

Liverpool Hospital Redevelopment

PART 3A PROJECT APPLICATION
BUILDING SERVICES

MILESTONE 3

- Rev 01
- 29 October 2010



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Sinclair Knight Merz
ABN 37 001 024 095
100 Christie Street
St Leonards NSW 2065 Australia
Postal Address
PO Box 164 St Leonards NSW 2065 Australia
Tel: +61 2 9928 2100
Fax: +61 2 9928 2500
Web: www.skmconsulting.com

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Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
00	22/10/2010	C. Semple	W. Nel	22/10/08	Final

Distribution of copies

Revision	Copy no	Quantity	Issued to
00	1	1 -pdf	Project Web

Printed:	29 October 2010
Last saved:	29 October 2010 04:55 PM
File name:	I:\NBAP\Projects\NB30201\Deliverables\5) Reports\5.2) MS3\Schematic Design Report\Part 3A report Rev00 sent\NB30201 MS3 Bldg Svcs Part 3A Report_Rev00.docx
Author:	Brian Philips, David Creasey, Michael Yan, Marianne Worrall, Jonathan Yapp, Daniel Rasins
Project manager:	William Nel
Name of organisation:	Bovis Lend Lease
Name of project:	Liverpool Hospital Redevelopment MS3
Name of document:	Part 3A Project Application Building Services
Document version:	Rev 00
Project number:	NB30201



Executive Summary

SKM has been engaged by Bovis Lend Lease to provide the building services design for the Liverpool Hospital Redevelopment project. These services include:

- Electrical Services;
- Communications Services;
- Security Services;
- Mechanical Services;
- Medical Gas Services;
- Hydraulic Services;
- Fire Services;
- Lift Services.

Standards/Guidelines

The engineering services shall be designed with reference to the following:

- The NSW Health Engineering Services Guidelines TS11 2005;
- The Building Code of Australia 2007;
- BCA Report; and
- Relevant Australian Standards;
- Government Department's Regulations.

Authorities and Councils requirements include:

- The requirements of relevant Local Councils and Local Water Corporation; and
- Energy Australia, NSW Fire Brigades and Environmental Protection Authority.

This Part 3A application summarises the building services schematic design for Milestone 3 (MS3) – refurbishment and the expansion of Ground Floor in the existing Oncology Building.

New standalone Clinical Skills Building is also part of this scope of work.



1. Mechanical Services

1.1. General

The mechanical services for the refurbishment & extension of Ground floor Oncology Building will provide a comfortable indoor climate that will assist with infection control and the medical treatment of patients. Existing air conditioning and ventilation plants to the Oncology Building is to remain with some modification to suit the changed floor plan.

New air conditioning systems shall be added to serve the new extension such as waiting area, cytotoxic drug area and new bunkers.

New dedicated mechanical services will be provided for the new research bunkers. Electricity consumption of the mechanical services for the research bunkers will be separately metered.

New dedicated mechanical systems will be provided for the new standalone 2-story Clinical Skills Building. A new plant room is proposed on the existing roof of education building to house the new chiller, boiler and air handling units.

1.2. Standards

- Mechanical ventilation and air conditioning: To AS/NZS 1668.1 and AS 1668.2.
- Microbial control: To AS/NZS 3666.1.
- Water supply: To AS/NZS 3500.1.2.
- Plumbing and drainage: To AS/NZS 3500.2.2.
- Electrical installations - Selection of cables: AS 3008.
- New South Wales Environmental Planning and Assessment Act and Public Health Act.
- Building Code of Australia 2007.
- Electrical work: To AS 3000.
- Degree of electrical protection: To AS 1939.
- Electrical supply: Services Rules, Regulations and Requirements of the Electrical Supply Authority.
- Safety and occupational health: The requirements of the New South Wales WorkCover Authority and New South Wales Occupational Health and Safety Act.
- NSW Health Engineering Health Guidelines TS-11 2005.

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1.3. New Research Bunker Area MS3

New dedicated mechanical systems will be provided for this area, for which sub-meter is to be provided to monitor power consumption. A new plant room area is required to hold the new mechanical equipments.

Chiller and Heat pump:

A new air cooled chiller and chilled water pump will be provided to supply chilled water to AHUs (Air Handling Units) for space cooling.

An air source heating water heat pump will be installed for space heating of the new research bunker. No natural gas line is required in this case.

Air handling systems:

New air handling systems serving the research bunkers are to be located in existing plant room, where space is made available by demolishing the redundant air handling system serving the existing cytotoxic drug area. The AHUs will incorporate ventilation requirements and economy cycle mode.

Helium exhaust and room exhaust:

Helium exhaust will be provided for MRI machines. Room exhaust can be activated automatically by the room sensor/controller and also manually by the panic button in the wall.

1.4. New Cytotoxic Areas MS3

Air handling systems:

New air handling systems will be provided for the new cytotoxic area to meet the requirements of room cleanliness, pressure, temperature, air speed, etc. The system consists of AHU with 100% outside air and various room terminal HEPA (High Efficiency Particulate Air) filters. Dedicated exhaust will be provided for the cytotoxic room with terminal HEPA filter over the Class II safety cabinet.

Emergency panic buttons will be provided to activate the spill mode of air handling systems, should the safety cabinet fails or drug spillage occurs in the cytotoxic room.



Chilled water and heating water:

Chilled water and heating water reticulation system required by the air handling systems will be connected to the existing Central Energy chilled water and heating water system.

Water to water heat exchanger and associated pumps will be provided to convert the high temperature water (nominal flow temperature 145°C) from Central Energy plant into lower temperature heating water (nominal flow temperature 80°C).

1.5. New Bunkers, Waiting Areas and CT meeting room MS3

Air handling systems:

New air handling systems will be provided for the new bunkers, waiting areas and the 18-person CT meeting room. The air handling systems will incorporate ventilation requirements and economy cycle mode.

Chilled water and heating water:

Chilled water and heating water reticulation system required by the air handling systems will be connected to the existing Central Energy chilled water and heating water system.

1.6. New Clinical Services Building

Chiller and Boiler:

New dedicated air cooled chiller, chilled water pump and buffer tank will be provided to supply chilled water to AHUs and FCUs for space cooling of the Clinical Skills Building.

A natural gas fired boiler will be installed for space heating, and heating water will be distributed to AHUs, FCUs, and heating coils via insulated pipework. This boiler will also be used to supply the domestic hot water demand, via a heat exchanger.

Electricity and gas consumption of mechanical services for this building shall be separately metered.

Air handling systems:

FCUs are provided for seminar rooms, clinical laboratories and tutorial rooms. AHUs incorporating ventilation requirement and economy cycle mode will be provided for other areas.

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2. Medical Gas Systems

2.1. General

Oxygen, Medical Air and Suction systems will be provided to the refurbishment and extension works of the MS3 project in accordance with AS 2896 and TS-11 2005.

Medical gas services for the Oncology Building will extend from the existing oxygen, medical air and suction pipework currently serving this building. High pressure air is also connected to some rooms within this building and will remain in the rooms that are not being demolished.

Services to the existing LinAc bunker rooms in Oncology shall remain operational during construction with minimal shut-down times.

Medical gas services for the Clinical Skills building will be sourced from bottle manifolds. Venturi suction and scavenge will be sourced from the Medical Air system.

2.2. Standards

New systems will be designed in accordance with the Building Code of Australia 2007, relevant Australian Standards and NSW Health Engineering Guidelines TS-11 2005 specific to the Liverpool Hospital Refurbishment project.

Medical gas systems: To AS 2896.

Degree of electrical protection (IP Code): To AS 60529.

Electrical work: To AS/NZS 3000.

Electromagnetic compatibility of electrical and electronic apparatus: To AS/NZS 4251.1 and AS/NZS 61000.6.1.

2.3. Oncology Building

2.3.1. Medical Gas Outlets

New outlets will be required for new rooms within the renovated areas, and redundant outlets will be removed. Number of outlets to be based on existing rooms, Australian Standards AS 2896, TS11 and User Group requirements.



2.3.2. Oxygen Source

Oxygen source (main oxygen and backup) to remain as existing, from the new bulk storage on Eastern campus and new backup tank on the Western side of the railway line.

No local backup oxygen source will be provided.

2.3.3. Medical Air Source

Medical Air source to remain as existing, from medical air compressors located at the Energy Station serving the entire hospital campus.

2.3.4. Vacuum Suction Source

Vacuum Suction source to remain as existing, from the Vacuum Suction Plant Room on Level 2 of the Pathology Building.

2.3.5. Nitrous Oxide

No Nitrous Oxide is required for the new building works.

2.3.6. High Pressure Air (Tool Air)

High Pressure Air currently leads to the Mould Making Room which will remain. There are no additional High Pressure Air requirements for the new building works.

2.3.7. Medical Gas Reticulation

Pipework within the Cancer Care building will be removed from ceilings and new pipework laid out to reflect new room layouts and use requirements. Existing pipework to the existing LinAc Bunker Rooms will be retained to minimise the cost of new pipework.

Staging is to be considered to maintain operation of the existing LinAc Bunker Rooms.

Fire collars are to be installed for pipework running through a fire wall.

2.3.8. Medical Gas Valve Boxes (MGVB)

Existing MGVB serving existing LinAc Bunker Rooms in the Oncology Building is to remain. New MGVB's will be required for new and refurbished areas.

2.3.9. Medical Gas Alarm Panel (MGAP)

Existing MGAP's to remain if possible. New MGAP's will be required for new and refurbished areas.

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2.3.10. Special requirement for the new Research Bunker

The new Research Bunker will be fitted out as a fully functioning bunker with oxygen, medical air and suction outlets. All medical gas serving this room will have a dedicated MGVB, MGAP and usage meters.

2.4. New Clinical Skills Building

2.4.1. Medical Gas Outlets

The new Clinical Skills building has two operating theatres on Level 1. The operating theatres and associated anaesthetic rooms and will be fitted out as fully functioning with oxygen, medical air, nitrous oxide, scavenging and suction outlets.

Typical outlets for rooms (based on Australian Standards and Australasian Health Facility Guidelines):

- Operating Theatre (located on the pendants): 4xOxygen, 2xMedical Air, 4xSuction, 2xNitrous Oxide, 2xScavenge
- Anaesthetic Room (located on a services panel on the wall): 2xOxygen, 1xMedical Air, 2xSuction, 1xNitrous Oxide, 1xScavenge

Medical gases will also be provided to the seminar rooms as required for educational purposes.

2.4.2. Medical Gas Sources

Oxygen, Medical Air and Nitrous Oxide gases will be obtained from bottle manifolds located near the new Clinical Skills building.

Venturi suction and scavenge will be derived from the medical air pipework system.

2.4.3. Medical Gas Reticulation

Pipework will be reticulated from the bottle manifold store area to Ground Floor and Level 1.

2.4.4. Medical Gas Valve Boxes (MGVB)

Shut-off valves will be provided for each floor within the pipework riser in a medical gas valve cabinet.

Medical gas alarm panels will be located outside each area where medical gases are provided. MGVB's that serve each Operating Theatre will be located within the control room.

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2.4.5. Medical Gas Alarm Panel (MGAP)

A medical gas alarm panel will be provided for each medical gas valve box. An additional alarm panel will be located within the control room for each operating theatre.



3. Electrical

3.1. General

This section of the report will describe the proposed electrical services for Milestone 3 (Refurbishment & Extension of Ground floor Oncology Building and the construction of the New Clinical Skills Building – 2 storeys).

There are no proposed works within the adjacent Pathology Building.

3.2. Standards

The design will take into account and cover all statutory requirements.

The new and refurbished areas will be designed strictly in accordance with current editions of the following Australian Standards:

- Electrical work: AS/NZS3000 (Wiring Rules)
- Patient Treatment Areas of Hospitals, Medical and Dental Practices: AS 3003
- Degree of electrical protection: AS 1939
- Guide to the safe use of electricity in patient care areas: AS 2500
- Electrical installations – Selection of cables: AS 3008
- Classification of the Fire and Mechanical Performance of Wiring Systems: AS 3013
- Low Voltage switchgear and control gear assemblies: AS 3439.1 and AS 3439.2
- Emergency Power Supplies in Hospitals: AS 3009
- Hard-wired patient alarm systems: AS 3811
- Interior Lighting: AS1680 (all parts)
- Exterior Lighting: AS1158.3.1
- Emergency Lighting to Buildings: AS 2293
- Requirements for customer cabling products: AS/ACIF S008
- Installation requirements for customer cabling (Wiring Rules): AS/ACIF S009
- Telecommunications installations - Generic cabling for commercial premises (ISO/IEC 11801:2002, MOD) : AS 3080
- Telecommunications installation – Telecommunications pathways and spaces for commercial buildings (ISO/IEC 18010): AS 3084
- The Building Code of Australia 2007



- The New South Wales Health Department – Engineering Guidelines Technical Series TS-11-2005 version
- NSW Service and Installation Rules

3.3. Scope of Works

Milestone 3

Major refurbishment works are expected to the Ground Floor of the Oncology Building. Electrical services to this floor is expected to be the provision of new services for power / lighting / comms / Nursecall / MATV and medical services panels.

Where new items are to be provided due to the refurbishment, then items of equal standard to the existing shall be proposed.

The construction of the new Clinical Skills Building shall include the following electrical services, power / lighting / comms / Nursecall / MATV and medical panels.

All items in the new Clinical Skills building will be new, and matching the existing systems used in the existing Clinical Services/Education building. New distribution cupboards and communications room shall be provided.

3.4. Services to be retained

For the refurbishment works to the existing Oncology building the main backbone infrastructure shall be retained, unless otherwise stated.

In Milestone 3, the main electrical supply to the Oncology building originates from the Pathology Building.

Areas where no refurbishment is to be carried out shall retain all existing services equipment.



3.5. Services to be Provided

In Milestone 3, the services to be provided are as follows:

- For the new Clinical Skills Building:
 - New electrical services items includes, but are not limited to,
 - Lighting installation including the following:
 - General Purpose lighting
 - Special Purpose lighting
 - Medical examination lighting
 - Exit signs and emergency lighting with computerised monitoring
 - Lighting control methods, including selective switching and energy management
 - New Distribution Boards (Normal and Essential)
 - General Purpose Power, including general RCD protection and cleaners outlets
 - New Communications room rack and dedicated UPS
 - Special Purpose Power, including Body and Cardiac Protected circuitry
 - Nurse Call equipment
 - X-Ray Viewing screens
 - Medical services panels
- For Oncology extension and refurbishment:
 - Safe disconnection and removal of the electrical services items within the zones deemed to be refurbished. All circuiting to be terminated at the respective distribution boards.
 - Lighting installation including the following:
 - General Purpose lighting
 - Special Purpose lighting
 - Medical examination lighting
 - Exit signs and emergency lighting with computerised monitoring
 - Lighting control methods, including selective switching and energy management
 - Existing Distribution Boards (Normal and Essential) – shall be modified. Refer to Distribution Board section
 - General Purpose Power, including general RCD protection and cleaners outlets
 - New Communications room dedicated UPS
 - Special Purpose Power, including Body and Cardiac Protected circuitry
 - Nurse Call equipment, where required shall match existing

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- X-Ray Viewing screens, where required
- Medical services panels, where required
- New power supplies to the two (2) - off new Linear Accelerators
- New metered power supply to a dedicated Distribution Board for the Research Bunker.
- New metered supply from the essential side of the MSB for the Research Bunker Linac and MRI machine.

3.6. Existing Electrical Power Supply – Normal and Hospital Essential

The existing electrical plantroom on the roof level of Alex Grimson Building contains the HV electrical infrastructure which originates from the Central Energy Services Building (CES).

This HV infrastructure serves three (3) buildings, namely, Alex Grimson, Pathology and Oncology.

The HV infrastructure comprises of three (3) HV/LV transformers, HV switches and HV/LV cabling.

The Alex Grimson Main Switchboard (MSB) supplies Pathology MSB, which in turn supplies the Oncology MSB.

All existing MIMs backbone cabling will be retained, including all cable risers, cable routes and trays.

Existing HV generators located at the CES provides the diesel generator back-up power supply to the Alex Grimson/Pathology and Oncology buildings, and forms part of the Hospital private HV network.

The electrical supply, Normal and Essential, for the new clinical skills building will originate from the existing original Clinical Services Building MSB.

3.6.1. Electrical Loads

In Milestone 3, it is estimated that the refurbishment and extension of the Oncology building can be sustained by the existing electrical infrastructure. It is estimated that the new clinical skills building can be sustained by the existing electrical infrastructure of the existing Clinical Services Building MSB.

3.6.2. Voltage Drop

Voltage drop of the distribution system shall not exceed 5% from the substation low voltage termination point, ie: the Alex Grimson MSB.

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It is assumed that the total voltage drop on the consumer mains at the Oncology Building MSB from the Alex Grimson Building MSB is approx 1 - 1.5%.

In general the maximum voltage drop allowances on the distribution system shall not exceed the following for new installation works:

Submains: 1.5%

Final Subcircuits: 2%

3.7. Sub-Mains and Distribution Boards

3.7.1. Sub-mains

In the refurbishment works, all submain cabling to respective distribution boards, normal and essential, shall be retained.

New submain cabling shall be provided for the new Clinical Skills Building.

3.7.2. Distribution Boards

Lighting and power circuits within each area shall originate and be protected from the existing respective distribution boards located in the existing electrical cupboards/risers.

Generally all distribution boards shall be fitted with circuit breakers with the appropriate RCD protection, together with a minimum current fault rating of 10kA.

All existing DB's are fitted with 36kA breakers, so the existing distribution boards shall be modified to fit 10kA breakers with RCD protection.

New distribution boards shall be provided within the new Clinical Skills Building.

3.8. Lighting

The general and specific lighting, for the refurbished and new works, will be designed in accordance with AS 1680 and TS11 requirements.

In non-medical areas, lighting and switching controls shall comply with the requirements of BCA Part J6.

3.9. Emergency Evacuation Lighting and Exit Signs

For the refurbishment works, the existing emergency and EXIT system shall be tested and audited prior to the new system being installed. This is to ensure that all the emergency and EXIT lighting

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in the refurbished floors shall have a fully compliant system. As some areas on the floors are not affected by the refurbishment, the audit will reveal these areas and the emergency and EXIT lighting shall be repaired or upgraded.

All new emergency lighting and Exit signs shall comprise self-contained individual units (SPU) with integral battery pack, control unit and inverter, connected to the existing computer monitored network.

The new pictogram style EXIT signs shall be used throughout the refurbished areas.

The new Clinical Skills Building shall be provided with new emergency and exit signs and shall be provided to match the same system as that installed in the original existing Clinical Services Building.



3.10. Wiring in Patient Protected Areas

All body and cardiac areas shall comply with the requirements of AS3003.

3.10.1. Body Protected Areas

Panel-mounted, 10 Amp power socket outlets shall be provided in accordance with the installation requirements of AS3003.

All outlets shall be protected by means of a 10mA earth leakage circuit breaker (RCD) which shall be located in the patient care area (and not at the distribution board).

3.10.2. Cardiac Protected Areas

Panel-mounted, 10 Amp power socket outlets shall be provided in accordance with the installation requirements of AS3003. In addition to the requirements for Body Protected Areas, full emphasis shall be provided regarding equipotential bonding within the patient care area.

Each patient location shall be provided with a minimum of two dedicated circuits from individual essential distribution boards (where available), which shall not be shared with other patients.

Visual and audible alarm shall be provided at each staff station for each Cardiac Protected area to alert nursing staff when a circuit breaker trips in a patient area. The audible alarm would be muted at the staff station, but the alarm lamp would remain on until the relevant circuit breaker has been reset.

Testing and re-certification of these areas shall be undertaken by a Biomedical Engineer.

3.11. Medical Services Panels

Medical services panels shall be provided to all required areas.

All panels and pendants shall have power components, voice/data, nurse call, medical gas and other monitoring components as required.

Generally, medical services panels shall be powder-coated.

3.12. Nurse Call

For the refurbishment, the new nurse call equipment shall be of the same make as that used in the existing Oncology Building.

This includes:

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- Alpha-numeric annunciator
- Nurse call / Staff assist / Emergency call buttons (incl. IP rated for ensembles)/PorterCall (where required)
- Over-door indicator lights
- Patient Entertainment Handsets and Patient Call Handset
- Other nurse call units deemed required by the Hospital (such as pneumatic pump)

The new Clinical Skills Building will be provided with a new Nurse call system.

3.13. MATV

The MATV system shall be discussed with the existing MATV service provider engaged directly by the Hospital/Area Health Service.

The existing reticulated MATV network shall be retained for the refurbishment and be reconfigured to suit the new refurbished layouts.

The new Clinical Skills Building will be provided with a new MATV system.

3.14. Lighting Control

Lighting controls generally will be achieved by manual local switches that compartmentalise corridor areas and ward areas.

No switches shall be located in public corridors.

All single toilets/WC with a single luminaire shall be provided with an essential lighting supply, where there is no dedicated emergency lighting present within.

General Patient lighting within the inpatient units will be locally switched. Corridor lighting around the ward areas will be locally switched at the staff stations.

General area corridors, not in ward areas, and open plan workstation areas will be switched from designated local switch points.

Consulting rooms and offices will be locally switched.



3.15. Communications Systems

3.15.1. Communications Design Parameters and Assumptions

In the refurbishment works of Milestone 3 the existing cross-connect and MDF will be retained. All existing backbone cabling will be retained.

All new horizontal structured cabling system shall be Cat 6a.

New racks and patch panels will be installed in the existing communications room.

These rooms may also contain other specific services equipment, such as MATV, Security and NurseCall.

The existing UPS DB within the rooms shall remain.

For the new Clinical Skills Building, a new communications rooms will be provided to each level. This communications room will house 2 racks, and be approx 3 x 3m in dimension.



4. Security Systems

4.1. Introduction

This report describes the conceptual recommendations, systems, and components that enhance the security operations and make up the proposed Security Management System (SMS) for the existing Oncology Department and new Clinical Skills Department at Liverpool Hospital. This redevelopment is known as Milestones 3 & 4.

4.2. Standards and Guidelines

The security systems design for the new Milestone 3 and Milestone 4 development shall comply wherever possible with the following standards and guidelines:

- AS/NZS 2201 Intruder Alarm Systems
- AS/NZS 4806 Closed Circuit Television (CCTV)
- AS/NZS 4485 Security for Health Care Facilities
- AS/NZS 1170.2 Wind Loads
- AS/NZS HB3 Drawing Standards
- AS/NZS 1049 Telecommunication Cable – Insulation and Sheath - Polyethylene
- AS/NZS 1099 Tests for Electronic Equipment
- AS/NZS 1100 Technical Drawings
- AS/NZS 1101 Graphical Symbols for General Engineering
- AS/NZS 1102 Graphical Symbols for Electro technology
- AS/NZS 1104 Informative Symbols for use on Electrical and Electronic Equipment
- AS/NZS 1345 Identification of the Contents of Pipes, Conduits and Ducts
- AS/NZS 1768 Lightning Protection
- AS/NZS 1882 Earth and Bonding Clamps
- AS/NZS 2052 Metallic Conduits and Fittings
- AS/NZS 2053 Non Metallic conduits and Fittings
- AS/NZS 2279 Disturbances in Mains Supply Networks
- AS/NZS 2546 Printed Circuit Boards
- AS/NZS 3000 S.A.A. Wiring Rules
- AS/NZS 3901 Quality Assurance Standards
- AS/NZS 3905.2 Quality Systems Guidelines
- AS/NZS 4251.1 Electromagnetic Compatibility – Generic Emission Standards

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- AS/ACIF S008:2006 Requirements for Customer Cabling Products
- AS/ACIF S009:2006 Installation Requirements for Customer Cabling (Wiring Rules)
- HB228:2001 Guidelines for Managing Risks in the Healthcare Sector
- IEC 297 Dimensions of Mechanical Structures of the 482.6 mm (19) series.
- ISO 9001 Quality Systems Guidelines
- ISO 9003 Quality Systems
- NSW Health: Engineering Services and Sustainability Development Guidelines, Technical Services TS11 2005
- Protecting People & Property: NSW Health Policy & Guidelines for Security Risk Management in Health Facilities dated December 2003
- Australasian Health Facility Guidelines.

4.3. Security Philosophy

The basis of the design is to establish the system parameters necessary to create and maintain a welcoming environment for all patients, staff, and visitors within the facility and provide a safe and secure environment for all those persons and assets within the site. The design and implementation of security systems and procedures for the refurbishment of the existing Oncology Department and new Clinical Skills Department will be integrated into the new systems being provided as part of Milestones 1 & 2 – taking into account all integration/migration issues.

As well as robust security operating policies and procedures, a mix of electronic and physical security measures have been employed in view of achieving the overall security objective.

The overall security philosophy will be to provide a series of integrated systems that have the operational flexibility to maintain an appropriate security posture based on the security threat level at a given point in time.

The system must further provide capability to deliver the highest quality for system expansion and change. The SMS will be comprised of such sub-systems as:

- Electronic Access Control and Intrusion Detection System (EACS & IDS):
 - Access Control
 - Intrusion Detection
 - Interfaces for building management and Liverpool Hospital administrative systems.
- Closed Circuit Television System (CCTV):
 - Fixed full body cameras

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- Fixed dome cameras
- Network Video Storage
- Video Analytics
- Interface with the ACID and Intercom System for event/alarm recording.
- Video Intercom System:
 - Remote Call Stations for assistance
 - Designated Master Stations for Call answering.
- Duress Alarm System:
 - Remote Call Stations for assistance

4.4. Security Design Consideration

The planning and layout of the building and site have contributed greatly in creating a physically secure structure and safe area. Locking hardware, entrances and exits, flow and traffic patterns of building occupants and other pedestrians, and the location of service areas such as lobby reception and visitor services all contribute towards the provision of a protective ring for the building.

As part of this Part 3A Report, the following recommendations were used as guidelines for the protection of Liverpool Hospital staff and assets at the existing Oncology Department building and new Clinical Skills Department and these recommendations are reflected in the design drawings.

- Control access to the wards by using access control at the entry point to each department. Authorised visitors are provided with intercom facilities at the entry point to the ward through which they can gain access after being identified by ward staff.
- CCTV coverage shall be provided to nominated public corridors, concourses, and waiting rooms.
- The new SMS shall be an extension of the new system installed at the new Clinical Services Building (Milestone 1) and refurbished areas of the existing Clinical Services Building (Milestone 2).
- The new SMS shall report and be monitored from the Security Control Room at Milestone 2.
- Access to Communications Rooms and staff only areas shall be controlled via electronic access control.
- For internal and external areas where patients are considered at risk, a hard wired duress alarm system shall be provided as per TS11 requirements.

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- Control access to managed and restricted medical, administration and services areas using electronic access control.
- Control access to wards – install video intercom stations at entry points to departments to allow staff to identify visitors / patients.

4.5. System Integration and Maintenance

For all areas not part of the Milestones 3 & 4 refurbishment works, the existing Access Control System (DKS System) shall be retained and operate as a stand-alone system, separate to the new Access Control System installed as part of Milestones 1 & 2.

For all areas not part of the Milestone 2 refurbishment works, the existing CCTV system shall be retained and operate as a stand-alone system, separate to the new CCTV system to be installed as part of Milestone 1.

When required the new CCTV and Access Control platform can be expanded to accommodate the existing hospital.

The Head end equipment for both the CCTV and the Access Control whilst primarily installed in the new building is intended to control and integrate the entire hospital, including the new works to be carried out under Milestone 2 at the existing Clinical Services Building. The existing Head End equipment at the existing CSB shall operate as a separate system to the new system being installed in Milestone 2.



5. Hydraulics

5.1. General

This section outlines the Hydraulic Services Design for the Clinical Skills Building hydraulic services installation.

The two level Clinical Skills Building will be provided with independent services connections to public utilities comprising Sanitary plumbing and Drainage, metered services comprising Domestic Cold water service and Fire hose reel service and Natural gas. The Fire hydrant service is not metered and will join the Liverpool hospital ring main hydrant service in compliance with the NSW Fire Brigade recommendations and the Liverpool Hospital Master Plan for Infrastructure.

Domestic hot water services will originate at a 500 litre volume Polypropylene Legionella resistant storage vessel which is heated from the buildings gas fired boiler by means of a stainless steel coil. Domestic hot water will be distributed through a system of copper tube reticulation, the temperature to fixtures used for ablution purposes being regulated in accordance with AS3500 and the NSW Health Engineering Guidelines (TS 11).

Rainwater collection from the building roof will join vertical down pipes in the positions shown by the architect, the system will be designed to accept a 5 minute peak storm duration with a storm recurrence frequency of 50 years for box gutter and 20 years for eaves gutters. The rainwater down pipe system will join the Civil Engineering scope of works.

The hydraulic services design will be compliant to AS/NZS 3500 National Plumbing and Drainage code (All parts). Materials selection will be Australian Standards and Sydney Water approved and based on environmental considerations, drainage and plumbing systems being PVC for all discharges other than very hot flows which will discharge to approved HDPE pipe and fittings. Waste pipes passing over consulting rooms, seminar teaching areas and similar noise sensitive areas will be acoustically insulated in accordance with the Building Code of Australia, the domestic hot and cold water services copper tube with silver solder joints, hot water will be circulated to maintain a minimum temperature, the hot water pipes will be thermally insulated.

Sanitary fixtures and fixtures including stainless steel fixtures will be specialised for health care work and will be selected by the Architect and supplied and fixed in the scope of the hydraulics work.

The Plumbing Drainage and Hydraulic services will be compliant to the following

- Earth Quake Code
- AS 3500 – National Plumbing Code all parts

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- NSW Health Memorandum of approved warm water systems
- AS 5601 Gas Code
- NSW Code of Practice (Plumbing and Drainage)
- Building Code of Australia 2007
- AS 2419.1 - 2005 Installation of fire hydrants
- AS 2441 – 2005 Installations of fire hose reels
- NSW Health Department Engineering Services and Sustainable Development Guidelines: TS11, 2005
- Safety and occupational health: The requirements of the New South Wales Work Cover Authority and New South Wales Occupational Health and Safety Act.
- The requirements of all authorities having jurisdiction over the site.
- Sydney Water requirements and Trade Waste Guidelines
- Sydney Water Building Over Sewers regulations



6. Fire Services

6.1. General

This section outlines the Fire Services design for the upgraded & modified areas of the existing and proposed work that comprises Milestone 3.

It is proposed to upgrade fire services within each of the fire compartments to current BCA2007 compliance for the extension & modifications to the MS3 Ground floor of Cancer (Oncology) Building & new Clinical Skills Building.

6.2. Standards

The design will take into account and cover all statutory requirements.

The refurbished areas will be designed strictly in accordance with the current:

- Building Code of Australia 2007
- BCA Report prepared by Davis Langdon
- Fire Engineering Report
- NSW Health Department Engineering Services and Sustainable Development Guidelines: TS11, 2005
- The requirements of the New South Wales Work Cover Authority and New South Wales Occupational Health and Safety Act and Regulation.
- NSW Fire Brigades.
- The requirements of all authorities having jurisdiction over the site.
- Earth Quake Code
- AS 2118.1 – 1999 Automatic fire sprinkler systems (Wall Wetting Sprinkler System)
- AS 1670.1 – 2004 Fire alarms & detection systems
- AS 1668.1 – 1998 Smoke Control
- AS 1670.4 – 2004 Sound systems and intercom systems for emergency purposes system
- AS 2444 – 2001 Portable Fire Extinguishers

6.3. Existing Building's Fire Systems

The existing fire services for the MS3 Cancer (Oncology) building were designed & constructed during 1993-94 with presumed BCA 90 compliance with unknown Amendment as follows:

- No current Fire Sprinklers are installed.

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- Fire Hydrant & Fire Hose Reels throughout the Cancer building appear to be fed via the Ground Floor from the hydrant pump room in Pathology Building.
- Fire Detection System throughout the building.
- Warden Intercom Points (WIP) & Manual Call Points located in exposed locations within egress corridors.
- EWIS throughout the building.
- Portable fire extinguishers throughout the building.

6.4. Wall Wetting Sprinkler Systems

MS3 Oncology Building: Wall Wetting Sprinklers

The MS3 Oncology Building, internal &/or external wall wetting sprinklers will be installed to suit fire compartment boundaries & exits from fire stairs as required by the BCA.

The water supply to the new wall wetting sprinkler electric pump within the new Oncology Building Pump Room is to be a compliant 150 mm underground fire sprinkler main connection incorporating a NSWFB booster and be connected to an approved water source as per Capital Insight & Client directions.

MS3 Clinical Skills Building: Wall Wetting Sprinklers

The MS3 Clinical Skills Building, internal &/or external wall wetting sprinklers will be installed to suit fire compartment boundaries & exits from fire stairs as required by the BCA.

The water supply to the new wall wetting sprinkler system within the new Clinical Skills Building is to be extended from the existing fire sprinkler installation No. 1 main connection within the Basement of the MS2 Existing Clinical Services Building.

6.5. Smoke Detection & Alarm Systems

The smoke detection & alarm system will be modified & upgraded in the MS3 Oncology Building Ground floor fire compartments and new extension to serve the MS3 Clinical Services Building.

MS3 Oncology Building:

Modify existing smoke detection & alarm system to existing modified compliance & incorporate the following:

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- Upgrading & reprogramming of existing Sub Fire Indicator Panel SFIP 3 for the Oncology Building.
- Additional fan override controls to allow NSWFB operations of existing mechanical purge system for smoke extraction within the Oncology Building.
- Reprogram existing addressable Main Sub Fire Indicator Panel located in the Fire Control Room on the Ground Floor of the Education Building.
- Stripping out & re-wiring of existing heat detectors with new addressable smoke detectors with wiring installed to suit upgraded fire compartments.
- Fire alarm zones to align with new EWIS zones & fire compartments.
- Non-programmable Nurse Station Annunciator Panels within Patient Care/Treatment Wards or Mimic Panels located in Non-Patient Care areas as part of the Fire Alarm System within upgraded Ground Floor fire compartments of Oncology.
- New addressable photo optical smoke detectors will be used throughout most of the upgraded fire compartments. Heat detectors will be used in areas not suitable for smoke detectors.
- Smoke detection will be tested & confirmed operational within the mechanical systems for Smoke Hazard Management for mechanical shutdown.
- Relocate or provide new Warden Intercom Points (WIP) and new red Manual Call Points (MCP). Both items shall be located adjacent to each Nurse Station Annunciator Panel & include a visual alarm.
- Additional manual call points shall be located within fire hose reel cupboards including signage; which are within 4.0 m of each upgraded fire compartment exits.
- Security system fire trip per floor of the Oncology Building to provide a signal to release of Security doors as required in paths of travel to an Exit.

MS3 Clinical Skills Building:

Provide new smoke detection & alarm system to the Clinical Skills Building Ground floor & Level 1 fire compartments, to incorporate the following:

- The smoke detection & alarm system will be extended from the main Fire Indicator Panel within the Fire Control Room to the Clinical Skills Building Ground floor and Level 1 fire compartments via a new link within the MS2 Clinical Services Building & Education Building Basement.
- Upgrading & reprogramming of existing Main Fire Indicator Panel FIP 1 for the Clinical Skills Building.
- Additional fan override controls to allow NSWFB operations of existing mechanical purge system for smoke extraction within the Education Building / Clinical Services Building.

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- Fire alarm zones to align with new EWIS zones & fire compartments (Note: multiple fire zones may be required within each EWIS zone)
- Non-programmable Nurse Station Annunciator Panel within Clinical Services Building Ground Floor Reception as part of the Fire Alarm System within upgraded Ground Floor fire compartments of Oncology, to provide early indication of fire alarm locations within each fire compartment.
- New addressable photo optical smoke detectors will be used throughout most of the upgraded fire compartments. Heat detectors will be used in areas not suitable for smoke detectors.
- Smoke detection will be tested & confirmed operational within the mechanical systems for Smoke Hazard Management for mechanical shutdown.
- Provide new Warden Intercom Points (WIP), new red Manual Call Points (MCP). Both items shall be located adjacent to Nurse Station Annunciator Panels & include Visual Alarms.
- Additional manual call points shall be located within fire hose reel cupboards, including signage; which are within 4.0 m of each upgraded fire compartment exits.
- All new fire zones, red type manual call points (MCP) & wiring will be connected to the upgraded Sub Fire Indicator Panels.
- Security system fire trip per floor of the Clinical Services Building to provide a signal to release of Security doors as required in paths of travel to an Exit.

6.6. Mechanical / Fire Services Interface

- The mechanical services will shut down under fire trip.
- Additional fan override controls to allow NSWFB operations of existing mechanical purge system for smoke extraction within the Oncology Building.
- Mechanical reset button via the BMS system and individual floor reset buttons will be provided on the existing FFCP for mechanical services reset in a post-fire condition.

6.7. Programmable Colour Graphics Computer Package

Fire Control Room:

- Update the building layout drawings to suit the modified & upgraded fire compartments with any Vigilant or equivalent graphics package hardware &/or latest software version including updates required located in the Fire Control Room at the Education Building.
- Provide all re-programming, including new drawing scans & integration of the Automatic Fire Alarm & Emergency Warning & Intercom Systems to the upgraded existing Clinical Services Building.

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6.8. Sound Systems and Intercom Systems for Emergency Purposes

A new sound systems and intercom systems for emergency purposes (EWIS) system will be installed to the Ground Floor of the Existing Oncology Building upgraded fire compartments.

The existing sound systems and intercom systems for emergency purposes system will be modified to the MS3 Oncology Building Ground floor upgraded fire compartments or new extension to serve the MS3 Clinical Services Building.

MS3 Oncology Building:

Modify existing sound systems and intercom systems for emergency purposes system to existing modified compliance & incorporate the following:

- Modify & reprogram existing Master Emergency Control Panel located in the Fire Control Room on the Ground Floor of the Education Building.
- Upgrading & reprogramming of existing Sub Emergency Control Panels located on the Ground Floor Pathology/Oncology Building entry to current AS1670.4 compliance for upgraded EWIS zones.
- Upgrading of the EWIS ISO temporal T3 warning signal & visual warning in existing areas connected to the upgraded Sub Emergency Control Panels.
- Provide new & modify wiring of new & modified speakers to suit upgraded fire compartments.
- Cone type speakers located within ceilings, horn speakers within exposed areas, strobe type visual indicators where required (interfaced with EWIS).
- Supplemental strobe type visual indicators will be required at Nurse Call Stations within patient care /treatment wards to provide additional warning where speakers are removed from patient care rooms.
- Installing EWIS system visual alarms in addition to ceiling speakers in Radiation Scanning areas /or Control Rooms where equipment noise levels may affect alarm warning. i.e. Radiation Bunkers.
- New & relocated Warden Intercom Points (WIP) will be located within fire hose reel cupboards, including signage which are within 4.0 m of each upgraded fire compartment's horizontal exit.

MS3 Clinical Skills Building:

A new extension of the sound systems and intercom systems for emergency purposes (EWIS) system will be installed to the Ground Floor and Level 1 of the Clinical Skills Building fire compartments & will incorporate the following:

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- Modify & reprogram existing Master Emergency Control Panel located in the Fire Control Room on the Ground Floor of the Education Building for new EWIS zones.
- Provision of the EWIS ISO temporal T3 warning signal & visual warning in existing areas connected to the upgraded Sub Emergency Control Panels.
- Provide new & modify wiring from MFIP within the Fire Control Room to the new Clinical Skills Building fire compartments via the Basement corridor of the Education / Existing Clinical Services Buildings.
- Provide new wiring, speakers, warden intercom points and manual call points to new fire compartments.
- Provide new wiring of new speakers to suit new fire compartments of the Clinical Skills Building.
- Cone type speakers located within ceilings, horn speakers within exposed areas, strobe type visual indicators where required (interfaced with EWIS).
- Supplemental strobe type visual indicators will be required at Nurse Call Stations if within a patient care /treatment wards.
- New Warden Intercom Points (WIP) will be located within fire hose reel cupboards, including signage; which are within 4.0 m of each upgraded fire compartment's horizontal exit.

6.9. Electromagnetic Interference (EMI) & Radio Frequency Interference (RFI)

The Fire Contractor will be required to investigate locations of wiring and the degree of shielding required; i.e. Radiation Bunkers.

The Fire Contractor will be required to consider the use of CPVC Plastic sprinkler pipework in such areas that are classified as Light Hazard under AS2118.1.

6.10. Portable Fire Extinguishers

New portable fire extinguishers will be installed within the upgraded building fire compartments & will incorporate the following:

- 3.5 kg Carbon Dioxide fire extinguishers for patient care wards (to suit NSW Health requirements).
- 5 kg Carbon Dioxide fire extinguishers for plant rooms, main switchboard, administration & office areas etc.
- 4.5 kg AB (E) Dry Chemical fire extinguishers for plant rooms etc.



All extinguishers will be installed within fire hose reel cupboards including external signage where possible.

6.11. Passive Fire Protection

All fire services passing through any walls, floors and ceilings required to have a fire resistance level (FRL) rating will be sealed with approved passive fire protection systems.

6.12. Fire Safety Management, Disaster & Evacuation Plan (Displan)

A comprehensive set of fire safety management and evacuation plans will be required to be developed by the NSW Health & Liverpool Hospital, which are consistent with all fire protection equipment to be installed and EPA regulations relating to OH&S and fire safety.

The existing 'DISPLAN' would require to be updated by the NSW Health & Liverpool Hospital to suit the additional requirements of the existing Oncology/Pathology building.