OWEN FERGUSON HEALTH

SOP PRIVATE HOSPITAL ELECTRICAL SERVICES DA REPORT

Steensen Varming (Australia) Pty Ltd

SYDNEY Level 2, 160 Sailors Bay Road Northbridge NSW 2063

> MELBOURNE 15 Gisborne Street East Melbourne VIC 3002

BRISBANE Level 4, 26 Wharf Street Brisbane QLD 4000

CANBERRA Ground floor, 128 Northbourne Avenue Braddon ACT 2612

1



SOP PRIVATE HOSPITAL ELECTRICAL SERVICES DA REPORT

07781sr0001

ELECTRICAL SERVICES DA REPORT

PRODUCED FOR

St Vincent's Hospital

ENGINEER

Steensen Varming (Australia) Pty Ltd Level 2, 160 Sailors Bay Road Northbridge NSW 2063 Tel: (02) 9967 2200 Fax: (02) 9967 2992

QUALITY ASSURANCE				
ISSUE	А	INITIALS	DATE	
REVISION	0			
PRELIMINARY ISSUE		RT	25.06.07	
FINAL ISSUE				

Copyright © 2006, by Steensen Varming (Australia) Pty Ltd.

All rights reserved. No part of this report may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of Steensen Varming (Australia) Pty Ltd.

07781sr0001

SOP PRIVATE HOSPITAL ELECTRICAL SERVICES DA 2 REPORT

CONTENTS

INTRODUCTION	. 4
General Description of the Project	4
General	4
Guidelines and Standards	4
Objectives	5
Staging Issues	5
ELECTRICAL SERVICES	. 6
Existing Conditions	6
Substation	6
Standby Power	7
UPS Power Supply	8
Intra Building Reticulation	8
Metering	10
Lighting	11
General Power	11
Lightning Protection	12
Plant Spatial Requirements	13
COMMUNICATIONS AND SECURITY	14
Site Infrastructure and Reticulation	14
PABX	14
MATV	14
Security Systems	14
Clocks	15
Call Systems	15
Communication Room and Cupboard Requirements	15
COST ESTIMATES	16

Electrical Services

Introduction

General Description of the Project

The SOP Private Hospital is a new six storey building with basement and roof top plant room.

The basement will comprise a Kitchen, car park, stores and plant rooms. The main switch room will be located at basement level.

The Ground floor level will comprise Administration, Hydrotherapy pool, Gymnasium, Main reception and Medical imaging. The substation will be located at ground level.

The first and second floors are both consultant rooms with some admin provisions on the second floor.

The third and forth floors are wards with an ICU ward on the forth level.

The fifth floor is operating theatres, recovery and CSSD.

General

Electrical installations shall comply with the requirements of AS/NZS3000, relevant communications standards, applicable Industry Regulator requirements and the Local Network Provider's requirements such as the Service and Installation Rules. In addition, electrical installations and equipment shall comply with all appropriate and relevant Australian standards, for the type of installation or equipment to be used. Where Australian standards are not available, recognised international or overseas national standards shall be used where they are relevant to the type of installation and to the installation conditions in Australia.

Standards are generally focussed on safety and therefore other industry guides and benchmarks need to be adhered to ensure the project achieves a high level of quality and performance. Some other guides include but not limited to the following;

- BSRIA Power Quality Guide AG2/2000 •
- CIBSE Guide K Electricity in Buildings
- HB 300 Electrical Installations Guide to Using the Wiring Rules
- HB 301 Electrical Installations Designing to the Wiring Rules

Guidelines and Standards

The electrical services shall be design and constructed in accordance with the requirements of the Building Code of Australia, relevant Australian Standards, NSW Health Department Engineering Services Guidelines TS11 and the relevant local Supply Authority requirements.

4

Occupational Health & Safety (OH&S)

Adequate space will be provided for servicing of equipment and parts in plant rooms and the general areas. Equipment will be installed to ensure adequate serviceability without the need for unsafe work practices. Reference will be made to:

- Manufacturer's installation instructions
- Workcover requirements
- Australian Standards

Equipment

Standardization of plant equipment shall be provided to reduce maintenance and numbers of different spare parts. Where possible equipment used will be equal to existing equipment currently in use at the hospital. Adequate space and access shall be provided to all plant equipment to avoid difficulties in servicing and replacing plant components. Therefore, where possible, new plant for all sites will be of similar configuration, component

manufacture and control sequence.

ESD

Green star environmental issues are to be included within the design.

Objectives

The objective of this document is to outline the services requirements for the proposed SOP Private Hospital development.

The design of the electrical installation shall achieve the following design objectives:

- **a.** safety and reliability
- **b.** properly designed and appropriately sized to allow the full and proper functioning of all equipment, plant and fittings
- **c.** facilitates the operational requirements of the specific equipment, materials, processes and functions in the building
- d. sized with adequate capacity for expansion
- e. arranged and routed in an organised and systematic manner and be accessible for operations and maintenance
- **f.** provided with necessary flexibility and versatility to allow isolation, shutdown and removal of equipment and systems as required for maintenance and extension
- **g.** compatibility with existing services and systems on the establishment and in the facility
- **h.** labelled and colour coded for ease of identification and operation, to suit semiskilled operation
- i. designed and installed to all relevant legislation, standards, codes and guidance that are appropriate and relevant to the type of electrical installation or equipment

Staging Issues

Since the construction is on a green field site we do not anticipate any staging issues.

Electrical Services

Existing Conditions

The site has a high voltage supply running along side it on the Olympic Boulevard boundary.

Substation

The proposed electricity supply arrangement is a new chamber substation. The capacity of the chamber substation is to accommodate this new Hospital building only.

The chamber substation is to be located at ground level in a central position on the rear of the site with a new site main switchroom located adjacent to the substation but at basement level.

Based on initial areas and using VA allowances as identified by TS11 the order of maximum demand is 1500kVA

The above mentioned anticipated maximum demand figures incorporate 20% spare capacity as required by TS11.

Tariff Selection

In accordance with the requirements of TS11, a detailed analysis of the likely demand and consumption of the new electrical installation shall be carried out to determine the most cost effective tariff. The main switch board and the metering facilities shall be designed to enable tariff selection changes without the need to modify the switchboard busbar system.

Power Factor Correction

Power factor correction equipment complete with anti harmonic reactors shall be provided to improve the electrical installation power factor to 0.98 lagging or better to minimize the demand charge in accordance with the requirements of TS11.

Redundancy and Spare Capacity

The redundancy and spare capacity provisions for the patient care areas will be in compliance with TS11.

Standby Power

In accordance with the Building Code of Australia requirements, the provision of emergency power supply for the following services is mandatory.

- Emergency evacuation lighting.
- Fire alarm system
- Emergency warning and intercom system

In addition the BCA also requires that emergency supply be provided for a lift installation comprising two or more lift cars but only when standby generator supply is available. The need for emergency supply to other essential services and critical care facilities is to be determined by the health care provider.

Essential Services

The generator may be either diesel or gas driven in accordance with the requirements of TS11 and support the BCA essential services and other critical load in accordance with AS3009 and TS11.

The generator shall be sized to accommodate approximately 30% of the building diversified load in accordance with the requirements of TS11. Refer to TS11 for recommendations of essential services equipment to be connected to the standby generator, final arrangement to be approved by the hospital executive.

Subject to approval by the local supply authority, the preferred method of testing the generator system shall be via live building load without the need of dummy load banks, in accordance with the requirements of TS11.

UPS Power Supply

It is proposed a central Uninterruptible power supply be provided with 30 minute battery autonomy and be adequately sized to accommodate the electrical capacity of the following:

- Computer Room Servers.
- Each communications room power outlets. (Incorporating BMCS data gathering panels).
- Electronic security system head end equipment.
- Nurse Call system head end equipment.
- Medical services pendants
- Security Services

The electrical reticulation associated with the UPS will be designed and installed to incorporate an external maintenance bypass to allow removal of the UPS (for maintenance if required) without compromising the integrity of the power supply to the items of equipment listed above.

The UPS will be sized to suit the load requirements of the equipment to be served and incorporate surge protection on the line side of the UPS.

The UPS power supply system shall be supported by the standby generator to extend the operation of theses critical items of equipment.

The UPS shall be located within the main switch room.

Each operating theatre procedure light will be provided with its own independent UPS. These UPS units will be located within the roof plant room.

Intra Building Reticulation

Submains

Submains shall originate from the main switchboard and be reticulated throughout the building generally via cable tray located within the ceiling space along accessible locations such as corridors. Submains shall rise up through the building via dedicated vertically aligned risers then terminate a distribution boards to serve dedicated areas.

Power cables are to maintain clearances from communications cable tray in accordance with Australian Standard requirements.

Submains shall be configured into three groups as listed below in accordance with the requirements of TS11.

Group A – Essential Services (SAA defined) Group B – Critical Care Areas (Health Department defined) Group C – General Services (Remainder)

Submains for normal supply shall be sized to incorporate spare capacity for future expansion in accordance with the requirements of TS11.

Main switchboard

The main switchboard shall be located within the main switchroom which shall be sized to accommodate the main switchboard, required metering, power factor correction equipment, records and framed/laminated single line diagrams and drawings of the installation.

The position and features of the Main Switchroom shall consider the following;

- Located in close proximity of the substation where possible to limit consumer mains length. The proposal currently is to locate the main switch room adjacent the substataion.
- Located in close proximity of the large air conditioning load where possible to limit the submain length
- Electromagnetic Interference on adjacent environment
- Access for maintenance and emergency personnel. Two access doors will be provided within the basement level.
- Dual personnel egress doors at opposite ends of the room
- Large or double doors for maintenance equipment access
- Passive fire protection to code and a limit on wet fire sprinklers
- Above recorded flood zones and away from hazardous areas

The main switchboard consists of all the instruments, bus-bars, cable zones, circuit protection devices and labelling. All of which, shall be an appropriate type, size and configured to accommodate the code requirements together with the functional and maintenance criteria.

The configuration of the Main Switchboard shall be determined by the following;

- Prospective short-circuit current at switchboard (based on substation rating from Supply Authority)
- Maximum demand and load characteristics
- Specific load requirements and dedicated supplies
- Metering and BMS remote control and monitoring
- Number of supplies from Supply Authority
- Redundancy and spare capacity
- Connection of the standby power
- Maintenance and emergency services isolation
- A balance of the insulation protection versus the temperature rise
- Other factors such as cable sizes, fault-loop impedance and ability of protective devices to electrically discriminate with each other.

The type of switchboard either Modular configuration or Custom made needs to be considered. The preference is an industry standard custom made main switchboard of Form 3B construction with a minimum of IP44 insulation protection to AS1939.

The maintenance of switchboards requires due consideration. Typically the board should be designed to limit the ability of a person to work "live". This includes the installation of isolators for relevant sections of the board thus reducing the need to isolate the complete board to carry out regular maintenance or modifications. This also helps to reduce the number of main switches which can assist emergency personnel in quickly isolating the relevant sections of the switchboard. The provision of a main isolator for the complete supply behind tooled covers shall also be considered to limit the future Supply Authority costs in switching power on and off as required.

There is need for specialist maintenance personnel to carry out work on a live switchboard such as completing thermo graphic scans. To address this issue the switchboard will be complete with rotary switch handles for all outgoing supplies however the interlocks shall be 'defeatable' by a special means.

Switchboards

Submains shall terminate at distribution boards which in turn will supply light and power subcircuits as required. At least one distribution board shall be provided for each fire compartment in accordance with the requirements of TS11. Separate distribution boards shall be provided for normal supply and emergency (generator) supply submains.

Distribution boards shall be fitted with circuit breakers and RCD's where required in accordance with the requirements of AS/NZS 3000 and AS/NZS 3003. Distribution boards shall be provided with spare space for future expansion in accordance with the requirements of TS11.

Wiring Systems for patient treatment areas will be provided in accordance with the requirements of AS/NZS 3003 and the recommendations of TS11.

Power sub-circuits will originate from each respective distribution board to provide both normal and standby supplies to outlets, equipment and appliances.

The whole of the electrical installation will be designed and installed in accordance with the Australian Standard AS/NZS 3000:2000.

Cable management systems will be utilized to ensure that cables are installed in a neat and professional manner and to ensure that equipment is serviceable.

Metering

Supply Authority meters shall be located in accordance with local authority requirements. It is proposed that authority meters be located within the main switchroom and these meters be digital with remote read facility. The main switchboard and the metering facilities shall be designed to enable tariff selection changes without the need to modify the switchboard busbar system.

Private metering shall be positioned on the main supplies and on selected loads shall consist of power monitors. These shall be microprocessor based 3phase power monitors that shall communicate with BMS units and shall be display and transmitting selected data such as:

- voltage
- current (each phase)
- frequency
- kilowatts
- kVA maximum demand (15 min. cycle)
- kilowatt hours
- kVA
- power factor
- THD including the details on the neutral conductor

The BMS shall be set up to log the selected information as trends and shall include the area in square meters and measurement units as defined within the within the data presented in the commonwealth document 'Measures for Improving energy efficiency in Commonwealth Operations'.

It is proposed that the electricity metering be arranged to allow for separate analysis of key loads to assist in establishing energy monitoring and targeting. Electrical CT sub meters shall be provided on all dedicated submains greater than 100amps and as required by the commonwealth document 'Measures for improving energy efficiency in Commonwealth Operations'. Metering is to be consistent with the requirement to manage energy usage and to report in accordance with government reporting requirements outlined in this document.

Lighting

Artificial lighting will be provided throughout the Hospital development in accordance with the following documents.

- AS 1680 Part 1: General Principles and Recommendations
- AS 1680 Part 2: Recommendations for Specific Tasks and Interiors
- AS 1680 Part 5: Hospital and Medical Tasks
- AS 1765: Artificial Lighting for Clinical Observation
- TS11 Engineering Services Guidelines

For cyanosis observation special lamps meeting the requirements of AS1680 Part 5 are required. The standard suggests that medical staff decide upon those areas where provision should be made for the usual detection of cyanosis. Hospital designers are to seek advice from health care teams as to what areas are to be designed for cyanosis detection.

For other areas and usual tasks the standard recommends triphosphor fluorescent lamps as follows:

Colour Temperature: 4000 Kelvin. Colour Rendering: 85.

Lighting control within the new building will generally be by local switches to individual rooms. Large open plan spaces may be bulk switch controlled. The lighting control system is to be designed and installed to utilize daylight wherever possible to minimise energy usage.

External lighting will be designed in accordance with AS 1158, AS4282 Obtrusive Lighting Code, AS4485 and any special requirements of SOPA, for new carpark areas, pedestrian pathways, and stairs.

Emergency exit lighting and emergency lighting is to be provided throughout the new buildings in accordance with the requirements of the Building Code of Australia and Australian Standard AS/NZS 2293.

General Power

Power socket outlets shall be provided in accordance with the requirements outlined by TS11 and in accordance with end user requirements which can be justified. Separate dedicated socket outlets for cleaning shall be provided along corridors and within patient treatment rooms in accordance with AS/NZS 3003.

The colour of power socket outlets shall be in accordance with AS/NZS 3003.

Power sub-circuits will originate from each respective distribution board to provide both normal and standby supplies to outlets, equipment and appliances.

The whole of the electrical installation will be designed and installed in accordance with the Australian Standard AS/NZS 3000:2000.

Cable management systems will be utilized to ensure that cables are installed in a neat and professional manner and to ensure that equipment is serviceable.

Wiring Systems for patient treatment areas will be provided in accordance with the requirements of AS/NZS 3003 and the recommendations of TS11.

Lightning Protection

It is recommended that a lightning protection risk assessment be completed during the early stages of design to establish the risk.

Should lighting protection be required then it shall be designed and constructed in accordance with the requirements of Australian Standard AS 1768.

If required, it is anticipated that lightning protection to the building shall be achieved by bonding the steel reinforcement rods within vertical concrete encased columns and bonding from these nominated down conductors to the metal roof to provide an electrically continuous path to earth from the roof and all exposed metal elements that project the roof line.

Plant Spatial Requirements ELECTRICAL SERVICES – SPACIAL REQUIREMENTS

The plant final spatial requirements shall be determined by the designers, however it is anticipated the following indicative spatial requirements would be required. These however should be used only as a guide at this stage.

Item	Area	Comments
Central surface chamber substation	~130m ²	Located on the ground level with clear vehicular road access adjacent. No construction permitted below new substation. Openings to be 6m away from supply air and openings. 120/120/120 fire rating.
Main Switchroom (MSB)	10m x 4m	Located adjacent to the Substation on ground level or directly above substation. Two forms of egress required. 120/120/120 fire rating
Generator room	8m x 4 m	Located on ground level close to the main switch room with vehicular access for refueling.
Generator tank room	3m x 4m	Adjacent generator room and bunded
UPS Room	4m x 3m	It should be close to the MSB. 120/120/120 fire rated
Electrical Distribution board cupboards per floor	2.1m x 0.8m (each)	Vertically aligned. One per fire compartment (or located between fire compartments to satisfy AS3009), Additional EDB cupboards to ensure 30 metre maximum radius coverage. Recommended 60/60/60 fire rating as a minimum.

Communications and Security

Site Infrastructure and Reticulation

In a health care facility, a range of communication facilities are provided to meet various functional needs of the hospital staff and patients. A structured telecommunications system shall be provided to support the various telecommunications requirements of the building. The communications system shall be provided in accordance with TS11, the relevant Australian Standards and the functional requirements of the hospital.

The structured cabling system shall incorporate optical fire and copper backbone cabling extending from the main communications room to the communications rooms located throughout the building. Horizontal facility UTP (Category 6 minimum) cabling shall extend from each communications room to terminate at telecommunications RJ45 outlets.

PABX

The PABX provision should fall outside the main construction works contract.

Paging System

A paging system shall be provided, as part of the PABX package.

MATV

A central MATV / Radio system will be provided.

The MATV system shall be capable to receive and/or distribute to outlets throughout the hospital:

- Local free to air TV channels (analogue / digital)
- Local AM and FM radio stations (analogue / digital)
- In house movie channels.
- Facility for future "Pay TV" channels (analogue / digital)
- Spare channels

Within wards the MATV system will be controlled by a patient entertainment handset, which will be part of the Nurse Call system.

Security Systems

Health care facilities need to provide a safe and secure environment for staff, patients and visitors. An electronic security system shall be provided in accordance with the requirements of TS11 and the NSW Health Department security guidelines.

It is anticipated that the electronic security system shall incorporate some if not all of the following functional elements.

- Access control
- Intruder detection and alarm system
- CCTV
- **Duress alarms**

Security Lighting 07781sr0001 ELECTRICAL DA JUNE 2007

SOP PRIVATE HOSPITAL 14

Clocks

Clocks shall be provided in accordance with the requirements of TS11 and to suit the requirements of the health care staff.

Call Systems

A Nurse Call system shall be provided to comply with the requirements of the medical staff and AS3811. The nurse call system shall comprise management systems, nurse call stations, annunciators, call points, over door indicators, pendants, patient entertainment handsets, power supplies and interface units.

The nurse call system shall incorporate the facilities to interface to other system such as the following to provide an integrated communications system throughout the building. The extent of call systems required shall be determined during the design phase of the project.

- DECT
- Pagers
- MATV
- Electronic Security
- Fire System
- Patient Wondering

Communication Room and Cupboard Requirements

The main communications room and communications rooms located throughout the building are to be clean, dust free, with painted walls and be provided with adequate air conditioning and lighting.

COMMUNICATION & SECURITY SERVICES – SPACIAL REQUIREMENTS

The plant final spatial requirements shall be determined by the designers, however it is anticipated the following indicative spatial requirements would be required. These however should be used only as a guide at this stage.

Item	Area	Comments
Main Communications	21m ²	Located on basement, first or ground level. Not
Room		adjacent to main switchroom to avoid electrical
		interference.
		Recommend 60/60/60 fire rating.
PABX Room could be part	12 m ²	Adjacent MCR.
of the MCR		
Telecommunications room	12m ²	12m ² vertically aligned, centrally located within the
per floor		building with a maximum cable radius of 50 metres.
		Exact layout and position to be firmed up once
		layout is complete. Rooms or cupboards will house
		nurse call, security, BMCS, voice and data cabling

		and marshalling nodes. Fire rating - Compliance with D2.7 of the BCA
Security	15 m ²	Security Room for Staff and monitors.
Fire detection services	-	Allow for wall space of 1600 wide x 1800 high

Cost Estimates

Electrical services order of cost – BASED ON VERY PRELIMINARY SYSTEM DETAILS

Exclusions

PABX

Computers and communications hardware

Inclusions

Basement - Substation Main switchborad Standby generator and fuel store Distribution boards and general lighting and power. Kitchen power outlets Main communication frames and racks Communication outlets Fire detection

Ground floor – Distribution boards General lighting and power to the reception, pool, gym and admin areas Emergency and exit lighting Communication racks Communication outlets Fire detection Only essential services to the medical imaging area

- Level 1 Distribution boards Essential services
- Level 2 Distribution boards Essential services
- Level 3 Distribution boards General lighting and power to all areas. Medical services panels

Nurse call system Emergency and exit lighting Communication racks Communication outlets Fire detection

Level 4 – Distribution boards General lighting and power to all areas. Medical services panels Nurse call system Emergency and exit lighting Communication racks Communication outlets Fire detection

Level 5 – Distribution boards General lighting and power to all areas. Medical services panels Medical services pendants (costs could increase dramatically depending on the final selection made) Operating theatre lights Nurse call system Emergency and exit lighting Communication racks Communication outlets

- Fire detection
- Roof level Distribution boards General lighting and power to all areas. Emergency and exit lighting Communication outlets Fire detection

Order of cost - \$4,400,000.00 plus GST