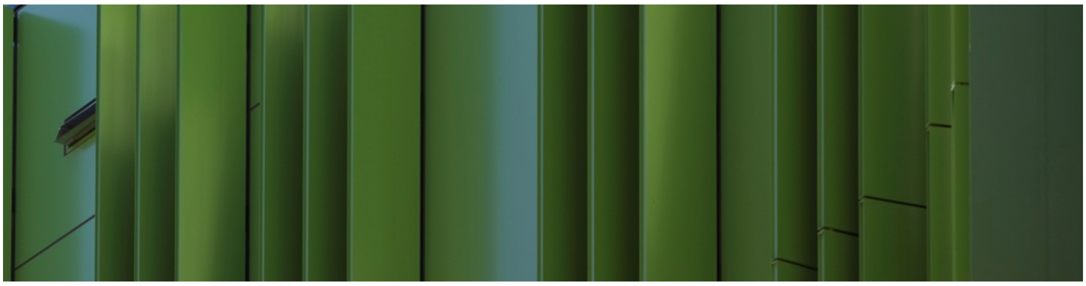
Structural



ST VINCENT'S PRIVATE HOSPITAL SYDNEY REDEVELOPMENT

SSD STRUCTURAL DESIGN STATEMENT

for St Vincent's Hospital Sydney

Issue B – 12 February 2015

121287

Taylor Thomson Whitting (NSW) Pty Ltd Consulting Engineers ACN 113 578 377
48 Chandos Street St Leonards NSW 2065 PO Box 738 Crows Nest 1585
T 61 2 9439 7288 F 61 2 9439 3146 ttwsyd@ttw.com.au www.ttw.com.au

SYDNEY
CANBERRA
MELBOURNE
QEC 22375

Quality ISO 9001

1.0 INTRODUCTION

As part of the proposed St Vincent's Private Hospital Sydney Redevelopment, Taylor Thomson Whitting (NSW) Pty Ltd has been engaged by St Vincent's Private Hospital Sydney (SVPHS) to provide advice on structural aspects of the project comprising:

- New East Wing building between the existing SVPHS and Sister Bernice Wing.
- Partial demolition of SVPHS low-rise wing Level 7 roof to accommodate new East Wing building.
- Addition of one building level over the existing SVPHS low-rise wing plant room for a new CSSD.
- Refurbishment works to the SVPHS high-rise wing.

The key issues raised include:

- The existing SVPHS low-rise wing columns have limited residual strength to support additional loads from the new CSSD building level and the link bridges connecting the new East Wing with SVPHS low-rise wing. Planned column strength investigations will determine the final configuration of the lightweight steel framed structure and the number of link bridge levels.
- The new East Wing building requires excavation in the courtyard of the current cafeteria area in hard rock, which will require strict controls of noise, dust and vibration. The use of saws rather than pneumatic hammers will be required.
- Fill over rock around the excavation adjacent existing buildings maybe removed and replaced with a temporary raised platform to maintain hospital escape routes. Alternately, a shoring system to support up to 3m of fill may be required.
- Excavation in rock for the new East Wing building may require local rock bolting at the direction of the Geotechnical Engineer. The founding level of the new East Wing columns is below two of the existing SVPHS high-rise wing column footings founded on Level 3 and additional underpinning or rock bolting works may be required following the Geotechnical Investigation.
- The new East Wing building columns along grid 5 are founded lower than columns on other grids to match the level of the existing SVPHS low-rise wing columns.
- The existing SVPHS low-rise wing building has a cantilever structure between Level 5 and 7 that is to be demolished to interface with the new East Wing building.
- The new East Wing building has transfer columns along grid 5 between Levels 6 and 8 to suit the architectural layout. The transfer columns will be located within the outline of the existing SVPHS low-rise wing Level 6 plant room and require partial demolition and replacement of Level 7 roof with infill lightweight steel roof to grid P.
- The new East Wing building has a stair and riser steel structure suspended over the existing SVPHS low-rise wing, which may be of modular construction.
- New link bridges from the East Wing building will require bolted connections to the existing Sister Bernice Wing and SVPHS low-rise and high-rise wings. Specific details will be required for the joints to accommodate structural movements.
- The new hoists from the CSSD penetrate through the existing SVPHS floors between Levels 3 and 6. These floors will require re-support with either trimmer beams or infill walls to strip footings on Level 2.

2.0 DESIGN LOADINGS

In general all loads and load combinations shall comply with AS/NZS 1170 Parts 0 to 4 Structural Design Actions. Live load reductions will be applied as permitted by AS/NZS 1170.1. Generally the design loads are:

2.1 Permanent Actions - Dead Loads

Dead load shall be considered as the self weight of the structure plus an allowance for services, toppings, walls and ceilings which vary significantly throughout the site.

The additional dead loads should not be less than the following:

	Services, ceilings, partitions etc.
Hospital Floors & Office areas	1.8 kPa
Car Park areas	N/A
Plant and concrete roof areas	2.2 kPa[1.]

[1.] Loading includes allowance of 1 kPa for metal deck roof over.

No facade or masonry wall loading is included in the above loads. At this stage our designs have been based on a facade loading of 1.2 kPa which equates to approximately 5 kN/m depending on the floor to floor heights. This will need to be confirmed (and probably reduced) once the facade type and extent is developed. In areas with a full glass facade the loading could be reduced to around 0.5 kPa.

It is assumed that all internal partitions will be of lightweight stud construction and specific allowance will be made for masonry partitions if required. In particular, masonry walls will most likely be required around services risers and additional band beams will be required around the major risers.

As agreed at the original design meetings, there will not be any allowance for integral or applied structural toppings to be incorporated into the structure.

2.2 Imposed Actions - Live Loads

Design floor live loadings are to generally satisfy the minimum provisions of AS 1170.1 and in particular the following:

	Uniformly Distributed Actions	**Concentrated Actions**
General Hospital Floors	3.0 kPa	2.7 kN
Theatres / X-ray Rooms	3.0 kPa	4.5 kN
Stairs & Corridors	4.0 kPa	4.5 kN
Office Areas	3.0 kPa	2.7 kN
Car Parking	2.5 kPa	13 kN
Truck areas up to 10,000 kg gross mass	5 kPa	31 kN
Plant and Utility Areas	Plant loads or 5.0 kPa (minimum)	4.5 kN (minimum)
General Store Rooms	2.4 kPa for each metre of storage height (Max 2.1m)	7.0 kN

Compactus	4.0 kPa for each metre of storage height. (Locations to be confirmed.)	To be calculated
Trafficable Roof	4 kPa	1.8 kN
Structural Steel Roof (Non-trafficable)	0.25 kPa	1.4 kN

No live load reductions are to be applied to any floor system elements. Pattern loading will be considered when determining worst case scenarios for strength and serviceability where required by AS1170. Live load reductions will be considered for columns, walls and footing design in accordance with AS1170.1.

Loads in plant areas are to be confirmed by services engineers once layouts are known. Higher loading will be required for large pieces of plant or tanks.

2.3 Wind Loads

Wind loads are in accordance with AS1170.2 and based on the following parameters:

Region:		A2
Importance Level (BCA Table B1.2a):		4
Annual probability of exceedance (BCA Table B1.2b):		1:2000 (ultimate) 1:25 (serviceability)
Regional Wind Speed:	Ultimate limit states -	V_{2000} = 48 m/s
	Serviceability limit states -	V_{25} = 37 m/s
Terrain Category (all directions):		3

2.4 Earthquake Loads

Earthquake loadings shall be in accordance with AS1170.4 – 2007 (Earthquake actions in Australia) and AS/NZS1170.0 – 2002.

Hazard Factor (Z):	0.08
Site Sub-Soil Class:	B_e (Buildings founded on rock)
Importance Level (BCA Table B1.2a):	4
Annual probability of exceedance (BCA Table B1.2b):	1:1500
Earthquake Design Category:	III

An importance level of 4, as outlined in the BCA will be required for the new structures that are a post disaster facility. If it is confirmed that the new facilities will not be designated as a post disaster facility the required earthquake and wind design loads could be reduced.

2.5 Barriers

Barriers including parapets, balustrades and railings are to be designed in accordance with Table 3.3 of AS/NZS 1170.1.

2.6 Design Standards

The structural design will be in accordance with the latest revision of all relevant Australian

Design Standards, Codes and other statutory requirements. As a minimum requirement, the design shall be based on, but not limited to;

NUMBER	EDITION	TITLE
AS/NZS 1170.0	2002	Structural design actions Part 0: General Principles
AS/NZS 1170.1	2002	Structural design actions Part 1: Permanent, imposed and other actions
AS/NZS 1170.2	2002	Structural design actions Part 2: Wind actions
AS 1170.4	2007	Structural design actions Part 4: Earthquake loads
AS 2159	2009	Piling – Design and installation
AS 2670.1	2001	Evaluation of human exposure to whole-body vibration
AS 3600	2009	Concrete Structures
AS 3700	2001	Masonry Structures
AS 4100	1998	Steel Structures

3.0 SERVICEABILITY

3.1 Deflection Limits

Deflection limits for the concrete structures are generally as follows.

	Maximum Floor Deflection Limit			
	Dead	**Incremental**	**Live**	**DL + LL**
Floors supporting masonry walls	Span/360	Span/1000 [1.]	Span/500	Span/300 (25mm max.)
Compactus areas	N/A	Span/750 [2.]	N/A	25mm max.
Other floor areas	Span/360 (20mm max.)	N/A	Span/500	Span/300 (25mm max.)

[1.] Areas supporting normal weight masonry partitions.

[2.] Incremental deflection after compactus installed

3.2 Durability

For concrete elements this will be achieved by specifying all elements in accordance with section 4 of AS 3600 which sets out requirements for plain, reinforced and post tensioned concrete structures and members with a design life of 40 to 60 years. Exposure classifications are as follows.

EXPOSURE CLASSIFICATION	ELEMENTS
A2	Internal
B1	In Ground & External

Protective coatings to structural steel elements shall comply with AS/NZS 2312 and ISO 2063 for the long-term protection category.

3.3 Occupant Perception of Motion

The vibration criteria being adopted is similar to that being used in the design of major NSW public hospitals. In this case, slab areas used for operating theatres and other sensitive areas (including the floor over) are to comply with RF1. This is a British Standards term that relates to a multiplying factor of 1 on the vibration base curve in AS 2670.2-1990 and ISO 10137-2007. For all other areas the vibration criteria is RF2.

The limits to be set on the vibration analysis and slab design are in accordance with Australian Standards and the International Standards Organisation where applicable. The design criteria are also informed by the report “Floor Vibration due to Human Activity” by Thomas Murray, David Allen and Eric Ungar.

Operating Theatres – 100 μm/s (amplitude) – RF1

If any laboratory areas are required these may be subject to tighter vibration limits depending on the use and sensitivity of the equipment.