Maynard Marks

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Invasive and Destructive Weathertightness Report

Karori Community Hall, England Lane, Karori, Wellington

Wellington City Council

Maynard Marks

DOCUMENT CONTROL

Report Title	Invasive and Destructive Weathertightness Report
Address	Karori Community Hall, England Lane, Karori, Wellington
Client	Wellington City Council
Date of Report	July 2024

Job Ref. AM01.04973.000

Version	Date of Issue	Status	Details
1	30 July 2024	Final	Issue to client.

AUTHORITY TO ISSUE ON BEHALF OF

Maynard Marks New Zealand Limited
Level 7, 40 Mercer Street, Wellington 6011
PO Box 25218, Featherston Street, Wellington 6146

Phone: +64 4 282 0650
Email: office@maynardmarks.co.nz
www.maynardmarks.co.nz

Author

Signed:

Giles Ingham *BSc (Hons), MRICS MNZIBS*
Chartered & Registered Building Surveyor
Senior Associate

Email: [redacted]
Mob: [redacted]

Peer Reviewer

Signed:

Simon Cunliffe *MRICS MNZIBS*
Chartered Surveyor & Registered Building Surveyor
Technical Director

Email: [redacted]
Mob: [redacted]

For and on behalf of Maynard Marks New Zealand Limited

TABLE OF CONTENTS

APPENDICES

Maynard Marks

EXECUTIVE SUMMARY

Construction

A predominantly steel framed, single level building with a high open entrance lobby/atrium to the north and part western sides and a high central auditorium, mainly constructed during 2016-2017, under Building Consent number 334503. However, the building remains incomplete, and internally the building is at various stages of completion, with no CCC yet issued for the build.

Perimeter walls to the lower height elevations on the south and part west and part east elevations are reinforced concrete blockwork, exposed externally.

The roof structures are timber rafters to the upper roof and timber trusses to the lower perimeter roofs.

Claddings include vertical metal wall cladding over horizontal cavibats and flexible wall underlay to the upper exterior walls of the auditorium and glazed curtain walling panels, supported by a steel frame to the lobby/entrance atrium.

The roofing comprises TrimRib asymmetric trapezoidal profile metal roofing. There is also a torch-on membrane roof adjoining the lower plant base area above the west elevation and a butyl rubber lined central internal gutter above the upper main roof.

Weathertightness Defect Summary

The key defects that are considered high-risk in weathertightness terms and that have or are deemed likely to fail to comply with the provisions of the New Zealand Building Code (NZBC) are listed below.

Weathertightness Defects

- Lack of barge flashing deflection at the roof soffit junctions (Photographs 20-64).
- Exposed blockwork exterior walls, including at joinery openings, with no evidence of a sealer/protective coating (Photographs 65-161).
- A lack of vertical control joints to exposed blockwork exterior walls, with visible vertical cracking to mortar joints (Photographs 72-90 & 106-109, 112-115).
- Exterior ground finishing higher than the internal floor slab at the base of the curtain walling and at door thresholds (Photographs 162-195).
- Inadequately modified and fixed cavity closer at the base of the metal cladding (Photographs 196-200).
- Inadequate eaves flashing projection over the metal gutters (Photographs 201-210).
- Rippling of the internal gutter membrane - main roof (Photographs 223-228).

Other Vulnerable Weathertightness and Maintenance Issues

- Localised barge and apron flashings inadequately terminated at the northeast external corner (Photographs 211-213).
- Localised inadequately lapped capping junctions to the western and eastern side of the main roof (Photographs 229-235).

- Corroding services plant to the west elevation, including screws, cowlings and grilles (Photographs 214-222).

- Moss and lichen build up to the western canopy roof (Photographs 236-237).

Confirmed Damage Summary

Damage includes but is not limited to:

- Localised decay damage to packers below the 2 sets of glazed double entrance doors.

- Evidence of moisture penetration at the base of the curtain walling/glazed doors to channel drain/exterior ground as the exterior levels finish above, as opposed to level with (or just below) the internal slab.

- Moisture penetration through barge soffit details and extensive moisture transfer through blockwork walls on the south and part east and west elevations, causing extensive efflorescence and moisture transfer into insulation as well as timber strapping which also supports internal linings to office, WC and kitchen areas.

Recommended Remedial Works

We consider the following summary list of works are likely to be required to remediate the exterior envelope of the building:

- Replacement of all barge flashings and soffit linings above the north and west elevations, including assessing the framing.

- Reinstallation of the two window joinery units and the metal egress door in the blockwork on the west elevation, including waterproofing.

- Removal of plasterboard linings where practicable on the exterior walls of the east, south and west elevations to further assess the condition of the strapping and insulation batts. Whether bathroom and kitchen fittings are to be disturbed will be dependent upon the outcome.

- Retrospective installation of vertical control joints throughout all blockwork exterior walls.

- Potential overcladding of the exterior face of the blockwork walls.

- Reinstallation of the 2 sets of double-glazed entrance doors on the north and west elevations, including nibs below.

- Replacement of the channel drain along the north elevation and lowering of the exterior ground (level access still feasible).

- Design and install a bespoke cavity closer to vermin proof the base of the cavity behind the metal wall cladding.

- Replace eaves flashings to the metal roofing.

- Install suitably detailed back flashings/additional cover flashings to vulnerable barge/capping details above the west and east elevations.

- Replace corroded service cowlings, etc.

- Clean down moss and lichen from the western canopy roof.

Further Recommendations

This report does not form a basis for undertaking any remedial works and detailed design documentation will need to be developed.

Designers engaged should liaise with the Building Consent Authority to discuss the process whereby an Amendment may be obtained for any works developed from this report, as well as other assessments (i.e. services, etc).

Considerations should be given to the most appropriate way to ensure weathertightness and durability associated with the blockwork exterior walls, Overcladding would significantly reduce weathertightness risk and dependent upon material selections could also reduce future maintenance.

Elements comprising the exterior envelope previously received producer statements and warranties. The Building Consent Authority may require updated producer statements and confirmation that warranties remain valid (or can be updated) as part of any consent amendment and CCC application documentation. We suggest that your designers identify the relevant manufacturers and installers and consider approaching these companies in this regard.

We recommend that detailed surveys are completed of all services installations/first fix items, etc to determine if these can remain in situ as part of completing the works. Independent specialist services engineers may be required for this process.

Only limited testing has been completed and we cannot rule out decay existing in other locations given the existence of the defects for 6 years+ and H1.2 timber treatment. Therefore, in terms of the soffit linings, all areas will need to be exposed to view.

Internally behind the blockwork exterior walls, we recommend a more cautious approach is taken to avoid unnecessarily disturbing WC and kitchen fixtures, by removing as much of the plasterboard from the internal face of the blockwork walls as possible to expose strapping and insulation, whilst avoiding areas and the base of walls where vinyl flooring upstands, cabinetry, sanitary fittings and other fixtures are in place. This will allow a more detailed inspection of the strapping and insulation, upon which a decision to go further could be based.

A timber remediation expert will be required upon exposing any framing for assessment.

We did not elect to remove any metal wall cladding, given the disturbance and damage this would cause, however we understand and the Council inspection photos from the property file show building wrap and cavibats over Speedwall as the main form of substrate, which is a durable construction type. Furthermore, without any penetrations or particular and consistent complex details, we did not consider it necessary to investigate this, other than visually.

Health and Safety

Refer to section 5.0.

1.0 GENERAL INFORMATION

1.1 Introduction

The report has been prepared by Giles Ingham, Chartered & Registered Building Surveyor of Maynard Marks on behalf of Wellington City Council **(WCC)** as per our Offer of Service dated 07 June 2024. The content of this report is private and confidential.

General particulars of this property are as follows:

Commissioned By	Wellington City Council
Site Address	Karori Community Hall, England Lane, Karori, Wellington
Inspection Dates and Weather	• 17 July 2024 – Overcast with rain early morning (prior to investigation starting) • 18 July 2024 – Rain (investigation from interior only)
Inspection By	Giles Ingham, Chartered and Registered Building Surveyor
Other Persons Present	17 July 2024: • [redacted], Property & Capital Projects Team, WCC (initially for access in the morning) • [redacted], Holmes Construction Ltd (assistant builder). • Operator for Elevated Work Platform (EWP), Hanging Around Ltd 18 July 2024: • None

1.2 Extent of Instruction

Reference should be made to Maynard Marks New Zealand Limited's Offer of Service dated 07 June 2024 at section 2.0 Scope of Service. For clarification purposes, the extent of instruction for this report is as follows:

- *Obtain and review a copy of the Council property file/Building Consent information to compare construction with the as-built situation and review the plans for additional items that ought to be considered.*
- *Review any reports/information, should such exist, in relation to the building that are available, relating to any concerns or confirmed defects that may exist and any repairs that may have been completed.*
- *Complete a visual survey of the exterior of the units to highlight any vulnerable weathertight defects/construction, variations to the Certified Building Consent documentation and non-compliant construction generally.*
- *Complete Invasive moisture meter testing of the exterior, including the mapping of test results.*
- *Complete destructive testing as deemed necessary, to confirm the condition of the timber/other substrates and to observe the defects, decay and any other damage.*

- *Access interior of building to observe any signs of moisture ingress and record (where access is made available).*

- *Develop a broad scope of recommended remedial work in general terms to remediate the complex should this be required.*

- *Document the results and findings of the site investigation and subconsultants information (if applicable) in a comprehensive report including photographic records, annotated elevation drawings showing test locations and results and broad scope of remedial works if required.*

1.3 Documents Reviewed

Documents reviewed for the benefit of this report include the following:

- Extracts of the Building Consent information on the Wellington City Council property file for the construction of the building (client supplied).
- The letter from WCC Building Compliance and Consents, dated 21 May 2024 outlining the specific areas of the building requiring inspection to determine the quality of installation and performance relative to the Building Code.

1.4 Formal Dialogue

Formal dialogue has been undertaken between Maynard Marks and the following parties in connection with this report:

- [redacted] - Property & Capital Projects, Wellington City Council

1.5 Methodology

Client supplied extracts of the property file relating to the Building Consent were obtained and reviewed.

A visual site survey was undertaken initially to identify any vulnerable weathertightness defects with the construction of the building, covering the areas and construction identified in the letter from WCC, dated 21 May 2024.

Access was gained via an EWP to the overhanging soffits and the main roof. Use of the EWP was only feasible and safe from the north elevation to destructively investigate soffit construction, under an approved Traffic Management Plan. Other areas deemed necessary to investigate and undertake invasive testing were conducted via ladder, otherwise areas were inspected from ground level, particularly from the interior behind the lower level blockwork exterior walls to the east, south and west elevations.

Destructive testing was undertaken to confirm the condition of the timber substrate and observe defects, decay and any other damage. Testing locations can be found at **Appendix A**.

The roof was visually inspected only, with much of the framing below the roof exposed to view from ground level internally.

Photographs were taken during the survey using a digital camera, selected copies of which are included at **Appendix B**.

Vulnerable and high-risk areas were selected to carry out localised dye and water testing, in order to indicate any areas of moisture ingress. Some of these areas were left for over 24 hours after the application of dye and a reinspection conducted the following day to determine any changes/evidence of moisture entry.

Samples of materials were extracted at various locations for specialist laboratory analysis. The Beagle Consultancy Report is included at **Appendix C**.

Whilst we have included broad remedial recommendations within this report, we have not provided a detailed scope or associated cost estimate. This report is intended to assist the client and any designers engaged.

1.6 Reporting Conditions

This report has been prepared under the following conditions of engagement:

(a) This report is based on a visual and limited invasive and destructive inspection.
(b) The report is provided for the use of Wellington City Council only and may not be used by others without written permission. Maynard Marks accepts no liability to third parties who may act on the report.

1.7 Exclusions

This report does not include comment about the following:

(a) The surrounding neighbourhood.
(b) The value of the property.
(c) Illegal works.
(d) Testing of services.
(e) Elements that are covered, hidden or below ground.
(f) Structural stability of the ground on the site by a Geotechnical Engineer.
(g) Investigation of structural elements of the building, including by a Structural Engineer.
(h) Investigation of passive and/or active fire protection systems by a Fire Engineer or Passive Fire Specialist.
(i) Investigation of building services (e.g. mechanical, electrical, hydraulic) by a Services Engineer.
(j) Resource Consent issues or any compliance or non-compliance with Bylaws.

Additionally, no search has been made of:

(a) Council rates.
(b) Government valuation.
(c) LIM or PIM reports.

1.8 Areas Accessed

Refer to Section 1.5 Methodology.

We were only able to safely conduct inspections of the metal cladding at the upper level elevations from ‘head and shoulders’ views from ladder set up points, as it was not feasible to obtain EWP access to the majority of these elevations with such equipment (only a narrow perimeter pathway exists).

We did not elect to remove any metal cladding to fully clarify the quality of construction, given the damage this would cause to not only the specific sheets, but adjoining sheets, as it is not possible to remove only one panel without affecting others, due to the concealed fixing/clip installation. We note this cladding is installed over a drained and ventilated cavity, behind which the substrate is Korok (Speedwall) lightweight prefabricated composite concrete and steel panel. Furthermore, there are no significant openings or penetrations in these elevations (such as joinery openings). Therefore, we consider there to be minimal weathertightness risk associated with the construction of the metal cladding as a whole (refer to later comments in this report regarding the base detailing, as an isolated issue).

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1.9 Orientations

The property is situated at the eastern end of England Lane in the suburb of Karori.

The front elevation containing the main entrance and canopy and accessible via the public walkway from Karori Road is considered the North elevation.

The property is located within a High/Very High wind zone boundary and Corrosion Zone C as per the BRANZ mapping tool contained on their website.

2.0 REVIEW REPORT

2.1 General Construction

- Predominantly steel framed, single level building with a high open entrance lobby/atrium to the north and part western sides and a high central auditorium. The south and part west and east elevations contain the lower height ancillary rooms, WCs, storage spaces and kitchenette areas.

- Perimeter walls to the lower height elevations on the south and part west and part east elevations a reinforced concrete blockwork, which has been partially strapped and lined with 90x45mm timber framing, glass fibre insulation batts and plasterboard. The blockwork is exposed externally and not overclad.

- The roof structures are timber rafters to the upper roof and timber trusses to the lower perimeter roofs.

- Claddings include:

    - **Upper parts of the south, part west and part east elevations:** Eurostyle Epic Magnaflow Vertical metal wall cladding over horizontal cavibats and flexible wall underlay, installed over vertically orientated Korok (Speedwall) composite concrete and steel panels.

    - **Entrance lobby/atrium to part of the north and west elevations:** Glazed curtain walling panels, supported by a steel frame.

- Localised exterior joinery on the west elevation only within the blockwork walls comprises double-glazed aluminium framed windows. Doors comprise a metal security fire door in the blockwork walls or double and concertina sliding glazed and aluminium framed doors in the curtain walling.

- The roofing comprises TrimRib asymmetric trapezoidal profile metal roofing with a Colorcote finish, above both the main upper roof and the lower lean-to roofs.

- With the exception of the gull wing inward falling pitches to the northern side of the main upper roof which fall to a central butyl rubber lined internal gutter, all remaining roofing falls to perimeter metal box gutters. The central membrane internal gutter has outlets and an overflow at the eastern end.

- There is a torch-on membrane roof adjoining the lower plant base area above the west elevation formed over a concrete slab substrate, which drains to the perimeter metal box gutter.

- Internally the building is at various stages of completion, with the auditorium still exposed Korok panels and roof framing. The atrium and lobby has lined and stopped walls and ceilings, partially painted, but no flooring. The lower level ancillary spaces are either exposed blockwork and concrete, through to the WCs and kitchen areas which are largely complete with all sanitaryware and cabinetry in place.

Refer to Appendix B photographs 1-19 for an overview and general construction of the building.

2.2 History of Construction

The following is a summary chronology taken from information contained in the Council property file extracts provided.

Date	Event
Unavailable	Building Consent application lodged – Application document is not available in the extracts provided.
02 August 2016	Building Consent number 334505 issued for the original Building Consent – this date is stamped on the drawings, but we have not been provided the actual Building Consent document.
November 2016 – December 2017 & ongoing	Main Construction period. Works are currently still incomplete, and some works have occurred between 2017 and the current time, but no Code Compliance Certificate (CCC) has been issued. Note: It is not known if the intent will be to obtain a CPU (Certificate of Public Use), if works progress and the Council wish to make the building available before a CCC is obtained.
30 April 2021	Amended Building Consent approved by Council (extracts of the plans provided only and we have not got information on the application for an amendment).
19 May 2021	Code Compliance Certificate (CCC) lodged with Wellington City Council by the Architects Shand Shelton.
21 May 2024	Letter from WCC Building Compliance & Consents (the BCA) to WCC Property & Capital Projects Team outlining confirmations and works required in order to close out the works and obtain a CCC.

2.3 Moisture Content Analysis

The term "damage" includes elevated moisture content levels of timber framing as the moisture content of such timber is indicative of the presence (or likely future development) of decay of such timber.

In places we ascertained the moisture content of framing timbers using an electrical resistance meter.

By way of explanation of the indicative moisture content readings of a resistance type moisture meter:

- 8-14%: approximate equilibrium moisture content (EMC) range for framing in wall cavities.
- 16%: (maximum moisture content (MC) quoted for wall cavity enclosure during construction and minimum moisture quoted in the literature at which fungal (e.g. mould) growth can occur but at which wood decay does not become established.
- 20%: widely accepted minimum threshold below which decay is prevented (allows a comfortable safety margin below the fibre saturation point (FSP) above which decay establishment is inevitable).
- 20 - 30%: range over which it is difficult to be certain what is occurring partly because of the limitations of detection devices but also because of other factors.
- <FSP (approx. 30%) decay establishment unlikely because no free moisture is available but there is significant margin for error in interpretation of MC values between EMC and FSP and therefore 30% is substantially too high a lower limit for reliable risk assessment.

- 16 - 30%: fungal growth often occurs but active wood decay unlikely although it may be imminent or very close by.
- >FSP (approx. 30%): decay inevitable.
- 40 - 70%: common MC range for aggressive decay.
- 80%: maximum MC sometimes quoted for brown rot.
- 30 - 400%: range for decay (120 - 400%: at or close to the wood saturation point at which decay stops or proceeds at greatly reduced rates due to shortage or lack of oxygen).

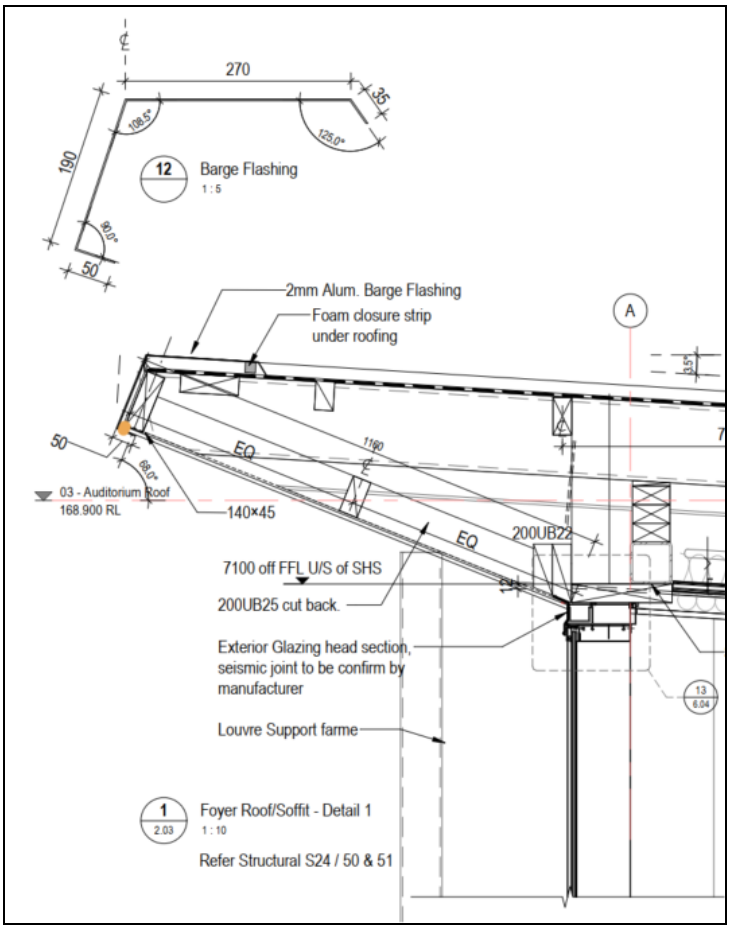
2.4 Weathertightness Defects and Damage

We set out below the features of the building, which have caused, or present a future risk of weathertightness failure.

2.4.1 Lack of Barge flashing deflection at the roof soffit junctions *(Photographs 20-64)*

Adjoining the reverse slope eaves above the north and west elevations, the barge flashing at the perimeter of the upper metal sheet roof laps vertically down and returns over the Villaboard compressed sheet soffit linings. This is as per the Building Consent details provided in the architectural drawings, produced by Shand Shelton (drawing sheet A6.06, Detail 1 – extra shown below).

Barge flashing detail in Consent number SR334503-1:



No drip edge has been provided to deflect water running down the face of the barge flashing away from the building, and instead the 50mm horizontal return directs water back onto the soffit linings. This has caused accelerated deterioration of the flush stopped joints between the Villaboard soffit panels, nearly all of which are visibly delaminating and damaged, with open gaps visible.

Closer observation revealed water droplets holding at the junction between the lowest edges of the barge flashing return and the soffit linings, which we consider provides a capillary path for moisture to track between the flashing and the soffit back, into the roof void.

Upon destructive testing of a select number of the worst affected soffit joints below the barge flashings, we observed open gaps in the joints of circa 3-10mm and significant degradation of the stopping compound, which also appeared to comprise a general fast drying builder's external filler (we do not know from the design information if this product was suitable or compatible).

Upon removal of sections of soffit lining either side of the joints, moisture staining was visible to the rear surface, but we did note continuous building wrap and flashing tapes over the framing, which we consider has assisted in protecting the soffit voids from higher levels of moisture ingress. Moisture-stained soffit lining sections were also removed from below the barge flashing downturn, confirming moisture has been absorbed behind these by capillary action in the absence of a drip edge detail at the barge.

At the soffit to façade/curtain walling junction a continuous reverse slope eave flashing protects the façade and roof void from moisture entry, reducing vulnerability in the weathertightness detailing of the façade at this point.

Where soffit framing was exposed, this did not exhibit any obvious moisture staining or decay damage, however high moisture content readings were taken from the boundary joist below the barge flashing, confirming moisture ingress and failure of these junctions to perform in accordance with Clauses E2: External Moisture and B2: Durability of the New Zealand Building Code **(NZBC).**

Samples of the soffit framing were removed, and subsequent specialist laboratory analysis has confirmed no decay damage, as well as the presence of H1.2 treatment, which is as per the Building Consent design and relevant New Zealand Standards for treatment of timber (NZS 3602).

However, due to the ability for moisture to ingress, the current barge and soffit construction has been confirmed as not performing and will, in our view, require redesign and reconstruction.

Destructive Test Location	**Observation/Analysis**
D#3 Boundary joist /fascia, North elevation.	Moisture content **(MC)** reading: 25.2%. Beagle Report: Decay & Fungal Analysis: *No established Decay. Low numbers of spores of Stachybotrys.* Replacement Guide: *No.* Treatment: Boron, e.g., *H1.2.* Toxigenic Mould: *Trace.*
D#4 Soffit joint to façade junction (below D#3), North elevation.	MC Reading: 20.7%. No sample collected. Observations: 10mm open gap at soffit board junction with stopping compound have completely deteriorated. Reverse slope heave flashing extends approx. 110mm up behind soffit linings and down over the head of the curtain walling below, although the building wrap does not lap over the eave flashing and is instead underlapped.
D#5 Boundary joist /fascia, North elevation.	MC Reading: 22.6%. Beagle Report: Decay & Fungal Analysis: *No established Decay.* Replacement Guide: *No.* Treatment: Boron, e.g., *H1.2.* Toxigenic Mould: *None detected.*

2.4.2 Exposed blockwork exterior walls, including at joinery openings, with no evidence of a sealer/protective coating *(Photographs 65-161)*

The lower portion of the south elevation and parts of the east and west elevations are formed of exposed reinforced 200mm wide concrete blockwork walls, as per the design intent of the Building Consent.

This construction can be used for exterior walls, as set out in CCANZ CP 01:2011 Code of Practice for Weathertight Concrete and Concrete Masonry Construction **(CoP)**. However, in summary, the Code of Practice and relevant New Zealand Standards require a minimum of a clear coating system with a suitable limit of permeability, so as to ensure the blockwork remains weathertight and does not absorb and transmit moisture to the interior face. We have not listed the specific requirements or associated relevant standards in this report, however, these are contained in Section 4.4 of the above Code of Practice.

Furthermore section 3.1.5 of the CoP - Windows and doors - refers to the need to apply waterproof membranes to the window and door openings in the blockwork, including, crucially, a sill membrane across the entire width (interior to exterior edge) of the opening. The CoP also allows face fixed head and jamb flashings, which are installed here, but ideally a drip edge or weathergroove is required at the heads of the openings to prevent water tracking back to the face fixed head angle flashing, which has been omitted in this situation.

Upon reviewing the Building Consent design there is no clear reference on the drawings of the need to apply either a protective coating externally to all blockwork, or to treat the joinery openings with suitable waterproof membranes and our on site observations of the surface of the blockwork in these areas indicate that such may not have been applied. Although, we note that clear sealer coats can be difficult to readily identify visibly after application and curing, dependent upon the specification of product. Therefore, we cannot categorically confirm that such a product has not been applied.

However, the extent of moisture transfer and deposits of efflorescence to the internal face of the blockwork generally throughout all of the blockwork walls strongly suggests that such coatings and waterproofing were not applied (or if applied are not performing), either as this was not clear from the Building Consent design, or that the building was not yet complete, and it may have been the intent of the contractor to complete this after the time works ceased on site.

Irrespective, the CoP also states that clear coats must be reapplied generally every 5 years or less (Section 4.4) and in our experience such frequencies are also dictated by the selected product manufacturer, which can in fact be more frequent. Given the blockwork was largely complete during 2017, it has been in place for approx. 6-7 years, with no known maintenance having been undertaken. Therefore, even if a clear coat had been applied, it would now have required re-application at least once by this stage and the ongoing deterioration of any originally applied coating (if applied) would now have contributed to the moisture ingress identified.

We have observed clear and consistent evidence of moisture ingress and efflorescence deposits throughout the internal face of the blockwork, both where unlined and, crucially in areas which are strapped with timber framing, insulation batts and plasterboard linings. We undertook destructive testing in select locations through the plasterboard linings and observed moisture entry via dye testing around a window on the west elevation, as well as moisture affected insulation and high moisture content readings from wall framing and bottom plates in areas. However, samples of timber strapping revealed no established decay to date upon laboratory testing, in the limited areas investigated.

A large number of these wall areas throughout the east, west and south elevations are strapped and lined and we cannot rule out more extensive moisture ingress and potential damage in areas not investigated, which coincide with kitchens and WCs, most of which are near complete. This will need further consideration in how to address the weathertightness and remediation of these walls/elevations (refer to the recommendations section of this report).

Destructive Test Location	Observation/Analysis
D#2 Stud, internal wall to block exterior.	MC Reading: 20.4% Beagle Report: Decay & Fungal Analysis: *No established Decay.* Replacement Guide: *No.* Treatment: Boron, e.g., *H1.2.*
D#6 Bottom plate behind blockwork and below LHS window, West elevation.	MC Reading: Day 1: 20.6% Day 2: 20.5% Beagle Report: Decay & Fungal Analysis: *No established Decay.* Replacement Guide: *No.* Treatment: Boron, e.g., *H1.2.*
D#7 Bottom plate, kitchen, strapping, South elevation.	MC Reading: Day 1: 21% Day 2: 23.7% Beagle Report: Decay & Fungal Analysis: *No established Decay.* Replacement Guide: *No.* Treatment: Boron, e.g., *H1.2.*

2.4.3 A lack of vertical control joints to exposed blockwork exterior walls, with visible vertical cracking to mortar joints *(Photographs 72-90 & 106-109, 112-115)*

The CoP for concrete masonry construction requires in section 3.2.6 that vertical control joints are no more than 6m apart (as per the requirements of New Zealand Standard NZS 4229). These are required to allow for natural expansion and contraction of the material, the effects of which are exacerbated over longer wall areas, to avoid unnecessary consequential stresses and cracking of the wall(s).

During our inspection, it was not clear whether correctly formed control joints have been applied, particularly to the longer single storey block walls on the east and south elevations, as these joints are usually wider than a typical mortar joints and sealant filled, with backing rods behind.

Added to this is the existence of frequent vertical cracks in the blockwork mortar joints, which are evident throughout particularly the east elevation.

Should control joints have been omitted altogether (which appears from our inspection to be the case), or installed incorrectly and/or in excess of the maximum centres, then this may account for the development of these cracks. When combined with the potential absence of a suitable weatherproof coating to the blockwork, we consider that this may either be a primary cause or contributory factor in the development of moisture ingress and efflorescence internally throughout the block walls.

Without the correct formation of control joints, such damage will continue to occur, irrespective of any filling of cracks, allowing ongoing moisture ingress.

Refer to observations and analysis for Destructive tests D#6 and D#7 in the previous section.

2.4.4 Exterior ground finishing higher than the internal floor slab at the base of the curtain walling and at door thresholds (*Photographs 162-195*)

At the base of the two sets of double access doors on the north and west elevations, we observed the exterior ground either ramped up or with a channel drain to create a level threshold. Internally the floor slab sits approximately 50-60mm lower than the exterior ground/drainage grate. Adjoining the north elevation curtain walling, the internal floor slab height is also approximately 10-20mm lower than the channel drain grate, which increases the reliance upon sill details and seals in the curtain walling for weathertightness, despite there being a channel drain along the length of the elevation.

The Building Consent drawings on sheet A2.01 include details for the formation of the channel drain relative to the base of the exterior walls. This shows the formation of a concrete nib upstand at the outer perimeter of the slab and the channel drain grate, for the curtain walling and doors to bear off. It is not clear if this nib has been installed, but based upon the frames of the doors and the curtain walling, the doors sit on timber packers and the curtain walling base extends lower, potentially sitting on the slab edge, as opposed to a nib. The designed detail also showed exterior and interior ground levels at the same height, which is not the as-built situation, as the ground is higher, increasing weathertightness risk.

Moisture-stained timber packers are evident beneath both sets of double glazed entrance doors, with laboratory analysis confirming decay in the timber and H1.2 treatment. Dye testing of the west elevation doors confirmed that moisture is able to track quite quickly into the interior, which if the property had received floor coverings would have manifested as damage to these, amongst other elements.

We have also observed some localised staining at the base of the walls on the north elevation below the glazed curtain walling, which could also be linked to currently localised moisture entry at the base of the walls at the junction with the channel drain.

In the formation of level thresholds and exterior to internal floor levels, it is crucial to select the correct materials and to ensure the exterior ground finishes level with or lower than the internal ground. For the ground level/drainage to finish higher than the internal floor slab requires very specific and robust material and design selections.

However, whilst the double doors will potentially require removal and reinstallation with modification of the thresholds, we consider it feasible to lower external ground levels and install a new channel drain to reduce weathertightness complexity.

Destructive Test Location	Observation/Analysis
D#1 Sill plate. D.doors, North elevation.	MC Reading: 52.5% Beagle Report: Decay & Fungal Analysis: *Pockets of early soft rot and suspected incipient to early brown rot across the depth and incipient to moderate brown rot decay.* Replacement Guide: *Yes.*

Destructive Test Location	Observation/Analysis
	Treatment: Boron, e.g., *H1.2 (leached)*

2.4.5 Inadequately modified and fixed cavity closer at the base of the metal cladding (*Photographs 196-200*)

Details on Building Consent drawing A6.03 show the positioning of a uPVC cavity closer strip at the base of the cavity behind the metal cladding, this was to be positioned approx. 50mm up behind the edge of the cladding.

We note in the Council inspection records (Pre-clad inspection dated 12 September 2017) the installation of cavity closers was identified, however during recent inspections by the Council and our investigation it has become evident that the cavity closer has fallen out of the base of the cavity below the sections of metal cladding.

The closer appears to be lacking the longer inner upstand which is how this is commonly fixed and taped to the face of the underlay and behind the lowest Cavibat, which is also the fixing method shown in the consent design.

We conclude that the upstand appears to have been cut off the cavity closer to allow this to be retro-fitted after the cladding, as it was missed during construction of the cavity. The method of fixing is also hard to determine, but it presents as though the cavity closer may have been pressure fitted or wedged into the cavity, as opposed to properly mechanically fixed, leaving it prone to move and dislodge with expansion and contraction of the cladding and cavity elements.

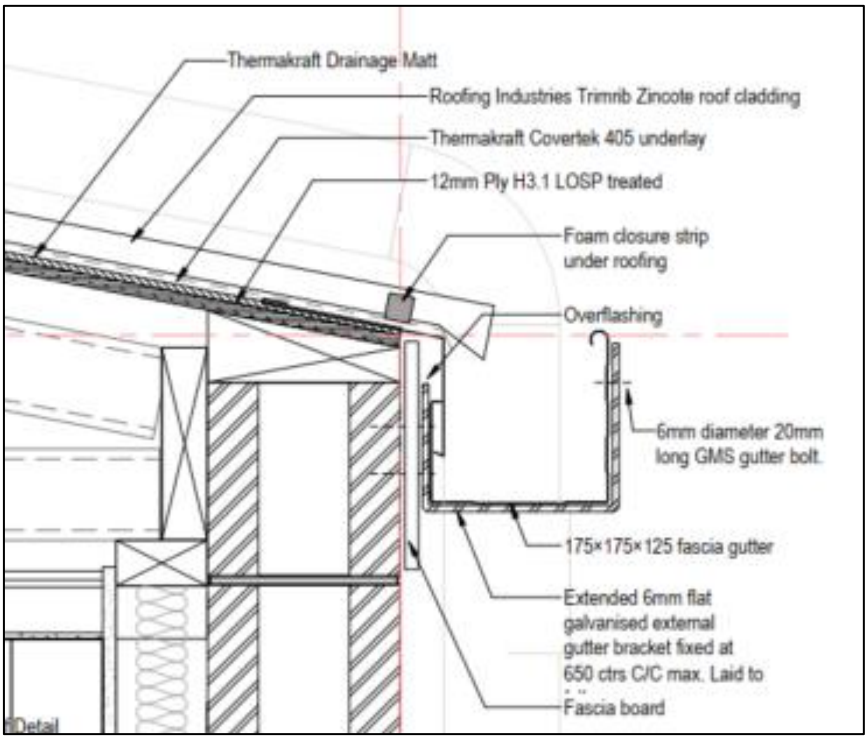
We consider that alternate means of replacing the cavity closer with a bespoke or modified design of cavity closer may be achievable without the need to remove cladding sheets, as the necessity for this closer is to protect the cavity from vermin and is an essential part of ensuring the cladding remains serviceable and durable.

2.4.6 Inadequate eaves flashing projection over the metal gutters (*Photographs 201-210*)

The eaves incorporate a flashing under the lowest edge of the roof sheets and down into the metal box gutters, however, this overhang is only 30mm, with a clear gap and minimal upstand at the internal edge of the gutter behind.

The details on Drawing Sheet A6.02 (snippet below) show a downturn to the eaves flashing which laps down over half the height of the internal side of the box gutter (125 x175 x175mm box gutter, therefore this would have been an approx. 65mm overlap).

Given the walls below are blockwork, mitigating flow of surface run off over these is an important consideration, including provision of correctly detailed eaves flashings on roofing with minimal roofing projection beyond the elevations below.



2.4.7 Rippling of the internal gutter membrane - main roof *(Photographs 223-228)*

Consistent rippling in the surface of the butyl rubber lined internal gutter of the main roof was noted during our inspection.

The causes of this are not currently clear and the manufacturer should be approached to assess and provide confirmation the installation remains durable and warranties remain valid.

The Building Consent design refers to the product Butylclad.

2.5 Other Localised Weathertightness Concerns and Maintenance Issues

2.5.1 Localised barge and apron flashings inadequately terminated at the northeast external corner (*Photographs 211-213*)

A barge flashing has been cut and integrated at the point an apron flashing returns back into the northeast external corner. The apron flashing has also been cut and the general arrangement has left visible gaps in the sequencing, which we consider present weathertightness vulnerability, despite dye testing of this junction not revealing anything on the interior of the property. To ensure on-going durability, we believe the junction could be improved to remove the future risk of moisture entry or accumulation.

2.5.2 Localised inadequately lapped capping junctions to the western and eastern side of the main roof (Photographs 229-235)

Where capping to barge flashing junctions meet above the east and west elevations, the dimensions of the two corresponding sections flashing are different sizes, in each case. As a result these have either not been suitably lapped or have been left butted together with open junctions visible.

These junctions are prone to potential premature failure and consideration should be given to installing purpose made welded under-soaker flashings to protect these junctions properly.

2.5.3 Corroding services plant to the west elevation, including screws, cowlings and grilles (*Photographs 214-222*)

Given the building has been incomplete and vacant for approximately 6-7 years, without maintenance, the grilles, cowlings and housing to the air handling plant are already showing signs of significant corrosion.

The condition of the plant is excluded from this survey, but given the above, there is concern as to the condition of any of the services installations, which were new at the time the building was constructed and were never fully commissioned. Specialist sub-contractors and manufacturers will be required to assess all services installations and provide reports on whether these are still fit for purpose and, if so, whether replacement of corroded elements of the housings/grilles to the external plant can be replaced in isolation, with warranties remaining valid.

2.5.4 Moss and lichen build up to the western canopy roof (*Photographs 236-237*)

Extensive moss and lichen growth is evident to the galvanized trough profile metal sheet roof on the more sheltered west elevation, which if not routinely removed, will begin to cause premature corrosion to this feature.

3.0 BUILDING CODE REQUIREMENTS

The Building Code is contained in Schedule 1 to the Building Regulations 1992. The Building Code is performance-based and not prescriptive. It sets out the performance criteria which must be met by a building, but it does not stipulate how such criteria should be met.

The defects listed at Section 2.4 above means that the building fails to comply with the following clauses of the Building Code.

3.1 E2 External Moisture

3.1.1 Objective

E2.1 The objective of this provision is to safeguard people from illness or injury, which could result from external moisture entering the building.

3.1.2 Functional Requirement

E2.2 Buildings shall be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

3.1.3 Performance (Includes Relevant Clauses Only)

E2.3.2 Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.

E2.3.3 Walls, floors and structural elements in contact with the ground shall not absorb or transmit moisture in quantities that could cause undue dampness, or damage to building elements.

E2.3.5 Concealed spaces and cavities in buildings must be constructed in a way that prevents external moisture being accumulated or transferred and causing condensation, fungal growth, or the degradation of building elements.

3.2 B2 Durability

3.2.1 Objective

B2.1 The objective of this provision is to ensure that a building will throughout its life continue to satisfy the other objectives of this code.

3.2.2 Functional Requirement

B2.2 Building materials, components and construction methods shall be sufficiently durable to ensure that the building, without reconstruction or major renovation, satisfies the other functional requirements of this code throughout the life of the building.

3.2.3 Performance (includes relevant clauses only)

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

(a) For the life of the building, being not less than 50 years if:

a. Those building elements (including floors, walls and fixings) provide structural stability to the building, or

b. Those building elements are difficult to access or replace
c. Failure of those building elements to comply with the Building Code could go undetected during both normal use and maintenance of the building.

(b) 15 years if:

a. Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in built chimneys and flues) are moderately difficult to access or replace, or
b. Failure of those building elements to comply with the Building Code could go undetected during normal use but would be easily detected during normal maintenance.

3.2.4 Limits on Application

Performance B2.3.1 applies from the time of issue of the applicable Code Compliance Certificate.

4.0 RECOMMENDATIONS

4.1 Remedial Works

As highlighted within this report, there are a number of details that lack longevity in terms of weathertightness and which have or are likely to result in moisture ingress and damage.

We note this investigation uncovers only a sample of areas and is not an exhaustive list of damage. More may become apparent during the process of designing and physically remediating the issues identified, for which suitable allowances should be made.

Considering the deficiencies that exist, we consider that, in summary the following works are likely to be required to remediate the exterior envelope of the building, so that it will comply with the performance requirements of the NZBC.

1. Removal of all barge flashings and soffit linings above the north and west elevations, cutting back the wrap and tapes, inspection of the framing, including any replacement framing as required, installation of new underlay, tapes and soffit linings, along with a new suitably detailed barge flashings incorporating means of deflecting run-off away from the building.

2. Removal and reinstallation of the two window joinery units and the metal egress door in the blockwork on the west elevation, including waterproofing and suitably detailing these openings.

3. Removal of plasterboard linings where practicable on the exterior walls of the east, south and west elevations to further assess the condition of the strapping and insulation batts. An assessment of whether bathroom and kitchen fittings are to be disturbed will be dependent upon the findings of this next step of investigation/ design, although we consider it likely these may simply need to be removed, including vinyl flooring, and what remains salvageable will need to be reinstalled (sanitaryware, cubicles, cabinetry, etc). Refer to the recommendations section of this report for further details.

4. Retrospective installation of vertical control joints throughout all blockwork exterior walls and mortar repairs to any current cracking.

5. Consideration to potential overcladding of the exterior face of the blockwork walls, particularly given most of these do not incorporate and openings or penetrations, with the exception of the west elevation only, thus reducing the cost implications of such action. The minimum required is a durable and compliant coating to the blockwork.

6. Temporary removal of the 2 sets of double-glazed entrance doors on the north and west elevations, casting of nib upstands/walls below these openings and reinstallation of these, suitably weatherproofed and sealed.

7. Removal and disposal of the channel drain along the north elevation and lowering of the exterior ground to lower the position of a newly installed channel drain relative to the curtain walling. Provide a checker plate transition/threshold plate (or similar) over the newly installed channel drain trench and grate at the north elevation doors, suitably fixed and hinged to allow access for maintenance. Consideration should be given to installing the same detail in front of the double doors on the west elevation where these are ramped up, allowing for connection into the channel drain to the below ground stormwater.

8. Design and install a bespoke cavity closer to vermin proof the wall cavity behind the metal wall cladding.

9. Replace eaves flashings to the metal roofing and install new suitably detailed flashings as per the Building Consent design, to ensure adequate lap into the box gutters.

10. Uplift and replace section of barge/capping and install suitably detailed back flashings/additional cover flashings to vulnerable details above the west and east elevations (roof barges/cappings and northeast corner).

11. Replace corroded services cowlings, etc, if feasible, to the installations above the western plant base.

12. Clean down moss and lichen from the western canopy roof and the torch-on membrane to the plant base.

4.2 Remedial Recommendations

Given the building is only part complete, and there is an existing Building Consent active for its construction, any designers engaged should in our view consider engaging with the Building Consent Authority to discuss the process whereby an Amendment may be obtained for any works developed from this report, as well as other assessments (i.e. services, etc).

This report does not form a basis for proceeding with or completing and remedial works. Works should only be undertaken based upon fully developed detailed and consented designs.

Considerations should be given to the most appropriate way to ensure weathertightness and durability, as well as reduced maintenance associated with the blockwork exterior walls. Whilst clear coats are permissible, these are reliant upon consistent application and fastidious cyclical inspection and maintenance. Furthermore, in the event of even a localised failure of the coating, where walls are strapped and lined internally, consequential moisture ingress through the block may go unnoticed during normal maintenance, until such time as linings and timber strapping start to degrade. Overcladding would significantly reduce such risk, and dependent upon material selections could reduce future maintenance, particularly if metal cladding was used, which could be washed down in conjunction with the remaining elevations and curtain walling. Your designers should consider all available design options in this regard.

An item of the letter dated 21 May 2024 from the consent Authority - paragraph 1, bullet 3, sub-item 5 ‘the installation of the screen holding water’ - we understand relates to the louvre screens. We did not identify anything with these installations that was readily obvious in terms of moisture accumulation, however, these are a bespoke fixture, which would normally require a manufacturer/fabricator to comment upon any perceived issues and the quality of installation, which we recommend is the process undertaken, if a concern still exists.

We recommend that detailed surveys are completed of all services installations/first fix items, etc to determine if these can remain in situ as part of completing the works. Independent specialist services engineers may be required for this process.

Furthermore, we note that most of the elements comprising the exterior envelope, notably the metal roofing and wall cladding, as well as the glazed curtain walling received producer statements and warranties, as held on the Council property file. Despite any comments in this report, the Building Consent Authority may require updated producer statements and confirmation that warranties remain valid (or can be updated), as verification from installers and producers that these products will comply with the performance requirements of the New Zealand Building Code. We suggest that your designers identify the relevant manufacturers and installers and consider approaching these companies in this regard, in conjunction with liaising with the BCA to determine their specific requirements.

Despite no evidence of timber decay damage being identified to soffit framing and wall strapping to date, only limited testing has been completed and we cannot rule out decay existing in other locations given the existence of the defects for 6 years+ and H1.2 timber treatment.

Therefore, in terms of the soffit linings, all areas will need to be exposed to view the timber framing behind as part of remediation.

Internally behind the blockwork exterior walls, we recommend that a more cautious approach is taken at the current time to avoid unnecessarily disturbing WC and kitchen fixtures. We therefore consider it feasible to remove as much of the plasterboard from the internal face of the blockwork walls as possible to expose strapping and insulation, whilst avoiding areas and the base of walls where vinyl flooring upstands, cabinetry, sanitary fittings and other fixtures are in place. This will allow a more detailed inspection of the strapping and insulation to determine if there is in fact more obvious damage and higher levels of moisture ingress in these walls, or if retention of the remainder represents little future risk, particularly if these walls are overclad externally.

A timber remediation expert will be required upon exposing any framing for assessment.

4.3 Temporary Repairs

We undertook inspections through soffit linings and internal linings, which have been temporarily patch repaired. We recommend that either more robust temporary repairs are undertaken soon (3-6 months), and any permanent repairs are completed within 1-2 years, after which a re-assessment may be required, given the time that will have elapsed by that stage.

5.0 HEALTH AND SAFETY

5.1 Background Information on the Health Effects of Leaky Buildings

The reference for the following information is taken directly from 'Information provided to the Building Industry Authority from the Ministry of Health regarding the Potential Health Effects of Leaking Buildings' article on 25 November 2002.

Introduction

'Leaky buildings' reflect a number of problems with building detailing, specification or construction. This leads to the production of moulds, which occur naturally in both the indoor and outdoor air. Mould spores are carried by the wind and will grow in any suitable conditions. While many moulds are harmless to healthy individuals, dampness and mould growth in buildings have been traditionally associated with poor health.

Health Effects and Symptoms Associated with Mould Exposure

In situations of high moisture, mould growth can cause unpleasant odours. A variety of health problems such as headaches, breathing difficulties (including the exacerbation of existing asthma symptoms), skin irritation and allergic reactions could potentially be associated with mould exposure.

The type of mould present, the extent of an individual's exposure and individual factors including the presence of pre-existing conditions, sensitivities or allergies will to a significant extent determine the type and severity of symptoms.

Specific reactions to mould growth described include:

Allergic Reactions

- *Touching or inhaling mould or mould spores may cause allergic reactions in sensitive individuals, which can be immediate or delayed.*
- *Flu like symptoms can occur, such as sneezing runny nose, red eyes and skin rash (dermatitis).*
- *Mould spores and fragments can produce allergic reactions in sensitive individuals regardless of whether the mould is dead or alive. Repeated or single exposure may cause non-sensitive individuals to become sensitive and thereby increase the potential for sensitivity.*

Asthma

- *Mould can trigger asthma attacks in individuals who are allergic to moulds.*
- *Irritants produced by moulds may worsen asthma in non-allergic people.*

Direct Irritant Effects

- *Mould exposure can cause irritation of the eyes, skin, nose, throat and lungs.*

Opportunistic Infections

- *Individuals with weakened immune systems are more vulnerable to infections by moulds, however usually healthy individuals are not at significantly increased risk of opportunistic infections from airborne mould exposure.*

Stachybotrys

- *Moulds such as Stachybotrys atra can release substances that are toxic and can induce illness. These can vary from mild irritation, aggravation of asthma attacks, to symptoms similar to influenza and more general fatigue-inducing disorders.*

5.2 Health and Safety Issues Specific to this Building

There are isolated areas where internal linings have been affected by water ingress and laboratory analysis confirmed traces of toxigenic mould within wall cavities. Generally, any cavities where moulds could/do exist are closed up and sealed and therefore remain isolated from the internal environment and living space. The situation should, however, be monitored, until remedial works are completed. As materials deteriorate, toxic mould spores may advance and become airborne should internal linings deteriorate, at which time the risk to health is increased.

APPENDIX A

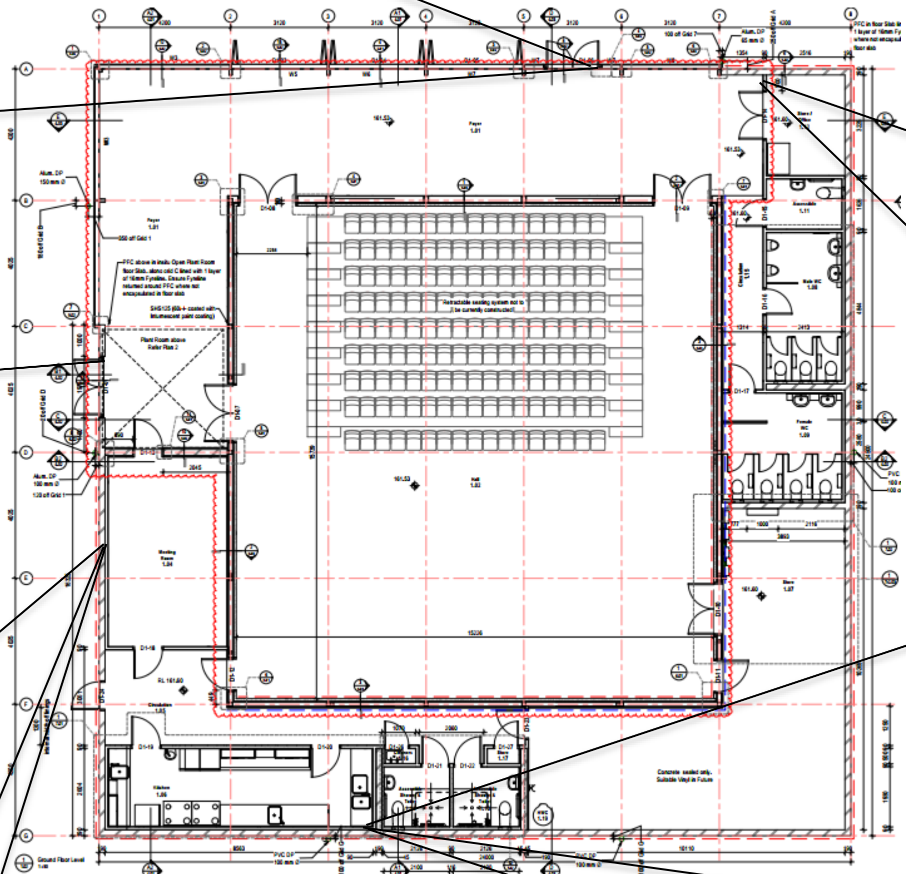
Destructive Test Locations

Karori Community Hall, Ground level

N

52.5%

D#1
Sill plate. Double doors, North elevation.
Decay & Fungal Analysis: Pockets of early soft rot and suspected incipient to early brown rot across the depth and incipient to moderate brown rot decay.
Replacement Guide: Yes.
Treatment: Boron, e.g., H1.2 (leached)



D#2
Stud, internal wall to block exterior.
Decay & Fungal Analysis: No established Decay.
Replacement Guide: No.
Treatment: Boron, e.g., H1.2.

20.4%

20.4%

D#7
Bottom plate, kitchen, strapping, South elevation.
Decay & Fungal Analysis: No established Decay.
Replacement Guide: No.
Treatment: Boron, e.g., H1.2.

D#6
DYE TEST
Bottom plate behind blockwork and below LHS window, West elevation.
Decay & Fungal Analysis: No established Decay.
Replacement Guide: No.
Treatment: Boron, e.g., H1.2.

Day 1:
20.6%

Day 2
20.5%

Day 1
21%

Day 2
23.7%

Karori Community Hall, Roof/Soffit level

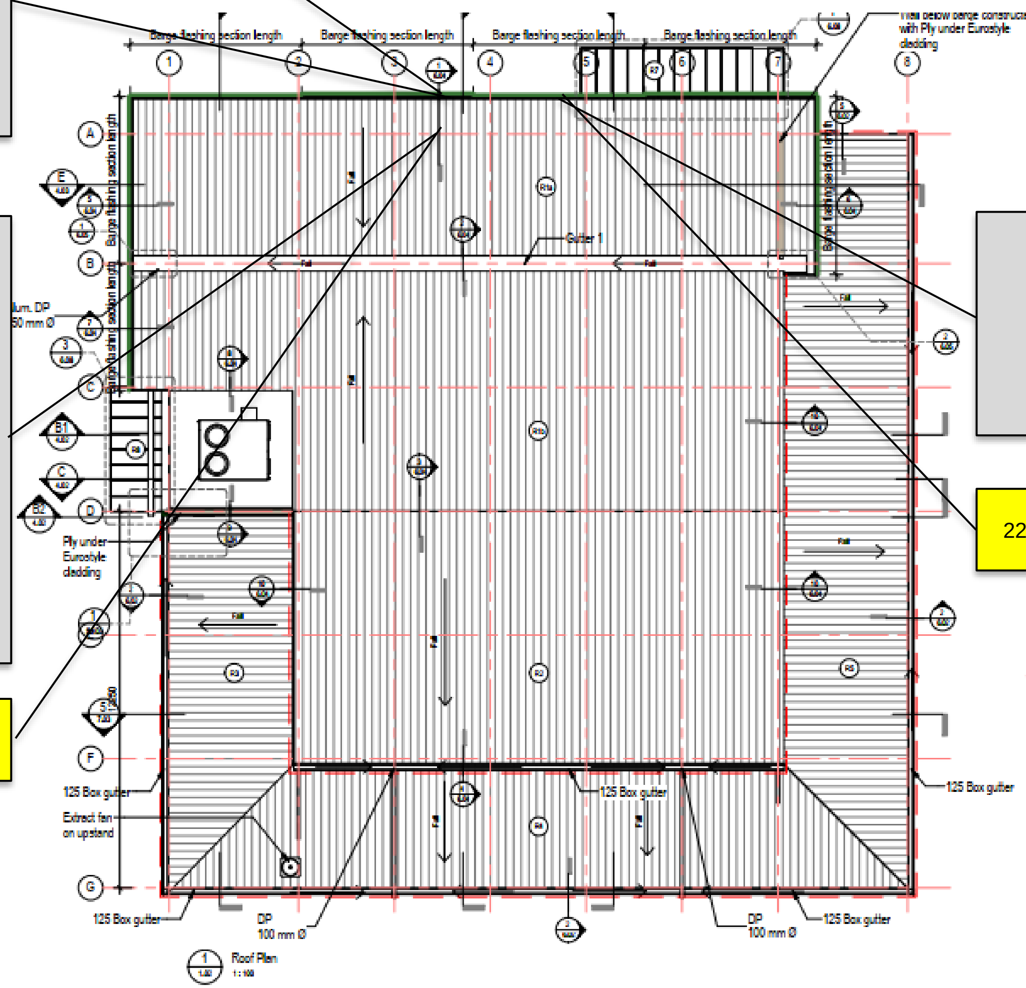
N

D#3
Boundary joist /fascia, North elevation.
Decay & Fungal Analysis: No established Decay. Low numbers of spores of Stachybotrys.
Replacement Guide: No.
Treatment: Boron, e.g., H1.2.
Toxic Mould: Trace.

25.2%

D#4
Decay & Fungal Analysis: No established Decay.
No sample collected.
Observations: 10mm open gap at soffit board junction with stopping compound have completely deteriorated. Reverse slope heave flashing extends approx. 110mm up behind soffit linings and down over the head of the curtain walling below, although the building wrap does not lap over the eave flashing and is instead underlapped.

20.7%



D#5
Boundary joist /fascia, North elevation..
Decay & Fungal Analysis: No established Decay.
Replacement Guide: No.
Treatment: Boron, e.g., H1.2.

22.6%

APPENDIX B

Photographs

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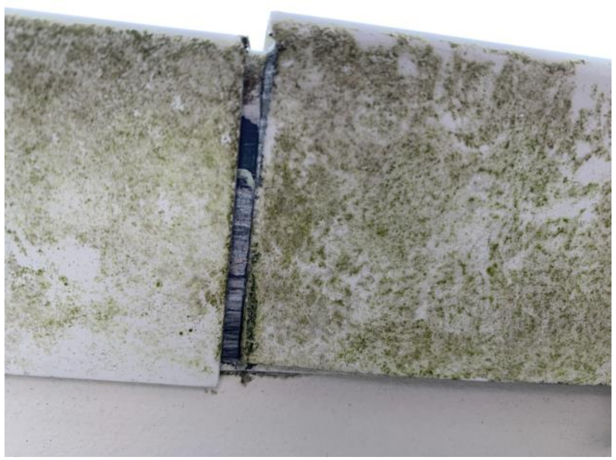

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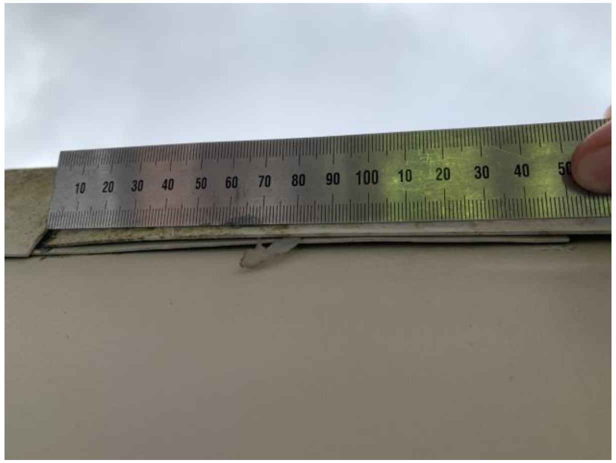

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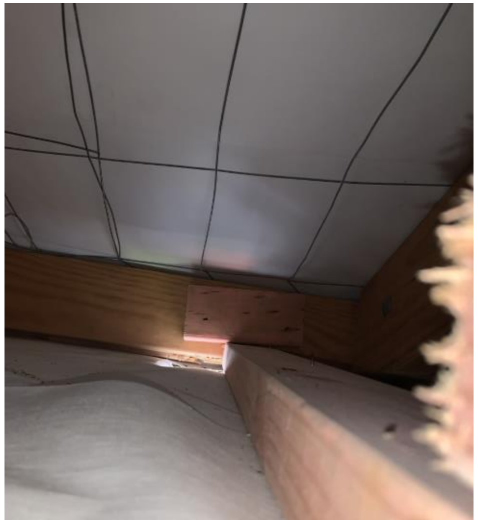

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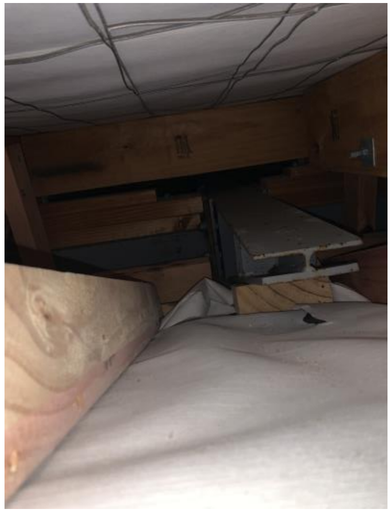
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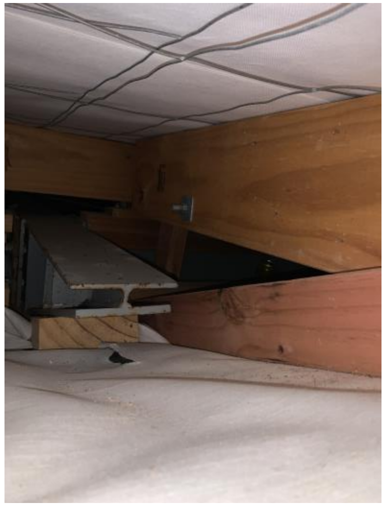
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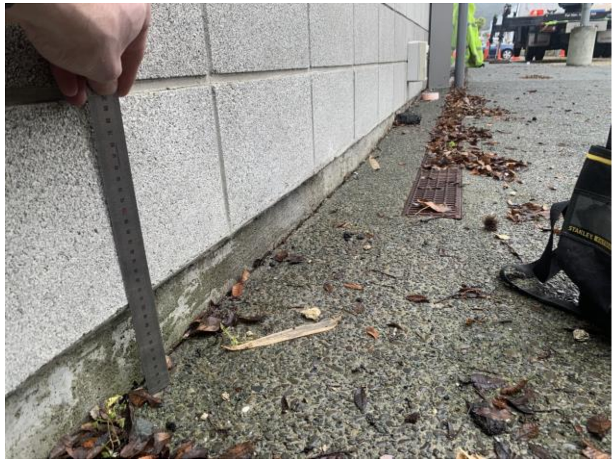

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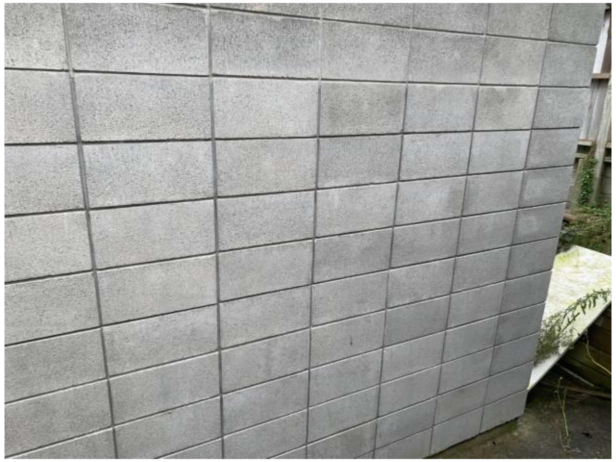

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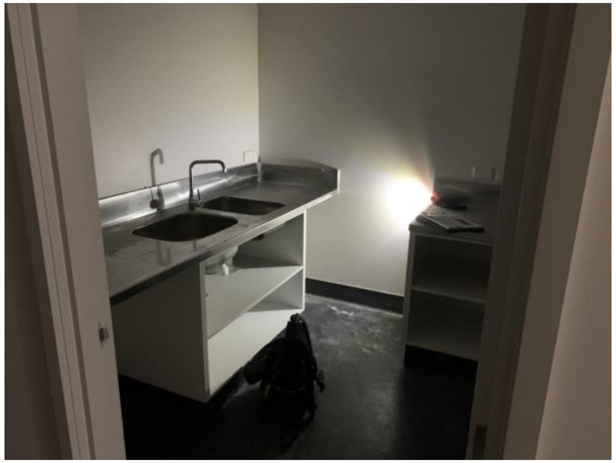

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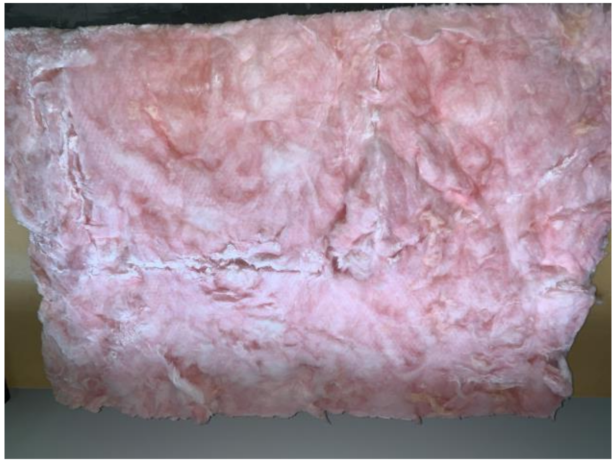

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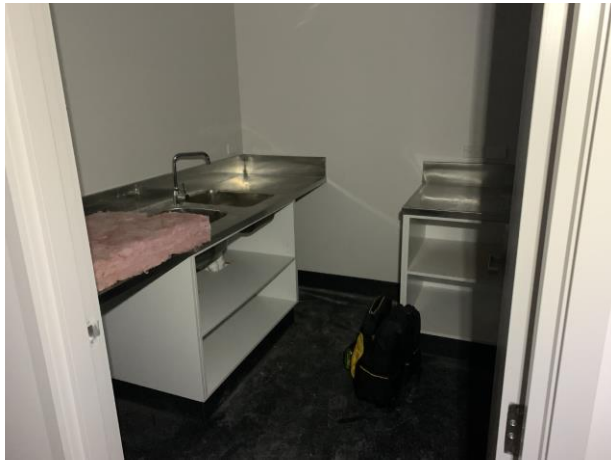

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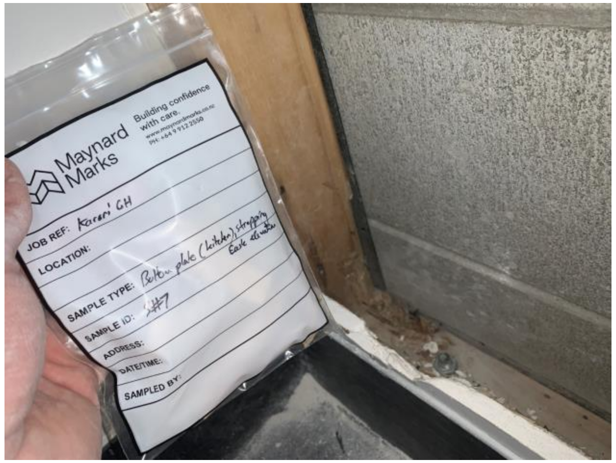

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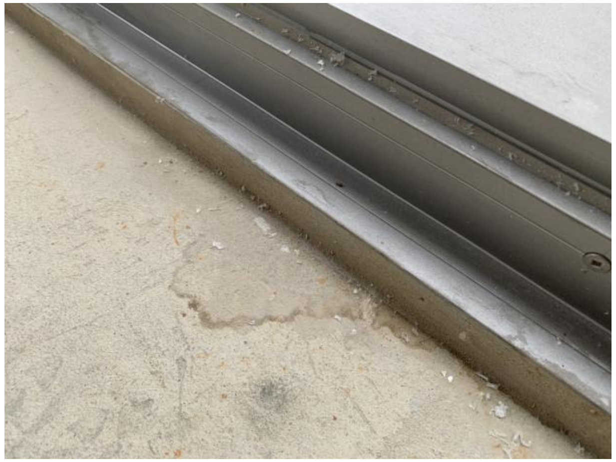

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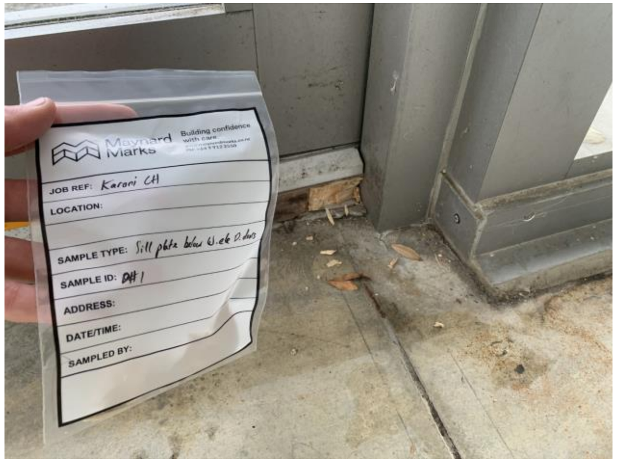

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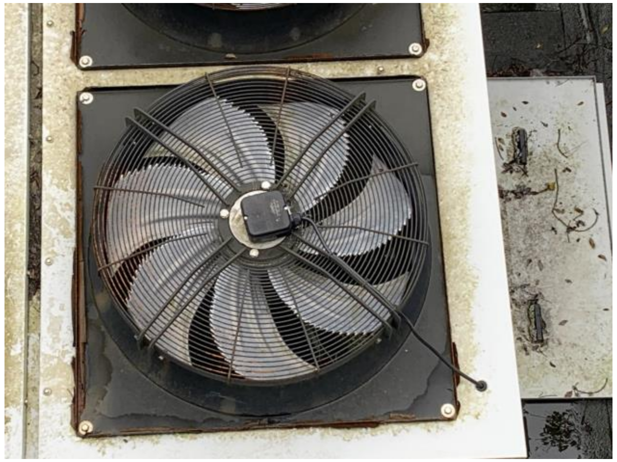

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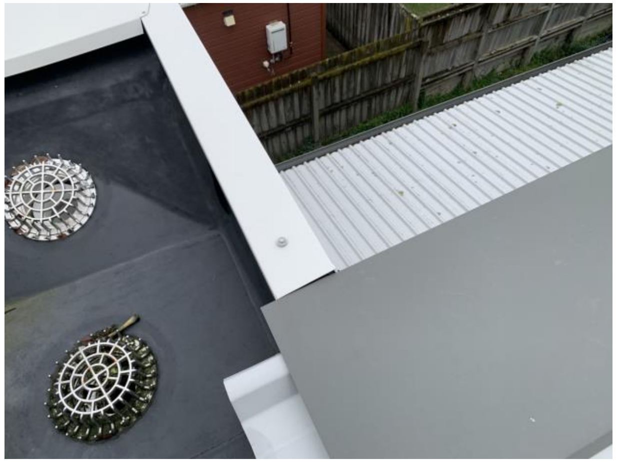
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APPENDIX C

Laboratory Analysis

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist

Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534

68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

6 November 2023

Mr Giles Ingham
Maynard Marks
Property & Building Consultants
Level 11, 36 Customhouse Quay
Wellington
[redacted]

Dear Giles,

RE: Wood decay, wood species, fungal, wood preservative and preliminary remediation analysis for Karori Community Hall, Wellington: AM01.04973.000

Objective

The Objective of the analysis covered here was to determine the extent of any decay and other microbiological activity (e.g., toxigenic mould) present, the type of framing (e.g., wood species and type of preservative treatment) and diagnose its implications for successful remediation.

Executive Summary

I. The fungal morphology, its distribution and the fungal types identified suggested that the samples examined had been exposed to elevated moisture that is inconsistent with sound building practice and that remediation is likely required.

II. Colorimetric qualitative preservative analysis suggested that samples 1-7 were treated with boron, e.g., wood was likely treated according to Hazard Class 1.2 of NZS3640:2003 or an earlier equivalent. Some boron loss due to leaching had likely occurred from sample 1.

III. Framing sample 1 contained well-established decay which may have caused significant loss of the original structural integrity in affected areas. According to strict remediation practice and classical remediation empirical wisdom, as a general rule of thumb wood with well-established decay should be replaced with appropriately treated framing. Replacement is typically recommended for framing in this condition, as part of robust remediation practice, and this is most likely required in this instance. (See points 7 and 8 of the appendix).

IV. Samples 2-7 contained fungal growths including current and/or recent activity, but no structurally significant decay was detected. Wood in this condition can typically be left in situ if other remediation provisos are applied although untreated wood in this condition is often located near wood with decay damage.

V. The toxigenic mould *Stachybotrys* was detected – see point 15 of the appendix.

VI. Presence of prolific fungal growths and/or decay typically has important implications for the building in general. It is important to establish the limits of fungal infection and/or decay and establish the causes and apply appropriate remediation – see main body of text. Other remediation considerations may be important depending on the local conditions.

Analysis Summary Table *(Framing samples were cut outs approximately 50-100 mm long, 10-20 mm deep and 20-35 mm wide, and as described in your letter dated 18 July 2024)*

No / Location		**Description**	**Decay & Fungal Analysis**	**Preliminary Replacement Guide***	**Treatment#**	**Toxigenic Mould[$]**
1	North elevation	Sill plate. D. doors	Pockets of early soft rot and suspected incipient to early brown rot across the depth and incipient to moderate brown rot decay	**Yes**	**Boron, e.g., H1.2 (leached)**	**None detected**
2	North elevation	Stud, internal wall to block exterior	**Radiata pine. No established decay micromorphology and no incipient brown rot detected in deeper wood.** Fungal growths predominantly typical of mould fungi, yeasts, sapstain and/or soft rot fungi. Fungal growths were present across the entire depth. Some yeasts and secondary moulds had morphology suggestive of current/recent activity (yeasts and hyphae with characteristically stained homogeneous cytoplasm, etc.,). Moulds: *Torula, Cladosporium, etc.*	**No[†]**	**Boron, e.g., H1.2**	**None detected**
3	North elevation	Boundary joist / fascia	Essentially the same as sample 2 with some secondary mould species variation Low numbers of spores of *Stachybotrys*	**No[†]**	**Boron, e.g., H1.2**	**Trace**

No / Location		Description	Decay & Fungal Analysis	Preliminary Replacement Guide*	Treatment#	Toxigenic Mould[$]
5	North elevation	Boundary joist / fascia	Essentially the same as sample 2 with some secondary mould species variation	**No†**	**Boron, e.g., H1.2**	**None detected**
6	West elevation	Bottom plate behind blockwork and below LHS window	Essentially the same as sample 2 with some secondary mould species variation	**No†**	**Boron, e.g., H1.2**	**None detected**
7	South elevation	Bottom plate, kitchen, strapping	Essentially the same as sample 2 with some secondary mould species variation	**No†**	**Boron, e.g., H1.2**	**None detected**

Table Key and related definitions intended to give an indication of the scale (1 - 4) of risk etc.

Replacement*: ***preliminary guide (replacement decisions require consideration of site factors and the sampling rationale applied since this may alter the preliminary guide e.g., sometimes a broad-brush replacement approach requires removal of a mixture of decayed and non-decayed wood to ensure removal of a critical mass of infected and/or decayed wood, and in other well understood situations small pockets of decay can be left in situ – see main body of report).***

1. No: No microbiological evidence of elevation moisture. Global remediation practice sometimes requires replacement of framing in this condition if overlapped by neighbouring repairs, e.g., to correct systemic weathertightness failures.

2. No†: **Lower immediate risk but potentially serious moisture hazard had been present.** No evidence of major structural damage and therefore **replacement is probably unnecessary**, provided that samples are sufficiently representative and that such wood is not interspersed with more seriously affected framing.

3. Probably††: **Intermediate risk**. Untreated wood with incipient brown rot decay and/or early soft rot decay typically comes from framing with more serious decay very close by and therefore as a general rule of thumb replacement is typically necessary for untreated framing i.e. under New Zealand leaky building conditions incipient decay typically occurs at the periphery of wood with an advancing front of established and structurally damaging decay whereas discrete pockets of incipient decay that might arise from spore arrival is less common. **This diagnosis also often applies to small discrete decay pockets in H1 boron treated framing although typically there is more latitude to leave such wood in place (e.g., replacement or further investigation is a common recommendation in such cases).**

4. Yes: **Higher risk.** According to strict remediation practice replacement is necessary except in unusual circumstances e.g., where removal poses drastic problems beyond normal remediation challenges and where an exceptional level of detail of the situation has been established which can enable consideration of an integrated non-replacement approach e.g., where it can be unequivocally shown that decay is highly localised and poses no structural integrity loss problems or ongoing decay problems. Where there is a risk of significant structural loss due to decay it is sometimes possible to compensate without framing removal using bracing techniques with additional framing.)

#Treatment: based on colorimetric qualitative spot test analysis for boron, copper and other metals (e.g., zinc and tin) – see points vi – ix of Appendix. $***:*** refer below and point 15 of the appendix.

Microscopic Analysis

Wood sections (25 – 100 micrometers thick) were cut using a microtome or razor blade, mounted in glycerol and examined under a compound light microscope using polarised light and bright field illumination. Approximately 10 - 20 sections from approximately 3 - 10 positions across the depth at each of approximately 3 – 10 lateral positions were

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

examined for each sample. All sections were stained with lactophenol aniline blue dye prior to examination.

- Key observations are given in the summary table.

- Wood was tentatively identified as radiata pine. (*Perishable medium density soft wood which is the dominant structural wood species used in New Zealand. A major advantage of this species is that it is easy to treat with preservative using factory processes thereby making it highly durable. However, if not treated prior to construction then it remains highly susceptible to biodeterioration damage. The effectiveness of remedial preservative treatment varies widely and is not a reliable substitute for NZS3640 compliant framing used in accordance with NZS3602:2003. In some situations, it acts as a very valuable additional "top-up" to other more important remediation practice, when applied correctly – see points 10 and 11 of the appendix. Remedial preservative treatment is typically a robust rule of thumb but unfortunately it is sometimes used as a poorly conceived substitute for other robust remediation strategy that often includes inadequate exposure and replacement of framing and other poor treatment practice. Leaky building damage can be seriously compounded by the dangers associated with such inappropriate remedial preservative treatment*).

- The toxigenic mould and soft rot fungus *Stachybotrys* was detected. This mould is very common in moisture compromised buildings – see point 15 of the appendix (presence on wood is rare but very common on paper (wood pulp) containing material like Gib, fibre cement and building wrap and therefore low incidence on wood samples can be misleading as a guide to likelihood of the scale of incidence in a building).

Wood preservative analysis

i. **Based on colorimetric qualitative spot tests samples 1-7 were treated with boron, e.g., according to Hazard Class 1.2 of NZS3640:2003 or an earlier equivalent.**

ii. *Spot tests typically do not detect the majority of the more modern light organic solvent preservatives (LOSP) e.g. the fungicide 3- iodopropynylbutylcarbamate (IPBC) and the insecticide permethrin, used in combination for H1.2 framing (since approximately late 2003 - March 2005, in accordance with NZS3640:2003 and NZS3602:2003, and slightly earlier as H1-plus (probably 2002 as a non-obligatory treatment), or substantially earlier in the case of permethrin used alone for H1 framing in accordance with MP3640:1992). The spot test used for tin is not wholly reliable for small samples or where retention* *is low. An H3.1 treatment based on tebuconazole, propiconazole and permethrin has been available since 2002 although it has only been used in New Zealand in substantial amounts since approximately 2006 (has largely replaced tributyl tin (naphthenate and oxide) today). Triazoles cannot be tested for using spot tests.*

iii. Quantitative preservative analysis was not performed in this instance because it was not necessarily of immediate value to the diagnosis. However, in some situations of particular scrutiny it is advantageous to have quantitative analytical data, for example if compliance with the retention requirements of NZS3640:2003 is an issue or if preservatives are of a type that are undetectable using sport tests, e.g., LOSP H1.2, some LOSP H3.1, LOSP H1 (permethrin) and LOSP H1plus.

iv. **See Appendix regarding background information.**

Discussion and Conclusions

1. **Framing sample 1 contained well-established decay which may have caused significant loss of the original structural integrity in affected areas. Overall cross-sectional integrity of the wood may have been compromised (risk of failure nearby).** According to strict remediation practice and classical remediation empirical wisdom, as a general rule of thumb wood with well-established decay should be replaced with appropriately treated framing (NZS3640:2003 specified H1.2, H3.1 or H3.2 depending on the location). In some situations, discrete pockets of well characterised early decay, in non-critical areas, can be left in situ provided that other remediation practice is applied (see point 2). **Replacement is typically recommended for framing in this condition, as part of robust remediation practice, and this is most likely required in this instance. (See points 7 and 8 of the appendix).**

2. **Wood samples 2-7 contained fungal growths, but no structurally significant decay was detected. The bulk of fungal morphology was typical of mould fungi, sapstain fungi and/or soft rot fungi, and yeasts. Wood in this condition can typically be left in situ if other remediation provisos are applied.**

3. There is an important caveat to the diagnosis for samples 2-7, this being that concealed decay damage is sometimes present nearby wood in this condition. Moisture hazards can compound suddenly, i.e., the initial period of the buildings life is sometimes misleading as a guide to the rate of future water-damage which may accelerate suddenly. It is vital to establish the limits and causes of affected wood which may require extensive removal of cladding and/or other building materials and/or iterative analysis. It is sometimes necessary to remove a proportion of sound wood along with substantially decayed wood during

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

remediation, to ensure that a critical mass of compromised wood is removed or to achieve the most cost-effective global replacement approach.

4. Based on observations from New Zealand buildings the condition of sample **1** was consistent with exposure to at least 1-3 years of elevated moisture conducive to decay (moisture levels typically above 30%) although on a balance of probabilities a longer period, e.g., of more highly intermittent moisture elevation, is also likely. *Decay typically develops within the first year after enclosure for many types of commonly occurring weathertightness deficiencies.* Samples **2-7** had been exposed to moisture elevation conducive to fungal growths and also at least marginal, e.g., highly intermittent, moisture conducive to decay, in at least some cases, but not yet deep structurally damaging decay, at least not for treated wood (serious decay may be present nearby) most likely for several years. *More refined diagnosis of the duration of decay damage and its commencement is often possible with more site-specific information.*

Fungal growth can occur over the range 16 – 30% (and of course at higher moisture contents where it usually occurs with decay in perishable framing) and possibly at even lower values if humidity is very high and/or transient condensation is an issue. Fungal decay requires free moisture, as occurs at moisture contents above the fibre saturation point near 29 - 30%. However, 30% is not a reliable lower limit for decay occurrence and some decay fungi can move into wood and initiate decay at considerably lower moisture content levels.

The only reliable and indisputable facts with respect to wood moisture content effects on decay within the context of moisture compromised building diagnostics, are that decay is inevitable above the fibre saturation point of approximately 30% and that values below this are unreliable as a guide to possible problems (partly due to the transient nature of moisture elevation and the limitations of detection techniques). However, understanding the significance of different moisture contents over the range of the lowest emc values encountered in wood in buildings (around 6% for furniture in a dry room) to the highest (about 22 – 25% such as might be found in a sauna), and for other moisture values of 25 – 30%, can be useful but is not straightforward and confusion often arises – see points 13 and 14 of the appendix. If in doubt, return to the rule of thumb stated here and then apply the *golden rule of thumb* referred to in point 6.

5. **The toxigenic mould and soft rot fungus *Stachybotrys* was detected. This fungus is very common in moisture compromised buildings. It may be necessary to take precautions to prevent or minimise contact with occupants and others (e.g., remediation workers) – see point 15 of the appendix.**

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

6. Whilst the principles of remediation science are straight forward the causes of decay in buildings are multivariate and the necessary remediation required varies significantly between sites. Diagnosis of the required remediation requires significant remediation knowledge and its on-site application. Several sampling iterations and analysis are sometimes necessary before an appropriate diagnosis and remedial response can be identified. *Always bear in mind the golden rule: keep looking until a very high degree of confidence exists that all causes of moisture elevation have been accounted for, and the limits of infection and decay have been identified and dealt with appropriately (particularly important for untreated perishable framing). Missing small areas of infection and decay is inevitable in some situations but in the great majority of cases this is not a problem provided that the golden search rule is diligently applied and provided that the attendant rules of thumb of remediation practice are not compromised along the way to final remediation.*

Appendix – Important Background Information

Wood preservative analysis

iv. The limit of detection of the boron spot test used was close to 0.02% BAE, similar to the detection limit for routinely employed quantitative analysis (0.01 – 0.04% depending on condition and size of sample). Spot tests can detect boron in wood with undetectable mean cross-sectional retentions due to the dilution steps carried out during wood preparation prior to analysis.

v. Minimum retentions needed to control decay fungi vary and typically fall within the range 0.1 – 0.5% (5 – 25 times the detection limit). The central 1/9 (11% of the wood volume) has traditionally required a minimum core retention of 0.04 for insect borer and 0.1 for decay fungi, this being a traditional check that adequate penetration was achieved it being correctly assumed that much higher retentions reside nearby in the other 89% of the wood volume. Unfortunately the core retention requirement was left out of H1.2 in 2003, a somewhat controversial omission (it is requirement for H1.1 wet frame).

vi. Typically, buildings constructed prior to the introduction of the new H1.2 boron retention minimum requirements in 2003, contain external framing that does not meet the retention requirements of NZS3640:2003. Observations from approximately 1000 buildings (mostly aged 4 – 10 years) have shown that boron retentions of 0.05 – 0.3% w/w BAE are common although retentions as high 1.5% have been recorded. It is highly unlikely that any house built prior to 2003 contains external wall framing with a **mean** boron retention of 0.4% or above and on this basis it is reasonable to recommend that all framing exposed during remediation is treated.

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

vii. Rarely, depending on the age of the framing and other factors, the H1 and H1.2 alternative treatments permethrin or IPBC were used for framing. Permethrin is an insecticide only and IPBC is a fungicide only. Since NZS3640:2003 was introduced IPBC has been used with permethrin as an LOSP H1.2 treatment (blue coded framing). However, IPBC was also used in "H1-plus" framing for approximately 18 months prior to 2003 and permethrin only was used as an H1 treatment (insecticide only) according to NZS3640:1992 i.e. since 1992.

viii. There are no spot tests available for IPBC and permethrin and the quantitative analysis necessary is relatively costly, time consuming (typically a 14 day turn around) and typically unnecessary since forthcoming information usually shows that these treatments were not relevant i.e. by a process of elimination.

ix. Unlike the more commonly used H1 treatment boron, permethrin is not a fungicide and is therefore of no durability value in the context of moisture compromised buildings and fungal decay. Boron adds resistants to decay in some low to moderate decay hazard situations found in moisture compromised wall cavities but this effect is dependent on boron retention which varies greatly for H1 framing i.e. durability of H1 (and H1.2) boron treated framing varies greatly in moisture compromised buildings.

Decay analysis and remediation

7. **According to strict remediation practice wood with established decay should be replaced with appropriately treated framing (NZS3640:2003 specified H1.2, H3.1 or H3.2 depending on the location).**

8. **Strict adherence to classical remediation practice is typically indicated for wood with well-established decay.** This typically involves removal of all decayed wood and sometimes an additional 1 meter of wood beyond the obviously decayed limit (***along continuous, not discontinuous framing e.g. framing broken by well defined breaks such as between parallel joists well separated by nogs or window frames, or similarly well-separated horizontal framing***). Latitude often exists for substantially less wood removal, particularly for preservative treated wood (not remedial treatment, including treatment applied during construction), and once the limits of decay have been well defined via suitable laboratory analysis or other appropriate methods. However, the 1 meter rule is a tried and tested approach in Europe and North America and provides a solid footing for recommendations in the first instance, or if there is doubt concerning the limits of decay. Where deviations from the rule are taken it may be important to take wood samples either side of the estimated limits of decay for further micromorphological analysis. As a general rule of thumb it is recommended that the 1 meter rule is applied unless there is a significant remediation cost-benefit in not doing so, and having

established the limits of decay accurately by thorough analysis, in some cases with further concurrent micromorphological analysis.

9. Whilst 4 weeks is typically an unrealistic timeframe in which to effect remediation, 4 weeks is intended as a guide for the minimum timeframe within which wood should essentially dry out if effective drying conditions have been implemented i.e. if wood has not dried within this timeframe a different strategy is probably required. Once established, decay can advance significantly within a 4 week period if left unchecked. All untreated or poorly treated wood that cannot be dried rapidly prior to remediation or after remediation should also be replaced irrespective of its condition. Effective and rapid drying sometimes requires complete removal of cladding and/or lining and it is vital to explore all possible moisture ingress points as well as areas several meters either side of all possible vertical leakage planes since some fungi can spread long distances over essentially dry materials in some situations. Other explorative measures may be indicated depending on the nature of the construction.

10. In-situ wood preservative treatment is recommended for all exposed framing that is not treated to Hazard Class H3.2 or H3.1 and any other suspect areas i.e. areas affected by moisture elevation. Typically, buildings constructed prior to the introduction of the new H1.2 (NZS3640:2003) boron retention minimum requirements in 2003 contains external framing that does not meet the retention requirements of NZS3640:2003. Therefore, in-situ preservative treatment of framing is often a wise precaution for all buildings that have had significant leakage problems irrespective of the extent of decay. However, the decision surrounding the extent of in situ treatment required varies according the local conditions and a pragmatic approach that takes account the ongoing likelihood of recurring leaks is needed.

11. ***Two liberal applications (500 mls per 10 linear metres of 100 x 50 mm framing) of Framesaver concentrate (do not dilute) by brush or airless spray is commonly used in New Zealand (typically the default recommendation because wood is often damp) although an LOSP type preservative such as Metalex is more suitable in some situations provided wood is essentially dry. However, because Framsaver has a thick consistency, much more typically gets applied during typical rapid brush strokes, and this is a substantial advantage because the retentions achieved are more realistic. It is typically vital to treat at least 3 faces of exterior framing paying particular attention to the exterior faces. However, treatment of 4 faces if at all possible is recommended.*** Complete removal of cladding and/or lining is often required to allow effective and rapid drying of framing and/or to facilitate discovery of all decay. Removal of cladding to expose exterior faces of external framing is typically the only effective way of allowing

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

sufficient access to framing that is in need of preservative treatment. Typically, it is not possible to treat bottom plates effectively in situ and consequently they need to be removed in some situations. Drilling holes where multiple adjacent framing occurs such as corners improves treatment of occluded faces and deeper wood but is typically impractical as a general method of extensive application (brush and/or airless spray is the most practical application method).

- *There is occasionally a misguided view amongst those of insufficient practical experience of remediation issues in New Zealand that it is acceptable to leave large amounts of deep, well established decay in situ during remediation provided a preservative is applied. This is sometimes incorrectly justified on the basis of limited artificial laboratory studies, where preservative applied to framing with decay at optimal moisture contents for preservative diffusion are maintained, and not surprisingly this allows diffusible preservative to halt decay in mini frame experiments. These conditions rarely occur in buildings where uneven moisture distribution and uneven fungal infection and decay pockets are the norm. (Small isolated pockets of decayed wood can be left in situ in some well understood situations).*

- *However, the questionable value of laboratory data to real building conditions is not the primary danger with respect to the inherently misguided nature of leaving large amounts of decayed wood in situ. Leaving extensive deep decay in situ, in most wall cavity situations, is dangerous because it encourages a lack of exploration and lack of identification of all the causative issues. It is also contrary to classical literature and the substantial base of empirical remediation wisdom and practice on which the literature is based. Therefore, those following this practice expose themselves to potential criticism and potential legal liability. It is wise to base ones advice on a long proven robust approach based on decades of sound classical remediation practice, as opposed to more recent advice based on a narrow and limited perspective.*

- *Also, there is a risk that structurally compromised framing will be overlooked and/or left in situ. Concealed decay is not uncommon and its thorough identification and the determination of its significance typically require the application of classical on-site investigation techniques and supportive off-site analysis.*

- *It is sometimes argued that New Zealand conditions are significantly different from situations on which the classical remediation literature is based and that new practice can therefore be applied. Such a view is premature at best considering the track record of New Zealand building practice in recent years* *and the relatively recent advent of improved practice and the recent introduction of a remediation skill base.*

- *There are also methods of pressure impregnation that can be used to treat framing in-situ. Pressure impregnation has a proven track record for use in buildings and whilst there are relatively few situations in New Zealand where this approach is useful within the context of moisture compromised building remediation, it may have application in highly specific and well understood situations. Radiata pine framing is essentially untreatable by pressure impregnation once it is part of a structure i.e. attempts to force liquid into the wood by pressure is likely to result in seepage and escape of preservative. It is typically vital to remove either the cladding or lining, and sometimes both, if wood is to be treated effectively without gross over-treatment and contamination of surrounding materials and the local area. Over-treatment may damage surrounding materials and may contaminate the living space (immediately or later if any excess dehydrated preservative becomes airborne) or the outside area and this may have health, safety and eco-toxicity issues. It is therefore essential to keep close track of where preservative goes at all times which is typically not possible if too much of the framing is concealed.*

12. In some situations it is possible to leave structural framing containing pockets of decay, in situ. This is typically not recommended, is not undertaken lightly and requires detailed knowledge of the situation. It is sometimes important to derive a method of eliminating active or potentially active decay fungus. This is difficult using surface applied preservative in many situations, the primary purpose of which is to provide future decay protection, not a sterilisation effect. Methods of sterilisation are available but their application requires specialist knowledge and equipment and is only cost effective in some situations e.g. where the cost of replacement exceeds the cost of in situ remediation. It is also vital to ensure that any structural damage left in place does not compromise the function of the affected framing or adjacent features or the overall integrity of the building.

13. Rules of thumb regarding the wood moisture content and decay.

For inspection purposes

i. When investigating an unknown situation it is important not to rely on MC readings in isolation i.e. never take a low value at face value because moisture elevation is often transitory (MC is only one tool in the repertoire).

ii. Always take any value above the expected equilibrium moisture content (emc) value as a warning i.e. including values below 18% (if possible it is useful to

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

obtain a few points of reference from areas that are "known" to be unaffected by poor design/faults etc. to establish the actual emc range). (Preservatives, wood extractives, moulds and sapstain fungi, wood species ect. can have substantial effects on emc.). Active fungal infection, including decay fungi, is very common in wood recorded at moisture values below 18% as measured in moisture compromised buildings in New Zealand.

For remediation and beyond

iii. Moisture must never go above 17% (exceptions arise from extenuating circumstances but these must be well defined).

Caveat rule of thumb

iv. An important qualification is that all moisture content measures and cardinal values used or referred to during investigation and remediation are indicative not absolute (including 18%). ***Once decay is established there is a significant probability that ongoing decay will occur at and close to 18% MC but for uninfected wood the MC conditions required for decay are closer to the fibre saturation point, probably 24 – 30%.*** (Fungi produce metabolic water during decomposition of wood and this local moisture may be undetectable with available detectors which pick up the macro-moisture % not the micro-moisture %. Furthermore, moisture conditions in the outer 1 – 5 mm are sometimes different (higher) than in deeper wood in situations that are marginal for decay e.g. where condensation occurs. Whilst references for decay at 18% are rare it nevertheless serves as the lower limit of reported activity (decay at 16% has also been reported but is probably not relevant in the context discussed here). For dry rot which can grow over and through wood that "was" below 18% (i.e. it translocates moisture as it advances) this typically requires RH values above 85% and optimally close to 100%. Moving air and RH values around 75% and below usually retard dry rot growth at low wood MC.)

14. Additional Critical Moisture Value Rules of thumb for moisture compromised building investigation

- *8 -14%: approximate emc range for framing in wall cavities*
- *16%: (maximum MC quoted for wall cavity enclosure during construction and minimum moisture quoted in the literature at which fungal (e.g. mould) growth can occur but at which wood decay does not become established)*
- *20%: widely accepted minimum threshold below which decay is prevented (allows a comfortable safety margin below the fsp above which decay establishment is inevitable)*

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

- *20 - 30%: range over which it is difficult to be certain what is occurring partly because of the limitations of detection devices but also because of other factors*
    - *<fsp (approx. 30%) decay establishment unlikely because no free moisture is available but there is significant margin for error in interpretation of MC values between emc and fsp and therefore 30% is substantially too high a lower limit for reliable risk assessment*
    - *16 - 30%: fungal growth often occurs but active wood decay unlikely although it may be imminent or very close by*
    - *>fsp (approx. 30%): decay inevitable*
- *40 - 70%: common MC range for aggressive decay*
- *80%: maximum MC sometimes quoted for brown rot*
- *30 - 400%: range for decay (120 - 400%: at or close to the wood saturation point at which decay stops or proceeds at greatly reduced rates due to shortage or lack of oxygen)*

Toxigenic mould (and related hazards): putting possible risks into perspective

15. Consideration of the possible health implications of *Stachybotrys* and related hazards that are sometimes more important, is not a simple exercise and in the current context can only be addressed with significant qualification and limitation, e.g., no single statement should be relied on in isolation and over reliance on limited air spore analysis and markers of hazards such as *Stachybotrys* is often an issue. **It is important to consider *Stachybotrys* not just in its own right but as an indicator of a much larger group of potential air quality hazards the implications of which are not well understood.** In general terms it is reasonable to consider *Stachybotrys* as a marker of such potential health hazards although there are many common situations were air spore analysis fails to detect *Stachybotrys* where it is prolific, e.g., in wall cavities, and where other moisture-related hazards are present. There are also common occurrences of *Stachybotrys* in buildings were it does not pose a significant health hazard. There are many damp building situations were other hazards collectively are far more important than *Stachybotrys*.

16. **Probably the best readily available summary of many of the issues are covered in the World Health Organisation (WHO) report "*guidelines for indoor air quality, dampness and mould*", a 2007 publication. However, guidelines based on empirical wisdom and available information that reasonably apply to the majority of people in the majority of known situations do not necessarily apply to everyone's health (some people are more sensitive)**

such that advice from a personal health care practitioner is essential if there are concerns in this regard.

17. Modern building designs, HVAC systems, and other issues that reduce dilution of internal air with clean and/or fresh air can increase the risk from moulds and other biohazards. In cities with high levels of pollution there is a probably trade-off although this is less of an issue in New Zealand. There is a significant amount of poor information available within this field and discerning investigation and consultation is therefore important.

18. *Stachybotrys* is typically the not the most important health risk issue in moisture compromised buildings.

19. *Stachybotrys* is often described as a toxigenic mould which means it contains substances that are known to have mammalian toxicity in some situations and which have been implicated as a cause of serious human illness, in some situations. There is significant controversy concerning the validity of a causal relationship between *Stachybotrys* exposure and illness, and no safe limits are available. Exposure to low doses of *Stachybotrys* is very common and there is no compelling evidence of a significant health risk to most people most of the time. On the other hand there are situations were exposure to even low doses of *Stachybotrys* and other species of fungi by some sensitive individuals, would be deemed inappropriate and risky for their health and wellbeing.

20. **Unlike some other types of biohazard and related hazards, *Stachybotrys* is commonly found in very high concentrations in wall cavities and other confined spaces in buildings that have undetectable amounts of *Stachybotrys* in the air. In fact this is an order of magnitude more common than other situations such as where *Stachybotrys* is detected at levels that truly reflect the total spore count within concealed areas, or where *Stachybotrys* is not detected in the air but is present in very high concentration in concealed spaces. This means that air spore analysis is typically an unreliable method of detection *per se*, particularly if not done regularly for a sufficient length of time. Air spore analysis is nonetheless a valuable tool that should be used in many common situations of building investigation, particularly during remediation and any other activity that disturbs building materials. It is important to monitor mould for a sufficient period after remediation because as materials settle and dry and go through multiple diurnal temperature and relative humidity cycles, air spore counts can change markedly. The possibility that other hazards, including volatiles and particulates that are not routinely looked for, may be significant should be given careful attention.**

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

Unfortunately the normal amount of airspore analysis routinely applied is inadequate and in the absence of other equally important types of analysis and prognostic qualification, the potential for problems is significant.

21. ***Stachybotrys* is also a relatively common soft rot decay fungus that has an extremely high propensity for growth on (and degradation of) any building material containing wood pulp (paper, Gibralter board linings, fibre cement cladding, etc.) which gets wet for periods in excess of a few days (usually several months, or more). As such it is commonly encountered by many people.** Because there are significant unknowns concerning the health risks of *Stachybotrys* and related contaminants, it is important to err on the side of caution which, in part means that it should, at the least be removed wherever possible to the point that it becomes undetectable within the living space, e.g., via use of air-spore analysis although this method has severe limitations for detecting health hazards related to moisture compromised buildings. It is nonetheless a valuable tool if used correctly. On the other hand it is commonly used poorly, the results are commonly misunderstood, and there is a significant risk of missing important issues and misrepresenting others.

22. Exposure of healthy individuals to small quantities of *Stachybotrys* is unlikely to pose a serious health threat in most cases, most of the time. However, it is wise to handle the mould (and other moulds) with caution, avoiding direct contact and inhalation of disturbed material. It is known that otherwise healthy individuals, who are regularly exposed to toxigenic moulds found on wood products, can suffer significant health problems. Some sensitive individuals are likely to be significantly affected by much lower doses. If mould is dry upon discovery airborne spores are more likely to be inhaled. **If mould is wiped with cleaning products this can increase the risk of inhalation.** Mouldy material in living spaces should be removed, taking care not to introduce airborne material. Mouldy wall cavity materials also pose a potential threat to occupants since spores can migrate into the living space however the most serious threat occurs when the material is disturbed and therefore removal should be carefully planned and executed.

    Trichothecence mycotoxins produced by *Stachybotrys* are lipophilic (fat soluble) and can potentially be absorbed through the skin. Therefore gloves, protective disposable clothing and approved breathing apparatus are recommended whenever significant quantities of mouldy material are handled.

    The majority of other moulds that occur in buildings are not generally considered to pose as serious a health hazard compared to *Stachybotrys*, although this may not necessarily be correct and therefore the presence of any mould in dwellings

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

can pose a health hazard, especially to those predisposed to pulmonary dysfunction (e.g. asthma sufferers) or those with a lowered immune response (e.g. the very young and very old). Other toxigenic moulds have been isolated from moisture compromised buildings although the bulk of information refers to mould that arises through poor management of ***internal*** moisture as described in the New Zealand building code. *Stachybotrys* can also arise in buildings as a result of poor internal moisture management (e.g. moisture from living activities such as hot water washing, cooking and breathing etc.) but in New Zealand it is almost certainly more commonly associated with ***external*** moisture, i.e., moisture that enters during leakage.

This could be related to the preference of *Stachybotrys* for very high moisture contents as are common in moisture compromised wall cavities, as opposed to dew points associated with condensation planes that tend to result in more transient elevated moisture conditions.

Other health hazards related to microbial degradation of damp building materials are possible e.g. release of volatile toxins, either directly from microorganisms, or from decomposing building materials. Other microorganisms including actinomycetes, bacteria and yeasts may also pose a health hazard in moisture compromised buildings in some situations.

Other information about assessing mould risks in buildings

23. Any generalisation on health issues carries a degree of risk for some people but in general terms the mainstream medical fraternity (or its representatives in Government departments) typically considers that health problems from mould in buildings beyond pulmonary function issues, e.g., asthma, particularly in the young, are not well substantiated, or are poorly substantiated, at least to the required standard of scientific rigor expected within scientific circles (not necessarily legal disputes). A small minority of medical experts profess strong links between exposure to mould in houses and a raft of illnesses, neurological disease in particular. Some scientific publications support some aspects of these links, at least indirectly, or anecdotally, but such risks are sometimes over-stated.

As a point of reference, mycotoxins are well understood to cause serious, sometimes life threatening health problems, e.g., in poorly stored peanuts and mycotoxins are tested for routinely to protect health in this situation (e.g., peanuts, and some other foods). In buildings, the issue is far less clear cut, although in general terms within the field of toxicology it is well understood that some toxic substances, possibly including mycotoxins, are especially toxic when inhaled. Advocates who argue that occupants were/are adversely affected by

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

mycotoxins in buildings often use logic that is poorly founded most of the time but that does not necessarily mean that they are wrong all the time, or that what they suggest is a remote possibility. For example, tremorgenic mycotoxins from *Aspergillus fumigatus* are reasonably well-established as a contributing factor for causing serious illness in sawmill workers in Sweden, as covered in respected peer reviewed scientific journals. However, high doses, usually over a prolonged period were necessary to cause symptoms in most individuals. However, sensitisation is a possibility and some individuals will start off being much more sensitive than the majority but are not necessarily taken seriously, sometimes for the wrong reasons.

One of the problems is a lack of commercial and Government funding in research on the effects of mould in poor housing. Furthermore, some of the issues are defined by complex, multifactorial parameters that are inherently difficult to investigate.

This situation means that the mould remediation industry is vulnerable to scaremongering and a lack of scientific robustness, and a lack of the most appropriate intervention to help people. The mould remediation industry regularly quotes the dire health consequences of exposure to mould where it is either inappropriate, or out of context, or at best is premature, or where a more measured approach would suffice. This is a particular problem in North America and some other countries. However, there is no question that damp buildings are bad for health in general terms (hence the WHO report) but not just because of mould and the often overly simplistic information given by mould remediation companies and laboratories attached to them, or used by them. There are other biohazards involved and chemical hazards, etc., and these are often not mentioned, or are overlooked. ***There is an over-reliance on, or poor deployment of, air spore analysis. An over-reliance on specific markers such as Stachybotrys. Links made between specific moulds and the level of health hazard tend to be too arbitrary, or are too generic.*** *For example, t*ypically, air spore testing is not carried out over a long enough period, or is carried out and interpreted poorly, e.g., in a way that is unrepresentative of the specifics of each building and/or the type of people who occupy them. Risks for different groups of people and different individuals varies greatly, as do the differences between buildings. Unfortunately, there is often a lack of in-depth scientific now how at a suitably high level that is brought to bear and too often generic testing methods and overly simplistic interpretation are applied to highly variable buildings without taking account of the relative risks faced by different individuals.

Sometimes when advice is sought by those with mould in houses, rather than giving the initial problem perspective and balance, the fires of worry are often

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
Mobile: 021 666 225
Business: 04 476 2532
Home: 04 476 2523
Fax: 04 476 2534
68 Homewood Avenue
Karori, Wellington 6012
robin@beagleconsult.co.nz

stoked upon learning the exaggerated, or misplaced risks of mould exposure. Given that it is well-established that the placebo effect and the suggestive effect are very powerful, this is likely to have a significant effect on people’s health issues in relation to mould in buildings, **particularly where information and advice is poor.** On the other hand there are situations where the health effects of mould carry an elevated risk, e.g., those who are immunocompromised, those undergoing surgery, the very young and the very old, etc. **However, generalisations can be misleading and ultimately each person is unique and should follow the advice of appropriate health professionals and people should consider seeking second and third opinions on serious issues.**

A glance at the literature within the field of mould-investigations of buildings suggests that poor forensic analysis of the causation is the norm rather than the exception, particularly in North America. The depth of objective science appears to be rather shallow in many cases. In part, this possibly relates to a shift away from the more traditional training routes for entering this field such as mould issues attached to the wood product-based sciences and industries, towards a situation where more people are coming from environmental sciences, etc., that do not appear to go into great depth with respect to the underlying science, particularly material science and microbial ecology. Possibly there are other reasons related to the huge growth in air quality related investigations and the emotive and often highly charged health issue arguments sometimes pushed by people working in this industry, although this less of a problem in New Zealand. **On the other hand, New Zealand has an unprecedented incidence of moisture compromised buildings and has other serious housing problems so this high incidence will elevate some of the risks in general terms.**

Yours Sincerely

Robin Wakeling BSc (Hons), MSc, PhD

BEAGLE CONSULTANCY LTD
Robin Wakeling PhD
BIODETERIORATION CONSULTANT
Wood and Building Materials Specialist
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Karori, Wellington 6012
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APPENDIX D

Wellington City Council letter dated 21 May 2024
& Amended Building Consent plans for SR 334503

21 May 2024

Wellington City Council
113 The Terrace
Te Aro
Wellington

Service Request No.334503
Property ID: 1908256

Inspection outcome

Site Address: 247 Karori Road
Legal Description: LOT 1 DP 488864

I refer to the inspection carried out at this address on 21 May 2024, by Wellington City Council (WCC) Building Officer Mike Thomson.[redacted] from the WCC property management office was also in attendance.

The purpose of the inspection was to enable the Council to consider whether the any additional work carried out under this building consent needs to be addressed since the last issuing of this letter.

As a result of this inspection, the following matters will need to be addressed to the Council's satisfaction before issuing a code compliance certificate can be considered;

1. The Council needs to be satisfied that the structural timber and associated elements are meeting the requirements of the building code, and that all elements have been installed in accordance with the building code;
   - Council requires a report from a member of the New Zealand Institute of Registered Building Surveyors; this is at your cost.
   - It is recommended that you advise the Council of your intended Building Surveyor prior to their engagement in order to confirm their suitability.
   - The report will need to confirm that the performance requirements of the relevant building code clauses are being met, as well as addressing the following issues that were identified during the inspection by Council officers ;
     - Weathertightness of the entire building envelope
       1. Onsite issues were identified with the cladding installation
       2. Issues with ground clearances
       3. Issues with the soffit weathertightness
       4. Issues identified with block wall moisture entry
       5. The installation of the screen holding water
       6. The curtain wall joinery namely the doors which daylight is visible through the leafs.
   - The Council requires that adequate testing (including invasive and destructive testing where necessary) is carried out by the Building Surveyor to support the conclusions in their report.
   - A repair schedule for any proposed remedial work is also required to be submitted to the Council for approval prior to any remedial work commencing. Please note

that any building code failure(s) identified will require a new building consent for the remediation work.

2. The following items need to be completed;
   - Complete the scope of the consent including ancillary rooms and bathrooms so that a building a plumbing final can be undertaken as the work is incomplete.
   - Complete the passive fire rating around the hall and take the fire rating to the underside of the roofing
   - Complete ventilation and fresh air supply
   - Complete the exterior escape door on the west elevation

Outstanding items from inspections to date:

- Where the screen installed to facade bolts through the cladding this requires EPDM washers between cladding and bracket
- Council's Public Drainage Engineer's Office to approved work under their supervision. Namely the connection to the public mains
- Electrical wires penetrating in two areas in ceiling space need to be sealed up. (South/east corner and on same corner further north up east wall.)
- All flush boxes to be replaced with intumescent ones with pads

3. Please provide the following documentation;
   - Submit an amendment to modify clause B2 – durability of the building code. The modified date should be December 2017. A copy of an amendment application form is enclosed with this letter. You will need to complete and return the amendment application form along with a covering letter (also enclosed) that acknowledges the nature of the amendment application being sought
   - Ventilation and commissioning results
   - Designer has increased fire rating in these areas with installation of 2x19mm fyreline, which is much more than stamped plans. Revised plans to be submitted as additional information.
   - Marked up plan from engineer identifying all elements that require fire rating as noted in the fire report for pre line.
   - Monkeytoe roof access ps3
   - Stage 2 consent submitted to address the changes in the Building code including the updated fire report. (It was noted onsite that the external spread of fire to the Northern may not comply due to the distance from the boundary. Confirmation from a fire engineer required)
   - As built plans to show that the louver construction changes

Please note;

- Additional outstanding items may be identified should remedial work proceed.
- Progress and communication with the Council needs to be maintained. If there is no communication with the Council for a period exceeding 3 months the file will be sent back to archives and payment of any outstanding fees will be required.
- A site meeting is advisable to clarify the content of this letter before any remedial work commences.

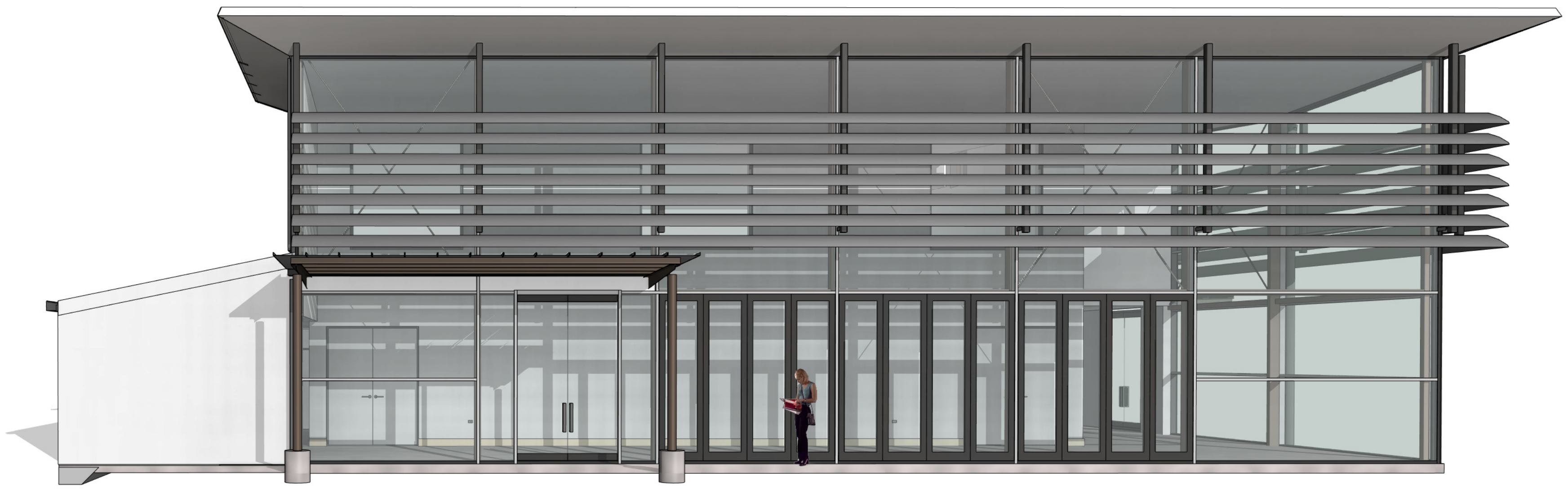
Please contact me if you have any queries.

Yours sincerely

Michael Thomson
Building Compliance and Consents
Wellington City Council
Telephone [redacted]

REVISED 29/04/2021

shand.
shelton



Karori Event Centre
Cover / Drawing Schedule

Building Consent Amendment
17/02/2021

(Revision A in response to RFI's 4, 5, 8, 9 & 10 - Dated 23/04/2021)

Building Consent Amendment

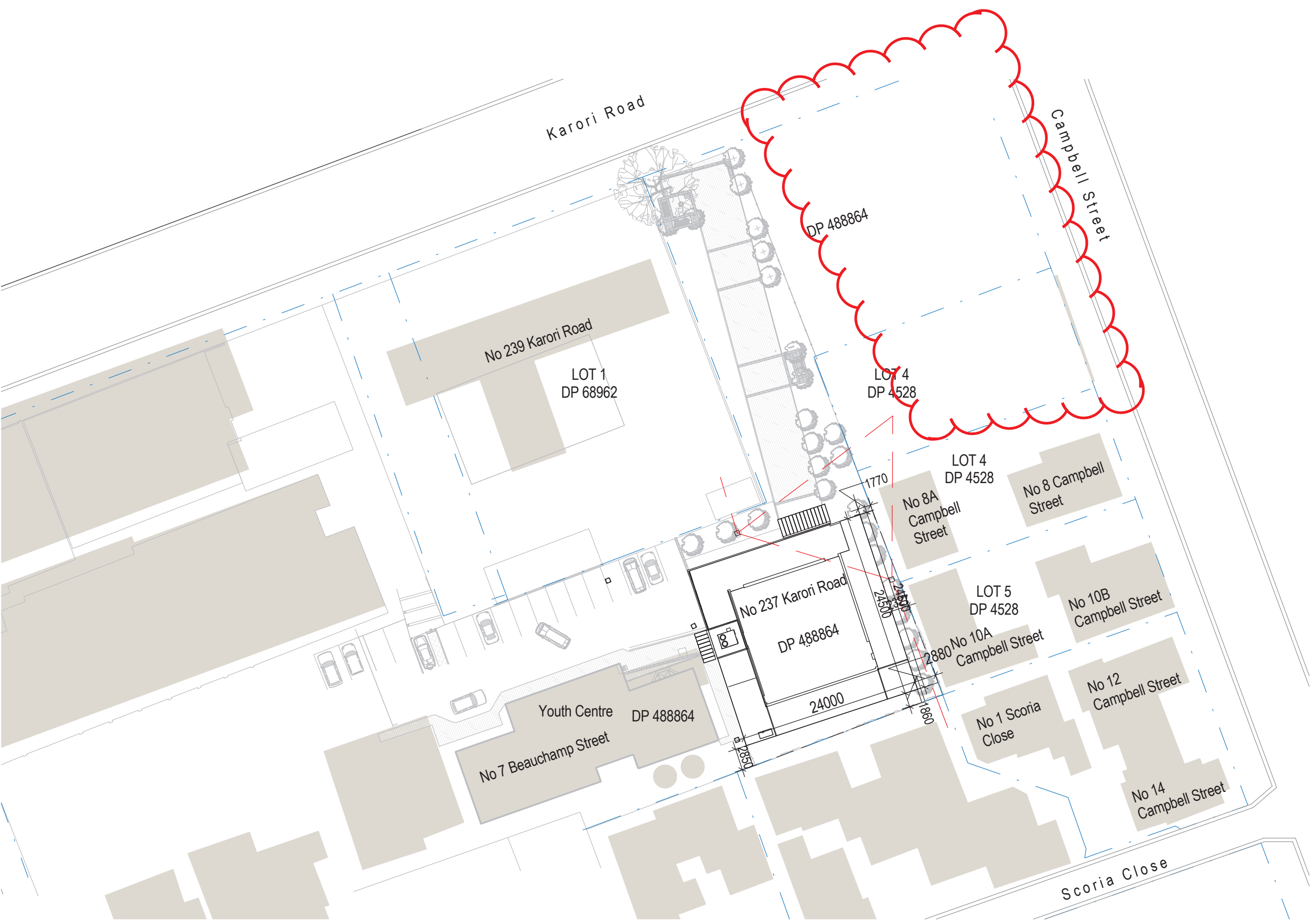
	Sheet Number	Sheet Name	Current Revision
Site			
A	1.01	Site Plan	2
A	1.02	Site Details	
A	1.03	Site Development Plan	1
A	1.04	Site Levels	
Plan			
A	2.01	Foundation Plan	1
A	2.02	Ground Floor Plan	2
A	2.03	Reflected Ceiling / Roof Plan	3
Elevations			
A	3.01	North & West Elevations	1
A	3.02	South & East Elevations	1
Sections			
A	4.01	Sections	4
A	4.02	Sections	3
A	4.03	Sections	1
Enclosure Details			
A	6.01	Wall Details	2
A	6.02	Masonry Wall Details	2
A	6.03	Wall Details	2
A	6.04	Roof / Soffit	2
A	6.05	Gutter 1 Details	
A	6.06	Open Plant Details	
A	6.07	Louvre Details	
A	6.08	Entrance Canopies	
Internal Details			
A	7.01	Kitchen	
A	7.02	Toilet	
Doors			
A	8.01	Door Schedule	2
Windows			
A	9.01	Window & Glazed Doors Schedule	2
A	9.02	Glazing Details	1

Building Consent Amendment Revision Log

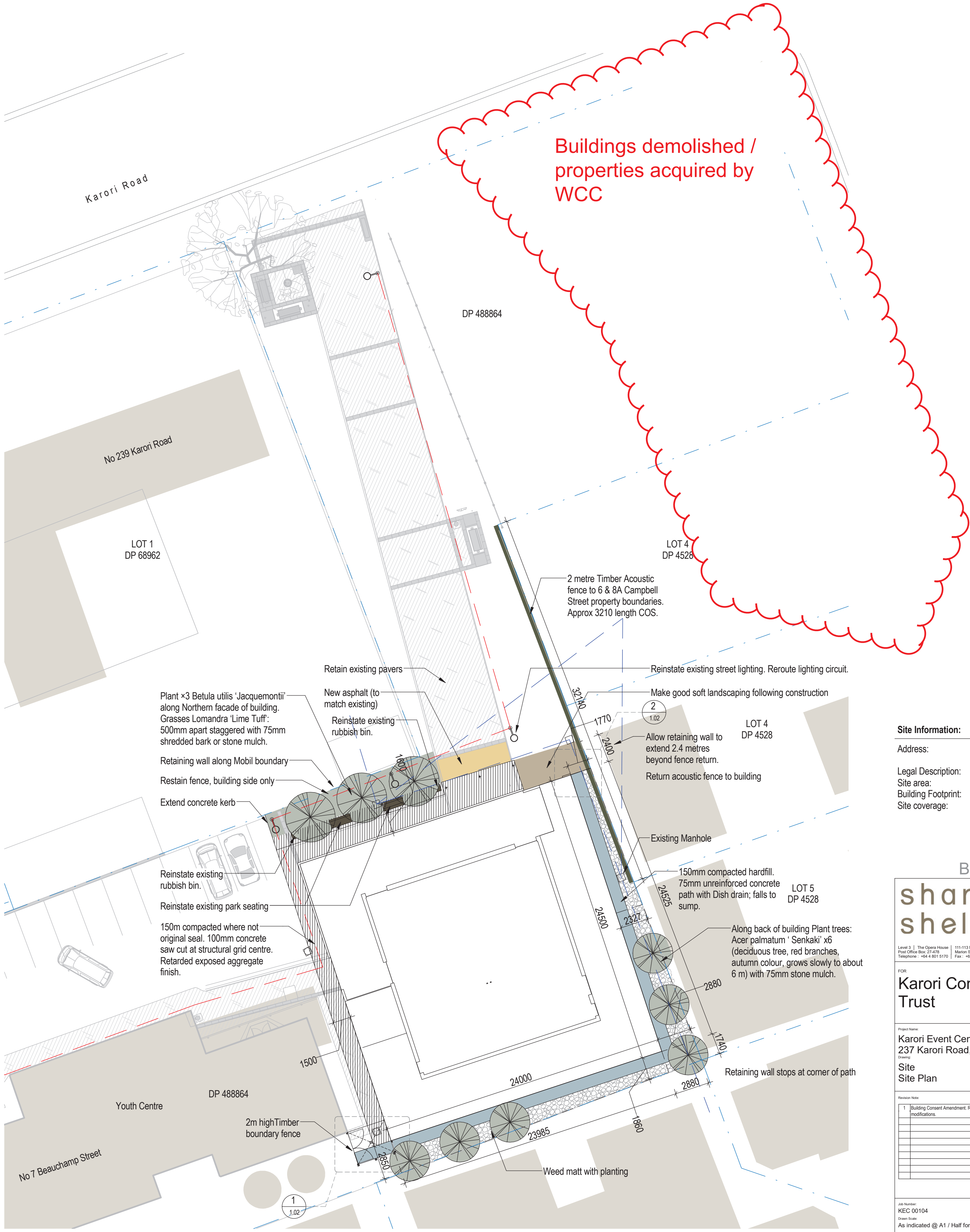
A-1.01	Church & No.6 Campbell street buildings demolished - Council acquired properties
A-1.02	No Change
A-1.03	Church & No.6 Campbell street buildings demolished - Council acquired properties
A-1.04	No change
A-2.01	Polished concrete topping slab removed. LVL bearer supported floor removed. Removal of threshold details (Double up of 9.02)
A-2.02	Polished concrete topping slab removed. LVL bearer supported floor removed. Threshold removed. Entry mats removed. Vinyl floor removed off drawing. No linings installed in Auditorium.
A-2.03	Auditorium ceiling linings note removed off schedule. Ceiling Linings removed.
A-3.01	No Change
A-3.02	No Change
A-4.01	Auditorium Linings Removed. Acoustic Wall linings Removed
A-4.02	Auditorium Linings Removed. Acoustic Wall linings Removed
A-4.03	Auditorium Linings Removed. Acoustic Wall linings Removed
A-6.01	Linings in Auditorium removed
A-6.02	Polished concrete topping slab removed.
A-6.03	Auditorium floor removed linings removed from auditorium side. Gib Soundseal sealant removed. Ceiling Details removed.
A-6.04	Ceiling Details removed.
A-6.05	No Change
A-6.06	No Change
A-6.07	No Change
A-6.08	No Change
A-7.01	No Change
A-7.02	No Change
A-7.03	Drawing Removed (acoustic wall treatments removed from stage 1 scope)
A-8.01	Polished concrete topping slab removed. LVL bearer supported floor removed.
A-9.01	Acoustically rated windows modified with Current Pacific window model (not consent item). Meeting room exterior windows amended to reflect windows shown in elevation.
A-9.02	Threshold detail modified. Polished concrete topping slab to be constructed under Stage 2.

REVISED 29/04/2021

1 Location Map
1 : 2000



2 Proposed Site
1.02 1 : 500



3 Landscape Plan
1.02 1 : 200

Site Information:

Address:	237 Karori Road, Karori, Wellington
Legal Description:	Lot 1 Deposited Plan 488864
Site area:	6264m² more or less
Building Footprint:	590m² or less
Site coverage:	10.6%

Building Consent

shand. shelton

Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington

Site
Site Plan

1 Building Consent Amendment. Refer to separate scope of works list for modifications. 18/02/2021

Job Number	Design By	Drawn by
KEC 00104	RS	CS

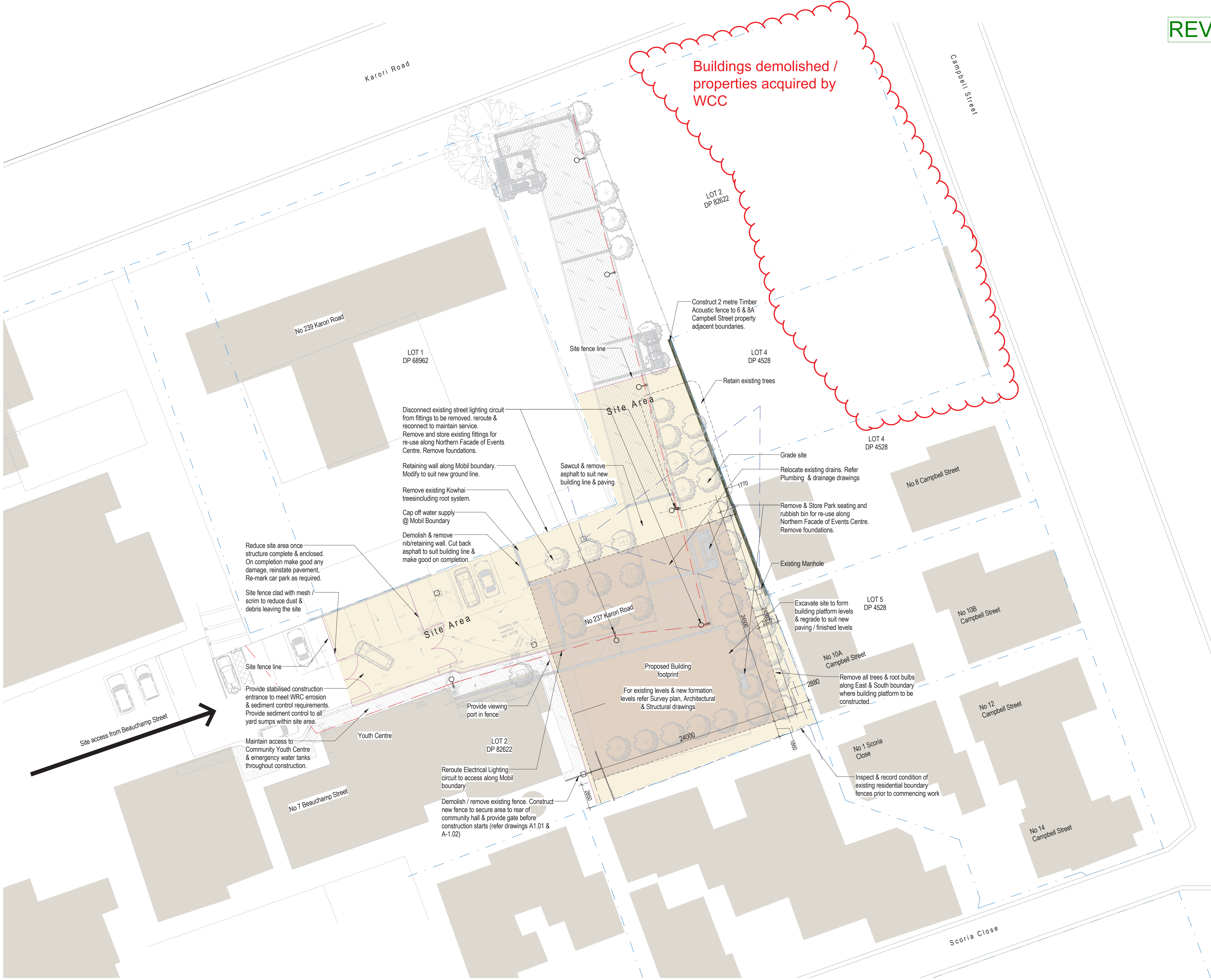
As indicated @ A1 / Half for A3 scale — 23/06/2016

A-1.01 — 2

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK.
DO NOT SCALE

WCC Approved plans AP:1 SR:334503 30/04/2021 A copy must be kept on site

REVISED 29/04/2021



Building Consent

shand. shelton

Level 3 | The Opera House | 111-113 Manners St | Te Aro | Wellington 6011 | New Zealand
Post Office Box: 27-478 | Marion Street Square | Te Aro | Wellington 6141 | New Zealand
Telephone : +64 4 801 5170 | Fax : +64 4 801 5172 | Email : reception@shandshelton.co.nz

FOR
Karori Community Hall Trust

Project Name:
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Site
Site Development Plan

Revision Note:

1	Building Consent Amendment. Refer to separate scope of works list for modifications.	18/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: 1 : 200 @ A1 / Half for A3 scale
Date: 23/06/2016
Sheet No: A-1.03
Revision: 1

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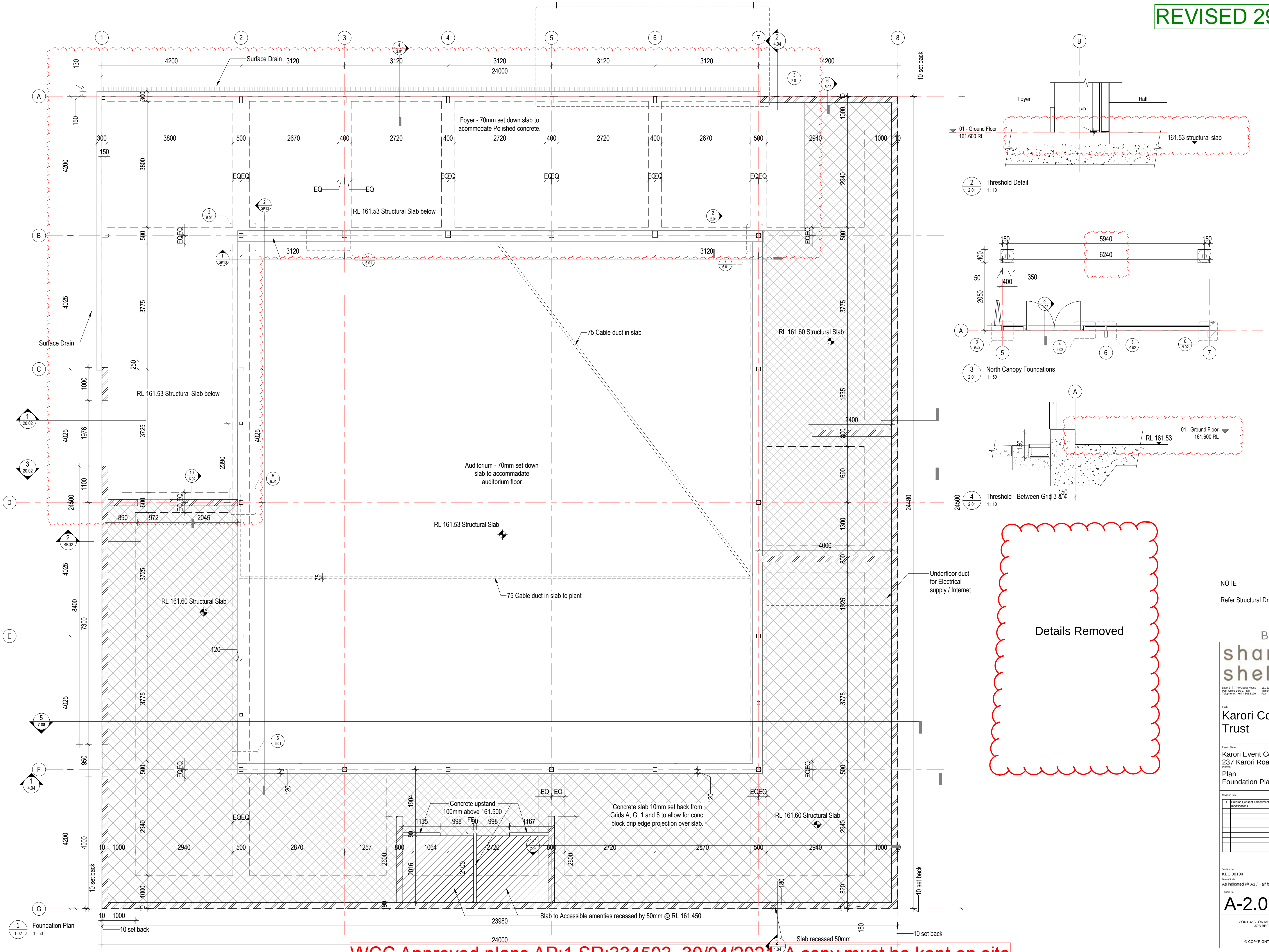

NOTE

Refer Structural Drawings S2 for further details

Building Consent

shand. shelton

Level 3 | The Opera House | 111-113 Manners St | Te Aro | Wellington 6011 | New Zealand
Post Office Box: 27-478 | Marion Street Square | Te Aro | Wellington 6141 | New Zealand
Telephone : +64 4 801 5170 | Fax : +64 4 801 5172 | Email : reception@shandshelton.co.nz

FOR

Karori Community Hall Trust

Project Name:

Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:

Plan
Foundation Plan

Revision Note:

1	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: As indicated @ A1 / Half for A3 scale
Date: 17/02/2021
Sheet No: A-2.01
Revision: 1

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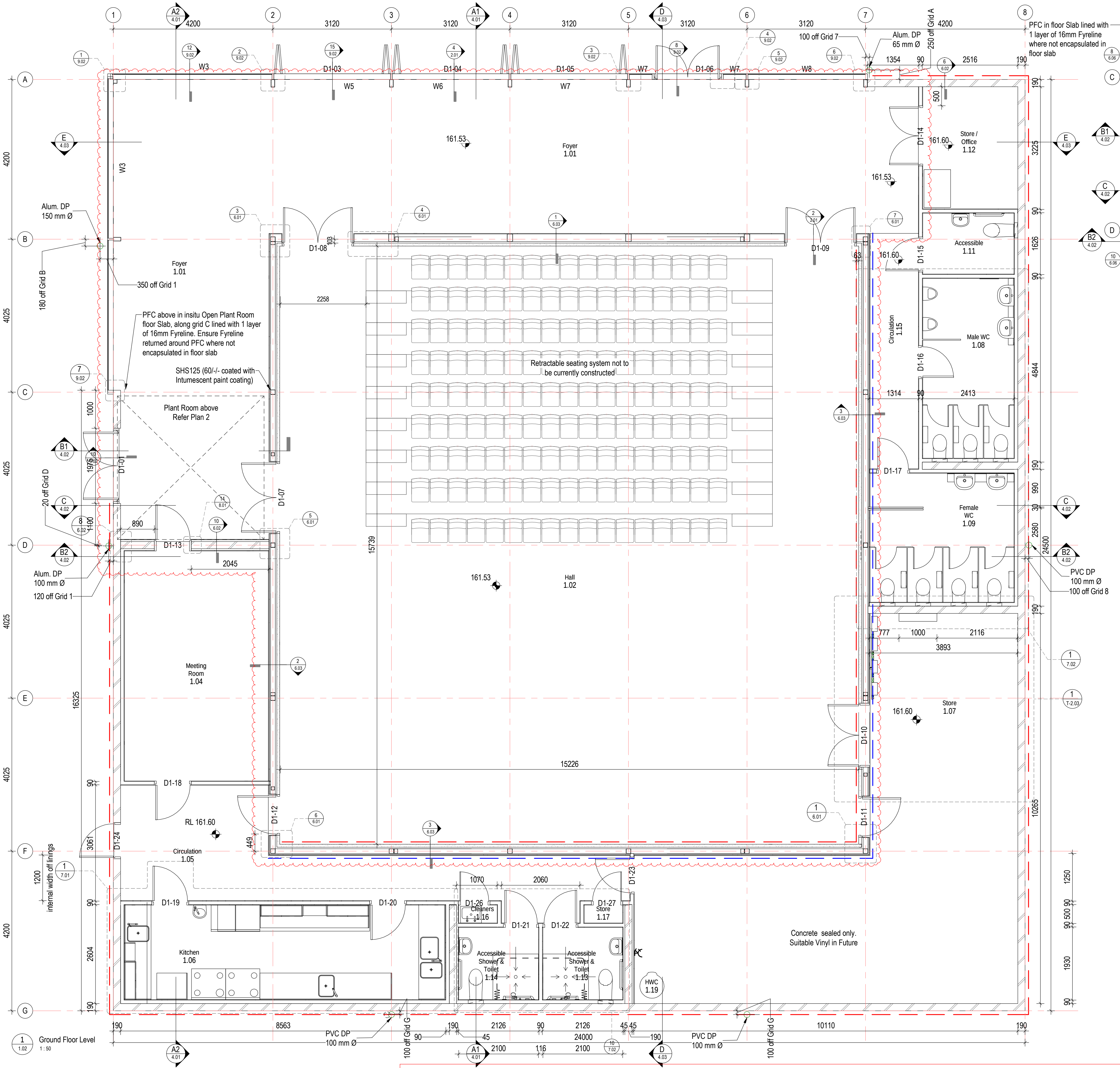

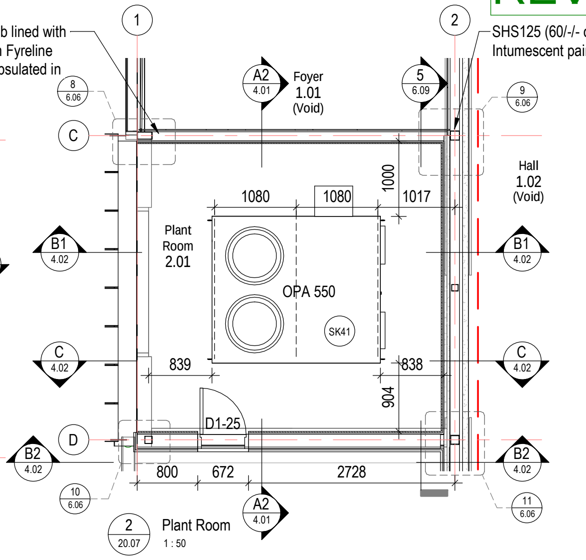

Room Area Schedule

Space No.	Space Name	Area m²
1.01	Foyer	115 m²
1.02	Hall	240 m²
1.03	Dressing room 2	12 m²
1.04	Meeting Room	23 m²
1.05	Circulation	24 m²
1.06	Kitchen	21 m²
1.07	Store	25 m²
1.08	Male WC	11 m²
1.09	Female WC	13 m²
1.10	Dressing room 1	12 m²
1.11	Accessible	4 m²
1.12	Store / Office	8 m²
1.13	Accessible Shower & Toilet	4 m²
1.14	Accessible Shower & Toilet	4 m²
1.15	Circulation	13 m²
1.16	Cleaners	0 m²
1.17	Store	0 m²
1.18	Circulation	11 m²
1.19	HWC	1 m²
2.01	Plant Room	15 m²

WALL FIRE RATING KEY

- 120/120/120 Wall
- Wall & Roof cavity lined with 2 layers 19mm Fyreline. Refer sheet A-6.03 / Detail 3 & 3a

Building Consent

shand. shelton
Level 3 | The Opera House | 113-119 Manners St | Te Aro | Wellington 6011 | New Zealand
Post Office Box: 27-478 | Marion Street Square | Te Aro | Wellington 6141 | New Zealand
Telephone : +64 4 801 5170 | Fax : +64 4 801 5172 | Email : reception@shandshelton.co.nz

FOR
Karori Community Hall Trust

Project Name:
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Plan
Ground Floor Plan

Revision Note:

	Issued for Preliminary Services Review	22/04/2015
1	Building Consent request for further information	1/08/2016
2	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: 1 : 50 @ A1 / Half for A3 scale
Date: 17/02/2021
Sheet No: A-2.02
Revision: 2

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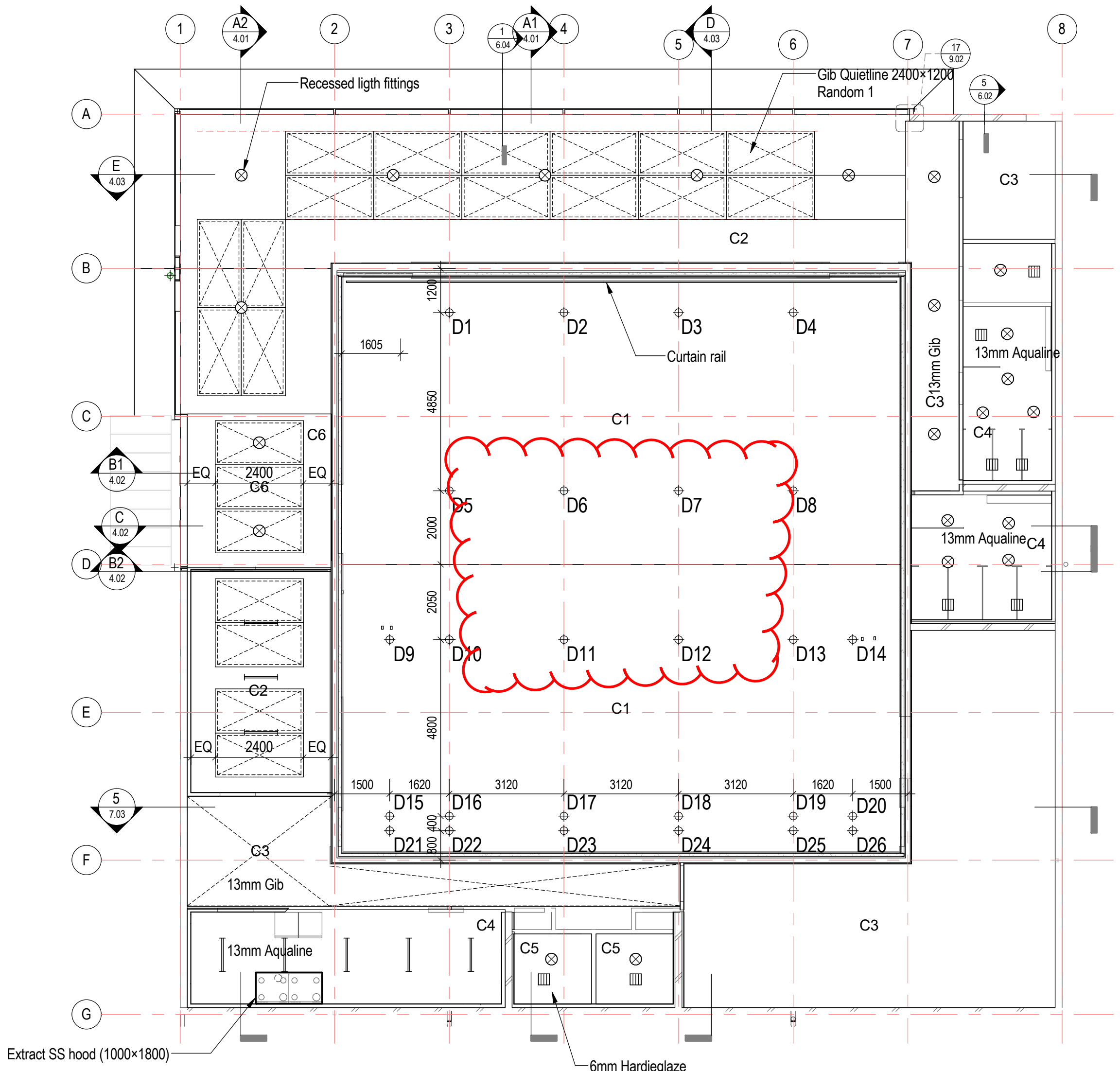
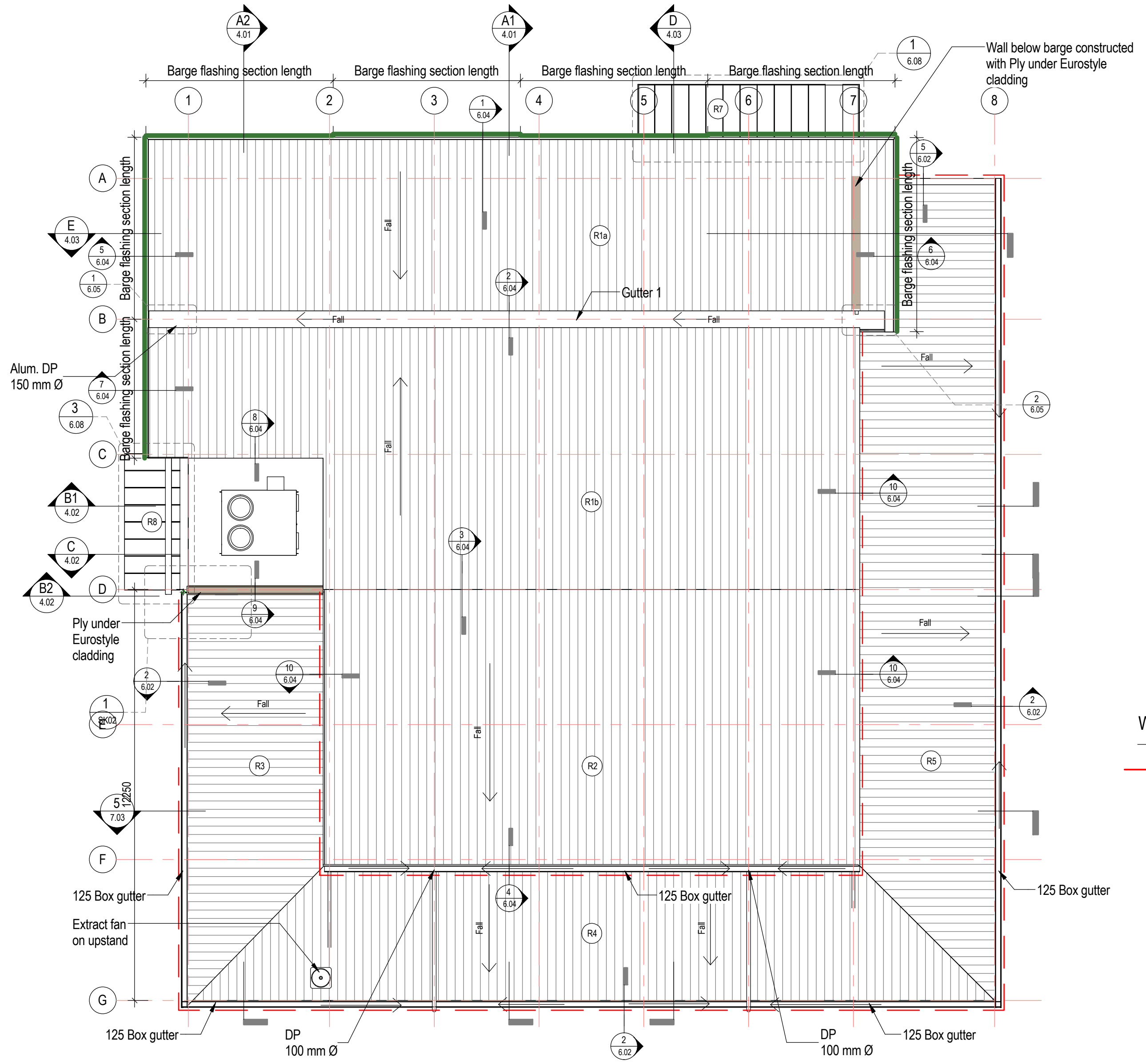
REVISED 29/04/2021



4 1.02 Reflected Ceiling Plan 1 : 100



1 1.02 Roof Plan 1 : 100

WALL FIRE RATING KEY

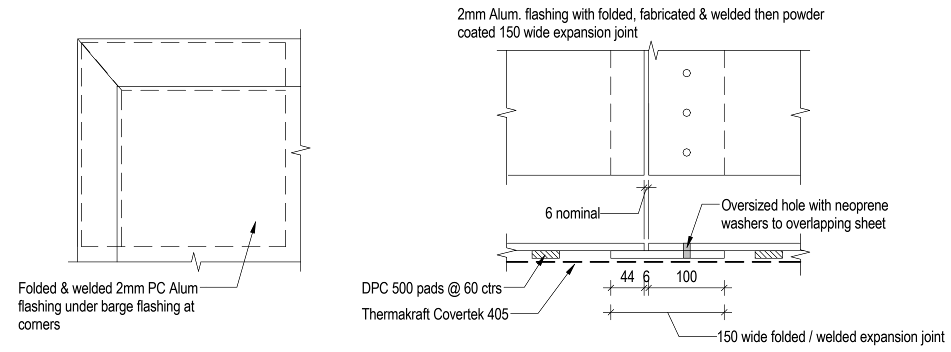
120/120/120 Wall

Key

	Gib Quietline - Random 1
	Ceiling grille
	Recessed light fitting
	Lighting mounted on ceiling
D#	Droppers trough ceiling (Refer Structural drawings S34 / Detail 78

Ceiling Schedule

Designation	Type	Area	Room
C1	2× 13mm Noise Line	120 m²	Auditorium
C1	2× 13mm Noise Line	120 m²	Auditorium
C2	1 × 13mm Gib Quiteline	25 m²	Meeting
C2	1 × 13mm Gib Quiteline	82 m²	Foyer
C2	1 × 13mm Gib Quiteline	16 m²	Foyer
C3	13mm Gib on Rondo	23 m²	Circulation
C3	13mm Gib on Rondo	14 m²	Toilet Corridor
C3	13mm Gib on Rondo	8 m²	Store / Office
C3	13mm Gib on Rondo	64 m²	Changing
C4	Aqualine on Rondo	23 m²	Kitchen
C4	Aqualine on Rondo	31 m²	Toilets
C5	Hardieglaze 6mm	4 m²	Accessible Showers
C5	Hardieglaze 6mm	4 m²	Accessible Showers
C6	1 × 13mm Gib Quiteline 1× 16mm Fyreline	16 m²	Foyer / U/S Plant



2 Barge Flashing Expansion Joint Diagram 1 : 5

NOTE: Flashings 6m lengths setout from centre. Expansion joints at all junctions

For Information

shand. shelton

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Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Plan
Reflected Ceiling / Roof Plan

Revision Note:

	Issued for Preliminary Services Review	22/04/2015
1	Building Consent request for further information	1/08/2016
2	Fire rating to PFC Revised. Ceiling lining added.	22/08/2016
3	Building Consent Amendment refer to separate scope of works list for modifications	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: As indicated @ A1 / Half for A3 scale
Date: 23/07/2016
Sheet No: A-2.03
Revision: 3

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DO NOT SCALE

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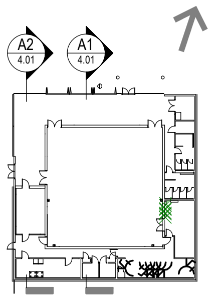
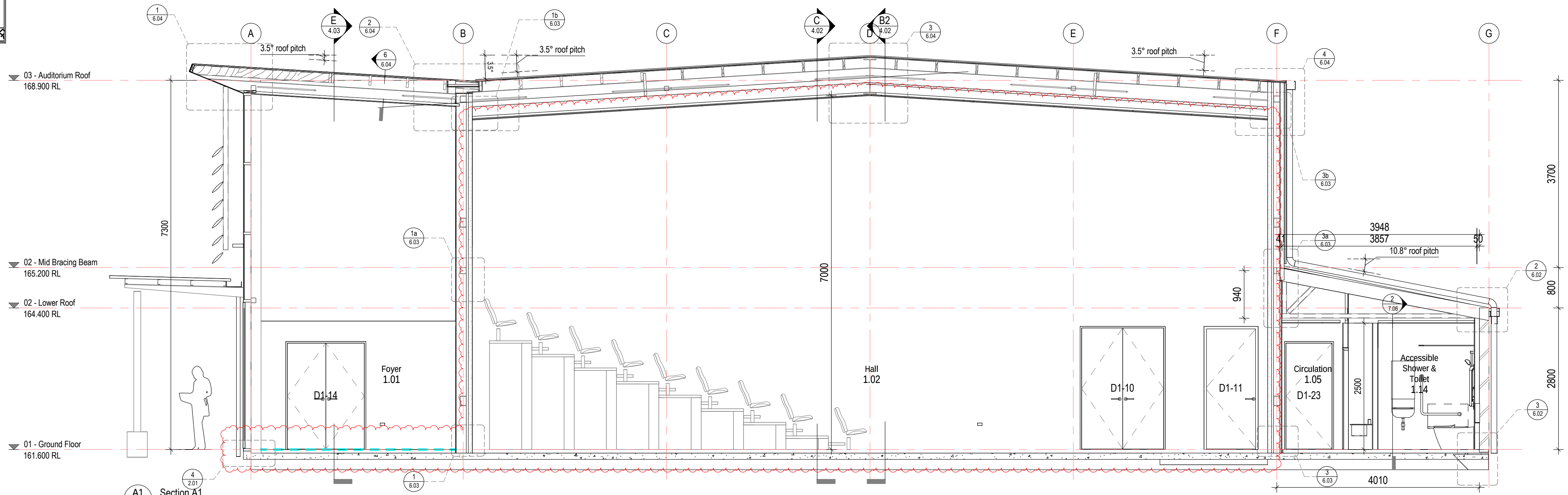
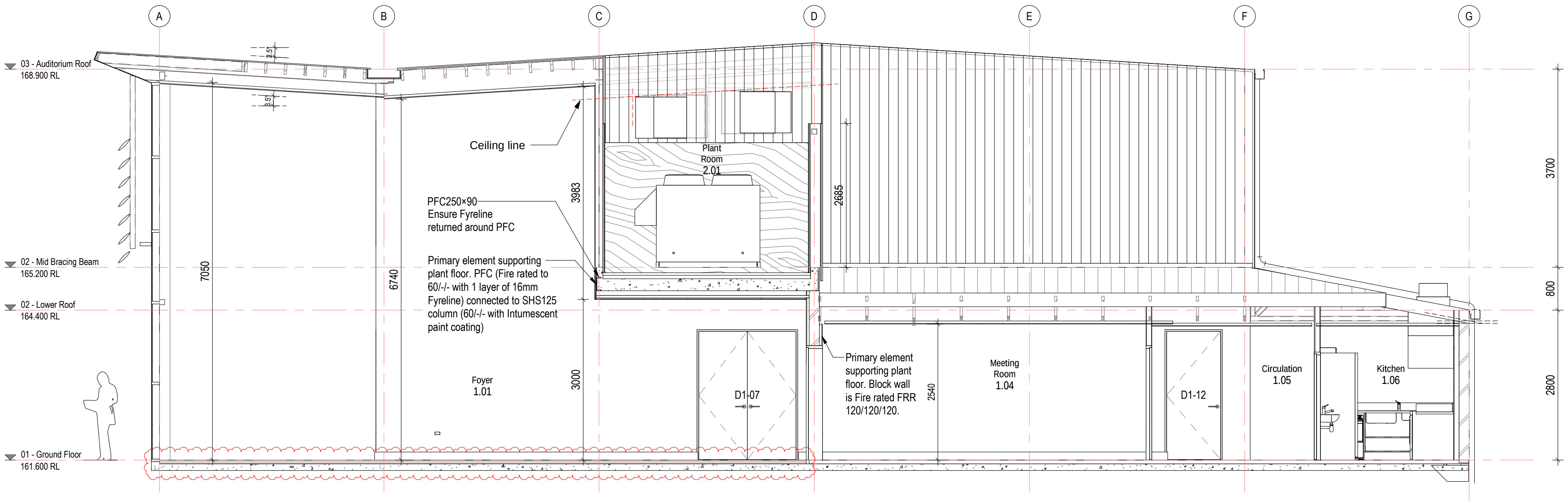


Section Key
1 : 500



A1 2.02 Section A1
1 : 50



A2 2.02 Section A2
1 : 50

Building Consent

shand. shelton

Level 3 | The Opera House | 111-113 Manners St | Te Aro | Wellington 6011 | New Zealand
Post Office Box: 27-478 | Marion Street Square | Te Aro | Wellington 6141 | New Zealand
Telephone : +64 4 801 5170 | Fax : +64 4 801 5172 | Email : reception@shandshelton.co.nz

FOR
Karori Community Hall Trust

Project Name:
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Sections
Sections

Revision Note:

2	Building Consent request for further information	19/08/2016
1	Building Consent request for further information	1/08/2016
3	Fire rating to PFC Revised. Ceiling lining added.	22/08/2016
4	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: As indicated @ A1 / Half for A3 scale
Date: 17/02/2021
Sheet No: A-4.01
Revision: 4

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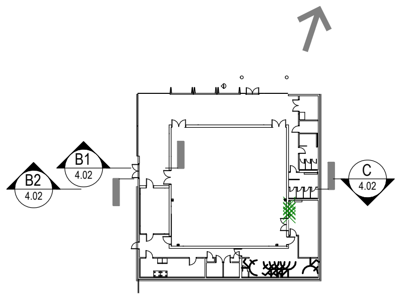

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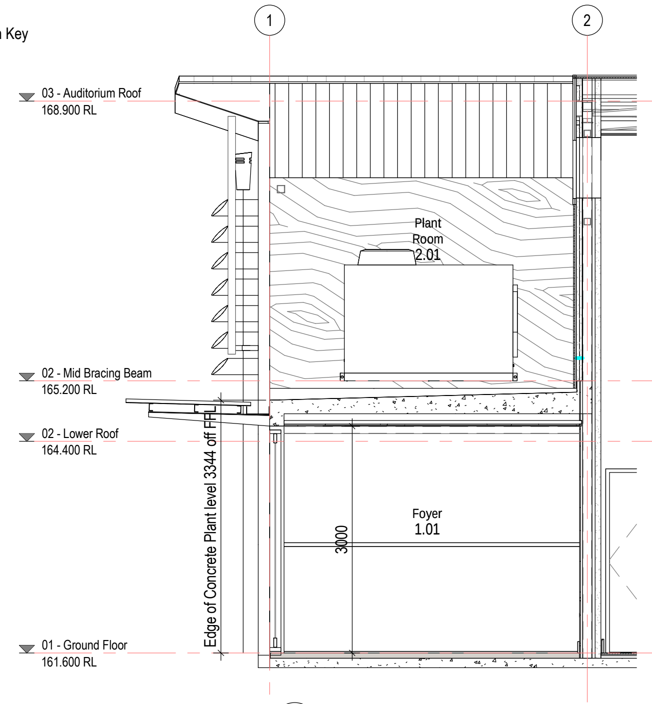
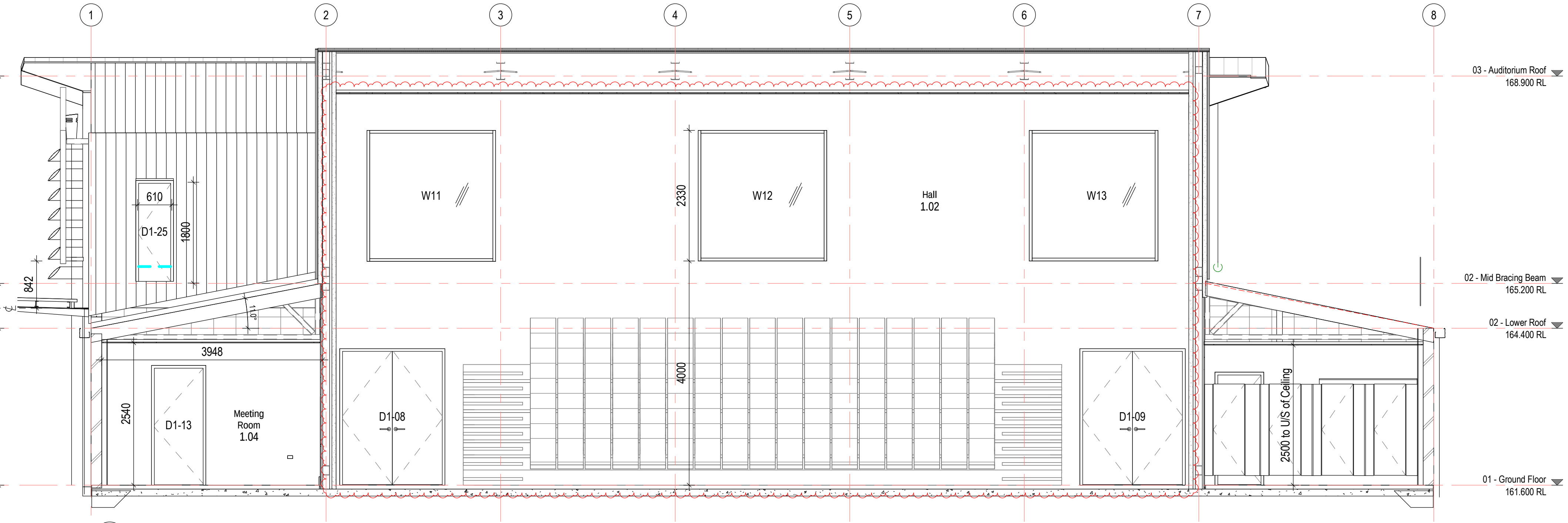
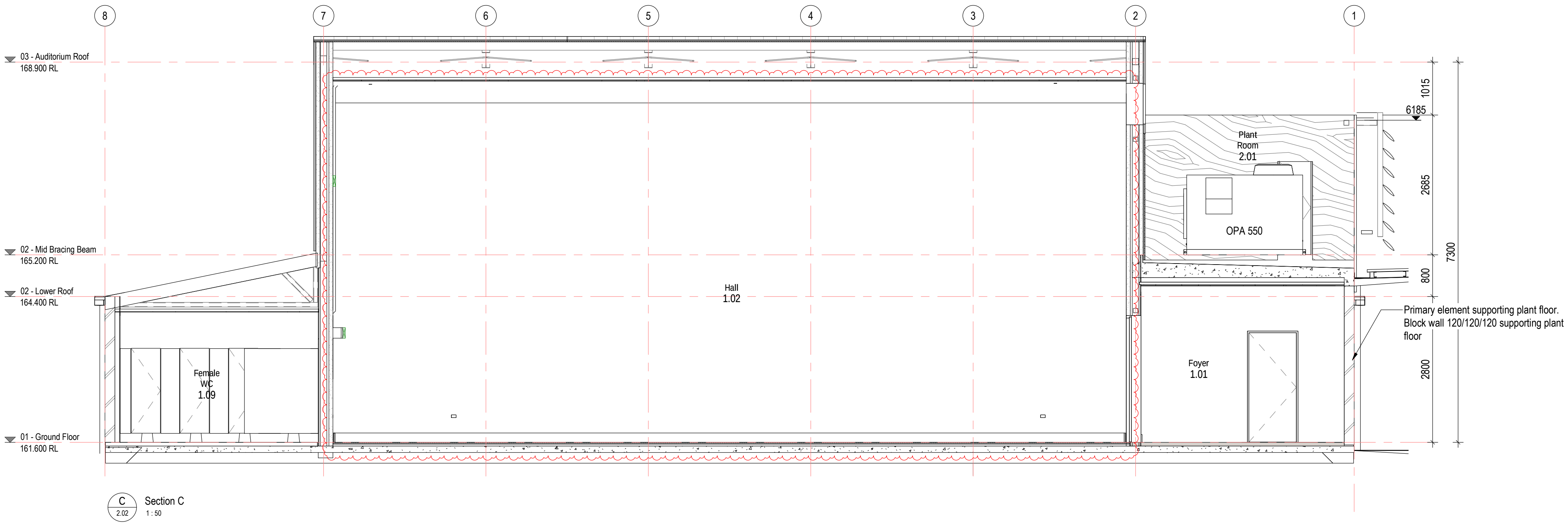


B1 2.02 Section B1
1 : 50



B2 2.02 Section B2
1 : 50



C 2.02 Section C
1 : 50

Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington
Sections
Sections

Job Number: KEC 00104
Design By: RS
Drawn by: CS
As indicated @ A1 / Half for A3 scale
Date: 17/02/2021

A-4.02
Revision: 3

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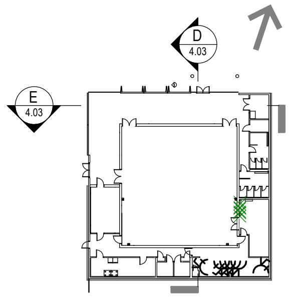

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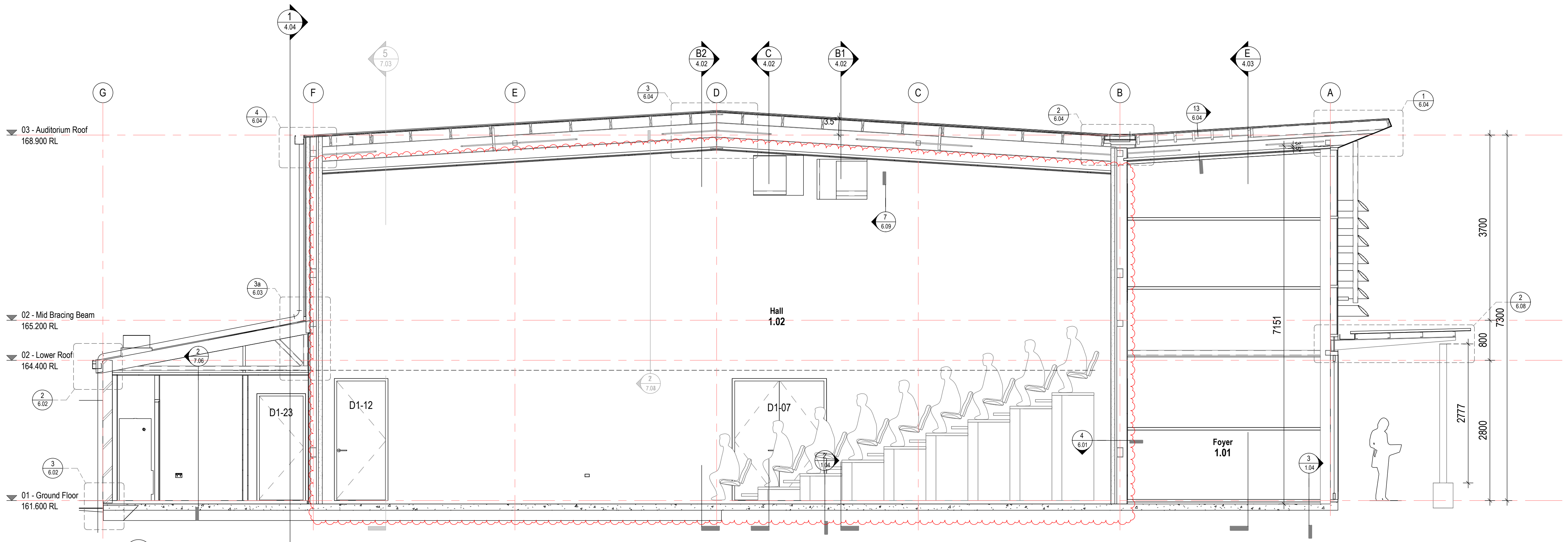
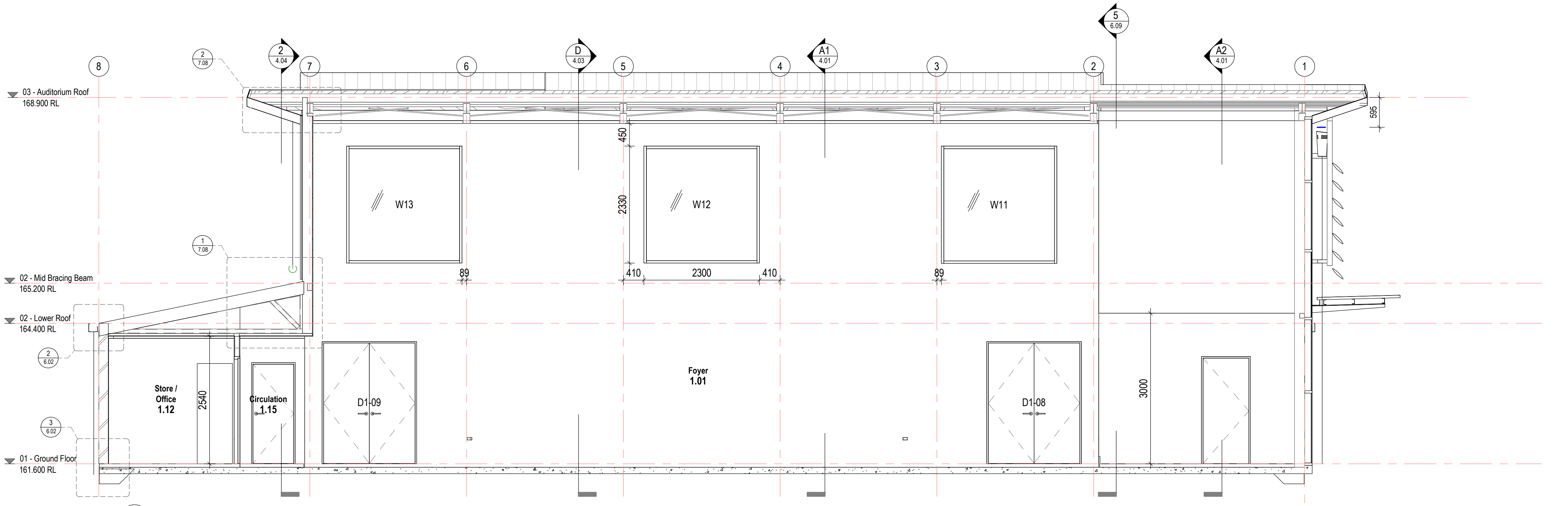


Section D
1 : 50



Section E
1 : 50

Building Consent

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FOR
Karori Community Hall Trust

Project Name:
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Sections
Sections

Revision Note:

1	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: As indicated @ A1 / Half for A3 scale
Date: 17/02/2021
Sheet No: A-4.03
Revision: 1

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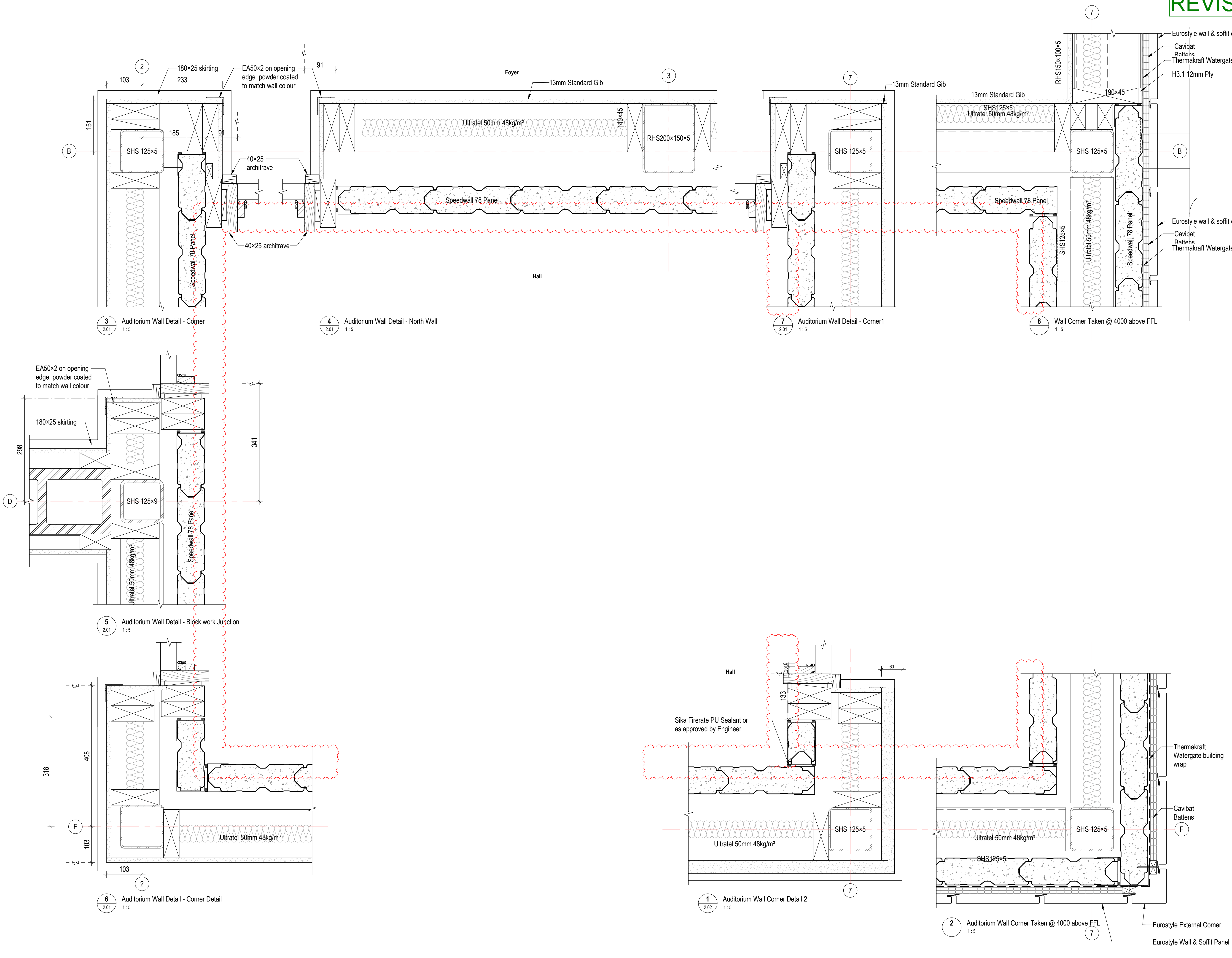

Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington
Enclosure Details
Wall Details

1	Building Consent request for further information	1/06/2016
2	Building Consent Amendment: Refer to separate scope of works list for modifications	16/02/2021

KEC 00104 — Design By: RS — Drawn by: CS
1 : 5 @ A1 / Half for A3 scale — 17/02/2021

A-6.01 — Revision 2

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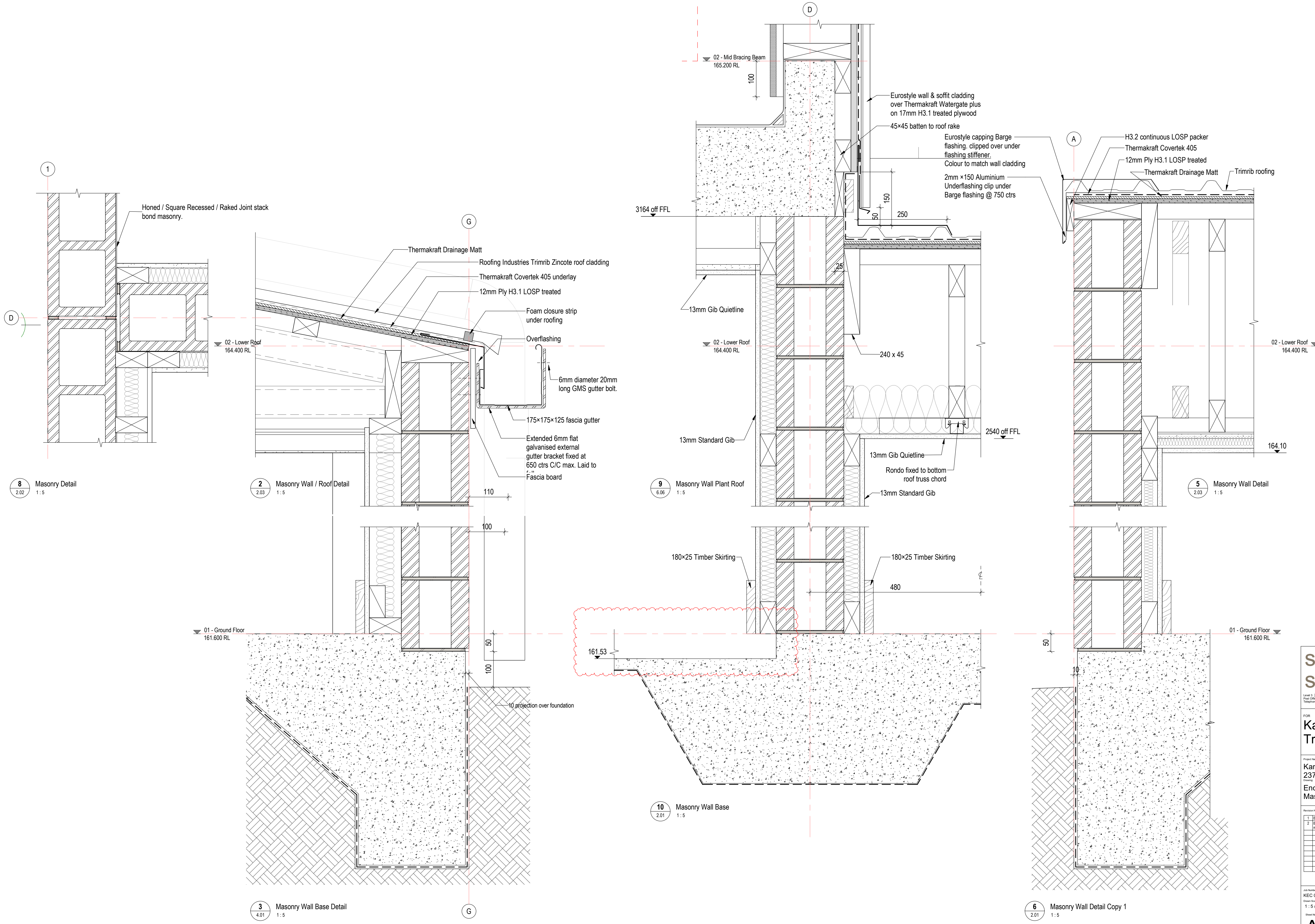
REVISED 29/04/2021



Building Consent

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FOR
Karori Community Hall Trust

Project Name:
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing:
Enclosure Details
Masonry Wall Details

Revision Note:

1	Building Consent request for further information	1/08/2016
2	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
Drawn by: CS
Drawn Scale: 1 : 5 @ A1 / Half for A3 scale
Date: 17/02/2021
Sheet No: A-6.02
Revision: 2

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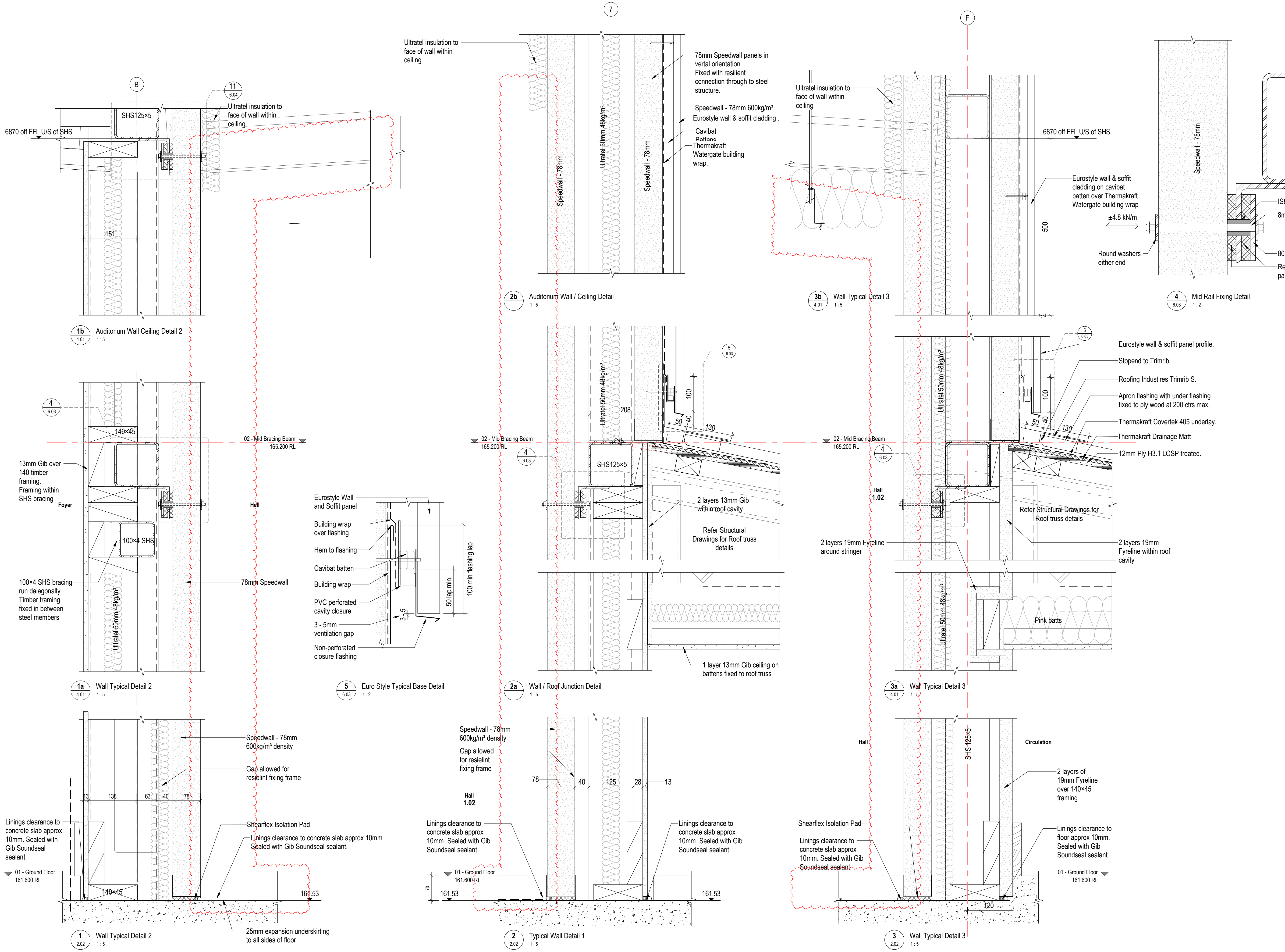
DO NOT SCALE

REVISED 29/04/2021



Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington
Enclosure Details
Wall Details

Job Number: KEC 00104
Design By: RS
Drawn by: CS
As indicated @ A1 / Half for A3 scale
Date: 17/02/2021

A-6.03 2

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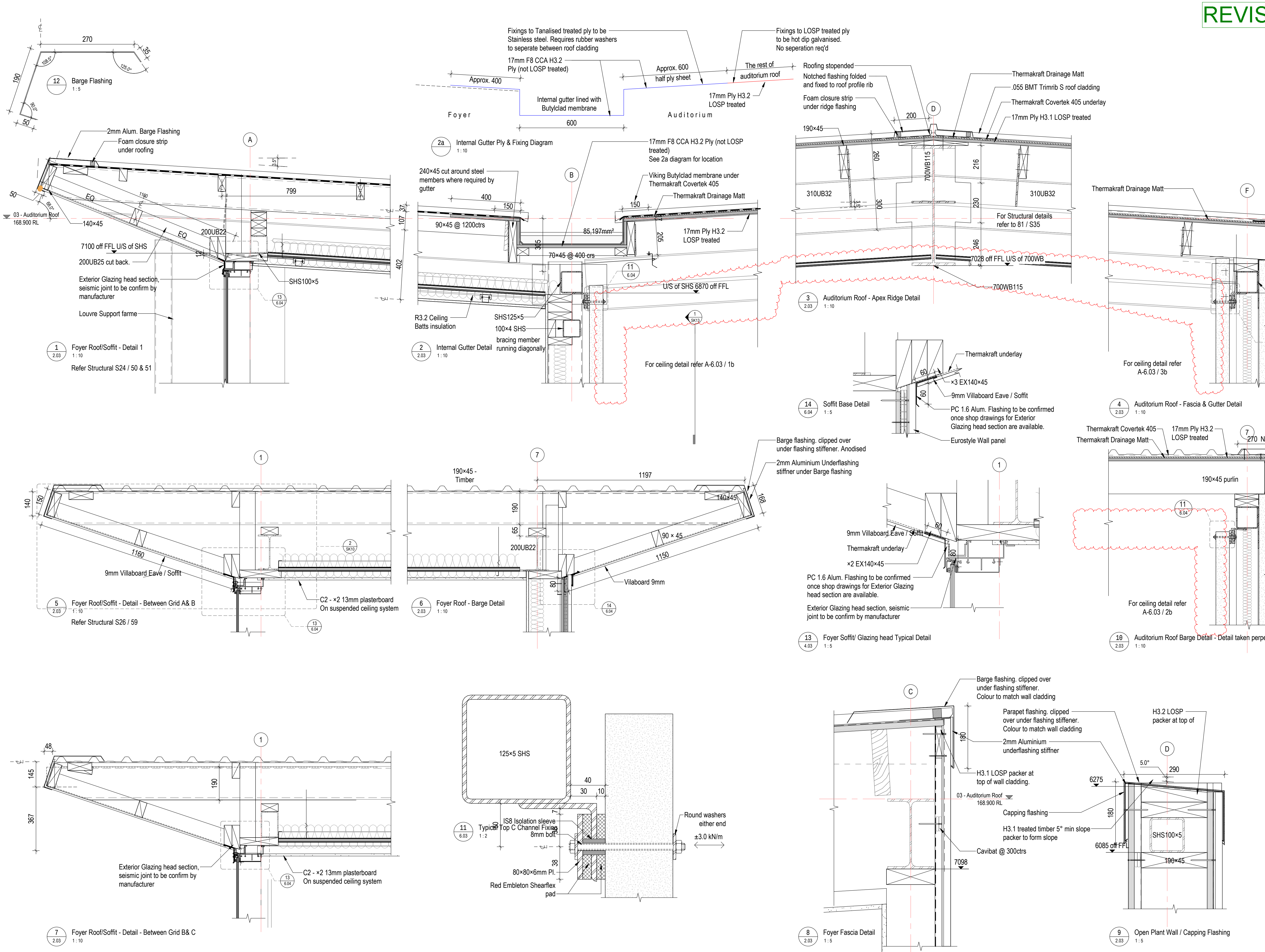

Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington
Enclosure Details
Roof / Soffit

1	Building Consent request for further information	1/08/2016
2	Building Consent Amendment: Refer to separate scope of works list for modifications	16/02/2021

Job Number KEC 00104 | Design By RS | Drawn by CS
As indicated @ A1 / Half for A3 scale | Date 17/02/2021

A-6.04 | Revision 2

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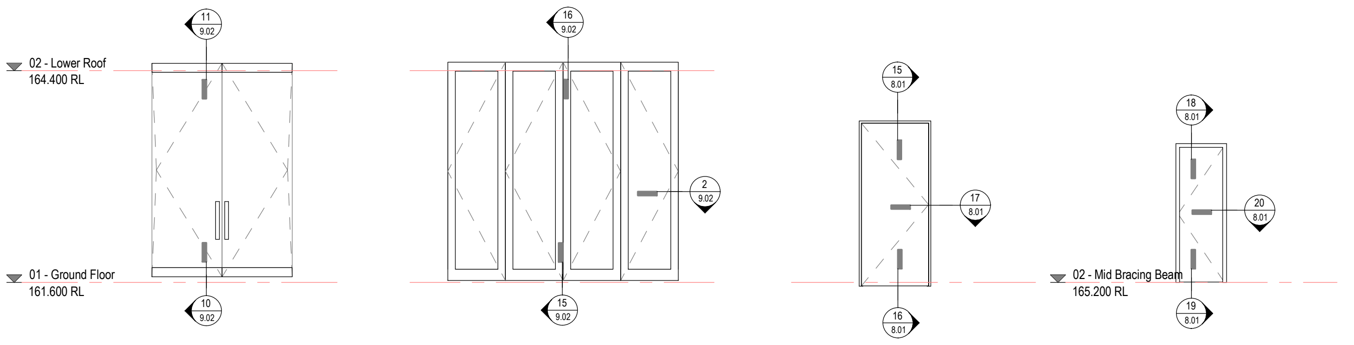
REVISED 29/04/2021

Door Schedule

wtza	Room	Door Type	Construction Type	Seals	Leaf Height	Leaf Width	Secondary Leaf Width	Panel Undercut	Vision Panel	Jamb Width	Hinges	Meeting Styles	Wall Grille
D1-33	Foyer	2	Glazed		1994	2494		0					
D1-34	Foyer	2	Glazed		1994	2494		0					
D1-35	Foyer	2	Glazed		1994	2494		0					
D1-36	Foyer	1	Glazed		1432	875	875	0					
D1-65	Dressing room 1	62			1980	660		0		20			
D1-68	Store	7	Solid Core		1980	860		0		20			
External													
D1-01	Foyer	1	Glazed		2824	928	928	0		30			
D1-03	Foyer	2	Glazed		2889	762		0		30			
D1-04	Foyer	2	Glazed		2889	762		0		30			
D1-05	Foyer	2	Glazed		2889	762		0		30			
D1-06	Foyer	1	Glazed		2874	875	875	0		30			
D1-24	Circulation	15	Aluminium		2150	888		0		20 30			
D1-25	Plant	4	Aluminium		1800	610		0		20 30			
Internal										30			
D1-07	Hall	5	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal. 2×RP16Si Astragal Seals	2400	910	910	5		20 30	4 sets	Square	
D1-08	Hall	5	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal. 2×RP16Si Astragal Seals	2400	910	910	5		20 30	4 sets	Square	
D1-09	Hall	5	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal. 2×RP16Si Astragal Seals	2400	910	910	5		20 30	4 sets	Square	
D1-10	Hall	5	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal. 2×RP16Si Astragal Seals	2400	810	810	5		20 30	4 sets	Rebated	
D1-11	Circulation	6	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal.	2400	1010		5		20 30	4 sets		
D1-12	Circulation	6	Solid Core	RP78Si & RP530 perimeter seals. RP70 base seal.	2400	1010		5		20 30	4 sets		
D1-13	Meeting Room	7	Solid Core		2100	910		0		20 30			
D1-14	Store / Office	8	Solid Core		2100	760	760	5		20 30			
D1-15	Accessible	7	Solid Core		1980	860		20		20 30			
D1-16	Male WC	7	Solid Core		1980	810		5		20 30			600×400
D1-17	Female WC	7	Solid Core		1980	810		5		20 30			600×400
D1-18	Meeting Room	7	Solid Core		2100	910		5		20			
D1-19	Kitchen	7	Solid Core		1980	910		5		20			
D1-20	Kitchen	7	Solid Core		1980	910		5		20			
D1-21	Accessible Shower & Toilet	7	Solid Core		1980	860		20		20			600×400
D1-22	Accessible Shower & Toilet	7	Solid Core		1980	860		20		20			600×400
D1-23	Circulation	7	Solid Core		2100	910		5		20			
D1-26	Cleaners	7	Solid Core		1980	760		5		20			
D1-27	Store	7	Solid Core		1980	760		5		20			



1 Type 1 / D1-01 & D1-06 1 : 50

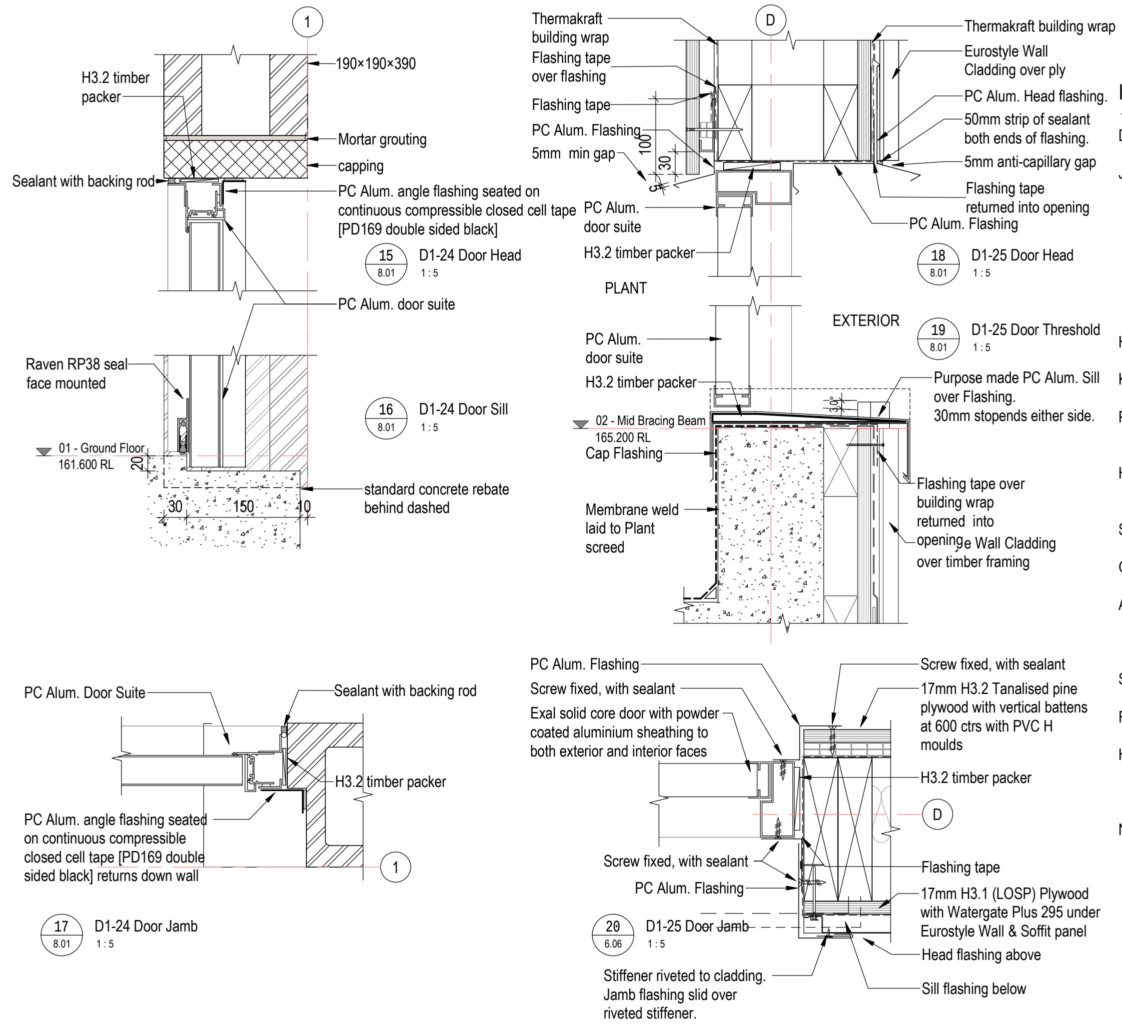
2 Type 2 / D1-03, D1-04 & D1-05 1 : 50

3 Type 3 / D1-24 1 : 50

4 Type 4 / D1-25 1 : 50

EXTERIOR

INTERIOR



15 D1-24 Door Head 1 : 5

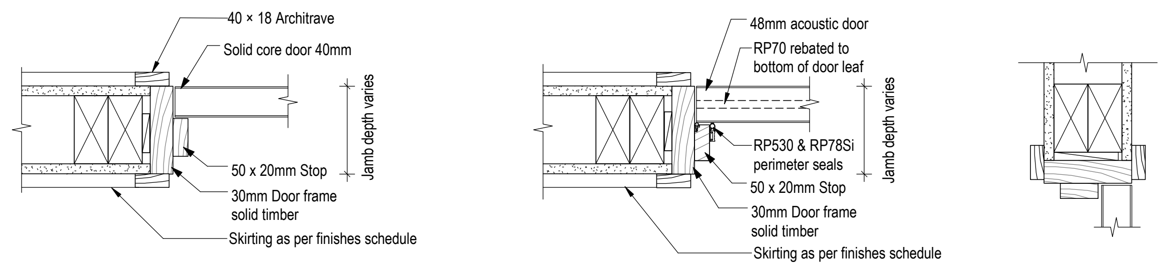
16 D1-24 Door Sill 1 : 5

17 D1-24 Door Jamb 1 : 5

18 D1-25 Door Head 1 : 5

19 D1-25 Door Threshold 1 : 5

28 D1-25 Door Jamb 1 : 5



Standard Door in Timber Framing

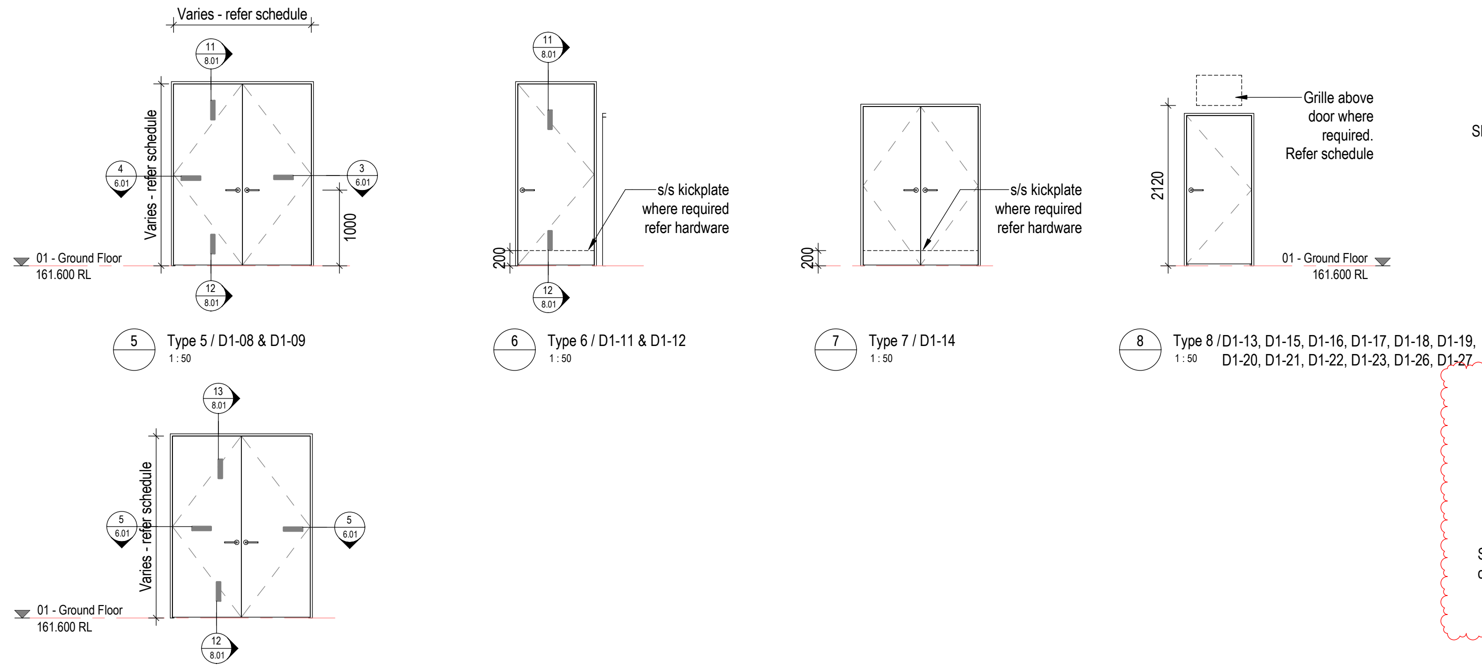
10 Typical Door Details 1 : 5

Acoustic Rated Door in Timber Framing

Head Detail

Interior Door Legend

Door Size:	All sizes shown are leaf size
Jamb Depth:	Door jamb depth varies to suit framing and linings. Typical jamb will be 116mm for 90x45 framing and 166mm for 140x45 framing. Allow extra for some Fyreline walls and where additional linings such as ply or tiles occur. Refer to A-200 Series floor plans and A-1500 Series for wall finishes. All sizes to be checked on site prior to manufacture
Handle Height:	1000mm above floor level
Kickplate:	200mm stainless steel both sides - refer Hardware
Panel Undercut:	All standard as per specification except where shown otherwise
Hinges:	100 x 75mm stainless steel butts - 3 sets per leaf unless otherwise scheduled.
Sliding Gear:	Refer Hardware
Grilles:	As scheduled
Acoustic Seals:	RP78Si & RP530 perimeter seals, RP70 bottom seals to solid threshold plate, 2 x Raven RP16Si astragal seal if double door system.
Smoke Seals:	Intumescent seals as detailed
Finish:	Timber Doors and frames paint finish P4
Hardware:	Refer to Assa Abloy Hardware Schedule ensure allowance for closer supports have been made to doors
Note:	The min. required opening for wheelchair access is 760mm from the leading edge of the door to the closing jamb



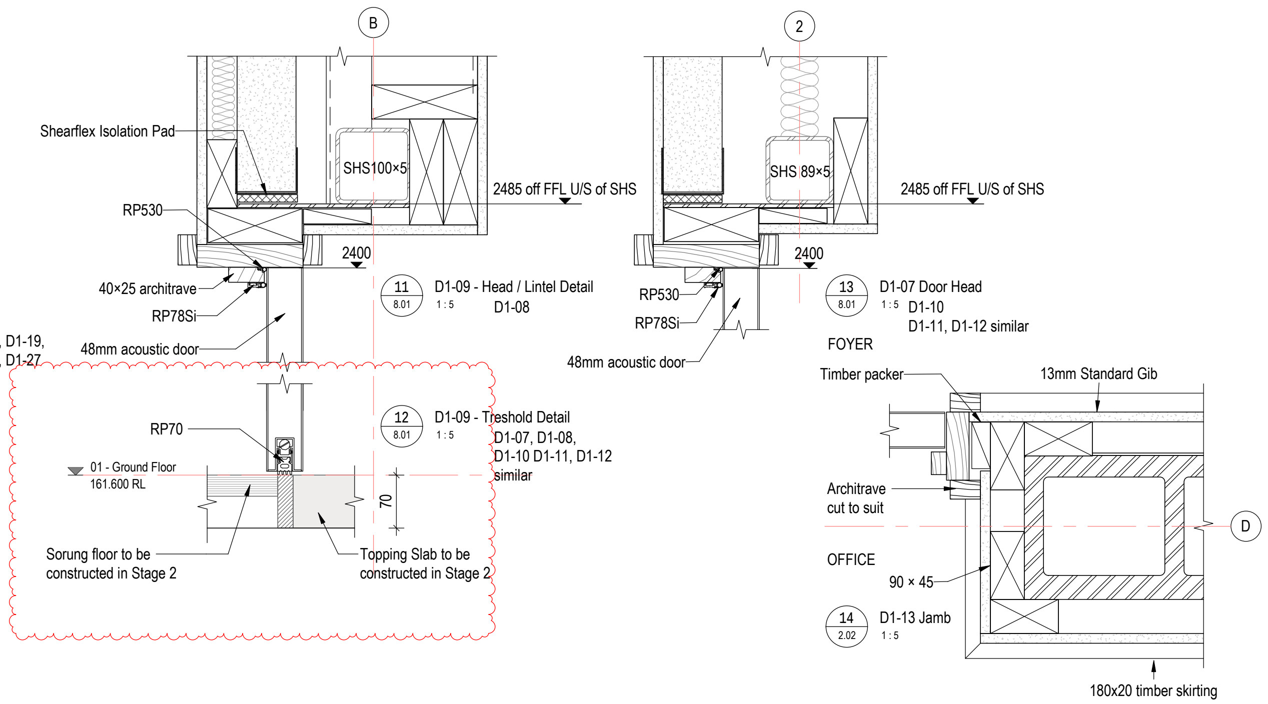
5 Type 5 / D1-08 & D1-09 1 : 50

6 Type 6 / D1-11 & D1-12 1 : 50

7 Type 7 / D1-14 1 : 50

8 Type 8 / D1-13, D1-15, D1-16, D1-17, D1-18, D1-19, D1-20, D1-21, D1-22, D1-23, D1-26, D1-27 1 : 50

9 Type 5 / D1-07 & D1-10 1 : 50



11 D1-09 - Head / Lintel Detail D1-08 1 : 5

12 D1-09 - Treshold Detail D1-07, D1-08, D1-10 D1-11, D1-12 similar 1 : 5

13 D1-07 Door Head D1-10 D1-11, D1-12 similar 1 : 5

14 D1-13 Jamb 1 : 5

Building Consent

shand. shelton

FOR
Karori Community Hall Trust

Project Name
Karori Event Centre
237 Karori Road, Karori, Wellington

Drawing
Doors
Door Schedule

1	Building Consent request for further information	1/06/2016
2	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104 | Design By: RS | Drawn by: CS
Drawn Scale: As indicated @ A1 / Half for A3 scale | Date: 17/02/2021
Sheet No: A-8.01 | Revision: 2

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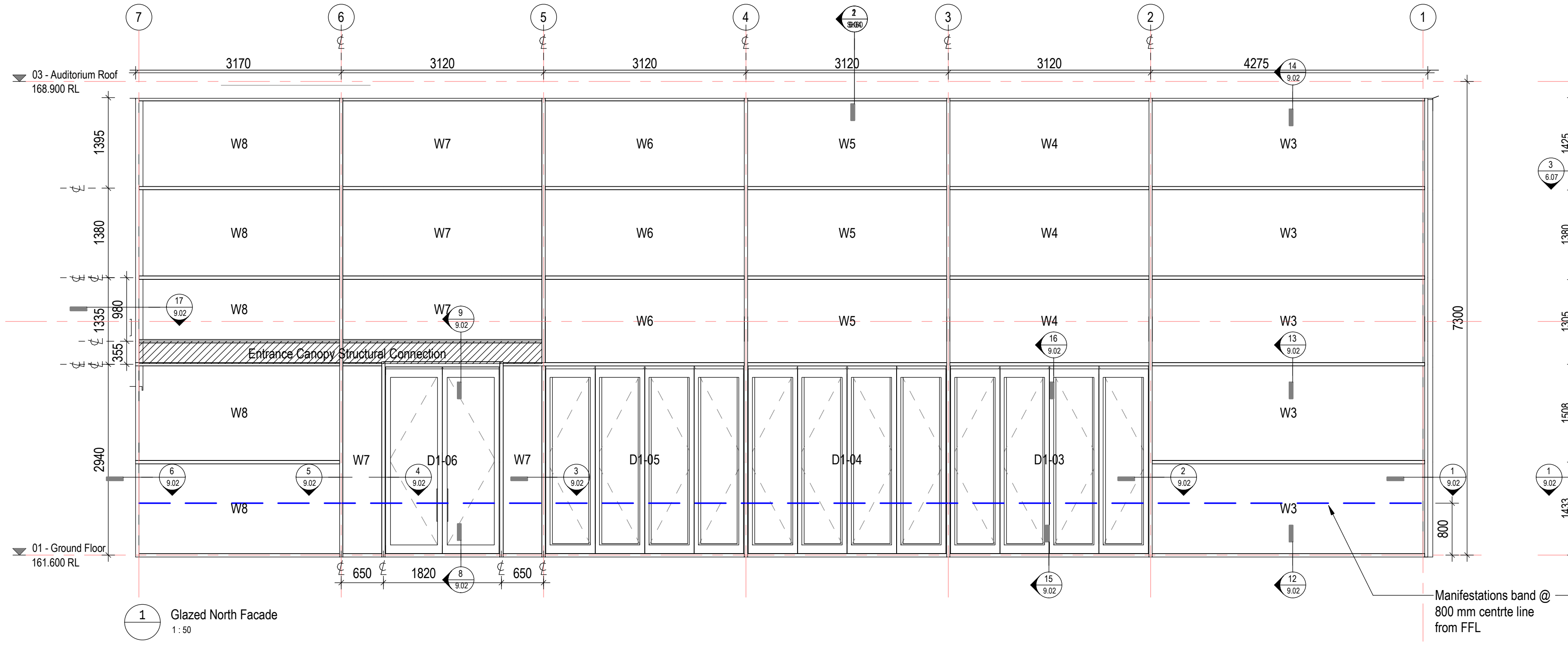
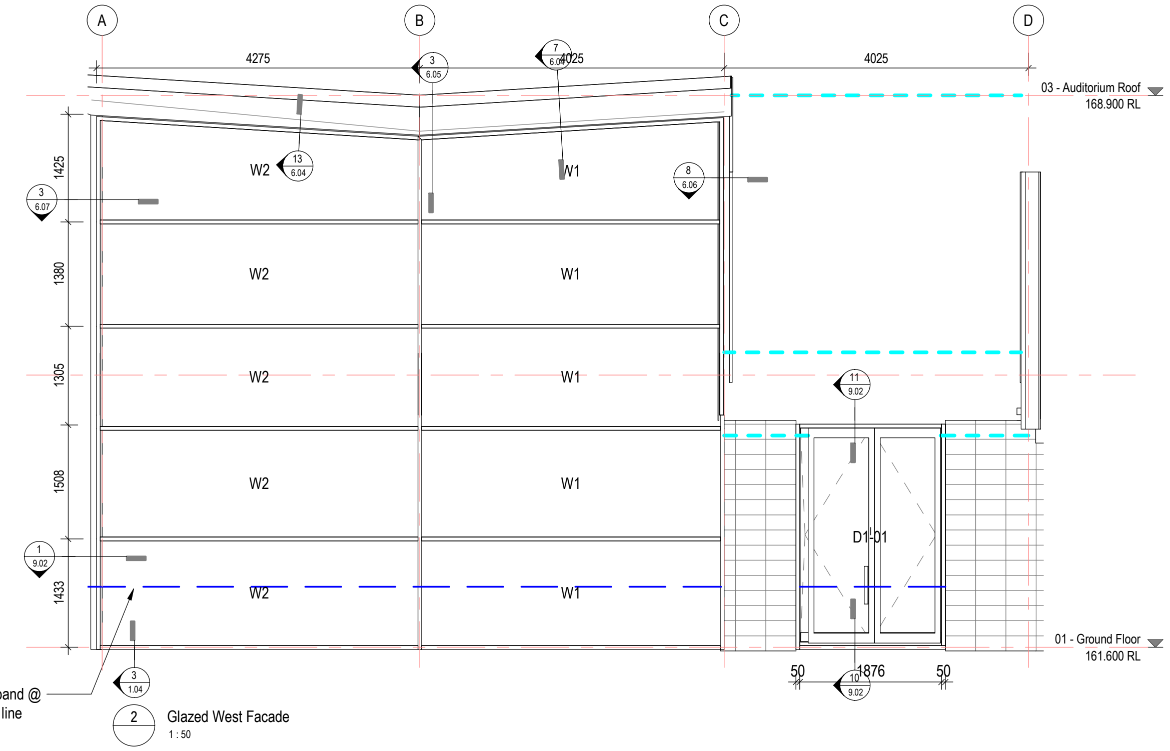
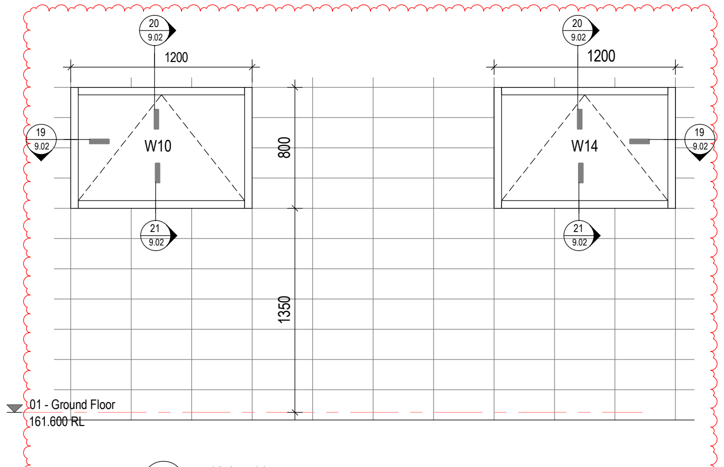


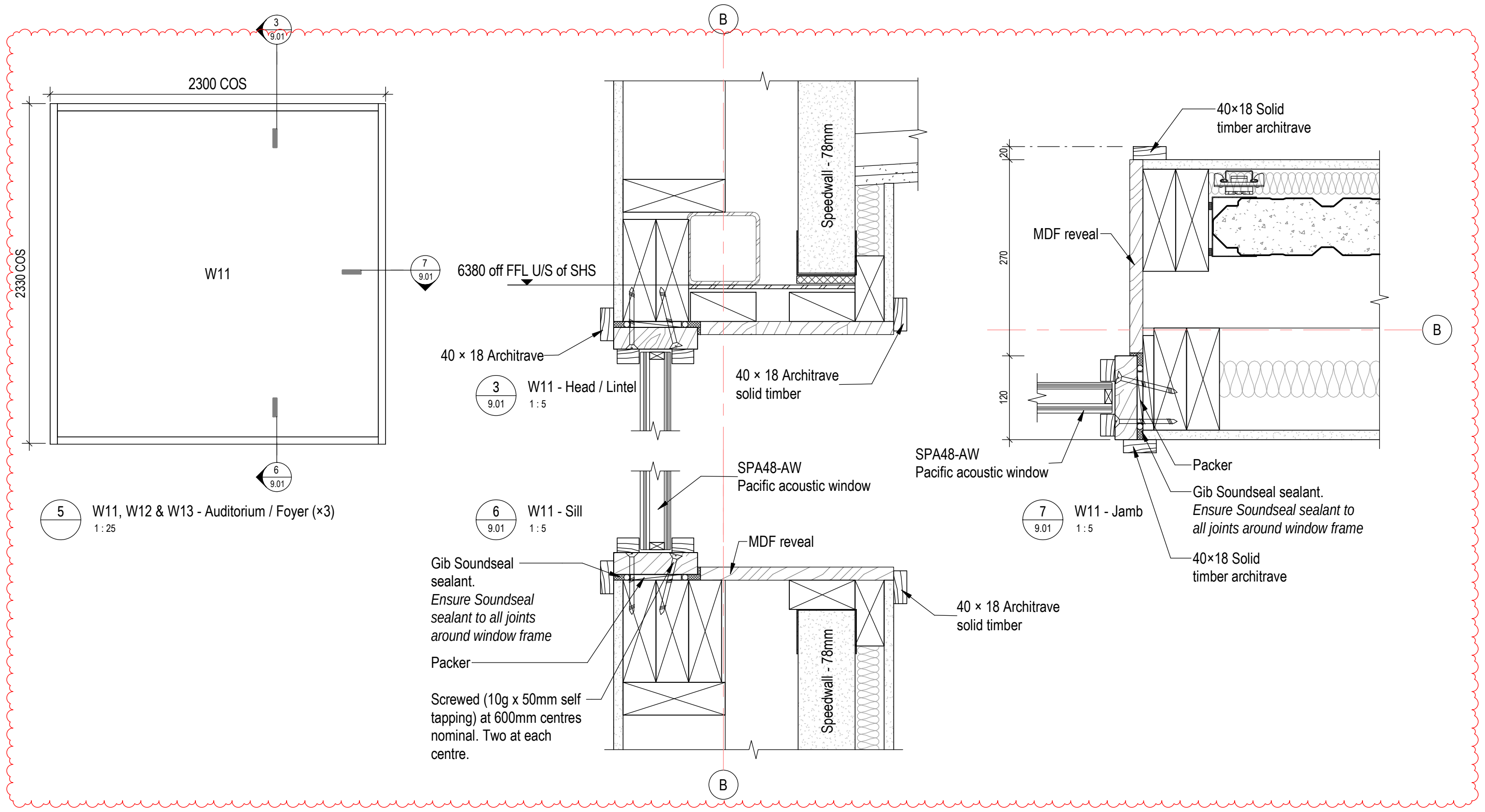
1 Glazed North Facade
1 : 50



2 Glazed West Facade
1 : 50



4 W10 & W14 - Meeting Room
1 : 25



5 W11, W12 & W13 - Auditorium / Foyer (×3)
1 : 25

3 W11 - Head / Lintel
1 : 5

6 W11 - Sill
1 : 5

7 W11 - Jamb
1 : 5

Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington

Windows
Window & Glazed Doors Schedule

	Issued for Preliminary Services Review	22/04/2015
1	Building Consent request for further information	1/08/2016
2	Building Consent Amendment. Refer to separate scope of works list for modifications.	16/02/2021

Job Number: KEC 00104
Design By: RS
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Date: 17/02/2021

A-9.01
2

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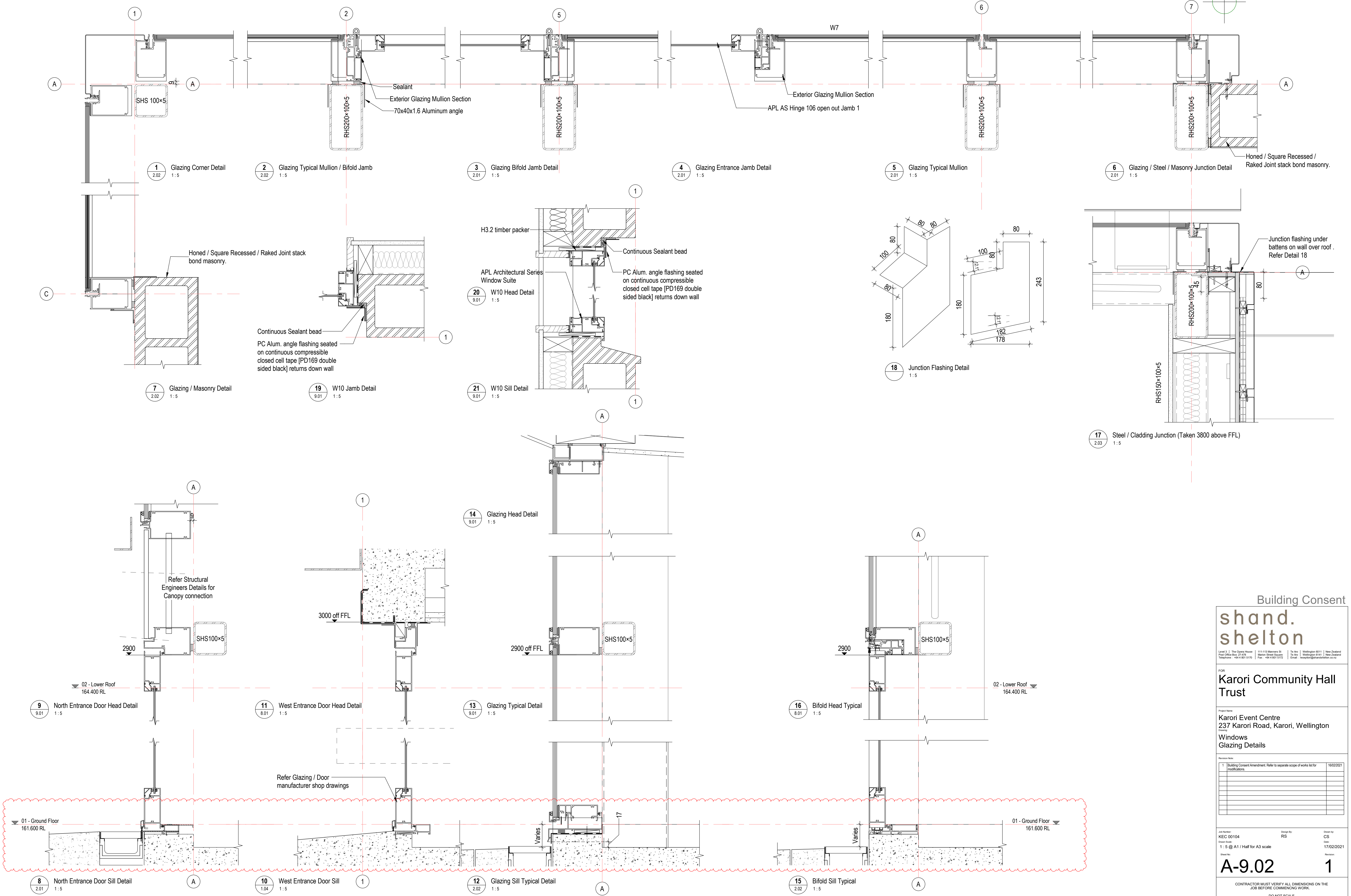

Building Consent

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FOR
Karori Community Hall Trust

Karori Event Centre
237 Karori Road, Karori, Wellington

Windows
Glazing Details

1	Building Consent Amendment: Refer to separate scope of works list for modifications.	16/02/2021

KEC 00104 RS CS
1 : 5 @ A1 / Half for A3 scale 17/02/2021

A-9.02 1

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