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Licensing Standards and Review Unit

Western Australia Health Facility Guidelines for Engineering Services 2006

Government of **Western Australia**
Department of **Health**

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Contents:

Part E: Engineering Services

1 Introduction

1.1 This document is the engineering hospital design and operation guidelines for Section E of the Australasian Health Facility Guidelines. This document is used when designing and operating Public hospitals built or altered in Western Australia. Its requirements take precedence over any conflicting requirements in the Australasian Health Facility Guidelines.

1.2 It also supersedes and updates engineering requirements of the Department of Health Private Hospital Guidelines for Private hospitals built or altered in Western Australia and will apply to all hospitals licensed.

2 Copyright

2.1 Copyright law covers the contents of this document, and reproduction of any part shall not be made without the approval of the Director General of Western Australia.

3 Compliance

3.1 Compliance with the latest issue of the Guidelines is required when:

- a new Facility is built;
- an existing Facility is altered[1];
- a new health care service or procedure is introduced to an existing Facility and
- required by the Licensing Standards and Review Unit policy (such as Facility changes ownership[2]).

3.2 When alterations are to be undertaken to Facilities supporting a particular medical service or services, all the facilities used in the delivery of that service or those services shall be included in the alterations, i.e.:

- A procedure room upgrade shall not be carried out in isolation from its support facilities.
- Site services standards; quality and reliability shall be appropriate to the required standards for the function being served by the alterations.

[1] Minor alterations, not changing function or introducing additional risks or not changing more than 20% of the space the altered functional unit occupies are not required to be submitted for DoH approval.

[2] Note: It is a specific requirement of the Health Act that facilities that change ownership comply with current Licensing standards. Some exceptions may be granted where risk management can be demonstrated to guarantee an equivalent health care environment.

3.3 Any alteration shall comply with the Guidelines but section 3.2 only applies where an alteration involves change to more than 20% of the space the altered functional unit occupies. Examples of functional units include: a ward, a clinical diagnostic unit, a health care support department, etc.

3.4 Any alteration provided to increase life safety should always be extended to cover the whole Facility in the shortest time period that practical operating considerations will permit, e.g. installation may have to be staged for reasons of disruption to services but should not be otherwise delayed. Refer to Section 6.

4 Boundaries of influence

4.1 The Guidelines apply to facilities built by the public sector and Hospitals and Day Procedure Facilities as defined as hospitals by the *Hospitals and Health Services Act.*

4.2 If a site has a Hospital or Day Procedure Facility and other classes of facility accommodation and there is any sharing of accommodation or building services then these Guidelines shall apply to all the facilities involved in the sharing, e.g. If there is a radiology unit in a medical consulting facility on the same site as a hospital and it is shared with the hospital then the radiology facility, its building services and the access ways to the radiology facility shall comply with the Guidelines.

5 Definitions

5.1 Terms used throughout the Guidelines have the following meanings:

Item	Term	Definition
1	Act	*The Western Australian Hospitals and Health Services Act 1927*.
2	Approval in Principle	The first of the following three stage facility approval process required before a Private Facility will be granted a licence to operate: ▪ Approval in Principle ▪ Approval to Construct ▪ Approval to Occupy See the Private Hospital Guidelines for details of how the process operates.

Item	Term	Definition
3	Australian Council on Health Care Standards	Australian Council on Health Care Standards PO Box 95 Waterloo NSW 2017 Phone: (02) 9662 2311 Fax: (02) 9662 6370
4	BCA	Building Code of Australia.
5	Day Procedure Facility	Any Facility within the compass of the Hospital Act where surgery is practiced and patients do not stay overnight.
6	Facility/Facilities	A site and its buildings, building services, fittings, furnishings and equipment of any of the categories defined to be covered by these Guidelines.
7	Guidelines	The requirements of this document.
8	Hospital	Any Hospital as defined in the Act in which patients stay overnight.
9	Maintenance (when applied with reference to facilities)	Any work required for a facility to reliably, safely and efficiently support its intended function throughout its used life.
10	NHMRC	National Health and Medical Research Council
11	Operation (when applied with reference to facilities)	Any action required to reliably, safely and efficiently operate sites, buildings, building services, and equipment to deliver each function carried out at a facility throughout its used life.
12	Operating Polices	A formal statement of the policies governing the delivery of each function contributing to the services the Facility will provide. They define inputs, outputs, organisation, authorities, service providers, service takers, normal and emergency operating conditions, performance requirements, performance reporting requirements, etc, etc to fully describe input resources and workload, functional management arrangements and expectations, and output capacity and quality requirements.
13	Project	Any project to build or alter a Facility.
14	Proprietor	The Executive Officer of the party who will operate the Facility.
15	Replacement (when applied with reference to facilities)	Any replacement of a facility, facility component or equipment item required for a facility as a whole to reliably, safely and efficiently reach its planned life.

Item	Term	Definition
16	Risk	Anything associated with the Project or operation and maintenance of a facility that requires a duty of care decision.
17	Risk Management Plan	Operating policies will define the risks to be mitigated related to each function contributing to the services the Facility will provide. In addition and to form part of a comprehensive Risk Management Plan there shall be a Facility Risk Management Plan that addresses any functional risks requiring facility solutions for appropriate mitigation and identifies and mitigates facilities planning, cost control, environmental, contracting, construction, commissioning, operation and maintenance risks associated with the Facility.
18	Shall and Should	In these Guidelines: The word shall mean the requirement described is mandatory. The world should indicates the requirement described in recommended but not mandatory.
19	Structural Engineer	A registered structural engineer.

6 Engineering services risk management plan

6.1 The Proprietor shall have a Facility risk management plan (FRMP) covering planning, design, construction, operation and maintenance of engineering services. The plan will be part of an overall Health Service risk management plan and the FRMP will be developed progressively and reach the following status at each Project stage:

- Commencement of design:
  - Define the Facility health care risks the services have to mitigate;
  - Define the Facility performance risks the design will have to mitigate;
  - Define the Facility construction, operation and maintenance risks the design will be required to mitigate;
  - Define responsibility for delivery of mitigation.
- Completion of engineering services design:
  - Full documentation of mitigation.
  - Assignment of mitigation tasks for the construction stage.
  - Establishment of mitigation quality control for the construction stage.

- Commissioning:
  - Assignment of mitigation for normal and emergency operation;
  - Training of persons assigned operational mitigation tasks;
  - Establishment of mitigation quality control for operating and maintaining the services;
  - Rehearsal of emergency operation mitigation. Define and implement health care and facilities risk management performance assessment.
- Operation:
  - Systematic performance review and improvement

6.2 Identification of risks shall meet requirements of statutory regulations and the Proprietor's duty of care. The guidelines of Australian Standard 4360 shall be applied.

6.3 The Facilities Risk Management Plan should include but not be limited to provide mitigation for:

- Health care risks related to quality and performance of Facilities;
- Facilities reliability and maintainability risks associated with the supply of building services under each of the conditions of operation required;
- Facilities services risks associated with maintaining the quality of facilities services outputs;
- Facilities services risks associated with the failure of utilities or consumables supplies;
- Safety risks associated with demolition, construction, use, operation, and maintenance of the facilities[3];
- Safety risks associated with continuing to operate facilities during additions to or alterations of existing facilities;
- Security risks associated with unauthorised access to facilities and facilities services;
- Facilities operating and maintenance risks related to non-availability of design parameter details or operating or maintenance instructions.

7 Reliability and redundancy criteria

7.1 All hospitals shall have at least reliability and redundancy in the provision and delivery of engineering services to comply with statutory specifications and Proprietor duty of care. In addition:

7.1.1 Hospitals required to withstand cyclones, or tornadoes, or with a post disaster role, i.e. the entire facility is expected to operate through any local disaster:

- Be built to withstand credible disasters as determined by risk analysis and defined by the Proprietor.

[3] Particular attention should be given to fire safety and to having a consistent level of safety across the whole Facility, e.g. when upgrading fire safety provisions they should be extended to the whole site as quickly as practicable allowing for business continuity considerations.

- Have redundancy, consumables storage, operator and maintainer skill training to maintain safe health care services, of the extent required to be provided during disasters, through all credible contingencies.

7.1.2 Hospitals that will continue to offer invasive surgery or emergency medical services through failure of normal utility services shall:

- Have redundancy, consumables storage, operator and maintainer skill training to maintain safe health care services, of the extent required to support the surgery and emergency stabilisation and post surgery or post stabilisation medical care, through all credible contingencies.

7.1.3 Hospitals that will close down surgery and emergency stabilisation on failure of normal utility services shall:

- Have redundancy, consumables storage, operator and maintainer skill training to maintain safe health care services, of the extent required to safely close down current surgery and emergency medical care and then maintain non interventional patient medical care, through all credible contingencies.

7.2 Contingencies to be covered shall be determined as part of the risk management process and shall include but not be limited to:

- Normal utilities source failure.
- Normal consumables source failure.
- Equipment and plant module failure.

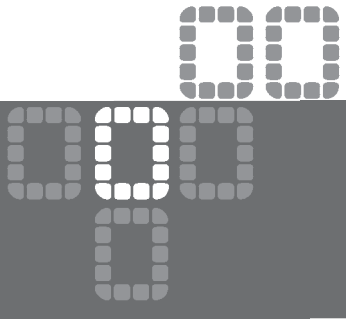
7.3 During contingencies non critical medical and medical support services that can be safely closed down may be so closed down if this is required to divert capacity or reliability to required critical services. Such diversions of services shall be part of the Facility Risk Management Plan which will define:

- Circumstances in which the diversion is permitted;
- Conditions and precautions associated with the diversion and reinstating normal operation;
- Who is authorised to make the diversion;
- Training of operators.

8 Engineering services operating policies

8.1 Operating Policies for engineering services shall be established by the Proprietor and should reach the following status related to project progress.

- Commencement of design:
  - Identify input and output parameters and qualities to be achieved;
  - Identify times and conditions under which the services shall be delivered.
  - Identify the planned life expected from the Facility.



- Completion of engineering services design:
  - Define operating parameter tolerances on which operating cost analysis has been based and which shall be achieved to deliver the project business plan;
  - Definition of the availability expected from the service.
- Commissioning:
  - Define operating and maintenance authorities and any conditions related to access for operation and maintenance;
  - Define any interdependence of services or components of services;
  - Define any licences or technical qualifications required to operate or maintain services.
- On Operation:
  - Record the as commissioned performance parameters of each service as tested in normal and emergency operating modes.

8.2 Services Operating Policies are a sub set of the policies covering every function the facility will deliver or require for delivery of its health care functions.

9 General & environmental requirements

9.1 Construction standards: Engineering services shall comply with the requirements of the Building Code of Australia for class 9a buildings except where these Guidelines require a higher standard[4].

9.2 Access: Services shall have safe access for maintenance and when components have a service life less than the planned life of the principal asset, e.g. the building they serve, be installed with provision for replacement. Access points shall:

- Be positioned to avoid interference with health care delivery;
- Be provided with appropriate access control for safety and security;
- Provide for safe handling of any goods requiring access.

9.3 Acoustic performance: Noise levels shall not exceed those defined in the BCA and AS/NZS 2107: Acoustics - Recommended design sound levels and reverberation times for building interiors. Acoustic isolation between spaces shall prevent the noise level in one space transmitting to an adjacent space and exceeding the allowable level in that space.

9.3.1 Commissioning and testing: Facilities shall be commissioned and tested as described in following sections of the Guidelines. The Proprietor may also be directed to provide further specific testing if needed to establish Approval to Operate status.

[4] See 4.2 concerning sites where other classes of building interface with class 9a Facilities.

9.3.2 Testing required shall be formally reported and held in the Proprietor's record system. Reports should:

- Describe methodology;
- Identify and provide the credentials of the commissioning and testing personnel;
- Identify test instruments and their calibration status;
- Report design and measured parameters;
- Report service outcomes and their stability.

9.4 Layout and capacity: Services layout and capacity shall provide for:

- Access for fire fighting on all sides of all buildings and for truck and crane access to install and remove any items of equipment requiring truck transportation or crane placement.
- Efficient safe access and egress for all service providers.
- Flexibility for development in health care practice and technology over the planned life of the facility.
- Safe, non-disruptive maintenance and replacements of facility components over the planned life of the facility.
- Non-disruptive impact on the neighbourhood.
- Compliance with the performance and risk management requirements of these Guidelines.

9.5 Optimising performance: New engineering services can only be commissioned to suit the season applying to the commissioning period. This rarely provides the opportunity to fully test the services are appropriately set up to deal with the whole range of conditions they will be required to cope with in service. Optimising resources shall therefore be provided to:

- Monitor performance during at least the first year of operation (commencing from when health care functions are fully commissioned) and demonstrate it meets agreed design objectives (monitoring shall continue until required performance is achieved);
- Establish the operating and maintenance regimes for the works;
- Establish performance audit reporting regimes for the works;
- Adjust operating and maintenance instructions for the works to reflect any optimising adjustments made;
- Adjust as constructed documentation of the works to reflect any optimising adjustment made;
- Establish the on going maintenance of the as constructed record;
- Audit services risk mitigation and propose any changes to the works or works operating and maintenance procedures that proper duty of care risk management should require.

Resources should also be provided to:

- Optimise performance to the limits of the services capability;
- Identify and report any scope for alterations to provide further worthwhile enhancements of performance;
- Establish performance audit reporting regimes for the works;

9.6 Project documentation: Project documentation shall be adequate for the assessment of compliance with the Guidelines and at least define:

- The design codes used in the design;
- The extent and layout of the services;
- The capacity of the services;
- The performance and quality of the services.

9.7 Protection and security: unauthorised persons or operating in circumstances that will damage the service or adjacent assets or people shall protect Engineering services from interference. There shall be:

- Out of tolerance alarms on all engineering services parameters critical to health care delivery or equipment and personnel safety;
- Mitigation for all foreseeable malfunctions, i.e. over and under parameter limit shut down; over pressure venting; leakage drainage; etc.;
- Access control on access ways to services controls and the fill points of tanks;
- Markers identifying the routes of underground services. Identifying markers on all equipment and controls[5].
- Warnings of all hazards.

9.8 Sustainability

9.8.1 In 1987 the United Nation's World Commission on Environment and Development identified sustainable development as:

"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs."

9.8.2 Sustainability shall comply with statutory and BCA requirements and should be pursued to the limits of available and appropriate technology, minimised planned life cost, and the quality of the attainable forecasting analytical information. Proprietors should note that statutory sustainability requirements are increasing rapidly and should be checked at the outset of each new project.

9.8.3 The Proprietor shall define any particular sustainability objectives, e.g. energy and other commodity consumption limits.

[5] It is recommended that in ground services are recorded on drawings and, in areas of complexity, photographically as they are being built.

9.8.4 Engineering services design should avoid design by application of convenient rules of past practice. Variables like machine efficiency, fluid flow resistance, and insulation resistance to heat transfer rates shall be reviewed for their influence on planned life costs and the design developed to minimise planned life costs. Similarly, facilities impediments to optimising health care production shall be considered and facilities configured to avoid production interference or on costs; availability of services and equipment can have a significant effect and shall be factored into analysis. Rigorous business case analysis not “rule of thumb” is required.

9.8.5 The Proprietor should define the cost analysis parameters required to be used by the Proprietor’s consultants in assessing alternative design solutions for minimised planned life costs.

9.9 Utilities: Utilities include electricity, gas, water, drainage, communications, medical gases, fuel supplies, ventilation, air conditioning and any similar services required by the facility functions. Utilities shall be configured to deliver a reliability, maintainability and risk mitigation to be defined in the Operating Policies provided by the Proprietor, and Section 7 and the following minimum requirements:

- Compliance with Supply Authority requirements;
- Back up or division into service modules to provide reliability and enable maintenance of critical functions during maintenance activities (minimum requirements are covered in the sections of the Guidelines dealing with particular services);
- Arrangements for alternative configuration of supply arrangements to cover foreseeable accidents and emergencies;
- Arrangements for alternative supply for functions that shall continue to function in all circumstances;

9.10 Vibration: Vibration in occupied spaces shall not exceed the just perceptible level defined by AS 2670.1: *Evaluation of human exposure to whole-body vibration – General requirements*. Vibration precautions shall include:

- Dynamic balancing of machines;
- Isolation of sources of vibration from vibration transmission paths (e.g. machines from pipes, ducts, support structures, etc.).
- Piping being designed to avoid pressure pulse noise or being fitted with effective pulse dampers.
- Structures being isolated from ground transmitted vibrations.
- Equipment being selected and supported to avoid operation at resonant frequencies.

10 Engineering services, civil

10.1 Site investigation

10.1.1 Sites shall be subjected to technical investigation for contamination and sub-structure design requirements for the buildings to be erected. Sites should:

- Be free from risk of flooding.
- Be free from chemical, asbestos and other hazardous contamination.
- Have appropriate sub soil drainage or other effective means to prevent rising damp or salt affected soil problems.
- Provide a stable foundation for buildings.

10.1.2 The investigation should comply with AS 1726 Site Investigation Code and provide sufficient information to provide recommendations on:

- Site classification in accordance with AS 2870.2 Residential Slabs and Footings.
- Suitable footing types, geo-technical design parameters and estimated settlement characteristics.
- Excavation characteristics, particularly with regard to occurrence of any strong rock and need for dewatering.
- Site preparation requirements, including any procedures for proof rolling, ground water control, and excavation of unsuitable soil.
- Suitability of on-site materials for use as fill and minimum compaction requirements.
- Site preparation requirements and CBR design values for car parking areas and roads.
- Soil permeability characteristics.
- Design requirements for temporary and permanent excavations and earth pressures behind retaining walls.
- Assessment of stability against global slip failures associated with retaining structures.
- Earthquake site factor and acceleration coefficient (where this may be modified due to localised soil conditions) in accordance with as 1170.4, including basis of selection in accordance with AS 1170.4, including basis of selection.

10.2 Roads, paved yards, car parks and pathways

10.2.1 Paved roads and/or pathways shall provide safe access to every car park, entrance, service delivery point, maintenance delivery point, emergency service delivery point and emergency evacuation assembly point.

10.2.2 Roads to service yards and delivery points, yards and car parks shall allow for turning radii and axle loads of delivery vehicles and design shall consider issues like:

- The intermittent need for cranes to off load heavy loads and place equipment.
- The need for marking maximum axle loadings to warn of design load limits of roads and structures.
- Where planned life of the facility exceeds maintenance free life of the pavement; the ability to maintain the pavement without adverse impact on Facility operation.

10.2.3 Pathways shall link with any adjacent public transport stops.

10.2.4 Roads and pathways shall have grades, tactile indicators and other design characteristics to comply with disabled access requirements.

10.2.5 Roads shall not double as pedestrian access ways.

10.3 Drainage

10.3.1 Site shall be provided with:

- Storm water drainage to prevent flooding of buildings and pooling of storm water on any paved area or recreational space.
- Sub soil drainage to prevent rising damp or flooding of any basement spaces.

10.3.2 Design of Facilities required to comply with sections 7.1.1 or 7.1.2 shall cope with 100 year worst storm conditions and shall place buildings at least 100mm above theoretical maximum flood level. Other Facilities shall comply with requirements of the Local Government Authority.

11 Engineering services, communications

11.1 Communications brief

11.1.1 The Proprietor shall define the extent of communication services to be provided and the performance required from them, which shall be not less than as required by statutory regulations and these Guidelines.

11.2 Extent of services

11.2.1 Communication services required may include but not be limited to:

- Assistance call systems;
- Building services monitoring;
- Data communications;
- Door call;
- Public address;

- Radio;
- Radio paging;
- TV and radio (patient entertainment);
- Duress alarm systems (refer section 17.5);
- Voice communications systems.

11.3 Common requirements

11.3.1 Communications services shall:

- Aid the proper delivery of health care;
- Not delay the delivery of care;
- Summons help within best practice time tolerances;
- Prevent equipment emergencies getting beyond control;
- Not interfere with medical processes or equipment nor unreasonably disturb the rest and comfort of patients;
- Keep patients competent to use the equipment in contact with their support networks;
- Provide ready access to the information needed to deliver health care services.

11.4 Data communications

11.4.1 There shall be a data network linking information and computing workstations.

11.4.2 The data network shall at least:

- Provide a locked accommodation allocated exclusively to network servers and a main cable distribution hub;
- Have cabling from main to sub distribution hubs run in dedicated channels in ducts or on tray;
- Have sub distribution hubs located in locked cupboards where required;
- With the exception of sub compartments within compartments required by the BCA, a hub shall not serve more than one fire compartment;
- Have cabling between sub hubs and data workstations terminating in wall sockets within 2000mm of the computing equipment to be connected.

11.4.3 Cabling shall:

- Be labelled at each connection to servers, hubs and wall outlets;
- Be neatly installed and supported and not run across floors;
- Be routed away from electro magnetic interference and vulnerability to mechanical damage.

11.4.4 Servers and hubs shall be securely supported.

11.4.5 Servers shall have an uninterruptible electricity supply connected to a Delayed Vital (30 second) circuit providing at least a four hour capacity at full load.

11.4.6 Server rooms shall provide environments complying with server maker's specifications.

11.4.7 The facility data network shall not be a limiting factor in the delivery of timely and competent health care outcomes.

11.5 Door call

11.5.1 There shall be assistance call facilities at each external and internal entrance or other control point that is a barrier to delivery of health care or health care support services.

11.5.2 Call facilities shall:

- Be prominently labelled and include any operating instructions;
- Be configured for use by the range people who may have need to use them;
- Generate a call signal in an area where assistance will always be available.

11.6 Emergency call

11.6.1 There shall be emergency assistance call facilities, for use by staff, in every patient room, patient bathroom, treatment room and anywhere else where staff may be alone with a patient and need help to deal with a patient emergency. Requirements for system operation shall meet requirements of the Facility Risk Management Plan and the following.

11.6.2 An emergency call point installed within a patient room will fulfil the accessibility requirement for an adjoining patient bathroom/ensuite dedicated for the sole use of that patient room.

11.6.3 Emergency call facilities shall be:

- In standardised positions throughout the facility;
- Located to avoid misuse;
- Waterproof if located in bathrooms;
- Connected to an instantaneous (1 second) electricity supply capable of supporting full functionality under all load conditions.

11.6.4 The call system operation shall:

- Raise audible and visual assistance alarms at destinations where there will always be competent assistance resources available;
- Identify the source of the alarm;
- Maintain the emergency alarms until cancelled at source.

11.6.5 If the emergency call system is integrated with other call systems, e.g. patient call, its alarms shall be of highest priority. Lower priority call shall return when emergency calls are cancelled.

11.7 Patient nurse call

11.7.1 There shall be a nurse call system, for use by patients, at every patient bed, toilet, shower, bath, hand basin and treatment position where a patient may be left unattended. System operation shall meet the requirements of the Proprietor's Facility Risk Management Plan.

11.7.2 Patient nurse call points shall:

- Be in standardised positions throughout the facility;
- Comply with appropriate requirements of AS 3811;
- Be waterproof if located in bathrooms;
- Be located and configured to be within reach of patients at each location and:
  - Mounted between 800mm to 1100mm AFL adjacent to toilets pans.
  - Mounted between 500mm to 750mm AFL where installed adjacent to sinks or within showers.
- Be connected to an instantaneous electricity supply capable of supporting full functionality under all load conditions.

11.7.3 At beds there shall be a call button on the wall at the bed head and on a pendant that can be positioned to suit the circumstances of the patient in the bed (pendants may control multiple services, e.g. television, radio, reading lights, bed position). Pendants shall be attached to the system via coaxial plug and socket connections. An alarm shall be generated if the plug is disconnected.

11.7.4 The call system shall:

- Raise audible and visual assistance alarms at destinations where there will always be competent assistance resources available;
- Identify the source of the alarm;
- Maintain the alarm until cancelled at source;
- Provide reassurance indication at source that the alarm has been transmitted;
- Have a distinct alarm signal that will not be confused with other alarms.

11.7.5 The call system should have provision for attaching special operating devices to suit patients with disabilities and may have pendants or pull cords or similar means of placing operation of the system within easy patient reach.

11.8 Staff assistance call

11.8.1 Proprietors may require a separate system of staff assistance call; where required staff assistance call facilities shall:

- Be in standardised positions throughout the facility;
- Comply with appropriate requirements of AS 3811;
- Be located to avoid misuse;
- Be waterproof if located in bathrooms;
- Be located and configured to be within reach of patients at each location;
- Be connected to an instantaneous (1 second) electricity supply capable of supporting full functionality under all load conditions.

11.8.2 The assistance call system shall:

- Raise audible and visual assistance alarms at destinations where there will always be competent assistance resources available;
- Identify the source of the alarm;
- Maintain the alarm until cancelled at source;
- Provide reassurance indication at source that the alarm has been transmitted;
- Have a distinct alarm signal that will not be confused with other alarms.

11.9 Colour coding and labelling of call buttons

11.9.1 Colour coding of call buttons should comply with AS 3811 but may be varied to suit established practice on any health care site. Where non-standard coding is used it should be consistently applied to the whole site.

11.10 Radio paging call

11.10.1 If facility Operating Policies require standby services from staff or contracted providers there shall be a radio paging system interfaced with other communication systems allowing authorised party or automatic calling of assistance as provided for in the policies.

11.10.2 The system shall at least:

- Incorporate arrangements to alarm if a response is not registered;
- Provide sufficient call information to clearly identify the response required;
- Log calls;
- Be capable of paging multiple receivers simultaneously;
- Interface with security, fire and other emergency alarm as required by the Operating Policies.

11.11 Public address[6]

11.11.1 A public address system may be installed in the facility and incorporate area paging, intercommunication facilities, background music and other communications services as appropriate.

[6] Cross reference to section 13.6

11.11.2 Where installed, such system should not be unduly intrusive to patients in ward areas.

11.12 Radio

11.12.1 Radio communications may be required for remote sites and for communication with patient and goods transportation.

11.13 Building services and equipment monitoring

11.13.1 Monitoring systems shall be provided where building services and equipment alarms need to be monitored continuously. Examples of where this is required include:

- Blood refrigerators;
- Food refrigerators and cold rooms;
- Food and laboratory freezers;
- Mortuary refrigerators;
- Remote equipment;
- Central plant.

11.13.2 Provision shall be made to connect such equipment to either:

- Any building management system;
- Or to an attended monitoring station;
- Or, if there is no attended monitoring station to assigned response personnel via the paging system.

11.13.3 Monitoring cabling may be integrated with other communications cabling. Cables shall be labelled as to purpose at each termination. Circuits shall be failsafe, i.e. automatically generate an alarm if deliberately or accidentally disconnected or cut.

12 Engineering services, electrical

12.1 Electrical brief

12.1.1 The Proprietor shall define the extent of electrical services to be provided and the performance required from them, which shall be not less than as required by statutory regulations and these Guidelines.

12.2 Extent of services

12.2.1 Electrical services shall include:

- Provision of normal, vital (30sec), instantaneous (1sec), and uninterruptible (No Break) electricity supplies;
- Switchgear and circuit protection to safely operate and control the

supplies;

- Distribution arrangements to supply electricity to each end use;
- Equipment to transform and condition voltages from supply voltage to end use voltage and within voltage and frequency tolerances;
- Equipment to use the electricity for lighting, heating and motive power.
- Where an electrical supply is denoted as being on an “Essential Supply” then this shall be arranged as a vital (30 sec) supply.

12.3 Electricity supply configuration

12.3.1 Hospitals required to comply with Sections 7.1.1 or 7.1.2 shall have a reliable electricity supply to ensure the continuous care of patients in accordance with the Facility Risk Management Plan and shall be provided with either:

- A 1 x 100% capacity normal supply and a 2 x 100% of critical load vital (30 second) supply;
- A 1 x 100% capacity normal supply, a 1 x 100% of critical load alternative normal supply, and a 100% of critical load vital (30 sec) supply;
- A 2 x 100% capacity normal supply and a 1 x 100% of critical load vital (30 second) supply;
- Another arrangement giving equivalent reliability and appropriate redundancy; and in each case;
- Vital (30 second) and Instantaneous (1 second) supplies at least complying with AS/NZS 3009 and with any additional requirements for modularisation or redundancy needed for risk mitigation as defined by the Proprietor.
- Uninterruptible supplies for surgical lights and any additional other equipment as defined by the Proprietor, e.g. computers.

12.3.2 Hospitals required to comply with Section 7.1.3 shall have at least a 1 x 100% capacity normal supply maximum demand and emergency/vital/instantaneous supplies complying with AS/NZS 3009 and capable of safely and reliably supplying the loads continuing to be needed until services are shut down.

12.3.3 Other hospitals[7] shall have at least a 1 x 100% capacity normal supply maximum demand; emergency/vital/instantaneous supplies complying with AS/NZS 3009; and uninterruptible supplies for surgical lights and any other additional equipment as defined by the Proprietor.

7 i.e. Not doing invasive surgery.

12.3.4 Definitions:

- 100% capacity = Maximum demand plus agreed load growth as further outlined within this guideline;
- Critical Load = The load of all the electrical services required to operate in a disaster plus a proportional allowance for growth.
- Emergency supply and normal supply have the meanings defined in AS/NZS 3009, i.e. emergency and vital (30 second) supplies have the same meaning.

12.3.5 Each normal supply shall come from a separate supply authority sub station or be configured so that a single fault or accident is not credibly likely to cause both supplies to fail. On site cable routes, transformers and switchgear shall also be segregated so that a single accident or fault is not credibly likely to cause both supplies to fail.

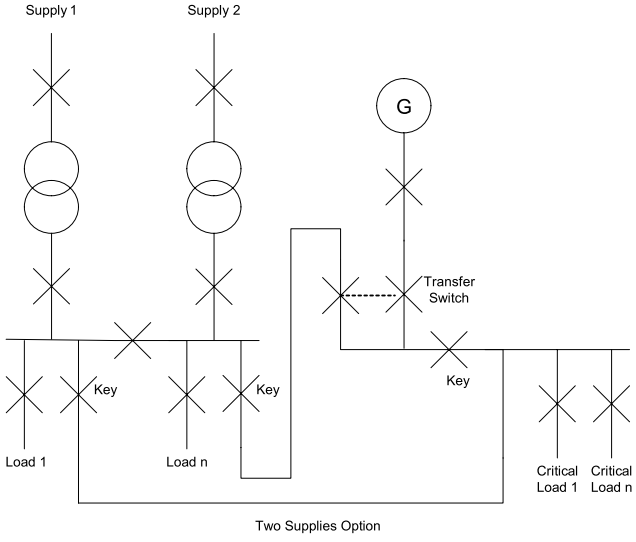
12.3.6 Any load shedding to reduce normal supply loads to critical load levels shall be automatically applied and fail safe.

12.3.7 Operation of emergency/vital (30 second) supply shall be as outlined in AS/NZS 3009.

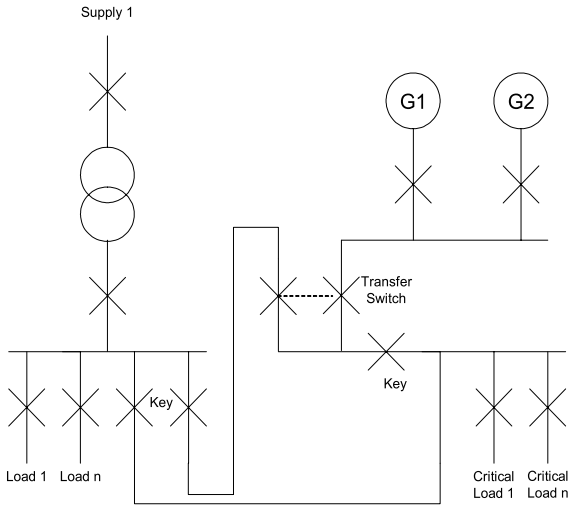
12.3.8 In any system where there are two or more modules of emergency/vital capacity needed to cover critical load they shall operate in synchronisation in parallel and there shall be an automatic loading and load shedding program for controlling loads if there is a fault on any module.

12.3.9 Infrastructure shall be designed so that all main circuit breakers can be routinely maintained without compromising redundant power supplies to critical equipment.

12.3.10 The diagrams following below illustrate the principles of the required supply configurations but will require adaptation to suit particular site distribution requirements:



Two Supplies Option



One Supply Option

12.4 Capacity

12.4.1 Supply and distribution systems shall have capacity to deliver the Project maximum demand at quality parameters to within tolerance of the end use equipment specifications without exceeding the manufacturer's ratings for reliable operation of any system component.

12.4.2 In addition systems should have capacity to accommodate load growth as defined by the Proprietor.

12.5 Standards and quality

12.5.1 Electrical systems shall comply with:

- AS/NZS 3000 Wiring Rules;
- AS/NZS 3003 Electrical installations – Patient treatment areas of hospitals…
- AS/NZS 3009 Electric installations - Emergency power supplies in hospitals.

12.6 High voltage installations

12.6.1 Where there are high voltage transformers and switch gear on site it shall:

- Either be housed in buildings or structures remote from patient areas or be located in a fire isolated part of the main building;
- Comply with the requirements of the BCA and Statutory Authority requirements for fire separation and/or isolation from buildings;
- Only be accessible to authorised persons;

- Be installed in environments where it can be accessed safely for operation and maintenance during the most extreme credible risk management conditions the Project is required to withstand; e.g. restoration of services during a storm;
- Provided with instantaneous lighting served from the vital electricity supply.
- Provided with instantaneous power to control switching served from the vital electricity supply.

12.6.2 A single line diagram of the high voltage system shall be mounted in the switch room and show:

- Source of supply;
- Extent of the system;
- Ownership interfaces of the equipment;
- Supply Authority contact person details;
- Ratings of protection;
- Ratings of cables;
- The location of any earthing equipment needed for the switchgear;
- The location of any standard switching schedules associated with use and maintenance of the switchgear;
- The location of safety and test equipment needed for switching;
- Contact details of persons authorised by the Proprietor to carry out, and qualified to perform the switching.

12.7 Mains and sub mains

12.7.1 Mains and sub main cables that supply emergency and vital services shall be fire rated and comply with the BCA and AS 3009.

12.7.2 Risk management consideration should be given to fire protection of all mains and sub mains to minimise disruption to other fire isolated areas from a remote fire. The Proprietor shall nominate where additional protection is required.

12.7.3 Sub mains serving surgical operating suites, intensive care units, emergency departments and diagnostic equipment and services critical to these facilities should be highly reliable. Risk management consideration should be given to their arrangement and a configuration provided that will allow electricity supply to be appropriately managed through electrical services maintenance or any credible accidental interruption event.

12.8 Earthing

12.8.1 There shall be an earthing diagram mounted in the main switch room identifying the earthing arrangements of the system and earth resistance test parameters to be achieved.

12.9 Cabling (general)

12.9.1 Cabling shall comply with the requirements of AS/NZS 3000, AS/NZS 3008.1, AS/NZS 3009 and the BCA.

12.9.2 Cabling should have a 25 percent spare capacity above the calculated maximum demand. The Proprietor shall nominate the spare capacity to be provided.

12.9.3 Cabling shall be located so as to not interfere with medical equipment sensitive to magnetic fields. Cabling carrying heavy loads should not be located adjacent to intensive care areas, operating rooms and similar areas where electrocardiograph-monitoring equipment is to be operated.

12.9.4 Special consideration shall be given to the impedance limits of cables serving x-ray equipment.

12.9.5 Cabling should be run on trays or in ducts on pre-planned routes where it can be accessed for additions. Trays should be generously sized so that cables are not entangled and it is practicable to remove redundant cables as any become disused.

12.10 Switchgear and circuit protection

12.10.1 Main and sub main switchgear and circuit protection shall be maintained to comply with makers recommendations; therefore it shall be configured to, and have any necessary redundancy to meet the Proprietor's duty of care and business continuity requirements during the maintenance required. The Proprietor shall define requirements.

12.10.2 Circuit protection shall be co-ordinated for the entire site (or for extensions and alterations to Facilities, as a minimum, with the immediate upstream protective device) to provide discrimination. In the event of over-current or short circuit occurring at the load side terminals of any sub main or final sub-circuit protective device:

- The sub main protection shall effectively discriminate;
- Lighting circuits shall continue to operate apart from lighting which is supplied by the faulty circuit;
- Power outlets in patient treatment areas shall continue to operate apart from any faulty circuits in those areas.

12.10.3 The use of separately fused light fittings is recommended.

12.10.4 Electro-medical circuit protection shall be provided where required by the Guidelines or the Proprietor's Operating Policies and as determined by the Proprietor's Risk Management Plan. The Proprietor shall define the type of protection required. Where provided the protection shall comply with AS/NZS 2500, AS/NZS 3003 and AS/NZS 3009.

12.10.5 Residual current device (RCD) protection shall be provided for general purpose power outlets except for:

- Outlets on isolated supplies;
- Outlets serving non-portable devices such refrigerators, freezers and similar equipment items that are plugged in and not subject to being regularly moved. Where socket outlets are not RCD protected, they shall be engraved as such and be identified as to purpose; i.e. REFRIGERATOR ONLY, BOILING WATER UNIT ONLY, etc.

12.10.6 Where staff without electrician's licences is required to reset RCD the reset button shall be in or adjacent to the room where the trip originated and located in a logically consistent way so that staff can easily find them. Unlicensed staff should not be permitted access switchboards.

12.11 Switchboards

12.11.1 Switchboard construction shall be in a form allowing main and sub-main switchgear to be maintained without having to isolate more than one circuit at a time

12.11.2 Rooms and cupboards enclosing switchboards shall comply with the requirements of the BCA and AS/NZS 3000. Switchboards distributing electricity within a hospital installation shall:

- Be mounted in a secure location only accessible to authorised personnel;
- Be protected from the external environment such that the board can be safely accessed and receive maintenance under the most severe environmental conditions through which the facility is expected to continue to provide health care services;
- Be readily accessible to authorised persons with access doors that do not obstruct any emergency egress route;
- Be well illuminated by Luminaires connected to the vital (30 sec) electricity supply, with access to and around the enclosure illuminated by luminaires connected to the instantaneous electricity supply;
- Be rated to adequately withstand the prospective short circuit currents at the installed location;
- Be provided on the basis of at least one distribution board in each fire compartment. Fire or smoke isolated areas within major fire compartments are exempt from this requirement;
- Have a main switch or switches controlling the incoming supply and be labelled with the source of that supply;
- Emergency supply sub-mains and sub-circuit cabling shall be segregated from Normal supply sub-mains and sub-circuit cabling.
- Be configured and labelled to permit ready comprehension of the circuits and loads served and the installed and maximum ratings of circuit protection of each circuit;

- Have separation of switchgear and busbars such:
  - That main and sub-main switchgear can be safely provided with manufacturer's recommended maintenance without isolating other than the circuit being maintained;
  - An arcing fault on any main or sub-main item of switchgear or busbar is unlikely to damage adjacent switchgear.
- Where fuses are used; have adequate spare fuse elements available at each switchboard;
- Be protected against vandalism and vehicular or other damage;
- Be supplied with a single line diagram and a schedule of circuits identifying the items supplied from the electrical switchboard. The schedule shall highlight the emergency equipment served. The diagram shall be laminated or mounted behind glass within the switchboard.
- Provision of bus-ties between emergency and normal supply sections on all switchboards should be considered.

12.12 Emergency/vital (30 second) electricity supplies

12.12.1 See Section 12.3 requirements.

12.12.2 Generators should:

- Comply with AS/NZS 3009;
- Have fuel supply arrangements that will keep them in operation for the longest credible normal supply outage as determined by risk analysis and as nominated by the Proprietor;
- Have provision for emptying fuel tanks so that fuel can be replaced if fuel condition monitoring indicates quality has deteriorated;
- Be installed in an environment where they can be serviced and maintained in the most unfavourable conditions that are credible for the Project site; e.g. the need to correct a failure to start problem in an outage caused by a storm would call to question the decision to install the generator outdoors;
- Have starting arrangements determined by risk analysis; e.g. remote sites may need independent means of recharging starting batteries.

12.13 Instantaneous (1 second) and uninterruptible electricity supplies

12.13.1 Fixed Surgical Luminaires:

- Shall be connected to an uninterruptible (no break) supply.

12.13.2 Procedure Room Examination Lights:

- Examination lights in procedure rooms and similar areas shall be connected to instantaneous (1 second) electricity supply.

12.13.3 Birth Room Examination Lights:

- Examination lights in birth rooms and similar areas shall be connected to vital (30 second) power supplies.

12.13.4 Emergency Evacuation and Exit Lights:

- Other instantaneous (1 second) lighting circuits may be connected to the central battery power system or may be self contained single point systems in accordance with AS2293.

12.13.5 PABX, Paging, Alarm and Call System Supplies:

- Battery supported equipment such as PABX, radio paging, fire alarm, medical gas warning, nurse call and similar systems shall be connected to instantaneous (1 second) circuits.

12.13.6 Battery Rooms:

- Battery installations shall comply with the appropriate installation requirements of AS 2676 Guide to installation, maintenance, testing and replacement of batteries in buildings AS 3011, Electrical installations – Secondary batteries installed in buildings including the provision of emergency wash down and washing facilities;
- Room fire rating shall comply with the requirements of the BCA
- Appropriate room exhaust/ventilation should be provided and where provided shall comply with the BCA requirements'' and connected to vital (30 seconds) power supply.

12.14 Lighting

12.14.1 General:

- Areas shall be illuminated by natural light or artificial means to afford safety and visibility commensurate with the purposes of each area;
- Artificial lighting shall be by means of electricity and the illuminance levels shall comply with AS/NZS 1680;
- Where working positions are fixed, advantage may be taken of the AS/NZS 1680 task lighting provisions;
- General lighting and lighting for clinical tasks, shall comply with the recommendations of AS/NZS 1680.2.5. The Proprietor shall define the extent of Cyanosis Observation areas as defined in AS1680.2.5.
- Luminaires requiring special lamps shall be fitted with labels, visible to the person changing lamps, defining the type of lamp required.

12.14.2 Ward Lighting: General ward lighting shall be configured to provide each bed with separately controlled: patient reading light switched from the Nurse Call pendant and the bed head; patient examination lighting switched from the bed head; room lighting switched from the room entrance and/or bed head; and night lighting switched from the room entrance.

12.14.3 Operating Room Lighting: General lighting in operating rooms and operating set up rooms, shall be flush mounted behind air tight diffusers;

12.14.4 Surgical Lighting: Surgical and treatment Luminaires shall Comply with the requirements of AS/NZS 3100, AS 3137, AS 3200 or alternatively IEC 598-2-25;

12.14.5 Kitchen Lighting: Lighting in kitchens and food preparation areas shall be flush mounted behind sealed diffusers.

12.14.6 Night lighting shall be provided to wards with a 24 hour operation:

- In addition to individual night lighting at each patient bed night lighting shall be provided to wards, ward corridors and associated exit passages where normal lighting may be extinguished during the night;
- Lights shall provide for safe transit (average of 0.2 lux on floor) of areas where normal lights are switched off;
- Night lighting locations and levels should not disturb sleeping patients.

12.14.7 Emergency Lighting:

- In addition to the requirements of the BCA and AS/NZS 2293 Part 1, emergency lighting shall be provided in corridors, stairways, bathrooms, ensuites, utility rooms, patient treatment areas and other critical use areas for the safe management of patient care.

12.14.8 External Lighting:

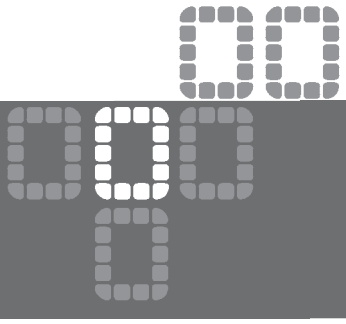
- External paths of travel from each exit, including emergency exits, to a public thoroughfare or open space shall be illuminated in accordance with AS/NZS 1158.

12.14.9 Lighting design shall take into account:

- Security requirements; entry points, car park and unattended areas shall be given special attention;
- Preventing light penetration into patient bedrooms.

12.14.10 Lighting Installation Details:

- Where automatic control of lighting is used in patient care or treatment areas, a prominently mounted separate manual switch shall be provided in the area serviced to directly override all automatic controls;
- External lighting shall be connected to circuits separate from those supplying the lighting in foyers, entry porches, emergency escape passageways and similar areas providing means of entry or egress;
- Where four or more lights are required to illuminate stairs or exit paths, luminaires shall be connected over at least two circuits and arranged so that all sections remain illuminated if one circuit fails;



- Luminaires installed within reach shall be suitably constructed or protected by guards against accidental damage so that bare lamps are not directly exposed;
- Luminaires in plant rooms shall be suitably protected from physical damage.

12.15 General purpose power outlets

12.15.1 Quantity: Sufficient general purpose electric power outlets shall be provided so that:

- There is no requirement for multi socket adaptors;
- Cleaning machines do not need more than a 15 metre extension cord;
- Other plug in equipment is within 2 metres of an outlet.

12.15.2 Characteristics: Outlets shall:

- In patient areas, comply with AS/NZS 2500 and AS3003;
- In disabled, aged or assisted patient use activity spaces, be installed in accordance with AS 1428;
- Indicate by labelling the supply circuit number and phase, and where connected via isolated supply or RCD, the device to which they are connected;
- If supplying non standard voltages or frequencies have different and incompatible socket configurations to standard outlets and be appropriately labelled;
- Accommodate low voltage transformers, i.e. be spaced above obstructions sufficiently so that the transformer with not be obstructed;
- In any children's play area be fitted with safety shutters;
- Have RCD protection as required in Section 12.10.5;
- In any area where electro-medical protection is needed for the functions performed comply with the requirements of Section 12.10.4.

12.16 Hazardous locations

12.16.1 Where flammable anaesthetics, solvents or fuels are utilised, the electrical light and power services shall comply with AS/NZS 2430.

12.17 Materials, plant and equipment

12.17.1 General: Electrical materials, plant and equipment shall as appropriate to the item:

- Have quality, capacity and modularisation to achieve the availability required by the Proprietor's Operational Policies, Risk Management Plan and Proprietor's Brief;
- Be suitable for operation in the environment in which they are installed;
- Have safe access for operation and maintenance;

- Be installed with provision for replacement of any items needing replacement within the planned life of the Project.

12.17.2 Electric Room Heaters shall:

- Comply with the requirements of AS/NZS 3000 and the Health (Public Buildings) Regulations;
- If of the permanently mounted fan and element type, shall not be used where excessive airborne lint, powder, or dust is present.

Electrical room heaters should:

- Not be of the portable bar or portable fan and element type;
- If of the wall mounted bar type, should be fitted with time switches to turn them off after an interval if they have been accidentally left on;
- If of the oil filled, fan type or similar low surface temperature heaters, may be installed either as portable or fixed appliances, provided they are fitted with over temperature protection;

12.17.3 Wall and Ceiling Fans:

- The installation of electric ceiling fans shall comply with the requirements of AS/NZS 3000 and the Health (Public Buildings) Regulations;
- Electronic fan controllers should match fan motors to eliminate electrical 'hum'.

12.18 Lightning protection

12.18.1 Lightning Protection risk assessments shall be carried out on all facilities to comply with AS/NZS 1768 a presented to the Proprietor. Risk assessment outcomes and mitigation strategies shall be agreed and recorded. Risks shall be mitigated, and as a minimum be in accordance with the recommendations of AS/NZS 1768.

12.19 Fixings and fastenings

12.19.1 Fixing methods and fastenings used for electrical components and fittings shall be to the approval of the Project Structural Engineer.

12.19.2 Any fixture or fitting within reach of patients and potentially used by a patient to try to recover from falling, shall be capable of supporting the forces potentially applied.

12.20 Specific tests

12.20.1 The electrical services shall be tested and commissioned before they are placed in operation. Testing and commissioning shall include:

- Inspection of each element to establish it is complete and of the quality required by the contract documentation;

- Testing of each element and service to establish it performs correctly in each operating mode;
- Review of arrangements for operation, servicing and maintenance to ensure that they are adequate for hospital needs;
- Testing of operating sequences and interlocks;
- Thermographic survey of switchboards, switchgear and cable joints;
- Calibration of controls and protection.
- Checking the certification provided by the supplier of electrical switchgear that circuit protection discrimination complies with Guideline requirements.
- Testing, commissioning and certification that:
  - Electro-medical power supplies comply with AS/NZS 3003;
  - HV switchboards and transformer to comply with the requirements of AS 2650 and AS 2374;
  - LV switchboards to comply with AS/NZS 3194;
  - The low voltage installation to comply with AS/NZS 3000;
  - Generating plant to comply with AS/NZS 3009;
  - Uninterruptible power supplies to comply with AS/NZS 3009;
  - Lightning protection systems shall be tested in accordance with AS/NZS 1768.

13 Engineering services, fire

13.1 Fire service brief

13.1.1 The Proprietor shall define the extent of fire services to be provided and the performance required from them which shall be not less than as required by the BCA, other statutory regulations, Fire and Emergency Services, these Guidelines and the Proprietor's Risk Management Plan.

13.2 Extent of services

13.2.1 Fire services shall be provided to comply with requirements of the BCA and the Proprietor's Risk Management Plan (see Section 6) and may include but not be limited to:

- Provision of materials and methods of construction complying with codes and regulations;
- Compartmentation of the building(s) into fire and smoke control compartments;
- Provision of complying fire egress arrangements;
- Provision of fire and smoke alarms;
- Storage arrangements for fire fighting water;

- Fire fighting water pressure boosting arrangements;
- Provision of smoke clearing ventilation;
- Smoke mode controls for ventilation plant;
- Provision of escape route air pressurisation;
- Provision of emergency warning and information equipment;
- Provision of hose reel and hydrant fire extinguishing equipment;
- Provision of automatic fire extinguishing systems;
- Provision of portable fire extinguishers and fire blankets;
- Provision of equipment to aid transportation of disabled persons;
- Provision of escape diagrams.

13.3 Compartmentation

13.3.1 Each nursing unit shall at least:

- Be in a separate smoke or fire zone complying with BCA deemed to comply requirements;
- Have access to an escape corridor or external exit without passing through another nursing unit;
- In buildings of more than one storey without direct access to an external exit; have access to another fire compartment with space to accept any non ambulant patients and their beds or trolleys while resources are assembled to deal with their evacuation.

13.3.2 Medical records storage and similar high-density storage of records or film shall be fire separated from surrounding areas with a FRL of 120/120/120.

13.3.3 Smoke and fire partitions above ceilings shall be labelled on both sides of wall every 10 metres.

13.3.4 Where non-ambulant patients are accommodated in locations without direct ground level egress then the egress path(s), i.e. stairs, lift lobby, lift shaft, and shall have a system(s) of air pressurisation to safeguard against entry of smoke.

13.4 Egress

13.4.1 Egress arrangements shall comply with the BCA and shall not be compromised by equipment storage or access doors to cupboards and ducts.

13.5 Suppression systems

13.5.1 The Proprietor shall designate where and what type and capacity of any fire suppression systems exceeding BCA requirements are to be provided to deal with special hazards or the Proprietor’s requirements for risk mitigation.

13.6 Warning and information systems

13.6.1 In Facilities over 1000 m² in gross floor area an emergency warning and information system (EWIS) shall be provided to comply with AS 1670.4.

13.6.2 In inpatient areas the system shall warn and inform staff but not be intrusive into patient bedrooms. The arrangement provided shall suit the Proprietor's fire risk management planning.

13.6.3 Systems should be divided into fire control zones so that warnings and information only reaches areas needing to be informed and whole sites are not unnecessarily disrupted.

13.7 Hydrants and hose reels

13.7.1 There shall be direct access from a fire hydrant to each face of each building, i.e. no fences obstructing, no enclosed courtyards without hydrants and no covered ways to impede fire fighting appliance access.

13.7.2 Internal fire hydrant cupboards shall have bunded floors and 50 mm diameter floor drains or hose reel cabinets shall have 50 mm diameter drain connections.

13.8 Portable extinguishers

13.8.1 The Proprietor shall designate where and what type and capacity of additional portable fire extinguishers and or fire blankets are needed to cover fire risks associated with equipment to be installed.

13.9 Signs and evacuation plans

13.9.1 The Proprietor's Operating Policies shall define any special requirements for fire signage and emergency evacuation plans needed to suit the functions of each functional area.

13.10 Water supply

13.10.1 Water supplies to facilities shall comply with AS 2118 grade 1 for facilities required to continue to operate post a disaster and with AS 2118 or AS 2419 as appropriate to the system for other facilities.

13.11 Specific tests

13.11.1 General: The fire services shall be fully tested and commissioned. Commissioning activities shall include:

- Inspection of each element to establish it is complete and of the quality required by the contract documentation;
- Testing of each element and service to establish it performs correctly in each operating mode;

- Review of arrangements for operation, servicing and maintenance to ensure that they are adequate for hospital needs;
- Testing of operating sequences and interlocks;
- Calibration of controls and protection.

13.11.2 Alarms: Test alarm systems to comply with AS 1670

13.11.3 Communications: Test EWIS system to comply with AS 1670.

13.11.4 Compartmentation: Inspect compartmentation including:

- Check fire door operation, labelling and certificates of compliance;
- Check partitions are complete and penetrations are sealed;
- Check above ceiling partitions is labelled.

13.11.5 Egress: Inspect egress routes including:

- Check opening sizes;
- Check door swing;
- Check for obstructions.

13.11.6 Fire Extinguishers: Check:

- Correctly installed and in operating condition;
- Signs and labels.

13.11.7 Hydrant and Hose Reels:

- Test the system to comply with AS 2419.1;
- Check signs and labelling;
- Check floor or cabinet drainage.

13.11.8 Materials Compliance: Check fire property compliance of floor coverings, window treatments and bed-screen curtains in compliance with specification C Fire Resistance of the BCA (see Section (reference to be inserted) Architectural).

13.11.9 Suppression Systems: Check to compliance with design codes.

13.11.10 Ventilation Systems: Test ventilation systems and fire systems to comply with AS/NZS 1668.1 (see Section 15 Mechanical).

14 Engineering services, hydraulic

14.1 Hydraulic service brief

14.1.1 The Proprietor shall define the extent of hydraulic services to be provided and the performance required from them, which shall be not less than as required by the BCA, other statutory regulations and these Guidelines.

14.2 Extent of services

14.2.1 Hydraulic may include but not be limited to:

- Cold potable water service;
- Hot potable water service;
- Warm potable water service;
- Water filtering and conditioning equipment;
- Water storage tanks;
- Gardens and grounds irrigation;
- Bore water supplies;
- Sanitary drainage service;
- Process waste water discharge conditioning facilities;
- Sanitary fittings and fixtures;
- Roof plumbing;
- Storm water drainage;
- Sub soil drainage;
- Sewerage treatment facilities;
- Natural or liquefied petroleum gas service.

14.3 Potable water supply configuration

14.3.1 Hospitals required to comply with Section 7.1.1 or 7.1.2 shall have either:

- Two independent connections to the water supply;
- One connection to the water supply and storage tanks with capacity to sustain critical water supplies for a period, defined by the Proprietor's Risk Management Plan.

14.3.2 An independent supply is defined as one fed from more than one source and which will not be interrupted by any accident or maintenance task on the other supply.

14.3.3 Other hospitals[8] shall have at least a single water source fed from two directions with sufficient separation in the alternative routes that simultaneous damage or closure for maintenance is appropriately unlikely and with valving arrangements to allow control of the feed direction.

14.3.4 Water distribution on site shall be by ring main or star sub-main arrangements that will allow the water supply to the majority of the site to be maintained though all credible system maintenance and alteration events.

[8] i.e. Those required to comply with Section 7.1.3 and those not performing invasive surgery.

14.4 Potable hot water supply configurations

14.4.1 Hospitals required to comply with Section 7.1.1 or 7.1.2 shall have either:

- A 2 x 100% full load hot water generation capacity;
- A 3 x 50% full load hot water generation capacity;
- Another configuration providing equivalent redundancy; and in each case
- Water distribution that will allow the water supply to the majority of the site to be maintained though all credible system maintenance and alteration events.

14.4.2 Other hospitals[9] shall have a configuration that will provide at least half normal capacity throughout any credible accident or maintenance event. Distribution systems shall be configured to allow reduced capacity to be distributed to all areas not immediately affected by the accident or maintenance.

14.5 Backflow prevention for potable water supplies

14.5.1 Backflow prevention of hot and cold water supplies shall comply with AS/NZS 3500.1.2 *National plumbing and drainage – Water supply – Acceptable Solutions.*

14.6 Water conditioning

14.6.1 Potable and process water shall be pre conditioned before use to control any risks associated with the quality of the water available.

14.6.2 The following additional treatment is required:

- Filtering of the whole water supply to remove particulates to 100 micron;
- Ultra violet irradiation to control Legionella and other organisms[10];
- Reverse osmosis treatment of water for steam generators, and selected outlets in pharmacies and laboratories.

14.6.3 Other treatment will be required by particular processes, e.g. dialysis, etc. and shall be defined by the Proprietor's Operating Policies.

14.6.4 Hot and cold potable water for general purposes shall comply with AS 3500 and the Australian Drinking Water Guidelines. The following water quality design parameters should not be exceeded:

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[9] i.e. Those required to comply with Section 7.1.3 and those not performing invasive surgery.

[10] UV irradiation should have a MP UV source (in preference to a LP UV treatment) at an effective operating wavelength of 240 to 280 nm to cover the most effective germicidal wavelength of 265 nm and that for deactivation of Cryptosporidium of 271 nm. LP UV is a monochromatic source with a wavelength of 254 nm. UV irradiation and required testing replaces the need for regular high temperature sanitisation of hot water lines. In the event of testing showing contamination has occurred 70°C sanitisation or chlorination will be required.

- Micro-organisms NIL
- Hardness 60 – 200 mg/L as CaCO3
- pH 6.5 to 8.5[11]
- Total Dissolved Solids less than (<) 500 mg/L
- True Colour less than (<) 15 Hazen units
- Turbidity less than (<) 1 NTU
- Residual Chlorine 0.2 to 0.6 mg/L
- Chlorine (for UV irradiated systems): NIL[12]
- The cold water supply system shall deliver peak draw at a pressure upstream of the outlet between 200kPa and 400kPa. The site main shall be fitted with flow and pressure test sampling points.

14.6.5 Water for dialysis shall be treated by filtering, carbon adsorption and reverse osmosis to meet at least the following quality standards:

Parameter	Maximum Value
Aluminium	0.01 mg/l
Antimony	0.005 mg/l
Arsenic	0.005 mg/l
Bacteriological count after 48 h incubation. Or alternatively Bacterial lipopolysaccharide concentration measured by Limulus amebocyte lysate assay.	200 CFU/ml 1ng/ml
Barium	0.01 mg/l
Beryllium	0.0004 mg/l
Cadmium	0.001 mg/l
Calcium	2 mg/l
Chloramines	0.1 mg/l
Chromium	0.014 mg/l
Copper	0.1 mg/l
Cyanide	0.02 mg/l
Fluoride	0.2 mg/l
Free Chlorine	0.5 mg/l

[11] The Guidelines allow this range; there is no need to reduce the range. For copper systems it may be beneficial to operate at the higher end to reduce potential corrosion.

[12] This applies only to chlorinated systems. UV treated systems should have no detectable chlorine levels. There should be no need to destroy any chlorine in the water supply from the mains as the UV irradiation will very effectively destroy any residual chlorine without added chemicals.

Parameter	Maximum Value
Lead	0.005 mg/l
Magnesium	4 mg/l
Mercury	0.0002 mg/l
Nitrate (as N)	2.0 mg/l
Potassium	8 mg/l
Selenium	0.09 mg/l
Silver	0.005 mg/l
Sodium	70 mg/l
Sulphate	100 mg/l
Thallium	0.002 mg/l
Total dissolved solids	1000 mg/l
Zinc	0.1 mg/l

14.6.6 Treated water for dialysis shall be circulated with turbulent flow, i.e. there shall be no dead legs and flow velocity shall be at least 1 m/s.

14.7 Stored potable water

14.7.1 Where water is stored:

- There shall be at least two modules of storage;
- Tanks shall be fully enclosed with a filtered breather vent;
- Incoming water shall be filtered for particulates over 100 micron;
- Tanks shall be shaded from the sun;
- Ultra violet irradiation shall be downstream of the storage tanks.

14.8 Performance, potable hot water systems

14.8.1 Hot water systems shall deliver peak draw at the temperatures within the following ranges and at pressures matching those of the cold water system:

- Bathrooms and hand washing: 45°C maximum;
- Nursery: 42°C maximum;
- Utensil washing sinks: Comply with Food and Hygiene Regulations;
- Dish washers:
  - Rinse water shall be at a temperature of not less than 50°C and contain not less than 50 mg/kg of sodium hypochlorite; or
  - Rinse water temperature shall not be less than 75°C[13].

[13] Heaters in the dishwasher may achieve temperature.

14.8.2 The time from tap on to water delivery at set point temperature shall not exceed 15 seconds. This will require hot water to be circulated and spur connections to outlets to have lengths less than 8 metres.

14.9 Non potable water

14.9.1 Non-potable water pipework and outlets (hot and cold) shall be clearly identifiable in both exposed and concealed positions. Identification shall comply with Australian Standard AS 1345 – *Identification of the contents of pipes, conduits and ducts*, in both colour and letter form.

14.10 Sewage and sanitary plumbing

14.10.1 Sewerage and sanitary plumbing systems, shall comply with AS/NZS 3500, these Guidelines and:

- Either be connected to the town sewerage and drainage scheme;
- Where approved by the Commissioner for Health to a system conforming to the regulations for Bacteriolytic Treatment of Sewerage, and the Disposal of Effluent and Liquid Waste under the *Health Act*.

14.10.2 Polluted water discharges shall be connected to sewer and not the storm water drainage system.

14.10.3 Accessible inspection and cleaning access shall be provided at all changes of direction and junctions in pipe routes. Access points shall be positioned external to the building wherever possible; and where not possible shall be positioned in ducts or within the wet area it serves and be raised to surface level. Inspection and cleaning access points should not be positioned in ceiling spaces.

14.10.4 Plant rooms containing water vessels and water services shall be bunded or graded and have sufficient drainage to contain an uncontrolled leak within the plant room.

14.10.5 Adequate overflow relief gullies shall be provided to minimise back flow into buildings. Floor wastes, shower wastes and the like should connect to overflow relief gullies or disconnector gullies.

14.10.6 Under building and underground drains shall be provided with adequate manholes at inspection and clean out points for efficient and quick maintenance.

14.10.7 Floor waste gully grates and surrounds, industrial floor waste grates and surrounds and cleanouts and surrounds should be brass with heavy-duty chrome plating or stainless steel with anti slip finish.

14.10.8 Baths shall have adequate floor drains adjacent to the edge of the bath.

14.10.9 Wastes and drainage cleanouts in vinyl floor areas and with other membranes shall have clamp rings fitted.

14.10.10 Puddle flanges shall be installed to all above ground level pipework penetrations of wet areas. Puddle flanges shall have 3mm diameter drain holes.

14.10.11 Grading to floor drains shall be arranged to prevent ponding of water and to suit transit by trolleys and commodes and positioning of shower chairs, i.e. the path or position shall be graded so that under normal use the commode or chair wheels/legs all maintain contact with the floor.

14.11 Industrial waste discharges

14.11.1 Treatment of industrial wastes (any waste other than domestic waste) shall comply with the requirements of Statutory Authorities.

14.11.2 Industrial traps shall be:

- Suitable for their purpose;
- Structurally sound;
- Air and water tight;
- Accessible for maintenance and pumping out when required.

14.11.3 Where mixing of waste effluents may result in fume emission, the mixing shall occur within the vented drainage system and shall not leak into occupied areas.

14.11.4 Selection of industrial floor wastes; bucket traps, floor grating, etc. shall comply with Occupational Health and Safety requirements for non-slip, non-trip and safe cleaning characteristics.

14.11.5 X-ray film process discharges to sewers shall:

- Comply with Statutory requirements, e.g. in WA:
  - the Water Corporation of WA. Document IWPUB27 Discharge of Photographic Wastes to Sewer;
  - Not discharge to sewer greater than 50mg/l or 140g/day of silver.
- Be tested to prove compliance.

14.11.6 Piping used for industrial waste discharge shall be selected to provide reliable service with the materials handled.

14.11.7 Radio active wastes and drainage shall comply with statutory requirements, e.g. in WA:

- Be in accordance with *Radiation Safety Act*, Radiological Council and Water Corporation requirements, which may include requirements for dilution, storage and controlled release.

14.12 Storm water drainage

14.12.1 See Section 10.3.

14.12.2 The stormwater drainage systems shall comply with AS/NZS 3500 Part 3 and chapter 2 of the Institute of Engineers Australia publication Australian Rainfall and Runoff.

14.12.3 Stormwater from buildings and paved areas shall be disposed of to comply with requirements of the Local Government Authority.

14.12.4 Pollutant traps should be installed prior to connection to the authority drainage system.

14.12.5 Drainage systems should be by gravity and pumping used only where gravity connection is impossible.

14.12.6 Paving areas shall be designed for the run-off intensities nominated in AS 3500.

14.12.7 Rainwater pipes shall incorporate relief grates at connection between pipes and storm water drain.

14.12.8 Rainwater pipes to have cleaning access at base.

14.12.9 Storm water and soak well drainage systems should incorporate relief grates, for air and stormwater relief.

14.12.10 Storm water drainage grates shall be of types suitable for wheel chair, walking stick, crutch and trolley traffic in all areas where such traffic may occur.

14.12.11 There shall be no open drainage channels adjacent to any area where disabled person traffic may occur.

14.13 Sewage and stormwater pumping

14.13.1 Where pumps are required for the disposal of sewerage, effluent or stormwater they shall:

- Be installed in duplicate;
- Be connected to the hospital emergency power supply;
- Pump from storage vessels with capacity to hold at least any four hour discharge to the system at the average hourly rate;
- Have alarm systems to provide early warning of pump failure and storage overflow;
- Be protected from entry of debris harmful to the operation of the pump.

14.14 Natural gas/lp gas service configuration

14.14.1 Where gas is required for space heating, potable water heating, or cooking hospitals required to comply with Sections 7.1.1 or 7.1.2 shall have at least either:

- An alternative means of maintaining heating and cooking services during any credible failure of the gas supply;
- A gas distribution configuration that will allow the gas supply to the majority of the site to be maintained though all credible on site system maintenance and alteration events.

14.14.2 Other hospitals[14] shall have at least:

- A gas distribution configuration that will allow the gas supply to the majority of the site to be maintained through all credible on site system maintenance and alteration events;
- An alternative means of providing heating and cooking to functions that will continue to operate through the gas supply failure.

14.14.3 Gas distribution systems shall have emergency isolation valves in each building fire zone served by gas. Valves shall have an adjacent warning notice requiring a check that terminal outlets are off before turning emergency valves on after any isolation.

14.15 Gas service

14.15.1 The gas service shall comply with AS/NZS 5601 and AS/NZS 1596 and relevant statutory authority requirements.

14.15.2 Gas services shall be designed to operate from delivery point to gas outlet at the complying 'prescribed pressure'.

14.15.3 Where over prescribed pressure is required to operate equipment, approval shall be obtained from the statutory authority and regulators installed to limit the over prescribed pressure to just the equipment that needs the higher pressure.

14.15.4 Where there is possibility of natural gas being available at a future date, LPG gas lines should be sized for natural gas.

14.15.5 LP Gas tanks and all gas mains control valves shall be located in locked compounds only accessible to authorised persons.

14.16 Hydraulic equipment

14.16.1 Tap ware shall:

- Be suitable for their purpose and in accordance with room detail sheet requirements.

[14] i.e. Those required to comply with Section 7.1.3 and those not performing invasive surgery.

- Be located and arranged to permit their proper use and operation:
  - Particular care should be given to the clearances required for elbow action type handles;
  - Shower taps shall be able to be operated from outside the shower recess without getting wet.
- Preferably have non thermal transmitting standard handles with effective finger grips;
- Be mounted at heights to suit the particular function e.g. paediatric, disabled, standard.

14.16.2 Basins shall suit the function, e.g.:

- Be appropriately sized for clinical hand washing[15];
- Have hands free operation in isolation rooms;
- Provide knee space for seated use by patients in wards.

14.16.3 WC pans shall suit the application, e.g.:

- Accommodate commode chairs;
- Be at appropriate heights for the users.

14.16.4 Accessible service valves shall be provided at least on every spur off main distribution hot and cold water supplies to provide localised isolation of water when servicing tap ware.

14.16.5 Noise emitted to occupied spaces from hydraulic services shall not exceed the levels defined as satisfactory in AS/NZS 2107.

14.17 Specific tests

14.17.1 Statutory Authority Tests: Following completion the sanitary plumbing and drainage system, and water systems shall be tested to prove compliance with Statutory Authority by laws.

14.17.2 Natural Gas Tests: Following completion the natural gas system shall be tested to prove compliance with AS/NZS 5601 and supply authority code requirements.

14.17.3 LP Gas Tests: Liquefied petroleum gas services shall be tested to prove compliance with AS/NZS 1596

14.17.4 Noise Tests: Where excessive noise is evident, noise level measurements shall be provided.

[15] See Australian Standard Handbook HB 260 Infection Control

15 Engineering services, mechanical

15.1 Mechanical service brief

15.1.1 The Proprietor shall define the extent of mechanical services to be provided and the performance required from them which shall be not less than as required for the clinical outcome, the BCA, other statutory regulations and these Guidelines

15.2 Extent of services

15.2.1 Mechanical services may include but not be limited to:

- Air cooling and heating services;
- Building automation control systems;
- Cool and freezer rooms;
- Energy management systems;
- Fume and dust extraction systems;
- Heat reclaim systems;
- Smoke control systems;
- Steam systems;
- Ventilation services;
- Water treatment systems.

15.3 Fire hazard

15.3.1 Mechanical Services shall be configured and controlled to minimise fire hazard. Systems shall comply with the following standards as appropriate:

- AS 1668 Part 1.
- Building Code of Australia.
- Fire and Emergency Services requirements.
- Section 12 Services, Fire.

15.4 Reliability and availability

15.4.1 Plant and equipment shall have at least the availability defined by the Proprietor's Risk Management Plan.

15.5 Ventilation service

15.5.1 Good ventilation is fundamental to proper hospital function it shall:

- Provide breathing air free from contamination harmful to building occupants or processes undertaken in and around the building

- Capture, as close as practicable to source, any air contaminated by persons or processes within the buildings and remove it to discharge at a safe place having first removed or neutralised any contamination hazardous to the environment.
- Provide special air environments for:
  - Isolation of infectious disease;
  - Protection of immuno-deficient patients;
  - Surgery;
  - Handling sterile instruments and goods;
  - Safe handling and storage of hazardous materials;
  - Body holding, viewing, and mortuary areas.
- Provide air pressure to control outside air infiltration and provide an internal airflow gradient from clean to dirty areas and processes.
- Provide air flow or pressure, in the event of fire, to prevent smoke entering escape routes and non fire affected fire zones where required by the BCA.

15.6 Ventilation performance

15.6.1 Ventilation shall comply with:

- The BCA, AS/NZS 1668.1 The use of ventilation and air conditioning in buildings, AS 1668.2 The use of ventilation and air conditioning in buildings and AS/NZS 3666 Air and Water Handling Systems of buildings; and as appropriate with:
  - Health care areas – HB 260-2003 Hospital acquired infections - Engineering down the risk;
  - Pharmaceutical – Code of Good Manufacturing Practice;
  - Food – Food and Hygiene Regulations, and Cook Chill Guidelines;
  - Laboratories – AS/NZS 2243 (All parts) Safety in laboratories;
  - Guidelines for Small Scale Genetic Manipulation Work.

15.6.2 Supply air shall be filtered to the following minimum standards:

Application	Filter Type, Class and Rating	Comments
Unitary air handlers suppling air to a single room	Type 1 Class A or B G4 to AS 1324.1	Outside air supplies to split unit air conditioners shall be filtered as for systems serving general hospital areas.
Systems serving: ▪ Administrative and general hospital areas	Type 1 Class A or B F5 to AS 1324.1	
Systems serving: ▪ C.S.S.D. preparation and clean areas not attached to operating rooms or set up rooms. ▪ Day procedure rooms and day procedure surgeries performing minor non-invasive surgery. ▪ Delivery rooms. ▪ Endoscope sterilising rooms. ▪ Recovery area. ▪ Sterile preparation/storage rooms not associated with operating rooms. ▪ T.S.S.U. preparation and clean areas not attached to operating rooms or set up rooms. ▪ Treatment rooms. ▪ X-ray rooms.	Type 1 Class A or B F6 to AS 1324.1	Lint screens may be required to protect filters in air handling units, which serve wards, operating rooms, recovery and intensive care rooms and linen processing areas.
Systems serving: ▪ Operating rooms. ▪ Operating set up rooms. ▪ Operating scrub rooms. ▪ Operating anaesthetic rooms. ▪ Sterile preparation/store rooms associated with operating rooms and pharmacies; ▪ Absolute containment isolation rooms ▪ Cytotoxic rooms. ▪ Clean rooms.	Grade 2 to AS 4260	HEPA filters shall have: ▪ Current performance certification complying with AS 1807.6 or AS 1807.7. ▪ High limit flow resistance alarms.

15.6.3 Filters shall:

- Be located in accessible non-occupied areas;
- Be installed with provision for safe handling of contaminated filters;
- For HEPA filters, have facilities for replacements to be made without contaminating the clean side of the filter or the system downstream from the filter;
- Have any filter resistance gauges installed to indicate when the filter needs replacement either due to a full dust load or filter resistance causing flow to fall below required minimum.

15.6.4 Ventilation of designated areas shall comply with the table below:

Area	Special Requirements
Air Intakes, Outside Air	Shall be inaccessible to unauthorised access.
Cytotoxic Material Handling Areas	Shall comply with AS 2639-1994 Laminar flow cytotoxic drug safety cabinets – Installation and use.
Endoscopy Units	Ventilation shall limit any chemical emission concentrations to comply with *National Exposure Standards NOHSC 1003*. Contaminated exhaust air streams shall not flow through the operator's breathing zone. Any chemical storage cupboards and hazardous chemical cleaned endoscope storage cupboards shall be exhaust ventilated. Incoming air to endoscope storage cupboards shall be filtered to F6 standard.
Evaporative Cooled Areas	Outside air shall be supplied at a rate and velocity to achieve an effective temperature of 28^{O}C or less.
Film Processing Rooms	Ventilation shall limit the maximum hourly average ozone photochemical oxidants to 0.1 ppm TWA to comply with NHMRC standards. To achieve this it is usual to provide: • Exhaust hoods over and/or exhaust connections to processors. • Exhaust hoods over or at the rear of processing sinks. • Exhaust ventilation of chemical storage and mixing areas and at silver reclaiming areas. • Exhaust ventilation rates between 15 and 25 air changes per hour depending on room size. • Vapour emission controls at drain connections to processor machines.

Area	Special Requirements
Isolation Rooms	Isolation rooms shall comply with Australian Standards Handbook HB 260-2003 *Hospital acquired infections – Engineering down the risk guidelines* for the particular level of isolation required. Supply and exhaust systems shall incorporate dual motor fans and automatic change over from duty to stand in the event of a failure of the lead unit. Rooms shall not be convertible from patient protection to patient isolation duties. The minimum differential pressure between the isolating room and adjacent areas shall be as follows: Room Type — Room — Ensuite — Airlock Type 5 — - 30Pa — - 30Pa — - 15Pa Type3 — + 30Pa — +30Pa — + 15Pa Other Types — Per HB260
Laboratories	Ventilation arrangements shall suit the laboratory functions and comply with the appropriate parts of AS/NZS 2243. Fume cupboard and safety cabinet provision shall comply with: • AS/NZS 2243.8 *Safety in laboratories - Fume cupboards*. • AS/2252.1 *Biological safety cabinets - Biological safety cabinets - Class I.* • AS 2252.2 *Biological safety cabinets - Laminar flow biological safety cabinets - Class II.* • AS/NZS 2647 *Biological safety cabinets - Installation and use.* Provision shall be made for safe methods of decontamination for maintenance of laboratory safety cabinets and fume cupboards. Laboratories used for genetic manipulation shall be accredited by the NHMRC and comply with the Guidelines for Small Scale Genetic Manipulation Work.

Area	Special Requirements
Laundries and Linen Processing Areas	Ventilation systems servicing linen processing rooms shall be designed to limit the annual mean level of total suspended particulates to 90µg/m³ to comply with NHMRC standards. Air shall be supplied at high level in a manner that minimises turbulence, and exhausted at low level exhaust with lint screens removing lint before air discharge. Heat and vapour exhaust shall be provided at washing, drying and ironing machines Soiled linen rooms shall be exhausted through a system arranged to draw air from clean linen handling areas towards soiled linen handling areas. Clean linen stores shall be air conditioned to reduce the moisture content of linen. Air pressure shall be positive in respect to the rest of the laundry.
Mortuaries and Autopsy Rooms	A separate exhaust ventilation system providing at least 20 air changes per hour shall be provided. Exhaust air shall be extracted via intakes around the perimeter of any autopsy table(s) and dissection sinks. Contaminated exhaust airflow shall not pass through the breathing zone.

Area	Special Requirements
Operating Rooms, General Surgery	Each room shall have its own ventilation system. Air filters shall be mounted with minimum separation from the outlet diffuser. Air shall be uniformly diffused downward over a minimum 1800mm x 1800mm ultra clean zone around the operating table. Air distribution arrangements shall minimise entrained room air into the air supply stream. Face velocity through the clean zone shall be at least 0.17 m/s and the air change rate in the operating room as a whole shall be at least 20 air changes per hour of which at least 25% shall be outside air. Room pressurisation of the operating room relative to adjacent rooms shall result in: • Inflow to the operating room, across the entire opening, through any opening of door(s) connecting to the sterile preparation area. • Outflow from the operating room, across the entire opening, through any open door(s) connecting to other adjacent rooms. Exhaust ventilation shall limit the anaesthetic gas exposure to comply with National Exposure Standards NOHSC 1003: • 50 ppm average anaesthetic concentration level represented in terms of an eight hour reference period or an eight hour time weighted average exposure (TWA). 500 ppm short term exposure limit (15 minutes) (STEL) There shall be high level return air and low level exhaust air intakes arranged to provide positive air flow from clean to less clean areas shall be achieved. Air not required for exhaust or sepsis control may be reconditioned and recycled. Where return air is utilised, the provision of an all outside air purge cycle is recommended. Outside air purge shall be incorporated where procedures may be septic or where obnoxious odours may be produced. When unoccupied ventilation shall be maintained at a rate to maintain flow gradients across the operating suite.

Area	Special Requirements
Operating Rooms, Laser Surgery	Depending on the type of laser and surgical procedure undertaken, laser surgery can produce a plume, which can be of noxious odour and create an infection control risk to either the patient or health service personnel. Plumes can contain blood-borne pathogens, air-borne contaminants, bacterial and viral particulates. If these risks apply they shall be managed via localised and dedicated mechanical extraction systems. Odour, bacterial and viral particulates, and other contaminants control may require use of absolute and activated carbon filters. AS/NZS 4173 *Guide to the safe use of lasers in health care* provides additional information.
Operating Rooms, Orthopaedic and similar highly invasive procedures	As for general surgery except: • The ultra clean zone shall be a minimum of 2400mm x 2400mm
Operating Room Scrub Rooms and Anaesthetic Rooms	Rooms shall be ventilated by the system serving the associated operating room. A minimum ventilation rate of 10 air changes per hour shall be provided. Room pressurisation of the room relative to adjacent rooms shall result in: • Inflow to the room, across the entire opening, through any opening of door(s) connecting to the sterile preparation area. • No flow to the operating room. • Outflow from the room, across the entire opening, through any open door(s) connecting to other adjacent rooms.

Area	Special Requirements
Recovery, Delivery, Intensive Care, Dental Procedure and other rooms where anaesthetic gases are administered or patients that have been gas anesthetised recover.	Exhaust ventilation shall limit the anaesthetic gas exposure to comply with National Exposure Standards NOHSC 1003: ▪ 50 ppm average anaesthetic concentration level represented in terms of an eight hour reference period or an eight hour time weighted average exposure (TWA). ▪ 500-ppm short-term exposure limit (15 minutes) (STEL). It is usual to provide 50 litre/s articulated arm exhaust units at each patient location or low level exhaust intakes adjacent to each position. Articulated exhaust arms where installed are commonly not used. A better option would be mid level behind bed head. Cupboards used to store anaesthetic machines shall be ventilated to remove the build-up of N2O within the cabinet.
Sterile Preparation Areas	Ventilation shall achieve a positive airflow from clean to less clean areas. Rooms shall be ventilated at a rate of at least 10 air changes per hour. Room pressurisation of the room and adjacent rooms shall result in outflow, across the entire opening, through any open door to other adjacent cleaner rooms.
Sterile Supply Areas	Heat and vapour exhaust shall be provided at washing and sterilising machines. A separate exhaust ventilation system shall be provided for emissions from any sterilisers and their aeration cabinets emitting hazardous gas or vapour. Emission concentrations shall not exceed limits of the *National Exposure Standards NOHSC 1003*, e.g.: ▪ for ethylene oxide, 1ppm; ▪ for formaldehyde, 1ppm. A local alarm system should be provided to warn of any unsafe emission levels.
Treatment and Procedure Rooms	Rooms shall be at positive pressure relative to surroundings. Ventilation shall achieve a positive airflow from clean to less clean areas.

Area	Special Requirements
Wards, General Rooms	Ventilation air movement in ward areas shall achieve a positive airflow from corridors to bedrooms and from bedrooms to ensuites.
Waste Handling Areas	Air from waste storage areas shall be exhausted through a dedicated ductwork system to a point remote from air intakes.
Confined spaces and Maintenance Spaces	Ventilation shall be designed to limit atmospheric contaminants within limits of *National Exposure Standards NOHSC 1003* and heat concentrations to suit equipment and worker access safe limits.

15.6.5 Supply air shall:

- Be provided in designed quantities to every room. This, when complying with AS 1668, may be air drawn from another room by an exhaust system.
- Be provided in quantities:
  - To comply with the BCA, AS 1668 and these Guidelines;
  - Providing pressure and flow sufficient to prevent air infiltration into controlled environments and prevent any contamination build up in the supplied room.
  - To provide approximately uniform ventilation and temperature within the space, with a design target of 40-60% RH.
  - Without causing drafts detrimental to occupant comfort;
  - Without causing dispersing turbulence to air streams capturing and conveying contamination.
- Have an outside air component to at least comply with AS 1668. Where AS 1668 Table A.1 does not specifically list air volumes under ‘Health Care’ for the space being designed, an equivalent class of occupancy from other areas of the Table shall be used;
- Have supply air volumes maintained above minimum levels throughout any variations in ventilation system flow resistance due to damper movements, filter fouling or similar system variables;
- Where ventilation systems are shut down or operate at reduced flow during periods when the area they serve is unoccupied:
  - The change of operating mode shall not compromise the performance requirements of ventilation in adjacent areas;
  - The shut down and restarting shall comply with AS 1688 requirements.
- Not include any unfiltered induced air in any area where airborne infections or contaminants may be present;

- Where variable volume supply air systems are used; incorporate controls to ensure minimum outdoor air supply is maintained to all areas as volume is varied;

15.6.6 Exhaust air shall be removed in the following minimum quantities:

Application	Minimum Rate
Single patient ensuite shower/toilet	10 litres/s/m²
Shared patient ensuite shower/toilet	15 litres/s/m²
Patient bath rooms	15 litres/s/m²
Dirty utility rooms	10 litres/s/m²
Cleaners' rooms	10 litres/s/m²
Other applications	To comply with BCA

15.6.7 Exhaust air shall:

- Be discharged to comply with AS 1668 Part 2, Clause 3.7;
- If necessary be decontaminated before discharge to meet national guidelines, e.g.:
  - WorkSafe Australia Guidance Note HOHSC 3008 and National Exposure Standards NOHSC 1003;
  - Interim National Indoor Air Quality Goals recommended by the National Health and Medical Research Council (NHMRC).

15.6.8 Exhaust systems shall:

- Draw contaminated air away from and not across any breathing zone or protected process;
- Not serve clean and dirty process rooms from a common system;
- Draw heavier than clean air contamination from not more than 200mm above floor level, e.g. nitrous oxide;
- Not have multiple intake sources if there is a risk of any backflow through the system.

15.6.9 Hoods shall be provided to capture any significant quantities of equipment or waste process heat or vapour near source before it is detrimental to the general environment. Any large exhaust ventilation hoods, e.g. kitchen hoods, should have a separate filtered air supply to minimise the hood exhausting air-conditioned air. Particular attention should be given to the heat rejected by grouped refrigerators or laboratory equipment.

15.6.10 Supply air and ventilation system noise generation in combination with other building services noise sources shall not exceed the levels defined in Section 9.3.

15.7 Ventilation system configuration

15.7.1 Air supply ventilation systems that are required to provide for odour, sepsis, and contamination control and general ventilation systems that may be interdependent with systems providing odour, sepsis and contamination control shall:

- Be supplied with electricity from the normal and emergency supply;
- Be fitted with alarms that detect failure of air flow;
- Be designed and built to provide highly reliable performance.

15.7.2 Air exhaust ventilation systems that are required to provide for odour, sepsis and contamination control shall:

- Be supplied with electricity from the normal and emergency supply;
- Be fitted with alarms that detect failure of air flow;
- Be provided in duty and standby configuration or with dual drives and automatic change over in the event of lead fan/fan drive failure.

15.7.3 Air exhaust ventilation systems that are required to provide for fire smoke control shall:

- Be supplied with electricity from the normal and emergency supply;
- Be fitted with alarms that detect failure of air flow;
- Be suitable and have circuit protection to suit the duty.

15.7.4 For hospitals required to comply with sections 7.1.1 or 7.1.2:

- Each of two operating suites (i.e. operating room anaesthetic room, scrub room) or at least each pair of more than two operating suites shall be independently ventilated.
- Each operating set up area, unless the set up area is dedicated to and part of the operating suite shall be independently ventilated.
- At least each of the following shall be independently ventilated:
  - Emergency Department;
  - Each ICU;
  - TSSU.

15.8 Cooling and heating

15.8.1 Space cooling and heating shall be provided to:

- Provide a comfortable internal environment for patients and staff;
- Provide special environments for surgery or management of particular medical treatment conditions;
- Provide safe environments for handling of food, storage of goods, conduct of processes or protection of equipment;
- Provide humidity control and prevent condensation on internal building surfaces.

15.8.2 Cooling and heating provided should comply with the table below but may be varied to suit specific medical requirements:

Area	Special Requirements
Equipment Rooms	Temperature and humidity controlled within equipment makers specified limits.
Food Handling	To comply with food handling regulations for the method of food handling.
General Occupied Areas, i.e. not listed elsewhere in this table.	Temperature controlled within the range 19°C to 27°C.
Isolation Rooms	Temperature controllable from the room in range 19°C to 25°C. Humidity controlled so there is no condensation on room surfaces.
Mortuaries and Autopsy Rooms	Temperature controlled in the range 19°C to 23°C.
Operating Rooms	Temperature controllable from the room in the range 18°C to 26°C and then controlled to within 1°K of set point. Relative humidity to stay within the range 40% to 70% Neo natal operating rooms shall have the controllable temperature range extended to 18°C to 30°C. Response to a change of temperature setting shall be achievable within five minutes under any ambient weather conditions and any change of setting. Operating rooms where flammable anaesthetic gases are used shall have a minimum relative humidity of 55%.
Procedure, Treatment Rooms and Surgeries performing non-invasive minor surgery under local anaesthetics.	Temperature controlled in the range 19°C to 24°C. Humidity controlled so there is no condensation on room surfaces.

Area	Special Requirements
Recovery, Delivery, Intensive Care, Dental Procedure and other rooms where anaesthetic gases are administered or patients that have been gas anesthetised recover.	Temperature controlled in the range 19°C to 24°C. Humidity controlled so there is no condensation on room surfaces.
Sterile Preparation Rooms	Temperature controlled in the range 19°C to 24°C. Humidity controlled so there is no condensation on room surfaces.
Sterile Supply Rooms	Temperature controlled in the range 19°C to 24°C. Humidity controlled so there is no condensation on room surfaces. Steriliser equipment rooms shall be ventilated and if necessary cooled to limit maximum temperatures to 30°C or lower if recommended by the equipment manufacturer.
Goods Storage Rooms	To suit the goods stored.
Wards, General Rooms	Temperature controllable in the range 19°C to 24°C. Humidity controlled so there is no condensation on room surfaces.
Waste Handling Rooms	Maximum temperature 27°C

15.8.3 Where evaporative cooling is used, the systems shall:

- Be readily and safely accessible for cleaning;
- To minimise Legionella risk, have sumps automatically drained when idle;
- Be sanitised for bacterial control in accordance with AS 3666;
- Have provision to prevent backflow heat leakage through convection during the heating season.

15.8.4 Waste handling rooms shall not be evaporative cooled.

15.8.5 Outside air may be used for cooling when ambient temperatures are suitable. Operation on outside air shall not jeopardise odour and sepsis control.

15.9 Cooling and heating plant configuration

15.9.1 Cooling and heating plant needed to serve patient related areas required to comply with sections 7.1.1 or 7.1.2 that will continue to operate during normal electricity supply failures shall be connected to normal and emergency electricity supplies.

15.9.2 For hospitals required to comply with section 7.1.3 the Proprietor shall assess the need for maintaining cooling and heating during the shut down of the medical services and shall provide means of maintaining cooling and heating required to mitigate medical risks.

15.9.3 Cooling and heating plant shall be provided in at least two modules of capacity with each module having capacity to support all functions that the Proprietor requires to keep operating during any capacity module failure.

15.10 Plant and equipment

15.10.1 Plant and equipment in general shall:

- Maintain reliable performance in the climatic and environmental conditions (e.g. temperature, humidity, dust and chemicals) in which installed;
- Provide stable operation;
- Operate below maximum limits for capacity, speed, temperature and pressure;
- Be provided with safety devices for the protection of the equipment, operators and users;
- Be provided with controls to automatically maintain correct operation in each of the required modes of operation.
- Deliver at least the performance required by these Guidelines;
- Have safe access for maintenance and component replacement;
- Have capacity and modules and parts availability to achieve the availability required by the Proprietor.

15.10.2 Exhaust and Return Air Grilles: Exhaust and return air grilles in wards, operating rooms, recovery and intensive care rooms shall have washable removable cores and be of a design to minimise collection of lint. Egg-crate type grilles should not be used.

15.10.3 Gas Heaters: Gas heaters shall be visible, readily accessible and easily maintainable; or, where not installed in such locations they shall be enclosed in a structure that shall not hinder maintenance and inspection but which shall provide a minimum fire resistance level of 60/60/60. The enclosure shall be monitored by smoke alarm as defined in the BCA.

15.10.4 Ductwork and Insulation: Ductwork shall:

- Comply with the requirements of the BCA, AS 1668 Part 1 and AS 4254;
- When insulated, be externally insulated. When flexible ductwork is used, conform to clause 2.8 of AS 4254. The length of flexible ductwork between metal ducts and diffusers/grilles shall not exceed 5000mm;
- Have an insulating performance selected by whole of planned life cost effectiveness determined applying Project cost analysis criteria.

15.10.5 Noise Attenuation: Duct acoustic treatment and equipment such as sound attenuators, fan coil and air handling units, VAV boxes etc. incorporating fibreglass and mineral wool products shall not have fibres exposed to the airstream. Perforated facings shall have impervious linings.

15.10.6 Noise and Vibration Levels: See Section 9.3 and 9.10.

15.10.7 Structural and Earthquake Loads: All equipment, duct work, cable trays etc. section shall be installed to comply with AS 1170-4 Section 5 (Requirements for Non Structural Components).

15.11 Tests

15.11.1 Certified commissioning and test reports shall be presented demonstrating:

- Work is completed to specification;
- System input parameters meet specified requirements;
- Systems are free from construction dust loads and contamination;
- Pressure integrity and safety of fluid systems;
- Flow volumes of service inlets and outlets under all operating modes are within tolerance and required pressure gradients and air flow direction are verified;
- Drains and vents are unobstructed;
- Correct calibration, sequence and operation of controls;
- Correct operation of safety devices and interlocks;
- Noise and vibration are within specified limits;
- Materials quality and installation quality complies with specification;
- Service outcomes comply with intent and are stable;
- Arrangements for operation and risk management of services comply with duty of care.

15.11.2 Airflow reports shall include air balance diagrams for each system and show interdependence between systems.

16 Engineering services, medical gases

16.1 Medical gas service brief

16.1.1 The Proprietor shall define the extent of medical services to be provided and the performance required from them, which shall be not less than as required by statutory regulations and these Guidelines.

16.2 Extent of services

16.2.1 Medical gas services may include but not be limited to:

- Oxygen storage and reticulation;
- Nitrous Oxide storage and reticulation;
- Medical breathing air storage and reticulation;
- Medical breathing air compression and conditioning;
- Medical suction pumping storage and reticulation.

16.2.2 The principles of this Section of the Guidelines will also apply to other gas services which may be found in some hospitals, e.g.:

- Nitrogen systems;
- Carbon dioxide systems;
- Industrial and instrument compressed air systems;
- Laboratory special gas supplies.

16.3 Medical gas services, general

16.3.1 Medical gas services shall comply with:

- AS 2896 Medical gas systems - Installation and testing of non-flammable medical gas;
- AS 2568 Medical gases – Purity of compressed medical breathing air.

16.3.2 An isolating valve shall be provided on each service in each fire zone adjacent to the point of entry or egress to the compartment.

16.3.3 For large systems ring main reticulation should be provided with isolating valves at appropriate intervals thus allowing system alterations without the need for total system shut down. These valves shall be located in plant rooms, ducts or ceiling spaces and labelled “Normally On – Close only on written work order instructions”.

16.3.4 Installation and commissioning shall be by specialist organisations certified to AS/NZS ISO 9002 by a third party certifying body that is JAS-ANZ approved.

16.3.5 An adequate supply of terminal equipment shall be provided, held at the point of service in a suitable manner for immediate use as required.

16.3.6 Warning system power supplies shall be from a vital (1 sec) supply.

16.4 Testing

16.4.1 Testing shall comply with AS 2896.

16.4.2 A medical representative of the hospital shall witness integrity and purity testing.

16.5 Permit to work

16.5.1 For medical gas systems being altered in an operating hospital facility work should be controlled under a permit to work documentation system with any isolation or recommissioning of the whole or part of systems signed off to by the facilities nominated medical officer.

17 Services, security

17.1 Security services brief

17.1.1 The Proprietor shall define the extent of security services to be provided and the performance required from them, which shall be not less than as required by statutory regulations and these Guidelines.

17.2 Extent of services

17.2.1 The Proprietor shall consider the need for:

- Access control systems;
- Asset tracking systems;
- Video surveillance systems;
- Crime prevention through environmental design;
- Door intercommunication systems;
- Intrusion detection systems;
- Security lighting;
- Security screens and fences;
- Duress systems;
- Secure parking;
- Security response resources and procedures;
- Security information systems recording and controlling access events, authorised entry parameters, security time schedules, video records, etc;
- Safes and strong rooms.

17.3 Access control

17.3.1 Access to facilities by persons and goods shall be controlled, with all access beyond control points being limited to persons authorised to be on site and goods that are appropriately risk managed to prevent harm to persons or facilities.

17.3.2 Access control shall:

- Not unreasonably impede legitimate access requirements of persons;
- Prevent unauthorised access to:
  - Patients;
  - Patient's records;
  - Dangerous goods;
  - Ventilation air intakes;
  - Controls of services;
  - Operation of machines and equipment;
  - Confined spaces;
  - High places;
  - Pits and trenches.

17.3.3 Mechanical locks shall be master keyed and the Proprietor's Risk Management Plan shall include a key issue and management protocol that protects the integrity of the system.

17.4 Door inter communication

17.4.1 Intercommunication systems should be considered to allow two way voice communication with any locked after hours entrance doors out of sight from any attended response point.

17.5 Duress systems

17.5.1 Duress alarm systems shall be provided where ever staff may be alone and threatened with duress, e.g.: interview rooms, drug storage cupboards, cashier stations, emergency admission points.

17.5.2 Duress alarm systems shall:

- Report to a position where there will always be an appropriate response;
- Report the location of the alarm;
- Maintain the alarm until reset at the point of origin;
- Have initiating mechanisms and alarm annunciation suited to the particular location and risk, i.e. configured to be unlikely to exacerbate the duress.

17.6 Security lighting

17.6.1 Security lighting shall be provided to:

- Light access ways to entrances and car parks to provide good visibility and eliminate dark areas where undesirables may lurk and confront patients, visitors and staff;
- Light car parks to reduce risk of theft and confrontation threats;
- Light areas vulnerable to forced intrusion or vandalism.

17.6.2 Configure lighting to prevent it entering bedrooms.

17.7 Security screens

17.7.1 Security screens or fences should be considered for:

- Emergency Department admissions counter;
- Pharmacy dispensing counters;
- Any cashier counters;
- After hours entry points;
- Ground floor windows;
- Staff car parks.

17.7.2 Fences should control the number of entry points to the site to reduce the risk of undetected unauthorised entry.

17.8 Intrusion detection

17.8.1 Intrusion detection should be considered for:

- Unattended areas of buildings;
- On windows and doors vulnerable to misuse or forced entry.

17.9 Video surveillance

17.9.1 Video surveillance should be considered for:

- After hours entrances;
- Car Parks;
- Otherwise unobserved waiting areas.

Individuals' right to privacy and the need to identify by signposting areas shall be considered when in installing video surveillance.

17.10 Response resources

17.10.1 The Proprietor's Risk Management Plan shall identify security risks and duty of care response to each risk.

17.10.2 Security response resources shall at least match the Risk Management Plan requirements.

18 Engineering services, structural

18.1 Structural brief

18.1.1 The Proprietor shall define the planned life of the facility as this will impact on the imposed loadings to be adopted in the design and on the corrosion protection measures to be specified for the Project.

18.1.2 The loadings to be applied to the structural design shall be not less than the minimum required by the BCA, relevant Australian Standards and these Guidelines but may be greater if the building has to serve a post disaster function or where the planned life exceeds 15 years.

18.1.3 The building structure shall:

- Have adequate foundations suited to the soil conditions of the site that provide adequate resistance to load to achieve settlements within the limits nominated in Australian Standards for the defined service life;
- For Facilities complying with Section 7.1.1 possess sufficient redundancies and adequate ductility to prevent progressive collapse.

18.2 Structural drawings and specifications

18.2.1 Project documentation shall at least define:

- The design codes used in the design;
- The design live loading including service loads;
- The wind loading parameters used for determining loads; (region, terrain, category, shielding multiplier, topographic multiplier, importance multiplier);
- The earthquake parameters used for determining loads;
- Any imposed construction/erection loadings, e.g. earth moving equipment;
- Any load limitations applying to use of particular areas;
- Foundation design parameters;
- Required concrete strength, slump and cover to reinforcement;
- Welding categories;
- Corrosion protection treatment;
- Any other details necessary to define the action and performance of the structure;
- Demolition requirements for any demolition associated with the project;
- Erecting sequence requirements for structures requiring a specific sequence.

18.3 Wind loads – loads in cyclonic areas

18.3.1 Facilities or parts of facilities required to comply with Section 7.1.1 shall be designed with an importance multiplier (Mi) as defined in AS 1170.2 of 1.1 all other Facilities shall be designed for a Mi = 1.0.

18.3.2 Buildings in regions C or D as defined by AS 1172.2 shall comply with the following:

- Assume not greater than a terrain category of 2½ with velocity multipliers equal to the average of those given in Table 3.2.5.2 for terrain categories 2 and 3. Note: This is used because the terrain roughness covered in category 3 may be subject to deterioration in high winds;
- In determining internal pressures, assume all window openings glazed or unglazed are regarded as potential dominant openings unless suitable protection against debris penetration is provided;
- Assume external doors are potential dominant openings unless doors and door fixings are shown adequate to resist the wind and impact loading.

18.3.3 An opening can be assumed to have adequate protection if shown capable of resisting a 4kg mass with a 100 x 50mm cross section striking at any angle with a velocity of 15 m/s.

18.3.4 The parts of the health facility building accommodating patients, accident and emergency department and operating theatres shall be strengthened to increase its potential to resist debris impact by increasing the loads defined above by 25%.

18.3.5 The structural consultant shall prepare a wind load diagram for all elevations of the Facility for inclusion in the Project glazing specification. The diagram shall explicitly identify the ultimate positive and negative wind loads and detail the location and extent of all applicable local pressure zones. For cyclonic regions this diagram shall nominate the windows to be capable of withstanding the impact loads of Sections 18.3.3 and 18.3.4.

18.4 Earthquake forces

18.4.1 Facilities shall be designed and constructed to withstand the force assumptions of AS 1170.4. All Facilities or parts of Facilities shall be designed, as type III using an importance factor of 1.25 for those required complying with Sections 7.1.1, 7.1.2 or 7.1.3, and an importance factor of 1.0 for other Facilities.

18.4.2 Particular attention shall be given to the design of non-structural elements where loads are likely to be imposed in accordance with AS 1170.4 Section 5 Requirements for Non-structural Components. The Structural Engineer shall define the allowable arrangements for mounting and fastening any non-structural elements on and from the structure. The Facility Risk Management Plan shall mitigate against mounting non-structural elements without complying with the Structural Engineer's requirements.

18.4.3 Construction of all seismic joints shall be designed to minimise the passage of fire and/or smoke horizontally or vertically.

18.5 Live loads

18.5.1 The structure shall be designed to be capable of sustaining the design loads listed in the Loading Code AS 1170 unless higher loads are required in the table below. The Structural Engineer shall determine actual loads but shall not be less than those nominated in the Live Loads Table.

18.5.2 Further allowance shall be made for access ways, aisles or spaces where heavy equipment loads may be moved or located during construction, installation or commissioning.

LIVE LOADS TABLE			
Area	**Element**	**Minimum Loading Condition < 15 Planned Life**	**Minimum Loading Condition > 15 Planned Life**
Minimum floor load.	Floor.	3.0 kPa UDL	5.0 kPa UDL
Superimposed dead load	Floor	1.0 kPa UDL	1.5 kPa UDL
Minimum ceiling load	Ceiling structure	0.5 kPa UDL	1.5 kPa UDL
Plant Rooms, Loading Dock, Waste Holding Areas, Bulk Stores, Film Store	Floor.	7.5 kPa UDL	7.5 kPa UDL
Loading Area, Medical Records.	Floor.	10.0 kPa UDL	10.0 kPa UDL
All other stores, Kitchen, Scullery, Catering, Dirty Utility, CSSU.	Floor.	5.0 kPa UDL	5.0 kPa UDL
Dairy and Bulk Food Cool Rooms.	Floor.	15.0 kPa UDL	15.0 kPa UDL

Area	Element	Minimum Loading Condition < 15 Planned Life	Minimum Loading Condition > 15 Planned Life
M.R.I.	Floor.	Check equipment, allow for equipment transport along access provided.	Check equipment, allow for equipment transport along access provided.
Medical Imaging, Ultrasound Unit, Operating Theatres.	Floor.	5.0 kPa UDL	5.0 kPa UDL
Medical Imaging, Ultrasound Unit.	Underside of slab over/ceiling structure.	One moving load of 10kN anywhere on the ceiling structure.	One moving load of 10kN anywhere on the ceiling structure.
Operating Theatres.	Underside of slab over/ceiling structure.	Minimum of 8 loads of 5kN each located anywhere in the ceiling.	Minimum of 8 loads of 5kN each located anywhere in the ceiling.

18.5.3 Areas designed for compactus loadings shall be clearly identified on the drawings. Final locations of these areas shall be determined during the planning of the building.

18.6 Dead loads and other loads (eg temperature)

18.6.1 Loads shall be assessed in accordance with AS/NZS 1170.1.

18.7 Sub structure

18.7.1 The sub structure includes the building footings and any basement areas of the building.

18.7.2 Sub structure design shall be based upon geotechnical site investigation (See Section 10.1

18.7.3 Sub-structure shall be designed to transmit the building loads to ground of a suitable bearing capacity, in accordance with the requirements of:

- AS/NZS 1170 SAA Loading Code(s);
- AS 3600 SAA Concrete Code;
- AS 1289 Methods of Testing Soils for Engineering Purposes
- AS 2159 Piling Code

18.7.4 Sub-structure shall be designed to:

- Tolerate movements in the foundations caused by moisture variations settlements etc. and comply with the relative differential movement limits as defined in AS 2870.2 and provide articulation of the superstructure consistent with these limits;
- Provide a projected building life at least equal to that of the building structure;
- Permit access for the performance of routine maintenance of sub-soil drainage systems and any other services located within this zone;
- Require no maintenance;
- Control vibration and noise transmission into and throughout the structure (See Section 9.3 and 9.10);
- Prevent ground water and storm water from entering any parts of the building.

18.8 Structure

18.8.1 The structure includes all components which contribute to the function of sustaining and transferring to the foundations all forces and moments arising from vertical and horizontal loadings on the building; e.g. columns, upper floors, roof structures, support beams, staircases, shear walls and structures supporting services and equipment. Design shall comply with:

- AS 1170 SAA Loading Codes (all parts);
- AS 3600 SAA Concrete Codes;
- AS 4100 Steel Structures;
- AS 1720 Timber Code;
- AS 3700 Masonry Code.

18.8.2 The structure shall be suited to the planned life of the building.

18.8.3 Maximum structural deflections shall not exceed the specifications of AS 1170 and for patient treatment and accommodation areas those of the following table:

DEFLECTION TABLE	
Structural Element	**Maximum Deflection**
Supporting Face Brick Walls	Span/1000 after construction of partitions
Supporting Rendered Brick Walls	Span/1200 after construction of partitions
Floors not supporting brittle elements	To comply with AS 1170.0
Stud walls under lateral loading	Span/500
Roof members under: a) Dead Load (G) + b) Live Load (ψs Q) + c) Wind Load (Ws) +	The lesser of span/360 or 25mm. Span/240. The lesser of span/150 or 10mm.

18.8.4 Notwithstanding compliance with AS 1170 and the deflection table, deflections shall also be limited to be visually acceptable and accommodate equipment/services mounting tolerances; e.g. the tracking and position holding of suspended operating lights, gas pendants and radiology equipment shall not be adversely effected by building structural deflections.

18.8.5 Control joints shall be constructed to minimise the effects of linear shrinkage of concrete and masonry, temperature effects and movement of the founding soils. Control joints shall be to the geometry of the slabs.

18.9 Additions and alterations to existing structures

18.9.1 Existing structures associated with Projects involving additions or alterations to the existing structure shall either:

- Comply with the requirements of these Guidelines; or
- Be shown by structural risk analysis to be safe for the loadings applied and purpose the altered building will serve.

18.10 Demolition

18.10.1 All structural elements shall be designed to allow for safe demolition at the end of their useful life.

18.10.2 Any special requirements for safe demolition shall be documented and provided to the Proprietor.

18.11 Fixings and fastenings

18.11.1 Fixing methods and fastenings to be used in the Project shall be to the approval of and endorsed by the Project Structural Engineer.

18.11.2 Any fixture or fitting within reach of patients and potentially used by a patient to try to recover from falling, shall be capable of supporting the forces potentially applied.

18.11.3 The Proprietor's Facility Risk Management Plan shall mitigate against any fixture or fitting or fixing method being applied without complying with a Structural Engineers directions.

18.12 Maintenance

18.12.1 See Section 23.

18.13 Design checking

18.13.1 For public hospitals structural design shall be independently checked to comply with requirements of the Structural Engineer commissioning contract.

18.13.2 For private hospitals structural design shall at least be checked to comply with an accredited third party quality management system.

18.14 Construction supervision

18.14.1 Construction supervision shall include at least:

- 100% review of shop drawings.
- 50% inspection of foundations.
- 75% inspection of foundations in reactive soil.
- 100% inspection of transfer elements.
- 75% inspection of suspended slabs and beams.
- 50% inspection of stairs.
- 50% inspection of columns and shear walls.
- 50% inspection of precast and tilt-up panels.
- 100% inspection of erected steelwork.

18.14.2 The Structural Engineer's inspection certification report, including certification of compliance with design, shall be recorded in the project as constructed records.

19 Engineering services, transportation

19.1 Transportation services brief

19.1.1 The Proprietor Brief shall define the extent of transportation services to be provided and the performance required from them, which shall be not less than as required by statutory regulations and these Guidelines.

19.2 Transportation drawings and specifications

19.2.1 Project documentation shall at least define:

- The design codes used in the design;
- The extent and layout of the services;
- The performance and quality of the services;
- The capacity of services.

19.3 Extent of services

19.3.1 The transportation brief shall consider the need for:

- Lifts;
- Document and specimen conveyors;
- Goods conveyors;
- Hoists.

19.4 Lifts

19.4.1 Any building of more than one storey that does not have ground level access to all levels shall have adequate lifts to provide safe and reliable vertical transport between levels for all conditions of persons and goods needing to move between levels.

19.4.2 The number of lifts and their size, speed and load carrying capacity shall be determined by a professional analysis of their anticipated usage. Minimum numbers shall comply with the BCA and the following:

- If there are no patient services on storeys other than those with level or ramp access to ground level lifts shall comply with the BCA.
- If there are patient services on a storey other than a storey with level or ramp access to ground level then if those services serve:
  - 1 to 60 patients at least one lift shall be provided;
  - 61 to 200 patients at least two lifts shall be provided;
  - 201 to 350 patients at least three lifts shall be provided;
  - Greater than 350 patients as determined by professional analysis but not less than three lifts shall be provided.
- From each building fire zone at least one lift shall be accessible without passing through another occupied fire zone, i.e. access shall be directly from each fire zone to the lift lobby or via a fire rated corridor to the lift lobby;
- Each lift shall accommodate the largest option available for equipment or patient circumstances requiring transport, e.g. a patient bed with all attachments, attendant trolleys and attendant staff that are needed for worst case safe patient movement. The Proprietor's Operation Policies shall define the lift dimensions needed to fulfil this condition and shall be not less than:
  - Clear internal dimensions, measured clear of all obstructions including handrails etc: 2280mm long x 1600mm wide x 2300mm high;
  - Door clear opening size shall be: 1300mm wide x 2100mm high.
- The number of lifts shall not limit the efficiency of medical treatment nor increase the risks of patient health treatment outcomes. The Proprietor shall consider these issues and the need for redundancy in the briefed lift requirements to achieve required reliability of production and appropriate risk management.

19.4.3 An additional goods lift should be considered if any lift carries a large portion of the hospitals goods traffic.

19.5 Lift performance and installation requirements

19.5.1 Lifts shall:

- Comply with the appropriate parts of AS 1735, AS 1668.1 and the requirements of the BCA;
- Have fire service control in accordance with Clause 29.6 of AS 1735 Part 2.

19.5.2 Precautions shall be taken to ensure that sound and vibration from hoisting motors, pumps, hydraulic systems and direct drive systems are not transferred into the structure or lift cars.

19.5.3 General-purpose power outlets associated with a lift installation shall be 30 mA residual current device protected. Common lighting and power circuits shall not be used on a lift installation.

19.5.4 Lifts shall be connected to the emergency electricity supply and if not all lifts can operate on the supply available:

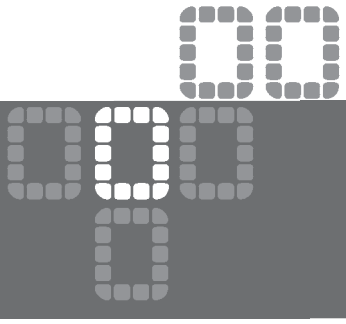
- At least one lift in each grouping of fire zones shall operate;
- At the beginning of emergency supply all lifts shall home to the egress floor at rated speed, open its doors to allow any passengers to alight and shut down with doors open. The homing process shall be controlled in a sequence that will not overload the emergency electricity supply nor prevent it assuming critical to health care loads;
- During the homing process all lifts shall by message or sign advise any passengers they are returning to ground floor;
- Once homed lifts shall by message or sign advise any person entering the car of their status, e.g. “out of service”, or “emergency power starting please wait”;
- Car ventilation shall operate on emergency supply;
- In the case of multiple lifts in a fire zone grouping if the lift selected to operate on emergency electricity is out of operation or fails to operate the duty shall automatically pass to the next lift in the group.

19.5.5 Lift car doors shall be:

- Horizontal opening power operated type with operators having adjustable speed and torque;
- Provided with a passenger protection device of the solid state modulated multi-beam infra red type with extended convergence zone protection into the hall way for greater passenger protection and to reduce the doors being damaged by trolleys and beds.

19.5.6 Lighting in lift cars shall:

- Where used for patient transfer where clinical observation is required comply with AS 1680.2.5;



- Include two self-contained battery/invertor emergency lights installed in each lift car and one on top of each lift car.

19.5.7 Traction lifts power and drive systems shall:

- Be of the direct drive solid state type with efficient filtering and electrically isolated from the main supply system;
- Comply with the Australian EMC framework for radio frequency applications;
- Comply with AS 1044, AS 1053 and AS 2279;
- Preferably have variable voltage, variable frequency a.c. type drives.

19.5.8 Electro-hydraulic lifts shall:

- Be fitted with oil coolers;
- Be fitted with silencers;
- In addition to being connected to the emergency power system, be equipped with a UPS powered emergency lowering and release system to provide automatic lowering of the lift car to the next floor and open the doors in the event of a power failure.

19.5.9 Provision for persons with disabilities shall include:

- Requirements of AS 1735 Part 12, Facilities for Persons with Disabilities and the BCA;
- A hands free two way emergency voice communication system provided from each lift car to an emergency 24 hour answering service;
- A digital car position indicator which shall be selected for colour, letter type and size to provide easy effective reading installed in each lift car operating panel;
- On lift services over two levels, direction of travel lanterns at each landing;
- The clearance between car sill and landing sill less than the width of a walking stick.

19.5.10 Features should include:

- For multi level lifts, each landing station incorporates a digital car position indicator;
- Speech announcement systems in each lift car for car direction, floor served and emergency messages;
- Permanent floor numbers installed on the sight guard and to the rear of each set of landing doors.

19.5.11 Lifts shall be provided with any fault and maintenance diagnostic facilities required for efficient and effective long-term maintenance and performance management.

19.6 Document and specimen conveyors

19.6.1 Any conveyor shall:

- Transport specimens without acceleration or impact causing damage to the specimen;
- Be connected to the emergency electricity supply;
- Comply with noise limits of Section 9.3;
- Have provision for directing incorrectly addressed carriers to an attended station.

19.7 Hoists

19.7.1 Hoists shall:

- Be labelled with safe working loads;
- Comply with relevant design codes.

19.8 Specific tests

19.8.1 Lifts shall be tested and commissioned as required by AS 1735, AS 3000, and Statutory Authorities.

20 Equipment

20.1 Equipment brief

20.1.1 The Proprietor shall define the extent of equipment to be provided and the performance required from each item, which shall be not less than as required by statutory regulations and these Guidelines.

20.1.2 The availability (i.e. % of the time available) the Proprietor requires from the equipment should also be specified; this will allow an assessment to be made of the need for special maintenance arrangements or redundancy in equipment numbers to cover down time for maintenance.

20.2 Equipment specifications

20.2.1 Equipment specifications shall at least define:

- The design codes to be complied with;
- The site conditions to apply;
- The performance and quality of the service to be delivered.

20.3 Equipment, general

20.3.1 It is not intended that these Guidelines describe requirements for every item of equipment used in hospitals but to specify general standards, requirements and principles and draw attention to particular equipment issues sometimes overlooked.

20.3.2 Equipment shall:

- If fixed to the Project structure or superstructure have supports and fixings to comply with AS 1170.4 Section 5 Requirements for Non-structural Components and the Project structural engineers guidelines;
- If standing on a suspended floor not impose floor loading in excess of design loadings advised by the Project structural engineer;
- Have operating noise and vibration levels complying with Section 9.3 and 9.10;
- Not cause radio or electro magnetic interference with any other equipment or processes in the facility;
- If to be permanently plugged in to the electricity supply and drawing more than 5 Amperes current be connected to a separate electrical circuit;
- If electrically powered by other than extra low voltage electricity be:
  - Inspected for electrical safety before being placed in service;
  - Inspected for electrical safety at intervals determined by Proprietor's duty of care;
  - Display a safety inspection label showing the date the next inspection is due.
- If handling any hazardous material be labelled with appropriate safety warnings.

20.3.3 Wheeled equipment shall be fitted with:

- Buffers to minimise damage to the equipment and the surfaces it contacts in transit;
- Wheels or castors that will not mark floor finishes or be trapped in joints or lift threshold gaps across which it will pass;
- Brakes to prevent it moving unintentionally or getting out of control.

20.3.4 The quantity of equipment of each type provided shall allow for the Proprietor's defined required availability of capacity and the required down times for maintenance, testing and cleaning.

20.3.5 Storage facilities shall be provided for portable equipment not in use that:

- Protects the equipment from interference;
- Makes it appropriately accessible for use;
- Prevents it obstructing egress routes or access to other equipment or services.

20.3.6 Power operated equipment used to lift or transport patients shall have manual means of restoring them to normal mobility if the powered motion fails.

20.4 Medical electrical equipment

20.4.1 Medical electrical equipment shall comply with all the appropriate parts of AS/NZS 3200 Medical electrical equipment.

20.5 Flammable liquid storage

20.5.1 Flammable liquids shall:

- Be managed so that quantities within any building are within limits specified in AS 1940;
- Have liquids not in use stored in ventilated flammable liquid cabinets.

20.6 Chemical storage

20.6.1 Arrangements for the storage of chemicals shall comply with AS/NZS 2243.10.

20.7 Cleaning equipment

20.7.1 Vacuum cleaners (that recirculate air to the space cleaned) cleaning patient areas shall be fitted with HEPA filters.

20.7.2 Portable electric powered cleaning equipment shall have electric cable lengths limited to 15 metres.

20.8 Cool rooms and freezer rooms

20.8.1 Cool and freezer rooms in which people are required to work with doors closed shall be provided with forced ventilation at a rate to maintain oxygen levels and appropriately dilute any air contamination.

20.8.2 Cool and freezer rooms shall be insulated or insulated and fitted with anti condensation heaters to prevent condensation on external surfaces.

20.9 Laboratory equipment

20.9.1 Fume cupboards shall comply with AS/NZS 2243.8

20.9.2 Biological safety cabinets shall, as appropriate to the application, comply with:

- AS 2252.1-2002 Biological safety cabinets - Biological safety cabinets – Class I;
- AS 2252.2-1994 Biological safety cabinets - Laminar flow biological safety cabinets - Class II;
- AS NZS 2647-2000 Biological safety cabinets - Installation and use;

- AS 2639-1994 Laminar flow cytotoxic drug safety cabinets - Installation and use.

20.9.3 Cabinets that require decontamination before access for maintenance shall be provided with means of safely venting any gases or vapours involved in the decontamination process.

20.10 Sterile supply equipment

20.10.1 Sterilisers shall comply with:

- AS 1410 Sterilisers – Steam - Pre-Vacuum;
- AS 2182 Sterilisers – Bench top;
- AS 2192 Sterilisers – Steam – Downward displacement;
- AS 2487 Dry heat sterilisers.

20.10.2 Washer/disinfectors shall comply with:

- AS 2945 Batch-type washer/disinfectors for health care facilities;
- AS 3836 Rack conveyor washers for health care facilities.

20.10.3 Ultrasonic cleaners shall comply with:

- AS 2773.1 Ultrasonic cleaners for health care facilities – Non- portable;
- AS 2773.2 Ultrasonic cleaners for health care facilities – Bench top.

20.10.4 Heat and vapour from sterile supply equipment shall be collected and exhausted without effecting the occupied environment.

20.10.5 Sterile supply equipment enclosures shall be maintained at temperatures that do not compromise equipment reliability.

20.10.6 Sterile supply equipment shall pass commissioning tests specified in the standards.

20.11 Catering equipment

20.11.1 Catering departments shall be equipped to maintain food services through any emergency and post disaster conditions the Facilities are required to continue to operate.

20.12 Laundry equipment

20.12.1 Facilities with outsourced laundry services, where the Facility is required to continue to function though emergencies and post disaster conditions, should consider whether they require some on site laundry capacity to cover break down of normal supplies.

20.13 Ward equipment

20.13.1 Pan flusher sanitisers shall comply with AS 2437 Flusher/sanitisers for bedpans and urine bottles.

20.13.2 Macerators if used for bedpan and bottle disposal shall be installed to Water Statutory Authority approval.

20.14 Film processing equipment

20.14.1 Film processing equipment and connections to drains shall be fitted with means to prevent chemical emissions exceeding statutory limits.

20.14.2 Effluent shall be treated to limit silver discharge to comply with Statutory Authority regulations.

21 Facility management

21.1 Facility manager

21.1.1 There shall be a person or organisation appointed by the Proprietor to manage the facility and implement the Facilities Operating, Maintenance and Risk Management Plans.

21.1.2 The Facility Manager should have a performance agreement with the Proprietor that:

- Defines delegation of authority and responsibility;
- Defines facility risk containment measures required by the Proprietor;
- Requires the facility to be managed to comply with these Guidelines;
- Requires the Manager to report, in writing to the Proprietor, any deficiencies that are beyond the Facilities Manager's competence or authority to keep within compliance standards.

21.1.3 Persons or organisations employed to operate, maintain or develop facilities shall have:

- History of competence to do the work assigned;
- Have access to the facility records;
- Have direction to supply any information needed to keep the records updated to record any changes arising from the work done.

22 Facility operation

22.1 Operating plan

22.1.1 There shall be a written facility Operating Plan.

22.1.2 The Plan shall address all operating objectives and risks.

22.1.3 The Plan shall include requirements for testing of emergency services and rehearsing change over to alternative service supply arrangements.

22.1.4 The Plan shall be reviewed at intervals to suit Proprietor's assessment of duty of care.

22.2 Facility operating policies

22.2.1 The Operating Plan shall define the Proprietor's Operating Policies for the facilities and facility services. Policies shall cover:

- Who is authorised to operate;
- The conditions under which they can be operated;
- The hours during which they are operated;
- The input and output parameter limits to be maintained for safe reliable cost effective operation;
- Emergency modes of operation and the circumstances that apply to changing to emergency operating configurations and changing back to normal operating modes;
- Testing and quality assurance requirements to keep facilities in safe reliable order and rehearsal requirements to keep operators and users able to deal with foreseeable contingencies.

22.2.2 Note: Facilities operating policies form a sub set of all operating policies for the functions performed at the facility.

22.3 Operator training

22.3.1 The Proprietor shall provide training and instruction to facility operators.

22.3.2 Instructions shall be available in writing for reference by operators.

22.4 Operator competence

22.4.1 The Proprietor shall assess operator competence and only allow competent operation.

22.5 Operating records

22.5.1 There shall be records of:

- Operating Policies;
- Operating Instructions;
- Operating Competence Assessment;
- Emergency Procedure Testing and rehearsal.

22.6 Specific requirements of the operating plan

22.6.1 Any emergency electricity generators shall be tested at not less than 40% load for four hours not less than once per month.

22.6.2 Any fire boost pumps shall be test operated not less than once per month.

22.6.3 Any cooling tower water shall be tested for Legionella not less that once per quarter.

22.6.4 Any water treatment system shall be tested for water within required quality limits initially weekly and then at intervals based on observed experience and providing duty of care risk mitigation and not exceeding three monthly.

22.6.5 Any ventilation system providing cross infection control flow or pressure gradients shall be tested for air balance and integrity of flow direction during heating and cooling modes at least once each year, i.e. once during the heating season and once during the cooling season.

22.6.6 Alternative service supply configurations shall be test operated not less than one per year.

22.6.7 Switchgear on main and sub main switchboards shall be operated not less than once per year.

22.6.8 Valves on piped services mains and sub mains shall be operated not less than once per year.

22.6.9 All facilities shall be inspected, not less than once per year, by persons appointed by the Proprietor and competent to assess details of facility condition, any changed risk status and action required to keep them within Guideline performance requirements. Inspection reports shall be provided to the Proprietor who shall act on the reports with appropriate duty of care.

23 Facility maintenance

23.1 Maintenance plan

23.1.1 There shall be a written Facility Maintenance Plan.

23.1.2 The Plan:

- Should provide for maintenance and component replacement of the facilities to deliver minimised facilities costs over the planned life of the facility;
- Shall maintain the facility to deliver duty of care facility risk management and provision of an appropriate health care environment.

23.1.3 Maintenance and replacements should be provided to comply with the Plan

and shall at least comply with statutory requirements.

23.1.4 The Plan should be performance managed by the Proprietor and reviewed at intervals to suit Proprietor's assessment of duty of care.

23.2 Maintenance instructions

23.2.1 The Maintenance Plan should include:

- Instructions for monitoring facilities condition and providing servicing, maintenance and replacements as needed to comply with Section 22.1.2.
- Instructions covering hazard precautions and safe working requirements associated with each task.
- Directions to as constructed information defining the extent, capacity, control, input and output parameters, and safety limits of each system and facility.

23.3 Maintenance training

23.3.1 The Proprietor shall provide training and instruction to facility maintainers.

23.3.2 Instructions shall be:

- Available in writing for reference by maintainers;
- Of a standard where any competent person unfamiliar with the facility is able to readily determine the extent and details of the system and safely execute the maintenance required.

23.4 Maintenance competence

23.4.1 The Proprietor should assess maintainer competence and only allow competent maintainers access to the facility.

23.5 Maintenance records

23.5.1 There should be records of:

- The as constructed details of the facility;
- Maintenance instructions used;
- Maintainer competence assessment;
- Each maintenance task completed;
- Materials used;
- Who provided the maintenance;
- Times maintenance was provided.

23.5.2 Maintenance records should be kept for the life of the item maintained.

23.5.3 It is recommended that when alterations to facilities are carried out the “as constructed drawings” are updated rather than recording the alterations on separate sheets. If this is not done, as time elapses and alterations increase, it gets increasingly difficult to identify the true “as constructed” status of the facility. The requirement for new in-ground services to be surveyed and photographed before being covered up must also be considered.

23.5.4 The records shall be held in an accessible location at the hospital for reference by maintenance personnel, fire authorities and other parties having need to reference this information.

23.5.5 A copy of the records should be made and be maintained at a separate location as a precaution against the working record being destroyed.

24 Project commissioning certificates

24.1 When presenting a project for Approval to Operate and in the case of Private Facilities issue of a Licence to operate the Proprietor shall provide the following signed certificates that:

- The Project complies with the Guidelines that were current at the date of Approval in Principle (see Section 3.3);
- The Project quality and performance at least complies with the documentation that was the basis for the Projected being granted Approval to Construct status;
- The tests described in the Guidelines have been performed, passed and there are records to prove it.
- There is a Facility operating plan and operators are trained ready to implement it and have access to written operating instructions. (See Sections 8 and 22);
- There is a Facility risk management plan and mitigation has been or is ready to be implemented (see Section 6);
- There is a Facility maintenance plan and arrangements have been made for it to be implemented and maintainers have access to written maintenance instructions (see Section 23).

24.2 Access to test reports and listed plans may be required as part of the Approval to Operate assessment process.