Department of Education

Picton HS Redevelopment

50% Documentation - acoustic report

July 2018

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1. Introduction

1.1 Purpose of this report

This is the 50% Schematic Design Report (SDR) for the Acoustic Engineering discipline for the proposed redevelopment of Picton High School situated at 480 Argyle Street, Picton (Property Lot 2 in DP 520158).

1.2 Scope of Services for the 50% SDR Phase

The scope of services for the 50% SDR phase included the following acoustic inputs:

- Internal acoustic separation, including:
  - sound transmission performance requirements for all internal partitions
  - marked up copy of the architectural drawings
  - provide construction recommendations for different partition types
- Internal room acoustic treatments, including:
  - determine satisfactory reverberation times for sensitive areas
  - conduct simple calculations to determine the reverberation time within each sensitive space
  - provide further surface finish recommendations to achieve comfortable and functional spaces
- Mechanical plant noise mitigation, including:
  - Noise and vibration mitigation recommendations for all external plant and equipment, including assistance with equipment selection, location and barrier/enclosure design
  - Design of mechanical ventilation to ensure acoustically rated partitions are not compromised by HVAC systems.
  - Design of internal plant rooms to reduce noise and vibration transmission within the building, and to nearby sensitive receivers

1.3 Scope and limitations

This report has been prepared by GHD for Department of Education and may only be used and relied on by Department of Education for the purpose agreed between GHD and Department of Education as set out in Section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than Department of Education arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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It is not the intention of the assessment to cover every element of the acoustical environment, but rather to conduct the assessment with consideration to the prescribed work scope. The findings of the acoustic assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

2. Acoustic requirements

2.1 Internal acoustic separation

The Department of Education *Design Guideline 11* (DG11), specifically sections 11.05 and 11.06 provide requirements on room to room noise control for educational infrastructure as follows:

Prescriptive Constructions

'The following elements have prescriptive acoustic performance or construction requirements:

- *Operable walls (between general learning areas, all schools): R_W 45*
- *Entry doors to occupied teaching, music, drama and sport spaces: Solid core, minimum 35 mm thick with acoustic weather (where external) seals on all rebated closing faces. Gap to floor to be minimized.*
- *Internal glazed sections in walls and vision panel in or adjacent to internal doors: minimum 10.38 mm laminated glass. In some situations acoustic windows may be needed for satisfactory noise separation.*
- *Where adjacent to an occupied space (and not serving that space), hydraulic supply pipework and wastewater pipework shall be separated from the adjacent occupied space. Construction between the adjacent spaces in this instance shall be a 'staggered stud' arrangement or otherwise discontinuous.*

Table 2-1 Guideline on activity noise and noise tolerance, DG11.06.2

Room	Source room activity noise	Receiving room noise tolerance
Art/craft studios	Average	Medium
Assembly halls up to 250 seats	High	Low
Assembly halls over 250 seats	High	Low
Audio-visual areas	High	Low
Computer rooms - Teaching	Average	Low
Computer rooms - Laboratories	Average	Medium
Conference room	Average	Low
Corridors and lobbies	Average	High
Dance Studios	High	Very low
Dining rooms	High	Medium
Drama Studios	High	Very low
Duplicating rooms/stores	High	High

Room	Source room activity noise	Receiving room noise tolerance
Engineering workshops	High	High
Gymnasiums	High	Medium
Interview/counselling rooms	Average	Low
Kitchens	High	High
Laboratories - Teaching	Average	Low
Laboratories - Working	Average	Medium
Lecture rooms - up to 50 seats	Average	Low
Lecture theatres - without speech reinforcement and >50 seats	Average	Very low
Lecture theatres - with speech reinforcement	Average	Low
Libraries - General areas	Low	Low
Libraries - Reading areas	Low	Low
Libraries - Stack areas	Average	Medium
Manual arts workshops	Average	Medium
Medical rooms (First aid)	Average	Low
Music practice rooms	Very high	Low
Music studios	Very high	Very low
Office areas	Low	Low
Open plan teaching areas	Average	Medium
Plant room	High	High
Professional and Administrative offices	Low	Low
Staff common rooms	Average	Medium
Study Rooms	Low	Low
Teaching spaces – Hearing impaired	Average	Very low
Teaching spaces – Primary schools	Average	Low
Teaching spaces – Secondary schools	Average	Low

Room	Source room activity noise	Receiving room noise tolerance
Toilet/change/showers	Average	High

Table 2-2 Impact sound insulation requirements (L'_{nTw}), DG11.06.2

Room	Impact sound insulation rating (L'_{nTw})
Art/craft studios	60
Assembly halls up to 250 seats	60
Assembly halls over 250 seats	60
Audio-visual areas	60
Computer rooms - Teaching	60
Computer rooms - Laboratories	60
Conference room	55
Corridors and lobbies	65
Dance Studios	55
Dining rooms	65
Drama Studios	55
Duplicating rooms/stores	65
Engineering workshops	65
Gymnasiums	65
Interview/counselling rooms	5
Kitchens	-
Laboratories - Teaching	60
Laboratories - Working	65
Lecture rooms - up to 50 seats	55
Lecture theatres - without speech reinforcement and >50 seats	50
Lecture theatres - with speech reinforcement	50
Libraries - General areas	55
Libraries - Reading areas	55
Libraries - Stack areas	55
Manual arts workshops	65
Medical rooms (First aid)	60

Room	Impact sound insulation rating (L'_{nTw})
Music practice rooms	55
Music studios	50
Office areas	55
Open plan teaching areas	55
Plant room	-
Professional and Administrative offices	60
Staff common rooms	60
Study Rooms	55
Teaching spaces – Hearing impaired	50
Teaching spaces – Primary schools	55
Teaching spaces – Secondary schools	55
Toilet/change/showers	-

Table 2-3 Airborne sound insulation requirements without operable wall, entry door or glazed panels (R_w), DG11.06.3

	Activity noise in source room				
		Low	*Average*	*High*	*Very high*
Noise tolerance in receiver room	*High*	*30*	*35*	*45*	*55*
	Medium	*35*	*40*	*50*	*55*
	Low	*40*	*45*	*55*	*55*
	Very low	*45*	*50*	*55*	*60*

2.2 Internal room acoustic treatments (reverberation control)

The Department of Education *Design Guideline 11* (DG11) provides guidance on reverberation times for educational developments. Specifically, room reverberation time requirements are provided in Table 2-4.

Reverberation Time

For most educational spaces, the performance guideline reverberation time is the average of the predicted or measured octave band values at 500 Hz and 1000 Hz.

*In **acoustically critical environments** (such as teaching spaces for hearing-impaired students), it is desirable to define and design for the required reverberation time at all octave band centre frequencies between 63 Hz and 8000 Hz. This is a more onerous requirement and advice should be sought from an acoustic engineer for individual cases.*

Table 2-4 Guideline on reverberation times, DG11.06.1

Room	Reverberation time, s $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$
Art/craft studios	< 0.8
Assembly halls up to 250 seats	See note 1
Assembly halls over 250 seats	See note 1
Audio-visual areas	< 0.8
Computer rooms - Teaching	< 0.6
Computer rooms - Laboratories	< 0.6
Conference room	< 0.7
Corridors and lobbies	Minimise
Dance Studios	< 1.2
Dining rooms	< 1
Drama Studios	< 1
Duplicating rooms/stores	-
Engineering workshops	Minimise
Gymnasiums	< 1.5
Interview/counselling rooms	< 0.6
Kitchens	-
Laboratories - Teaching	< 0.7
Laboratories - Working	< 0.8
Lecture rooms - up to 50 seats	See note 1
Lecture theatres - without speech reinforcement and >50 seats	See note 1
Lecture theatres - with speech reinforcement	See note 1
Libraries - General areas	< 0.6
Libraries - Reading areas	< 0.6
Libraries - Stack areas	< 0.6
Manual arts workshops	Minimise
Medical rooms (First aid)	< 0.8
Music practice rooms	See note 1
Music studios	See note 1

Room	Reverberation time, s $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$
Office areas	< 0.8
Open plan teaching areas	< 0.8
Plant room	-
Professional and Administrative offices	< 0.8
Staff common rooms	< 0.6
Study Rooms	< 0.8
Teaching spaces – Hearing impaired	< 0.4
Teaching spaces – Primary schools	< 0.5
Teaching spaces – Secondary schools	< 0.6
Toilet/change/showers	-
Note 1: The approximate reverberation time shall be influenced by the internal volume and intended space. Guidance from an acoustical engineer shall be sought. Also refer to AS/NZS 2107:2000 Figure A1 for guidance values.	

2.3 Mechanical plant design

2.3.1 Noise emission to external receivers

The Department of Education *Design Guideline 11* (DG11) provides guidance on the noise emission for educational developments. The Wollondilly City Council does not provide any specific criteria for the assessment of noise emission from educational establishments, so the NPI criteria will be used.

Noise emission criteria

'Generally noise emission to the environment from mechanical services noise sources (such as air conditioners) are the subject of a development consent conditions. In NSW the development consent conditions will refer to the Industrial Noise Policy (INP) or Local Council requirement.

Where no condition regarding noise sources exists for a school development, noise emission from such sources should be designed, in-principle, to satisfy the requirements of the Industrial Noise Policy.

Noise associated with school activity (such as music or sport within a hall) are not a stationary noise source and is not subject to the INP requirements.'

Note should be made that the Industrial Noise Policy (EPA 2000) has been superseded by the Noise Policy for Industry (EPA 2017).

Details regarding the requirements of the NPI, the process of obtaining background noise levels and criteria are provided in GHD's Acoustic Assessment (dated 5 April 2018). A summary of project specific noise trigger levels for the assessment of mechanical plant noise emission have been reproduced in Table 2-5 below.

Table 2-5 Operational noise criteria, dBA

Receiver	Time period	Project $L_{Aeq(15\ min)}$ specific noise criteria (external), dBA
Residential receiver (NCA1)	Day	44
	Evening	40
	Night	35
Residential receiver (NCA2)	Day	53
	Evening	45
	Night	35
Place of worship	When in use	50
Active recreation	When in use	55
Commercial	When in use	65
Industrial	When in use	70

Note: The INP defines day, evening and night time periods as:

- Day: the period from 7 am to 6 pm Monday to Saturday; or 8 am to 6 pm on Sundays and Public Holidays.
- Evening: the period from 6 pm to 10 pm.
- Night: the remaining period.

2.3.2 Noise emission to internal areas within school

In addition to the above criteria, the mechanical plant should be designed to achieve internal and external recommended noise levels within the school area. The assessment includes:

- Noise intrusion through the external façade
- Internal noise levels from HVAC

Table 2-6 details the internal noise level requirements within the school.

Table 2-6 Guideline on internal noise levels, based on tables 11.06.1 from DG11

Room	Internal noise level (dB L_{Aeq})
Art/craft studios	40
Drama Studios	30
Duplicating rooms/stores	50
Engineering workshops	50
Gymnasiums	40
Interview/counselling rooms	35
Kitchens	50
Laboratories - Teaching	40
Laboratories - Working	45

Room	Internal noise level (dB L_{Aeq})
Lecture rooms - up to 50 seats	35
Lecture theatres - without speech reinforcement and >50 seats	30
Lecture theatres - with speech reinforcement	35
Libraries - General areas	40
Libraries - Reading areas	35
Libraries - Stack areas	45
Manual arts workshops	40
Medical rooms (First aid)	40
Music practice rooms	35
Music studios	30
Office areas	40
Open plan teaching areas	40
Professional and Administrative offices	35
Staff common rooms	40
Study Rooms	35
Teaching spaces – Hearing impaired	30
Teaching spaces – Primary schools	35
Teaching spaces – Secondary schools	35
Toilet/change/showers	50

2.3.1 Noise emission to external areas within school

In the absence of guidance relating to external areas of the school within the DG11, the Noise Policy for Industry (EPA, 2017) provides guidance on suitable noise levels within active recreation areas, such as school playgrounds. The recommended noise levels for the playground areas should not exceed **55 dBA**, when in use.

3. Internal acoustic separation

3.1 Summary

3.1.1 Partition Performance Requirement

It is necessary to maintain the acoustic privacy between various spaces, to minimise sound being transmitted between adjoining spaces and also from common spaces.

The materials and construction of dividing partitions determine the amount of sound transmission between adjoining spaces and also from common spaces into noise sensitive spaces. The acoustic performance of a light-weight partition is largely dependent upon the number, thickness and density of the lining, the type and width of framing system (single/multiple frames) and the type of acoustic insulation within the cavity. The performance is also influenced by the workmanship involved with the building element e.g. gaps and cracks can degrade the performance of the system.

3.1.2 Door and Glazed Partitions

The provision of a door within an acoustically rated wall will generally reduce the overall acoustic performance of the partition, as doors are normally considered the weakest element for sound insulation in a partition.

Similarly, installation of glazed elements along an acoustic partition between sensitive spaces will result in a reduction in the overall acoustic performance of the wall, unless a highly rated acoustic glazing system is used.

3.2 Partition Construction Requirements

3.2.1 Wall Construction Requirements

Table 3-1 provides the acoustic rating of the partition and corresponding wall construction requirement. Refer to Appendix A for the internal acoustic wall markup diagrams.

GHD has been advised that some existing walls will be retained. At this stage it is unknown the exact construction of these walls. These walls are likely to require upgrading to achieve the required Rw rating detailed in the markups. Once this existing construction is known, GHD can provide further details regarding the upgrades.

Table 3-1 Wall Construction Requirement

Mark-up ID (Refer to Appendix A)	Minimum Rw Rating of the Installed Wall System	Wall Construction requirement	Comments
	40	110 mm thick brick	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	40	13 mm plasterboard / 76 steel stud with a minimum of 75 mm thick glass wool insulation (with a minimum density of 11 kg/m^3) / 13 mm plasterboard	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	45	13 mm render or standard plasterboard / 110 mm brick / 13 mm render or standard plasterboard	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	45	13 mm plasterboard / 76 steel stud with a minimum of 75 mm thick glass wool insulation (with a minimum density of 11 kg/m^3) / 2 layers of 13 mm plasterboard OR 16 mm fire rated plasterboard / 76 steel stud with a minimum of 75 mm thick glass wool insulation (with a minimum density of 11 kg/m^3) / 16 mm fire rated plasterboard	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	50	13 mm render or standard plasterboard / 110 mm brick / 13 mm standard plasterboard fixed to 28 mm furring channel with 25 mm thick glass wool or polyester insulation (with a minimum density of 11 kg/m^3)	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	50	2 x 13 mm fire rated plasterboard / 76 mm steel stud with 75 mm glass wool insulation (with a minimum density of 11 kg/m^3) / 2 x 13 mm fire rated plasterboard. OR	Full height wall system to be taken to the underside of the roof sheeting or soffit.

Mark-up ID (Refer to Appendix A)	Minimum Rw Rating of the Installed Wall System	Wall Construction requirement	Comments
		13 mm plasterboard / 2 rows of 64 or 76 mm steel stud with 20 mm air gap and 50 mm glass wool insulation (with a minimum density of 11 kg/m^3) in one row of studs / 13 mm plasterboard.	
	55	110 mm brick / minimum 64 mm stud spaced 20 mm from masonry with 50 mm thick glass wool or polyester insulation (with a minimum density of 11 kg/m^3) / 13 mm standard plasterboard fixed to 28 mm furring channel.	Full height wall system to be taken to the underside of the roof sheeting or soffit.
	55	16 mm fire rated plasterboard / 2 rows of 64 or 76 mm steel stud with 20 mm air gap and 50 mm glass wool insulation (with a minimum density of 11 kg/m^3) in both rows of studs / 16 mm fire rated plasterboard	Full height wall system to be taken to the underside of the roof sheeting or soffit.

3.2.2 Glazed Partition Construction Requirements

Installation of glazed partitions/walls around the acoustically rated wall system is likely to result in a reduction of the overall performance of the overall wall rating. This would depend on the overall glazing dimensions and thickness. Generally, single 10.38 mm thick laminated glazing with acoustic seals would achieve an acoustic rating of Rw 35. Higher acoustically rated glazed element would potentially need customised single glazed or double glazed construction. It should be noted that single glazing generally cannot achieve the required Rw > 40 on its own and as such, enhanced single glazing or double glazing options have been considered below.

The contribution of the sound intrusion through the overall acoustically rated partition can be minimised by reducing the size of the glazed partition.

The window in Table 3-2 should be installed in partitions in the following areas:

- Partition separating woodwork and metalwork areas from the adjacent teaching areas
- Partition separating all music rooms from the adjacent teaching areas

Table 3-2 Recommended Acoustically Rated Glazed Partition

Weighted Sound Reduction Index Rw	Proposed Glazed Partition with Acoustic Frame and Seals
45	Double fixed glazing system equivalent to: • 10.38 mm thick laminated glass with acoustic seals • 100 mm air gap • 6 mm thick float glass with acoustic seals

The installed window system shall be an acoustically lab tested window systems with acoustic frames and seals that achieve the recommended Rw rating. Acoustically lab tested glazing systems must be in accordance with the following standards:

- *AS 1191:2002 Acoustics – Method for Laboratory Measurement of Airborne Sound Transmission Insulation of Building Elements*
- *AS/NZS ISO 717.1:2013 Acoustics – Rating of Sound Insulation in Buildings and of Building Elements – Part 1: Airborne Sound Insulation (ISO 717.1)*

Acoustic lab test report for the window systems, showing conformance with AS 1191 and ISO 717.1, must be provided to and approval sought from a suitably qualified acoustic consultant prior to on-site installation.

In addition, the section of the glazed partition located between the frame and the slab soffit shall be constructed in a manner that does not compromise the acoustic integrity of the overall partition. Partition sections above glazed partition frames should be constructed to full height as per the recommended wall system in this report, or alternatively via acoustically treated ceiling system.

3.2.3 Floor construction – impact noise

The floor finishes within the majority of rooms within the school are proposed to be carpet tile or vinyl. These areas will meet the impact isolation requirements.

Where tiles are proposed (toilets) above other toilets, there are no impact isolation requirements.

There is one toilet located in Building F, which is located directly above a classroom. In this situation, it is recommended that a 4.5 mm thick acoustic underlay (equivalent to Regupol 4515) be installed under this tiled area.

The product data sheet should be reviewed by a suitably qualified acoustic engineer prior to installation to ensure the minimum impact isolation is achieved.

3.2.4 Door Construction

Table 3-3 details the recommended acoustic door construction for the identified noise sensitive spaces. These spaces include:

- Partition separating woodwork and metalwork areas from the adjacent teaching areas
- Partition separating all music rooms from the adjacent teaching areas

As discussed in Section 3.1.2, the installation of door systems would likely result in a reduction of the overall performance of the wall rating.

Note that mohair/brush/weather pile type seals are not acceptable for an acoustically rated door system. All door acoustic seals should be compressible bulb or rubber type seals. Ensure that all installed seals are continuous and fully engaged around the perimeter of the door frame. Install all sealing joints hard-butted to each other with no gaps. It is also critical that the door provides sufficient compression against the seals to minimise noise leakage around the edges of the seals.

Other types of acoustic door seals may be acceptable subject to review by an Acoustic Specialist.

Table 3-3 Recommended Acoustically Rated Door Systems

Weighted Sound Reduction Index Rw	Proposed Entry Door Construction	Acoustic Seals
≥38	Double doors Back to back interconnecting 50 mm solid core timber door (minimum density 28 kg/m^2 or higher) No glazed vision panels should be included in doors	Perimeter: Raven RP94si with RP530 Bottom seals: Raven RP8si or RP70 Threshold: Raven RP117si
≥35	Single door 50 mm solid core timber door (minimum density 28 kg/m^2 or higher) with 1.5 mm thick metal sheet faced Any glazed vision panel element along the door to be constructed of minimum 10.38 mm glazing (acoustic framed)	Perimeter: Raven RP78si with RP530 Bottom seals: Raven RP38si or RP70 Threshold: Raven RP117si

3.3 General Requirements

3.3.1 Acoustic Sealant Requirements

Unless stated otherwise in this acoustic specification, all acoustic sealant to walls and floors shall be 100% polyurethane flexible mastic type sealant. Other type of sealant may be used subject to approval from a suitably qualified Acoustic Consultant.

Acrylic type sealants are not acceptable.

3.3.2 Installation Requirements

The installation of the acoustically rated wall must meet the following requirements:

- Plasterboard linings to have a gap (minimum 10 mm, max 15 mm) at the top and bottom of the wall and caulk gap to full depth of plasterboard with 100% polyurethane sealant .
- Any GPO outlets to be backed with acoustic rated box (no back-to-back arrangement).
- Any penetration along the acoustically rated wall shall be acoustically treated to maintain the acoustic integrity of the wall.
- Where hydraulic services are required within the acoustically rated wall, they shall be surface mounted or otherwise externally lagged using the specified acoustic lagging (5 kg/m^2 loaded vinyl with 25 mm thick convoluted open cell foam, equivalent to Soundlag 4525C).

3.3.3 Plasterboard Joint Requirements

When applicable, joints in plasterboard sheeting in dry wall systems must be staggered where multiple layers of material are used on walls so that the joints should not overlap. All joints shall be installed hard-butted against each other.

3.3.4 Wall Junction Requirements

Where an acoustically rated wall meets a façade or corridor wall junction, the acoustically rated partition shall be taken through to the external element of the façade or corridor wall and acoustically sealed at the junction. Tape and set joint may be used at the internal layer of the façade wall element, where required.

Where acoustically rated walls meet at mullion window junction, the wall construction should be built to meet the façade mullion. Wall sheeting to enclose the mullion and caulked is preferable, or alternatively backed mullion from top to bottom with one layer of 16 mm thick plasterboard on both sides of the frame.

Any cable trunking across the acoustically rated wall system is to have insulation packing at the partition intersection area with compressed high density Rockwool insulation.

3.3.5 Staggered Stud Wall System

Should staggered studwork be constructed to achieve certain acoustic ratings, there shall be no mechanical connection between the staggered stud configurations.

3.3.6 Ceiling/Bulkhead Penetration

All penetrations on the acoustically rated ceiling shall be acoustically treated such that they will not reduce the acoustic performance of the ceiling.

All downlight light fittings shall be acoustic downlight with enclosure at the back. Light fitting using gimballed downlights shall be acoustically treated with acoustic box, or alternatively using acoustically rated downlight system.

3.3.7 Window seals

Acoustic seals shall be compressible bulb seals (Schlegel Q-lon seals or equivalent). The contractor shall ensure that all installed seals shall be fully engaged around the perimeter of the window frame. All sealing joints are to be hard-butted to each other with no gaps. Brush type seals are not acceptable for acoustically rated window system.

3.3.8 Building Services Architectural Treatment

Please note that the recommended acoustic partition construction details in Table 3-1 are to be read in conjunction with the recommended architectural acoustic treatment for building services provided in Appendix C.

3.4 Open plan learning areas

The design for Picton High School incorporates a number of open plan learning areas throughout the school. The Design Guideline provides requirements for acoustic rated partitions separating teaching areas to reduce the impact of noise between areas. However, the requirements are not applicable for open plan areas. Without acoustically rated partitions separating teaching areas, noise transfer between the areas will increase. Depending on the level of noise and sensitivity of the adjacent classes, this may lead to unsatisfactory learning conditions.

To reduce the noise impact of one class on another, the following is recommended to be implemented to minimise the increase in noise, however it is noted that these are not requirements of the Design Guideline:

- Highly absorptive ceiling throughout the areas (proposed design incorporates Euroblade S1-1 and Autex Quietspace panels)
- Absorptive furniture throughout the area where possible
- Additional absorptive wall linings where possible
- Timetabling of areas to manage the class types. For example, avoiding classes where high noise levels may exist (groupwork etc) adjacent to a class where the teacher will be talking to the students for the majority of the time.

Noise levels within classes can vary largely depending on numbers of children and types of activities. Noise modelling has been undertaken for informational purposes and may not reflect the true noise levels within these classrooms. The following examples are provided for comparison:

- Teacher speaking in one area of the open plan learning area without absorptive ceiling
- Teacher speaking in one area of the open plan learning area with absorptive ceiling
- Five groups of five children within one area of the open plan teaching area without absorptive ceiling
- Five groups of five children within one area of the open plan teaching area with absorptive ceiling

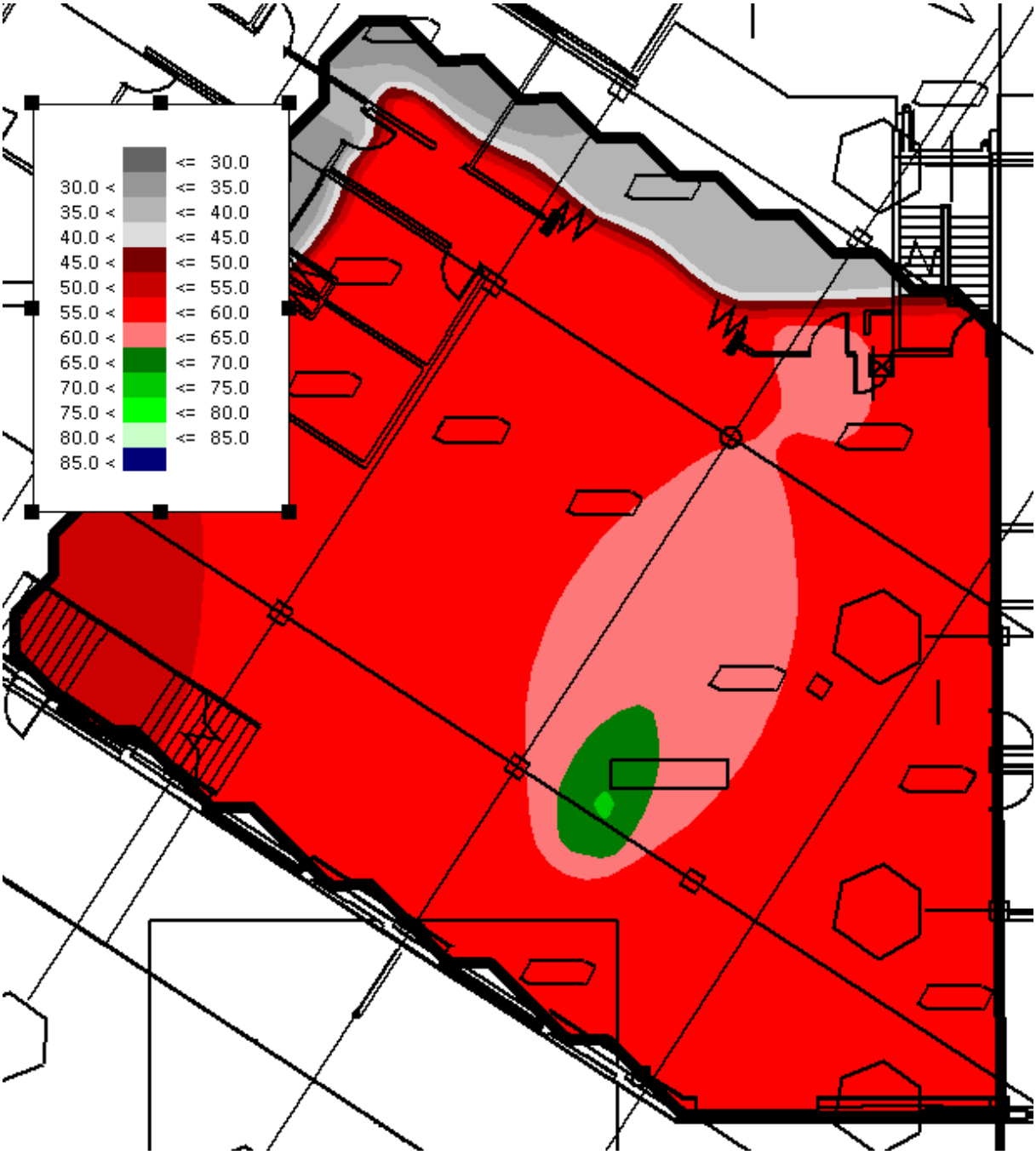


Figure 1 Teacher speaking in one area of the open plan learning area without absorptive ceiling

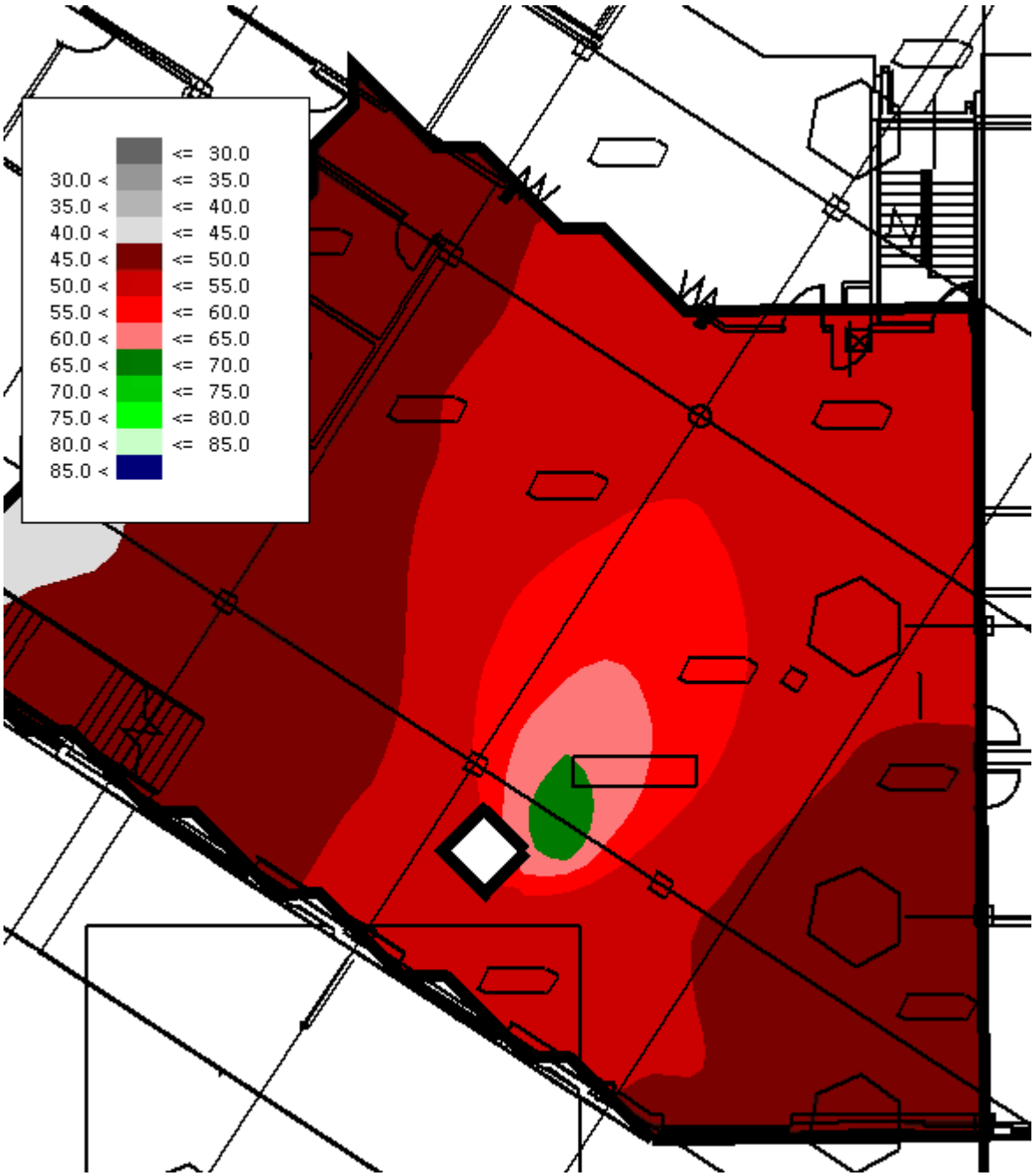


Figure 2 Teacher speaking in one area of the open plan learning area with absorptive ceiling

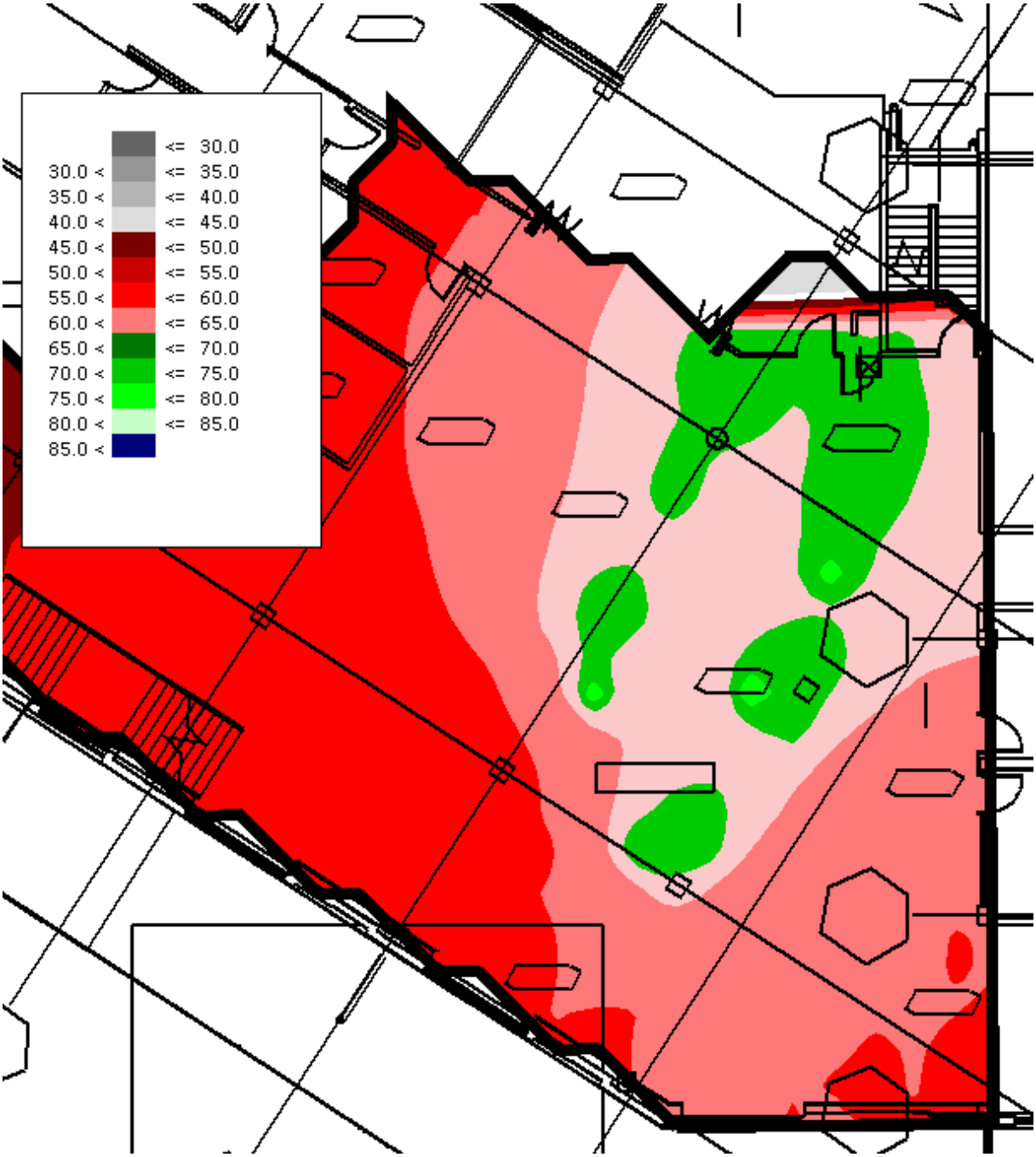


Figure 3Groups of children within one area of the open plan teaching area without absorptive ceiling

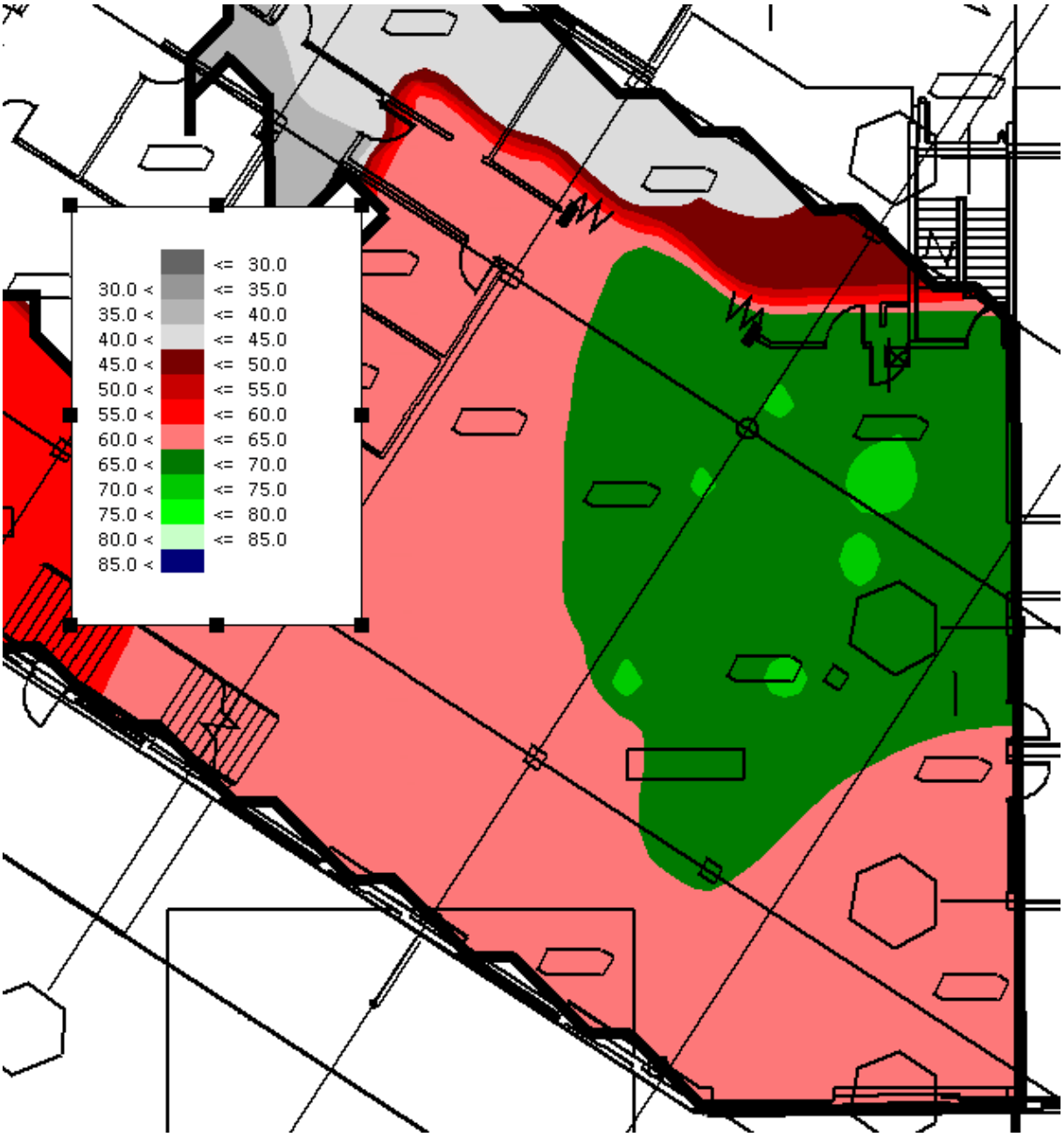


Figure 4 Groups of children within one area of the open plan teaching area with absorptive ceiling

The modelling and diagrams above indicate the following

- Noise levels can be reduced with the implementation of absorptive materials, in particular on the ceiling
- Even with absorptive materials, the noise levels from one open learning area to the adjacent learning area are predicted to be above the recommended unoccupied noise levels and may lead to unsatisfactory learning conditions.

3.5 STEAM building and music / food tech building – acoustic separation

High noise generating areas such as the STEAM building (Building E) and the music / food tech building (Building F) require further analysis to assess the impact of these areas on the nearby

learning areas. The partitions separating these areas should be designed to reduce the noise transmission from noisy areas to sensitive areas, which may go beyond the requirements of the Design Guideline.

Where possible, the partitions should be designed to achieve a high sound transmission performance. These have been outlined in Section 3.2.1, where Rw 55 systems are required.

In addition to the wall being designed with a high sound transmission performance, other elements of the partition, being doors and windows, should be designed to high sound transmission performance. The following treatments are recommended:

- 50 mm thick solid core door with full perimeter seals and bottom drop seal (approx. Rw 35)
- double fixed glazing system equivalent to 10.38 mm thick laminated glass with acoustic seals, 100 mm air gap and 6 mm thick float glass with acoustic seals (approx. Rw 45)

The STEAM building is particularly sensitive as open learning areas are located directly adjacent to the woodwork and metalwork rooms. Modelling has been undertaken to provide an example of the likely noise impact from activities within the woodwork and metalwork room based on the following assumptions and recommended partition construction:

- Average internal reverberant sound pressure levels within each room of 95 dBA. Note that individual events and machinery may lead to higher levels for short durations
- The wall has a minimum sound transmission loss of R_w 55
- The door has a minimum sound transmission loss greater that R_w 35, which would incorporate a 50 mm thick solid core door with full perimeter seals and bottom drop seal
- The windows have a minimum sound transmission loss of R_w 45, which consists of a double fixed glazing system equivalent to:
  - 10.38 mm thick laminated glass with acoustic seals
  - 100 mm air gap
  - 6 mm thick float glass with acoustic seals

Figure 5 demonstrates that noise from the woodwork and metalwork rooms are predicted to result in noise levels of between 40 and 55 dBA in the open learning areas directly adjacent to these rooms. Depending on the class type proposed within these learning areas, these levels may have a negative impact on this learning space as these are above the recommended internal noise levels of 40 dBA for an unoccupied open learning area. Management should be established to ensure that noisy activities within the work areas do no coincide with noise sensitive classes in the open learning area. Alternatively, double doors could be installed, however advice provided indicates that these are not a feasible option in this area.

Noise levels in the open learning areas on the level above, which are exposed to the same noise levels due to the void outside the woodwork and metalwork rooms, would be exposed to similar noise levels as those presented in Figure 5 above.

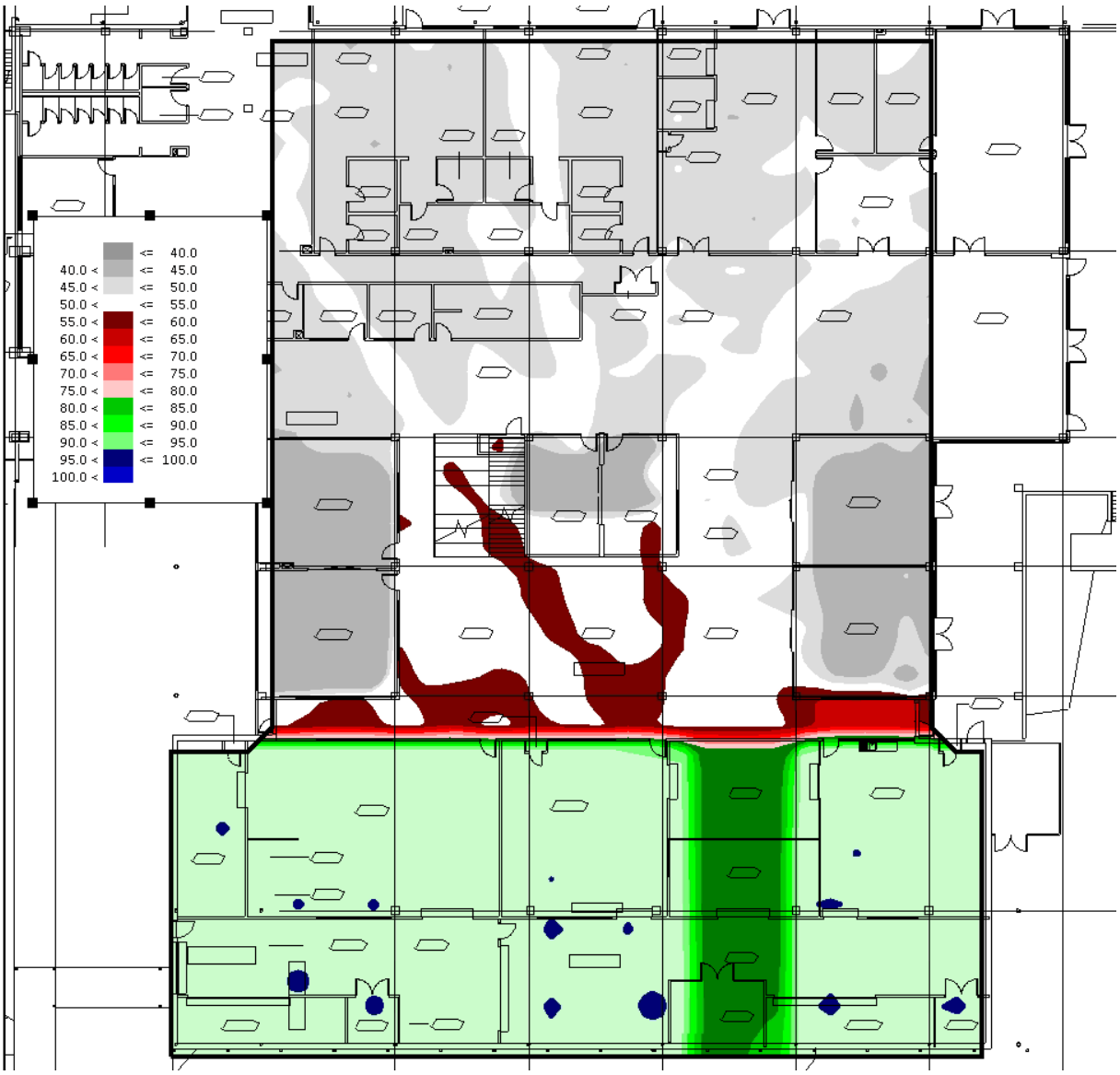


Figure 5 Noise levels from woodwork and metalwork rooms

Recommendations are provided to reduce the impact of the noise transmission between noise generating areas (music rooms, food tech areas) are provided below:

- The wall has a minimum sound transmission loss of R_w 55
- The door has a minimum sound transmission loss greater that R_w 55, which would incorporate double doors, both 50 mm thick solid core doors, with full perimeter seals and bottom drop seal
- The windows have a minimum sound transmission loss of R_w 45, which consists of a double fixed glazing system equivalent to:
  - 10.38 mm thick laminated glass with acoustic seals
  - 100 mm air gap
  - 6 mm thick float glass with acoustic seals

Door and window sizes should be minimised throughout this area.

4. Internal room acoustic treatments (reverberation control)

Calculations were undertaken to assess the reverberation time (RT_{60}) in the sensitive areas throughout the school. The calculations are based on drawings provided by the architectural design team and include a variety of surface finishes.

The material and associated acoustic absorption coefficients shown in Table 4-1 have been used as the basis for the model. Any variations to partition sizes or materials used will impact the predicted reverberation values presented in Table 4-2.

Table 4-1 Material Absorption Coefficients

Material	Octave Band (Hz) Material Absorption Coefficients							
	63	125	250	500	1000	2000	4000	8000
Walls								
Opening	1	1	1	1	1	1	1	1
IL-101 (Standard plasterboard)	0.25	0.20	0.15	0.10	0.08	0.05	0.05	0.04
IL-106 (Fibre cement)	0.1	0.1	0.05	0.03	0.04	0.03	0.03	0.02
IL-201 (Vinyl)	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02
IL-301 (Pinnable wall lining – Autex quietspace panel, 25 mm thick)	0.08	0.12	0.47	0.88	0.98	0.99	0.93	0.9
IL-302 (Pinnable wall lining – Autex Cube)	0.02	0.05	0.1	0.3	0.65	0.9	0.95	0.9
IL-401 (Ceramic tiles)	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
IL-501 (Plywood)	0.3	0.3	0.34	0.25	0.19	0.15	0.1	0.05
IL-503 (Timber slats – Euroblade S2-1)	0.03	0.14	0.57	0.93	0.39	0.27	0.34	0.3
Floors								
FL-102 (Carpet tiles)	0.01	0.01	0.02	0.06	0.15	0.25	0.45	0.35
FL-301 (Vinyl)	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02
FL-201 (Entry matting)	0.01	0.01	0.02	0.06	0.15	0.25	0.45	0.35
FL-401 (Ceramic tiles)	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
FL-303 (Rubber flooring)	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02
Concrete (rough finish)	0.01	0.01	0.01	0.015	0.02	0.02	0.02	0.02
Windows and doors								
Wooden, solid core, doors	0.14	0.14	0.1	0.06	0.08	0.1	0.1	0.1
Laminated glass	0.12	0.1	0.06	0.04	0.03	0.02	0.02	0.02

Material	Octave Band (Hz) Material Absorption Coefficients							
	63	125	250	500	1000	2000	4000	8000
Ceilings								
Perforated plasterboard (with insulation)	0.05	0.15	0.25	0.4	0.5	0.3	0.15	0.1
Perforated plasterboard	0.3	0.4	0.65	0.8	0.7	0.65	0.55	0.45
Standard plasterboard (with insulation above)	0.29	0.29	0.1	0.06	005	0.04	0.04	0.03
Renhurst Rippletone	0.4	0.6	0.85	0.75	0.65	0.7	0.65	0.6
Euroblade S2-1[1]	0.03	0.14	0.57	0.93	0.39	0.27	0.34	0.3
Armstrong metalwork's F-plank: F2030M2	0.4	0.7	0.84	0.59	0.7	0.71	0.72	0.7
Autex Frontier – 300 mm spacing[2]	0.1	0.25	0.5	0.6	0.8	1	1	0.8
Autex Quitespace panel – 25 mm thick[3]	0.08	0.12	0.47	0.88	0.98	0.99	0.93	0.88
Ceiling tiles with insulation above	0.3	0.4	0.65	0.8	0.7	0.65	0.55	0.45
Versilux lining	0.1	0.1	0.05	0.03	0.04	0.03	0.03	0.02
Furnishings and people								
Cushioned seats - empty	0.32	0.32	0.4	0.42	0.44	0.43	0.48	0.45
Cushioned seats – 2/3rd full	0.44	0.44	0.56	0.65	0.72	0.72	0.67	0.6
High school students (10)	0.22	0.22	0.3	0.38	0.42	0.45	0.45	0.4

[1] Euroblade S2-1 is the worst performing product in the Euroblade S range, therefore any of the other options are considered acceptable if the S2-1 product is acceptable.

[2] 300 mm spacing is the largest and worst performing spacing option, therefor any smaller spacing options are considered acceptable if the 300 mm spacing is acceptable.

[3] 25 mm thickness is the thinnest and worst performing option, therefor any thicker options of this lining are considered acceptable if the 25 mm thick option is acceptable.

4.1 Reverberation time requirements

The predicted reverberation times are provide in Table 4-2. The surface finish requirements to achieve the reverberation time requirements are specified in Table 4-2.

Table 4-2 Predicted reverberations times (s) and surface finish requirements

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
Building A				
Ground Floor – AA10-0101/2 P3				
1	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Aluminium frames door with large glass viewing panel Window: laminated glass	0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2		0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
3		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5		0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
6	Flooring: Concrete, 20% covered by furnishings Ceiling : Versilux lining Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.56	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
7	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.7	
8		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
9	Flooring: vinyl, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
10		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
11	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
12 – 13	Flooring: Carpet tiles and concrete, 20% covered by furnishings Ceiling : Plasterboard, Euroblade S2-1 and Autex quiet space panels 300 mm spacing Walls: Standard plasterboard and openings	0.52	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
14	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Plasterboard Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
15	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Euroblade Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
16	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
17	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation and Euroblade S2-1 Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
18	Flooring: Carpet tiles Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
19	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
20	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.50	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
21	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Armstrong Metalwork's F-plank Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
22	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
23	Flooring: Carpet tiles Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.50	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
24	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
25		0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
26	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation and Autex frontier with 300 mm spacing Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
Hallway	Flooring: Carpet tiles, 20% covered by furnishings	0.52	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel			
Level 1 – AA10-0201/2 P3				
1	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Perforated plasterboard with insulation, ceiling tiles with insulation, Autex frontier with 300 mm spacing Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
2	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
3		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
4	Flooring: Concrete, 20% covered by furnishings Ceiling : Perforated plaster board with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Euroblade S2-1 Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
6	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
7		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
8	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	
9	Flooring: Concrete, 20% covered by furnishings Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.38	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.8$	
10	Flooring: Vinyl and concrete Ceiling : Perforated plasterboard with insulation and Armstrong metalwork Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.49	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.8$	
11	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.6$	
12		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.6$	
13		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.6$	
14	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Perforated plasterboard with insulation and Autex Frontier at 300 mm spacing Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.8$	
15	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)} < 0.6$	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
16	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.46	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	
Building D				
Lower Ground Floor – AD10 – 0001 P2				
1	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Renhurst Rippletone Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
3	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Armstrong metalwork's Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.49	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4	Flooring: Carpet tiles Ceiling : Autex Quietspace panelling Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.31	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5	Flooring: Carpet tiles, 20% covered by furnishings Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
6		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
7	Flooring: Carpet tiles Ceiling : Autex frontier and Quietspace panelling	0.38	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
8	Flooring: Carpet tiles and vinyl Ceiling : Autex frontier and Quietspace panelling Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
9	Flooring: Concrete Ceiling : Plasterboard Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.37	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
10	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated Plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.7[2]	
Ground Floor – AD10 – 0101 P2				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Renhurst Rippletone Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2		0.50	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
3	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4		0.34	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
5	Flooring: Carpet, 20% covered by seats and benches Ceiling : Renhurst Rippletone Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.50	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
6		0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
7	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.34	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
8	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.49	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
9	Flooring: Concrete Ceiling : Versilux lining Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.36	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
Building E				
Lower Ground Floor – AA10-0003/4 P4				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2	Flooring: Carpet, 20% covered by seats and benches	0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Ceiling : Autex frontier (300 mm spacing) and (25 mm thick) Quietspace panelling Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel			
3	Flooring: Carpet and vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5		0.52	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
6	Flooring: Carpet and vinyl, 20% covered by seats and benches Ceiling : Armstrong metalwork's, Autex frontier (300 mm spacing) and Autex Quietspace panelling (25 mm thick) Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
7	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
8		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
9		0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
10		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
11		0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
12		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
13	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Autex Quietspace panelling (25 mm thick)	0.31	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
14	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.48	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
15	Flooring: Concrete Ceiling Armstrong metalwork's Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.57	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	
16		0.56	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	
17		0.56	Minimise $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	
18		0.51	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
19		0.56	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
Ground Floor – AA10-0103/4 P4				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation and Autex frontier(300 mm spacing) Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.46	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
3	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation above Walls: Standard plasterboard	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4		0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8[2]	
5		0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
6		0.48	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8[2]	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
8	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
9	Flooring: Carpet, 20% covered by seats and benches Ceiling : Armstrong metalwork's Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
10	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.55	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
11	Flooring: Carpet, 20% covered by seats and benches Ceiling : Euroblade S2-1 Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
12	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
13		0.44		

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
Building F				
Lower Ground Floor – AF10-0001 P2				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
2	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.7	
3	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
4	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.47	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
6		0.48	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
7	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.48	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
8	Flooring: Vinyl, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard and openings Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.49	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
Ground Floor – AF10-0101 P2				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Armstrong metalwork's Walls: Standard plasterboard and opening Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
2	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
3	Flooring: Carpet, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4	Flooring: Carpet, 20% covered by seats and benches	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
5		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
6	Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
7		0.45	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
8		0.27	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
9		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
10		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 1	
11		0.43	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 1	
Building G				
Lower Ground Floor – AG10-0001 P2				
1	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 1.5	
2		0.41	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
3		0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
4	Flooring: Rubber Ceiling : Renhurst Rippletone Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.56	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 1.5	
5	Flooring: Carpet Ceiling : Autex Quietspace panelling (25 mm thick) Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.37	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
Ground Floor – AF10-0101 P2				
1	Flooring: Concrete, 20% covered by seats and benches Ceiling : Perforated plasterboard with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.34	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
2	Flooring: Carpet, 20% covered by seats and benches	0.48	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	

Room ID[1]	Surface finish requirements	Predicted $RT_{60(Av\ 500Hz\ and\ 1000Hz)}$	DG11 Requirements	Design Verification Evidence
	Ceiling : Armstrong metalwork's Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass			
3	Flooring: Carpet and vinyl, 20% covered by seats and benches Ceiling : Armstrong metalwork's Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
4	Flooring: Carpet, 20% covered by seats and benches Ceiling : Ceiling tiles with insulation Walls: Standard plasterboard Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.40	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
5		0.44	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.6	
6	Flooring: Vinyl Ceiling : Ceiling tiles with insulation Walls: Perforated plasterboard with insulation Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.42	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 0.8	
7	Flooring: Vinyl Ceiling : Ceiling tiles with insulation Walls: Perforated plasterboard with insulation Doors: Solid core wooden door with or without glazed viewing panel Window: laminated glass	0.54	$RT_{60(Av\ 500Hz\ and\ 1000Hz)}$ < 1.2	

[1] Room ID can be seen in the mark ups provided in Appendix B.

[2] Determined in accordance with AS/NZS 2107:2016

Note: all rooms with proposed plasterboard ceiling exceed acceptable reverberation times and it has been recommended that in place of the plasterboard, perforated plasterboard with insulation above be used.

For open floor plan areas such as open learning areas, surrounding areas must be included during calculations, therefore these open learning areas and hallways act as a single room for modelling purposes.

For rooms without doors, it was assumed that they had a single, typically door.

For doors without material specification, they were assumed to aluminium framed with a glazed viewing panel.

5. Mechanical plant design specifications

5.1 Plant rooms

The following section details the requirements for the plant rooms. These requirements are based on the following documents, which are detailed above in Section 2.3:

- Noise emission to external receivers (Noise Policy for Industry)
- Noise intrusion into internal areas of school (DG11)
- Noise emission to external areas / play areas of the school (Noise Policy for Industry)

Internal HVAC design servicing individual rooms is to be assessed in Section 5.2 once equipment specifications of the HVAC system is supplied.

5.1.1 Building A

There are two plant rooms within Building A. These are shown in Figure 6.

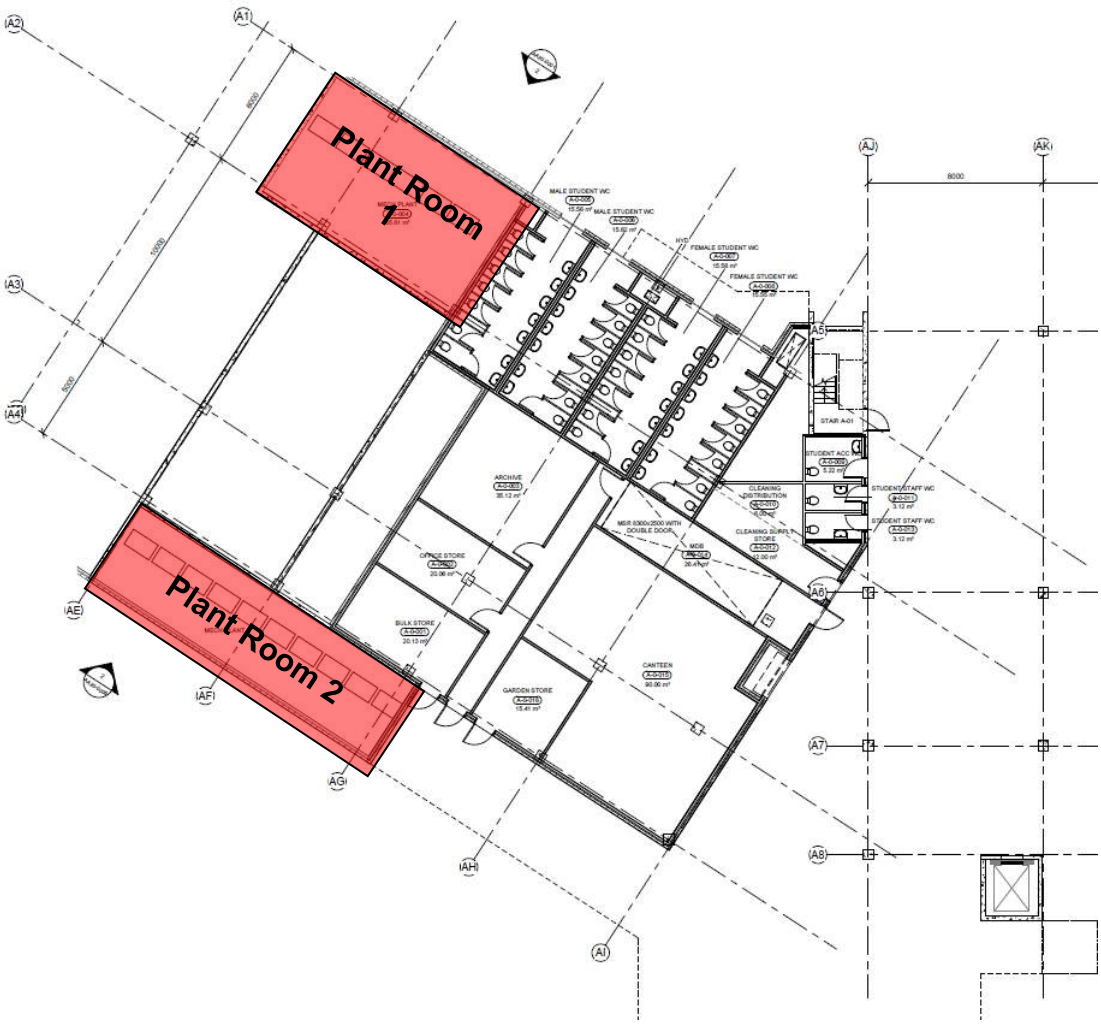


Figure 6 Plant room locations - Building A

5.1.2 Building G

There is one plant room within Building G. This is shown in Figure 7.

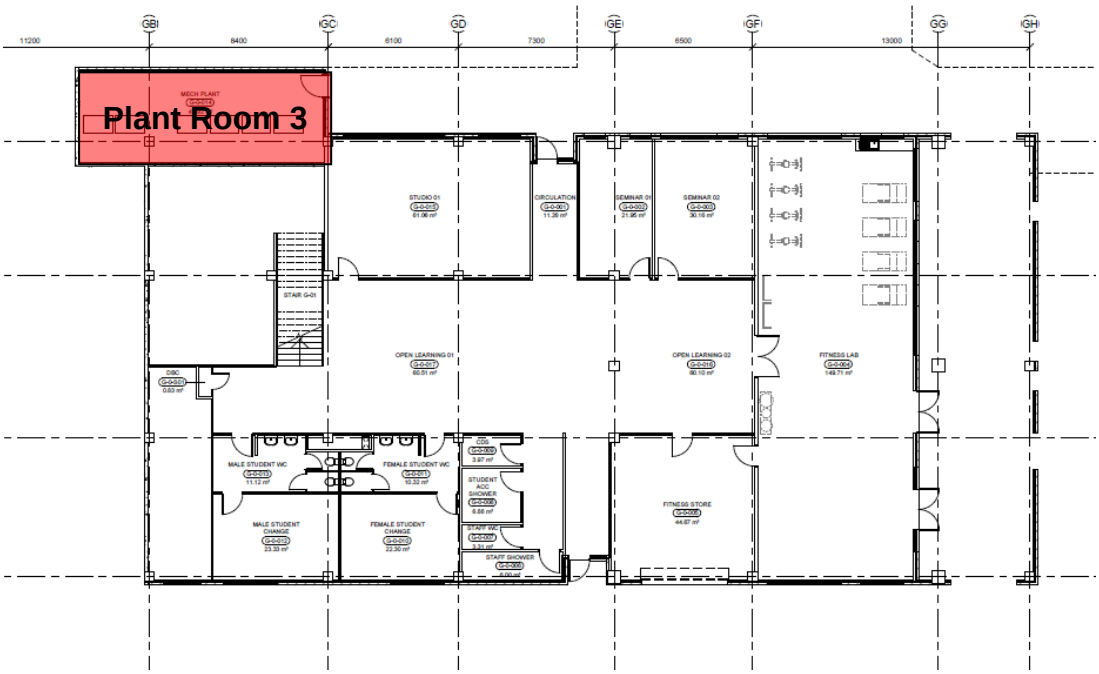


Figure 7 Plant room locations - Building G

5.1.3 Building F

There is one external plant area within Building F. This is shown in Figure 8.

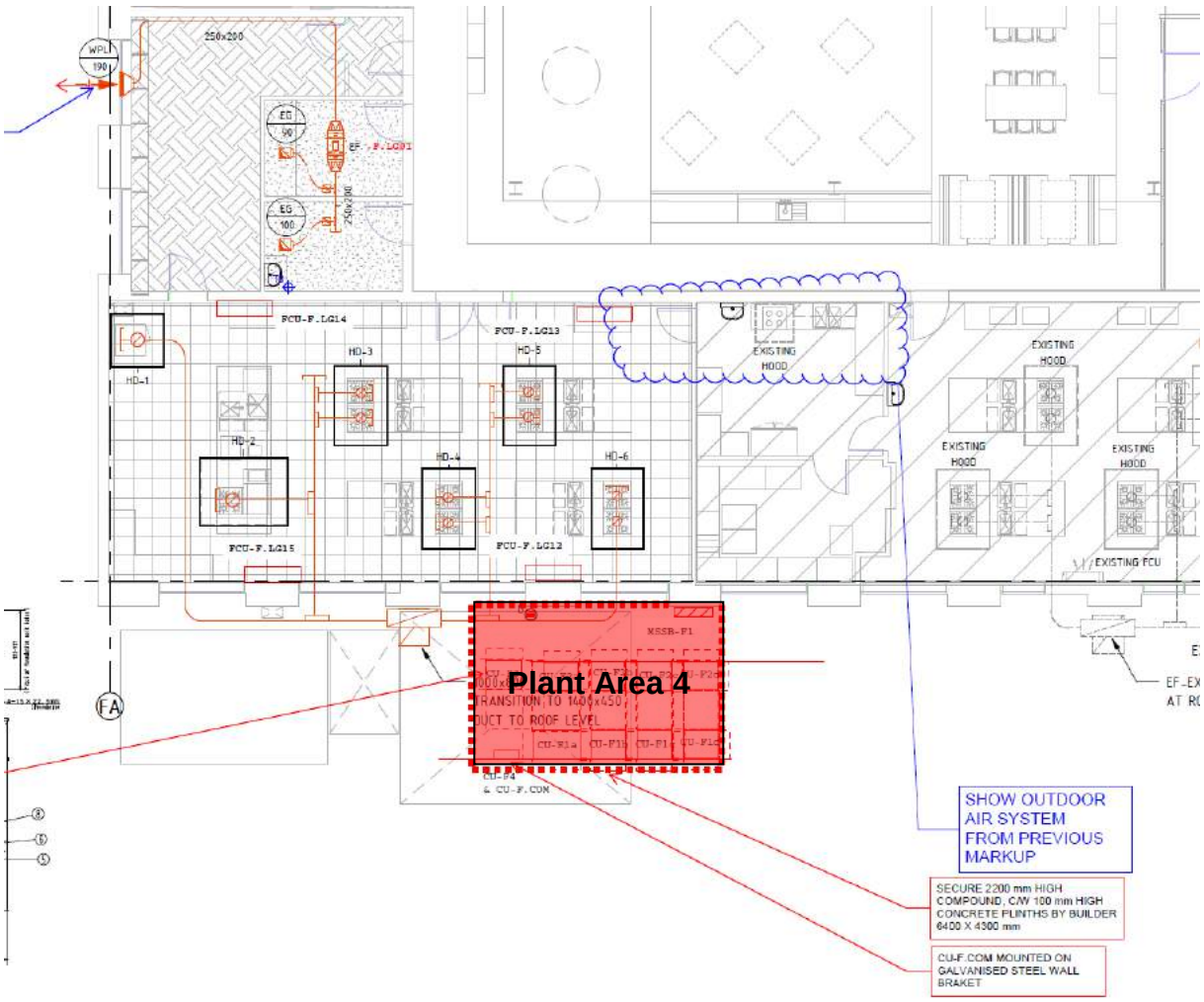


Figure 8 Plant locations - Building F

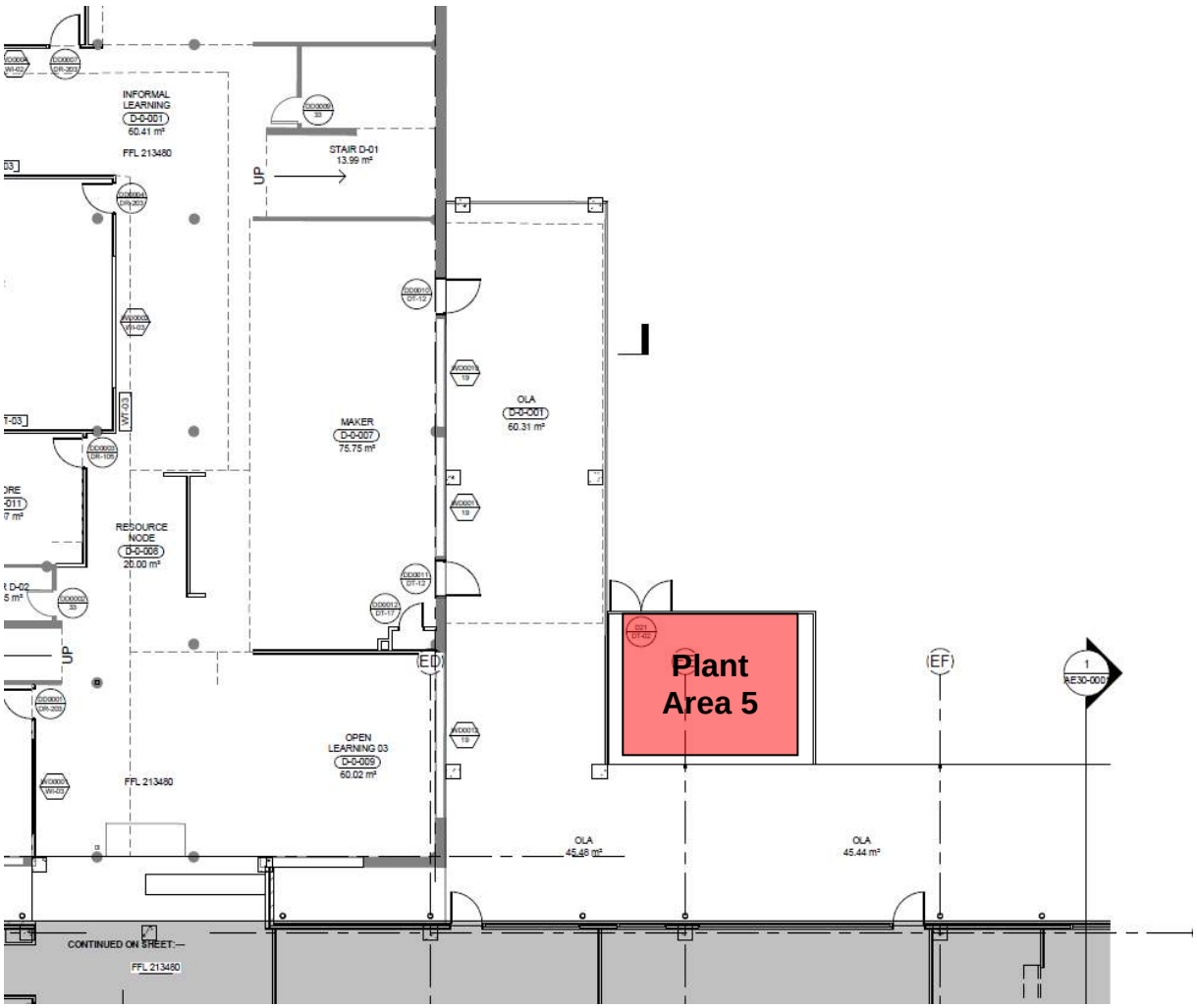


Figure 9 Plant locations - Building D

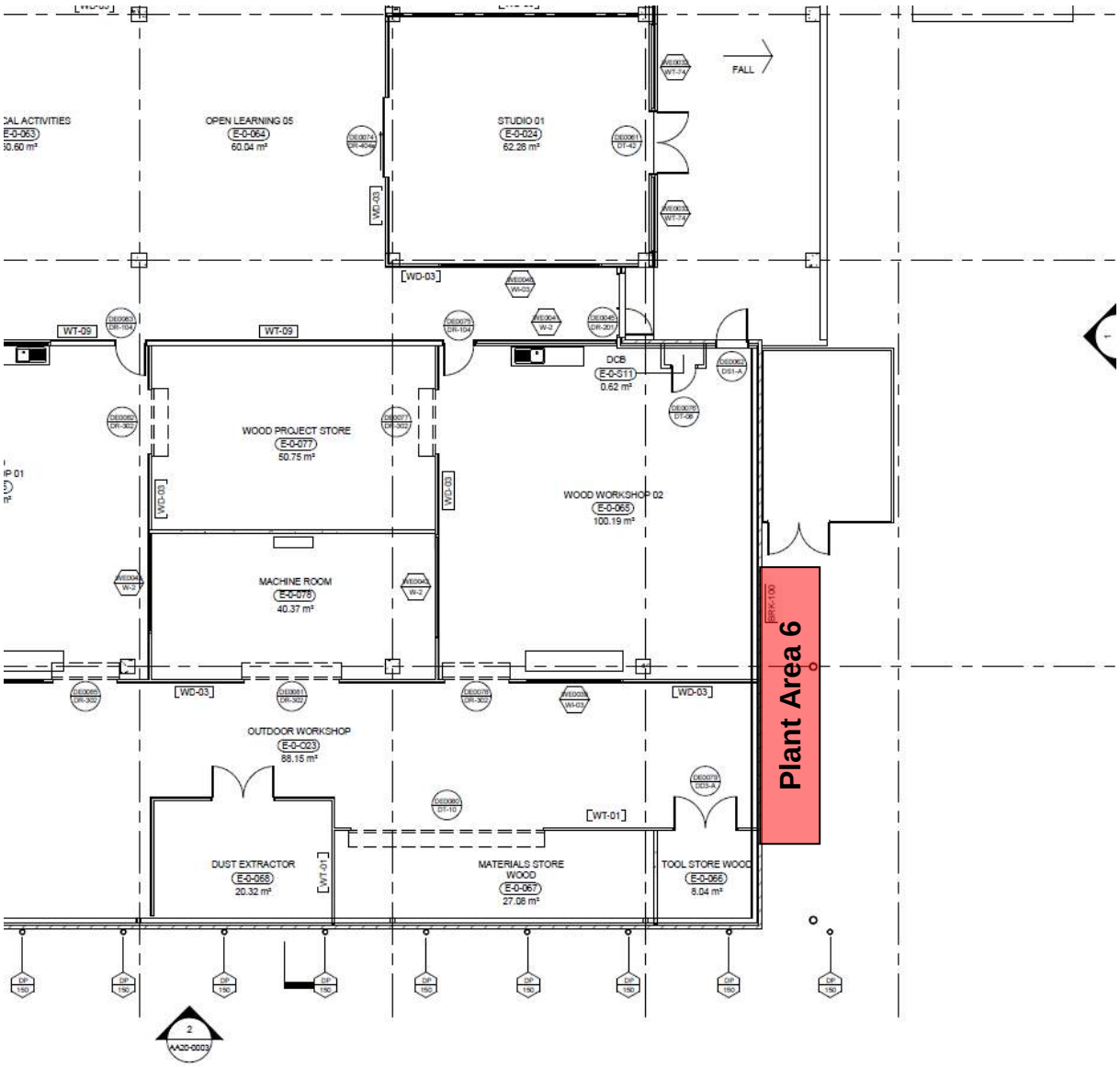


Figure 10 Plant locations - Building E

Table 5-1 Plant room equipment, acoustic mitigation specification and noise emission levels

Plant Room	Equipment	Acoustic mitigation specifications	Resultant noise levels (dBA)	
Plant Room 1 (Building A) - internal	6 x Daikin REYQ12TY1 VRV outdoor units Sound Pressure Level 59 dBA measured at 1 metre	50 % of internal plant room faces to have absorptive lining finishes of 1 layer of 50 mm thick, 80 kg/m3 Bradford Fibretex 450 Thermofoil HD Perforated Rockwool insulation (or equivalent). The lining should be evenly distributed throughout the plant room	Nearest external residential receiver (to the north)	30
			Nearest internal school space[1] – offices	35
			Nearest external play area	47
Plant Room 2 (Building A) - internal	10 x Daikin REYQ12TY1 VRV outdoor units Sound Pressure Level 59 dBA measured at 1 metre	50 % of internal plant room faces to have absorptive lining finishes of 1 layer of 50 mm thick, 80 kg/m3 Bradford Fibretex 450 Thermofoil HD Perforated Rockwool insulation (or equivalent). The lining should be evenly distributed throughout the plant room	Nearest external residential receiver (to the west)	32
			Nearest internal school space[1] – informal learning	< 20
			Nearest external play area	53[2]
Plant Room 3 (Building G) - internal	6 x Daikin REYQ12TY1 VRV outdoor units Sound Pressure Level 59 dBA measured at 1 metre	50 % of internal plant room faces to have absorptive lining finishes of 1 layer of 50 mm thick, 80 kg/m3 Bradford Fibretex 450 Thermofoil HD Perforated Rockwool insulation (or equivalent). The lining should be evenly distributed throughout the plant room	Nearest external residential receiver (to the west)	22
			Nearest internal school space[1] – interview room / studio	22
			Nearest external play area	53[2]

Plant Room	Equipment	Acoustic mitigation specifications	Resultant noise levels (dBA)	
Plant Area 4 (Building F) - External	6 x Daikin unknown VRV outdoor units Sound Pressure Level 61 dBA measured at 1 metre	**Option 1 – Upgrade glazing** Windows on the southern façade of building F to be upgraded to 10.38 mm laminated glass with acoustic seals (see section 3.3.7) **Option 2 – Enclosure** 2 metre solid barrier constructed on the western, northern and eastern sides of the plant area with a solid roof extending a minimum of 2 metres from the northern section of wall. The internal face of the enclosure should be lined with absorptive material.	Nearest external residential receiver (to the south)	29
			Nearest internal school space[1] – food tech and music classroom	35
			Nearest external play area	52
Plant Area 5 (Building D) - External	4 x Daikin unknown VRV outdoor units Sound Pressure Level 61 dBA measured at 1 metre	**Option 1 – Upgrade glazing** Windows on the eastern façade of building D and northern façade of building E to be upgraded to 10.38 mm laminated glass with acoustic seals (see section 3.3.7) **Option 2 – Enclosure** 2 metre solid barrier constructed on the western, northern and southern sides of the plant area with a solid roof. The eastern end can remain open to allow for airflow. The internal face of the enclosure should be lined with absorptive material.	Nearest external residential receiver (to the north)	38
			Nearest internal school space[1] – open learning 03	35
			Nearest external play area	48
Plant Area 6 (Building E) - External	5 x Daikin unknown VRV outdoor units Sound Pressure Level 61 dBA measured at 1 metre	No mitigation required. It is assumed that the external façade adjacent to the plant area is solid brick with no windows.	Nearest external residential receiver (to the north)	26
			Nearest internal school space[1] – workshops	< 35

Plant Room	Equipment	Acoustic mitigation specifications	Resultant noise levels (dBA)	
			Nearest external play area	47

Note: 1) Based on information provided to GHD, it has been assumed that windows will be closed during the operation of any air conditioning. Therefore, the internal noise level has been calculated based on the sound transmission performance of a typical 6 mm thick glazing.

2) This is the cumulative noise level from Plant Room 2 and Plant Room 3

5.2 Other plant and HVAC system design

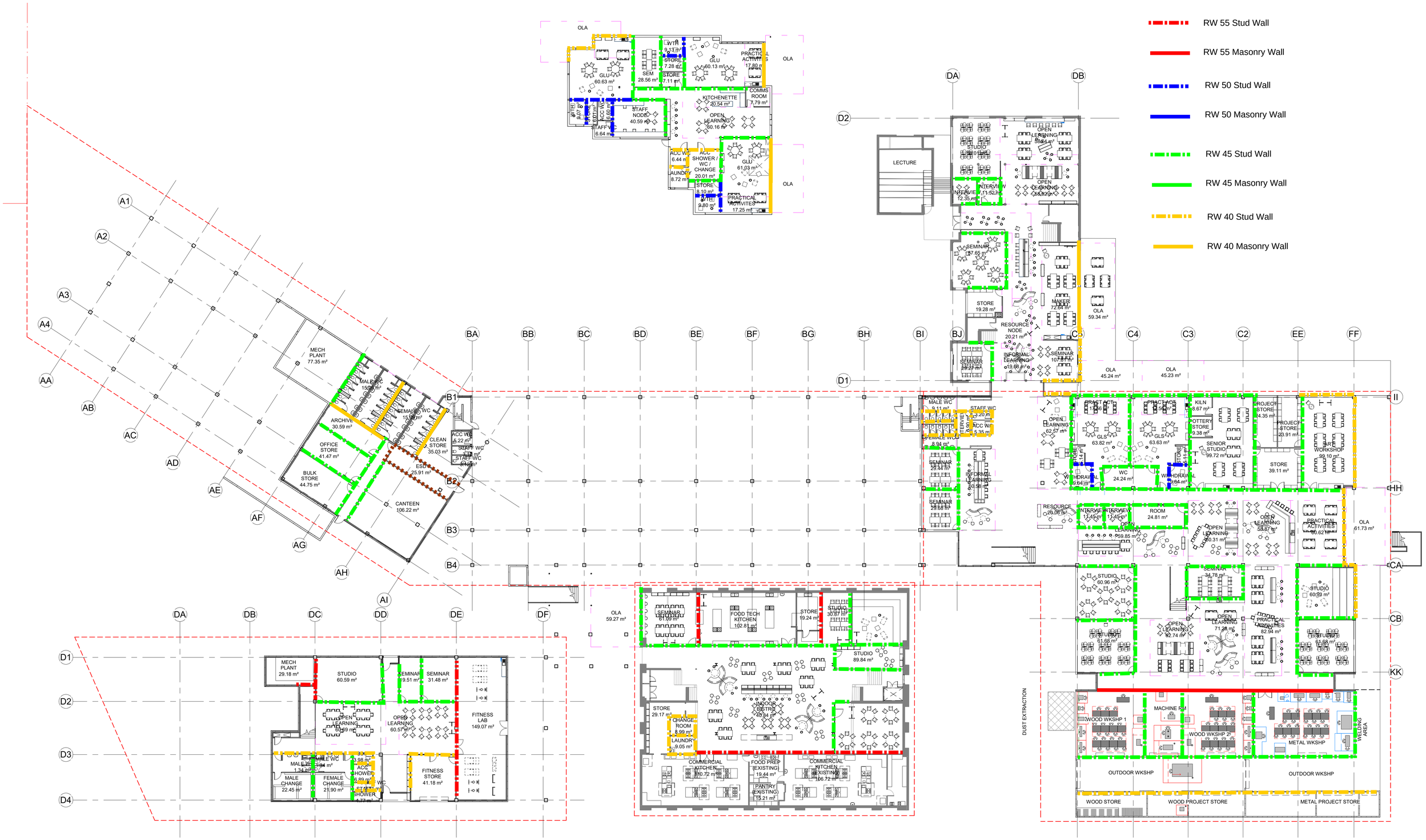
If there are any additional plant areas, it is assumed that these would be similar to those provided and noise mitigation specifications would be similar to those detailed above. Detailed design and specification can be provided once the exact details of any additional plant is known.

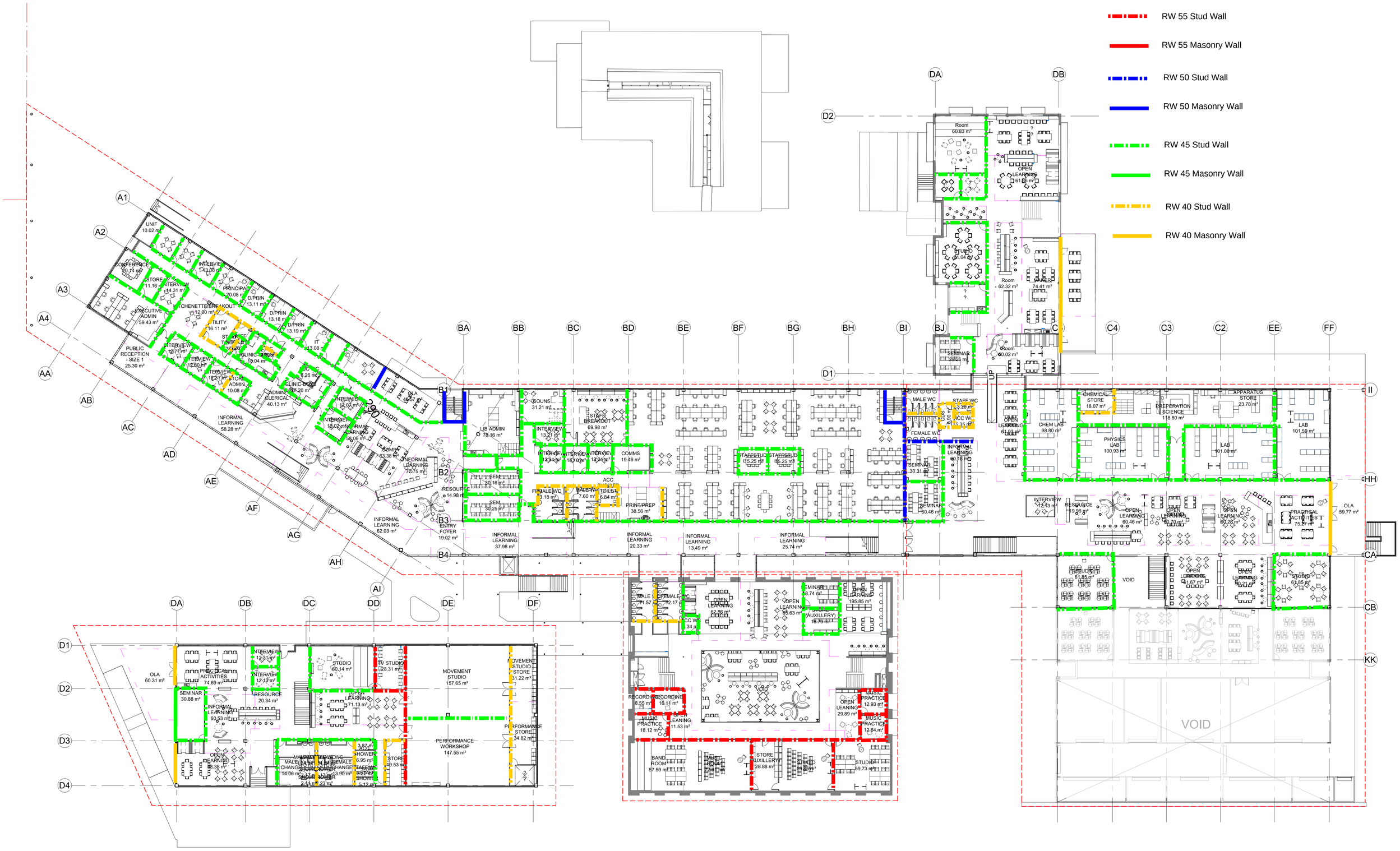
The locations of the exhaust and supply fans have been provided, however details regarding the type and model of these fans have not been provided. These fans should be selected to comply with the relevant noise emission criteria and should be reviewed at detailed design.

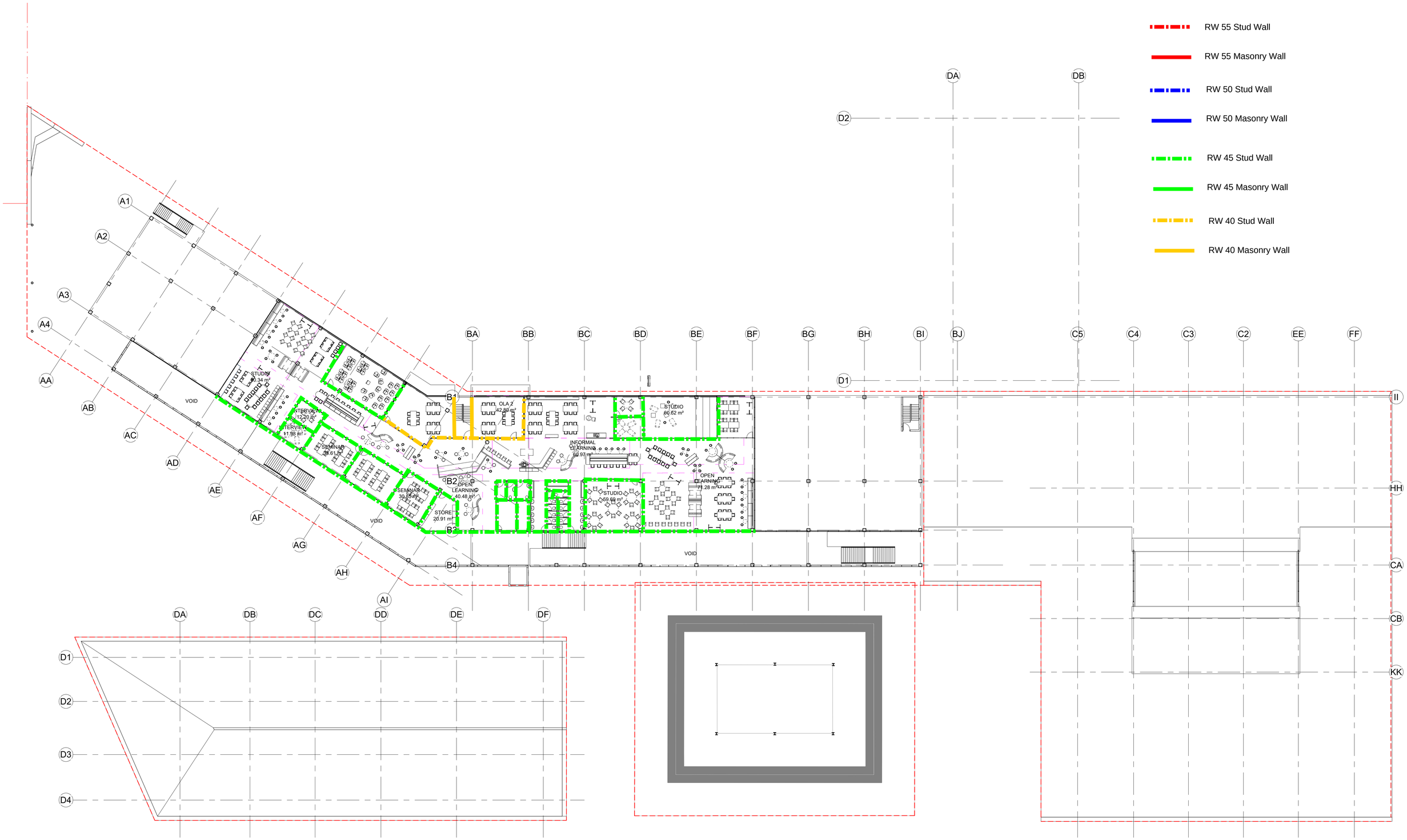
Internal HVAC design servicing individual rooms is to be assessed once detailed equipment specifications of all HVAC system is supplied.

Appendices

Appendix A – Wall mark-ups


RW 55 Stud Wall
RW 55 Masonry Wall
RW 50 Stud Wall
RW 50 Masonry Wall
RW 45 Stud Wall
RW 45 Masonry Wall
RW 40 Stud Wall
RW 40 Masonry Wall
MECH PLANT 77.35 m²
ARCHIVE 30.59 m²
OFFICE STORE 41.47 m²
BULK STORE 44.75 m²
CLEAN STORE 35.03 m²
CANTEEN 106.22 m²
LECTURE
STUDIO 120.15 m²
OPEN LEARNING 85.45 m²
OPEN LEARNING 56.82 m²
INTERVIEW 11.52 m²
SEMINAR 37.65 m²
STORE 19.28 m²
MAKER SPACE 72.84 m²
RESOURCE NODE 20.21 m²
INFORMAL LEARNING 19.88 m²
SEMINAR 107.8 m²
OLA 59.34 m²
OLA 45.24 m²
OLA 45.23 m²
OLA 61.73 m²
OLA 59.27 m²
OPEN LEARNING 62.57 m²
PRACTICAL ACTIVITIES 50.62 m²
KILN 8.67 m²
POTTERY STORE 9.38 m²
SENIOR STUDIO 99.72 m²
PROJECT STORE 23.91 m²
STORE 39.11 m²
WORKSHOP 98.10 m²
WITHDRAWAL 9.64 m²
WC 24.24 m²
RESOURCE 29.06 m²
INTERVIEW 11.45 m²
OPEN LEARNING 59.85 m²
ROOM 24.81 m²
OPEN LEARNING 50.31 m²
OPEN LEARNING 58.67 m²
SEMINAR 34.78 m²
STUDIO 60.96 m²
STUDIO 60.93 m²
STUDIO 61.68 m²
OPEN LEARNING 82.74 m²
OPEN LEARNING 71.28 m²
PRACTICAL ACTIVITIES 82.94 m²
DUST EXTRACTION
WOOD WKSHP 1
MACHINE RM
WOOD WKSHP 2
METAL WKSHP
WELDING AREA
OUTDOOR WKSHP
OUTDOOR WKSHP
WOOD STORE
WOOD PROJECT STORE
METAL PROJECT STORE
MECH PLANT 29.18 m²
STUDIO 60.59 m²
SEMINAR 19.51 m²
SEMINAR 31.48 m²
OPEN LEARNING 60.89 m²
OPEN LEARNING 60.57 m²
FITNESS LAB 149.07 m²
MALE WC 1.34 m²
FEMALE WC 3.94 m²
ACC SHOWER 6.89 m²
MALE CHANGE 22.45 m²
FEMALE CHANGE 21.90 m²
FITNESS STORE 41.18 m²
SEMINAR 51.99 m²
FOOD TECH KITCHEN 102.81 m²
STORE 19.24 m²
STUDIO 30.57 m²
STUDIO 89.84 m²
STORE 29.17 m²
CHANGE ROOM 8.99 m²
LAUNDRY 9.05 m²
INDOOR BISTRO 40.84 m²
COMMERCIAL KITCHEN 110.72 m²
FOOD PREP (EXISTING) 19.44 m²
PANTRY (EXISTING) 19.21 m²
COMMERCIAL KITCHEN (EXISTING) 106.72 m²
OLA
GLU 60.63 m²
SEM 28.56 m²
WTR 9.13 m²
STORE 7.28 m²
STORE 7.11 m²
GLU 60.13 m²
PRACTICAL ACTIVITIES 17.80 m²
COMMS ROOM 7.79 m²
KITCHENETTE 20.54 m²
OPEN LEARNING 60.16 m²
STAFF NODE 40.59 m²
WTR 8.07 m²
STORE 6.60 m²
STORE 6.60 m²
STAFF 6.64 m²
ACC WC 6.44 m²
ACC SHOWER / WC / CHANGE 20.01 m²
LAUNDRY 8.72 m²
STORE 8.10 m²
WTR 9.80 m²
GLU 61.03 m²
PRACTICAL ACTIVITIES 17.25 m²
MALE WC 9.11 m²
STAFF WC 5.20 m²
ACC WC 5.35 m²
FEMALE WC 8.94 m²
SEMINAR 29.44 m²
INFORMAL LEARNING 50.98 m²
SEMINAR 29.68 m²


RW 55 Stud Wall
RW 55 Masonry Wall
RW 50 Stud Wall
RW 50 Masonry Wall
RW 45 Stud Wall
RW 45 Masonry Wall
RW 40 Stud Wall
RW 40 Masonry Wall
UNIF 10.02 m²
CONFERENCE 20.14 m²
STORE 11.16 m²
INTERVIEW 14.31 m²
INTERVIEW 13.08 m²
PRINCIPAL 20.08 m²
D/PRIN 13.11 m²
D/PRIN 13.18 m²
D/PRIN 13.19 m²
EXECUTIVE ADMIN 59.43 m²
KITCHENETTE/BREAKOUT 12.00 m²
UTILITY 16.11 m²
STAFF LOUNGE 26.00 m²
CLINIC PROS 19.04 m²
IT 13.08 m²
PUBLIC RECEPTION - SIZE 1 25.30 m²
INTERVIEW 12.77 m²
INTERVIEW 12.80 m²
INTERVIEW 12.31 m²
STORE ADMIN 10.08 m²
CLINIC BED 6.26 m²
CLINIC BED 6.20 m²
ADMIN CLERICAL 40.13 m²
INFORMAL LEARNING 58.28 m²
INTERVIEW 12.07 m²
INTERVIEW 12.02 m²
INFORMAL LEARNING 58.06 m²
COMMS 63.38 m²
INFORMAL LEARNING 70.75 m²
INFORMAL LEARNING 62.03 m²
RESOURCE 14.98 m²
ENTRY FOYER 19.02 m²
LIB ADMIN 78.16 m²
SEM 30.16 m²
SEM 30.25 m²
COUNS 31.21 m²
INTERVIEW 13.21 m²
STAFF BREAKOUT 69.98 m²
INTERVIEW 12.34 m²
INTERVIEW 12.10 m²
INTERVIEW 12.24 m²
COMMS 19.46 m²
ACC WC 7.60 m²
FEMALE WC 7.18 m²
MALE WC 7.60 m²
TOILET 6.84 m²
PRINT/PREP 38.56 m²
INFORMAL LEARNING 37.98 m²
INFORMAL LEARNING 20.33 m²
INFORMAL LEARNING 13.49 m²
INFORMAL LEARNING 25.74 m²
STAFF STUD 15.25 m²
STAFF STUD 15.25 m²
MALE WC
STAFF WC 3.26 m²
ACC WC 5.35 m²
FEMALE WC
SEMINAR 30.31 m²
INFORMAL LEARNING 60.18 m²
SEMINAR 50.46 m²
Room 60.83 m²
OPEN LEARNING 61.06 m²
STUDIO 61.04 m²
Room 62.32 m²
TEA MAKER 74.41 m²
SEMINAR 28.28 m²
Room 60.02 m²
CHEMICAL STORE 18.07 m²
PREPERATION SCIENCE 118.80 m²
APPARATUS STORE 23.78 m²
OPEN LEARNING 61.03 m²
CHEM LAB 98.80 m²
PHYSICS LAB 100.93 m²
LAB 101.06 m²
LAB 101.59 m²
INTERVIEW 12.43 m²
RESOURCE 19.96 m²
OPEN LEARNING 60.46 m²
OPEN LEARNING 60.70 m²
OPEN LEARNING 60.28 m²
PRACTICAL ACTIVITIES 75.27 m²
OLA 59.77 m²
STUDIO 61.85 m²
VOID
OPEN LEARNING 61.67 m²
OPEN LEARNING 60.24 m²
STUDIO 63.85 m²
VOID
OLA 60.31 m²
PRACTICAL ACTIVITIES 74.69 m²
INTERVIEW 12.31 m²
INTERVIEW 12.10 m²
STUDIO 60.14 m²
TV STUDIO 28.31 m²
MOVEMENT STUDIO 157.65 m²
MOVEMENT STUDIO STORE 31.22 m²
SEMINAR 30.88 m²
RESOURCE 20.34 m²
INFORMAL LEARNING 60.53 m²
OPEN LEARNING 71.13 m²
PERFORMANCE WORKSHOP 147.55 m²
PERFORMANCE STORE 34.82 m²
OPEN LEARNING 58.38 m²
MALE CHANGE 14.06 m²
FEMALE CHANGE 13.90 m²
SHOWER 3.87 m²
SHOWER 6.95 m²
STORE 19.53 m²
TAFE WC 5.12 m²
MALE WC 7.57 m²
FEMALE WC 7.17 m²
OPEN LEARNING 62.86 m²
OPEN LEARNING 65.63 m²
SEMINAR 28.74 m²
STORE (AUXILLERY) 16.70 m²
OPEN LEARNING 195.85 m²
ACC WC 3.34 m²
VOID
RECORDING 8.55 m²
RECORDING 16.11 m²
MUSIC PRACTICE 18.12 m²
OPEN LEARNING 11.53 m²
BAND ROOM 57.59 m²
MUSIC ROOM 7.04 m²
STORE (AUXILLERY) 28.88 m²
STUDIO 59.85 m²
OPEN LEARNING 29.89 m²
MUSIC PRACTICE 12.93 m²
MUSIC PRACTICE 12.64 m²
STUDIO 59.73 m²
VOID


RW 55 Stud Wall
RW 55 Masonry Wall
RW 50 Stud Wall
RW 50 Masonry Wall
RW 45 Stud Wall
RW 45 Masonry Wall
RW 40 Stud Wall
RW 40 Masonry Wall
STUDIO 90.34 m²
INTERVIEW 12.20 m²
INTERVIEW 11.98 m²
SEMINAR 28.61 m²
SEMINAR 30.85 m²
VOID
OLA 2 42.80 m²
INFORMAL LEARNING 58.97 m²
STUDIO 60.62 m²
OPEN LEARNING 40.48 m²
STORE 20.91 m²
STUDIO 59.69 m²
OPEN LEARNING 71.28 m²
VOID
A1
A2
A3
A4
AA
AB
AC
AD
AE
AF
AG
AH
AI
B1
B2
B3
B4
BA
BB
BC
BD
BE
BF
BG
BH
BI
BJ
C5
C4
C3
C2
EE
FF
II
HH
CA
CB
KK
DA
DB
DC
DD
DE
DF
D1
D2
D3
D4

Appendix B – Room mark-ups

WORK IN PROGRESS
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DOCUMENTATION

REV		
P3	50% DRAFT	05-07-18
P2	COORDINATION	20-06-18
P1	PRELIMINARY	30-05-18

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A&E GA GROUND FLOOR SHEET 1

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Drawing No AA10-0101	Revision P3

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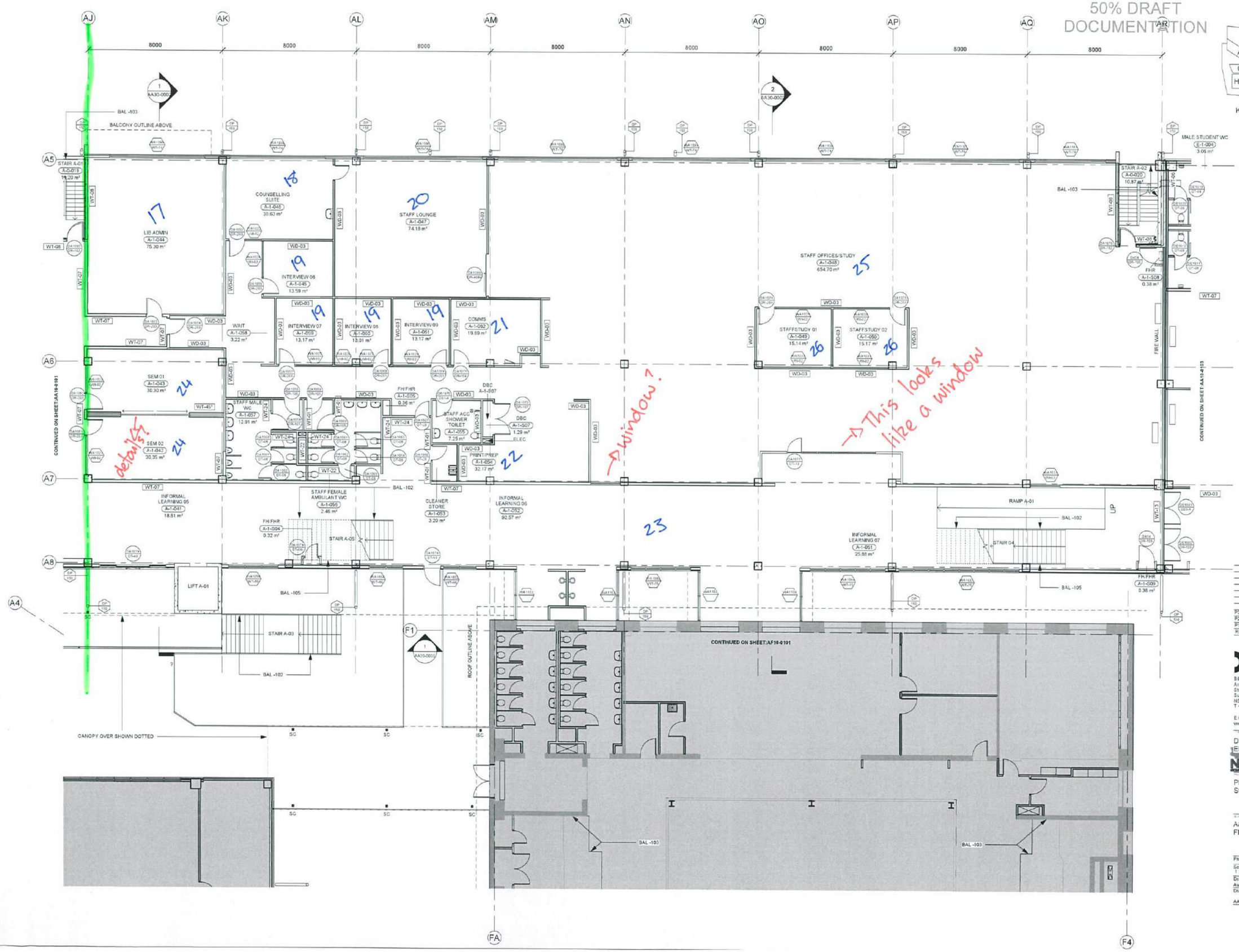

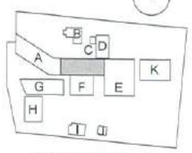

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AA10-0201	P3

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1:100

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TO BE FIXXED BY BCP

Is this glass? Details?

not on the window schedule

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P2	COORDINATION	20-06-18
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A&E GA FIRST FLOOR SHEET 2

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P1	PRELIMINARY	30-05-18
REV		

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Drawing No	Revision
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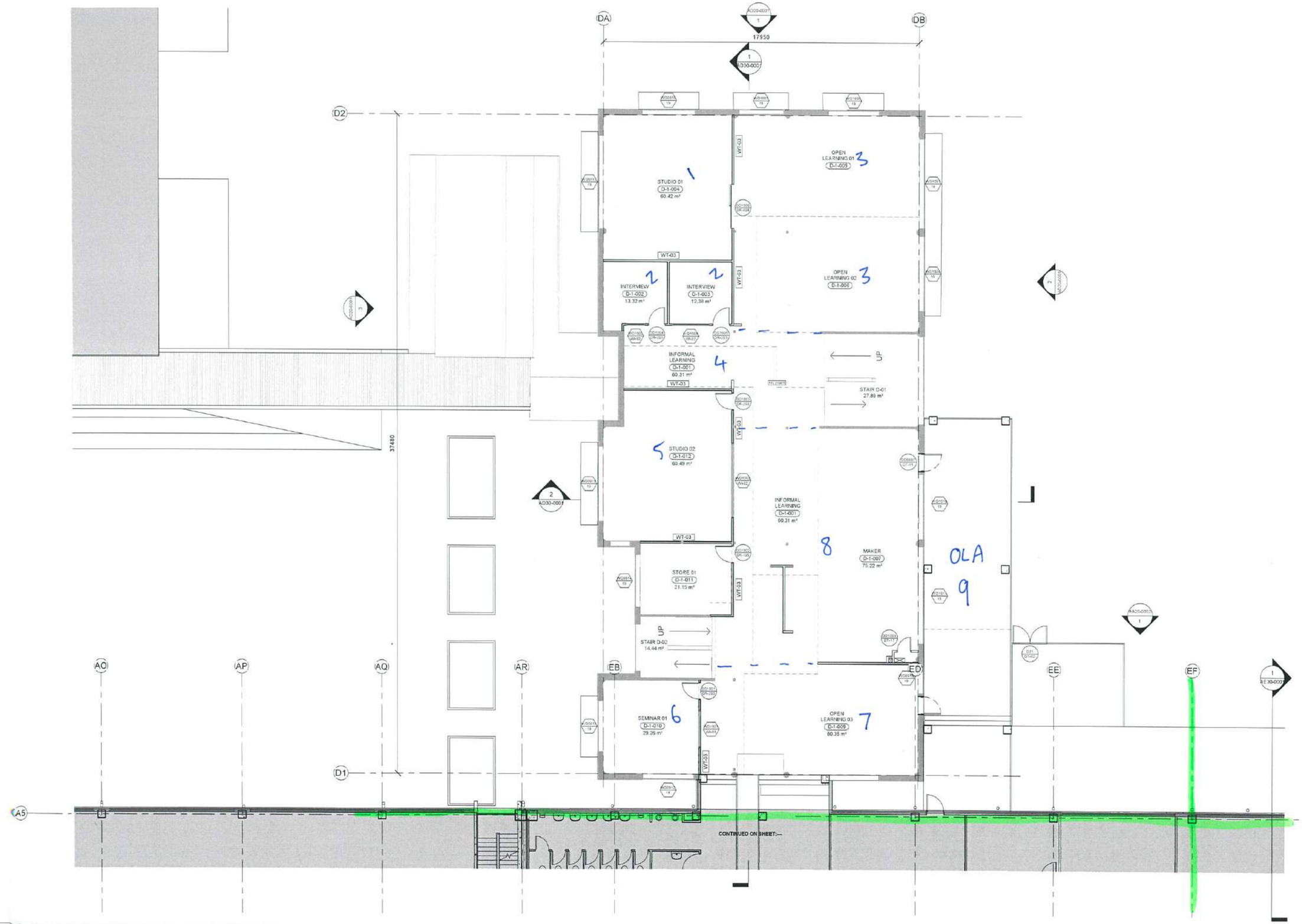

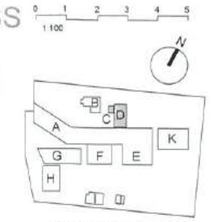

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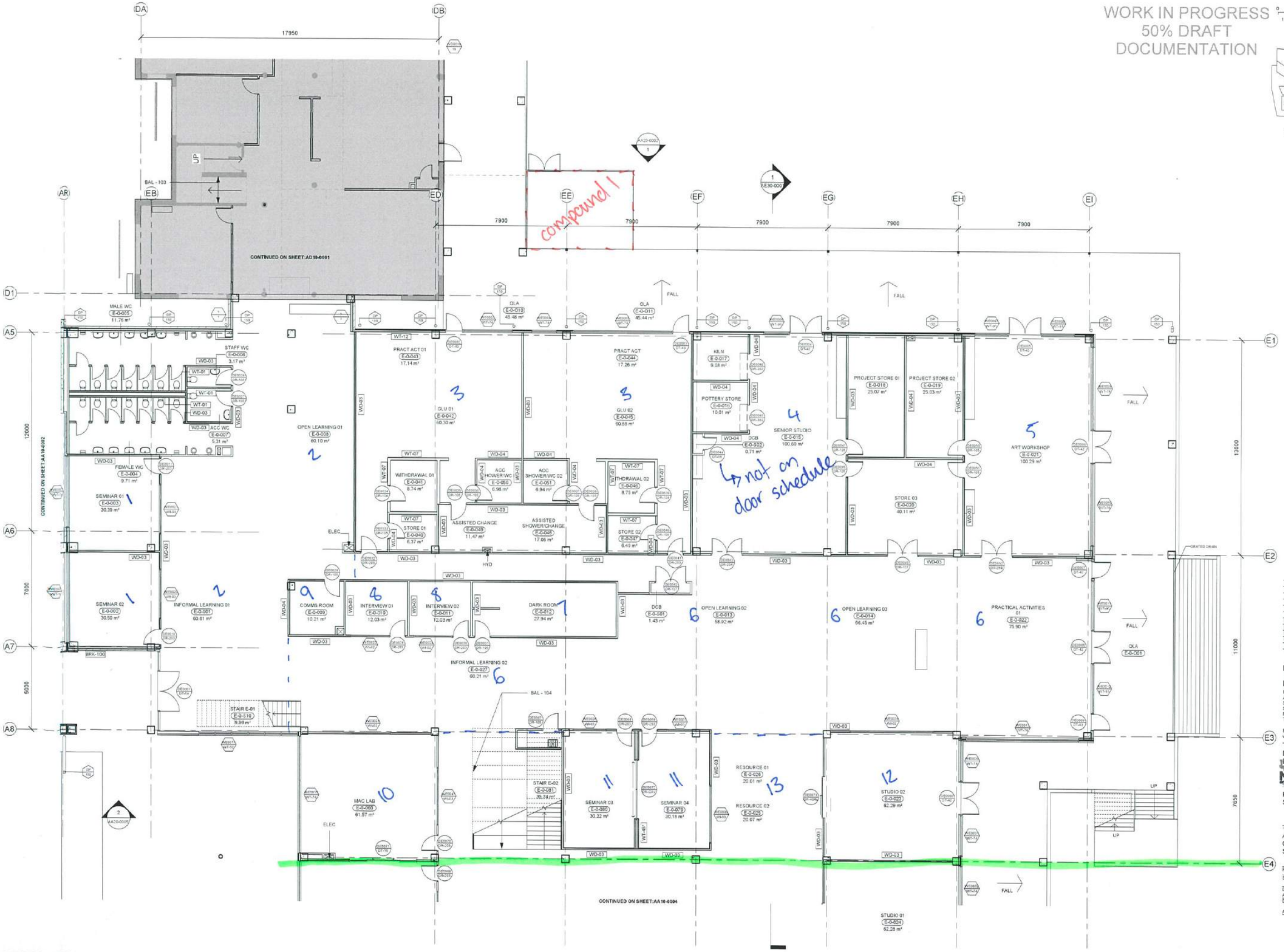

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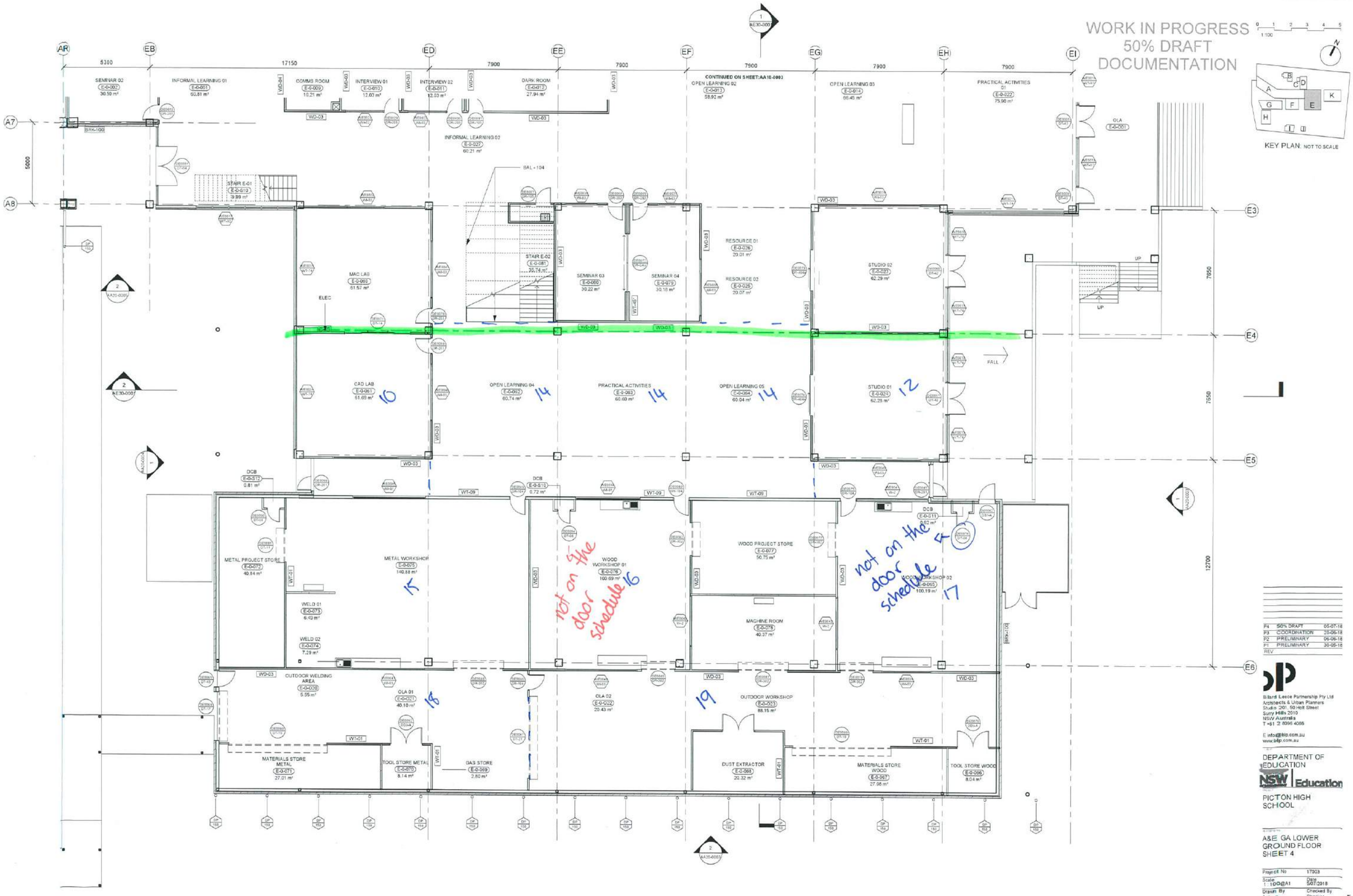

KEY PLAN NOT TO SCALE

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P1	PRELIMINARY	30-05-18

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Drawing No AA10-0004	Revision P4

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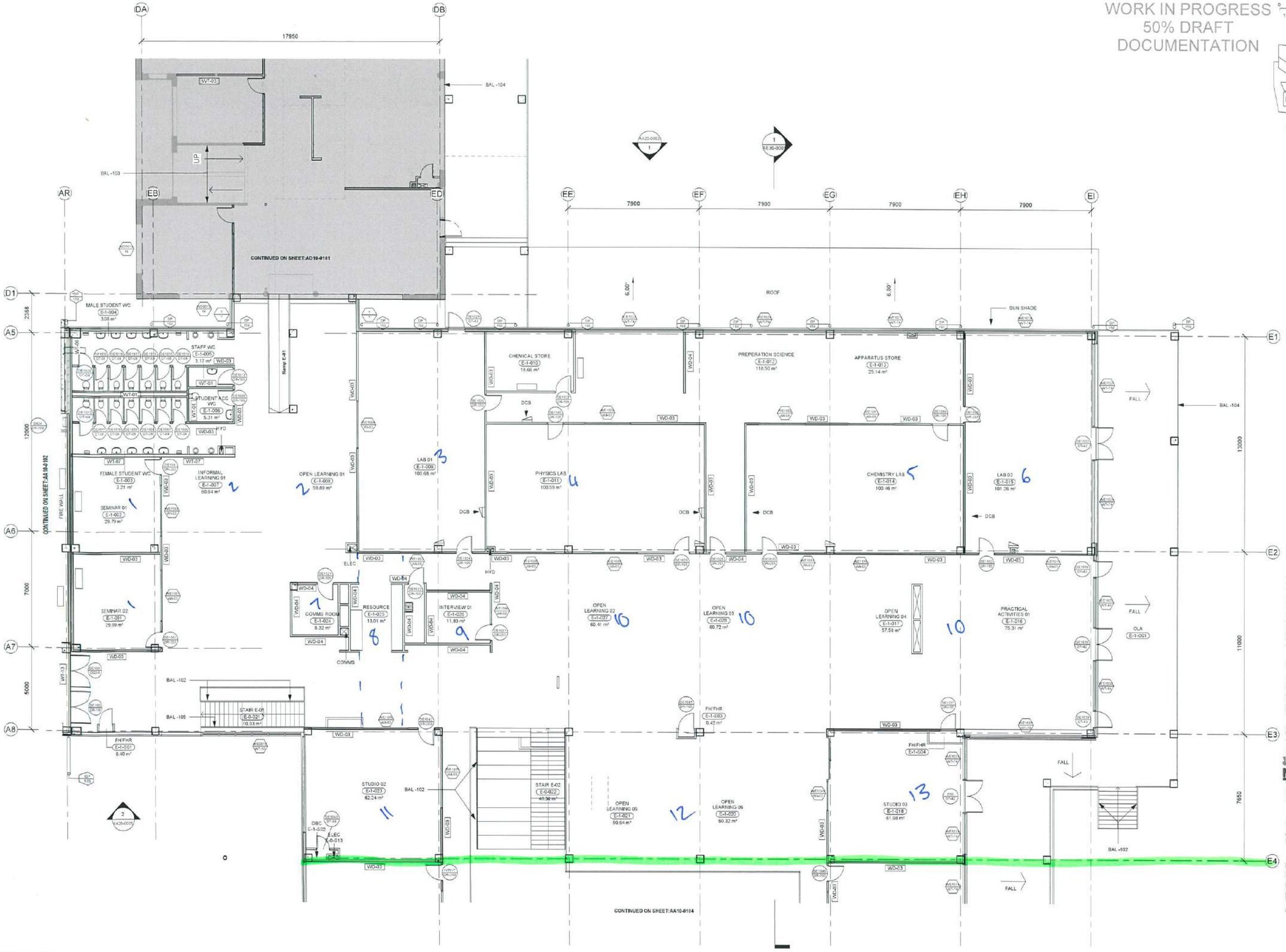

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P1	PRELIMINARY	30-05-18

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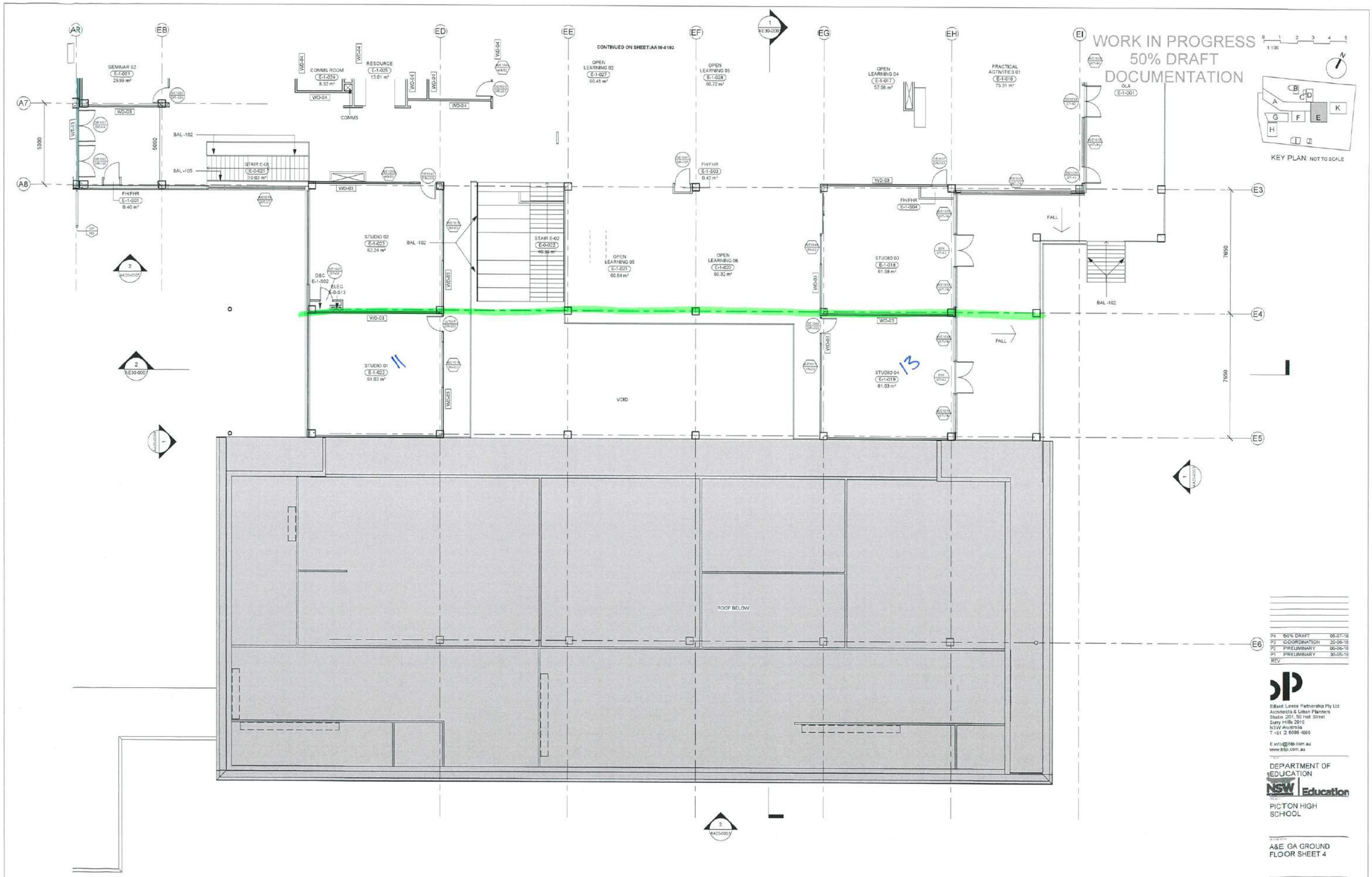

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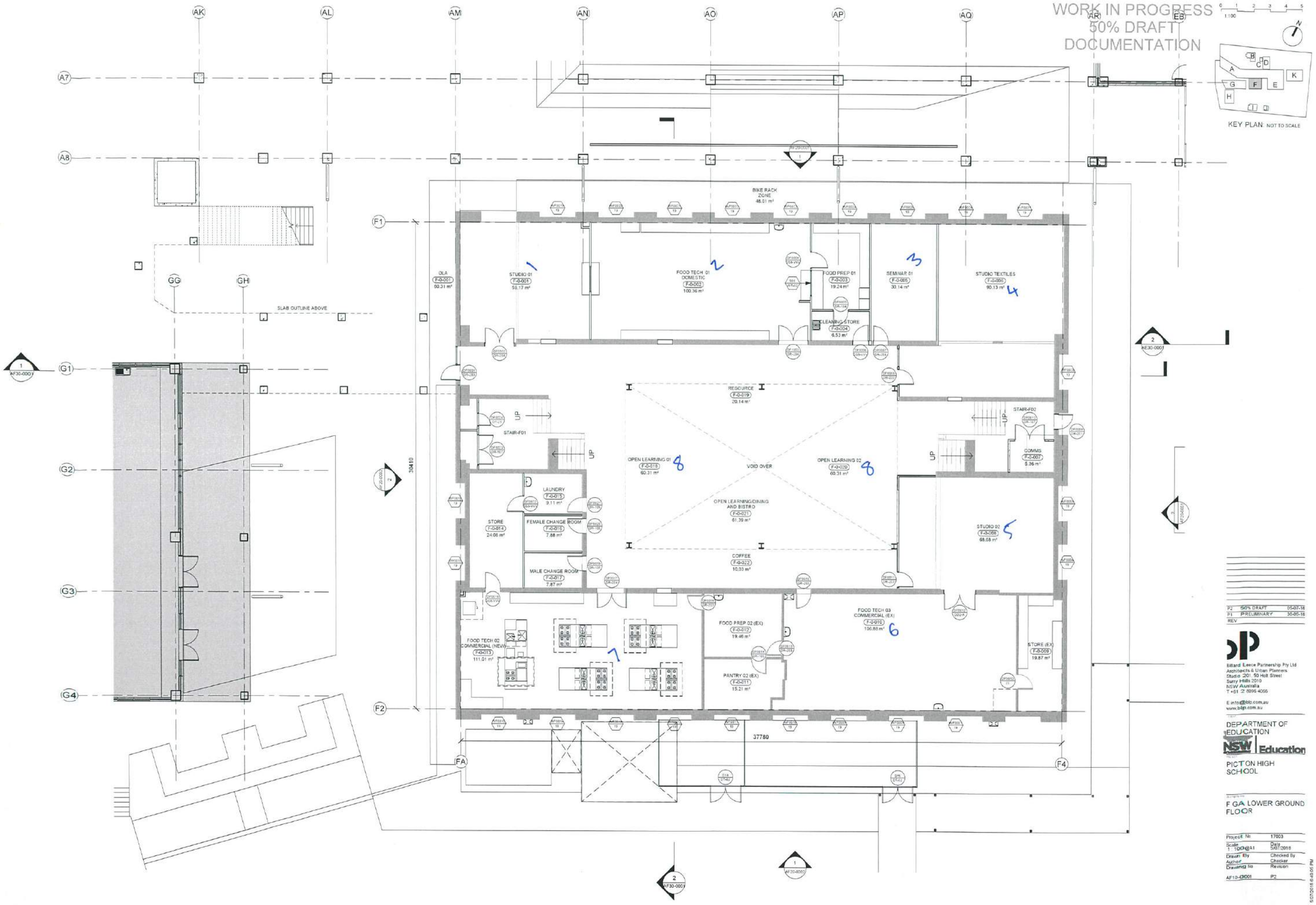

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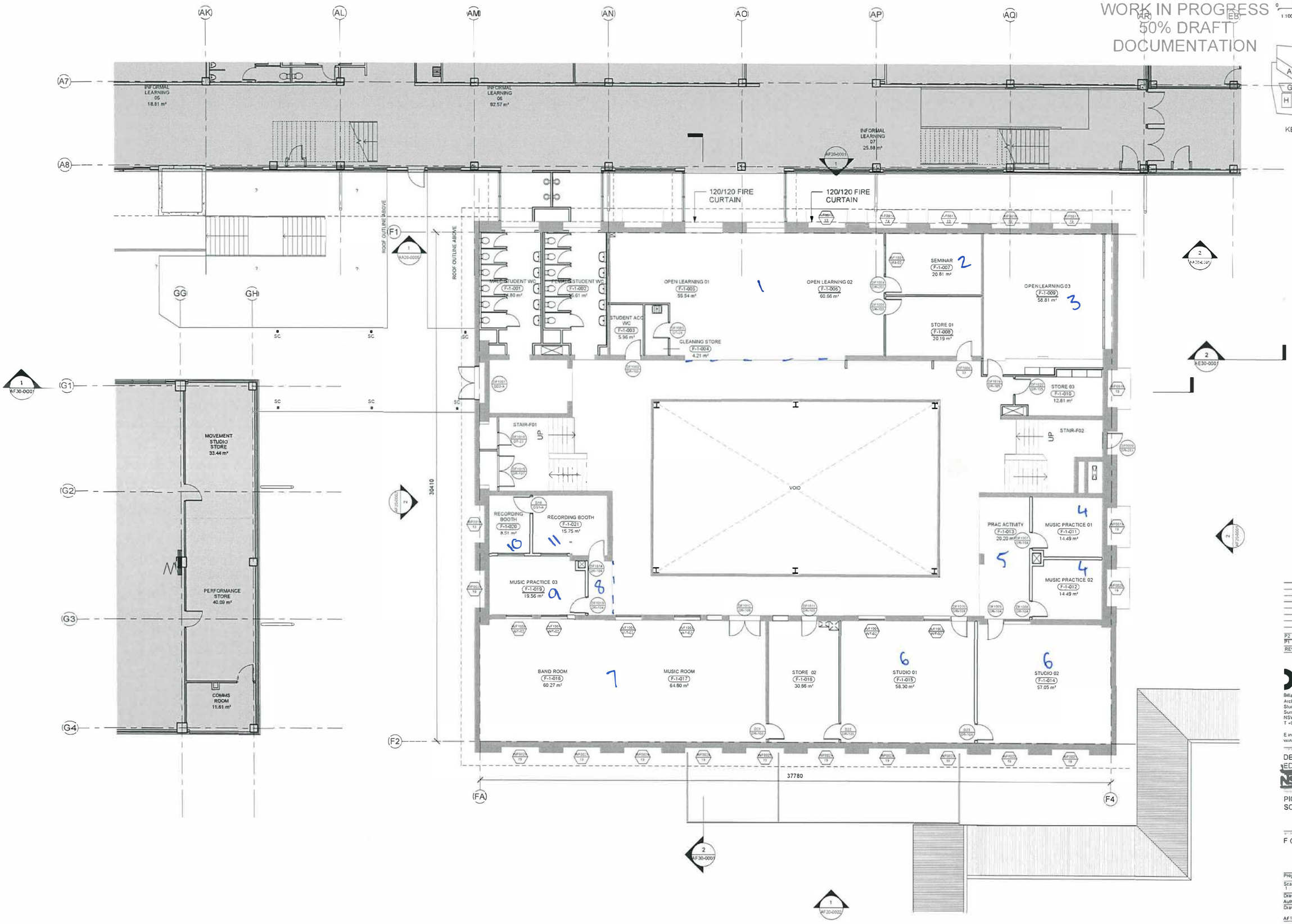

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P1	PRELIMINARY	30-05-18

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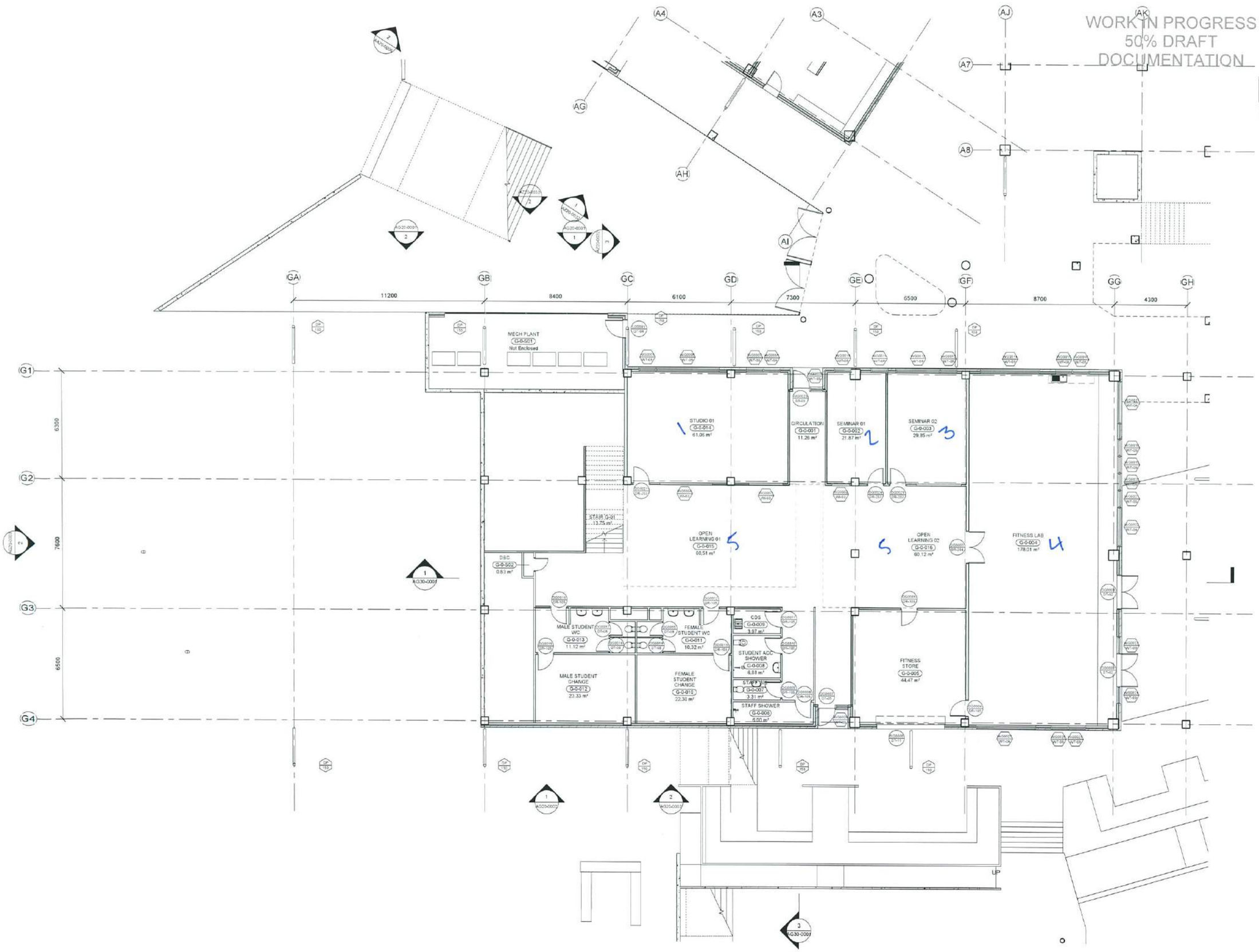

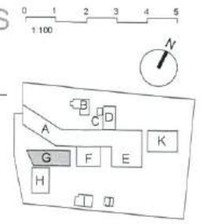

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P1	PRELIMINARY	30-05-18

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Drawing No	Revision
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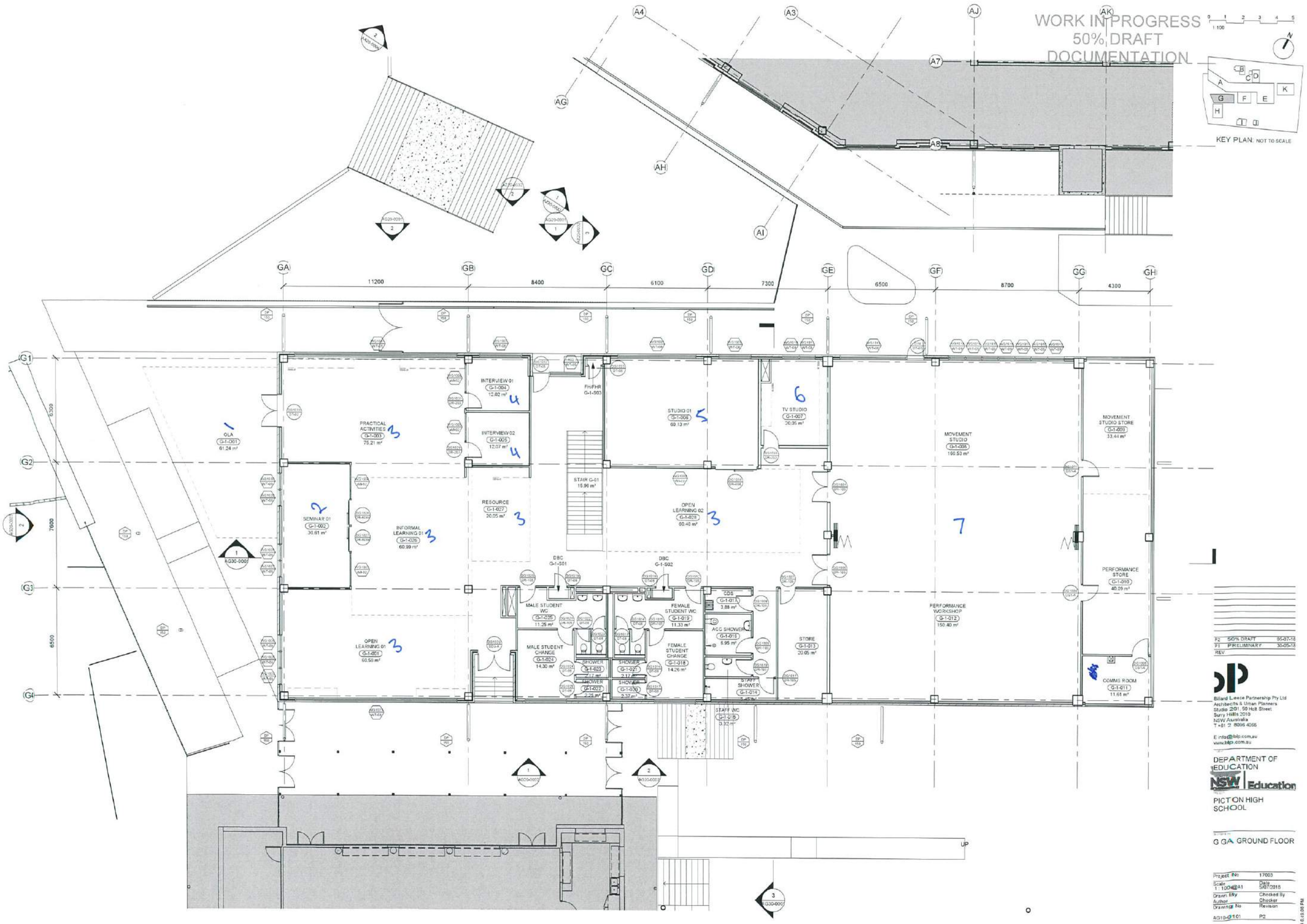
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DOCUMENTATION
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SEMINAR 01 G-1-002 30.61 m²
INTERVIEW 01 G-1-004 12.02 m²
INTERVIEW 02 G-1-005 12.07 m²
INFORMAL LEARNING 01 G-1-026 60.99 m²
RESOURCE G-1-027 20.05 m²
OPEN LEARNING 01 G-1-001 60.58 m²
STAIR G-01 15.96 m²
FH/FHR G-1-503
STUDIO 01 G-1-006 69.13 m²
TV STUDIO G-1-007 20.05 m²
OPEN LEARNING 02 G-1-028 60.40 m²
MOVEMENT STUDIO G-1-005 160.53 m²
MOVEMENT STUDIO STORE G-1-009 33.44 m²
PERFORMANCE STORE G-1-010 40.09 m²
PERFORMANCE WORKSHOP G-1-012 150.40 m²
COMMS ROOM G-1-011 11.61 m²
DBC G-1-S01
DBC G-1-S02
MALE STUDENT WC G-1-025 11.26 m²
MALE STUDENT CHANGE G-1-024 14.30 m²
SHOWER G-1-023 2.17 m²
SHOWER G-1-022 2.28 m²
SHOWER G-1-021 2.17 m²
SHOWER G-1-020 2.37 m²
FEMALE STUDENT WC G-1-019 11.33 m²
FEMALE STUDENT CHANGE G-1-018 14.26 m²
CDS G-1-017 3.88 m²
ACC SHOWER G-1-016 6.95 m²
STAFF SHOWER G-1-014
STAFF WC G-1-015 3.92 m²
STORE G-1-013 20.05 m²
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P2 50% DRAFT 05-07-18
P1 PRELIMINARY 30-05-18
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Appendix C – Penetration acoustic details

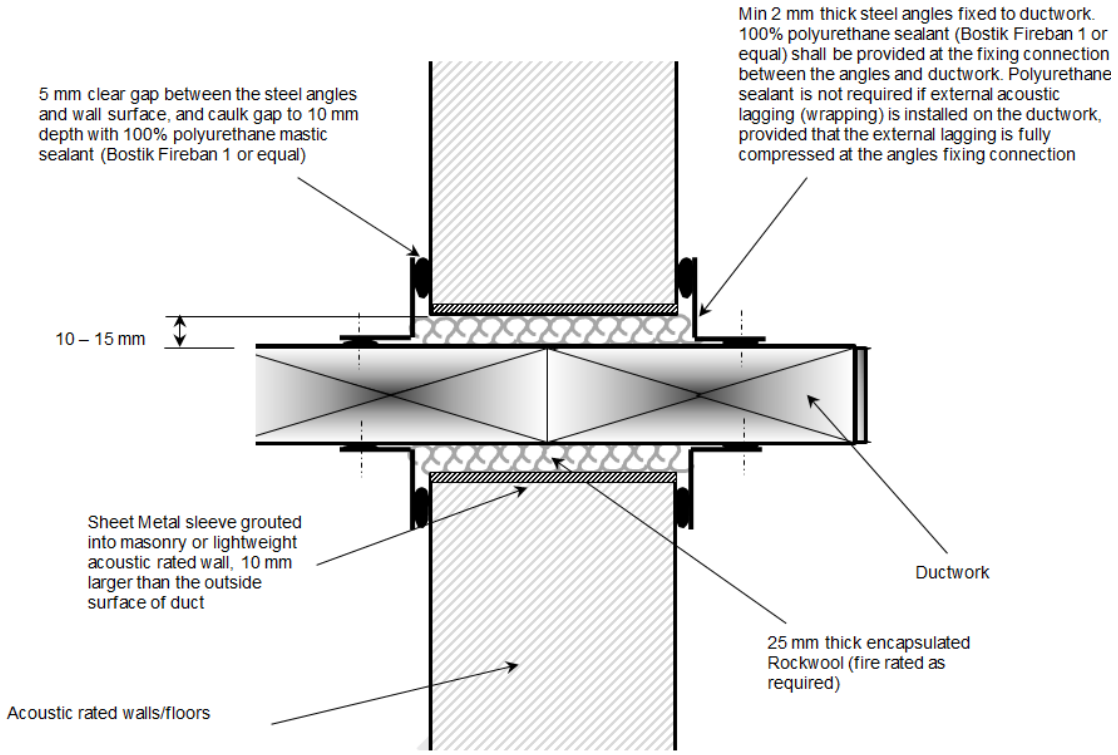

Figure 11 Ductwork Penetration Acoustic Sealing Detail

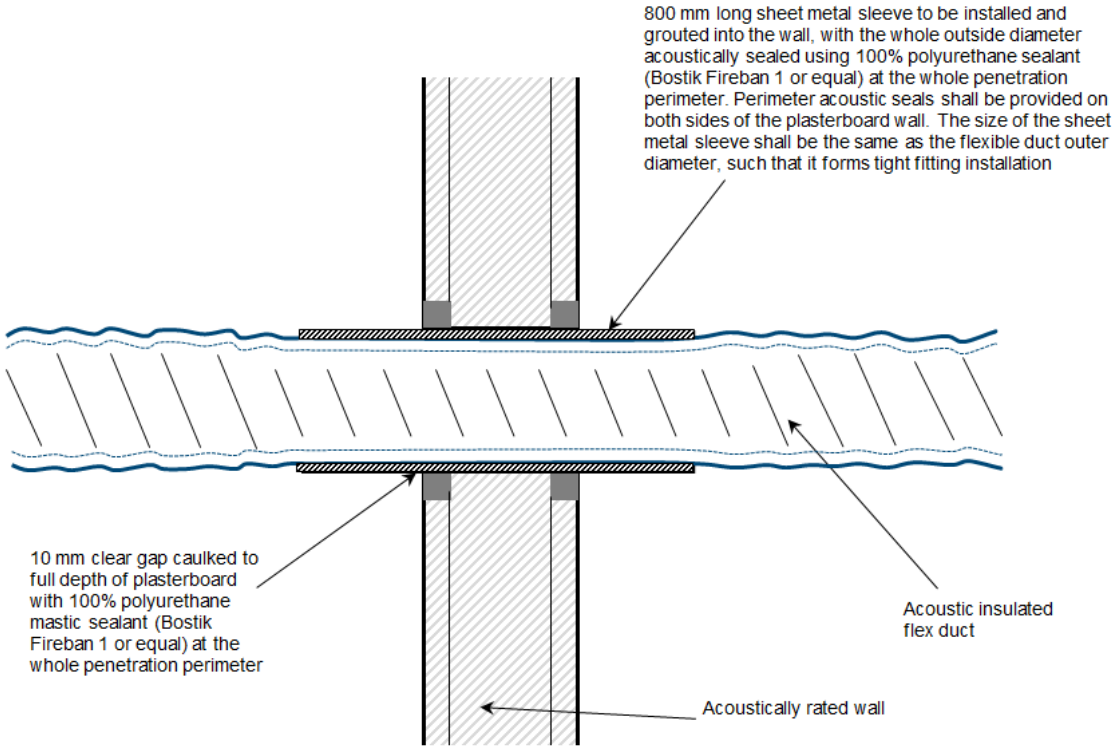

Figure 12 Flexible Ductwork Penetration Acoustic Sealing Detail

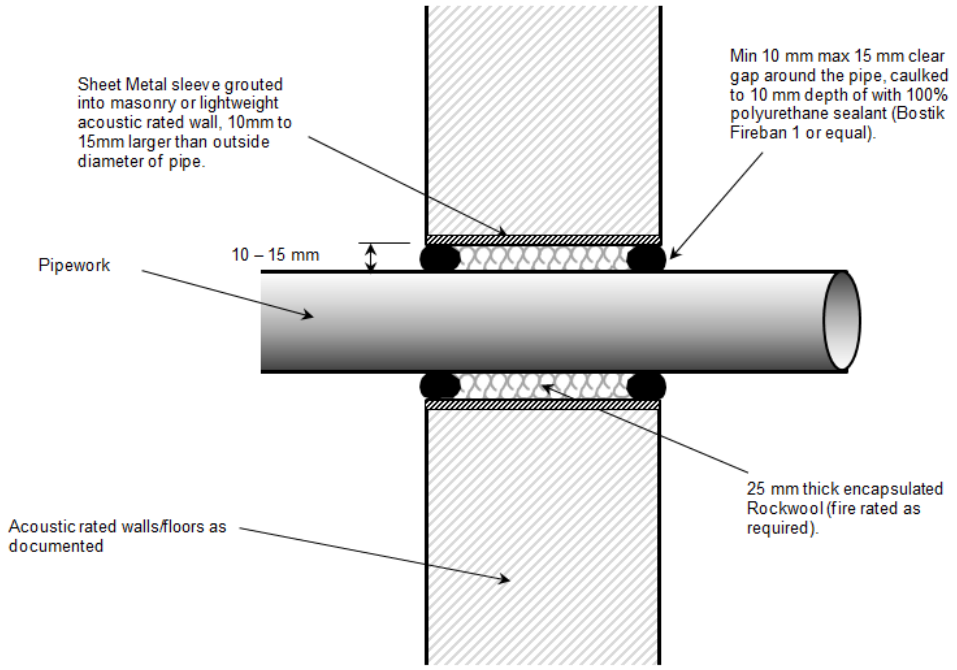

Figure 13 Pipework Penetration Acoustic Sealing Detail

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	C Gordon / K Thurecth	E Milton		E Milton		12/07/2018

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