Government of **Western Australia**
Department of **Health**
Licensing and Accreditation Regulatory Unit

Building Guidelines

Western Australian Health Facility Guidelines for Engineering Services

Guidelines for the construction, establishment and maintenance of

Private Hospitals
Public Hospitals
Day Hospitals – Class A
Day Hospitals – Class B
Day Hospitals – Class C
Day Hospitals – Class D
Psychiatric Day Hospitals – Class D
Nursing Post
Nursing Home

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1. Background

The Western Australia Health Facility Guidelines for Engineering Services (The Guidelines) are the engineering design, operation guidelines for health facilities in Western Australia. The Guidelines are presented in the form of minimum requirements. Mandatory requirements identified with the word “shall” are prescribed.

The first edition of The Guidelines was endorsed in 1992, with further updates having been released in 1994, 1996, 1998 and 1999, 2021[1]

During 2005, the Department of Health Licensing Standards and Review Unit, now the Licensing and Accreditation Regulatory Unit (LARU) established an Engineering Services Working Party which carried out an extensive review of engineering guidelines for health facilities. The working party consisted of over 40 individuals representing all engineering disciplines and including private enterprise and public and private healthcare facilities. The draft engineering guidelines were circulated for comment to public and private healthcare facilities prior to finalisation. The Director General endorsed the Western Australia Health Facility Guidelines for Engineering Services 2006, as a contemporary document to direct public and private health facilities throughout Western Australia.

As part of an ongoing review process, the Engineering Services Working Party was re-established in February 2016. With over 30 representatives from all engineering disciplines including private enterprise and public and private healthcare facilities, this team brought to the review extensive experience and expertise in the engineering field. The working party saw the opportunity to further enhance the 2006 guidelines, reviewing, advising and making recommendations to ensure The Guidelines remain the primary support for engineering services in Western Australia.

2. Compliance

Compliance with The Guidelines is mandatory when designing and operating public and private health facilities in Western Australia. The Guidelines take precedence over any conflicting requirements in the Australasian Health Facility Guidelines.

Compliance with The Guidelines is required when:

- a new facility is built;
- an existing facility is altered;
- a new health care service or procedure is introduced to an existing facility;
- facility maintenance is carried out in accordance with Section 22 of the Guidelines;
- equipment replacement is in accordance with the equipment requirements of the Guidelines;
- facility operation is carried out in accordance with Section 21 of the Guidelines; or
- required by LARU policy (such as facility changes of ownership).

When alterations are to be undertaken to facilities supporting a particular medical/health service or services, all the facilities used in the delivery of that service or those services shall be included in the alterations, for example a procedure room upgrade shall not be carried out in isolation from its support facilities.

Site services standards, quality and reliability shall be appropriate for the function being served.

Any alterations or works 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. For

[1] This version contains corrections to the numbering system

example, installation may have to be staged for reasons of disruption to services but should not be otherwise delayed.

All building services shall meet the relevant requirements of Australian Standards and the National Construction Code. WA Health approval does not negate the need to comply with the requirements of other statutory authorities, for example Water Corporation, Western Power, Local Authorities, Economic Regulation Authority (ERA), Environmental Protection Authority (EPA), Radiological Council of Western Australia, Dangerous Goods - Department of Mines, Industry Regulation and Safety and the Department of Fire and Emergency Services (DFES).

Dispensation

Dispensation may be granted to mandatory items in circumstances where additional time is required in order to achieve compliance with The Guidelines or where compliance is not practically achievable due to the specific circumstances. Dispensations allow for the identification of a risk mitigation strategy which will be monitored by LARU. Further, it enables a performance solution where deemed to comply cannot occur.

To request a dispensation, a written request must be submitted by the Proprietor to LARU. The request shall include the following as a minimum:

- identification of the area where a dispensation is sought;
- a detailed rationale for the dispensation;
- confirmation of the process to minimise risk;
- confirmation of the process for monitoring compliance and rectification;
- an expected timeframe for the duration of the dispensation;
- any additional documentation that supports the request; and
- the expected date by which compliance is to be obtained.

LARU will assess the evidence provided and may seek additional information if required. This may or may not include a site inspection. Following a review, mandatory requirements and timelines will be put forward to the Proprietor for consideration and response back to LARU.

Where additional clarification, policy and/or direction is required LARU may issue appendices to The Guidelines.

3. Boundaries of influence

The Guidelines apply to Western Australian Private Hospitals and Day Procedure Facilities as defined as hospitals by the *Private Hospitals and Health Services Act 1927.*

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 dependent on the class of building required these Guidelines shall apply to all the facilities involved. For example, 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.

4. Definitions

Item	Term	Definition
1	Act	The Western Australian *Private 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 Refer the Private Hospital Guidelines, Guidelines for the Construction, Establishment of Private Hospital and Day Procedure Facilities for details of how the process operates.
3	Australian Council on Health Care Standards (ACHS)	Australian Council on Health Care Standards 5 Macarthur Street Ultimo NSW 2007 Tel: 02 9281 9955 Email: achs@achs.org.au Website: http://www.achs.org.au
4	Australian Standards (AS/NZS)	Standards Australia Level 10, The Exchange Centre 20 Bridge Street Sydney NSW 2000 Tel: 02 9237 6000 Website: http://www.standards.org.au
5	National Construction Code (NCC)	National Construction Code Australian Building Codes Board http://www.abcb.gov.au/
6	Day Procedure Facility	Any facility within the compass of the Hospital Act where either surgery or an interventional treatment is practiced, and patients do not stay overnight.
7	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.
8	Facility Manager	Eligible for membership of the Institute of Healthcare Engineering Australia (IHEA).
9	The Guidelines	The Western Australia Health Facility Guidelines for Engineering Services.
10	Hospital	Hospital as defined in the *Private Hospitals and Health Services Act 1927* and *Health Services Act 2016.*
11	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.
12	National Health and Medical Research Council (NHMRC)	National Health and Medical Research Council Level 1 16 Marcus Clarke Street Canberra ACT 2601 Tel: 13 000 NHMRC (13 000 64672) Email: nhmrc@nhmrc.gov.au Website: https://www.nhmrc.gov.au
13	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.
14	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, and the like, to fully describe input resources and workload, functional management arrangements and expectations, and output capacity and quality requirements.
15	Project	Any project to build or alter a facility.
16	Proprietor	The Executive Officer of the party who will operate the facility.
17	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
18	Risk	Anything associated with the Project or operation and maintenance of a facility that requires a duty of care decision.
19	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.
20	Shall and Should	The word **shall** mean the requirement described is mandatory. The word **should** mean the requirement described is recommended but not mandatory.
21	Acoustic Engineer	An acoustic engineer registered with Australian Acoustic Society and holds a valid membership with grade as member (MAAS).
22	Electrical Engineer	An electrical engineer eligible for MIEAust (Member of the Institution of Engineers Australia).
23	Fire Engineer	A fire engineer eligible for MIEAust (Member of the Institution of Engineers Australia).
24	Hydraulic Engineer	A hydraulic engineer registered with the Association of Hydraulic Services Consultants Australia (AHSCA). The membership shall be a full membership.
25	Mechanical Engineer	A mechanical engineer eligible for MIEAust (Member of the Institution of Engineers Australia).
26	Security Consultant	A security consultant holding a current Security Consultant License from the WA Police Commercial Agents Squad. (Security Consultants require a Security Consultants License, and installers require a Security Installers License from the WA Police Commercial Agents Squad).
27	Structural Engineer	A structural engineer registered with the Institution of Engineers Australia (MIEAust, NER).
28	BSN	Building Services Network.
29	Minor Works	Works, to the licensed premises, that are minor in nature and that are required to enhance assets and facilities to standards suitable for their intended function or change of function. Minor works may include works such as refurbishment, change of function, removal/replacement of redundant out of date equipment, minor door and opening changes to improve flow efficiency and minor external and landscape works.
30	Concept Approval	The proposed conceptual framework, building approval process and possible staging is discussed with LARU prior to proceeding with an Approval in Principle for the works.
31	CSD/CSU	Central Sterilising Department or Unit
32	Nursing Unit	The module by which a hospital is developed to ensure cost efficient nurse coverage for patient safety and service e.g. One (1) nursing unit = 30 to 35 acute patient bedrooms = One (1) ward.
33	FRMP	“Facility Risk Management Plan” or “Risk Management Plan”.
34	NHMRC	National Health and Medical Research Council.
35	GMK	Grand Master Keys.
36	GGMK	Grand Grand Master Keys.
37	FOP	Facility Operating Plan.
38	FMP	Facility Maintenance Plan.

5. Facility risk management plan

The Proprietor shall have a Facility Risk Management Plan (FRMP). The purpose of the FRMP is to manage the risk likelihood and consequence with planning, designing, construction, operation and maintenance of engineering services.

The FRMP shall be part of an overall health service risk management plan and shall be developed progressively and reach the following status at each Project stage:

5.1 Commencement of design

- Define the Facility health care risks the services will be required to mitigate.
- Define the Facility performance risks the design will be required to mitigate.
- Define the Facility construction, operation and maintenance risks the design will be required to mitigate.
- Define responsibility for delivery of mitigation.

5.2 Completion of engineering services design

- Full documentation of mitigation strategy.
- Assignment of mitigation tasks for the construction stage.
- Establishment of mitigation quality control for the construction stage.

5.3 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.

5.4 Operation

- Systematic performance review and improvement.
- Ongoing update and review of the risk management plan.

Identification of risks shall meet the requirements of statutory regulations and the Proprietor's duty of care. The guidelines of AS/NZS ISO 31000 should be applied.

The FRMP should include but not be limited to provide mitigation for:

- health care risks related to quality and performance of Facilities.
- reliability and maintainability risks associated with the supply of building services under each of the conditions of operation required.
- services risks associated with maintaining the quality of facilities services outputs.
- services risks associated with the failure of utilities or consumables supplies.
- safety risks associated with demolition, construction, use, operation, and maintenance of the facilities.[2]
- safety risks associated with continuing to operate facilities during additions to or

[2] 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.

alterations of existing facilities.

- security risks associated with unauthorised access to facilities and facilities services and
- operating and maintenance risks related to non-availability of design parameter details or operating or maintenance instructions.

6. Reliability and Redundancy Criteria

6.1 All hospitals shall have reliability and redundancy provision in the delivery of engineering services. The services shall comply with statutory provisions and the duty of care by the Proprietor as detailed within their Business Continuity Plan.

Hospitals shall comply with the Redundancy and Disaster Planning in Health's Capital Works Programs document, where the Proprietors facility is specifically identified.

6.1.1 Hospitals shall comply with the Redundancy and Disaster Planning in Health's Capital Works Program documents, where the Proprietors facility is specifically identified.

6.1.2 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) shall comply with the Redundancy and Disaster Planning, January 2012 Second Edition.

6.1.3 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.

6.1.4 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.

6.2 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.

6.3 During contingencies non-critical medical and medical support services that can be safely closed may be so closed 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 shall 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; and
- Training of operators.

7. Engineering services operation policies

7.1 Operating Policies for engineering services shall be established by the Proprietor and should reach the following status in relation to the project stages.

7.1.1 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.

7.1.2 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.

7.1.3 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.

7.1.4 On operation:

- Record the as-commissioned performance parameters of each service as tested in normal and emergency operating modes.

7.2 Services Operating Policies are a subset of the policies covering every function the Facility will deliver or require for delivery of its health care functions.

8. General and environmental requirements

8.1 Construction Standards

Engineering services shall comply with the requirements of the National Construction Code except where these Guidelines require a higher standard.

8.2 Access

Services shall have safe access for maintenance. When components have a service life less than the planned life of the principal asset (e.g. the building they serve) they shall 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.

8.3 Acoustic service brief

8.3.1 The Proprietor shall define the extent of acoustic services to be provided and the performance required.

8.3.2 Extent of Service

Acoustic Services shall be provided to comply with requirements of the relevant Australian Standards, environmental regulations and the Proprietor's Risk

Management Plan. As a minimum the acoustic services shall address the following:

- WA Environmental Protection (Noise) Regulations 1997;
- Internal noise levels;
- Internal sound insulation;
- Reverberation time; and,
- Vibration and structure borne noise.

8.3.3 Environmental Noise Emissions

Environmental noise resulting from operations of the facilities shall comply with the assigned noise levels at the nearest noise sensitive premises. The noise emissions from operational activities of a new or redeveloped hospital/health care facility are addressed through the *Environmental Protection Act 1986* with the prescribed standards detailed in the *Environmental Protection* (Noise) *Regulations 1997* (WA EPNR).

Various activities that are typically expected at a hospital and that shall require assessment include, but are not limited to, the following:

- Central Energy Plant containing mechanical and electrical plant (generators – emergency or standby);
- Any outdoor mechanical plant;
- Loading docks; and
- Back of house areas which have the potential to generate noise.

The WA EPNR regulations also require that the noise character shall be “free” of annoying characteristics, namely, tonality, modulation and impulse generation. If these characteristics cannot be reasonable and practicably removed, a series of adjustment to the measured levels are required as per the regulations.

8.3.4 The internal noise levels shall comply with the design levels presented in Australian Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors. The noise ingress levels and noise from building services shall be designed 5dB below the maximum levels in order to allow for the cumulative noise not to exceed the maximum design sound levels.

8.3.5 Internal Sound Insulation

Air-borne sound insulation requirements for each room should be adequately designed so the noisy activities from one room do not interfere with the need for quiet in adjacent rooms. Air-borne sound insulation requirements for partitions and floors have been provided based on the activity noise in one room to the noise tolerance in the adjacent room.

Tables 1 & 2 (following) provide the minimum sound insulation requirements for various areas. The sound insulation requirements shall be established by assessing the privacy between a pair of rooms in each direction and the higher sound insulation requirement shall be selected for the partition separating two rooms.

The air-borne sound insulation performance of various partitions and floors is generally available in terms of weighted sound reduction (Rw). The acoustic performance on site (DnT,w) will be assessed as 5-8 dB below the Rw rating depending on construction quality and room acoustic parameters. The difference between Rw and DnT,w can be significant if noise flanking paths are not controlled.

Table 1: Sound insulation parameters of rooms

Room	Noise generation of source room	Noise sensitivity of receiving room
Clinical areas		
Patient Room/Single bed ward	Average	Low
Multi Bed Ward	Average	Medium
Toilet/Ensuite	Average	High
Counselling/Interview Room	Average	Low
Consultation Room	Average	Low
Treatment/Medication/Examination Room	Average	Low
Speech and Language Therapy	High	Low
Operating Theatre	Average	Very Low
Birthing Room or Delivery Suite	Very High	Low
Intensive Care	Average	Very Low
Staff areas		
Meeting Rooms – Small	Average	Low
Meeting Rooms – Large	High	Low
Board/Conference Rooms	High	Low
Private Offices	Average	Low
Lecture Theatre	High	Low
Library	Average	Low
Classrooms, Training Rooms	Average	Low
Laboratories	High	Medium
Public areas		
Reception and Waiting Areas	High	High
Toilets	Average	High
Corridors/Lobby Spaces	Average	High
Multi Faith Room/Chapel	Average	Low

Table 2: Sound insulation performance to be achieved on site (DnT,w,dB)

Minimum DnT,w	Noise sensitivity in receiving room	Noise generation of source room			
		Low	Average	High	Very High
	High	25	30	35	40
	Medium	30	35	40	50
	Low	35	40	50	55
	Very Low	40	50	55	*

*Adjacencies should be avoided by planning of layouts, where possible. Where it is not possible DnT,w 60 should be achieved as a minimum.

Attention should be given to the situations where electrical services are located back-to-back in acoustically rated partitions. Sockets, switches, medical-gas outlets, integrated plumbing system (IPS) panels and the like should not be back-to-back in partitions intended to provide sound insulation DnT,w above 35.

A discontinuous partition is required where impact noises are expected and in areas where a sensitive space (such as in-patient bedrooms, consulting rooms and the like) separates a non-sensitive space likely to be a source of impact noise (such kitchen and cleaners' rooms). A discontinuous construction is satisfied when two separate leaves of a partition are separated by a minimum of 20 mm.

Service risers separating a sensitive space (inpatient rooms, consulting rooms, Operating Theatres) shall achieve a minimum sound transmission rating of $D_{nT,w+Ctr}$ 40 and $D_{nT,w+Ctr}$ 25 where it separates a non-sensitive space.

8.3.6 Doors

It is important to note that where a door or window is included in a sound rated partition the overall performance of that partition will be significantly reduced and be limited by the acoustic performance of the door or glazing.

Typical solid core doors with perimeter and drop-down acoustic seals are expected to achieve a maximum sound insulation rating of Rw 30-35, unless high performance acoustic rated doors or two doors with an air lock arrangement are used.

If no acoustic seals are provided, (because of infection control), it should be recognised that sound insulation performance will be reduced. Careful space planning shall be undertaken to locate noise sensitive spaces away from areas where it is likely people can overhear.

Doors to the following areas shall achieve a minimum sound transmission rating of Rw30. For plant areas, higher ratings for doors may be required depending upon the equipment within the plant room and the noise sensitivity of adjacent rooms.

- Counselling/Interview Room;
- Consultation Room;
- Treatment/Medication/Examination Room;
- Meeting Rooms;
- Board/Conference Rooms;
- Private offices;
- Multi Faith Room/Chapel.

8.3.7 Impact isolation

Impact noises due to various sources such as footfall and trolleys shall be controlled at the floor surface where possible.

8.3.8 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, lifts, and the like).
- 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.

8.3.9 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.

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; and
- Report service outcomes and their stability.

8.4 Layout and capacity

Services layout and capacity shall provide for:

- Access for firefighting to 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.

8.5 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;
- Update operating and maintenance instructions for the works to reflect any optimising adjustments made;
- Update as constructed documentation of the works to reflect any optimising adjustment made;
- Establish the ongoing 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;

8.6 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;
- extent and layout of the services;
- capacity of the services;
- performance and quality of the services.

8.7 Protection and Security

Engineering services shall be appropriately protected from interference, damage and poor functionality. 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, e.g. over and under parameter limit shut down; over pressure venting; leakage drainage; and the like;
- Access control on access ways to service controls and the fill points of tanks;
- Markers identifying the routes of underground services. Identifying markers on all equipment and controls3.
- Warnings of all hazards.

8.8 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, The Guidelines and the following minimum requirements:

8.8.1 Compliance with Supply Authority requirements;

8.8.2 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);

8.8.3 Arrangements for alternative configuration of supply arrangements to cover foreseeable accidents and emergencies;

8.8.4 Arrangements for alternative supply for functions that shall continue to function in all circumstances;

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

9. Engineering services, civil

9.1 Site Investigation

9.1.1 Sites shall be subjected to geotechnical investigation as well as an investigation by a suitably qualified environmental scientist for contamination and sub-structure design requirements for the buildings to be erected. Sites should:

- Have a low risk of flooding. (refer also to 9.3 below);
- 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 (such as where clay is the founding soil particular care is required as clay is volumetrically sensitive to moisture content. Without appropriate design pavements break up and buildings could potentially move).

9.1.2 The investigation should comply with AS 1726 Geotechnical Site Investigations 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 movement characteristics are required from a suitably qualified and experienced Geotechnical engineer to guide the Civil Engineer.
- Excavation characteristics, particularly regarding occurrence of any strong rock and need for dewatering. Provide classification and description of rock is required.
- 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 California Bearing Ratio (CBR) design values for car parking areas and roads.
- Soil permeability characteristics for encountered soil profiles at various depths.
- 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) including basis of selection. This shall be in accordance with AS 1170.4.

9.2 Roads, Paved Yards, Car Parks and Pathways

9.2.1 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.

9.2.2 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 the following issues as a minimum:

- 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 associated 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;
- Pathways shall link with any adjacent public transport stops.

9.2.3 Roads and pathways for accessibility (AS/NZS 1428) shall have grades, tactile indicators and other design characteristics to comply with disabled access requirements.

Roads shall not double as pedestrian access ways.

9.3 Drainage

9.3.1 Sites shall be provided with:

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

9.3.2 Design of Facilities required to comply with clauses 6.1.2 or 6.1.3 shall be designed to cope with 100-year Annual Recurrence Interval storm conditions and 100-year ARI storm surge event in coastal plains and shall place buildings at least 500 mm above this level so determined or as designated by the Local Authority. Other Facilities shall comply with requirements of the Local Government Authority. (Comment - Australian Runoff and Rainfall (ARR) requires > 300mm above FFL, take into account high tides with cyclonic surge).

9.3.3 All drainage systems shall be designed with short, medium- and long-term maintenance requirements in mind. On site storage basins/tanks/infiltration systems shall have incorporate contamination removal prior to discharge (Water Sensitive Urban Design (WSUD practises).

Drainage systems shall be designed in accordance with WSUD where possible.

10. Engineering services, communications

10.1 Standards and Quality

Communication systems and the installations shall comply with the current versions of the following:

- AS/NZS 3000 Wiring Rules
- AS/NZS 3811 Hard-wired patient alarm systems, and
- Any other codes that are applicable.

10.2 Communication Brief

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.

10.3 Extent of Services

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

- Assistance call systems
- Data communications
- Door call
- Public address
- Two-way Radio
- Messaging Systems
- TV and radio (patient entertainment)
- Voice communications systems
- Wireless Access Points

10.4 Common Requirements

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 unreasonable disturb the rest and comfort of patients: and
- Provide ready access to the information needed to deliver health care services.

10.5 Passive Data Communications

10.5.1 There shall be a structured cabling network provided for the Information and Computing Technology (ICT).

10.5.2 The data network shall at least:

- Be provided within locked accommodation facilities;
- Have backbone cabling suitably protected via ducts or on tray (or similar protecting cable management solution);
- Communications rooms/cupboards shall be suitably designed, located and/or fire protected (two hour) to ensure that a fire within one compartment does not interrupt the communications services to another fire compartment.

10.5.3 Cabling shall:

- Be labelled at each end;
- Be neatly installed and supported and not run across the floor; and
- Be routed away from electromagnetic interference and vulnerability to mechanical damage.

10.5.4 All communications equipment shall be securely supported and mounted above floor level.

10.5.5 Data communications cabinets shall have an uninterruptible electricity supply, rated to suit the needs of the equipment/service.

10.5.6 Data communication equipment shall be provided with suitable environments.

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

10.6 Door Call

10.6.1 There shall be assistance call facilities at each public and patient control point that is a barrier to health care delivery or health care support services.

10.6.2 Call facilities shall:

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

10.7 Emergency Call

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

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

10.7.3 Emergency call facilities shall be:

- In standardised positions throughout the facility;
- Located to avoid misuse;
- Waterproof if located in areas that may get wet; and
- Connected to an uninterruptable electricity supply capable of supporting full functionality under all load conditions.

10.7.4 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; and
- Be zoned to maintain full local ward functionality without the dependency upon Ethernet communications via ICT or BSN.

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

10.7.6 Assistance call annunciators (containing description details of location and type of call) shall, as a minimum, be provided in the corridor adjacent to each staff station.

10.8 Patient Nurse Call

10.8.1 There shall be a nurse call system, for use by patients, at every patient location (including bed, toilet, shower, bath, and hand basin, treatment position) and any location where a patient may be left unattended.

10.8.2 Systems operation shall meet the requirements of the Proprietor's Facility Risk Management Plan.

10.8.3 Patient nurse call points shall:

- Be in standardised positions throughout the facility;
- Be waterproof if located in areas that may get wet;
- 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 uninterruptable electricity supply capable of supporting full functionality under all load conditions.

10.8.4 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, such as television, radio, reading lights, bed position). Pendants shall be cabled and have socket connections. An alarm shall be generated if the plug is disconnected.

10.8.5 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; and
- Be zoned to maintain full local ward functionality without the dependency upon Ethernet communications via ICT or BSN.

10.8.6 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.

10.8.7 Assistance call annunciators (containing descriptive details of the location and type of cable) shall, as a minimum, be provided in the corridors adjacent to each Staff Station.

10.9 Staff Assistance Call

10.9.1 Proprietors may require a separate system for staff assistance call; where required staff assistance call facilities shall:

- Be in standardised positions throughout the facility;
- Be located to avoid misuse;
- Be waterproof if located in areas that may get wet; and
- Be connected to an uninterruptable electricity supply capable of supporting full functionality under all load conditions.

10.10 Colour Coding and Labelling of Call Buttons

10.10.1 Colour coding of call buttons should comply with AS 3811. Where non-standard coding is used it should be consistently applied to the whole site.

10.11 Messing Systems

10.11.1 If the Facility Operating Policies require services from roaming/remote staff or contracted providers there shall be a messaging system interfaced with other communication systems allowing authorised party or automatic calling of assistance as provided for in the policies.

10.11.2 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 messaging multiple parties simultaneously; and
- Interface with security, assistance call, fire and other emergency alarms as required by the Operating Policies.

10.12 Two-Way Radio

10.12.1 Two-way radio communications may be required for remote sites and for communication with patient and goods transportation.

11. Engineering Services, Electrical

11.1 Electrical Brief

11.1.1 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.

11.1.2 Works being completed on any treatment, procedure or operating rooms shall comply with attachment 2, titled “Treatment/Procedure/Operating Room Matrix”.

11.2 Extent of Services

11.2.1 Electrical services shall include:

- Provision of normal, vital (30sec), and uninterruptible (no break) electricity supplies;
- Switchgear and circuit protection to safely operate and control the supplies;
- Definitions:
- 100% capacity = Maximum demand plus agreed load growth as further outlined within this guideline;
- Critical or Essential Load = The load of all the electrical services required to operate in situations where normal supply is no longer available plus an appropriate allowance for growth;
- Vital supplies shall have the meaning defined in AS/NZS 3009 Electrical installations-emergency power supplies in hospitals;
- Uninterruptable shall have the same definition as instantaneous as defined in AS/NZS 3009 with an additional requirement of being no-break; and

- Normal supply is the supply as provided by the Supply Authority.
- Where an electrical supply is denoted as being on an “Essential Supply” then this shall be arranged as vital supply; and
- “Emergency” supply/service shall be a Safety Service as per AS/NZS 3000.

11.3 Electricity Supply Configuration

11.3.1 Hospitals required to comply with clause 6.1.2 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 2 x 100% normal load capacity supplies and a 1 x 100% essential load capacity supply; or
- A 1 x 100% normal load capacity supply and a 2 x 100% essential load capacity supplies to a minimum of 100% of the normal load.
- Together with an uninterruptable battery supply with a minimum duration of 20 minutes.
- Another arrangement giving equivalent reliability and appropriate redundancy.

11.3.2 Hospitals required to comply with clause 6.1.3 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% normal load capacity supply and a 2 x 100% essential load capacity supply; or
- A 1 x 100% normal load capacity supply, a 1 x 100% essential load alternative supply authority feeder and a 1 x 100% essential load capacity supply.
- Together with an uninterruptable battery supply with a minimum duration of 20 minutes.
- Another arrangement giving equivalent reliability and appropriate redundancy.

11.3.3 Hospitals required to comply with clause 6.1.4 shall have reliable electricity supply to ensure the continuous care of patients in accordance with the Facility Risk Management Plan and shall be provided with:

- A 1 x 100% normal load capacity supply and essential/uninterruptable supplies complying with AS/NZS 3009 being capable of safely and reliably supplying the loads continuing to be needed until services are shut down; and
- An uninterruptable battery supply with a minimum duration of 120 minutes (as per AS/NZS 3009).

11.3.4 Other facilities shall have at least a 1 x 100% normal load capacity supply, and uninterruptable supplies for surgical lights and any other additional equipment as defined by the Proprietor with a minimum duration of 240 minutes (as per AS/NZS 3009).

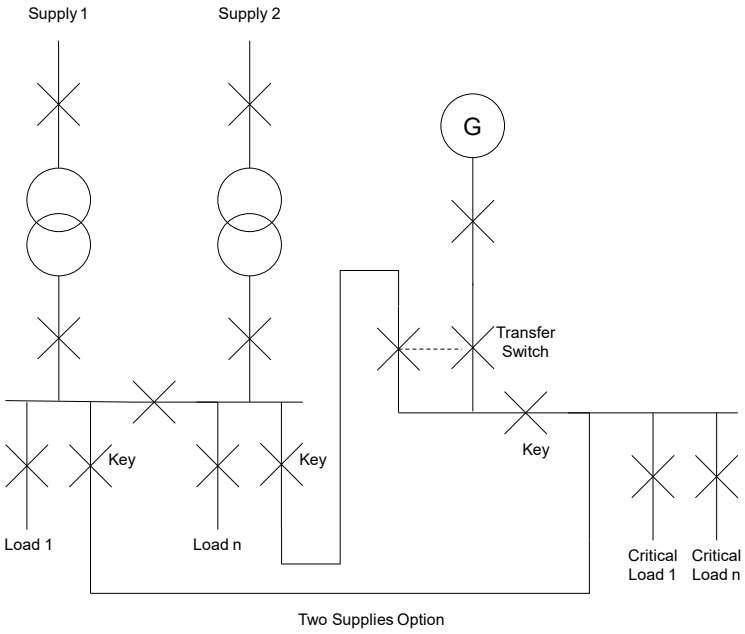
11.3.5 Each normal supply shall come from a separate supply authority sub-station or shall be configured so that a single fault or accident is not credibly likely to cause both supplies to fail. Cable routes, transformers and switchgear shall also be segregated so that a single accident or fault is not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

11.3.6 Any load shedding to reduce normal supply loads to essential load levels will not be accepted. The intent of this is to eliminate the use of a single submains to switchboards providing normal and essential services.

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

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

11.3.9 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

11.4 Transfer Switches

11.4.1 Transfer switches should:

- be automatic in operation;
- be bumpless upon return to normal supply; and
- include overlapping neutrals.

11.5 Seismic Restraints

11.5.1 Health care facilities required to comply with clauses 6.1.2 or 6.1.3 shall include seismic restraints in accordance with AS1170.4 Earthquake actions in Australia.

11.5.2 As a minimum the following parts and components and their connections shall be designed for seismic restraints for both horizontal & vertical forces:

- Substation components including transformers and HV switchgear;
- Diesel generators;
- Electrical switchboards and distribution boards;
- LIOM transformers and support frames;
- Uninterruptable power supplies (including batteries);
- Communication racks and cabinets;
- Lighting fixtures;

- Electrical and communications cable trays including supports;
- All electrical conduits greater than 64 mm inside diameter; and
- Busduct risers.

11.6 Capacity

11.6.1 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.

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

11.7 Standards and Quality

11.7.1 Electrical systems and the installations shall comply with:

- AS/NZS 3000 Wiring Rules;
- AS/NZS 3003 Electrical installations - Patient treatment areas of hospitals;
- AS/NZS 3009 Electrical installations - Emergency power supplies in hospitals; and
- Any other codes that are applicable.

11.8 High Voltage Installations

11.8.1 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 National Construction Code 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 facility is required to withstand; e.g. restoration of services during a storm;
- Provided with emergency (AS 2293) lighting served from the vital electricity supply; and
- Provided with uninterruptable power to control automated switching served from the vital electricity supply.

11.8.2 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; and
- Contact details of persons authorised by the Proprietor to carry out, and qualified to perform the switching.

11.9 Mains and Sub Mains

11.9.1 Mains and sub main cables that supply essential/vital services shall be rated to WS52W as specified in AS/NZS 3013, as a minimum, and comply with the National Construction Code and AS/NZS 3009.

11.9.2 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.

11.9.3 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 shall 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.

11.10 Earthing

11.10.1 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.

11.11 Cabling (General)

11.11.1 Cabling shall comply with the requirements of AS/NZS 3000, AS/NZS 3008.1 and AS/NZS 3009

11.11.2 Cabling should have a 25 percent spare capacity above the calculated maximum demand (after allowance for voltage drop). The Proprietor shall nominate the spare capacity to be provided.

11.11.3 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.

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

11.11.5 Cabling should be run on cable trays, baskets or in ducts on pre-planned routes where it can be accessed for additions. Containment should be generously sized so that cables are not entangled, and it is practicable to remove redundant cables.

11.12 Switchgear and Circuit Protection

Main and sub main switchgear and circuit protection shall be maintained to comply with the manufacturer's recommendation. It shall be configured, and have any necessary

redundancy, to meet the Proprietor's duty of care and business continuity requirements during the maintenance required.

11.12.1 The Proprietor shall define the requirements.

- 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.

11.12.2 In the event of a fault 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; and
- Power outlets in patient treatment areas shall continue to operate apart from any faulty circuits in those areas.

11.12.3 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 Facility 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.

- The types of clinical actions shall define the type of protection required.
- Where provided the protection shall comply with AS/NZS 3009.

11.12.4 Residual current device (RCD) protection shall be provided for all lighting and socket outlets except for:

- Outlets on isolated supplies; and
- Communication equipment in accordance with AS 3000;

11.12.5 Where staff without electrical licences are required to reset RCD's (such as cleaner's outlets for instance) 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 to switchboards.

11.13 Switchboards

11.13.1 Switchboard construction shall be to AS/NZS 61439, and in addition comply with the following:

11.13.2 Hospitals required to comply with clauses 6.1.2 and 6.1.3 shall have the Main Distribution Board rated to a minimum of Form 2B;

11.13.3 Switchboards which have separate normal, essential and/or uninterruptable supplies shall be rated at a minimum of Form 2B with additional segregation between switchboard sections (normal, vital, uninterruptable, Extra Low Voltage (ELV), and the like);

- Switchboards which have separate normal and essential sections should have bus-ties (with appropriate interlocking) between the normal and essential supply sections;
- Be rated to adequately withstand the prospective short circuit currents at the installed location;
- 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;
- Have a main switch or switches controlling the incoming supply and be labelled with the source of that supply; and

11.13.4 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 transparent protection within the switchboard accommodation.

11.13.5 Switchboard accommodation shall comply with the requirements of the National Construction Code 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 electricity supply, with access to and around the enclosure illuminated by emergency (AS 2293) luminaires;
- Switchboards shall be suitably designed, located and/or fire protected (two-hour) to ensure that a fire within one fire compartment does not interrupt the electrical services to another fire compartment. Fire or Smoke isolated areas within major fire compartments are exempt from this requirement; and
- Be protected against vandalism, vehicular or other damage.

11.13.6 A single line diagram of the low voltage system shall be mounted in the main switch room and show:

- Source of supply;
- Outgoing submains;
- Other interfaces (e.g. Emergency Power Generation systems);
- Switchboard manufacturer 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; and

- Contact details of persons authorised by the Proprietor to carry out, and qualified to perform the switching.

11.14 Essential/Vital Electricity Supplies

Refer sub-section 11.3 “Electricity Supply Configuration” requirements

11.14.1 Power supplies to lifts shall comply with clause 18.5.4.

11.14.2 Generators shall:

- 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; and
- Be regularly tested at not less than monthly intervals.

11.15 Uninterruptable Electricity Supplies

11.15.1 Uninterruptable supplies shall have a duration based upon the resilience of the site electrical supply configuration and take into consideration the time required for alternate supplies to become available.

11.15.2 As a minimum the uninterruptable supplies shall have a battery duration time as specified within sub-section 11.3 “Electricity Supply Configuration”.

11.15.3 Fixed Surgical Lights:

- Shall be connected to an uninterruptible supply.

11.15.4 Procedure Room Examination Lights:

- Examination lights in procedure rooms and similar areas should be connected to an uninterruptable electricity supply.

11.15.5 Birth Room Examination Lights:

- Examination lights in birth rooms and similar areas shall be connected to an essential power supply.

11.15.6 Treatment Room Examination Lights:

- Examination Lights in treatment rooms and similar areas shall be connected to an essential power supply.

11.15.7 Integration and BSN infrastructure:

- Servers, Ethernet switches, associated network equipment and Proprietor nominated workstations used for critical systems Building Services Monitoring and Control Systems should be connected to uninterruptable power circuits.

11.15.8 PABX, Paging, Alarm and Call System Supplies:

- Equipment with integral batteries such as PABX, radio paging, fire alarm, medical gas warning, nurse call and similar systems should be connected to essential power circuits.

11.15.9 Battery Rooms:

- Battery installations shall comply with the appropriate installation requirements of AS 2676 and AS 3011;
- Room fire rating shall comply with the requirements of the National Construction Code; and
- Appropriate room exhaust/ventilation should be provided in accordance with the National Construction Code requirements and be connected to an essential power supply.

11.16 Lighting

11.16.1 General:

- Areas shall be illuminated by natural light and/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 AS 1680.2.5.
- Luminaires requiring special lamps shall be fitted with labels, visible to the person changing lamps, defining the type of lamp required.

11.16.2 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 (on essential supply) switched from the bed head or from the head of an articulated arm style of examination light;
- Room lighting switched from the room entrance and/or bed head (with a minimum of one light on essential supply); and
- Night lighting switched from the room entrance.

11.16.3 Operating Room Lighting:

- General lighting in operating rooms and operating set up rooms shall be flush mounted behind sealed diffusers (to suit the clean room environment). At least 50% shall be on an essential supply;

11.16.4 Surgical Suite Lighting:

- Lighting within the clean/sterile zones of the surgical suite shall be flush mounted with sealed diffusers (to suit the clean room environment). At least 50% shall be on an essential supply;

11.16.5 Surgical Lighting:

- Surgical and treatment luminaires shall comply with the requirements of AS/NZS 3100, AS 3137, AS/NZS 3200 or alternatively IEC 598-2-25;

11.16.6 Kitchen Lighting:

- Lighting in kitchens and food preparation areas shall be flush mounted behind sealed diffusers.

11.16.7 Sterilization Department:

- Lighting within the clean/sterile zones of the sterilisation department suite shall be flush mounted with sealed diffusers (to suit the clean room environment).

11.16.8 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; and
- Night lighting locations and levels should not disturb sleeping patients.

11.16.9 Emergency Lighting:

- In addition to the requirements of the National Construction Code and AS/NZS 2293, emergency lighting shall be provided in corridors, stairways, bathrooms, ensuites, utility rooms, patient treatment areas, interview rooms, consulting rooms and other critical use areas for the safe management of patient care;
- Emergency lighting is not required within patient ward rooms; and
- All switchboards shall include appropriate identification of circuits which contain emergency luminaires.

11.16.10 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.

11.16.11 Lighting design shall take into account:

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

11.16.12 Lighting Installation Details:

- Where automatic control of lighting is used in a patient treatment room, a facility shall be provided in the area serviced to directly override-on all automatic controls. This requirement only applies where a patient is non-ambulatory and does not apply to rooms such as consulting, interview, lounges, corridors and the like.
- Where automated control of lighting is used, the proprietor should consider the provision of override-off functionality for the automated controls (to facilitate maintenance).
- Light switch toggles shall be colour coded as follows:
    - White colour if connected to the normal supply.
    - Red if connected to the vital supply.
    - Blue if connected to an uninterruptable supply.
- Lighting controls (switches, motion sensors and the like) shall indicate by permanent labelling the supply circuit number and phase. Labelling shall be engraved, IPA stud type, or as provided by the manufacturer, however in all instances labelling shall not be stick on and/or removable without damaging the faceplate.
- Extra-low voltage controls (such as touchscreens associated with electronic lighting control systems) shall be provided with permanent labelling identifying the supply switchboard. Provide directly adjacent to the switchboard, a

diagram of the extra-low voltage controls showing all controllers and circuits controlled (including supply circuit numbers, phases and areas/rooms controlled).

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

11.17 General Purpose Power Outlets

11.17.1 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; and
- Other plug in equipment is within 2 metres of an outlet.

11.17.2 Characteristics: Outlets shall:

- In patient areas, comply with AS/NZS 2500 and AS/NZS 3003;
- In disabled, aged or assisted patient use activity spaces, be installed in accordance with AS 1428;
- Indicate by permanent 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 shall 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 will not be obstructed and accessible for maintenance or replacement;
- Have permanent labelling in accordance with AS/NZS 3003 where located within body or cardiac protected areas; and
- Labelling shall be engraved, IPA stud type, or as provided by the manufacturer, however, in all instances labelling shall not be stick on and/or removable without damaging the faceplate.

11.18 Hazardous Locations

11.18.1 Where flammable anaesthetics, solvents, fuels or other hazardous liquids or gases are utilised, the electrical light and power services shall comply with AS/NZS 60079.

11.19 Materials, Plant and Equipment

11.19.1 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 Brief;
- Be suitable for operation in the environment in which they are installed;
- Have safe access for operation and maintenance; and

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

11.20 Lightning Protection

11.20.1 Lightning Protection risk assessments shall be carried out on all facilities to comply with AS/NZS 1768 and 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.

11.21 Testing and Commissioning

11.21.1 The electrical services shall be tested and commissioned before they are placed in operation. Testing and commissioning shall include as a minimum:

- 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.
- Certification that:
- Electro-medical power supplies comply with AS/NZS 3003;
- HV switchboards and transformer comply with the requirements of AS 62271 and AS 2374;
- LV switchboards comply with AS/NZS 61439;
- The low voltage installation complies with AS/NZS 3000;
- Generating plant complies with AS/NZS 3009;
- Uninterruptible power supplies comply with AS/NZS 3009;
- Lightning protection system testing complies with AS/NZS 1768;
- Emergency Lighting complies with AS/NZS 2293 and the NCC;
- The installation complies with the requirements of AS/NZS 3000 (RCD’s, and the like); and
- Body protection and cardiac protected areas are in accordance with AS/NZS 3003.

12. Engineering Services, Fire

12.1 Fire Strategy and Service Brief

12.1.1 The Proprietor shall define the fire safety strategy and extent of fire services to be provided and the performance required which shall be not less than as required by the National Construction Code, other statutory regulations, Fire and Emergency Services, these Guidelines and the Proprietor's Facility Risk Management Plan.

Works being completed on any treatment, procedure or operating rooms shall comply with attachment 2, titled 'Treatment/Procedure/Operating Room Matrix.

12.2 Extent of Services

12.2.1 Fire safety provisions shall be provided to comply with requirements of the National Construction Code and these Guidelines 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 fire egress arrangements (suitable for the nature of the facility and occupant/patient);
- Provision of automatic fire detection and alarm system;
- Provision of Emergency Warning and Intercommunication (EWIS);
- Storage arrangements for firefighting water;
- Firefighting 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 fire hydrant equipment;
- Provision of automatic fire extinguishing and suppression systems;
- Provision of first attack firefighting equipment, including fire hose reels, portable fire extinguishers and fire blankets;
- Provision of equipment to aid transportation of disabled persons;
- Provision of escape/evacuation diagrams;
- Provision of a National Construction Code Compliance Report prepared by the building Surveyor, to be kept at the facility at all times; and
- Provision of fire/smoke compartmentation drawings prepared by the architect to be kept at the facility at all times.

12.3 Compartmentation

12.3.1 The design/layout of each nursing unit patient care area/ward shall comply with the ABCB Codes and Standards and in particular shall:

- comply with Part C2 Compartmentation and Separation, Section C Fire Resistance;
- be in a separate smoke or fire zone complying with National Construction Code deemed to comply requirements where the nursing unit is required to be independently closed, locked, isolated or the like; and
- have access to an escape corridor or external exit without passing through another compartment unless that compartment is provided with suitable facilities to maintain patient care.

12.3.2 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 when measured in both directions.

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

12.3.4 Penetrations through fire and smoke partitions shall be labelled on each side in accordance with AS 1851 and AS 4072.1.

12.4 Egress

12.4.1 Egress arrangements shall comply with National Construction Code.

12.4.2 Egress routes shall not be compromised by equipment and/or storage. Storage recesses shall be provided to ensure egress routes are not compromised.

12.5 Suppression Systems

12.5.1 The Proprietor shall designate where and what type and capacity of any fire suppression systems exceeding National Construction Code requirements. Fire suppression systems be provided to deal with special hazards or the Proprietor's requirements for risk mitigation.

12.6 Occupant Warning Systems

12.6.1 In facilities provided with an Emergency Warning and Intercommunication System (EWIS), the systems shall be divided into evacuation zones to minimise disruption across the site. This should be supplemented by a clearly documented emergency management plan developed in accordance with AS 3745.

12.7 Fire Detection System

12.7.1 Fire detection systems shall be configured such that no more than one smoke compartment is required to be isolated to undertake works which may result in spurious alarms.

12.8 Hydrants and Hose Reels

12.8.1 Internal fire hydrant cupboards shall have bunded floors or drip trays with a minimum depth of 50 mm.

12.9 Portable Extinguishers

12.9.1 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.

12.10 Signs and Evacuation Plans

12.10.1 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 in accordance with AS 3745 and AS 4083.

12.11 Water Supply

12.11.1 The water supply for facilities shall comply with the requirements of the National Construction Code, AS 2118 and AS 2419.

12.11.2 The water supplies for facilities required to continue to operate post a disaster shall comply with the WA Department of Health Disaster Preparedness and Management Unit. Redundancy and Disaster Planning Guide 2012.

12.12 Testing and Commissioning

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

12.12.2 Alarms: Test alarm systems shall comply with AS 1670.

12.12.3 Compartmentation: Inspection shall include:

- Provision of register of all fire and smoke compartmentation penetrations, for recording of maintenance activities;
    - Check fire door operation, labelling and certificates of compliance;
    - Check partitions are complete, and penetrations are sealed; and
    - Check above ceiling partitions are appropriately labelled.
- Egress: Inspect egress routes including:
    - Check opening sizes;
    - Check door swing; and
    - Check for obstructions.
- Fire Extinguishers: Check:
    - Correctly installed and in operating condition; and
    - Signs and labels.
- Hydrant and Hose Reels:
    - Test the system to comply with AS 2419.1; and

        - Check signs and labelling;
    - Suppression Systems: Check to compliance with design codes.
    - Ventilation Systems: Test ventilation systems and fire systems to comply with AS/NZS 1668.1 (refer Section 14 “Engineering Services, Mechanical”).

12.12.4 All fire services equipment shall be maintained in accordance with AS1851.

13. Engineering Services, Hydraulic

13.1 Hydraulic Service Brief

13.1.1 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 current NCC, other statutory regulations, including but not limited to Plumbing Licensing Board of Western Australia, Water Corporation of Western Australia, ATCO Gas requirements, these Guidelines and the following most current version of these standards:

- AS/NZS 3500 - National Plumbing and Drainage Code incorporating:
    - Part 1 - Water Supply;
    - Part 2 - Sanitary Plumbing and Drainage;
    - Part 3 - Stormwater Drainage;
    - Part 4 - Heated Water Services.
- AS/NZS 1596 - The Storage and Handling of LP Gas;
- AS/NZS 5601 - Gas Installations;
- AS/NZS 4187 - RO water requirements for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment;
- EN 285 - RO water requirements to produce clean steam;
- Australian Drinking Water Guidelines;
- Plumbing licensing board of Western Australia; and
- Industrial Waste – Water Corporation of Western Australia.

13.2 Extent of Services

13.2.1 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;
- Special Water Treatment (Renal and Reverse Osmosis Water)
- Water storage tanks;
- Sanitary drainage service;
- Process waste water discharge conditioning facilities;
- Sanitary fittings and fixtures;
- Roof gutters and downpipe systems;

- Storm water drainage;
- Sewerage treatment facilities;
- Natural or liquefied petroleum gas service;
- Industrial waste and drainage.

13.3 Potable Water Supply Configuration

13.3.1 Hospitals required to comply with clauses 6.1.2 or 6.1.3 shall have either:

- Two independent connections to the water supply; or
- One connection to the water supply and storage tanks with capacity to sustain critical water supplies for a period of 24 hours usual usage. Any additional requirements and re supply arrangements as outlined in the Redundancy and Planning Guideline (Second edition dated January 2012),

In addition, the Proprietor shall provide their FRMP to outline how the hospital functions in an emergency situation.

13.3.2 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.

13.3.3 Other hospitals[4] 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.

13.3.4 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.

13.3.5 Water sampling points shall be provided at main interface points of the water system.

13.3.6 Flushing points shall be incorporated into the system to enable flushing of each section of the system for possible disinfection.

13.3.7 Consideration shall be given to equal balancing of the network.

13.3.8 Water distribution in building internals shall be of ring main arrangement with isolation valves on either supply end to provide cross flow within the main reticulation line. Cold water branch/spur lines shall be limited to contain a maximum water volume of three litres.

13.4 Potable Hot Water Supply Configurations

13.4.1 Hospitals required to comply with clauses 6.1.2 or 6.1.3 shall have:

- A 2 x 100% full load hot water generation capacity; or
- A 3 x 50% full load hot water generation capacity; or
- 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; and
- Fuel source to each hot water plant shall be of two independent supplies.

[4] i.e. Those required to comply with clause 6.1.4 and those not performing invasive surgery.

13.4.2 Other hospitals[5] 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.

13.5 Backflow Prevention for Potable Water Supplies

13.5.1 Backflow prevention of hot and cold-water supplies shall comply with AS/NZS 3500.1.2 National plumbing and drainage - Water supply - Acceptable Solutions. The main backflow prevention device at the incoming water supply to the site shall have a duty/standby arrangement.

13.6 Redundancy of Hydraulic Equipment

13.6.1 The following hydraulic equipment and plant are essential for an operating hospital and shall have an N+1 redundancy configuration (where components N have at least 1 back up component) to maintain continuation of operation in the event of a failure:

- Potable water pressure pump system including filtration and UV Sterilisation system;
- Hot Water Circulation Pumps;
- RO Systems; and
- Sewer or Stormwater pumping systems.

13.7 Water Conditioning

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

13.7.2 The incoming main water supply to the site shall have a permanent online water quality monitoring system in place and connected to the building management system. The following data should be monitored, and an alarm sent, should the incoming water parameters change or be outside of the set parameters:

- pH: 6.5-8.5
- Chlorine: 0.2 – 0.6 mg/L
- Hardness: 60-200 mg/L
- Total Dissolved Solids (TDS): 0-500 mg/L
- True colour: 0-15 TCU
- Turbidity: 0-5 NCU
- Temperature maximum of 25°C

13.7.3 The following additional treatment shall be provided:

- Filtering of the whole incoming water supply before entering any water storage tank to remove particulates over 200 microns;
- Filtering of the whole water supply after any water storage tank to remove particulates over 100 microns;
- Ultraviolet irradiation to control Legionella and other organisms at the outlet of the tank/pump systems; and
- Cooling system to keep supply water temperature to hospital below 25°C.

[5] i.e. Those required to comply with clause 6.1.4 and those not performing invasive surgery.

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

- Micro-organisms: ..... NIL
- Hardness: ..... 60 – 200 mg/L as CaCO3
- pH: ..... 6.5 to 8.5[6]
- 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[7]
- 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.

13.7.5 Reverse osmosis water treatment

Reverse osmosis treatment of water shall be provided for steam generators, instrument washers and selected outlets in pharmacies and laboratories. The water quality of the reverse osmosis shall meet the following:

- AS/NZ 4187 in regard to water quality for rinsing of instruments;
- EN 285 in regard to water quality to produce clean steam for sterilisers;
- Other treatment will be required by particular processes, e.g. dialysis, and the like and shall be defined by the Proprietor's Operating Policies.
- The Reverse Osmosis treatment system shall meet the following:
- Reverse osmosis water storage tank shall have a minimum of 24-hour storage capacity; and
- RO water reticulation shall be in a flow and return loop configuration and filtration trains, pumps and the like shall have N+1 configuration.

13.7.6 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

[6] 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.

[7] 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 of chlorination will be required.

Parameter	Maximum Value
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
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

13.7.7 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.

13.8 Stored Potable Water

13.8.1 Where water is stored:

- There shall be at least two modules of storage;
- Tanks shall be fully enclosed with a filtered breather vent; and
- Tanks shall be shaded from the sun.

13.9 Performance, Potable Hot Water Systems

13.9.1 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: .....38°C maximum;
- Utensil washing sinks: .....Comply with Food and Hygiene Regulations;
- Dish washers and sinks in hospital kitchens:

- 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°C8.
- Only thermostatic mixing valves shall be used in clinical areas. No tempering valves are permitted;
- Thermostatic Mixing Valves shall be of point of use arrangement and integrated into the tapware to avoid mixed warm water dead legs; and
- Hot water branch/spur lines shall be limited to contain a maximum water volume of 2L (maximum length of 6m of DN 20 or 10m of DN 15 pipe).

13.10 Performance, Potable Warm Water Systems

13.10.1 Warm water systems may be utilized to 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: .....38°C maximum;

Additional local booster systems or a secondary hot water loop shall deliver water at the correct temperature for the following:

- Utensil washing sinks;
- Dish washers and sinks in hospital kitchens;
- Beverage bays; and
- Where required to comply with Food and Hygiene Regulations;

13.10.2 Warm water system configuration shall comply with the following:

- UV disinfection in duty/standby configuration shall be installed in warm water flow line. A bypass line for UV system shall be provided for thermal disinfection; and
- Warm water valve shall be in duty/standby configuration and have the availability for thermal disinfection cycle.

13.10.3 The same design principles to hot water system shall be applied in regard to thermostatic mixing valves and length of branch lines.

13.11 Non-Potable Water

13.11.1 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.

13.12 Sewage and Sanitary Plumbing

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

- Either be connected to the town sewerage and drainage scheme; and
- 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.

[8] Heaters in the dishwasher may achieve temperature.

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

13.12.3 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.

13.12.4 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.

13.12.5 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. Path of overflow relief shall be indicated on drawings.

13.12.6 Under building and underground drains shall be provided with adequate manholes for inspection, externally at 60m intervals and clean out points for efficient and quick maintenance internally at 30 m intervals.

13.12.7 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.

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

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

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

13.12.11 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. This shall be arranged in compliance with AS1428.1.

13.13 Industrial Waste Discharges

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

Industrial traps shall be:

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

13.13.2 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.

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

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

13.13.5 Radioactive wastes and drainage shall comply with all statutory requirements including the Radiation Safety Act, Radiological Council and Water Corporation requirements, which may include requirements for dilution, storage and controlled release.

13.13.6 Should decontamination showers be required the decontamination storage tank shall be designed and sized to match the Proprietors FRMP. Calculations shall be provided on request.

13.14 Storm Water Drainage

13.14.1 Refer to sub-section 9.3 “Drainage”.

13.14.2 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.

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

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

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

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

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

Rainwater pipes shall have cleaning access at base.

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

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

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

13.15 Sewage and Stormwater Pumping

13.15.1 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; Required calculations shall be provided on drawings for review and comment;
- have alarm systems to provide early warning of pump failure and storage overflow; and
- be protected from entry of debris harmful to the operation of the pump.

13.16 Natural Gas/LP Gas Service Configuration

13.16.1 Where gas is required for space heating, potable water heating, or cooking, facilities required to comply with sections 6.1.2 or 6.1.3 shall have at least either:

- an alternative means of maintaining heating and cooking services during any credible failure of the gas supply; this shall be outlined in the Proprietors FRMP and shall be supplied for review; or
- 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.
- Other hospitals9 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; and
- an alternative means of providing heating and cooking to functions that will continue to operate through the gas supply failure.

13.16.2 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.

13.17 Gas Service

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

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

13.17.3 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.

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

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

13.18 Seismic Restraints

13.18.1 Hospitals required to comply with clauses 6.1.2 or 6.1.3 shall include seismic restraints to AS/NZS 1170.4 in particular Section 8.

13.18.2 As a minimum the following parts and components and their connections shall be designed for seismic restraints for both horizontal and vertical forces:

- Potable water tanks;
- Water pumps and water treatment systems;
- Hot water plant, pumps;
- LP gas tanks; and
- Pipe fixing for major distribution main service runs.

[9] i.e. Those required to comply with clause 6.1.4 and those not performing invasive surgery.

13.19 Hydraulic Equipment

13.19.1 Tap ware shall:

- be suitable for their purpose and in accordance with room detail sheet requirements;
- 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; and
  - 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;
- have thermostatic mixing valve integrated where required; and
- have free draining spouts and outlets. Gooseneck outlets shall be avoided.
- Basins shall suit the function, i.e.
- Be appropriately sized for clinical hand washing[10];
- Have hands free operation in isolation rooms and scrub areas; and
- Provide knee space for seated use by patients in wards.

WC pans shall suit the application, i.e.

- Accommodate commode chairs;
- Be at appropriate heights for the users; and
- Shall be rimless type pans.

13.19.2 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.

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

13.20 Interface Requirements

13.20.1 All hydraulics monitoring and control systems should be physically connected to the BSN via TCP/IP and capable of high-level interface using an appropriate open protocol. This includes:

- Water treatment;
- Pump stations;
- Reverse osmosis treatment;
- Domestic hot and warm water systems;
- Hot and warm water circulation pumps;
- UV radiation and backwash filtration system; and
- Tank levels;

[10] See Australian Standard Handbook HB 260 *Infection Control*

13.21 Testing and Commissioning

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

13.21 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.

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

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

14. Engineering Services, Mechanical

14.1 Mechanical Service Brief

14.1.1 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 National Construction Code, other statutory regulations and these Guidelines.

14.1.2 Works being completed on any treatment, procedure or operating rooms shall comply with attachment 2, titled ‘Treatment/Procedure/Operating Room Matrix.

14.2 Extent of Services

14.2.1 Mechanical services may include but not be limited to:

- Air cooling and heating services;
- Mechanical Services Direct Digital Control (DDC) systems;
- Cool and freezer rooms;
- Building and energy management systems;
- Fume and dust extraction systems;
- Heat reclaim systems;
- Smoke control systems;
- Steam systems;
- Ventilation services;
- Water treatment systems associated with air cooling and heating systems.

14.3 Fire Hazard

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

- AS/NZS 1668.1, AS/NZS 1682.1, AS/NZS 1682.2 and AS/NZS 1670.1;
- National Construction Code – Building Code of Australia; and
- Section 12 “Engineering Services, Fire”.

14.4 Reliability and Availability

14.4.1 Plant and equipment shall have at least the availability defined by the Proprietor's FRMP and Business Continuity Plan.

14.4.2 Plant, equipment and infrastructure shall comply with the Redundancy and Disaster Planning in Health's Capital Works Programs Document where the Proprietors facility is specifically identified.

14.5 Ventilation Service

14.5.1 The ventilation systems 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; and
- Processes that generate excessive heat output that may impact room conditions, generate dust or produce biological waste which may present increased exposure risk to occupants.
- Provide air pressure to control outside air infiltration and provide an internal airflow gradient from clean to dirty areas and processes; and
- 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 National Construction Code.

14.6 Ventilation Performance

14.6.1 Ventilation shall comply with:

- The National Construction Code, AS/NZS 1668.1 The use of ventilation and air conditioning in buildings, (Fire and smoke control in buildings), AS/NZS 1668.2 The use of ventilation and air conditioning in buildings and (Mechanical ventilation in buildings), AS/NZS 1670.1 Fire detection, warning, control and intercom systems-systems design, installation and commissioning fire) AS/NZS 3666 Air and Water Handling Systems of buildings; and as appropriate with:
- Health care areas - HB 260 Hospital acquired infections - Engineering down the risk;
- Pharmaceutical – Code of Good Manufacturing Practice – Australian Government Therapeutic Goods Administration;
- Food – Food and Hygiene Regulations, and Cook Chill Guidelines;
- Laboratories – AS/NZS 2243 (All parts) Safety in laboratories;

Supply air shall be filtered to the following minimum standards:

Application	Filter Type, Class and Rating	Comments
Ducted unitary air handlers supplying air to a single room.	Type 1 Class A or B F5 to AS 1324.1	Outside air supplies to split unit air conditioners shall be filtered as for systems serving general hospital areas (minimum F5)
Non-ducted unitary air handlers supplying air to a single room.		Outside air supplies to split unit air conditioners shall be filtered as for systems serving general hospital areas (minimum F5).
Systems serving: • Administrative and general hospital areas.	Type 1 Class A or B F5 to AS 1324.1	Outside and return air supplies shall be filtered (minimum F5)
Systems serving: • Delivery rooms. • Recovery area. • Treatment rooms. • X-ray rooms. • Patient accommodation areas.	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: • CSSD 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. • Endoscope sterilising rooms. • Sterile preparation and sterile storage rooms not directly connected to operating rooms.	Grade 2 to AS/NZS 4260	HEPA filtration • Current performance certification complying with AS/NZS 1807.6 or AS/NZS 1807.7.
Systems serving: • Operating rooms. • Operating set up rooms. • Operating scrub rooms. • Operating anaesthetic rooms. • Sterile preparation and sterile storerooms directly connected to operating rooms and pharmacies; • Absolute containment isolation rooms • Cytotoxic rooms. • Clean rooms.	Grade 2 to AS/NZS 4260	HEPA filters shall have: • Current performance certification complying with AS/NZS 1807.6 or AS/NZS 1807.7. • High limit flow resistance alarms.

For central or ducted systems filters:

- Shall be accessible for cleaning and/or replacement;
- Shall be installed with provision for safe handling of contaminated filters;
- HEPA filters shall have facilities for replacements to be made without contaminating the clean side of the filter or the system downstream from the filter;
- Where HEPA filters are not in a terminal position, all ductwork (inclusive of fittings and the like.) downstream shall be of cleanable, seamless stainless steel or coated with chemical resistant anti-microbial finish; and
- Shall have 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.

Ventilation of designated areas shall comply with the table below:

Area	Special Requirements
Air Intakes, Outside Air	Shall be inaccessible to unauthorised access.
Chemical Decontamination Rooms	Chemical decontamination rooms shall be at negative pressure relative to adjacent rooms. Supply and exhaust systems shall incorporate dual motor fans and automatic change over from duty to standby in the event of a failure of the lead unit. Exhaust air shall be filtered by activated charcoal filters prior to discharge. Rooms used for chemical decontamination may be convertible to a negative pressure isolation room. Rooms shall not be convertible to patient protection duties.
Clean Utilities	Rooms shall be at positive pressure relative to surroundings. A minimum ventilation rate of 10 air changes per hour shall be provided.
Cohort rooms and cohort wards as defined in the Redundancy and Disaster Planning Health's Capital Works Program Document	Shall comply with the Redundancy and Disaster Planning in Health's Capital Works Program Document. The air conditioning system serving cohort rooms/wards shall be capable of being isolated from other areas. Cohort rooms shall be at negative pressure relative to adjacent rooms. Supply and exhaust systems shall incorporate dual motor fans and automatic change over from duty to standby in the event of a failure of the lead unit. System is to be capable of providing continued operation whilst the failed drive/impeller is being repaired. Exhaust air shall be HEPA filtered prior to discharge.
Cytotoxic Material Handling Areas	Shall comply with AS/NZS 2639 Laminar flow cytotoxic drug safety cabinets - Installation and use.
Endoscopy Units	Ventilation shall limit any chemical emission concentrations to comply with the Safe Work Australia Adopted National Exposure Standards (NOHSC 1003). Contaminated exhaust air streams shall not flow through the operator's breathing zone. Rooms shall be at positive pressure relative to surroundings for endoscopy procedures. Rooms shall be at negative pressure relative to surroundings for bronchoscopy procedures. 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 Grade 2 HEPA standard.
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.
Isolation Rooms	Isolation rooms shall comply with Australian Standards Handbook HB 260 Hospital acquired infections - Engineering down the risk guidelines for the particular level of isolation required. Supply and exhaust systems shall incorporate dual motor and dual impeller fans and automatic change over from duty to standby in the event of a failure of the lead unit. System shall be capable of providing continued operation whilst the failed drive/impeller is being repaired. All exhaust air from negative pressure isolation rooms shall be HEPA filtered prior to discharge. Rooms shall not be convertible from patient protection to patient isolation duties. A negative pressure isolation room may be configured to be convertible to normal patient room and/or a chemical decontamination room. Switching between modes shall be controlled by staff (via key switch or similar). The room mode of use must be clearly

<table>
<tr><th>Area</th><th>Special Requirements</th></tr>
<tr><td></td><td>identified via a control panel at the entry to the associated airlock.
The minimum differential pressure between the isolating room and adjacent areas shall be as follows:
<table>
<tr><th>Room Type</th><th>Room</th><th>Ensuite</th><th>Airlock</th></tr>
<tr><td>Type 5</td><td>- 30Pa</td><td>- 30Pa</td><td>- 15Pa</td></tr>
<tr><td>Type 3</td><td>+ 30Pa</td><td>+30Pa</td><td>+ 15Pa</td></tr>
<tr><td>Other Types</td><td colspan="3">Per HB260</td></tr>
</table>
Particular attention must be paid to room construction and sealing to minimise leakage.</td></tr>
<tr><td>Laboratories</td><td>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/NZS 2252.1 Biological safety cabinets - Biological safety cabinets - Class I.
• AS/NZS 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.
Diagnostic and analysis equipment heat shall be direct coupled and discharged external to the building where their equipment permits such a connection.
Laboratories used for genetic manipulation shall be accredited by the NHMRC and comply with the Guidelines for Small Scale Genetic Manipulation Work.</td></tr>
<tr><td>Laundries and Linen Processing Areas</td><td>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.
All spaces where gas fired equipment is housed shall be ventilated in accordance with the requirements of the Gas Installations Australian Standard AS/NZS 5601 as applicable.
Air shall be supplied at high level in a manner that minimises turbulence and exhausted at low level exhaust with cleanable lint screens removing lint before air enters any ductwork.
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.</td></tr>
<tr><td>Mortuaries and Autopsy Rooms</td><td>A separate exhaust ventilation system providing at least 20 air changes per hour shall be provided. The exhaust system shall incorporate dual motor fans and automatic change over from duty to standby in the event of a failure of the lead unit. System is to be capable of providing continued operation whilst the failed drive/impeller is being repaired.
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.</td></tr>
<tr><td>Operating Rooms, General Surgery</td><td>Each room shall have its own ventilation system.
Air filters shall be mounted with minimum separation from the outlet diffuser where possible.
All mechanical ductwork surfaces exposed to sterile airflow downstream of the HEPA filter shall be stainless steel or coated with chemical resistant anti-microbial finish.
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 between 0.15 and 0.2m/s at the operating table level 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 10 air changes per hour shall be</td></tr>
</table>

Area	Special Requirements
	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 door(s) connecting to other adjacent rooms. Exhaust ventilation shall limit the anaesthetic gas exposure to comply with the Safe Work Australia Adopted 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. 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.
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 2,400mm x 2,400mm
Operating Room Scrub Rooms and Anaesthetic Rooms	Rooms shall be ventilated by the system serving the associated operating room. A minimum ventilation rate of ten 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) connected to the Operating set-up room. • No flow to the operating room. • Outflow from the room, across the entire opening, through any open door(s) connecting to other adjacent rooms.
Procedure rooms with HEPA filtration	Air filters shall be mounted with minimum separation from the outlet diffuser where possible. All mechanical ductwork surfaces exposed to sterile airflow downstream of the HEPA filter shall be stainless steel or coated with chemical resistant anti-microbial finish. Room pressurisation of the operating room relative to adjacent rooms shall result in: • Inflow to the room, across the entire opening, through any opening of door(s) connecting to any sterile preparation area. • Outflow from the room, across the entire opening, through any door(s) connecting to adjacent rooms. Air not required for exhaust or sepsis control may be reconditioned and recycled.
Recovery, Delivery, Intensive Care, Dental Procedure and other rooms where anaesthetic gases are administered or patients that have been gas anesthetised recover.	Exhaust rates shall comply with AS/NZS 1668.2. Exhaust ventilation shall limit the anaesthetic gas exposure to comply with the Safe Work Australia Adopted National Exposure Standards (NOHSC 1003). • 50 ppm average anaesthetic concentration level represented in terms of an eight-

Area	Special Requirements
	hour reference period or an eight-hour time weighted average exposure (TWA). • 500-ppm short-term exposure limit (15 minutes) (STEL). Provide low level and mid-level (bed head level) exhaust intakes adjacent to each patient position. Provide a minimum of 50 litre/s exhaust at each patient location. Cupboards used to store anaesthetic machines shall be ventilated to remove the build-up of N2O within the cabinet.
Operating Set-up room	Ventilation shall achieve a positive airflow to all adjacent areas. Rooms shall be ventilated at a rate of at least ten 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 cleaner rooms.
Sterile Storage Area	Rooms shall be at positive pressure relative to surroundings. A minimum ventilation rate of ten air changes per hour shall be provided.
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 with the Safe Work Australia Adopted 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.
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 the Safe Work Australia Adopted National Exposure Standards (NOHSC 1003) and heat concentrations to suit equipment and worker access safe limits.

14.6.2 Supply air shall:

- Be provided in designed quantities to every room. This, when complying with AS/NZS 1668, may be air drawn from another room by an exhaust system.
- Be provided in quantities:
- To comply with the National Construction Code, AS/NZS 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; and
- Without causing dispersing turbulence to air streams capturing and conveying contamination.
- Have an outside air component to at least comply with AS/NZS 1668.2. Where AS/NZS 1668.2 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. Suitable fixed relief paths shall be provided to ensure airflow rates are maintained irrespective of the room door being open or closed;
- 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; and
- The shut down and restarting shall comply with AS/NZS 1668.2 requirements.
- Not include any unfiltered induced air in any area where airborne infections or contaminants may be present; and
- 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.

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 bathrooms	15 litres/s/m²
Dirty utility rooms	10 litres/s/m²
Cleaners' rooms	10 litres/s/m²
Other applications	To comply with National Construction Code
Process applications	Sufficient to contain containment or heat to source of production

14.6.3 Exhaust air shall:

- Be discharged to comply with AS/NZS 1668 Part 2, clause 3.7; and
- If necessary be decontaminated before discharge to meet national guidelines, e.g.
- Safe Work Australia Guidance on the interpretation of Workplace Exposure Standards for Airborne Contaminants and Safe Work Australia Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment (NOHSC 1003); and
- Interim National Indoor Air Quality Goals recommended by the National Health and Medical Research Council (NHMRC).

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 below staff breathing zone, e.g. nitrous oxide. Where staff breathing zones are not defined, exhaust points shall be not more than 200mm above floor level;

- Not have multiple intake sources if there is a risk of any backflow through the system; and
- Have adequate fixed relief paths to maintain required ventilation rates at all times. Relief paths to be acoustically treated where privacy is required.

14.6.4 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.

14.6.5 Supply air and ventilation system noise generation in combination with other building services noise sources shall not exceed the levels defined in sub-section 8.3 “Acoustic Services Brief”.

14.7 Ventilation System Configuration

14.7.1 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 vital supply; where the facility is required to have a vital (essential) supply;
- Be fitted with alarms that detect failure of air flow; and
- Be designed and built to provide highly reliable performance.

14.7.2 Air exhaust ventilation systems that are required to provide for odour, sepsis or contamination control shall:
- Be supplied with electricity from the normal and vital (essential) supply where the facility is required to have a vital supply;
- Be fitted with alarms that detect failure of air flow;
- Be provided in duty and standby configuration or with dual drives, dual impellers and automatic change over in the event of lead fan/fan drive failure; and
- Be capable of providing continued operation whilst the failed drive/impeller is being repaired

14.7.3 Air exhaust ventilation systems that are required to provide for fire smoke control shall:
- Be supplied with electricity from the emergency supply;
- Be fitted with alarms that detect failure of air flow;
- Be suitable and have circuit protection to suit the duty; and
- Be controlled and monitored in accordance with the requirements of AS/NZS 1668.1, AS/NZS 1670.1 and the local fire authority.

14.7.4 For hospitals required to comply with clauses 6.1.2 or 6.1.3:
- Each operating suite (e.g. operating room anaesthetic room, scrub room) 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; and
- At least each of the following shall be independently ventilated:

- Emergency Department;
- Each ICU;
- CSSD.

14.8 Cooling and Heating

14.8.1 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.

14.8.2 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.
Evaporative Cooled Areas	Outside air shall be supplied at a rate and velocity to achieve an effective temperature of 28°C or less.
General Occupied Areas, i.e. not listed elsewhere in this table.	Temperature controlled within the range 19°C to 27°C. Humidity management so there is no condensation on room surfaces.
Isolation Rooms	Temperature controllable from the room in range 19°C to 25°C. Humidity management so there is no condensation on room surfaces.
Mortuaries and Autopsy Rooms	Temperature controllable 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°C 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%. Supply air temperature shall be controlled by a temperature sensor located in the supply duct. A wall mounted space temperature sensor located outside the clean zone may be provided for monitoring. Space temperature and humidity control can be set-back to conserve energy. Set-back conditions shall not compromise condensation control.
Pharmacy/Drug Storage Rooms	Temperature controlled to suit the drugs stored.
Procedure, Treatment Rooms and Surgeries performing non-invasive minor surgery under local anaesthetics.	Temperature controlled in the range 19°C to 24°C. Humidity management so there is no condensation on room surfaces.
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 management so there is no condensation on room surfaces.
Specialised equipment rooms – Central ICT rooms	Rooms shall be provided with precision air conditioning systems incorporating close temperature, humidity and in-built redundancy as appropriate to their importance level.
Sterile Preparation Rooms	Temperature controlled in the range 19°C to 24°C. Humidity management so there is no condensation on room surfaces.

Area	Special Requirements
Sterile Supply Rooms	Temperature controlled in the range 19°C to 24°C. Humidity management 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 management so there is no condensation on room surfaces.
Waste Handling Rooms	Maximum temperature 27°C.

14.8.3 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; and
- Have provision to prevent backflow heat leakage through convection during the heating season.

14.8.4 Waste handling rooms shall not be evaporative cooled.

14.8.5 Evaporative cooling shall not be used in clinical areas or where condensation on room or equipment surfaces is a risk.

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

14.9 Cooling and Heating Plant Configuration

14.9.1 Cooling and heating plant needed to serve patient related areas required to comply with clauses 6.1.2 or 6.1.3 that will continue to operate during normal electricity supply failures shall be connected to normal and vital (essential) electricity supplies.

14.9.2 For hospitals required to comply with clause 6.1.4 the Proprietor shall assess the need for maintaining cooling and heating during the shutdown of the medical services and shall provide means of maintaining cooling and heating required to mitigate medical risks.

14.9.3 Cooling and heating plant shall be provided in at least two modules of capacity. The capacity required to support all functions that the Proprietor requires to keep operating, as defined within their Business Continuity Plan shall not be affected by the failure of the lead module.

14.10 Plant and Equipment

14.10.1 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; and
- Be located to avoid service access through ceiling/walls within sterile zones.

14.10.2 Exhaust and Return Air Grilles: Egg-crate grilles shall not be used. Exhaust and return air grilles shall have washable removable cores and be of a design to minimise collection of lint.

14.10.3 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 National Construction Code.

Ductwork and Insulation: Ductwork shall:

- Comply with the requirements of the National Construction Code, AS/NZS 1668 Part 1 and AS/NZS 4254;
- When insulated, be externally insulated. When flexible ductwork is used, conform to clause 2.8 of AS/NZS 4254. The total length of flexible ductwork between primary metal ducts and diffusers/grilles shall not exceed 3000mm.

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

Noise and Vibration Levels: Refer sub-section 8.3 “Acoustic Services Brief”.

14.10.5 Structural and Earthquake Loads: All equipment, duct work, cable trays and the like section shall be installed to comply with AS/NZS 1170-4 Section 8 (Design of parts and components).

14.11 Direct Digital Controls

14.11.1 The DDC system shall be provided with a site licensed engineering software tool for programming of field DDC equipment.

14.12 Interface Requirements

14.12.1 If the Proprietor chooses to use an integrated platform; it should be physically linked to the BSN via TCP/IP and capable of high-level interface using an appropriate open protocol.

14.12.2 Packaged mechanical equipment with built in controls should be linked to the Integration Platform via the BSN using an appropriate open protocol. This includes:

- Chillers;
- Boilers;
- Variable Speed Drives;
- Fume Cupboards;
- Refrigerant Monitoring;
- Condenser Water Treatment;
- Computer Room Units;

- Package DX Units.

14.13 Testing and Commissioning

14.13.1 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;
- Correct airflow directions are achieved in Operating Suites;
- 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;
- End to end testing of the DDC in conjunction with the Integration Platform; and
- HEPA filter integrity. Ongoing testing shall be carried out at a minimum 12 monthly intervals.

14.13.2 Airflow reports shall include air balance diagrams for each system and show interdependence between systems. Provide air gradient diagrams for all sterile airflow areas.

15. Engineering Services, Medical Gases

15.1 Medical Gas Service Brief

15.1.1 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.

15.2 Extent of Services

15.2.1 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.

15.2.2 The principles of this section of The Guidelines shall 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.

15.3 Medical Gas Services, General

15.3.1 Medical gas services shall comply with:

- AS/NZS 2896 Medical gas systems - Installation and testing of non-flammable medical gas;
- AS/NZS 2568 Medical gases - Purity of compressed medical breathing air;
- AS/NZS 4332 Medical Gases – The storing and handling of gases in cylinders; and
- The Redundancy and Disaster Planning in Health's Capital Works Programs document.

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

15.3.3 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".

15.3.4 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.

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

Warning system power supplies shall be from a vital supply.

15.3.6 Structural and Earthquake Loads: All equipment, pipework, cable trays and the like shall be installed to comply with AS/NZS 1170.4 Section 8 (Design of parts and Components).

15.4 Interface Requirements

15.4.1 The Medical Gas monitoring system shall interface with the BSN (where available), using an appropriate open protocol.

15.5 Testing and Commissioning

15.5.1 Testing shall comply with AS/NZS 2896.

15.5.2 As required a member of the health care facility experienced in administration of medical gases to patients shall witness integrity and purity testing for non-respirable gases in accordance with AS/NZS 2896.

15.6 Permit to Work

15.6.1 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.

16. Services, Security

16.1 Security Services Brief

16.1.1 The definition of the extent of security services shall be underpinned by a security risk assessment, carried out in accordance with HB 167 and AS/NZS 4485. Where the Proprietor engages a third-party security consultant to provide these or other security services this consultant shall be fully licenced in accordance with the Western Australia Police Security and Related Activities (Control) Act 1996.

16.2 Extent of Services

16.2.1 The Proprietor shall consider the need for:

- Crime prevention through environmental design;
- Segregation of areas public, semi-public areas, controlled public areas, secure service areas, back of house staff only areas;
- Access control systems;
- Intrusion detection systems;
- Asset tracking systems;
- Patient tracking systems;
- Duress alarm systems fixed and mobile;
- Automated barrier controls;
- Video surveillance systems; including cameras, monitoring and data storage;
- Key management systems;
- Communication systems including door intercommunication systems, UHF radio systems and PSTN communication systems;
- Security lighting;
- Security screens and fences;
- Secure parking;
- Security response resources and procedures;
- Security solution interfacing with lifts, BMS and fire systems;
- Security information systems recording and controlling access events, authorised entry parameters, security time schedules, video records, and the like;
- Safes and strong rooms; and
- Credential integration with patient entertainment systems.

16.3 Access Control

16.3.1 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.

16.3.2 Access control shall:

- Be implemented in strategic areas as identified by the risk assessment;

- 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; and
- Pits and trenches.

16.3.3 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.

16.3.4 Where practical the master keying system shall be designated to limit or remove the requirement to issue or routinely use Grand (or Grand Grand) Master Keys (GMK or GGMK).

16.4 Door Inter Communication

16.4.1 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.

16.5 Duress Systems

16.5.1 Duress alarm systems shall be provided:

- In strategic areas as identified by the risk assessment; and
- Specifically, wherever staff may be alone and threatened with duress, e.g. interview rooms, drug storage cupboards, cashier stations, emergency admission points.

16.5.2 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; and
- Should locating remote duress be available, report the identity of the person activating the alarm in addition to the location.

16.6 Security Lighting

16.6.1 Security lighting shall be provided to:

- Strategic areas as identified by the security risk assessment;
- Light access ways to entrances and car parks to provide good visibility and minimise dark areas where undesirables may lurk and confront patients, visitors and staff;

- Light car parks to reduce risk of theft and confrontation threats; and
- Light areas vulnerable to forced intrusion or vandalism.

16.6.2 Ensure security lighting characteristics and levels are compatible with and fully support the effective performance of any installed or provided video surveillance system.

16.7 Security Screens and Barriers

16.7.1 Security screens, barriers and fences should be considered for:

- Strategic areas as identified by the risk assessment;
- Security of the facility building perimeter;
- Security segregation of all department areas of the facility;
- Emergency Department admissions counter;
- Pharmacy dispensing counters;
- Any cashier counters;
- All entry exits to the facility with specialist treatment of after-hours entry points;
- Ground floor windows; and
- Staff car parks.

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

16.8 Intrusion Detection

Intrusion detection should be considered for:

- Strategic areas as identified by the risk assessment;
- Unattended areas of buildings;
- Security of all serviced areas; and
- Windows and doors vulnerable to misuse or forced entry.

16.9 Video Surveillance

Video surveillance should be considered for:

- Strategic areas as identified by the risk assessment;
- All entrances and exits;
- After hours entrances;
- Car parking;
- Otherwise unobserved waiting areas;
- Areas designated for the handling or management of currency;
- Reception and administration desks exposed to the public or patients;
- Drug dispensing areas;
- Lift foyers; and
- Stairwell doors.
- Individuals' right to privacy and the need to identify by signposting areas shall be

considered when installing video surveillance.

16.10 Response Resources

16.10.1 The Proprietor's FRMP shall identify security risks and duty of care response to each risk.

16.10.2 Security response resources shall at least match the FRMP requirements.

17. Engineering Services, Structural

17.1 Structural Brief

17.1.1 The Proprietor shall define the planned life of the facility as this will impact on the durability requirements for the project. The brief shall define in service duty required to first maintenance (in years) as this may impact on the choice of reinforcement type in reinforced concrete, and corrosion protection for, inter alia, steel elements incorporated in the external fabric of the building.

17.1.2 Facilities or parts of facilities required to comply with clauses 6.1.1, 6.1.2 or 6.1.3 shall be assigned with an Importance Level of 4 in accordance with the NCC. All other facilities shall be designed for an Importance Level as appropriate to the NCC.

17.1.3 The loadings to be applied to the structural design shall be not less than the minimum required by the NCC, the 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.

17.1.4 The building structure shall:

- Have adequate foundations to not exceed settlement limits nominated in the Australian Standards for the defined service life particularly where clay soils are present.
- Have foundations not solely based on Standard Designs outlined in AS 2870 (Residential Slabs and Footings).
- Treat the ClayLock System (invented by Airey Taylor and patented in 2005) as a preferred method of design where clay soils are present on site. This is based on research performed by the Government of WA at Moora Hospital.
- For facilities complying with clauses 6.1.2 or 6.1.3 possess sufficient redundancies and adequate ductility to prevent progressive collapse.

17.2 Structural Drawings and Specifications

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 the use of particular areas;
- Foundation design parameters;
- Required concrete strength, slump, cover to steel reinforcement and type of

reinforcement e.g. reinforcing steel complying with AS 3600 or Glass Fibre Reinforced Polymer complying with CSA S806-12;

- Structural steel grades used;
- Deflection limits/criteria used;
- Welding categories;
- Corrosion protection treatment;
- Demolition requirements for any demolition associated with the project;
- Erecting sequence requirements for structures requiring a specific sequence. In particular, where tension elements have been used in the design; and
- Any other details necessary to define the action and performance of the structure.

17.3 Wind Loads – Loads in Cyclonic Areas

17.3.1 Buildings in regions C or D as defined by AS/NZS 1170.2 shall comply with the following:

- Assume not greater than a terrain category of 2½ as defined under Cl 4.2.1;
- Wind speeds to be factored in accordance with Cl 3.4;
- In determining internal pressures, assume all unprotected openings are regarded as potential dominant openings unless the building envelope (windows, doors and cladding at heights up to 25m) can be shown to be capable of resisting impact loading from windborne debris determined in accordance with Cl 2.5.8. The determination of internal pressures shall be in accordance with Cl 5.3; and
- All cladding, its connections and immediate supporting members and their fixings shall demonstrate performance under the pressure sequences defined in Cl 5.4.4, AS 4040.3 (methods of testing sheet roof and wall cladding-resistance to wind pressures for cyclone regions) and the NCC, based on the ultimate limit state wind pressure on external and internal surfaces as determined in accordance with this Standard.

17.3.2 An opening can be assumed to have adequate protection if shown capable of resisting the impact loading from windborne debris in accordance with Cl 2.5.8 of AS 1170.2.

17.3.3 The parts of the health facility building envelope accommodating patients, accident and emergency departments and operating theatres shall be designed to resist debris impact by increasing the loads defined above by 25%.

17.3.4 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 (acting towards the surface) and negative (suction) 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 as listed above.

17.4 Earthquake Forces

17.4.1 Facilities shall be designed and constructed to withstand the force assumptions of AS/NZS 1170.4. All facilities or parts of facilities that are considered essential for post disaster operation, complying with clauses 6.1.2 or 6.1.3, shall have in

Importance Level of 4 according to the NCC, whereas all other facilities shall attract an Importance level as defined by the NCC.

17.4.2 Particular attention shall be given to the design of non-structural elements where loads are likely to be imposed in accordance with AS/NZS 1170.4 Section 8 Design of Parts and Components. The Structural Engineer shall define the allowable arrangements for mounting and fastening any non-structural elements on and from the structure. The FRMP shall mitigate against mounting non-structural elements without complying with the Structural Engineer's requirements.

17.4.3 All seismic joints shall be designed to minimise the passage of fire and/or smoke horizontally and vertically.

17.5 Live Loads

17.5.1 The structure shall be designed to be capable of sustaining the design loads listed in the loading code AS/NZS 1170.0 and AS/NZS 1170.1 unless higher loads are required in the following live loads table. The Structural Engineer shall determine the actual loads but shall not be less than those nominated in the Live Loads Table below.

17.5.2 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	Concentrated Load
Minimum floor load	Floor	3.0 kPa UDL	5.0 kPa UDL	4.5kN
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	4.5kN
Loading Area, Medical Records.	Floor	10.0 kPa UDL	10.0 kPa UDL	7.0kN
All other stores, Kitchen, Scullery, Catering, Dirty Utility, CSSU.	Floor	5.0 kPa UDL	5.0 kPa UDL	4.5kN
Dairy and Bulk Food Cool Rooms.	Floor	15.0 kPa UDL	15.0 kPa UDL	9.0kN
M.R.I.	Floor	Check equipment, allow for equipment transport along access provided.	Check equipment, allow for equipment transport along access provided.	Check equipment load
Medical Imaging, Ultrasound Unit, Operating Theatres	Floor	5.0 kPa UDL	5.0 kPa UDL	4.5kN
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.	

Live Loads Table				
Area	**Element**	**Minimum Loading Condition < 15 Planned Life**	**Minimum Loading Condition > 15 Planned Life**	**Concentrated Load**
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.	

17.5.3 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.

17.6 Dead Loads and Other Loads

17.6.1 Superimposed dead loads and other loads such as that induced by temperature variations shall be assessed in accordance with the NCC and relevant Australian Standards.

17.7 Sub Structure

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

17.7.2 Sub structure design shall be based upon geotechnical site investigation (refer sub-section 9.1 “Site Investigation”).

17.7.3 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 (all parts)..... Structural design actions;
- AS/NZS 3600 ..... Concrete structures;
- AS/NZS 1289 (all parts)..... Methods of testing soils for engineering purposes;
- AS/NZS 2159 ..... Piling – Design and installation; and/or
- AS/NZS 2870 ..... Residential slabs and footings.

17.7.4 Sub-structures shall be designed to:

- Tolerate movements in the foundations caused by moisture variations, settlements and the like and comply with the relative differential movement limits as defined in the Geotechnical Report and the relevant Australian Standards, 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 (refer Section 8 “General & Environmental Requirements”); and
- Prevent ground water and storm water from entering into any parts of the building (refer sub-section 9.3 “Drainage”).

17.8 Structure

17.8.1 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, inter alia:

- AS/NZS 1170 (all parts)..... Structural design actions;
- AS/NZS 3600 ..... Concrete structures;
- AS/NZS 4100 ..... Steel structures;
- AS/NZS 1720 (all parts)..... Timber structures;
- AS/NZS 3700 ..... Masonry structures;
- AS/NZS 2870 ..... Residential slabs and footings;
- AS/NZS 1664 (all parts)..... Aluminium structures; and/or
- AS/NZS 3850 (all parts)..... Prefabricated concrete elements.

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

17.8.3 Maximum structural deflections shall not exceed the specifications of the Australian Standards 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/NZS 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
Designers are to take cognisance of future use of an area	

17.8.4 Notwithstanding compliance with the Australian Standards and the above Deflection Table, deflections shall also be limited to 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 affected by building structural deflections.

17.8.5 Control joints shall be constructed to minimise the effects of linear shrinkage of concrete and masonry, temperature effects, movement of the founding soils and prevent structural pounding in an earthquake or cyclone event. Control joints shall suit the geometry of the slabs and shall not compromise the performance of the Facility.

17.9 Additions and Alterations to Existing Structures

17.9.1 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 the purpose the altered building will serve

17.10 Demolition

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

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

17.11 Fixings and Fastenings

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

17.11.2 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.

17.11.3 The Proprietor's FRMP shall mitigate against any fixture or fitting or fixing method being applied without complying with a Structural Engineer's directions.

17.12 Design Checking

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

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

17.13 Construction Supervision

17.13.1 Construction supervision shall include at least:

- 100% review of shop drawings;
- 50% inspection of foundations and sub-structures;
- 75% inspection of foundations and sub-structures in reactive soils (all classes other than Class A and S as defined in AS/NZS 2870);
- 100% inspection of transfer elements;
- 75% inspection of suspended slabs and beams;
- 50% inspection of stairs connecting suspended floors;
- 50% inspection of columns;
- 75% inspection of shear and core walls;
- 50% inspection of precast and tilt-up panels; and
- 100% inspection of erected steelwork.

17.13.2 The Structural Engineer's inspection certification reports, including the certification of compliance with design, shall be recorded in the Project 'as-constructed' records.

18. Engineering Services, Transportation

18.1 Transportation Services Brief

18.1.1 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.

18.2 Transportation Drawings and Specifications

18.2.1 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; and
- The capacity of services.

18.3 Extent of Services

18.3.1 The transportation brief shall consider the need for:

- Lifts;
- Document and specimen conveyors;
- Goods conveyors;
- Hoists and gantries for bariatric patients;
- Electrical Vehicles; and/or
- RGV's.

18.4 Lifts

18.4.1 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.

18.4.2 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 NCC 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 NCC;
- 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 and the like: 2280mm long x 1600mm wide x 2300mm high;
  - Door clear opening size: 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.

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

18.5 Lift Performance and Installation Requirements

18.5.1 Lifts shall:
- Comply with the appropriate parts of AS/NZS 1735, EN81, AS/NZS 1668.1 and the requirements of the NCC;
- Have fire service control in accordance with the NCC.

18.5.2 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.

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

18.5.4 Lifts shall be connected to the vital electricity supply (where available) and if not, all lifts can operate on the vital supply available, then:
- 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"; and
- In the case of multiple lifts in a fire zone grouping if the lift selected to operate on vital electricity is out of operation or fails to operate the duty shall automatically pass to the next lift in the group.

18.5.5 Car ventilation shall be connected to the vital supply where available.

18.5.6 Lift car doors shall be:

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

18.5.7 Lighting in lift cars shall:

- Where used for patient transfer where clinical observation is required comply with AS/NZS 1680.2.5; and
- Include two self-contained battery/invertor emergency lights installed in each lift car and one on top of each lift car.

18.5.8 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/NZS 1044, AS/NZS 1053 and AS/NZS 2279; and
- Have variable voltage, variable frequency alternating current type drives.

18.5.9 Traction lifts power and drive systems should 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.

18.5.10 Electro-hydraulic lifts shall:

- Be fitted with oil coolers;
- Be fitted with silencers; and
- In addition to being connected to the vital power system (where available), 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.

18.5.11 Provision for persons with disabilities shall include:

- Requirements of AS/NZS 1735 Part 12, Facilities for Persons with Disabilities and the National Construction Code;
- 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; and
- The clearance between car sill and landing sill (running clearance) shall less than the width of a walking stick 32mm.

18.5.12 Additional lift 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; and/or

- Permanent floor numbers installed on the sight guard and to the rear of each set of landing doors.

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

18.5.14 Floor finishes shall meet relevant fire codes and NCC.

18.6 Document and Specimen Conveyors

18.6.1 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 sub-section 8.3 “Acoustic Services Brief”; and
- Have provision for directing incorrectly addressed carriers to an attended station.

18.7 Hoists

18.7.1 Hoists shall:

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

18.8 Testing and Commissioning

18.8.1 Lifts shall be tested and commissioned as required by AS/NZS 1735, AS/NZS 3000, and relevant Statutory Authorities.

19. Equipment

19.1 Equipment Brief

19.1.1 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.

19.1.2 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.

19.1.3 Equipment should be supported in Australia and parts available for a minimum of ten years from date of purchase.

19.2 Equipment Specifications

19.2.1 Equipment specifications shall at least define:

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

19.3 Equipment, General

19.3.1 It is not intended that these Guidelines describe requirements for every item of equipment used in facilities but to specify general standards, requirements and

principles and draw attention to particular equipment issues sometimes overlooked.

19.3.2 Equipment shall:

- If fixed to the Project structure or superstructure have supports and fixings to comply with AS/NZS 1170.4 Section 5 Requirements for Non-structural Components and Section 17 “Engineering Services, Structural”;
- If standing on a suspended floor does not impose floor loading in excess of design loadings advised by the Project structural engineer;
- Have operating noise and vibration levels complying with sub-section 8.3 “Acoustic Services Brief”;
- Not cause radio or electromagnetic interference with any other equipment or processes in the facility;
- 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; and
- Display a safety inspection label showing the date the next inspection is due.
- If handling any hazardous material be labelled with appropriate safety warnings.

19.3.3 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.

19.3.4 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.

19.3.5 Storage facilities shall be provided for portable equipment that:

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

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

19.4 Medical Electrical Equipment

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

19.5 Flammable Liquid Storage

19.5.1 Flammable liquids shall:

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

19.6 Chemical Storage

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

19.7 Cleaning Equipment

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

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

19.8 Cool Rooms and Freezer Rooms

19.8.1 Any refrigerated or cooling chamber, or the like which is of sufficient size for a person to enter shall:

- Have adequate means of communicating or alerting other occupants in the building in case of an emergency; and
- Have a door which is of adequate dimensions to allow occupants to readily escape; and openable from inside without a key at all times.

19.8.2 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.

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

19.8.4 Cool and freezer rooms shall be fitted with entrapment alarms and connected to the BMS (where available).

19.9 Laboratory Equipment

19.9.1 Fume cupboards shall comply with AS/NZS 2243.8.

19.9.2 Fume cupboards (and fume hoods) shall have fault alarms (i.e. fan failure alarms) and be interfaced to the BMS (where available).

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

- AS/NZS 2252.1-2002 Biological safety cabinets - Biological safety cabinets – Class I;
- AS/NZS 2252.2-1994 Biological safety cabinets - Laminar flow biological safety cabinets - Class II;
- AS/NZS 2647-2000 Biological safety cabinets - Installation and use;
- AS/NZ 2639-1994 Laminar flow cytotoxic drug safety cabinets - Installation and use

19.9.4 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.

19.10 Sterile Supply Equipment

19.10.1 Sterilisers shall comply with:

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

- AS/NZS 4187 Reprocessing of reusable medical devices in health services organisations.

19.10.2 Washer/disinfectors shall comply with:

- AS/NZS 2945 Batch-type washer/disinfectors for health care facilities;
- AS/NZS 3836 Rack conveyor washers for health care facilities; and
- AS/NZS 4187 Reprocessing of reusable medical devices in health services organisations.

19.10.3 Ultrasonic cleaners shall comply with:

- AS/NZS 2773.1 Ultrasonic cleaners for health care facilities – Non- portable;
- AS/NZS 2773.2 Ultrasonic cleaners for health care facilities – Bench top; and
- AS/NZS 4187 Reprocessing of reusable medical devices in health services organisations.

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

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

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

19.11 Catering Equipment

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

19.12 Laundry Equipment

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

19.13 Ward Equipment

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

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

19.14 Film Processing Equipment

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

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

20. Facility Management

20.1 Facility Manager

20.1.1 There shall be a Facility Manager belonging to an organisation or alternatively directly appointed by the proprietor to manage the facility and implement the facilities operating, maintenance and risk management plans.

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

- Defines the purpose of the performance agreement;
- 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 level of authority to keep within compliance standards;
- Identifies key performance indicators (KPI's);
- Scope of service and response times;
- Defines the Facility Operating Plan;
- Defines the FRMP;
- Defines the Facility Asset Management Plan; and
- Ensures the facilities building services and equipment are managed and maintained in accordance with the NCC, Australian Standards, legislation, manufacturers recommendations and organisational policies.

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

- History of competence in facility management in healthcare or equivalent environments or demonstrated experience in the facility management of a large complex building/s;
- Have the ability to effectively manage and maintain a computerised works management system incorporating asset and maintenance history;
- Have direction to supply any information needed to keep the records updated to record any changes arising from the work done; and
- Eligible for membership of the Institute of Healthcare Engineering Australia.

21. Facility Operation

21.1 Facility Operating Plan

21.1.1 There shall be a written Facility Operating Plan (FOP).

21.1.2 The FOP shall address all operating objectives and risks.

21.1.3 The FOP shall include requirements for testing of all engineering services emergency preparedness scenarios including rehearsing changeover to alternative supplies service.

21.1.4 The FOP shall be reviewed annually to ensure alignment with changes in Standards and Guidelines. Any changes to the FOP shall be actioned within agreed timeframe

21.1.5 The FOP shall be developed to ensure safe and reliable operation of services by Facility operators.

21.2 Specific Requirements of the Facility Operating Plan

21.2.1 Any standby electrical plant (such as generators, emergency electricity generators shall be maintained and tested along with records of operation and maintenance in accordance with AS/NZS 3009;

21.2.2 All fire protection services (wet and dry) shall be maintained and tested in accordance with AS/NZS 1851;

21.2.3 Develop and implement a Water Quality Risk Management Plan in accordance with "The West Australian Guidelines for Managing Microbial Water Quality in Health Facilities";

21.2.4 Microbial control of cooling water systems shall be maintained and tested in accordance with AS/NZS 3666.3;

21.2.5 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, e.g. once during the heating season and once during the cooling season;

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

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

21.2.8 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.

21.3 Facility Operating Policies

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

- Who is authorised to operate;
- The conditions under which they can be operated;
- The hours during which they are operated;
- The equipment operating and performance parameters 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; and
- Reporting on asset and asset management performance.

21.3.2 Note: Facilities operating policies form a subset of all operating policies for the functions performed at the facility.

21.4 Operator Training

21.4.1 The Proprietor (or organisation supplying Facility Management Services) shall

provide and support adequate and ongoing training and instruction to facility operators; and in accordance with regulatory requirements where applicable.

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

21.5 Operator Competence

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

21.6 Operating Records

21.6.1 There shall be records of:

- Operating Policies;
- Operating Instructions;
- Operating Competence Assessment;
- Emergency Procedures testing and Rehearsal;
- Audits and inspections of facilities, plant and equipment; and
- Commissioning, testing and certificates of compliance for all facilities plant and equipment.

22. Facility Maintenance

22.1 Facility Maintenance Plan

22.1.1 There shall be a written Facility Maintenance Plan (FMP) which as a minimum:

- Should provide for maintenance and component replacement of the facilities or equipment to improve efficiency and maximise economic life while minimising operational 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;
- Shall demonstrate that the facility, plant and equipment are maintained, and maintenance activities are documented; and
- Should be monitored and managed by the Proprietor and reviewed at a minimum of two-yearly intervals.

22.2 Maintenance Training

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

22.2.2 Maintenance instructions shall be:

- Available in writing for reference by maintainers; and
- 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.

22.3 Maintenance Competence

22.3.1 The Proprietor should assess or employ a competent person to assess the maintainer competence and only allow competent maintainers access to the facility.

22.4 Maintenance Records

22.4.1 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; and
- Dates and times the maintenance was provided.

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

22.4.3 When alterations to facilities are carried out the site 'as constructed drawings' should be updated rather than recording the alterations 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 should also be considered.

22.4.4 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.

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

22.5 Facility Asset Management Plan (FAMP)

22.5.1 All facilities shall have a FAMP.

22.5.2 The purpose of the FAMP is to plan the life of the asset from date of purchase to date of disposal.

22.5.3 The FAMP shall provide clear guidelines to ensure that the assets are maintained to maximise economic life for financial, liability and insurance purposes.

22.5.4 All new assets purchased that require planned preventative maintenance shall be added to the FAMP.

22.5.5 As a minimum the FAMP shall:

- Comply with these guidelines;
- Uniquely identify each major asset;
- Provide a safe environment;
- maintain business continuity;
- be reviewed annually;
- update preventative/predictive maintenance strategies for new assets;
- record disposal of assets no longer required;

22.5.6 All major assets should be identified within the FAMP with the following:

- Asset Number;
- Asset name/description;
- Location;
- Date of purchase or installation;
- Anticipated end- of-life date;

23. Project Commissioning Certificates

23.1 Information to be provided

23.1.1 When presenting a project for Approval to Occupy 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.
- The project quality and performance at least comply with the documentation that was the basis for the project 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.
- There is a FRMP and mitigation has been or is ready to be implemented (refer Section 5 “Facility Risk Management Plan”).
- There is a Facility Maintenance Plan and arrangements have been made for it to be implemented and maintainers have access to written maintenance instructions (refer Section 22 “Facility Maintenance”).
- There is a Facility Asset Management Plan and arrangements have been made for it to be updated for all new and disposed assets (refer Section 22 “Facility Maintenance”).
- The Facility Manager or their competent delegate should witness all commissioning of services to ensure they meet the requirements of this Guideline
- The Facility Manager shall receive all ‘as constructed’ documentation of at least one hard copy and one electronic copy.

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

Appendix 1

1 Approval to Occupy Inspection Checklist

1.1 General

The Approval to Occupy Inspection as carried out by the licensing and Accreditation Regulatory Unit (LARU) of the Department of Health is a random audit of the facility/area. It is the Licence Holders and/or their representative's responsibility to do due diligence to ensure that the facility/area complies with Private Hospital Guidelines, Building Code of Australia and all relevant Australian Standards and is fit for intended function/use.

1.2 Glossary of terms

Architect means an individual registered architect or licensed architectural corporation that are currently registered with the Architects Board of Western Australia.

Building Surveyor, a surveyor who is registered as a surveyor contractor under the Building Services Registration Act 2011.

Certification means certification of the design and installation by the Engineer and certification of the installation by the installation contractor or specialist sub-contractor.

Date of Occupation means the date nominated by the 'Licence Holder' that the facility/area has been fully commissioned (both building commissioning and clinical commissioning) and is the day the service will commence.

DOH means Department of Health.

Engineer means an engineer as defined within the Western Australia Health Facility Guidelines for Engineering Services.

Hydraulic Designer means a designer with relevant AHSCA membership.

LARU means Licensing and Accreditation Regulatory Unit of the Department of Health.

Practical Completion means when all works are complete, except for any defects or omissions that do not prevent the building from being used for its intended purpose. The building is handed over to the owner at practical completion.

Shall means that the referenced item is mandatory.

Should means that the stated requirement is recommended but is not mandatory.

Submitted design(s) mean the plans and specifications submitted to LARU at Approval to Construct and modified to incorporate all agreed Approval to Construct Mandatory Items. Submitted design(s) shall include any approved variations submitted after approval was granted.

The following issues ***shall*** be addressed prior to the Health Department of Western Australia Approval to Occupy Inspection.

- An Approval to Occupy Inspection will not be conducted by LARU until all components of the works have been certified as having reached "Practical Completion" and the facility/area is completed in accordance with documentation and plans approved by LARU at Approval in Principle and Approval to Construct.
- The certifications must be completed by the Architect and all Engineering Consultants and Contractors, and full services commissioning and certification data, as specified herein, must be available on site on the day of inspection and retained on site whilst the facility is licensed.
- The facility/area shall prior to the Approval to Occupy Inspection be fully commissioned and compliant with all relevant standards for patient, staff or intended

function.

- Clinical commissioning – includes all furniture and equipment in situ:
  - Consumables (medical and non-medical),
  - Cleaning and environmental testing of sterile critical areas, and
  - Staff training in emergency responses and use of medical equipment to be completed.
- The 'Declaration for Approval to Occupy Inspection' form shall be completed and returned to LARU two (2) weeks prior to the Approval to Occupy Inspection.

2 Practical Completion

2.1 The works *shall* have reached "Practical Completion" and *shall* have been certified as such by the Architect and Engineering Consultants**.**

Note: The 'Practical Completion' date is not the same as the 'Date of Occupation'

2.2 The Architects and Engineers certification of practical completion and the registered building surveyor's certification of construction compliance (BA17) or the certificate of building compliance (BA18) as required by the as West Australian Building Act 2011 shall be submitted and made available at the Approval to Occupy Inspection.

2.3 The certifying statement(s) shall confirm that the design and completed works have been completed and comply (in the professional opinion of the certifier) with the statutory requirements of the various Government controlling agencies, with the Department of Health West Australia Private Hospital Guidelines, current Building Code of Australia and relevant Australian Standards, any relevant Fire Engineering Report, and with the mandatory items that were identified with the issue of the Approval in Principle and Approval to Construct.

2.4 A list of defects, omissions and outstanding items shall be available at the ATO inspection and these items shall be made evident during the inspection.

3 Clinical Commissioning

The facility/area shall have been clinically commissioned and made ready for patient, staff or intended function prior to the Approval to Occupy Inspection.

3.1 All medical consumables, equipment and furniture shall have been installed.

3.2 A hospital clean shall have been carried out for the area(s) to be inspected.

3.3 Staff fire evacuation and emergency training shall have been completed.

3.4 All operational and clinical policies and rosters for the facility/area shall have been completed and on site.

3.5 Cleaning and environmental testing of operating suites, operating rooms, procedure rooms, CSD areas and similar shall be completed and results on site.

3.6 Staff orientation and equipment training to the facility/area shall be completed.

3.7 Clinical commissioning shall ensure that all builders materials, hoardings, security fencing and site facilities etc. have been removed from the site.

For operating and procedure rooms the licence holder shall submit prior to the Approval to Occupy
Inspection:

3.8 A statement of the procedures to be performed in each operating and procedure room.

3.9 Documentation that specifies the Operational Procedures for cleaning and environmental testing of each operating and procedure room.

In addition to the above the following shall be made available at the Approval to Occupy Inspection:

3.10 The statement of function for the facility/area to be inspected.

3.11 Any infection control audits or report that may have been carried out for the facility/area.

3.12 Any occupational health and safety audits or reports that may have been carried out for the facility/area.

4 Structural and Civil Certification

A statement by the design structural engineer that certifies that the building has been built in compliance with Section 18 of the West Australian Health Facility Guidelines for Engineering Services. The civil engineer shall similarly submit a statement that the building complies with Section 10. Similar certifications shall also be provided by independent Structural and Civil reviewers of the submitted design(s).

5 System Testing

All building systems (fire, mechanical, electrical, hydraulic, etc.) shall have been fully tested and be working as designed/documented (as approved by the DOH).

6 Engineering Design Certification

Refer - Consultant's Certification Template (attachment A).

Certified statements which confirm that the designed, documented and witnessed mechanical, electrical and hydraulic engineering systems comply (in the professional opinion of the Certifier) with the statutory requirements of the various Government controlling agencies (including the DOH) shall be provided to the DOH.

The statement shall be prepared by professional mechanical, electrical engineers and hydraulic designers. The professional mechanical or electrical engineer or hydraulic designer shall certify the design and all commissioning and test data complies with the DOH West Australian Health Facility Guidelines for Engineering Services, relevant Australian standards, relevant Fire Engineering Report(s), and the mandatory items that were established or implied with the issue of the 'Approval in Principle' and 'Approval to Construct'., the DOH Guidelines and all other statutory requirements.

7 Engineering Installation Certification

Refer - Installer's Certification Template (attachment B).

The installing contractors or specialist subcontractors or the mechanical, medical gas, electrical and hydraulic services shall certify that the installation and construction complies with DOH West Australian Health Facility Guidelines for Engineering Services, relevant Australian Standards, relevant Fire Engineering Report(s), and mandatory items that were established or implied with the issue of the "approval to construct". Certification of compliance with the other controlling Statutory Authorities (Water Corporation, Worksafe WA, etc) shall also be provided.

8 Engineering Scope

The engineering services mentioned in clauses 5, 6 and 7 above include, but are not limited.

8.1 Mechanical systems:

8.1.1 Air conditioning.

8.1.2 Heating.

8.1.3 Ventilation.

8.1.4 Exhaust.

8.1.5 Special exhaust.

8.1.6 Chilled and heating hot water.

8.1.7 Medical gases and medical vacuum (including alarm systems).

8.1.8 Air filtration.

8.1.9 Air pressure differentials.

8.1.10 Sterilisers (typically steam).

8.1.11 Steam generators (or similar systems).

8.1.12 Mechanical switchboards and controls.

Note that where evaporative coolers are used, a statement is required certifying that a system for sanitation for Legionella control has been tested and is operational. The procedure shall be described in the Maintenance Manual (refer Clause 25).

Commissioning of medical gases and suction services shall be in strict accordance with the procedure outlines in AS 2896. This testing shall be witnessed and certified by the Mechanical Engineer and witnessed by a senior hospital representative.

8.2 Electrical and communication systems:

8.2.1 High voltage installation.

8.2.2 Vital power supplies.

8.2.3 Earthing.

8.2.4 Switchboards.

8.2.5 Discrimination and cascading.

8.2.6 Sub-mains and sub-circuit cabling.

8.2.7 Internal and external lighting.

8.2.8 Lighting for clinical observation.

8.2.9 Emergency evacuation lighting.

8.2.10 RCD protection.

8.2.11 Body and cardiac protection.

8.2.12 Lightning protection systems.

8.2.13 Structured cabling installation.

8.2.14 Messaging Systems.

8.2.15 Assistance call systems.

8.2.16 Fire detection and alarm systems, etc.

8.3 Hydraulic systems:

8.3.1 Fire hydrants, hose reels and sprinklers systems.

8.3.2 Potable and non-potable cold and hot water reticulation systems.

8.3.3 Backflow prevention systems.

8.3.4 Water Softening and Reverse Osmosis Water Systems.

8.3.5 Natural or LP gas systems.

8.3.6 Sanitary Fixtures and Tapware.

8.3.7 Hospital appliances such as flushing rim sinks, washer/disinfector, macerator, etc.

8.3.8 Siphonic or gravity stormwater systems.

8.3.9 Gravity or pump sewer systems.

8.3.10 Industrial waste and drainage systems.

9 Mechanical Ventilation and Air Conditioning Systems

Specific written data shall be provided in tabulated form confirming commissioning figures for toilet and general exhaust, ventilation rates (supply and return air), supply air and outside air quantities. The following presentation style is required.

Measurement Location	Code Requirement	Design	Actual	% of Design
e.g. Shared resident toilet and shower	10/Ls.m^2	45 L/s	47 L/s	104

The method of determination and calibration data shall also be provided to enable assessment of the appropriateness of measurement.

Cold DOP testing of absolute (HEPA) filters shall be conducted in accordance with AS/NZS 1132.9. HEPA filters shall also be certified in accordance with AS/NZS 1807.6 or AS/NZS 1807.7 as appropriate, after initial installation.

Air flow patterns within, to and from Operating, Set-Up, Cytotoxic and Isolation Rooms, and other critical infection control areas served by absolute filters, shall be verified by air flow tests. Air flow diagrams showing the direction of flow to and from these areas shall be provided.

10 Medical Gas Services

The specialist Medical Gases installation contractor shall certify in writing that they are experienced and competent installers as required by AS/NZS 2896 "Medical Gas Systems - Installation and Testing of Non-Flammable Medical Gas Pipeline Systems" and the WA Health Facility Guidelines.

Commissioning of gas and suction services shall be in strict accordance with the procedures outlined in the Australian Standard AS 2896. Tests shall be witnessed by the Mechanical Engineer and a senior medical representative of the Hospital. Flow test results of oxygen nitrous oxide, medical air and vacuum services shall be provided. Cross connection and purity tests shall be provided for each outlet. All test results shall be submitted in AS 2896 format. Procedures for regular reliable ongoing replenishment and service of all systems and equipment shall be verified as appropriate.

11 Electrical Systems

Specific written test data shall be provided for the electrical installation including the following:

11.1 Routine testing to AS/NZS 3194 of all switchboards

11.2 Compliance with AS/NZS 3000 (such as earthing, RCD's and the like) and functional operation of the system

11.3 Where the electrical system incorporates a customer owned HV supply, all testing and commissioning data shall be provided to the Australian Standards, statutory authorities requirements and any other regulatory requirements for the HV system shall be provided

The O&M manuals shall include (as a minimum) the following:

11.4 Certifications of compliance to AS/NZS 3000 and all other mandatory standards

11.5 All electrical test result required for compliance to AS/NZS 3000

11.6 Supply authority tickets

11.7 A copy of all circuit schedules

11.8 Shop drawings for all switchboards, generators, transfer switches and the like

11.9 A copy of all single line diagrams (revved up to As Constructed)

11.10 A copy of all electrical drawings (revved up to As Constructed)

12 Emergency Lighting Systems

Emergency lighting systems shall be tested in accordance with AS/NZS 2293 and full test results in 'logbook' format shall be provided.

Certifications shall be provided of compliance to AS/NZS 2293 and the Building Code of Australia.

13 Vital Power Supplies

Full commissioning data shall be provided for emergency diesel, UPS and any other vital power supplies. Full discharge test results shall be provided for all battery systems.

Certifications shall be provided that the whole of the installation complies with AS/NZS 3009.

14 Electromedical Areas

All electromedical areas shall be tested by an approved testing and commissioning company qualified to undertake testing to AS/NZS 3003.

Full test results to AS/NZS 3003 shall be provided including a complete and certified checklist.

Certifications shall be provided that the whole of the installation complies with AS/NZS 3003.

15 Assistance Call Systems

Functional test results shall be provided for the patient and emergency assistance call system.

A checklist for each point shall be provided indicating the operating status at the time of testing.

16 Fire Detection and Alarm Systems

Fire Detection and Alarm Systems shall be tested in accordance with the Australian Standards and statutory requirements, and any Fire Engineering Reports (if applicable). Full test results shall be provided.

Certifications shall be provided that the whole of the installation complies with AS/NZS 1670.

17 Domestic Hot Water System and Temperature

Hot water installation systems shall be tested in accordance with the Australian Standards and statutory requirements. Full pressure test results shall be provided.

Specific written data shall be provided in tabulated form confirming commissioning figures for all tempered water outlets and hot water heater to confirm commissioned exact water temperatures. The following presentation style is required.

Measurement Location	Design	Actual
e.g. Level 1: Hand basin in room 1.02	45°C	44.6°C

A confirmation test certificate shall be provided including laboratory test result to proof that the hot water system is free of Legionella and within the limitations of the Australian Drinking water guideline. The procedure shall be described in the Maintenance Manual (refer Clause 25).

The testing requirements and sanitation procedures shall be covered in the Maintenance Manuals.

18 Cold Water System

Cold water installation systems shall be tested in accordance with the Australian Standards and statutory requirements. Full pressure test results shall be provided.

A confirmation test certificate shall be provided including laboratory test result to proof that the cold-water system is free of Legionella and within the limitations of the Australian Drinking water guideline. The procedure shall be described in the Maintenance Manual (refer Clause 25).

19 RO Water Systems

SAT shall be carried out and commissioning data shall be supplied to confirm that the system is fully operational, and the provided RO water quality complies with AS/NZS 4187.

20 All other Hydraulic Systems (including Wet Fire Services)

All systems shall be tested in accordance with the relevant Australian Standards and statutory requirements. Full test results shall be provided.

21 Environmental Tests

The cleanliness of Operating Suites, including Operating Rooms, Set-up Rooms, Sterile Stores, Angiography and Cardiac Catheterisation Rooms, any other room(s) in which such sterile procedures will be completed, and Central Sterile Department/Units (CSD) shall be verified by air flow checks and bacterial sampling conducted by an appropriately NATA certified professional. Before testing, the following are required:

21.1 All building and engineering works have been completed.

21.2 The ducting has been cleaned, absolute filters installed, Cold Dispersed Oil Particulate (DOP) tests satisfactorily completed and air flows verified.

21.3 The operating room/s have been thoroughly cleaned.

21.4 The plant has been running under normal operating conditions for 24 hours prior to the test.

21.5 There is no activity in the operating room/s/unit.

21.6 The room(s) shall be tested by:

21.6.1 Noting the direction of air movement using a smoke test.

21.6.2 Performing counts of bacterial colony forming units in both the air and on surfaces.

This is to be repeated once to confirm that duplication of results is possible.

If the room(s) fail the tests, the Engineer (mechanical) shall be consulted to confirm air velocities and filter integrity. The tests shall be repeated once the criteria are met.

22 Steriliser Tests

The results of commissioning and appropriate testing data shall be provided in accordance with AS/NZS 4187 Reprocessing of Reusable medical devices in health service organisations. These include:

22.1 Validation program is performed to evaluate the reliability of a sterilisation process.

22.2 Validation will demonstrate that a given sterilisation cycle in an identified steriliser will render a specified load sterile.

22.3 Verification of satisfactory cycle check tests and daily leak rate tests.

22.4 Bowie-Dick type test (conforms to BS 7720) where applicable.

22.5 Access to suppliers' tests.

22.6 Calibration of gauges.

23 Washer/Disinfector Tests

Washer/disinfector machines, including pan washers, instrument washers and anaesthetic tubing washers shall pass appropriate cycle and challenge tests for mechanical action and disinfecting activity where applicable, also artificial soil tests and thermocouple tests post installation where indicated. Foil and graphite tests for ultrasonic cleaners. The results of the validation tests shall be provided.

24 Anaesthetic Equipment Tests

Certification is required from a specialist anaesthetist that the facilities and equipment are in accordance with the Guidelines for Safe Anaesthetic Practice issued by the Faculty of Anaesthetists, Royal Australasian College of Surgeons, in particular:

24.1 T1.Recommended Minimum Facilities in Safe Anaesthetic Practice in Operating Suites.

24.2 P4.Guidelines for the Care of Patients Recovering from Anaesthesia in the Recovery Room.

25 Fire Safety

In addition to the fire alarm and detection system, emergency and exit lighting, and the firefighting (hydraulic) services mentioned prior, certification of the following (where appropriate) shall be provided:

25.1 Integrity and completeness of fire and smoke barriers, i.e. full compartment/isolated space separation as required, with penetrations fully sealed with a material capable of maintaining the fire/smoke resistance of the barrier or protected by an approved device designed for the purpose. Fire and smoke barriers must extend from true floor to the underside of the roof/slab over, and a fire wall must be able to maintain its structural integrity in the event of a wall and roof collapse on one side. Appropriate fire-resistant packing between the top of a fire wall and roof cladding must be installed in a way that provides a continuous seal.

25.2 Fire dampers (in mechanical ductwork) tested and operational.

25.3 Door closers (hydraulic or electromagnetic) on all fire and smoke doors being fully operational and closing speed adjusted for safe operation.

25.4 Door sequence closing devices operational (where double fire/smoke doors are fitted).

25.5 Fire door certification plates fitted to all fire doors and frames which comply with AS/NZS 1905.1.

25.6 Appropriate and permanent smoke seals fitted to all smoke doors.

25.7 Appropriate fire extinguishers and fire blankets installed.

25.8 Appropriate signposting installed in accordance with the relevant codes.

25.9 Special fire suppression systems tested and operational.

25.10 Use of fire resistance rated plasterboard to a tested system (Fyrchek, Boral, etc.) for the construction of fire barriers.

25.11 Appropriate and unobstructed means of egress.

25.12 The installed floor coverings, window treatments and bed screen curtains in compliance with section C1.10 (specification), fire hazard indices, of the Building Code of Australia.

25.13 The installation, completeness and operation of the early warning fire system and its integration with all other associated systems.

26 Fire Brigade Facilities

Confirmation of the successful outcome of the following fire systems tests shall be forwarded to the DOH:

26.1 Testing of heating, ventilation and air conditioning (HVAC) systems in relation to smoke control to ensure compliance with Section E2 of the BCA. These tests will involve the use of artificial smoke to assess the movement of smoke and gases

produced by a fire, to the greatest extent possible, particularly as to:

26.1.1 means of egress;

26.1.2 exit passageways or other similar areas;

26.1.3 operating suite; and

26.1.4 nurseries, birthing suites, etc.

26.1.5 time taken to activate alarms, fire and smoke doors to close, and for smoke evacuation.

26.2 Testing of hydrant flow and pressure in accordance with AS/NZS 2419.1 Section 7. Test results shall be provided.

26.3 Testing of hydrant hose reel flow and pressure in accordance with AS/NZS 2441.

26.4 Provision of appropriate access routes and hardstanding for fire trucks. Earlier discussions and agreement with the fire brigade as a requirement at the design stage is assumed.

Where a Direct Brigade Alarm (DBA) connection is required, the connection shall be approved by the fire brigade and operational at the time of the ATO.

Where a DBA connection is not implemented at the time of the ATO, details shall be provided of the measures or works required that will be implemented to address this issue. These measures or works required shall be implemented prior to ATO.

27 Security

A certified statement shall be provided that confirms successful testing of any special electronic security systems, where provided.

28 Furniture and Equipment

All furniture and equipment shall be installed prior to Approval to Occupy Inspection so that an evaluation can take place during the Approval to Occupy Inspection. Where this is not possible, a written description of the type and quantity of loose furniture and equipment, including size and spatial requirements, to be installed including its location shall be provided.

29 Other Certification Issues

Certification of successful testing of any other items or systems that have been installed AND which have not had DOH approval, along with a description of the system, what is replaced, and why, shall be provided.

30 “As Constructed” Drawings

A full set of ‘As Constructed’ drawings (architectural, structural, interior design, landscaping and services) shall be available for perusal as required during the Approval to Occupy Inspection.

All documentation that is required shall be labelled, sorted and placed into appropriate sections in folders to allow LARU Consultants to access relevant information.

All of the above documentation shall be kept at the facility for future reference.

If there have been any changes to documentation after the ATC approved set, a separate set of drawings that have changes clearly highlighted in colour shall be available on the day of the inspection and these changes shall be made evident to the LARU inspection team at the start of the inspection.

Six A3 floor plans (needn’t be to scale) highlighting the areas to be inspected and with all rooms correctly labelled in accordance with installed signposting, shall be available for LARU use during the inspection.

31 BCA Compliance Report and Fire Engineering Report

The Final BCA Compliance Report and Final Fire Engineering Report shall be available for perusal as required during the Approval to Occupy Inspection. These documents shall also be kept on site at all times.

32 Consultant Availability

The Project Architect, Engineering design consultants, specialist sub-consultants, and/or appropriately skilled contract personnel, shall be available during the Approval to Occupy inspection to answer technical questions and assist DOH officers in the systems checking process.

If there have been any changes to the professional consultants that were listed in the contact list at the time of the AIP submission (AIP 2), LARU shall be notified in writing of this change together with a brief reason for the change prior to the ATO inspection.

33 Hospital Personnel Availability

The hospital/facility/area personnel who have been involved in the design, planning and commissioning of the hospital/facility/area and the senior staff who will be responsible for the day to day management/running of the hospital/facility/area shall be available during the Approval to Occupy Inspection to answer technical questions and assist DOH officers in the systems checking process.

34 Maintenance Manual

Proof shall be provided that a manual exists which instructs the building proprietor on the maintenance requirements of the engineering systems and all equipment (including air conditioning plant, autoclaves, sterilisers and washer disinfectors, catering equipment, other plant, etc.). Availability of equipment manuals for operators and maintenance staff shall be confirmed.

35 Typical Consultant's Certification Letter

Typical Consultant's Certification Letter – Template:

Add other Services where relevant

Anywhere Private Hospital

Electrical/Mechanical/Medical Gases/Hydraulic Services

We advise that the electrical/mechanical/hydraulic services, documented for the, …… have been effectively completed.

All engineering services have been tested and found to be working as designed.

To our knowledge the electrical/mechanical/medical gases/hydraulic/fire services installation, testing and commissioning complies with the contract documents and the Health Department of WA West Australian Health Facility Guidelines for Engineering Services, Australian Standards and the mandatory items that were established or implied with the issue of the 'Approval in Principle' and 'Approval to Construct'.

Medical Gases cross connection and purity tests for each outlet have been witnessed by a senior hospital medical representative (medical gases only).

36 Typical installer's certification

Typical installer's certification – Template:

Certification is required for each relevant service.

Anywhere Private Hospital

Electrical/Mechanical/Medical Gases/Hydraulic/Fire/Electromedical Services

We advise that the electrical/mechanical/hydraulic services, installation for the, ……. have been effectively completed.

All engineering services have been tested and found to be working as designed.

To our knowledge the electrical/mechanical/medical gases/hydraulic/fire services installation, testing and commissioning complies with the contract documents and the Health Department of WA, West Australian Health Facility Guidelines for Engineering Services, Australian Standards and the mandatory items that were established or implied with the issue of the ‘Approval in Principle’ and ‘Approval to Construct’.

Appendix 2 – Treatment/Procedure/Operating Room Matrix

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Treatment	Consultation Examination Treatments Suturing Dressings Catheterisations Eye wash Lumbar puncture	Hands free clinical handbasin. (Type A) in Room. 2.7m high ceiling minimum. • 16m^2	HVAC - Class F6 Filtration or better. Positive pressure relative to adjacent corridor / surroundings. Medical Gases as required - to be defined by users. WAHFG/ES compliance.	Body protection to AS/NZS3003. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets at the bed head. Emergency call point.	Single procedure light connected to essential / vital supply. The light to be a minimum of 20,000 lux (at 1m - affl). General lighting to a minimum average of 400 lux across the room to AS/NZS1680.2.5.	Mobile trolleys. Cabinetwork. Removable / easy clean. Treatment couch/ trolley / chair.	Clean Room (4A). Secure Drugs storage (4R/8).	Aseptic technique.	Nil. Local anaesthetic.
Endoscopy Procedures	Endoscopy • colonoscopy lower • endoscopy upper • polyp removal	Hands free Clinical handbasin (Type A) Entry. 2.7-3m high ceiling. Lead shielding. • 20-30m^2.	HVAC - HEPA filtration. Positive pressure relative to adjacent corridor / surroundings. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous Oxide and Tool Air. Temperature controllable from within room. WAHFG/ES compliance.	Body protection to AS3003. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets at the bed head. Emergency call point.	Single procedure light connected to essential / vital supply. The light to be a minimum of 50,000 lux (at 1m - affl). General lighting to a minimum average of 400 lux across the room to AS/NZS1680.2.5.	Anaesthetic Machine Mobile trolleys. Scope storage cabinets (HEPA) - optional. Pass through recommended. Endoscope machine. Diathermy machine. Reprocessing equipment.	Aseptic. Secure Drugs storage (4R/8). AS/NZS 4187. GENCA Standards. ACORN standards.	Non-invasive. Surgical / diagnostic in nature (endoscopy). Surgically clean field or sterile field. Semi critical. (AS//NZS 4187 - device that comes into contact with mucous membrane or broken skin)	Local anaesthetic. Sedation.

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Procedures	Dental Surgery Minor surgery Procedures under local and Sedation only	Hands free Clinical handbasin (Type A) at Entry. 2.7-3m high ceiling. Lead shielding. • 25-30m^2.	HVAC - HEPA filtration. Positive pressure relative to adjacent corridor / surroundings. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous Oxide and Tool Air. Temperature controllable from within room. WAHFG/ES compliance.	Body protection to AS/NZS3003. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets at the bed head. Emergency call point.	Single procedure light connected to essential / vital supply. The light to be a minimum of 50,000 lux (at 1m - affl). General lighting to a minimum average of 400 lux across the room to AS/NZS1680.2.5.	Operating table or chair (that can go into Trendelenburg position). Anaesthetic Machine. Anaesthetic trolley. Mobile trolleys. Diathermy machine.	Aseptic room. Secure Drugs storage 4R/8). AS/NZS 4187. ACORN standards.	Sterile field. Semi critical. (AS/NZS 4187 – device that comes into contact with mucous membrane or broken skin).	Local anaesthetic. Sedation.

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Operating (Small)	Minor surgical Laparoscopic procedures Dental Surgery	Barrier entry Mobile equipment 3m high ceiling (minimum). 6m minimum width. Laser - safe working environment to AS/NZS 4173. Lead shielding. Hands free Scrub external / adjacent entry. • 30m^2.	HVAC - HEPA filtration (DD) minimum 1.8 x 1.8 mm at ceiling level. 20 air changes per hour. Room pressurisation to comply with WAHFG/ES. L Exhaust. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous Oxide, Tool Air and Carbon Dioxide. Temperature controllable from within room. WAHFG/ES compliance.	Body or Cardiac protection to AS/NZS3003. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets installed on the medical pendants (or major services panels). Emergency call point.	Single surgical light connected to UPS. The light to be a minimum of 125,000 lux (at 1m - affl). Sterile "clean room" type general lighting to AS/NZS1680.2.5. 'X-ray / Laser in Use' illuminated sign outside each entry. Room in Use lights outside each entry. Minimum of one pendant. EWIS / Fire visual indicator / strobe.	Anaesthetic Machine. Anaesthetic trolleys (drugs and intubation). Mobile trolleys (various). Limited specialist equipment. Diathermy. Operating table. Mobile x-ray / laser.	Aseptic Room. ACORN standards. Secure Drugs storage 4R/8). AS/NZS 4187.	Invasive. Sterile field.	General anaesthetic. Sedation. Regional block. Local anaesthetic (optional).

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Operating (General)	General ENT Urology Gynaecology Ophthalmic Plastics Neurology Orthopaedic Laparoscopic Plastic / reconstructive Maxillo / facial Dental Surgery	Barrier entry. Mobile equipment. 3m high ceiling (minimum). 6m minimum width. Laser safe working environment to AS/NZS 4173. Lead shielding. Hands free Scrub external / adjacent entry. • 36m^2.	HVAC - HEPA filtration (DD) minimum 1.8 x 1.8 mm at ceiling level. 20 air changes per hour. Room pressurisation to comply with WAHFG/ES. L Exhaust. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous Oxide and Tool air. Temperature controllable from within room. WAHFG/ES compliance.	Body protected to AS/NZS3003. Cardiac protected (to AS/NZS3003) where required to suit the type of procedure to be conducted. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets installed on the medical pendants (or major services panels). Emergency call point.	Single surgical light connected to UPS. The light to be a minimum of 160,000 lux (at 1m - affl). Sterile "clean room" type general lighting to AS/NZS1680.2.5. 'X-ray / Laser in Use' illuminated sign outside each entry. Room in Use lights outside each entry. Minimum of one pendant. EWIS / Fire visual indicator / strobe.	Anaesthetic Machine. Anaesthetic trolleys. Mobile trolleys (various). Monitors. Specialist equipment. Diathermy. Operating table. Mobile x-ray / laser.	Aseptic Room. ACORN standards. Secure Drugs storage (4R/8). AS/NZS 4187.	Invasive. Sterile field. Critical medical device (A device which enters or is capable of entering tissue that would be sterile under normal circumstances).	General anaesthetic. Sedation. Regional block. Local anaesthetic (optional).

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Operating (Large)	Cardiac (Angio) (42) Orthopaedics / Neuro Vascular (49) Cardiothoracic (60)	Barrier entry. Mobile equipment. 3m high ceiling (minimum). 6.5m minimum width. Laser safe working environment to AS/NZS 4173. Lead shielding. Perfusion Room adjacent for Cardiothoracic. Hands free Scrub external/adjacent entry. Hands free door activation. • 42/49/60 m^2.	HVAC - HEPA filtration (DD) minimum 2.4 x 2.4 min at ceiling level. 20 air changes per hour. Room pressurisation to comply with WAHFG/ES. L Exhaust. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous Oxide and Tool air. Temperature controllable from within room. WAHFG / ES compliance.	Cardiac protection to AS/NZS3003. LIOM protection to all UPS and essential supply outlets on medical pendants. UPS power required to a minimum of 25% of socket outlets installed on the medical pendants. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets installed on the medical pendants. Emergency call point.	Multiple surgical lights connected to UPS. The primary light to be a minimum of 160,000 lux (at 1m - affl) and the satellite to be a minimum of 125,000 lux (at 1m - affl). Sterile "clean room" type general lighting to AS1680.2.5. 'X-ray/Laser in Use' illuminated outside each entry. Room in Use lights outside each entry. Minimum of two pendants. EWIS/Fire visual indicator/strobe	Anaesthetic Machine. Anaesthetic trolleys. Mobile (various). Monitors. Major specialist equipment. Diathermy. Operating table.	Aseptic Room. ACORN standards. Secure Drugs storage (4R/8). AS/NZS 4187.	Invasive. Sterile field. High staffing levels.	General anaesthetic. Sedation. Regional block. Local anaesthetic (option).

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Interventional	Radiological driven surgery Catheter driven Angiography / Neurosurgery	Barrier entry. Radiological equipment in-room (fixed). 3m high ceiling (minimum). Control room / Equipment room adjacent. Lead shielding. Additional shielding as required (e.g. Magnetic). Laser safe working environment to AS/NZS 4173. Hands free Scrub external to Room. Hands free door activation. • 55-70m^2	HVAC - HEPA filtration (DD) minimum 2.4 x 2.4 min at ceiling level. Room pressurisation to comply with WAHFG / ES. L Exhaust. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous, Tool Air and Carbon Dioxide. WAHFG / ES compliance as for Operating Room / General Surgery.	Cardiac protection to AS/NZS3003. LIOM protection to all UPS and essential supply outlets on medical pendants. UPS power required to a minimum of 25% of socket outlets installed on the medical pendants. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets installed on the medical pendants. Emergency call point.	Multiple surgical lights connected to UPS. The primary light to be a minimum of 160,000 lux (at 1m - affl) and the satellite to be a minimum of 125,000 lux (at 1m - affl). Sterile "clean room" type general lighting to AS/NZS1680.2.5. 'X-ray / Laser in Use' illuminated outside each entry. Room in Use lights outside each entry. Minimum of two pendants. EWIS/Fire visual indicator/strobe.	Anaesthetic Machine. Anaesthetic trolleys. Mobile (various). Monitors. Major specialist equipment (including radiological). Diathermy. Operating table.	Aseptic Room. ACORN standards. Secure Drugs storage (4R/8). AS/NZS 4187.	Invasive. Sterile field. High to very high staffing levels.	General anaesthetic. Sedation. Regional block. Local anaesthetic (option).

	Activity	Architectural	Mechanical	Electrical/ Communications	Lighting/Pendants	Equipment	Clinical	Asepsis	Anaesthetic
Hybrid	Radiological enhanced surgery 'Keyhole' surgery (minimally invasive) Image guided robotics	Barrier entry. Radiological equipment in-room (fixed). 3m high ceiling (minimum). Control room / Equipment room adjacent. Lead shielding. Additional shielding as required (e.g. Magnetic). Laser safe working environment to AS/NZS 4173. Hands free Scrub external to Room. Hands free door activation. • 80m^2+	HVAC - HEPA filtration (DD) minimum 2.4 x 2.4 min at ceiling level. L Exhaust. Medical Gases - preferably on anaesthetic Pendant. Include Suction, Oxygen and Medical Air. Consider Nitrous, Tool Air and Carbon Dioxide. Temperature controllable from within room. WAHFG/ES compliance as for Operating Room / General Surgery.	Cardiac protection to AS/NZS3003. LIOM protection to all UPS and essential supply outlets on medical pendants. UPS power required to a minimum of 25% of socket outlets installed on the medical pendants. Vital / Essential supply power required to a minimum of 25%, and a maximum of 75% of socket outlets installed on the medical pendants. Emergency call point.	Multiple surgical lights connected to UPS. The primary light to be a minimum of 160,000 lux (at 1m - affl) and the satellite to be a minimum of 125,000 lux (at 1m - affl). Sterile "clean room" type general lighting to AS1680.2.5. 'X-ray / Laser in Use' illuminated sign outside each entry. Room in Use lights outside each entry. Minimum of two pendants. EWIS / Fire visual indicator/strobe.	Anaesthetic Machine. Anaesthetic trolleys. Mobile (various). Monitors. Major specialist radiological equipment, possibly in attached but separate room. Diathermy. Operating table.	Aseptic Room. ACORN standards. Secure Drugs storage (4R/8). AS/NZS 4187.	Invasive. Sterile field. High to very high staffing levels.	General anaesthetic. Sedation. Regional block. Local anaesthetic (option).

Legend:

ACORN .....Australian College of Operating Room Nurses
AHFG .....Australasian Health Facility Guidelines
AS .....Australian Standards
Barrier Entry.....Exit Bay Scrub Bay/Set-up/OR (Controlled access)
CC .....Colour Corrected
DD .....Downward Diffusion
EWIS .....Emergency Warning & Intercommunication System
GENCA .....Gastroenterology Nurses College of Australia
HVAC .....Heating, Ventilation and Air Conditioning
HEPA .....High Efficiency Particulate Air
LL/HL .....Low Level/High Level
HG.....Private Hospital Guidelines
Type A .....Size of handbasin, refer to Australasian Health Facility Guidelines
WAHFG/ES .....WA Health Facility Guidelines for Engineering Services

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