including the shape, size, depth and orientation of the floor plates, etc.) shall be optimised to minimise solar heat gain, maximise natural daylight benefits and optimum access to diffuse natural light, and provide optimum HVAC outcomes.

- The mechanical services and building passive design shall complement each other in design and operation to jointly achieve the functional outcomes for the building, including providing an energy-efficient, healthy, thermally comfortable and acoustically acceptable indoor environment.
- Water conservation and water cycle management are to be included in the design (e.g. rainwater reuse, stormwater management, water recycling).
- Environmentally-sound materials (with minimal impact on the environment, minimised use of non-renewable resources, non-hazardous substances, minimised impact on indoor air quality and high recycled/recyclable content) are to be used wherever possible.
- The development shall be designed to improve upon the minimum requirement of Section J of the Building Code of Australia. It is a requirement of NSW Health that energy modelling be undertaken for all projects larger than $10m. The energy modelling shall be undertaken in accordance with either verification method JV2 or JV3 from the BCA. The facility shall be designed such that the designed energy performance achieves a minimum of 10% improvement when compared with either the "stated value" or the deemed to satisfy reference building.
- For all projects greater than $10m an independent commissioning agent shall be engaged such as to ensure that all mechanical services and automated control systems are commissioned to meet the required function and for minimum energy use. The process shall follow the proforma identified in Greenstar, with appropriate adjustment to suit healthcare.
- For all projects greater than $10m the project shall undergo the Greenstar rating process, using the Greenstar Pilot Healthcare Tool, such as to achieve a minimum 4 star rating.

1.9.20 ENVIRONMENTAL OUTCOMES AND PERFORMANCE REPORTING

The applicable environmental principles, performance areas, strategies and objectives are described in the EPGB.

The required environmental outcomes to be achieved must be developed, identified and adopted in the development of the design to suit the strategies outlines in the EPGB.

Consultants need to demonstrate how the design, including the proposed building services, will achieve the environmental outcomes required.

The consultant must provide a specific Environmental Performance Report (EPR) at the completion of the part of the design for each milestone in the form of electronic Excel files or included in the EPGM. The scope of the EPR reporting will be advised in the brief.

The specific project requirements will be contained in the architectural and sub-consultant brief.

Responsibility

1.10.00 GENERAL

This document aims to achieve greater definition of engineering services at an earlier stage of the project and to clearly define the responsibilities of both user groups/briefing teams and the engineering designers.

The consultant team, in consultation with the user groups, are required to justify (in terms of clinical service need) any engineering service that are not in accordance with the Guidelines.

The designers are required similarly to justify any decisions not in accordance with the Guidelines and to demonstrate the logic (through life cycle costing analysis) of the systems proposed.

Engineering designers are also required to report their costs in a set cost format that requires a close focus on the actual design, rather than relying on per square metre rates or other broad bases of cost estimation.

It is assumed that accepted engineering practice, relevant codes and statutory regulations will be observed as part of normal professional services and that these aspects require no specific reference.

1.10.05 RISK MANAGEMENT

An important role of engineering services is controlling specific risk factors within a particular Health Care Facility. Engineering services become part of the complex risk management environment that 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).

This document 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.

As energy efficient solutions are becoming increasingly important further requirements are proposed for inclusion in the BCA in the near future. 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. Life cycle cost analysis should be done for these systems. The final design decision shall be made in consideration of both the life cycle costing and, for ventilation air heat recovery, the benefits of potential improved indoor air quality.

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.

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