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Project Application

BCA Assessment Report

for

Acute Hospital Building

Royal North Shore Hospital
PPP Project

Prepared for

Thiess Pty Ltd

on behalf of

Infrashore

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1.0 INTRODUCTION

1.1 Purpose of Report

The following report for the proposed Acute Hospital Building at Royal North Shore Hospital has been prepared for the Project Application submission, at the request of Thiess Pty Ltd on behalf of Infrashore, for the purpose of providing a preliminary overview of significant issues pertaining to compliance with the Building Code of Australia (BCA 2008).

The report is intended to be read as a preliminary assessment only.

1.2 BCA Version

The version of the BCA against which this review is made is the current version of BCA 2008 incorporating the NSW Variations (adopted in NSW on 1 May 2008).

In this regard it is to be noted that the applicable version of the BCA is that which is in force at the date of submission of the Construction Certificate application to the Certifying Authority.

1.3 Referenced Drawings

Referenced architectural drawings for this report, all prepared by Bligh Voller Nield Architecture, are:

Drawing No	Title	Issue
DWG-MH-AR-0001	Site Plan	T04
DWG-MH-AR-0101	Level 01 Floor Plan	T07
DWG-MH-AR-0102	Level 02 Floor Plan	T07
DWG-MH-AR-0103	Level 03 Floor Plan	T07
DWG-MH-AR-0104	Level 04 Floor Plan	T07
DWG-MH-AR-0105	Level 05 Floor Plan	T07
DWG-MH-AR-0106	Level 06 Floor Plan	T07
DWG-MH-AR-0107	Level 07 Floor Plan	T06
DWG-MH-AR-0108	Level 08 Floor Plan	T06
DWG-MH-AR-0109	Level 09 Floor Plan	T06
DWG-MH-AR-0110	Level 10 Roof Plan	T03
DWG-MH-AR-0120	Mental Health Unit Floor Plans	T04
DWG-MH-AR-0121	Douglas Building Level 02 Floor Plan	T04
DWG-MH-AR-0122	Level 1 Floor Plan Douglas Building	T03
DWG-MH-AR-0401	West Elevation	T02
DWG-MH-AR-0402	South Elevation	T02
DWG-MH-AR-0403	East Elevation	T03
DWG-MH-AR-0404	North Elevation	T02
DWG-MH-AR-0501	North South Section 01	T02
DWG-MH-AR-0502	North South Section 02	T03
DWG-MH-AR-0503	North South Section 03	T02
DWG-MH-AR-0504	East West Sections 01	T03
DWG-MH-AR-0505	East West Sections 02	T03

2.0 ALTERNATIVE SOLUTIONS

For compliance with the BCA, the relevant Performance Requirements must be met. This is achieved by either complying with the Deemed-to-Satisfy (DTS) Provisions or by means of an Alternative Solution, which demonstrates that the Building Solution is no less effective than the applicable DTS provisions, i.e. is equivalent to the level of health, safety and amenity provided by the DTS provisions.

In the process of preparing this assessment, we have made comment on various matters which could be applicable for consideration/ resolution as Alternative Solutions.

For some of these potential Alternative Solutions, it is feasible that deemed-to-satisfy design solutions are achievable. It is also possible that the need for further Alternative Solutions for specific matters may be identified as the design development/ checking process proceeds.

Where Alternative Solutions require fire engineering, as is generally the case, under current legislation it is to be noted that Alternative Solutions related to means of egress, excessive travel distance, fire suppression (sprinklers), smoke detection and smoke management are subject to assessment and issue of a Compliance Certificate by a third party 'certifying' Accredited Fire Engineer prior to Construction Certificate issue, in accordance with Clause 144A of the Environmental Planning and Assessment Regulation 2000.

In addition, the requirement for the approval of the NSW Fire Brigades under Clause 144 of the Environmental Planning and Assessment Regulation 2000 is also applicable in some cases as noted in the Schedule below. This approval must also precede issue of the Construction Certificate by the Certifying Authority.

Possible Alternative Solutions and related Performance Requirements identified to date are summarised in the following schedule.

Item	Description & Parts of Premises Affected by Proposed Alternative Solution	Relevant BCA Deemed-to-Satisfy Provisions (Not Satisfied)	BCA Performance Requirements to be achieved by Alternative Solution	Assessment Method to be used to Establish Compliance	Remarks
1.0 Fire Resistance & Compartmentation					
1.1	Reduction of 180/180/180 FRLs, associated with Class 6 areas, and 240/240/240 FRLs, associated with Class 7b and 8 areas, down to 120/120/120 FRLs.	Clause 3/ Table 3 of Specification C1.1, C2.8, C2.9	CP1 CP2	A09 Fire Engineering Analysis	
1.2	Fire and smoke compartment size limits exceeded for some patient care areas compartments.	Clause C2.5	CP2 CP3	A09 Fire Engineering Analysis	
1.3	Nil FRL to the two level 05 link bridges.	Clause 3/ Table 3 of Specification C1.1	CP1	A09 Fire Engineering Analysis	
2.0 Access and Egress					
2.1	Travel distance in patient care areas, in some instances, to a point of choice between alternative exits exceeds the DTS maximum distance of 12m.	Clause D1.4(d)(i)	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
2.2	Overall travel distance in patient care areas, in some instances, to an exit exceeds the DTS maximum distance of 30m.	Clause D1.4(d)(i)	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required

Item	Description & Parts of Premises Affected by Proposed Alternative Solution	Relevant BCA Deemed-to-Satisfy Provisions (Not Satisfied)	BCA Performance Requirements to be achieved by Alternative Solution	Assessment Method to be used to Establish Compliance	Remarks
2.3	Distance between alternative exits in patient care areas, in some instances, measured through the point of choice, exceeds the DTS maximum distance of 45m.	Clause D1.5(c)(iii)	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
2.4	Travel distance in non patient care areas, in some instances, to a point of choice between alternative exits exceeds the DTS maximum distance of 20m.	Clause D1.4(c)(ii),	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
2.5	Overall travel distance in non patient care areas, in some instances, to an exit exceeds the DTS maximum distance of 40m.	Clause D1.4(c)(i)	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
2.6	Distance between alternative exits in non patient care areas, in some instances, measured through the point of choice, exceeds the DTS maximum distance of 60m.	Clause D1.5(c)(iii)	DP4 EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
2.7	Descending fire stairs 4, 5 and 6 converge at level 03 with ascending fire stairs in the same shaft, serving levels 01 and 02, and discharge in each case via common corridors and stairs in lieu of discharging independently.	Clause D1.7(b) Clause D2.4	DP4 DP5	A09 Fire Engineering Analysis	
2.8	At level 03 north-western corner the cafeteria stair and fire stair 1 (rising & descending stairs) discharge onto the roof of the R&E Building (separate building) in lieu of discharging to a road or open space, being a space on the allotment directly attributable to the subject building.	Clause D1.7(b)	DP4 DP5	A09 Fire Engineering Analysis	
2.9	In some non patient care fire compartments horizontal exits exceed 50% of the required number of exits.	Clause D1.11(c)	DP4	A09 Fire Engineering Analysis	
3.0 <u>Services and Equipment</u>					
3.1	The fire control room is situated at level 01, accessed via the loading dock, in lieu of being at level 03 adjacent to the front entrance.	Clause & Specification E1.8	EP1.6	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required
3.2	The Fire Brigade boosters are located at level 01 adjacent to the loading dock entrance in	Clause E1.3(b) Clause 7.3(c) of AS 2419.1	EP1.3	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence

Item	Description & Parts of Premises Affected by Proposed Alternative Solution	Relevant BCA Deemed-to-Satisfy Provisions (Not Satisfied)	BCA Performance Requirements to be achieved by Alternative Solution	Assessment Method to be used to Establish Compliance	Remarks
	lieu of being within sight of the main entrance to the building.				Required
3.4	Fire engineered zone smoke control system relative to the extensive fire compartment-ation at each storey.	Clause E2.2/ Table E2.2a	EP2.2	A09 Fire Engineering Analysis	NSW Fire Brigades Concurrence Required

3.0 BUILDING PROFILE

3.1 Building Description

The proposal involves the construction of a nine storey Acute Hospital Building with a floor area of approximately 90,000m^2.

3.2 Building Uses & Classification

3.2.1 The building's uses and classification are described as follows:

Level	Use	Classification
Level 01 (RL84.8)	Patient Care – Treatment Areas Hospital Ancillary - Pharmacy, Kitchen (<10%),Plant, Engineering, Stores, Loading Dock (>10% of major use)	Class 9a Class 9a ancillary Class 7b & 8
Level 02 (RL90.0)	Patient Care – Ward Areas Patient Care – Treatment Areas Administration (>10%)	Class 9a Class 9a Class 5
Level 03 Main Entry (RL94.2)	Patient Care – Treatment Areas Administration (>10%) Retail/ Cafeteria (>10%)	Class 9a Class 5 Class 6
Level 04 (RL98.4)	Patient Care – Treatment Areas Administration (>10%)	Class 9a Class 5
Level 05 RL102.6	Pathology, Sterilizing, Plant Administration	Class 9a ancillary Class 5
Level 06 (RL106.8)	Patient Care – Treatment Areas & Ward Areas Administration (>10%)	Class 9a Class 5
Level 07 (RL111.0)	Patient Care – Treatment Areas & Ward Areas Administration	Class 9a Class 5
Level 08 (RL 115.2)	Patient Care – Ward Areas Administration	Class 9a Class 5
Level 09 (RL119.4)	Staff On-Call Residential Facilities Administration Plant room	Class 3 Class 5 Ancillary

In determining the Class 9a classifications the following definitions from Part A1 of the BCA are of relevance:

- **Class 9a** — a health-care building, including those parts of the building set aside as a laboratory.
- **Health-care** building means a building whose occupants or patients undergoing medical treatment generally need physical assistance to evacuate the building during an emergency and includes—

  (a) a public or private hospital; or

(b) a nursing home or similar facility for sick or disabled persons needing full-time care; or

(c) a clinic, day surgery or procedure unit where the effects of the predominant treatment administered involve patients becoming non-ambulatory and requiring supervised medical care on the premises for some time after the treatment.

- **Patient care area** means a part of a health-care building normally used for the treatment, care, accommodation, recreation, dining and holding of patients including a ward area and treatment area.
- **Treatment area** means an area within a patient care area such as an operating theatre and rooms used for recovery, minor procedures, resuscitation, intensive care and coronary care from which a patient may not be readily moved.

3.3 Rise in Storeys

As determined in accordance with Clause C1.2, the Acute Hospital Building has a rise in storeys of nine.

3.4 Effective Height

The effective height of the building is calculated as being 34.6m, measured between Level 01 (RL 84.8), being the lowest floor providing direct egress to a road or open space, and the topmost storey, being level 09 (RL 119.4).

3.5 Type of Construction

Type A construction is applicable for the whole building.

3.6 Fire Safety Measures

Having regard to the effective height of the building being in excess of 25m and the 9a classification, major fire safety measure requirements applicable for this building include:

- Automatic sprinkler system throughout - Table E2.2a, E1.5/ Specification E1.5 & AS 2118.1;
- Zone smoke control system throughout - Table E2.2a & AS 1668.1;
- Stair pressurisation to all fire stairs - Table E2.2a & AS 1668.1;
- Automatic smoke detection and alarm system - Specification E2.2a & AS 1670.1;
- Emergency lighting - E4 & AS 2293.1;
- Exit signs - E4 & AS 2293.1;
- Fire hydrants - E1.3 & AS 2419.1;
- Fire hose reels - E1.4 & AS2441;
- Portable fire extinguishers - E1.6 & AS 2444;
- Emergency sound & intercom system (formerly known as EWIS - E4.9, AS 1670.4 & AS 4428.4;
- 2 emergency lifts - E3.4;
- Fire control centre (E1.8/ Specification E1.8); and
- Fire stair re entry.

4.0 BCA MATTERS

The documentation has been reviewed against the following significant BCA related matters.

4.1 Section B - Structure

4.1.1 The building and its materials and components must be capable of sustaining load requirements and satisfy the structural resistance of materials and forms of construction requirements arising from Clauses B1.1, B1.2 and B1.4 or B1.3 and B1.4.

These requirements would be subject to validation at Construction Certificate stage.

4.2 Section C – Fire Resistance

4.2.1 As identified at item 3.5 above Type A construction is applicable for the building. Accordingly compliance with the relevant Deemed-to-Satisfy (DTS) provisions of Part C is required. The applicable fire resistance levels (FRLs) are determined from Clause 3 and Table 3 of Specification C1.1 which, in general terms, requires 120/120/120 FRLs for the Class 5 and 9a classifications, 180/180/180 FRL for the Class 6 classifications and 240/240/240 FRL for the Class 8 and 9b classifications. It may be feasible to reduce these higher FRLs down to a consistent 120/120/120 FRL by fire safety engineering. Accordingly, this possible Alternative Solution is identified in the Alternative Solutions Schedule at item 2.

4.2.2 Class 6 areas must be fire separated from Class 5 and 9a areas by 180/180/180 FRL construction. Note that this results in 180/180/180 FRL structure and fire walls at the level 03, 04 and 05 void. Similarly Class 7b and 8 areas must be fire separated from the remainder by 240/240/240 FRL structure and fire walls. It may be feasible to reduce these higher FRLs down to 120/120/120 FRLs to be consistent with that of the greater part of the building. This would necessitate justification as an Alternative Solution as identified in the Alternative Solutions Schedule at item 2.

4.2.3 Assuming that it is intended that the two level 05 external link bridges will be of steel frame construction with lightweight cladding and fire doors at each end in lieu of Type A construction, justification as an Alternative Solution, as identified in the Alternative Solutions Schedule at item 2, would be applicable.

4.2.4 For Type A construction, all external walls must be non combustible necessitating careful consideration of the use of sandwich panels, composite panels and the like.

4.2.5 Clause C2.2 and Table C2.2 limit the floor area and volume of any fire compartment in a Type A Construction building.

In the first instance the size of any fire compartment in the building is limited to the areas and volumes set down in Table C2.2, which for Class 9a non-patient care areas and Class 6, 7 and 8 areas, is 5,000m^2 and 30,000m^3. For Class 5 areas the fire compartment size limits increase to 8,000m^2 and 48,000m^3.

For patient care areas, the compartmentation limits are further governed by Clause C2.5, the principal limitations being:

- Maximum fire compartment size of 2,000m^2.
- Ward areas must be divided into maximum floor areas of 1,000m^2 by 60/60/60 FRL walls and further divided into smoke compartments not exceeding 500m^2.

- Treatment areas must be divided into floor areas not exceeding 1000m^2 by smoke proof walls.
- Ancillary areas such as a kitchen, hyperbaric facility, medical records rooms greater than 10m^2, laundry must be separated from patient care areas by 60/60/60 FRL construction.

Examples of situations where the above DTS criteria are not at this stage fully satisfied include:

i. The smoke compartment size at 1,036m^2 for the level 1 Cancer Care Centre exceeds the 1000m^2 limit for Treatment Areas.

ii. 120/120/120 FRL fire wall separation of the level 01 Satellite Pharmacy from the adjacent Patient Care area is necessary, which may in turn allow for deletion of the fire wall adjacent to the corridor.

iii. The fire compartment size at 2,066m^2 for the level 2 Emergency Department (southern compartment) exceeds the 2,000m^2 limit.

iv. A 120/120/120 FRL fire wall is necessary at level 02 to fire separate the Emergency Vehicle Parking compartment from the adjacent office compartment.

v. At level 03 the void to the mental health unit office annex requires 120/120/120 FRL fire wall separation from patient care below.

vi. At level 04 fire compartments to the south eastern operating theatre/ PACU areas warrant review as previously suggested.

vii. At levels 04 and 05, 180/180/180 FRL fire walls must extend through to the western façade to fire separate the void from adjacent level 04 and 05 patient care areas.

viii. The Smoke compartment size at 1,048m^2 for the level 4 Cardiac Catheter Labs exceeds the 1,000m^2 limit for Treatment Areas.

ix. At level 05, provide fire separation and fire doors at the bridge links.

x. At level 06, the intermediate 120/120/120 FRL east-west fire wall shown on the compartmentation drawing within the two ICU/HDU compartments can be substituted with a 60/60/60 FRL fire/ smoke wall.

xi. At level 09, provide 60/60/60 FRL walls and -/60/30 fire doors to fire separate the Class 3 area and the medical lounge area.

xii. At level 09, provide 120/120/120 FRL fire wall and -/120/30 fire doors to fire compartment the medical lounge corridor area from the office area to provide for horizontal egress from both of these areas.

xiii. 120/120/120 fire wall separation of non patient care areas from patient care areas is necessary at various locations, e.g.
   - administration area at the north western corner of level 02 Medical Imaging;
   - administration area in the eastern compartment of level 02 Medical Imaging;
   - level 03 Academic Psychiatry from Acute Dialysis;
   - administration area to the south of level 04 Pain Management; and
   - level 07 Orthopaedics/Rheumatology from Inpatient Therapies.

It is expected that departures of this nature will be identified in more detail and addressed during design development or, in some cases such as for minor excesses in smoke and fire compartment sizes, as an Alternative Solution by fire safety engineering, as identified in the Alternative Solutions Schedule at item 2.

4.2.6 The interconnection of levels 03, 04 and 05 via the void spaces in the central spine is permissible in accordance with the provisions of D1.12(c) and G3.1(b) subject to:

- each of the connected storeys being protected throughout with a sprinkler system. In this regard the whole building is required to be sprinkler protected;
- the aggregated floor area and volume of the three storeys not exceeding the Table C2.2 fire compartment limit for Class 6 use of 5,000m^2/ 30,000m^3 which is satisfied. In determining the volume of the void space (atrium), the volume of the atrium well from the level of the first floor above the atrium floor is not counted; and
- the Class 9a portion at level 03, 04, 05 being fire separated from the void by 180/180/180 FRL construction, unless 120/120/120 FRL fire wall separation is justified as an Alternative Solution as discussed at item 4.2.2.

4.2.7 In accordance with Clause and Table C3.3 openings at the external corners between opposing fire compartments must be separated by at least 4m with not less than 60/60/60 FRL construction or the openings must be protected in accordance with Clause C3.4. This situation occurs at most levels.

4.2.8 This requirement is also applicable at overhead bridge links to the building where automatic fire doors are also necessary.

4.2.9 Review of the extent of façade exposure to fire source features presented by nearby buildings, such as the R &E Building to the north, and necessary mitigation measures in accordance with C3.2 and C3.4 is necessary.

4.2.10 Lift motor rooms, lift control panels, emergency generators, central smoke control plant, boilers, batteries, switchrooms, substations must be separated from the remainder of the building by construction having an FRL of 120/120/120. Doorways must be protected by self-closing -/120/30 fire doors and fire door frames.

4.2.11 Fire hazard properties of any material or assembly throughout the building must comply with Clause C1.10 which requires compliance with the 'Spread-of-Flame' and 'Smoke-Developed' indices requirements of Specification C1.10 – 'Fire Hazard Properties – General' for materials and assemblies <u>other</u> than floor materials, floor coverings, wall and ceiling linings, and the 'critical radiant flux' and 'Group number' requirements of Specification C1.10a – 'Fire Hazard Properties - Floors, Walls and Ceiling'.

4.2.12 Protection of openings requirements within the building apply to door openings in fire-isolated exits, horizontal exits, fire walls, lift shafts, service shafts, and services openings through any fire rated element, all of which must be addressed in accordance with Part C3.

4.3 Section D – Access & Egress

4.3.1 For the purposes of egress compliance, in general terms Part D1 of the BCA requires:

- For Class 9a patient care areas
  - Maximum 12m travel distance to a point of choice.
  - Maximum 30m travel distance to an exit, being a fire isolated stair or horizontal exit.
  - Maximum 45m between alternative exits measured through the point of choice.

▪ For the Class 5 and 6 areas and Class 9a non patient care areas	-	Maximum 20m travel distance to a point of choice.
	-	Maximum 40m travel distance to an exit, being a fire-isolated stair or horizontal exit.
	-	Maximum 60m between alternative exits measured through the point of choice.
▪ In all cases	-	Minimum of 9m between exits.
	-	Exits located so that alternative paths of travel do not converge to less than 6m apart.

- Fire-isolation of exits is applicable
- Each of the patient care area fire compartments must have at least one fire-isolated exit and one horizontal exit.
- All parts of all floors must have access to at least two exits.
- Every fire compartment to which a horizontal exit leads must have at least one vertical exit.
- For each compartment to which a patient care area horizontal exit discharges, a clear area of 2.5m^2 per patient for the total number in the patient care area compartment must be available.
- Corridor widths of at least 1.8m and doorway widths in accordance with D1.6(b)(ii), (f)(i) and (ii) are applicable in patient care areas.

Having regard to the above main criteria, review of the documentation has determined various DTS departures, examples of which follow, which will be identified in more detail and addressed during design development or, in some cases, will be addressed as an Alternative Solution by fire safety engineering, as identified in the Alternative Solutions Schedule at item 2.

4.3.2 Extended travel distances beyond the 12m/30m/45m limits in various patient care areas are evident, such as:

i. 12m dead end travel distance exceeded from the following locations necessitating an alternative means of escape:
   - level 01 court yard area near fire stair 1 (18m);
   - level 01 Cons/Exam area at the north western corner of the Cancer Care Centre (20m);
   - level 02 Ultra Sound in Medical Imaging (16m);
   - level 02 Paeds Fast Track (16m);
   - level 02 Transit Lounge (16m);
   - level 02 Emergency (north western corner) (16m);
   - level 02 Paediatrics (south western corner) (16m);
   - level 02 PEC (22m);
   - level 02 Mental Health Unit (east wing) - Alternative Solution ? on the basis of fail-safe electric strike exit doors to outside;
   - level 02 Mental Health Unit court yards) - Alternative Solution ? on the basis of fail-safe electric strike exit doors to outside;
   - level 02 Mental Health Unit (north wing) - Alternative Solution ? on the basis of fail-safe electric strike exit doors to outside;
   - level 03 Medical Day Procedure Unit (32m);
   - level 04 NSPH (19m);

- level 04 Diagnostic Cardiology - Alternative Solution ? on the basis of minor excess;
- level 04 23 Hr Recovery Unit (16m);
- level 07 IPU 10 Acute Geriatric and IPU 12 Spinal Injury Unit eastern end (16m);
- level 08 IPU 11 Haematology and IPU 3 Medical Surgical eastern end (to 17m).

ii. 30m travel distance exceeded from the following locations necessitating an alternative means of escape:
- level 01 Day Oncology Treat/Iso on western side (33m);
- level 02 Paediatrics (south western corner) (39m);
- level 02 Mental Health Unit court yards and adjacent meeting/lounge areas) - Alternative Solution ? on the basis of fail-safe electric strike exit doors to outside;
- level 04 NSPH (32m);
- level 06 ICU/HDU north eastern corner rooms (36m) - Alternative Solution ?;
- level 06 ICU/HDU south eastern and south western corner rooms (to 39m) - Alternative Solution ?;
- level 06 wards, left middle bedroom (33m) - Alternative Solution ?;
- level 07 wards, left middle bedrooms, south side (33m) - Alternative Solution ?;
- level 08 wards, left middle bedrooms, south side (34m) - Alternative Solution ?

iii. 45m between alternative exits exceeded from the following locations necessitating an alternative means of escape:
- level 02 Medical Imaging (eastern compartment) (54m);
- level 03 Ambulatory Care Centre (53m) - Alternative Solution ?;
- level 03 Resus/Path/Pod 7 (to 56m) which could be solved by moving adjacent fire wall in easterly direction;
- level 04 23 Hr Recovery Unit (eastern side) (46m) which could be solved by moving adjacent fire wall;
- level 06 ICU/HDU north eastern corridor (58m) - Alternative Solution ?;
- level 06 ICU/HDU south eastern compartment, various corridors (to 60m) - Alternative Solution ?;
- level 06 ward corridors (50m) – add fire-isolated corridor to stair?;
- level 07 ward corridors, south side (to 50m)- add fire-isolated corridor to stair?;
- level 08 ward corridors, south side (to 50m) - add fire-isolated corridor to stair?

iv. 12m/30m/45m travel distance limits are variously exceeded from level 01 Radiation Oncology necessitating alternative means of escape and or justification as an Alternative Solution.

v. 12m/ 30m/ 45m travel distance limits exceeded from level 02 nuclear medicine, necessitating a north-south egress corridor towards lift lobby.

vi. 12m/30m/45m travel distance limits variously exceeded from Orthotics and Physiotherapy necessitating alternative means of escape.

vii. Further review of egress from the level 04 theatres and PACU is warranted in conjunction with review of fire wall locations in this area and consequent provision of horizontal exits.

4.3.3 Extended travel distances beyond the 20m/40m/60m limits in various non patient care areas are evident, such as:

i. 20m dead end travel distance exceeded from the following locations necessitating an alternative means of escape:
   - level 02 Medical Imaging, north western corner (24m);
   - level 02 Primary Medical Records Store (29m);
   - level 03 Clinical Administration offices (28m);
   - level 03 Mental Health Unit Administration offices where a corridor, as discussed, is recommended as an alternative means of escape;
   - level 04 plant room above Mental Health due to plant layout. Review further when plant layout is known. An external stair may be necessary.
   - level 05 corridor adjacent to the north link bridge necessitating unimpeded access to stair 1.
   - level 05 PaLMS Admin - Alternative Solution ? on the basis of marginal travel distance excess.
   - level 05 Sterilizing Services Department.

ii. 40m travel distance exceeded from the following locations necessitating an alternative means of escape:
   - level 03 Retail Store (45m);
   - level 03 Clinical Administration offices (48m);
   - level 05 PaLMS/Pathology (54m);
   - level 05 north-eastern sector (51m);
   - level 05 plant room – introduce additional exit doors as discussed.

iii. 60m between alternative exits exceeded from the following locations necessitating an alternative means of escape:
   - level 04 central void corridor (65m) - Alternative Solution ? subject to confirmation that unimpeded egress is available from public areas via stairs 4 and 5;
   - level 05 PaLMS/Pathology (82m) - Alternative Solution ?;
   - level 05 north-eastern sector (78m);
   - level 05 PaLMS/Pathology corridor between stair 8 and horizontal exit to void (68m)- Alternative Solution ?.

iv. Level 01 plant rooms, switch rooms necessitating provision of sufficient doors and review of paths of travel around plant to ensure compliance.

v. Level 01 loading dock necessitating by-pass doors including to outside if a roller shutter is proposed.

vi. At level 04 an east west corridor is necessary from the Pain Management office area compartment, as discussed, to achieve travel distance compliance and to overcome the need to escape into the Pain Management fire compartment, thereby overcoming the need for a vertical exit from the Pain Management Health Care fire compartment.

vii. At level 05 unimpeded egress between Decontamination/ Receiving and Preparation Area plus provision of an exit door and passageway via the eastern side of the plant room is necessary.

4.3.4 Attention is drawn to the requirement of Clause D1.6(b) for minimum corridor widths of 1.8m in patient care areas, e.g. level 04 north-eastern corridor.

4.3.5 Attention is drawn to the requirement of Clause D1.6(f)(ii) for horizontal exit doors to provide for a minimum unimpeded doorway width of 1,250mm, e.g. at:

i. level 06 from ICU/HDU north compartment to the lift lobby corridor.
ii. level 07 from IPU 9 Orthopaedics to Rheumatology.
iii. level 07 from Inpatient Therapies to Orthopaedics.
iv. level 07 from IPU 12 Spinal Injury to the lift lobby.
v. level 07 from IPU 10 Acute Geriatric to the lift lobby.
vi. level 08 from IPU 11 Haematology to the lift lobby.
vii. level 08 from IPU 3 Medical/Surgical to the lift lobby.

4.3.6 Each fire stair must discharge independently via its own fire-isolated passageway to open space in accordance with Clause D1.7(b) Furthermore, in accordance with Clause D2.4, descending fire stairs must not be connected with fire stairs ascending from below ground level, i.e. separate discharge is necessary. As this is not the case for fire stairs 4/10, 5/13 and 6/12, justification as an Alternative Solution by fire safety engineering, as identified in the Alternative Solutions Schedule at item 2, is applicable.

4.3.7 At level 03 the discharge of the cafeteria stair and fire stair 1 (two discharge doors as rising & descending stairs are separated) onto the roof of the R&E Building (separate building) at the north-western corner requires particular attention in respect of the following:

i. An easement/ covenant is considered to be the minimum basis for justification of an Alternative Solution which deals with the discharge of exits onto the roof of another building, i.e. the R&E building. Accordingly, this is identified in the Alternative Solutions Schedule.
ii. A dedicated path of travel, leading to Reserve Road, would need to be established which has a clear unimpeded width of at least 2m, for the two fire stairs, plus 2m for the cafeteria doors as scaled, if these doors are to be designated as an exit from the cafeteria.
iii. Defining the path of travel with line marking is likely to be problematic. Something which provides for a permanent definition of the limits of the path of travel would be necessary, perhaps purpose built planters or the like.
iv. If the path of travel, leading from fire stair 1 to Reserve Road is within 6m of the northern façade and passes the level 3 Cafeteria doors, it would be necessary to provide:
    - -/60/30 fire doors to the cafeteria doors or internal wall wetting sprinklers to self-closing or automatic closing doors;
    - Internal wall-wetting sprinklers to the northern glazed wall for a distance of at least 3m above and below the level of the path of travel;
    - Fire resistant construction for the northern external wall, in accordance with the requirements for Type A construction and the distance to the fire source feature, i.e. the R&E building.

    This requirement is not applicable to the cafeteria stair discharge as it is not a fire-isolated exit.

4.3.8 Discharge of fire stairs 2, 3 and 11 (two discharge doors in each case as rising and descending stairs are separated) to the R&E Building loading dock forecourt area at the northern side of the building is subject to

compliance with Clause D1.10, i.e. the area constitutes a public space and the paths of travel leading to the street are sufficiently protected bollards or the like.

4.3.9 At level 01, because fire stairs 4 and 10 converge as one exit, fire stair 10 should not be accessible at level 01.

4.3.10 In patient care compartments, Clause D1.11(d) requires horizontal exits to have a clear area on the side of the fire wall to which occupants are evacuating of not less than 2.5m^2 per patient (in bed) and 0.5m^2 per person in any other case. Compliance should be confirmed in each case by documentation of the required clear areas, ideally on the fire compartmentation drawings.

4.3.11 In non patient care compartments Clause D1.11(c) requires that horizontal exits not comprise more than 50% of the required number of exits from that compartment whereas this requirement is exceeded in the:

- level 04 administration compartment, south western corner;
- two level 05 PaLMS/Pathology compartments;

These departures are to be addressed as an Alternative Solution by fire engineering, as identified in the Alternative Solutions Schedule at item 2.

4.3.12 For the purpose of determining aggregate exit width requirements for the level 03 cafeteria, the number of seats is indicated as 300 whereas a NLA of 920m^2 would, in theory, allow for 920 people at the rate of 1m^2 per person in accordance with Table D1.13 for restaurant/café use. Obviously this is rather high and if this is not to apply, then the client must agree that 300 will be the maximum number of seats, as referred to at Clause D1.13(b). The two exits in the eastern façade of the cafeteria scale off at 1.5m each and a further 1.5m exit to the north, subject to the Alternative Solution referred to at item 4.3.7(i), provide for 4.5m of aggregate exit width which will serve 500 persons in accordance with D1.6(d).

4.3.13 In accordance with Clause D2.20 all exit doors, including horizontal exit doors (an exit door in a fire wall between two different fire compartments), must swing in the direction of egress. As such various horizontal exit doors, as identified to date, must be either re-swung in the opposite direction to that shown, or swing in both directions. As horizontal exit doors must be fire doors, careful attention is warranted as to the selection of proprietary double swing fire doors.

4.3.14 Where it may be proposed to provide security doors to exits or in a path of travel leading to an exit, such doors must be fitted with electric strikes which automatically unlock on fire trip from anywhere in the building.

4.3.15 Electricity meters, distribution boards, central telecommunications distribution boards or equipment, electrical motors and the like, installed adjacent to exits or in the path of travel leading to an exit must be enclosed in non-combustible smoke tight construction, including in the ceiling space, in accordance with Clause D2.7 of the BCA. Where non-rated doors are proposed, the inside of the door must be lined with a non-combustible lining. Full perimeter smoke seals must be provided to the doors and all cable penetrations and the like must be fire stopped.

4.3.16 As the building exceeds 25m in effective height as well as being predominantly Class 9a, re-entry from within all fire-stairs onto all floors is required, i.e. fire-stair doors must not be lockable from within such as to prevent re-entry at each storey. Alternatively, where the doors are lockable from inside the stair, this can only be done by a fail-safe device, i.e. electric strike which, upon activation of a fire alarm, unlocks all doors. In this situation, additional requirements prohibiting locks to every fourth floor

with appropriate signage is required or alternatively an intercommunication system or audible or visual alarm system and associated signage must be installed to every floor level.

4.3.17 A general review of circulation space at doorways, including corridor widths, is necessary for compliance with the accessibility requirements of AS1428.1. It is recommended that an access consultant be engaged to review all issues pertaining to accessibility requirements and the Federal Disability Discrimination Act 1992.

4.4 Section E – Services & Equipment

4.4.1 Typical fire safety measures required for this building are as listed at item 3.6.

4.4.2 In addition to location of hydrants at the storey landings within each fire-isolated stair and hose reels within 4m of fire stair doors, hydrants and hose reels must be located on both sides of each horizontal exit. The required maximum 40m hydrant coverage (30m hose length plus 10m hose stream with the nozzle reaching at least 1m inside the furthest internal doorway) and maximum 40m hose reel coverage (36m hose length plus 4m hose stream with the nozzle reaching at least 1m inside the furthest internal doorway) must be achieved to all areas of the building.

4.4.3 Note that the engineering services and stores uses at level 01 and the retail use at level 03 attract an OH3 classification in accordance with AS 2118.1 which in turn leads to a higher rooftop secondary sprinkler water storage capacity than 25,000 litres, otherwise permitted by BCA Clause 7 of Specification E1.5 for building occupancies with hazard classifications not greater than OH2.

4.4.4 Because the fire control room is located at level 01 and is accessed via the loading dock in lieu of being at level 03 adjacent to the front entrance, this departure is subject to justification as an Alternative Solution, as identified in the Alternative Solutions Schedule at item 2.

4.4.5 The F.B Boosters at level 01 must be shielded from the building by 90/90/90 FRL construction for a minimum 2m each side and 3m above the upper hose connection. Furthermore, as the boosters are not located within sight of the main entrance to the building, this departure is subject to justification as an Alternative Solution, as identified in the Alternative Solutions Schedule at item 2.

4.4.6 Having regard to the extensive number of fire compartments at each storey, review is recommended with regard to the extent of effective compliance achievable with the zone smoke control requirements of Table E2.2a, both horizontally across all fire compartments on each floor as well as vertically between each storey and the extent to which, an Alternative Solution is to be applied.

4.4.7 Two emergency lifts in different banks must be provided and at least one of the emergency lifts must be of sufficient size to comply with the stretcher facility requirement of E3.2 by providing for a space of not less than 600mm wide x 2,000mm long x 1,400mm high.

4.4.8 The passenger lifts must be provided with facilities for people with disabilities and fire service controls in accordance with E3.6 and E3.7 respectively of the BCA.

4.5 Section F – Health & Amenity

4.5.1 To satisfy the damp and weatherproofing requirements of Part F1, the following apply:

F1.1 - Stormwater drainage compliance with AS/NZS3500.3;

F1.5 - Metal sheet roofing compliance with AS1562.1;

F1.6 - Sarking compliance with AS/NZS4200 Parts 1 and 2;

F1.7 - Waterproofing of wet areas in accordance with Clause F1.7 and AS 3740;

F1.9, F1.10 - Damp-proofing in accordance with Clause F1.9 and F1.10.

4.5.2 Sanitary facilities, including accessible facilities, must be provided in accordance with Part F2, in particular Tables F2.3 and F2.4, as follows:

Employee Facilities

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	Number	Design Occupancy	Number	Design Occupancy	Number
Male employees	1 — 20	1	1 — 10	0	1 — 30	1
	> 20	Add 1 per 20	11 — 25	1	> 30	Add 1 per 30
			26 —50	2		
			>50	Add 1 per 50		
Female employees	1 — 15	1			1 — 30	1
	> 15	Add 1 per 15			> 30	Add 1 per 30

Patient Facilities

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	Number	Design Occupancy	Number	Design Occupancy	Number
Male patients	1 — 16	2			1 — 8	1
	>16	Add 1 per 8			> 8	Add 1 per 8
Female patients	1 — 16	2			1 — 8	1
	>16	Add 1 per 8			> 8	Add 1 per 8
One shower for each 8 patients or part thereof						
One island-type plunge bath in each storey containing a ward area						

Note:

1. A unisex facility required for people with disabilities may be counted once for each sex.

2. Part F2 of the BCA is silent on requirements for visitor facilities although it is to be noted that the access requirements of Part D3 for disabled persons leads to the requirement for accessible toilet facilities for visitors to the minimum extent laid down in Clause and Table F2.4.

3. In determining the sanitary facilities, in the absence of nominated occupant numbers by the Client, it becomes a matter of calculating occupant numbers such as staff numbers relative to the occupancy rates nominated in Table D1.13 which nominates $10m^2$/person for patient care areas and office use. This is on the basis of the requirement of Clause F2.2 for sanitary facilities to be determined relative to the number of persons accommodated, calculated according to D1.13 if it cannot be more accurately determined by other means. The other means would be the numbers nominated by the client.

   Although Table D1.13 is appropriate for determining aggregate exit widths and also the occupant numbers for staff facilities in staff only office, pathology and the like areas, it may be rather extreme for determining WC requirements for staff in patient care areas and even for patient numbers such as in wards with single bed room facilities. Although for patient care areas, the patient numbers would be spelled out by the brief.

   In the absence of client nominated numbers for staff and visitors, it would be necessary for the architect to schedule out nominated occupant numbers for particular areas and seek the client's agreement to those numbers as the basis for determining the required sanitary facilities.

4.5.3 At level 09 the office staff sanitary facilities appear to be unisex and do not indicate provision of urinals and basins. Separate male and female facilities must be provided in accordance with the Class 5 rates from Table F2.5.

4.5.4 At level 09 the proposed unisex 'ensuite' facilities (4 off) with assumed WC, shower and handbasin within each ensuite, will adequately accommodate the proposed 9 sole occupancy bedrooms (Class 3) of the Staff On-call Facilities residential wing, in accordance with Table F2.1.

4.5.5 Minimum required ceiling heights are as follows:

- Patient care area : 2.4m;
- Operating theatre or delivery rooms : 3.0m;
- Treatment room, clinic, waiting room, passageway, corridor, or the like : 2.4m;
- Office areas : 2.4m;
- Sanitary compartments etc : 2.1m;
- Retail, Cafeteria : 2.4m.

4.5.6 All rooms used for sleeping purposes must be provided with natural light at the rate of at least 10% of the room floor area. Review is warranted, for example, with regard to one bedroom in the level 07 IPU 9 Orthopaedics compartment, three bedrooms in the level 08 Sleep Studies compartment, and bedrooms in the level 09 Class 3 Staff-On Call Facilities.

4.5.7 Artificial lighting to the relevant provisions of AS 1680.0 must be provided in the stairs, passageways, corridors, lobbies and throughout the building.

4.5.8 Mechanical ventilation must be provided throughout the building to the requirements of AS 1668.2.

4.6 Section G – Ancillary Provisions

4.6.1 NSW Clause G1.101 requires that windows located 3 or more storeys above ground level be provided with a safe method of cleaning that complies with the Occupational Health and Safety Act 2000 and regulations under that Act.

4.6.2 As discussed at item 4.2.6, the interconnection of levels 03, 04 and 05 via the void spaces in the central spine is permissible under the atrium provisions of Clause G3.1(b). Significantly due to the limitation of the interconnection to

three storeys in a sprinkler protected building with one of those storeys situated at the entry level, the additional requirements of Specification G3.8 do not have application.

4.7 Section J – Energy Efficiency

As part of the Australian Government's greenhouse gas reduction strategy, new energy efficiency measures for commercial and public buildings have been incorporated as Section J in the BCA since 1 May 2006. Located within the BCA's 'Climate Zone 5' (Sydney east), the proposal's various building components must comply with the following energy efficiency requirements of Section J:

- Part J1 - Building Fabric;
- Part J2 - External Glazing;
- Part J3 - Building Sealing;
- Part J4 – Air Movement (relates to level 9 Staff On-Call Residential Facilities (Class 3) only)
- Part J5 - Air Conditioning and Ventilation systems;
- Part J6 - Artificial lighting and Power;
- Part J7 - Hot Water Supply; and
- Part J8 - Maintenance.

At design stage, compliance is subject to documented verification in the form of a Section J Energy Efficiency Report and certification of compliance by the Design Consultants with the requirements of the relevant parts of Section J of the BCA.

This Section J report must be a stand alone document from other ESD reports related to ABGR and Green Star ratings.

5.0 CONCLUSION

This report represents an assessment of the current architectural documentation provided to date.

This preliminary BCA review has identified potential departures from the deemed-to-satisfy provisions of the BCA, which must either be rectified during design development or addressed on a fire engineered Alternative Solution basis.