APPENDIX H

Acoustic Report

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St George Hospital Acute Services Building Redevelopment

Schematic Design Report

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1 INTRODUCTION.

This report presents an outline of the levels of acoustic performance proposed as part of the proposed works in the St George Hospital Stage 2 Redevelopment and in-principle systems to be adopted to meet these ratings.

This review will involve:

- A summary of the sound transmission ratings proposed for partition walls and description of the audibility of the level of transmitted noise from one space to another.
- Description of the different wall types proposed and outline of the proposed location of all wall types.
- Review of related architectural systems (glass partitions, doors, etc) to identify potential acoustic issues which may impact acoustic privacy/wall ratings between spaces.
- Review of external noise impacts and recommended building shell design.
- Acoustic objectives for services noise (hydraulic and mechanical). However detailed description of the acoustic treatment services (duct lining/attenuators etc) will not be included in this document (as they have been outlined in detail in our Acoustic Specification).

2 REVIEW OF ARCHITECURAL SYSTEMS

2.1 ACOUSTIC SEPARATION OF SPACES

2.1.1 Walls – Proposed Wall Ratings

Suitable sound transmission class ratings for the various partition walls have been determined with reference to the following:

- The architectural layouts. Different space types will generate differing noise levels (eg – a meeting room is likely to produce more noise than a private office). Further, different space types will require differing levels of acoustic privacy (eg a meeting room will require a higher level of privacy than a lounge area). Appropriately selected partition walls will take into account these factors.
- Studies carried out to determine the audibility of human speech with varying degrees of STC/R_w rated partitions. These studies have been performed for a number of recent projects with the aim of determining the minimum acceptable level of sound transmission for a particular wall. An understanding of the perception of sound and general audibility/intelligibility of human speech with different sound rated partitions is fundamental to determine appropriate STC ratings for the partition walls.
- Flanking paths – Flanking occurs where sound travels to one space to another by some path other than through the sound rated wall. For example, sound may pass from room to room via a ceiling cavity. Elements such as mechanical systems (duct layouts etc) and the position of doorways should be reviewed in order to ensure that flanking paths do not detrimentally affect a sound rated wall.

The best manner in which to describe the level of sound privacy provided by different partition systems is by comparison between the level of audibility in a "receiver" room as a result of a number of different noises generated in an adjacent "source" room.

Table 1 below outlines the level of acoustic privacy afforded by different partitions.

Table 1 - Sound Transmission of Speech through Partition Walls

Speech Noise Level	Represents	STC/Rw Rating of Partition	Audibility of Speech In Adjacent Office
60 dB(A)	Normal conversation	25	Speech clearly audible
60 dB(A)	Normal conversation	30	Speech audible. Content of speech just recognisable.
60 dB(A)	Normal conversation	35	Speech faintly audible/inaudible. Content of speech not recognisable.
70 dB(A)	Raised voice	30	Speech clearly audible. Content of speech recognisable.
70 dB(A)	Raised voice	35	Speech audible. Content of speech recognisable.
70 dB(A)	Raised voice	45	Speech faintly audible.
70 dB(A)	Raised voice	50	Speech generally inaudible.

From the above table we note:

- An STC 30 partition provides a moderate level of privacy for normal conversation levels. Raised conversation levels through an STC 30 partition would be audible in an adjacent space.
- Increasing the rating from STC 30 to 35 marginally reduces the noise level from raised conversation in the adjacent room. However, speech is still typically audible, and the content of the speech still intermittently recognisable.
- An STC 45 partition would provide an adequate level of privacy for any typical use of a private room– raised voice would be unintelligible, normal voice barely audible (if at all) in an adjacent room.
- An STC 50 partition would provide an adequate level of privacy for any noise intensive uses of a room – raised voice would be inaudible, shouting would be just audible.

The ALC recommended STC/R_w ratings for the various spaces types are shown in the table which follows overleaf.

Details of corresponding wall types are presented in Appendix 1.

Table 2 - Recommended Wall Acoustic Ratings

SPACE TYPE	Recommended STC/R_w Ratings*	ALC Wall Type (refer to Appendix 1)
Office	37	AC003a/b
Staff Room	37	AC003a/b
Toilet	37	AC003a/b
Ward Rooms generally	43	AC002a/b
Shared ensuite	43	AC002a/b
Consult room containing an inter-connecting door	43 (see section 2.1.3)	AC002a/b
Treatment	43	AC002a/b
Meeting Room	50	AC001
Theatres, Consult Rooms Generally	50	AC001
WC to office or training.	43 + dummy wall	AC004

*Note – These ratings are laboratory recommended ratings. After construction, a field measured rating will commonly be less than the laboratory recommended rating. This can occur as a result of field testing uncertainties (ie – test is not conducted under laboratory conditions). A deficiency of 5 points between the field test result and the laboratory recommended rating can occur as a result of field test uncertainty, and does not necessarily indicate a defect in construction.

Note:

- Walls are to be constructed as per the details in appendix 1, which correspond to the ratings set out above.
- A wall containing a door or window will achieve a lower rating than the table above, as a result of the acoustic limitation of the glass/door. However – the wall must still be constructed as per the detail (ie – if an Rw 43 wall will be limited as a result of the door, the wall must still be constructed as per the Rw 43 detail, not the Rw 35 detail.
- The ratings specified above will reduced as a result of the installation of doors or windows in the wall. The following sections will present a discussion of the window/door treatments necessary to minimise the downrating as a result of the window/door.
- Carry out the installation of all walls/partitions in a manner that will not reduce the performance of the walls below the tabled Rw/STC/FSTC requirements. This includes but is not limited to the proper filling of joints between blocks/panels, back filling with mortar any chasing of walls and sealing of wall junctions.
- Walls / Partition Systems (i.e. wall and ceiling combined where walls are not full height) in fully refurbished areas are to comply with the ratings in table 2 above. In areas of medium refurbishment (which may include renewing ceiling tiles), the existing acoustic performance of the Partition System is to be maintained. In areas of light refurbishment, it is proposed to keep the existing ceiling and wall constructions - any new penetrations in existing walls would need to be treated to maintain the performance of the partition.

2.1.2 Fire/Impact Rated Plasterboard

Details attached in appendix 1 use standard plasterboard unless stated otherwise. Use of fire or impact rated plasterboard (where required for reasons other than acoustics) for any of the plasterboard sheets will result in the wall rating being marginally increased, and therefore also satisfactory.

2.1.3 Internal Glass Partitions

Glass partitions/elements in wall separating adjacent offices, wards, consult rooms, meeting rooms are not recommended as the required acoustic rating (Rw 43 to 50) cannot be maintained.

Glass elements in corridor walls can be used as the acoustic rating of the wall will be limited as a result of the entry door in any event.

Any glass used in corridor walls should be:

- 10.38mm if used for consult, meeting rooms, treatments rooms.
- 6.38mm if used for general office areas or other less noise sensitive rooms.

2.1.4 Doors

Doors will limit the acoustic performance of a wall.

Even a solid core door with seals will reduce the acoustic rating of a Rw 43 wall. For example:

- For a door without seals installed in a Rw 43 wall, the rating of the door will be approx Rw 25, with the combined wall/door rating will be Rw 25-28
- For a door with seals installed in a Rw 43 wall, the rating of the door will be approx Rw 28, with the combined wall/door rating will be Rw 28-31.

This downrating of the wall is not typically an issue, for a wall with door separating a ward/office from a corridor. However, one situation where the downrating can be a problem is for an inter-connecting door between two consultant offices. Unlike the corridor wall situation, audible noise transmission from consult room to consult room is likely to be an issue. In this situation, use of a proprietary acoustic door can be warranted. When using a proprietary door, it is typically not pragmatic to select an acoustic door with an Rw rating of greater than 43, as the door will become prohibitively heavy and expensive. Given that the door rating will be approximately Rw 43, there will be no point in building an Rw 50 wall, as the door will limit the acoustic performance of the wall in any event.

We recommend:

- For consult to consult inter-connecting doors, an Rw 43 proprietary door (from Pyrol, Colpro or similar) is recommended.
- For meeting, consult (other than the inter-connecting door), treatment and the two ward rooms to the north of the lounge area – doors to consist of solid core door with seals (Raven RP 10 to top and sides, Raven RP 38 drop seal to base).
- For other doors – solid core door with gaps minimised.
- It is acceptable to have viewing panels in the doors.

2.1.5 Ceilings and Reverberant Noise Controls

Ceiling design is undertaken so as to:

- Ensure that acoustic privacy achieved by the partitions is not downrated as a result of sound transmission via ceiling cavities. Where internal partitions do not run full height, ceilings tiles have been selected so as to ensure that room to room noise transmission via the ceiling cavity does not downrate the acoustic performance of the partition (as nominated in table 2).

- Reverberation times within rooms generally compliant with AS2107 are achieved (to ensure suitable levels of sound clarity within a space).

The above design requirements have been achieved through:

- The selection CAC 38/NRC 0.6 ceiling tiles with appropriate partition/ceiling junctions, as per the details attached at the end of this report.

- Use of hard ducted internally lined transfer ducts between ward room/office and corridor for movement of return air in the ventilation system.

- No perforated ceilings, or untreated ceiling penetrations should be designed without review by acoustic consultant.

2.1.6 Access Panels.

Access panels are to maintain the acoustic rating as the plasterboard removed for their installation. Typically, an Rw+Ctr 25 access panel with gasket seal will be satisfactory.

2.1.7 Risers

Risers will be designed to ensure operational noise from services is compliant with AS2107 acoustic goals. Refer to appendix 1 for recommended riser constructions for hydraulic services.

2.2 EXTERNAL GLAZING (CONTROL OF EXTERNAL NOISE IMPACTS)

Appropriate building shell construction (glass/roof and wall) is necessary to ensure that external noise does not adversely impact the proposed development.

2.2.1 Design Goals

External noise goals generally (excluding helicopter noise)

External noise impacts will be assessed with reference to AS2107 recommended noise levels for internal spaces. In addition, peak noise event acoustic criteria, based on commonly adopted sleep disturbance criteria will be presented.

Table 3 –Design Internal Sound Levels (External Noise)

Space/Use	Design Internal Sound Level
Ward Rooms	Average Noise - 35-40dB(A)$L_{eq(1hr)}$
Consult, Office, Meeting.	40-45dB(A) $L_{eq(1hr)}$
Lounge, Corridors	45-50dB(A)$L_{eq(1hr)}$

Helicopter Noise

Helicopter noise, from the relocation of the existing helipad from the roof of the existing carpark to the roof of the new sub-acute building will potentially impact the proposed development.

Aircraft noise is typically assessed with reference to AS2021 guidelines. We note, however, that helicopter movements are for emergency only and are anticipated to be infrequent (we assume no more than 1-2 per day, on average). Consequently, AS2021 guidelines are not recommended to be applied. Instead, a less stringent guideline, as detailed below, is recommended.

It has been assumed that helicopter movements will be limited to emergency situations. Based on this assumption the design noise level to be applied will typically be the recommended AS 2021 level plus 20 dB(A). Design noise levels adopted in building shell design are set out below.

Table 4 - Design Internal Sound Levels (Helicopter Noise)

SPACE TYPE	NOISE LEVEL OBJECTIVE dB(A)L_{max}
Wards (IPU, ICU), Treatment/Consult Rooms, Private offices, Conference areas	70
Theatres	65
Service Areas/Corridors	85
Offices - general	75
Research Centre	70
Level 9 HLS Lift Lobby	-

2.2.2 Glazing Recommendations

The following table presents the required glazing performance (refer also tables 6 and 7).

Table 5 – Recommended Glazing

LEVEL	LOCATION	SPACE TYPE	GLAZING
7	Grid 3 to Grid 9	IPU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	Remaining	All	6.76mm Laminated / 12mm airgap / 6mm
6	Grid 3 to Grid 9	IPU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	Remaining	All	6.76mm Laminated / 12mm airgap / 6mm
5	North and North West Façade Grid 3 to Grid 10	ICU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	North and North East Façade Grid 3 to Grid 6	ICU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	Remaining	Ward Rooms, Staff /Meeting Rooms	6.76mm Laminated / 12mm airgap / 6mm
	Remaining	Corridor	6.76mm Laminated / 12mm airgap / 6mm
4	North and North West Façade Grid 3 to Grid 10	ICU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	North and North East Façade Grid 3 to Grid 6	IPU Rooms (wards)	8.38mm Laminated / 12mm airgap / 8mm
	Remaining	Ward, Treatment Rms, Offices, Meeting,	6.76mm Laminated / 12mm airgap / 6mm
	Remaining	Corridor	6.76mm Laminated / 12mm airgap / 6mm
3	North and North East Façade Grid 3 to Grid 9	CT Reporting, Staff Meeting, Recovery Bays	8.38mm Laminated / 12mm airgap / 8mm
	North West Façade	Meeting / Staff	6.76mm Laminated / 12mm airgap / 6mm
	Remaining	Corridor	6.76mm Laminated / 12mm airgap / 6mm
2	North East & West Façade Grid 4 to Grid 9	Theatres & Recovery	8.38mm Laminated / 12mm airgap / 8mm
	North West Façade Grid 9 to Grid 14	Theatres	6.76mm Laminated / 12mm airgap / 6mm
	North and North East	Offices	6.76mm Laminated / 12mm airgap / 6mm
	Link	Link	6.76mm Laminated / 12mm airgap / 6mm
1	North West Façade Grid 5 to 7	Offices	6.76mm Laminated / 12mm airgap / 6mm
	Remaining	Office/Meeting	6.76mm Laminated / 12mm airgap / 6mm

The glazing nominated in the above table is for compliance with internal noise goals, bearing in mind the thermal requirements for a double glazed unit. In some areas, a jockey sash with integral blind is also required for infection

control (refer architectural drawings for extent). Where a jockey sash is required 6mm float glass is acoustically acceptable and the overall system will still comply with the project goals.

2.2.2.1 Glazing performance

The required performance of the glazing is presented in tables 6 and 7 below.

Glazing GLZ01: Glazing suite to be 6.76mm / 12mm air gap / 6mm float glass. Suite to achieve the following minimum transmission loss.

Table 6 – Glazing System GLZ01 – Minimum Transmission Loss

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
22	24	22	32	35	34	39	45

Note: Glazing system GLZ07 is to be 6.76mm / 12mm air gap / 6mm float glass, plus 6mm jockey sash internally. The required minimum transmission loss is as per Table 6 above.

Glazing Suite GLZ06: Glazing suite to be 8.38mm / 12mm air gap / 8mm float glass. Suite to achieve the following minimum transmission loss.

Table 7 – Glazing System GLZ06 – Minimum Transmission Loss

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
24	25	28	39	48	49	57	60

Note: Glazing system GLZ02 is to be 8.38mm / 12mm air gap / 8mm float glass, plus 6mm jockey sash internally. The required minimum transmission loss is as per Table 7 above.

2.2.3 Façade Construction

The following table presents the required façade construction.

Table 8 – Recommended Façade Construction*

LEVEL	LOCATION	SPACE TYPE	Façade
7	Grid 3 to Grid 9	IPU Rooms (wards)	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	All	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
6	Grid 3 to Grid 9	IPU Rooms (wards)	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	All	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
5	North and North West Façade Grid 3 to Grid 10	IPU Rooms (wards)	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	North and North East Façade Grid 3 to Grid 6	IPU Rooms (wards)	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	All	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
4	North, North East and North West Façade Grid 3 to Grid 10	ICU Rooms (wards)	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	All	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
3	North and North East Façade Grid 3 to Grid 9	CT Reporting, Staff Meeting, Recovery Bays	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	Meeting / Staff, Corridor	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
2	North East & West Façade Grid 4 to Grid 9	Theatres & Recovery	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 240mm cavity with insulation and 2x13mm plasterboard internally
	Remaining	Theatres, Offices, Link	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally
1	North West Facade	Office Areas	0.48mm Metal Cladding or 6mm fibre cement sheeting externally, 220mm cavity with insulation and 13mm plasterboard internally

*Plasterboard to be CSR EC08 Complete, or approved alternative.

2.2.4 Light Weight Roof and Ceiling Construction

External light weight roofs appear over habitable spaces on levels 7 and 5 however, these have concrete slabs beneath the light weight roof.

New external light weight roofs without concrete below are limited to circulation spaces and plant rooms. Plant rooms do not need to be treated for helicopter or environmental noise intrusion. The following table presents the construction for light weight roofs over circulation spaces.

Table 9 – Recommended Light Weight Roof Construction

LOCATION	ROOF TYPE	Roof Construction
Link	Light weight	0.48mm Metal roofing, min 220mm cavity withminimum 75mm thick 11kg/m^3 glasswool insulation and 1x13mm plasterboard internally

2.2.5 Helicopter Noise Impacts on Research House

Helicopter peak noise levels at the Research Centre are predicted to increase by 1-2decibels, taking into account the following:

- The new Helicopter Landing Site (HLS) is closer to the Research Centre than the existing HLS, but at greater elevation.
- An 11 degree glide path and a 2m drop/ rise on landing/take off for both existing and proposed HLS;
- Description from Research Centre staff of helicopters traversing over the carpark at the rear of their building flying to the existing HLS; and
- Description from Research Centre staff of building construction coupled with visual acoustic inspection of the existing building.

Staff from Research Centre have advised ALC that the occupants do not appear to be adversely impacted by the existing levels of helicopter noise.

A difference in noise level of up to 2 decibels is generally not perceptible by the human ear. On that basis, the change in helicopter noise level is not predicted to result in any additional disruption to the occupants.

2.2.6 Helicopter Noise Impacts on Existing Wards

The proposed location of the HLS will impact the existing ward block to the south east to a lesser extent than the existing HLS, as there is greater distance from the new HLS to the existing ward block than the previous site.

3 GENERATED TRAFFIC NOISE FROM CARPARK EXPANSION

The Stage 2 Refurbishment includes the extension of the Gray Street carpark. An additional 2 levels of car parking will be provided in addition to the existing 4 levels of parking, increasing the existing provision by approximately 50%. An increase of 50% will result in an increase in the peak hour usage of less than 2dB, which is not generally perceptible to the human ear.

4 SERVICES NOISE

This section nominates the acoustic standards for mechanical and hydraulic services. The section will be separated into two sub-sections;

i. Mechanical services
ii. Hydraulic services

Detailed review of plant treatments has been undertaken as part of detailed acoustic design, with acoustic treatments for individual plant items set out in our Acoustic Specification.

4.1 MECHANICAL SERVICES

Criteria required to assess the impact of mechanical systems are as follows:

- Internal noise levels within the development.
- Noise emissions to external areas
- Vibration levels from plant to all habitable spaces.

4.1.1 Internal Noise Levels

Noise from mechanical plant within the development has been designed to meet the criteria presented in Australian Standard 2107-1987 "Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors", summarised below.

These criteria apply to noise levels with the plant operating under all normal operating conditions, however do not apply to emergency plant.

Table 10 - Recommended Internal Noise Levels*

SPACE/ACTIVITY TYPE	NOISE LEVEL dB(A)L_{eq}
Wards	35
Office Spaces (Private), Consult Rooms, Meeting Rooms, Treatment Rooms, Quiet Rooms.	40
Lounge	45
Corridors , Lobby / Reception	50
Toilets / Store Rooms	50

*All noise should be free of tonality or low frequency dominance.

4.1.2 Noise during a Fire Emergency

Noise from all plant during a fire emergency shall comply with the requirements of AS1668.1. Noise levels inside the fire control room shall not exceed 65dB(A) during a fire emergency.

4.1.3 External Noise Levels

Noise levels emitted by the mechanical plant at all property boundaries and nearby buildings on adjacent properties shall meet the requirements of:

- Local Council (Kogarah)
- NSW EPA

As there are no specific noise emission guidelines for Hospitals or similar developments in the any Kogarah Council planning control. In the absence of this, the following noise emission controls will be adopted:

- For ventilation plant generally – the EPA Industrial Noise Policy and commonly adopted EPA sleep disturbance guidelines.
- For the emergency generator – the EPA Noise Control Manual will be used.

4.1.3.1 Industrial Noise Policy and Sleep Disturbance Guidelines (Ventilation Plant).

The INP and sleep disturbance guidelines will be applied for typical noise generating activities (typical use of plant, not emergency).

4.1.3.2 INP Intrusiveness Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the Leq descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality. Table 6 below provides the measured background noise levels and the resulting intrusiveness criteria. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Table 11 – Industrial Noise Policy – Intrusiveness Criteria

TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A)L_{90}	RECOMMENDED ACCEPTABLE NOISE LEVEL - dB(A)$L_{eq(15min)}$ (BACKGROUND + 5dB(A))
Day (7am-6pm)	51	56
Evening (6pm-10pm)	48	53
Night (10pm-7am)	45	50

4.1.3.3 INP Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Table 7 provides the recommended ambient noise levels for the suburban residential receivers for the day, evening and night periods. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Table 12 – Industrial Noise Policy – Amenity Criteria

TYPE OF RECEIVER	TIME OF DAY	AMENITY NOISE LEVEL dB(A)$L_{eq(Period)}$`
Residential (Suburban)	Day	55*
	Evening	45*
	Night	40*
Commercial	When in use	65
Hospital - Internal - External	 Noisiest 1-hour period Noisiest 1-hour period	 35 50

*However, if Leq noise levels in the vicinity of the site already exceed EPA Amenity Criteria, noise from the site should be designed to levels 10dB(A) below the ambient Leq level presented in table 1 (as per Industrial Noise Policy section 2.2, table 2.2). Design "amenity" noise level therefore become 53dB(A) (day), 51dB(A) (evening) and 46dB(A) (night), being 10dB(A) below the Leq levels presented in table 1

4.1.3.4 Sleep Arousal Assessment

Potential sleep arousal impacts should be considered for noise generated after 10pm. Sleep arousal is a function of both the noise level and the duration of the noise.

To assess potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An "emergence" test is first carried out. That is, the L1 noise level of any specific noise source should not exceed the background noise level (L90) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out overleaf.

Table 13 – Sleep Arousal Emergence Criteria (10pm-7am)

Location	Background Noise Level dB(A)L_{90}	Emergence Level dB(A) $L_{1(1min)}$
All Potentially Affected Residential Properties	45	60

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in appendix B of the DECC Environmental Criteria for Road Traffic Noise.

4.1.4 Emergency Generator (EPA Noise Control Manual).

Emergency plant is typically excluded from the Industrial Noise Policy. In the absence of this, chapter 151 of the EPA Noise Control Manual (Generators, Emergency) is of assistance.

For the residential receivers on Gray Street, the following criteria were adopted in Stage 1:

Table 5 – Industrial Noise Policy Recommended Acceptable Noise Levels

Receiver Type	Time of Day	Recommended Criteria	RECOMMENDED NOISE LEVEL dB(A)L_{eq}
Residential	Day/Evening (7am-10pm)	Background+10dB(A)	61 (day), 58 (Evening)
	Night (10pm-7am)	Background+5dB(A)	50

4.1.5 Vibration Produced By Plant

Tactile structure vibration levels produced by the plant should not exceed the criteria given in AS2670.2-1990. Where the standard recommends a range of criteria for a particular occupancy, the low end of the range shall be used.

4.2 DETAILED ACOUSTIC DESIGN OF SPECIFIC PLANT ITEMS

The acoustic design of the noise emissions from the specific mechanical plant selections will need to be conducted during the detailed design phase. To assist with the cost planning, indicative calculations have been undertaken based on equipment used on similar projects, with the relevant assumptions presented in each section.

4.2.1 Cooling towers

Assuming 3 off, each with a Sound Power Level of 99dB(A) (based on file data for a 1300kW unit), 300mm deep high performance acoustic louvres would be required to the fresh air intake for the control of noise breakout to the hospital rooms below. The towers will also require suitable vibration isolation for compliance with the project noise goals to the occupied space below. Note: assuming the cooling towers ramp down to 55% at night time (mechanical engineer to confirm), acoustic louvres are not required for noise emissions to neighbours by virtue of the screening offered by the building itself.

4.2.2 Chillers

The proposed load is 2x 1250kW and 1x500kW, but particular plant selections have not been made. Nominal sound power level in the order of 95dB(A) is plausible for this equipment. It is our understanding that chillers require only nominal ventilation, therefore it is recommended that the chillers and associated pumps be sectioned off from the main AHU plant room and the external louvres to the chiller room are then blanked off. If active louvres are to remain then it is likely they would need to be 300mm deep high performance acoustic louvres.

Suitable vibration isolation (including isolated plinth and spring/neoprene mounts) will be required for will also require for compliance with the project noise goals to the occupied space below.

4.2.3 AHU Plant Rooms

It is unusual for the Sound Pressure Level in a Hospital AHU plant room to be greater than 80dB(A). Assuming a sound pressure level of 80dB(A) for these plant rooms, the following treatments are indicative:

- Level 8 AHU rooms would not generally require acoustic louvres to the façade for the intakes. In duct treatment to the discharge is likely, particularly for the Return Air Fan(s) as RAF emissions tend to dominate in AHU plant rooms.

- Remaining AHU rooms would generally require acoustic louvres to the façade for the intakes along with in duct treatment to the discharges.

- AHU plant will need to be vibration isolated for compliance with the project internal noise goals.

4.2.4 Hydraulic Plant Rooms

Pump noise levels can vary greatly, therefore it is recommended that acoustic louvres be shown to the hydraulic plant room as a contingency.

4.2.5 Generator

Level 8 generator room will require extensive treatment for the management of noise emissions to the existing tower block. Given the proximity of the existing tower and the range of noise levels, indicative treatments are not included.

As the plant is for replacement power, noise emissions are to comply with the goals presented in section 4.1.3.

4.2.6 Plant in refurbished areas

In areas of light refurbishment, treatment of mechanical plant is typically limited to servicing only i.e. the cleaning of ductwork and/or replacement of filters. Such work is not likely to result in a significant change in the internal noise level.

In areas of medium refurbishment, there may be some minor adjustments to ductwork but generally plant would remain. External noise emissions likely to remain the same. Internal noise is to comply with the goals presented in 4.1.1.

In areas of full refurbishment, new equipment is to be installed and it would need to be assessed to ensure the internal noise comply with the goals presented in section 4.1.1 and that external noise emissions to the neighbours and the Hospital campus overall comply with the goals in 4.1.3.

4.3 HYDRAULIC SERVICES

The principal requirement for noise from the hydraulic services is that all waste/stormwater pipe passing through the various spaces of the hospital development comply with AS2107 satisfactory noise levels, as listed below.

Table 14 – AS2107 - Recommended Internal Hydraulic Noise Levels

SPACE/ACTIVITY TYPE	NOISE LEVEL dB(A)L_{eq}
Wards	35
Office Spaces (Private), Consult Rooms, Meeting Rooms, Treatment Rooms, Quiet Rooms.	40
Lounge	45
Corridors , Lobby / Reception	50
Toilets / Store Rooms	50

*All noise should be free of tonality or low frequency dominance.

Typically, any waste or stormwater pipework running over private offices, consult rooms, meeting rooms, treatment rooms, ward rooms (or within 1000mm of the room where walls are not full height) should be externally wrapped with 5kg/m^2 foam backed loaded vinyl from Vibralag from Acoustic Supplies (or equal).

5 DEMOLITION AND CONSTRUCTION NOISE

With any major construction site there will be noise associated with demolition and construction. The management of impacts arising from these activities is now routine practice, both to address impacts to surrounding properties, and for commercial reasons, to limit impacts on nearby tenancies.

The requirement for a noise management plan to be developed prior to works commencing is not uncommon. This should be done once a construction programme and methodology has been determined.

5.1 ACOUSTIC GOALS

5.1.1 Noise emission goals

The applicable EPA guidelines and standards are:

- "Interim Construction Noise Guideline" which nominates the following objectives for the proposed hours of construction:
    - Within Standard Working Hours (7am-6pm) – background + 10 dB(A).
    - Outside Standard Working Hours – background + 5 dB(A).

In the event that strict compliance with the RPA guidelines cant be achieved - Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site". The requirements stipulated in Section 3 of the standard will be followed.

5.1.2 Vibration goals

Typically, any construction vibration should comply with the objective in the DECC document "Assessing Vibration – A technical guideline", with the criteria for intermittent vibration applied.

In addition, we recommend that there be consultation with the hospital in the event there is existing vibration sensitive equipment to the work site (medical imaging equipment or similar). If so – operational and equipment damage guidelines from the equipment manufacturer should be provided.

5.2 RECOMMENDATIONS

A detailed construction noise and vibration management plan should be developed once a construction program has been prepared by the builder.

In the event that there are extensive amounts of demolition or excavation proposed in the vicinity of vibration sensitive equipment, we recommend that a vibration monitor be installed on site during the demolition/excavation process. Monitoring system should incorporate a SMS warning capability to enable the contractor to be notified in the event predetermined "trigger" levels are exceeded.

6 CONCLUSION

This report has presented a summary of the design goals and proposed treatments to be adopted in the St George Hospital Stage 2 redevelopment.

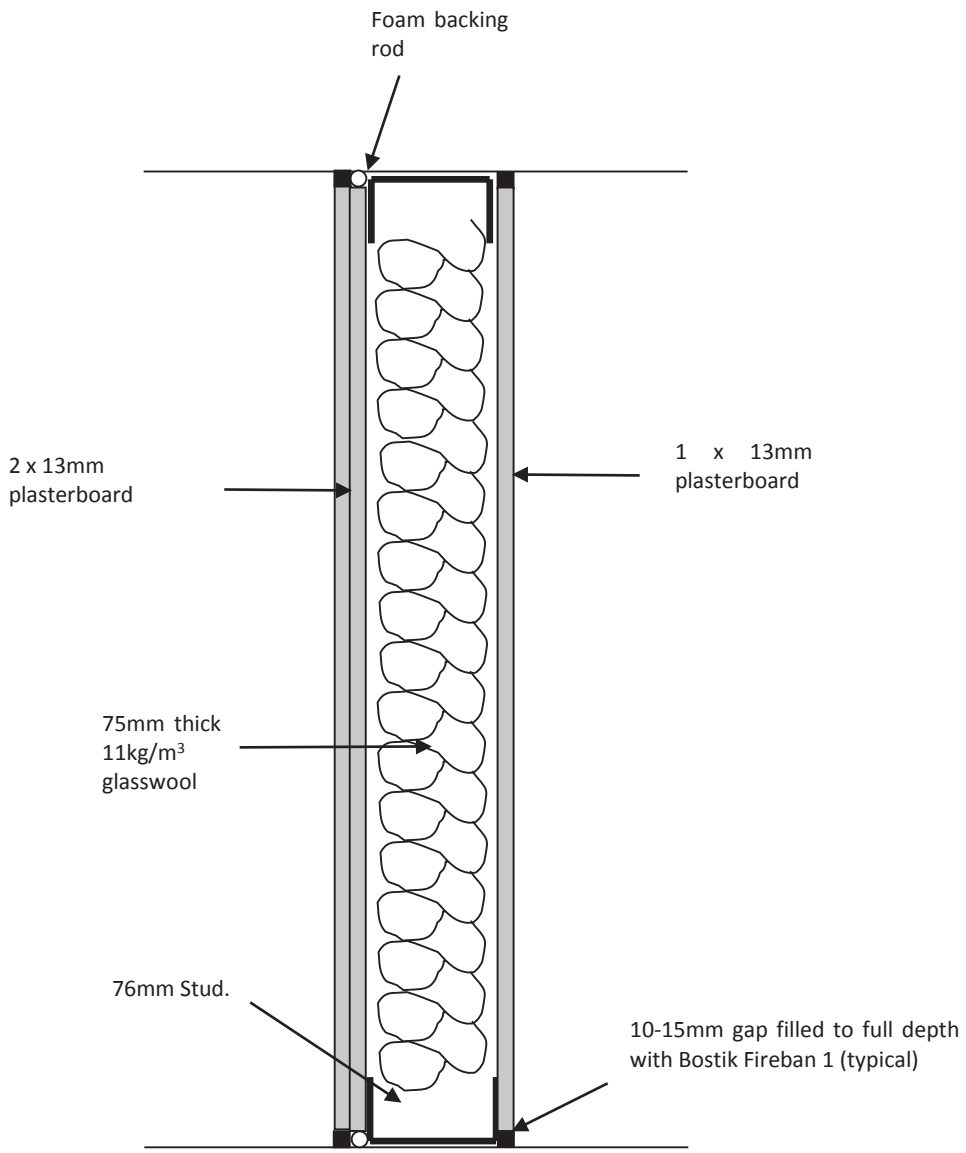
Compliance with the design goals will ensure that acoustic performance both within the development and to nearby properties will comply with relevant Australian Standard guidelines and NSW EPA and Council requirements.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Hilary Pearce

APPENDIX 1: ACOUSTIC DETAILS



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			St George Hospital – ASB	
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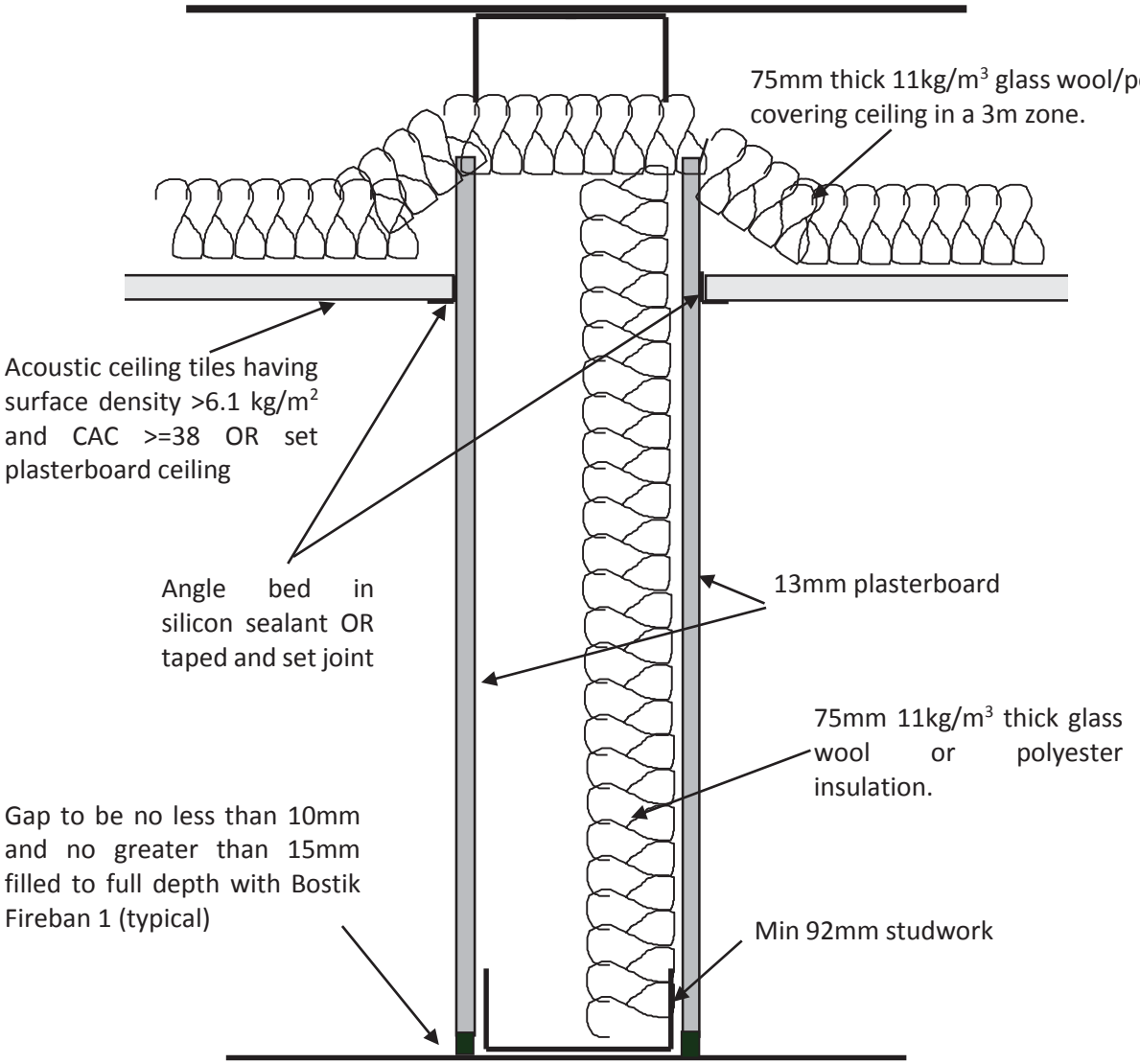

Note:

-All wall penetrations to be acoustically sealed. GPOs to have acoustic box (HPM firebox) behind or offset 600mm

-Ceiling penetrations including mechanical ventilation grilles to be acoustically treated with plenum box to the rear of the grille with offset spigot and acoustic flexible ducting

R_w43 WALL – Option 2	**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399**
	St George Hospital – ASB

Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
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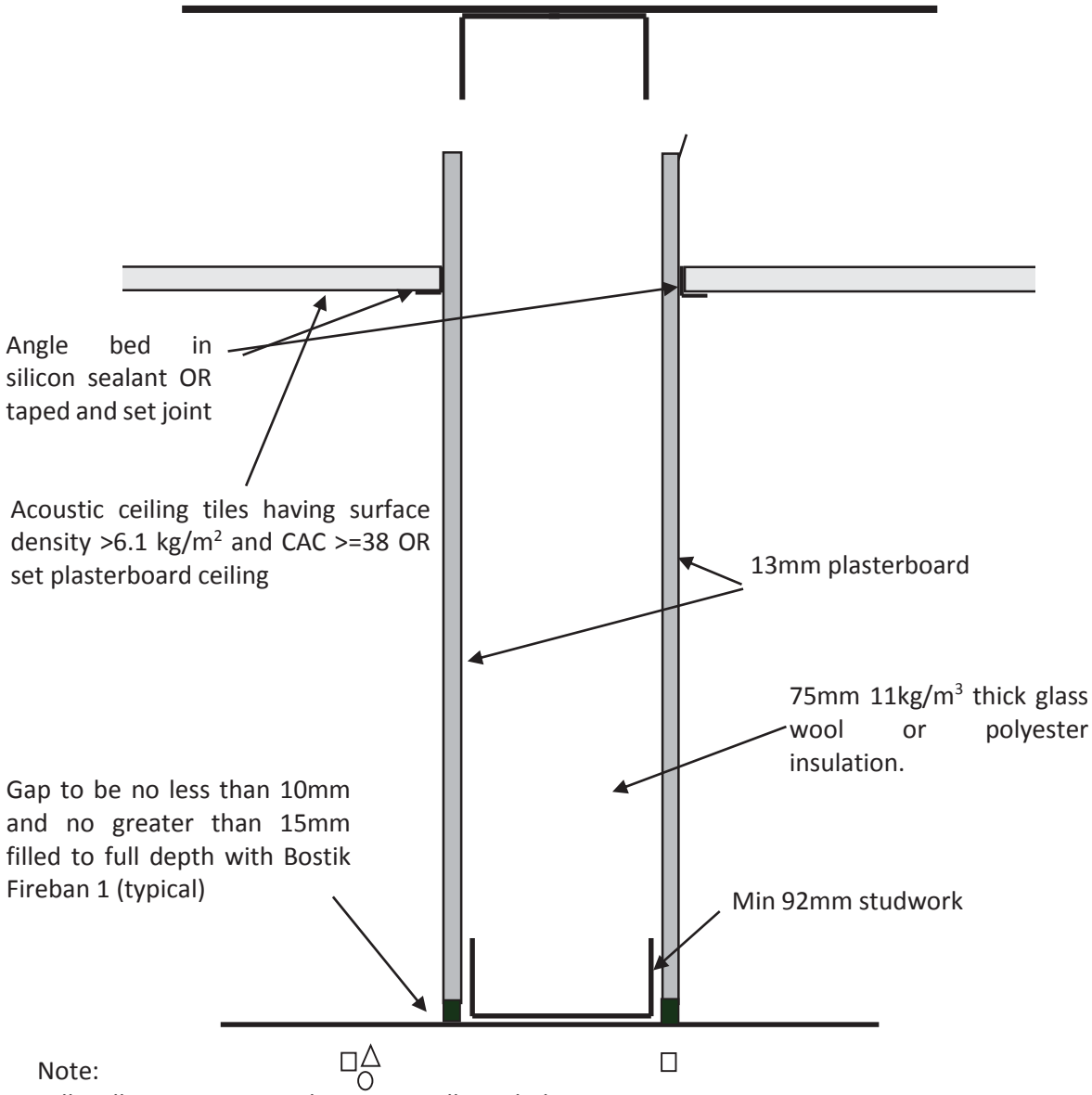

Note:
-All wall penetrations to be acoustically sealed.
-Ceiling penetrations including mechanical ventilation grilles to be acoustically treated with plenum box to the rear of the grille with offset spigot and acoustic flexible ducting

R_w37 WALL – Option 1			**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399**	
			St George Hospital – ASB	
Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
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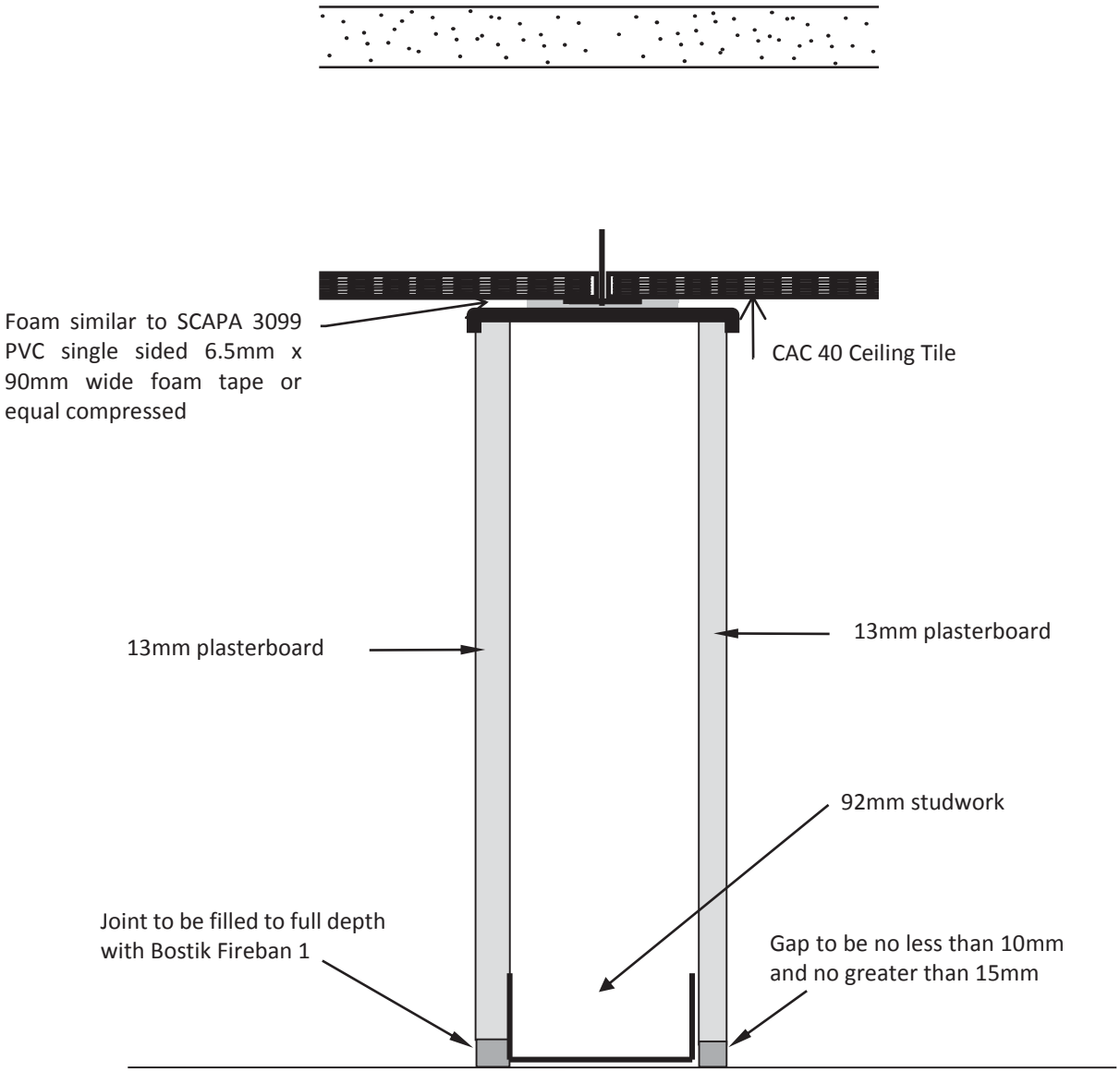

Note:

-All wall penetrations to be acoustically sealed. GPOs to be offset 300mm

-Ceiling penetrations including mechanical ventilation grilles to be acoustically treated with plenum box to the rear of the grille with offset spigot and acoustic flexible ducting

R_w37 – Option 2	**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399**
	St George Hospital – ASB

Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
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Issue	**Scale:**	**Approved**		
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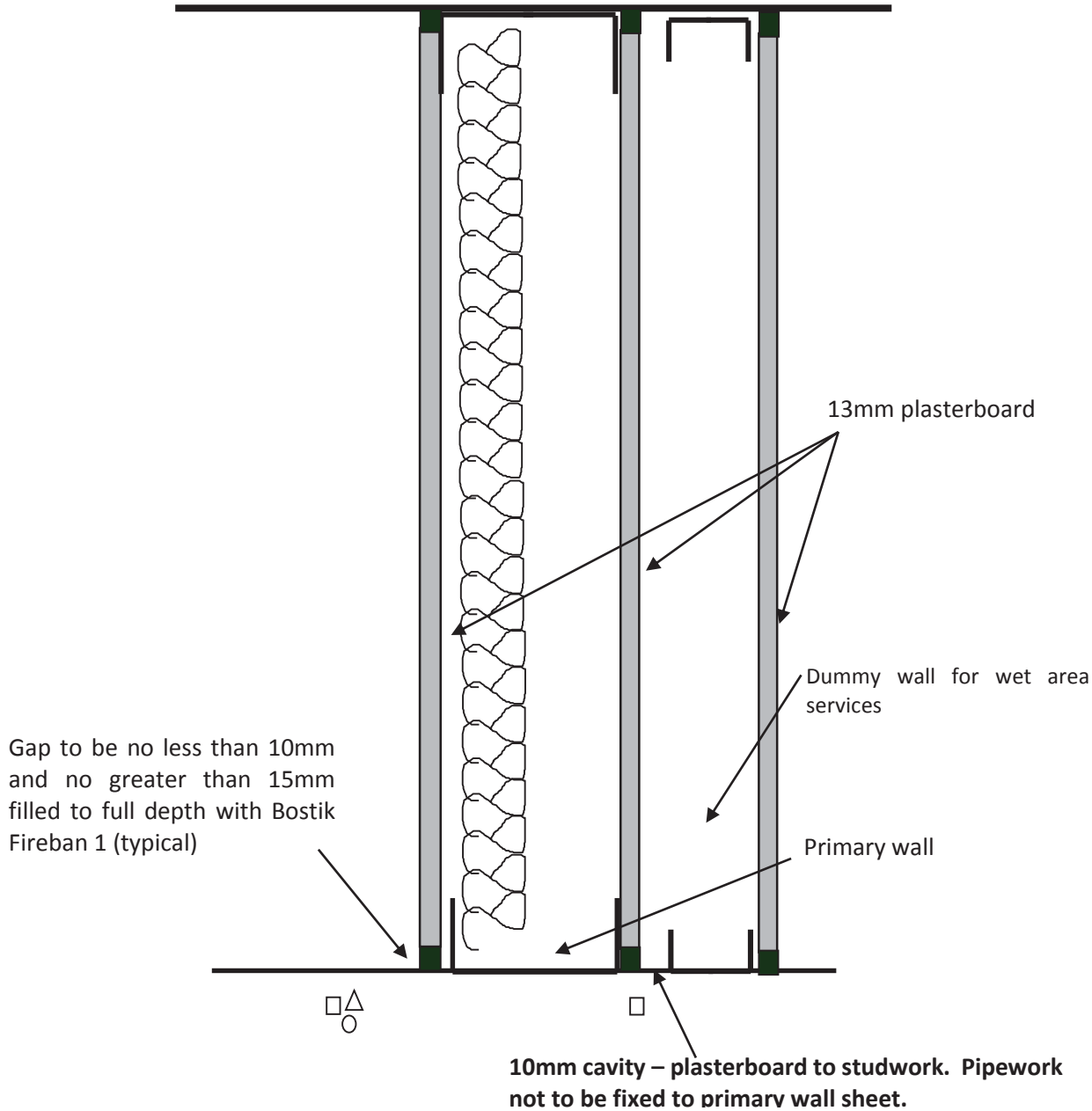

Dummy Wall Detail **Beverage Bay to Isolation Room**	**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399** **St George Hospital – ASB**

Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
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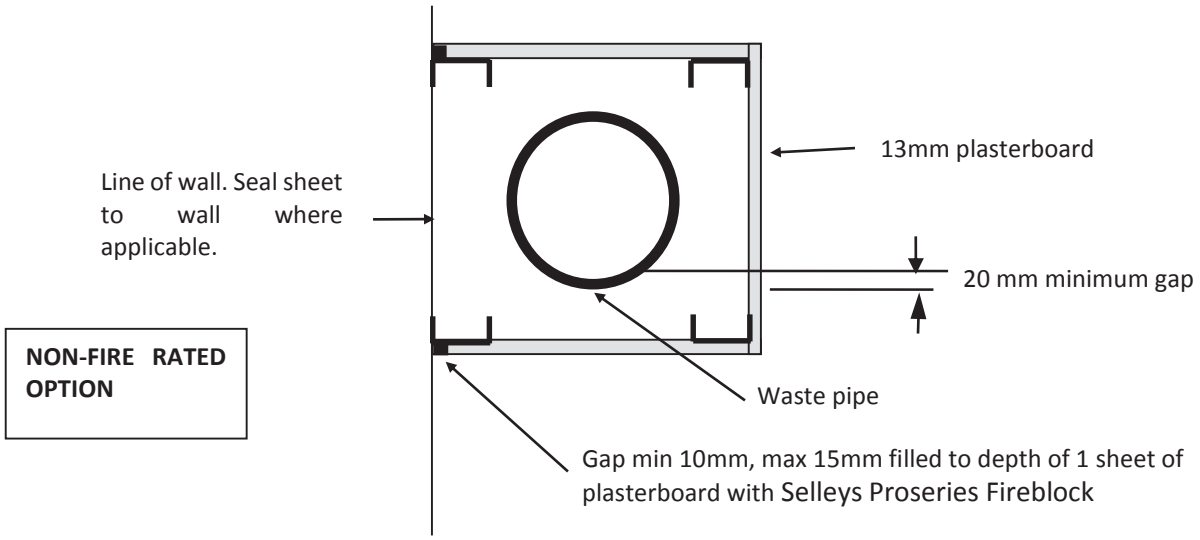
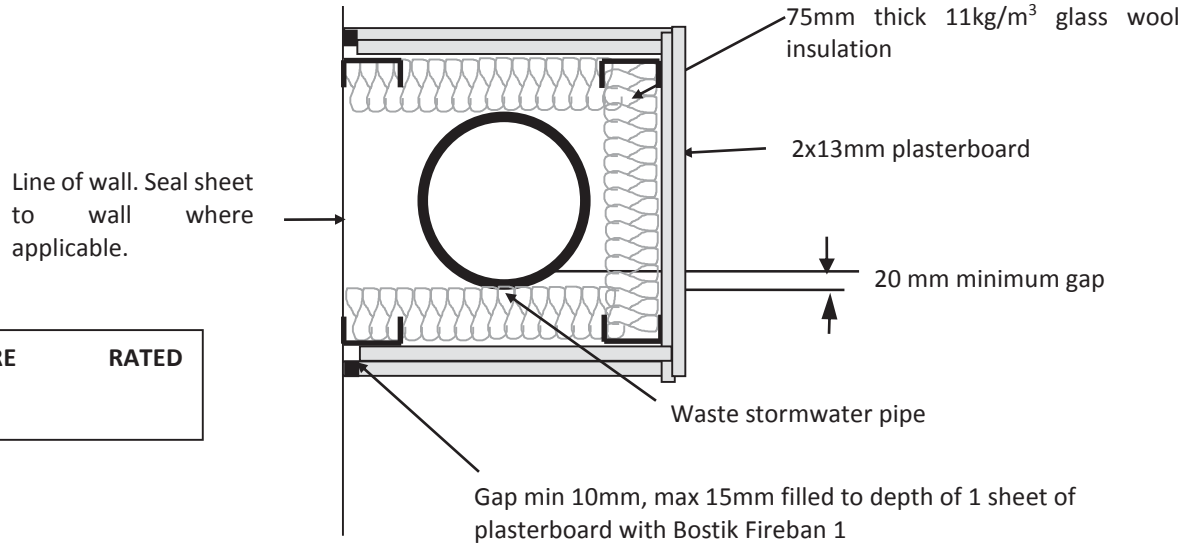


NON-FIRE RATED OPTION

Note - Access panel – Minimum Rw 28 access panel required in this riser.

WASTE / STORMWATER RISER TREATMENT **RISER TREATMENT FOR WET, UTILITIES AREAS, CORRIDORS**			**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399** **St George Hospital – ASB**	
Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
April 2012	MAS		20141489.1	AC005
Issue	**Scale:**	**Approved**		
R1	NTS			



NON-FIRE RATED OPTION

Access panel – Minimum Rw 34 access panel required in this riser.

RISER TREATMENT – RISER ADJACENT TO OFFICES, CONSULTING, TREATMENT, MEETING, INTERVIEW and WARD ROOMS			**Acoustic Logic Consultancy Pty Ltd** 9 Sarah Street, Mascot **Tel: 8338 9888 Fax: 8338 8399**	
			St George Hospital – ASB	
Date:	**Drawn:**	**Checked:**	**Project No:**	**Drawing No:**
April 2012	TT		20141489.1	AC006
Issue	**Scale:**	**Approved**		
	NTS			

APPENDIX 2: ACOUSTIC MARKUPS

NOTES:

KEY

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

1	15.01.15	RH	Design Team	Issue for Construction
0	17.12.14	RH	Design Team	SCHEMATIC DESIGN ISSUE 100%
0	12.12.14	RH	Design Team	ISSUE FOR CONSIDERATION
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0	07.11.14		Design Team	SCHEMATIC DESIGN ISSUE FOR CONSIDERATION
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	13.03.14			40% SD ISSUE
REV	DATE	DRAWN	CHK'D	APP'D	AMENDMENT

KEY PLAN

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PROJECT
ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT
ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE
ARCHITECTURE
GA Plans - Level 7 Zone 1

DRAWING STATUS
PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	REVIEWED BY: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14
SCALE: 1:200	
DRAWING No.: NB00043-ECA-DG-0108	REV: 9

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16/01/2015 4:18:53 PM

NOTES:

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- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	CHK'D	APP'D	AMENDMENT
9	16.03.15	MH	Design Team		Issue for Coordination
8	17.12.14	MH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	MH	Design Team		ISSUE FOR COORDINATION
6	03.11.14	MH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DISTINCTION
5	16.10.14	MH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DISTINCTION
4	07.10.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DISTINCTION
3	30.09.14	MH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DISTINCTION
	11.09.14				40% SD ISSUE

KEY PLAN:

PROJECT MANAGER: aurora

CLIENT: NSW GOVERNMENT Health Infrastructure

JACOBS

PROJECT: ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE: ARCHITECTURE
GA Plans - Level 6 Zone 1

DRAWING STATUS: PRELIMINARY ISSUE

DRAWN: KS/YURH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DOCUMENT REVIEW: MH/AC
SCHEDULED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE: 1 : 200

DRAWING No.: NB00043-ECA-DG-0107

REV: 9

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NOTES:

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- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	PROJ.	APP'D	AMENDMENT
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H	01.11.14	KH	Design Team		GEOMETRIC DESIGN ISSUE FOR SCOPING DEFINITION
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F	07.10.14		Design Team		GEOMETRIC DESIGN ISSUE FOR SCOPE DEFINITION
E	02.10.14	KH	Design Team		GEOMETRIC DESIGN ISSUE FOR SCOPE DEFINITION
	10.09.14				40% DD ISSUE

KEY PLAN

PROJECT MANAGER: aurora

CLIENT: NSW Health Infrastructure

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PROJECT
ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT
ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE
ARCHITECTURE
GA Plans - Level 5 Zone 1

DRAWING STATUS
PRELIMINARY ISSUE

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DESIGNED: AC/DG/JACOBS	DESIGN DIRECTOR: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

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E	02.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
D	13.10.14				40% SD ISSUE

KEY PLAN

PROJECT MANAGER: aurora

CLIENT: NSW GOVERNMENT Health Infrastructure

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PROJECT
ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT
ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE
ARCHITECTURE
GA Plans - Level 4 Zone 1

DRAWING STATUS
PRELIMINARY ISSUE

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DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
APPROVED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

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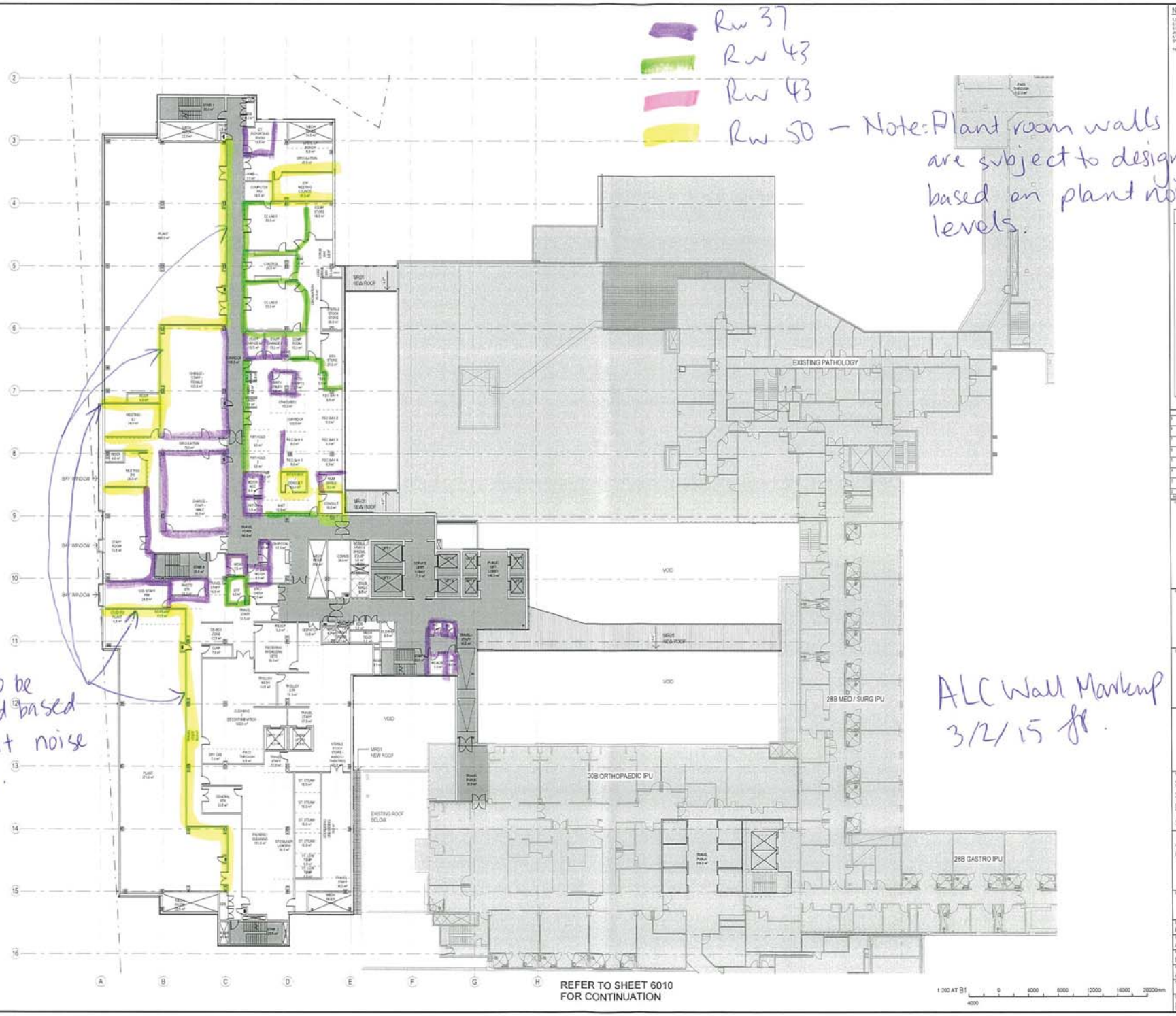

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- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING – AREA OF NO REFURBISHMENT

D	19.01.15	RH	Design Team	Issue for Coordination
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2	31.10.14			40% SD ISSUE

REV | DATE | DRAWN | ISSUE | APPD | AMENDMENT

KEY PLAN

PROJECT MANAGER: aurora

CLIENT: NSW Government Health Infrastructure

JACOBS

PROJECT: ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE: ARCHITECTURE
GA Plans - Level 3 Zone 1

DRAWING STATUS: PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGNED INCHARGE: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14
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- EXISTING BUILDING - AREA OF NO REFURBISHMENT

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B	23.10.14	RW	Design Team		SCHEMATIC DESIGN ISSUE FOR DISCIPLINE DISTRIBUTION

KEY PLAN

PROJECT MANAGER: aurora

CLIENT: NSW Government Health Infrastructure

JACOBS

PROJECT: ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL, KOGARAH NSW 2217

TITLE: ARCHITECTURE
GA Plans - Level 2 Zone 1

DRAWING STATUS: PRELIMINARY ISSUE

DRAWN: KS/VL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/PC/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

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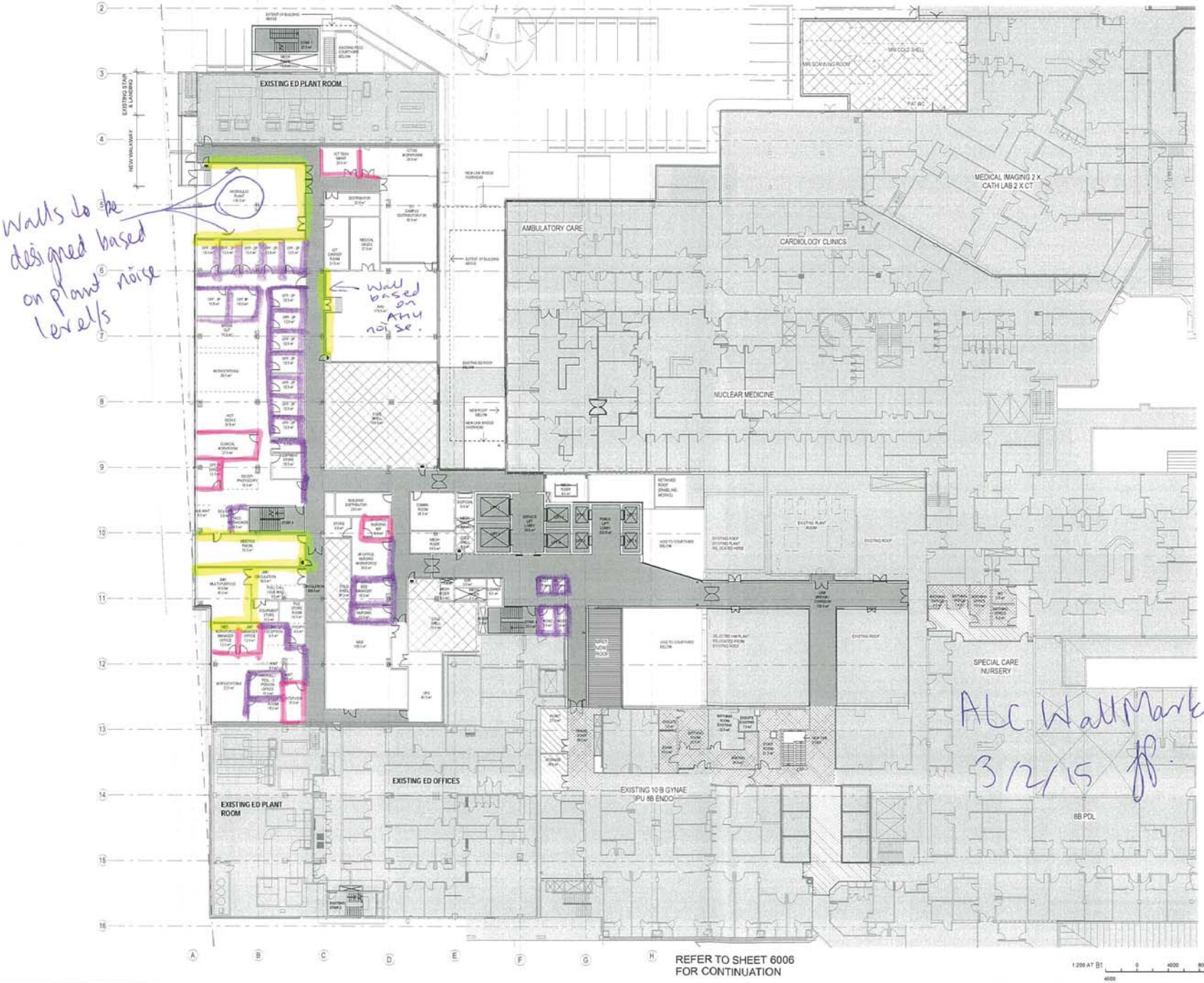

NOTES:

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- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

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A	15.10.14		Design Team	MEN IND ISSUE

KEY PLANS

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NSW Government Health Infrastructure

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ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

ARCHITECTURE
GA Plans - Level 1 Zone 1

PRELIMINARY ISSUE

DRAWN: KS/YU/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

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REV: 9

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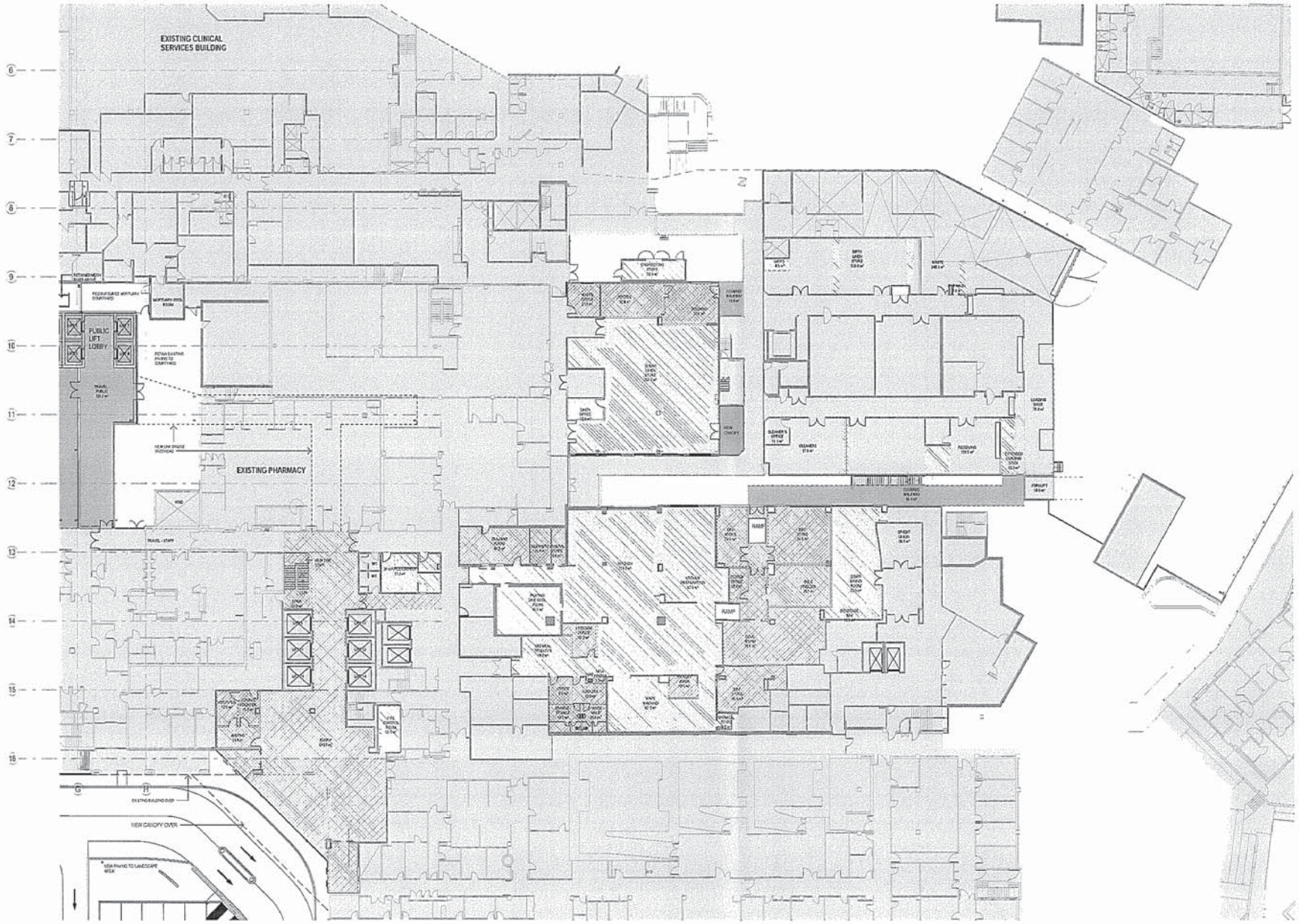

NOTES:

1 DO NOT SCALE DRAWINGS - WRITTEN DIMENSIONS GOVERN.
2 ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3 ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE PROCEEDING WITH THE WORK.
4 REPORT ALL DISCREPANCIES OR OMISSIONS IMMEDIATELY.
5 THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACT DOCUMENTS, SPECIFICATIONS, CONSULTANTS AND SHOP DRAWINGS.

THIS DRAWING IS UNCONTROLLED COPY UNLESS NOTED OTHERWISE

KEY

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

5	18.01.15	RW	Design Team		Issue for Construction
4	17.12.14	RW	Design Team		SCHEMATIC DESIGN ISSUE FOR COSTING
3	03.12.14	RW	Design Team		ISSUE FOR CONSTRUCTION
2	29.11.14	RW	Design Team		DEVELOPED SCHEMATIC DESIGN ISSUE FOR COSTING DISTRIBUTION
1	19.11.14	RW	Design Team		DEVELOPED SCHEMATIC DESIGN ISSUE FOR COSTING DISTRIBUTION
0	07.11.14		Design Team		DEVELOPED SCHEMATIC DESIGN ISSUE FOR COSTING DISTRIBUTION
1	03.11.14	RW	Design Team		DEVELOPED SCHEMATIC DESIGN ISSUE FOR COSTING DISTRIBUTION
0	13.10.14				NEW SET ISSUE

REV | DATE | DRAWN | PCG'D | APP'D | AMENDMENT

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL, KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Ground Floor Zone 2

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: AC
PREPARED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE
1 : 200
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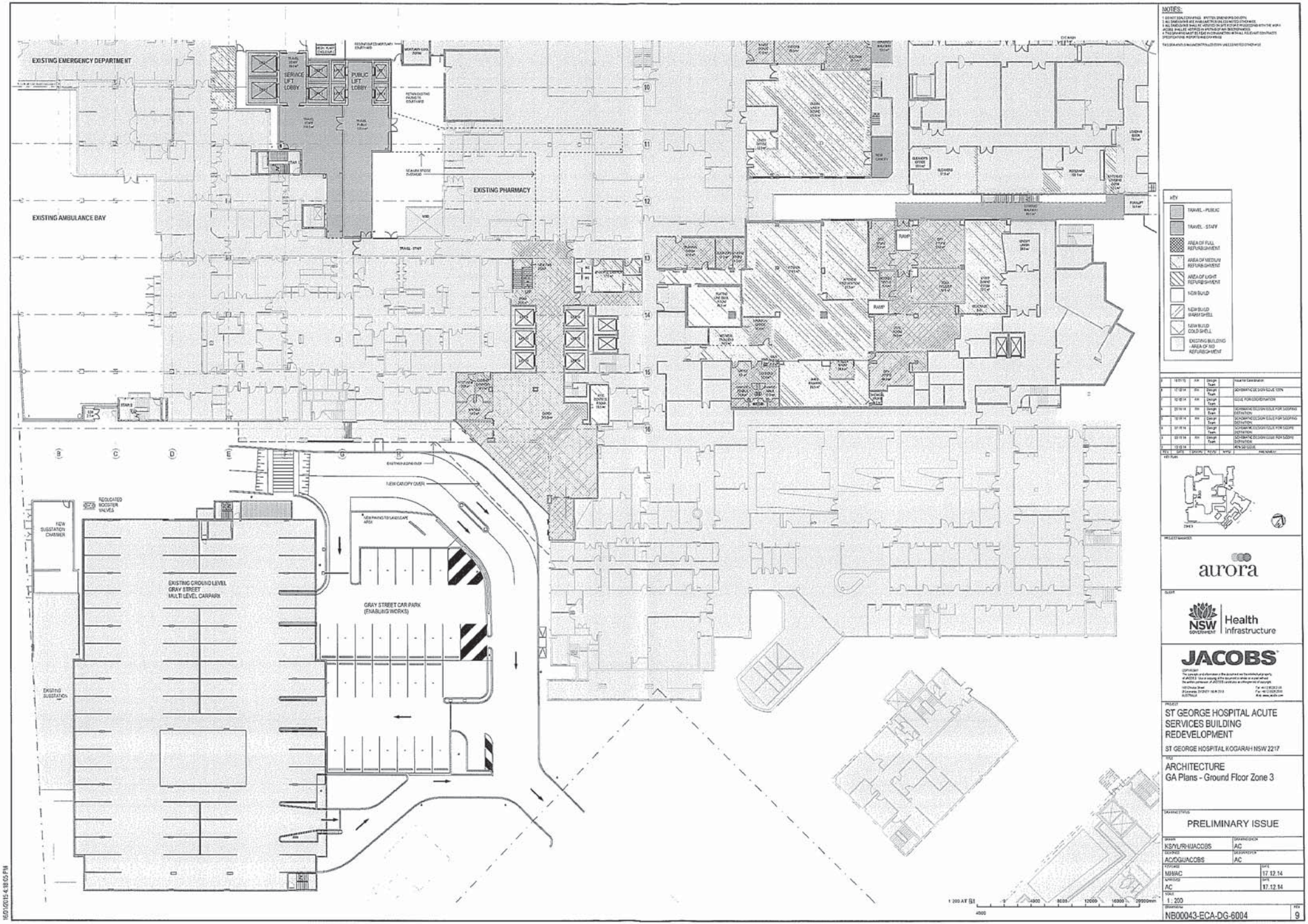
DRAWING No.
NB00043-ECA-DG-6003

REV
9

18/01/2015 4:17:48 PM



NOTES:

1 DO NOT SCALE DRAWINGS - WRITTEN DIMENSIONS ONLY TO BE USED.
2 ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3 ALL DIMENSIONS ARE TO BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK OR SHOP DRAWINGS. NOTIFY DISCREPANCIES.
4 THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS SPECIFICATIONS, REPORTS AND DRAWINGS.

THIS DRAWING IS NOT CONTRACT DOCUMENTATION UNLESS NOTED OTHERWISE

5	18.12.14	AM	Design Team	Issue for Construction
4	17.12.14	SW	Design Team	PRELIMINARY DESIGN ISSUE 100%
3	12.12.14	AM	Design Team	ISSUE FOR COORDINATION
2	03.10.14	AM	Design Team	PRELIMINARY DESIGN ISSUE FOR SKIDMORE DISTRIBUTION
1	12.09.14	AM	Design Team	PRELIMINARY DESIGN ISSUE FOR SKIDMORE DISTRIBUTION
A	27.08.14		Design Team	PRELIMINARY DESIGN ISSUE FOR SKIDMORE DISTRIBUTION
0	22.08.14	AM	Design Team	PRELIMINARY DESIGN ISSUE FOR SKIDMORE DISTRIBUTION
REV	13.03.14	DRAWN	ROOM	APPROVED

KEY PLAN

PROJECT MANAGER: aurora

CLIENT: NSW GOVERNMENT Health Infrastructure

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PROJECT
ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE
ARCHITECTURE
GA Plans - Ground Floor Zone 3

DRAWING STATUS
PRELIMINARY ISSUE

DRAWN: KS/YUR/HJACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGNED CHECK: AC
APPROVED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

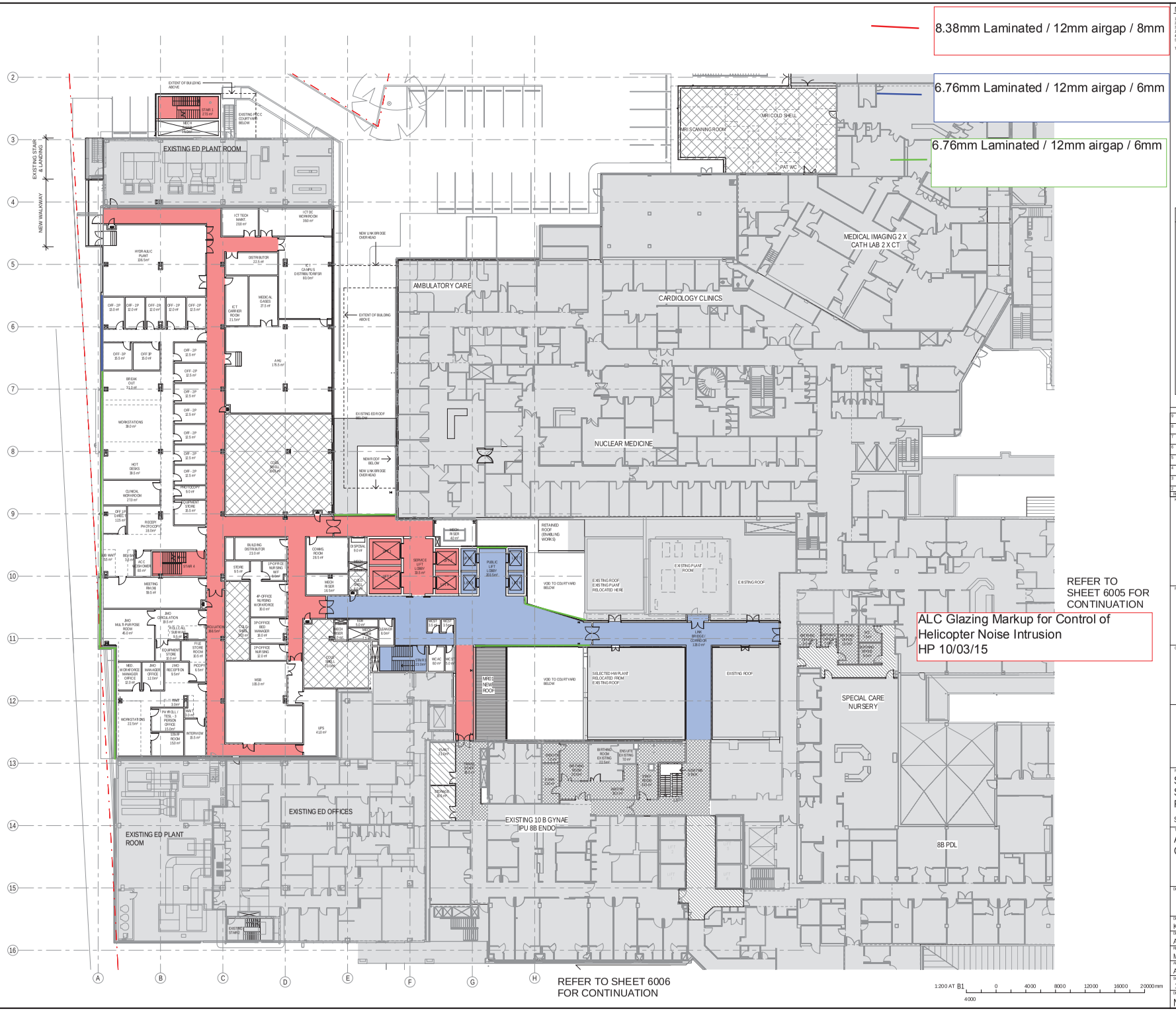
SCALE: 1 : 200

1:200 AT S1

DRAWING No: NB00043-ECA-DG-6004

REV: 9

16/01/2015 4:18:05 PM



NOTES:

1. DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE WORK. JACOBS SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.
4. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS, REPORTS AND DRAWINGS.

THIS DRAWING IS AN UNCONTROLLED COPY UNLESS NOTED OTHERWISE

KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				40% SD ISSUE

KEY PLAN

PROJECT MANAGER

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CLIENT

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 1 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

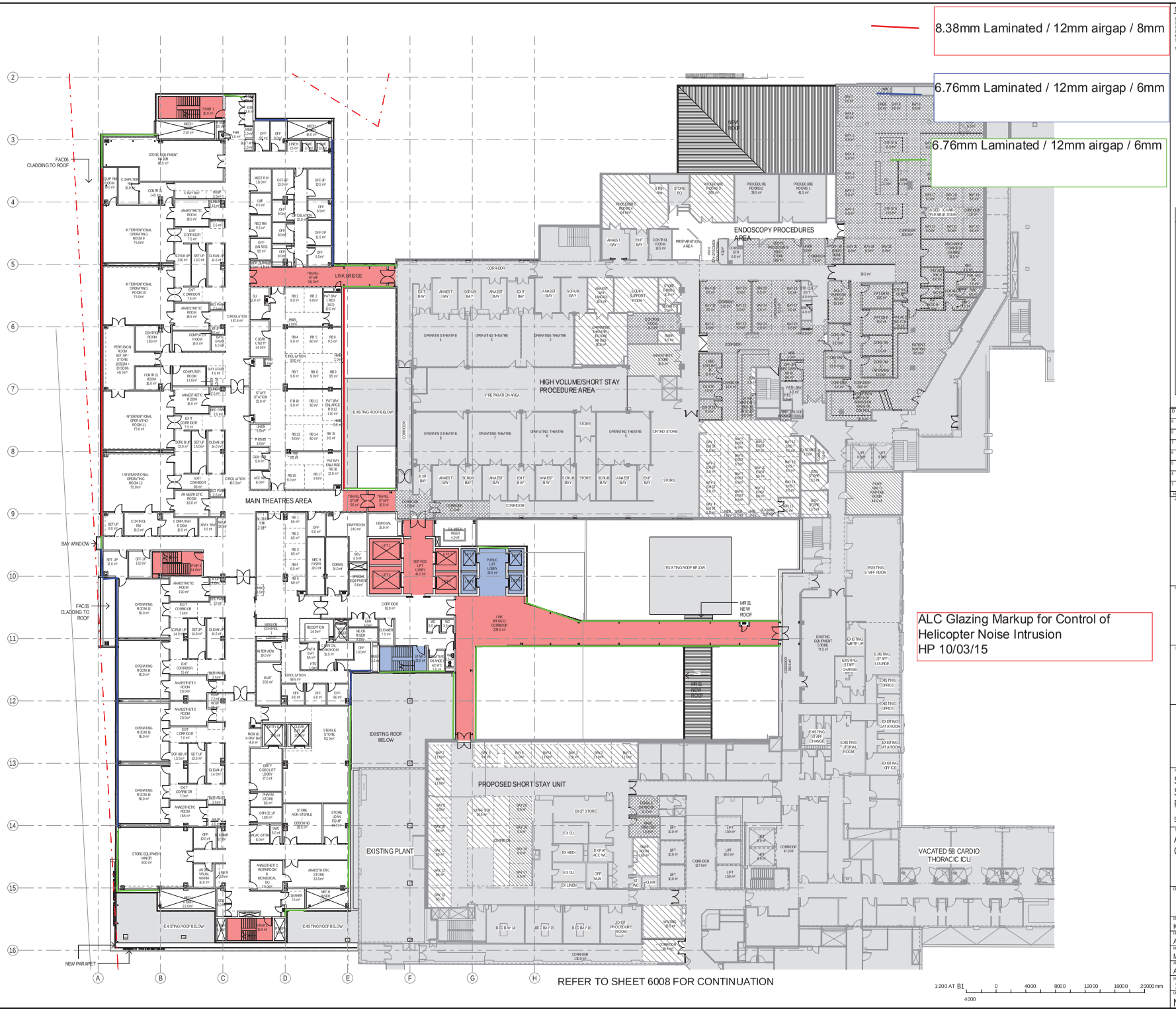
SCALE: 1 : 200

1:200 AT B1 — 0 4000 8000 12000 16000 20000mm

DRAWING No: NB00043-ECA-DG-0102

REV: 9

16/01/2015 4:17:01 PM



NOTES:

1. DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT CONTRACTS, SPECIFICATIONS, REPORTS AND DRAWINGS.
4. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS, REPORTS AND DRAWINGS.

THIS DRAWING IS AN UNCONTROLLED COPY UNLESS NOTED OTHERWISE

KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

ID	DATE	DRAWN	REVD	APPD	AMENDMENT
D	16.01.15	RH	Design Team		Issue for Coordination
C	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
B	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
7	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
6	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	13.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION

KEY PLAN

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 2 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/PC/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE: 1 : 200

1:200 AT B1 — 0 4000 8000 12000 16000 20000mm

DRAWING No: NB00043-ECA-DG-0103 REV: 10

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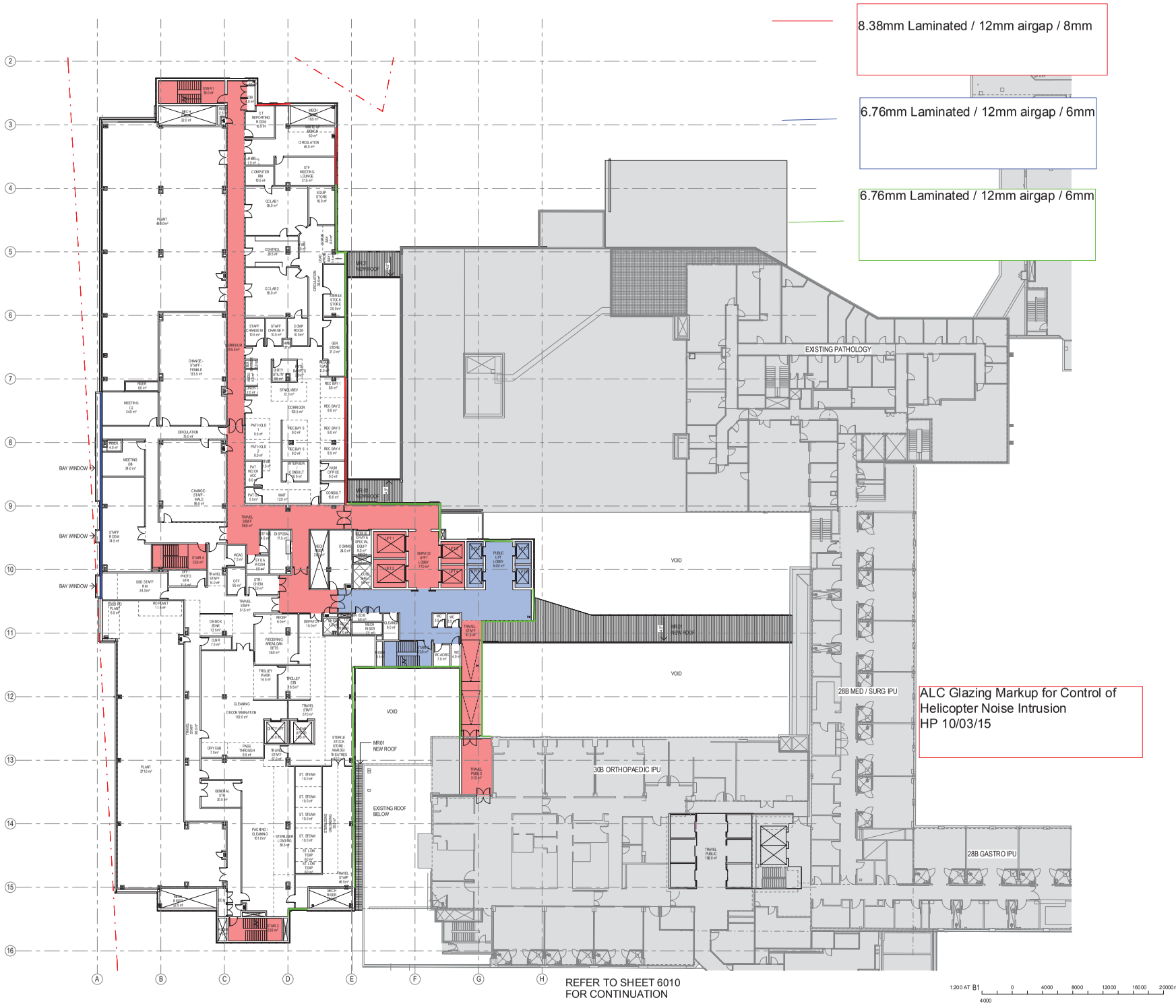

NOTES:

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THIS DRAWING IS AN UNCONTROLLED COPY UNLESS NOTED OTHERWISE

KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				KEYL SD ISSUE

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 3 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE: 1 : 200

DRAWING No: NB00043-ECA-DG-0104

REV: 9

16/01/2015 3:47:59 PM

NOTES:

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KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				KEYL SD ISSUE

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 4 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE: 1 : 200

DRAWING No: NB00043-ECA-DG-0105

REV: 9

16/01/2015 3:48:54 PM

NOTES:

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4. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS, REPORTS AND DRAWINGS.

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KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				KEY PLAN ISSUE

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 5 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE

1 : 200

1:200 AT B1 — 0 4000 8000 12000 16000 20000mm

DRAWING No: NB00043-ECA-DG-0106

REV: 9

16/01/2015 4:18:50 PM

NOTES:

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3. ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK. JACOBS SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.
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KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				40% SD ISSUE

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 6 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE: 1 : 200

DRAWING No: NB00043-ECA-DG-0107

REV: 9

16/01/2015 4:18:52 PM

NOTES:

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2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
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KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
9	16.01.15	RH	Design Team		Issue for Coordination
8	17.12.14	RH	Design Team		SCHEMATIC DESIGN ISSUE 100%
7	12.12.14	RH	Design Team		ISSUE FOR COORDINATION
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				KEN, SD ISSUE

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL ACUTE SERVICES BUILDING REDEVELOPMENT

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 7 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: MH/AC
REVIEWED: MH/AC	DATE: 17.12.14
APPROVED: AC	DATE: 17.12.14

SCALE

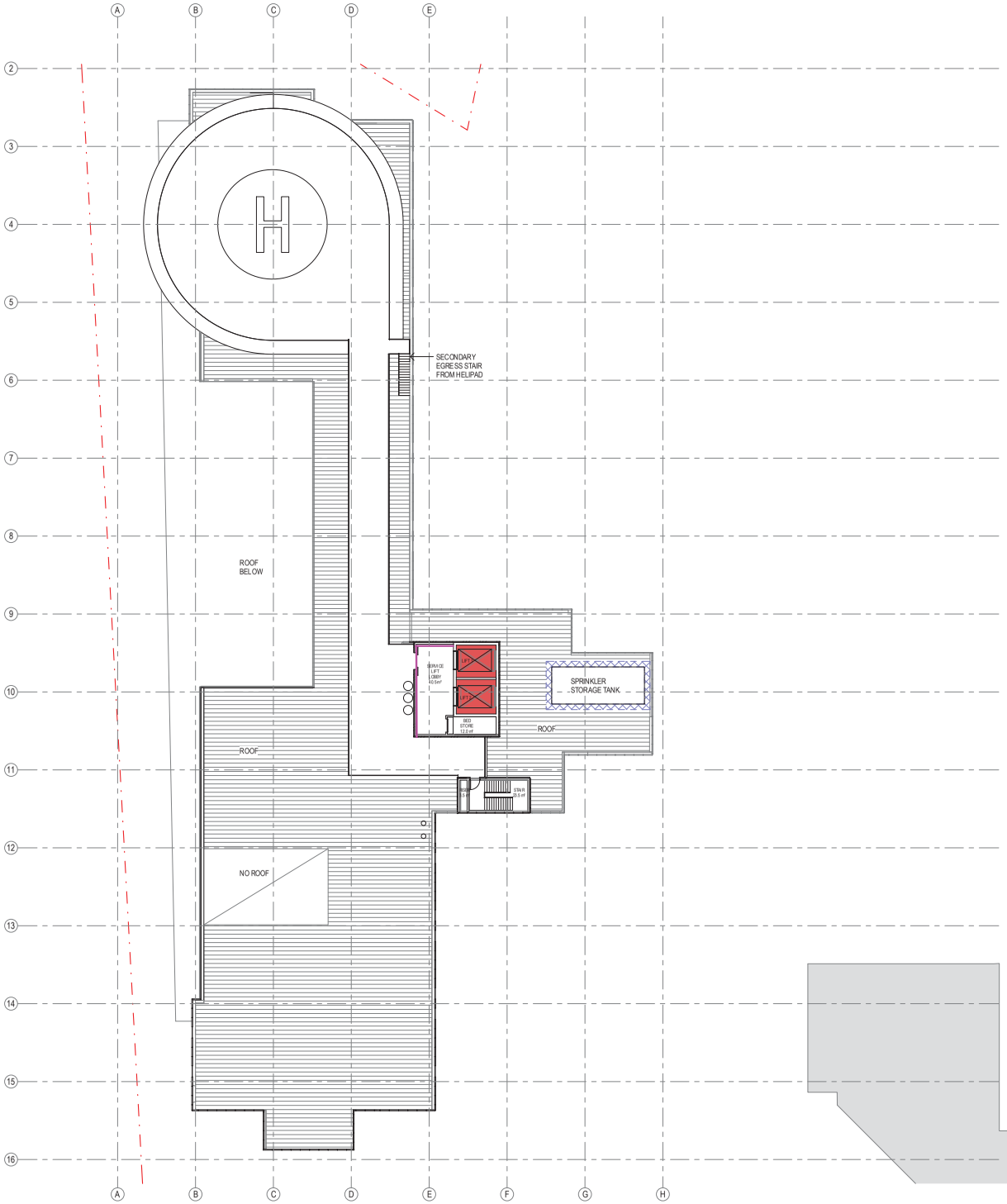
1 : 200

1:200 AT B1 — 0 4000 8000 12000 16000 20000mm

DRAWING No: NB00043-ECA-DG-0108

REV: 9

16/01/2015 4:18:53 PM



Glazing to architect's detail

ALC Glazing Markup for Control of Helicopter Noise Intrusion
HP 10/03/15

1:200 AT B1 0 2|4000 4|8000 6|12000 8|16000 12|20000mm
24000

NOTES:

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KEY:

- TRAVEL - PUBLIC
- TRAVEL - STAFF
- AREA OF FULL REFURBISHMENT
- AREA OF MEDIUM REFURBISHMENT
- AREA OF LIGHT REFURBISHMENT
- NEW BUILD
- NEW BUILD WARM SHELL
- NEW BUILD COLD SHELL
- EXISTING BUILDING - AREA OF NO REFURBISHMENT

REV	DATE	DRAWN	REVD	APPD	AMENDMENT
6	20.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
5	18.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPING DEFINITION
4	07.11.14		Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
3	03.11.14	RH	Design Team		SCHEMATIC DESIGN ISSUE FOR SCOPE DEFINITION
2	13.10.14				40% SD ISSUE
1	19.09.14	RH	Design Team		Issue for Coordination

KEY PLAN

PROJECT MANAGER

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PROJECT

ST GEORGE HOSPITAL
REDEVELOPMENT STAGE 2
ENABLING WORKS

ST GEORGE HOSPITAL KOGARAH NSW 2217

TITLE

ARCHITECTURE
GA Plans - Level 9 Zone 1

DRAWING STATUS

PRELIMINARY ISSUE

DRAWN: KS/YL/RH/JACOBS	DRAWING CHECK: AC
DESIGNED: AC/DG/JACOBS	DESIGN REVIEW: -
REVIEWED: AC	DATE: -
APPROVED: -	DATE: 26.08.14

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