

10 Minshull Street and 11 Bloom Street

FLOOR BUILD UP, SHADOW GAP DETAIL BREAKDOWN

PLANNING CONDITIONS RELEASE 11(d)

Planning Permission 119374/FO/2018 – BOTH BUILDINGS

- Prepared by Manchester Design & Build

September 2021



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1. Introduction

Manchester Design and Build has prepared the following Detail Breakdown report to facilitate the release of the planning condition 11(d) for Planning Permission 119374/FO/2018 – BOTH BUILDINGS, as per the following:

“11) Notwithstanding the details as set out in condition 2 above no development shall commence in relation to the following items in respect of Mindel House (10 Minshull Street) And 11 Bloom Street and until final details (including where appropriate specification and method statement) of the following have been submitted to and approved in writing by the City Council as Local Planning Authority:

(d) Details of shadow gaps”

1.1 Scope and Purpose of Report

This report has been prepared to facilitate the release of the above condition and is intended to provide a high-level breakdown of the floor build-up and wall head proposal for both the listed buildings in the scheme. The report serves to inform the reader of the existing proposal and its unsuitability as well as the subsequent further options, summarising a preferred, heritage lead solution.

1.2 Reasoning & Reader Notes

It should be noted that MDB has had experience in delivering buildings that enjoy the same status as this project. During this time it has become apparent, with the unfortunate events of Grenfell Tower that the specifications for approval of fire related items has become substantially more onerous. This has meant that what has been accepted in the past is no longer approved by Fire engineers across the board. The reader should bare this in mind whilst reviewing the contents of this report.

It is understood that the main objective of the heritage lead approach here is to retain as much of the existing historic fabric from the buildings as possible. This is to be done whilst still conforming to Building Regulations requirements in an appropriate thought-out method of application, prioritising the safety of occupants.

The Fire consultant has performed charring rate calculations of both the existing timber floorboards and timber structural beams (**Appendix A1**) which is the structural make-up of the floor, on which we will be installing a new build-up. The calculations show the charring that will occur during a 60 minute fire and the loss of effective structural material.

Given the loss of structural material to charring during the fire, the Structural Engineer has then proofed the effectiveness of the board to perform under the appropriate loads for this scheme for the required duration of the fire, to enable evacuation of the affected areas. (**Appendix A2**)

The SE calculated that the existing floorboards would not perform if any wear over 5mm in depth was present, as the structural threshold in the event of a fire would not be met. For this reason a survey was commissioned to establish where existing boards are reduced greater than 5mm (**Appendix E1 & E2**). It is important to note that approximately 17% in Bloom and 30% in Mindel, of the existing floorboards would need to be removed in order to retain the exposed soffit. A further summary of the survey outcomes is outlined below.

1.3 Survey Summary:

As previously discussed a survey was performed of both buildings to establish, as per the Structural and Fire Engineers technical notes (**Appendix A1 & A2**), where specifically existing floorboards are worn to a depth of less than 65mm. This survey information (**Appendix E1 & E2**) has been instrumental in highlighting which boards require removal in place of new boards to be installed to effectively form a certified fire separation compartment between floors.

Bloom Building:

Ground Floor:

The ground floor has a dramatically reduced area of floorboards in comparison to the rest of the floor plates. The removal of the floorboards is caused by former proposals the building has historically experienced. The percentage of the floorboards that require removal due to parameters of the SE calculations not being met equates 8.3%.

1st Floor:

This floor has various spots of wear most of which is focused towards the Richmond Street Elevation and a corner fronting Bloom Street and the Alleyway. The percentage of the floorboards that require removal due to parameters of the SE calculations not being met equates 19%.

2nd Floor:

This floor has various spots of wear throughout and it should be noted that large areas could not be surveyed due to the presence of existing ceilings. The percentage of the floorboards that require removal due to parameters of the SE calculations not being met equates 13%.

3rd Floor:

This floor has the most wear of all the floor plates with large areas of focused wear that is evident on the plans. The percentage of the floorboards that require removal due to parameters of the SE calculations not being met equates 24%.

4th Floor:

This floor has no wear as it is all more recent millboard, installed because of historic fire damage. The survey shows no signs of wear over 5mm.

Summary:

In a situation where the soffit is exposed, the overall calculations shows the percentage of boards that would require removal from the building would equate to 16.5%. The working out of these figures is performed by MDB and can be seen in **Appendix E1 & E2**.

Mindel House:**Ground Floor:**

This area was unable to be surveyed in the same way as the following floors as floor coverings are currently in place.

1st Floor:

This floor has various spots of wear most of which is focused towards the Richmond Street Elevation. The percentage of surveyed floorboards that require removal due to parameters of the SE calculations not being met equates 21%.

2nd Floor:

This floor has various large areas of wear throughout and it should be noted that large areas could not be surveyed due to the presence of existing ceilings. The percentage of surveyed floorboards that require removal due to parameters of the SE calculations not being met equates 36%.

3rd Floor:

This floor has the most wear of all the floor plates with large areas of focused wear that is evident on the plans, specifically facing the Minshull St. elevation. The percentage of surveyed floorboards that require removal due to parameters of the SE calculations not being met equates 61%.

4th Floor:

This floor has various large areas of wear throughout and it should be noted that large areas could not be surveyed due to the presence of existing ceilings. The percentage of surveyed floorboards that require removal due to parameters of the SE calculations not being met equates 40%.

Summary:

In a situation where the soffit is exposed, the overall calculations shows the percentage of boards that require removal from the building would equate to 40% of the surveyed floor area and 30% when taking into account the whole floor plate on each of the surveyable floors. The working out of these figures is performed by MDB and can be seen in **Appendix E1 & E2.**

1.4 Executive Summary:

From the options presented below it is clear that any solutions exposing the existing floorboards require intrusive, unapproved, uncertified and irreversible fire separation works to existing historic fabric. Further to this, a survey (**Appendix E1 & E2**) shows a total of 16.5% and 30% of the existing floorboards in the Bloom building and Mindel House respectively would require wholesale removal from the site for effective fire separations works to be performed (**Appendix A1 & A2**). Beyond this, the only acceptable but uncertified fire rated solution with exposure of the floorboards, involves the installation of a sprinkler system, which if triggered will cause irreparable damage to historic elements, further detailed out below in the breakdown. It should be mentioned that all proposals seek to retain on view the existing timber beams which require the stripping and cleaning of surfaces to receive an intumescent treatment.

Further to the fireproofing works, the acoustic separation between apartments on the same floor is compromised on all options where the soffit is exposed, or a deflection head detail/ shadow gap is on show. Flanking noise transmission occurs either through the ceiling or the exposed deflection head and will cause the reduction in the overall dB rating of the wall construction. This in turn requires the removal of the shadow gap plan arrangement to the vertical perimeter walls, where the detail is most aesthetically valuable.

Although from an aesthetic point of view it is preferred that the existing floorboards should remain visible, the contents of this report clearly highlights that this would be more detrimental to the preservation of the historic fabric of the building than beneficial. For this reason, the option put forward for approval is **solution D** outlined in **section 5**.

It is noted that a similar approach has been taken on other schemes approved by MCC for example:

- Kampus – Two listed buildings on Chorlton Street converted into residential apartments. (**Appendix B1**)
- 47 Peter Street – A listed building converted into a hotel (ie. rooms for residential purposes) (**Appendix B2**)

Clear advantages of the approach include:

- Neat and clean finish to soffit.
- Acoustic requirements are satisfied between floors and walls to apartments, flanking issues eliminated.
- Unintrusive, approved, certified and reversible fire separation works.
- 18mm plyboard helps to deal with existing variation in levels across floors and reduces impact sound transmission.
- Non-invasive approach existing floorboards can be retained in place and left undisturbed.
- Ability to produce shadow gap detail at vertical perimeter wall junctions between proposed internal walls and existing exposed masonry perimeter walls.

To this end drawing 061_508_D (**Appendix F**) has been amended and updated as the preferred solution and is the submitted drawing for approval and conditions discharge.

2. Original Approved Solution A

2.1 Detail Breakdown

Fig. 1 shows the original floor build-up proposal covering the existing floors of both buildings, consisting of an insulated underfloor heating solution, along with acoustic insulation and battens for sound reduction performance between apartments both horizontally and vertically. The solution for the fire separation between floors here was the introduction of an intumescent paint to the underside of the existing floorboards.

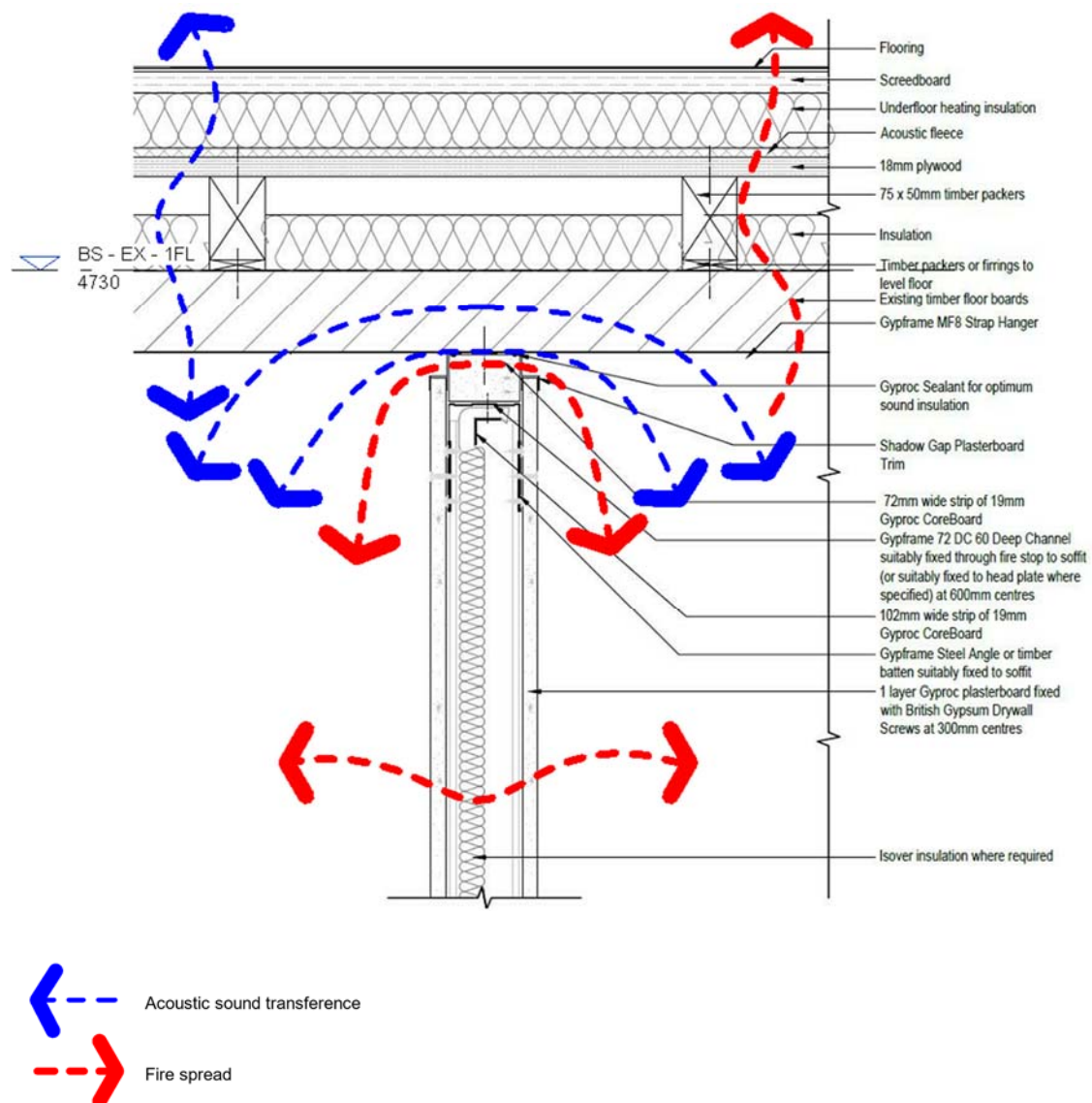


Fig.1: APPROVED DRAWING 061_508_A

2.2 Advantages

- Exposure of existing floorboards to the apartments.

2.3 Disadvantages

- Intrusive unapproved/ uncertified fire separation works:
 - Existing boards to be stripped back of existing failed paint.
 - Existing boards to be relayed with no gaps present
 - Existing boards under 65mm depth to be removed and replaced with new boards.
 - Existing boards to be intumescent painted to underside.
 - Intumescent mastic to be applied to gaps between boards from below.
- Acoustic separation between apartments horizontally and vertically is severely underperforming due to flanking noise transference through the existing floorboards as well as impact transmission vertically. (Refer to acoustic report in **Appendices C1** for further detailed breakdown).
- After further detailed design it has become apparent underfloor heating would not be an effective strategy to heat the building as perimeter external facing walls are not insulated, meaning that in winter months the space would not be heated fast enough to account for the dissipation of heat through the existing unlined walls.
- Lack of ability to level off existing floorboards to receive new build-up.

2.4 Summary

The suitability of this particular detail after further design development, has been determined to be insufficient in several ways as highlighted above.

The most concerning deficiency being the fire related treatments involved in bringing the floor to a standard that still does not serve as a separating compartment between apartments. The fire treatment is such that it requires unavoidable and considerable intervention and removal to existing elements of the building. The fire consultant cannot approve this solution.

From a heritage aspect this solution removes a significant quantity of the existing fabric from the building, which is unnecessary upon review of the further options below.

Given the further detailed design and assessment of the current approved approach to the floor build-up it is evident that this solution fails to satisfy the LBC, LA, Fire Consultants, M&E Consultants or the Acousticians requirements. For a safe, BR compliant and rentable approach it is obvious that this solution would be unacceptable both from an occupancy and heritage viewpoint.

3. Amended Proposed Solution B

3.1 Detail Breakdown

Fig. 2 shows an amended investigated proposal, similar to the original approved solution above. A build up covering the existing floors of both buildings, consisting of an acoustic cradle and batten system with insulation between, a screed board above for sound reduction performance between apartments both horizontally and vertically. The solution for the fire separation between floors here is the introduction of an intumescent paint to the underside of the existing floorboards.

In addition to this, to alleviate some of the flanking problems experienced in Solution 1, steel angles have been introduced to the vertical wall head detail. Compressed mineral wool behind the steel angles is tightly packed with acoustic mastic sealing joints. To aid acoustics further, a resilient bar acoustic wall has also been introduced to help with the reduction of sound transmission between apartments horizontally.

Not relevant to the detail however it should be noted that, the heating solution has been changed to panel radiator system, in place of an underfloor heating system.

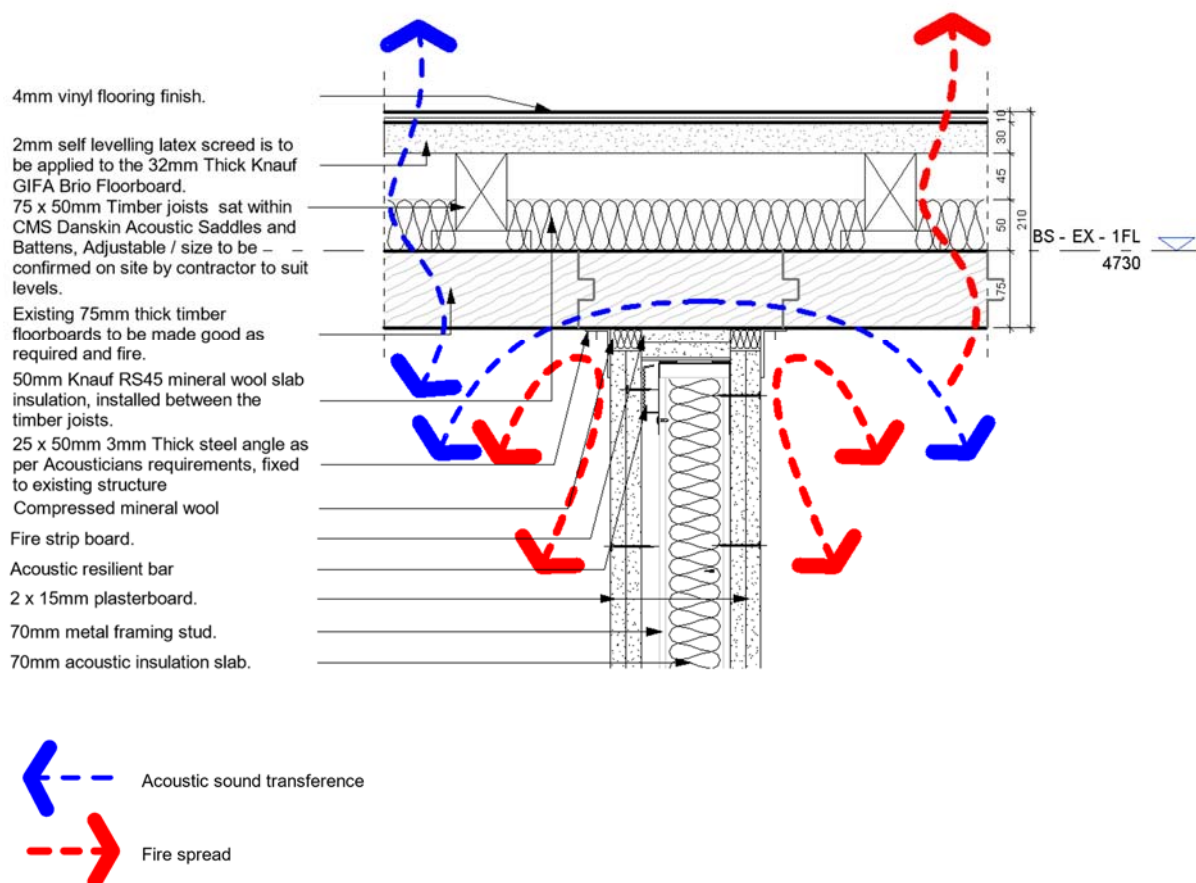


Fig 2:

3.2 Advantages

- Exposure of existing floorboards to the apartments.
- A further level of acoustic separation horizontally and vertically to that of Solution 1.

3.3 Disadvantages

- Intrusive unapproved/ uncertified fire separation works:
 - Existing boards to be stripped back of existing failed paint.
 - Existing boards to be relayed with no gaps present
 - Existing boards under 65mm depth to be removed and replaced with new boards.
 - Existing boards to be intumescent painted to underside.
 - Intumescent mastic to be applied to gaps between boards from below.
- Acoustic separation between apartments horizontally is still compromised due to flanking noise transference through the existing floorboards. (Refer to acoustic report in **Appendices C2** for further detailed breakdown)
- Acoustic separation between apartments vertically is severely underperforming due to impact transmission. (Refer to acoustic report in **Appendices C2** for further detailed breakdown).
- Shadow gap at vertical junctions where proposed meets existing cannot occur. (Refer to acoustic report in **Appendices C2** for further detailed breakdown)
- Lack of ability to level off existing floorboards to receive new build-up.
- Metal trim will not meet the desired aesthetic finish as seen in the **Appendices D1**.

3.4 Summary

The suitability of this particular detail after further design development has taken place, has been determined to be insufficient in a number of ways as highlighted above.

Although this is an improvement to solution A acoustically, it still does not alleviate the underperformance the acoustician has previously presented.

The most concerning deficiency being the fire related treatments involved in bringing the floor to a standard that serves as a separating compartment between apartments. The fire treatment is such that it requires unavoidable and considerable intervention and removal to existing elements of the building.

From a heritage aspect this solution removes a significant quantity of the existing fabric from the building, which is unnecessary upon review of the further options below.

It is evident that this solution fails to satisfy the LBC, LA, Fire Consultants, M&E Consultants or the Acousticians requirements. For a safe, BR compliant and rentable approach it is obvious that this solution would be unacceptable both from an occupancy and heritage viewpoint.

4. Amended Proposed Solution C

4.1 Detail Breakdown

Fig. 3 shows an amended investigated proposal adding to solution B. A build up covering the existing floors of both buildings, consisting of an acoustic cradle and batten system with insulation between, a screed board above for sound reduction performance between apartments both horizontally and vertically. An 18mm plyboard fixed to the existing boards has been introduced in this option to increase acoustic performance, reducing impact noise transmission. The solution for the fire separation between floors as well as flanking acoustic transference here, is the introduction of 2 no. layers of fire line board to the former exposed soffit via a fixed ceiling top hat channel to the existing boards and acoustic insulation to the cavity.

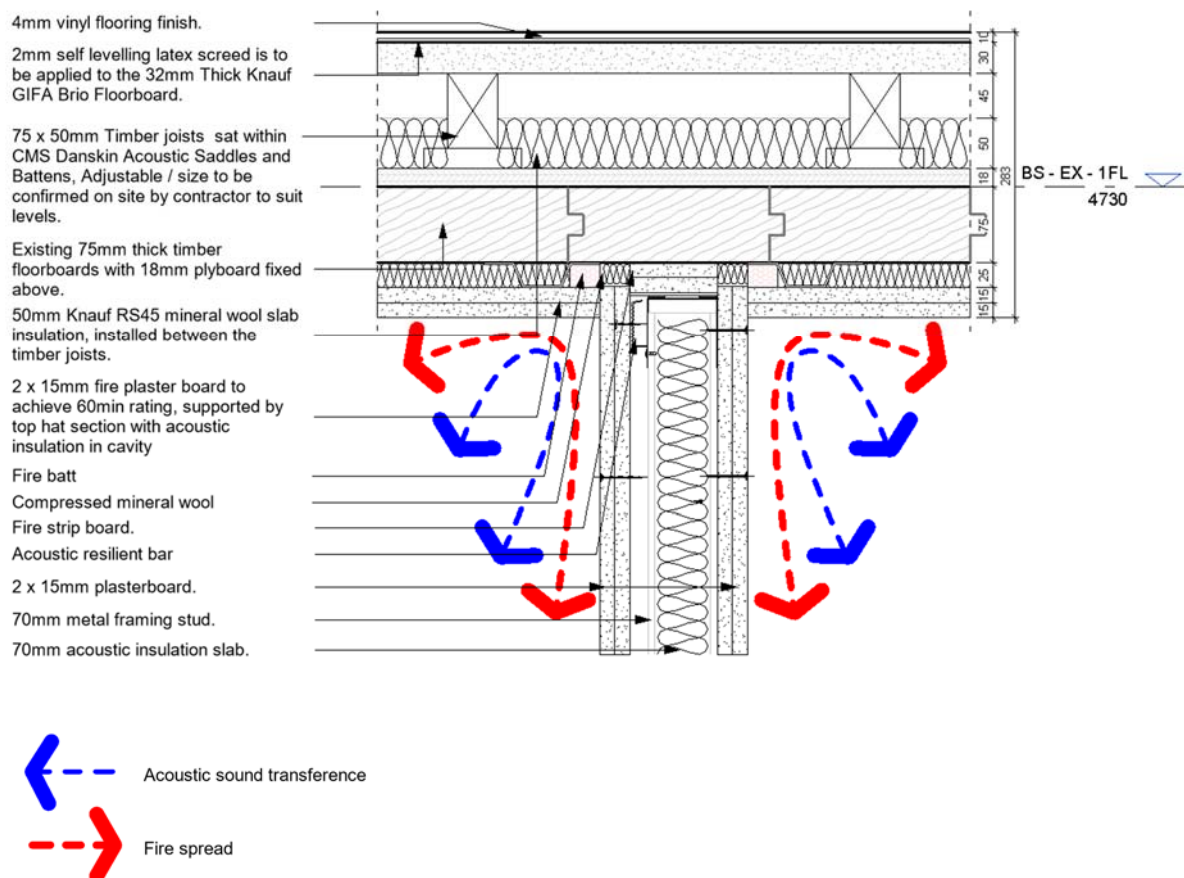


Fig. 3

4.2 Advantages

- Neat and clean finish to soffit whilst maintaining exposure of existing timber beams.
- Acoustic requirements are satisfied between floors and walls to apartments, flanking issues eliminated.
- Unintrusive, approved, certified and reversible fire separation works.
- 18mm plyboard helps to deal with existing variation in levels across floors and impact noise resistance.
- Non-invasive approach, existing floorboards can be retained in place and left undisturbed.
- Reversible solution for retention and future uncovering of original fabric.

4.3 Disadvantages

- Departure from original approval, concealment of existing floorboards to apartments at ceiling level.
- Current M&E services proposal is compromised.
- Shadow gap at vertical junctions where proposed meets existing cannot occur. (Refer to acoustic report in **Appendices C3** for further detailed breakdown)

4.4 Summary

From the options presented so far this is the most effective solution. The further materials added to the detail enable all acoustic requirements to be fulfilled in line with Building Regulations.

Fire separation between floors is also dealt with in an efficient approach, with no removal to the historic fabric. Unlike the other solutions existing materials on site will not require intervention or removal from the building only supplementary covering which could be easily removed at a later date to reveal the intact historic fabric.

From a heritage aspect this solution does not remove any existing valuable fabric from the building, nor does it require any invasive works to be carried out on the existing floorboards.

The M&E strategy for the buildings is however compromised in that the reduction in floor to ceiling height makes the services running through the existing tight corridor layouts to be a more bespoke solution, with fittings and arrangement increasing ventilation noise due to duct shapes and sizes.

Unfortunately, this detail does enable the shadow gap arrangement to be present at vertical wall junctions to the existing perimeter masonry. Although this is a departure from the original approval, given the further detailed design and assessment of the options presented so far, it is apparent that this is a solution that would serve all stakeholders in the scheme including the buildings themselves.

5. Amended Proposed Solution D (PREFERRED SOLUTION)

5.1 Detail Breakdown

Fig. 4 shows an amended investigated proposal improving on solution C. A build up covering the existing floors of both buildings, consisting of an acoustic pedestal system with insulation between, a screed board above for sound reduction performance between apartments both horizontally and vertically. An 18mm plyboard fixed to the existing boards has been introduced in this option to increase acoustic performance, reducing impact noise transmission. The solution for the fire separation between floors as well as flanking acoustic transference here, is the introduction of 2 no. layers of fire line board to the former exposed soffit via a fixed ceiling top hat channel to the existing boards and acoustic insulation to the cavity.

As well as this a twin stud has been specified in order that a shadow gap detail can be retained at vertical existing perimeter wall junctions.

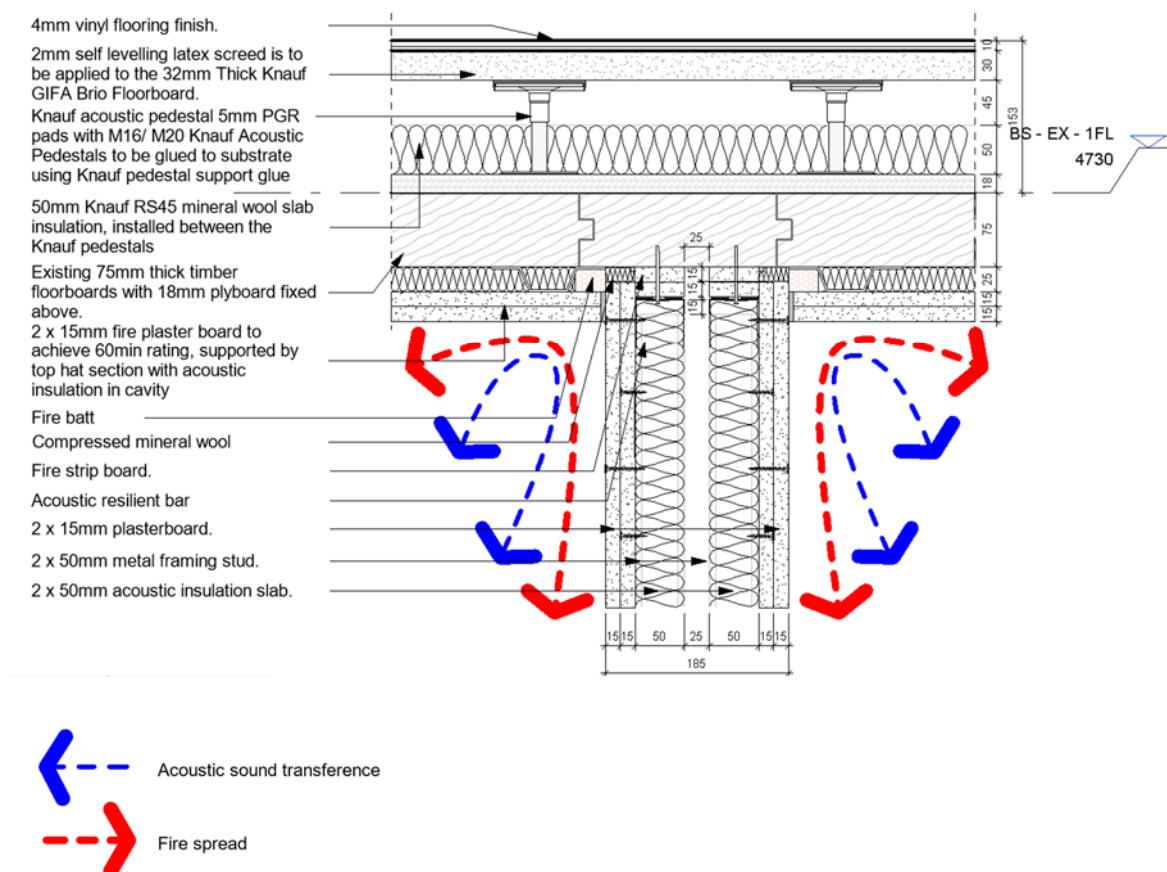


Fig. 4

5.2 Advantages

- Neat and clean finish to soffit.
- Acoustic requirements are satisfied between floors and walls to apartments, flanking issues eliminated. **(Appendix C4 and C5)**
- Unintrusive, approved, certified and reversible fire separation works.
- 18mm plyboard helps to deal with existing variation in levels across floors and impact noise resistance.
- Non-invasive approach existing floorboards can be retained in place and left undisturbed.
- Reversible solution for retention and future uncovering of original fabric.

5.3 Disadvantages

- Departure from original approval because of concealment of existing floorboards to apartments at ceiling level.
- Current M&E services proposal is compromised with a new strategy required.

5.4 Summary

From the options presented so far this is the most effective solution. The further materials added to the detail enable all acoustic requirements to be fulfilled in line with Building Regulations.

Fire separation between floors is also dealt with in an efficient approach, with no removal to the historic fabric. Unlike the other solutions existing materials on site will not require intervention or removal from the building only supplementary covering which could be easily removed at a later date to reveal the intact historic fabric.

From a heritage aspect this solution does not remove any existing valuable fabric from the building, nor does it require any invasive works to be carried out on the existing floorboards.

The M&E strategy for the buildings is however compromised in that the reduction in floor to ceiling height makes the services running through the existing tight corridor layouts to be a more bespoke solution, with fittings and arrangement increasing ventilation noise due to duct shapes and sizes.

This detail also enable the shadow gap arrangement to be present at vertical wall junctions to the existing perimeter masonry. Although the ceiling treatment is a departure from the original approval, given the further detailed design and assessment of the options presented so far, it is apparent that this is a solution that would serve all stakeholders in the scheme including the buildings themselves.

6. Amended Proposed Solution E

6.1 Detail Breakdown

Fig. 5 shows a build-up covering the existing floors of both buildings, consisting of an acoustic pedestal system with insulation between, with a screed board above for sound reduction performance between apartments both horizontally and vertically. An 18mm plyboard fixed to the existing boards has been introduced in this option to increase acoustic performance, reducing impact noise transmission. The solution for the fire separation between floors here is the introduction of a sprinkler system to the apartments along with intumescent treatment to the underside of the existing floorboards.

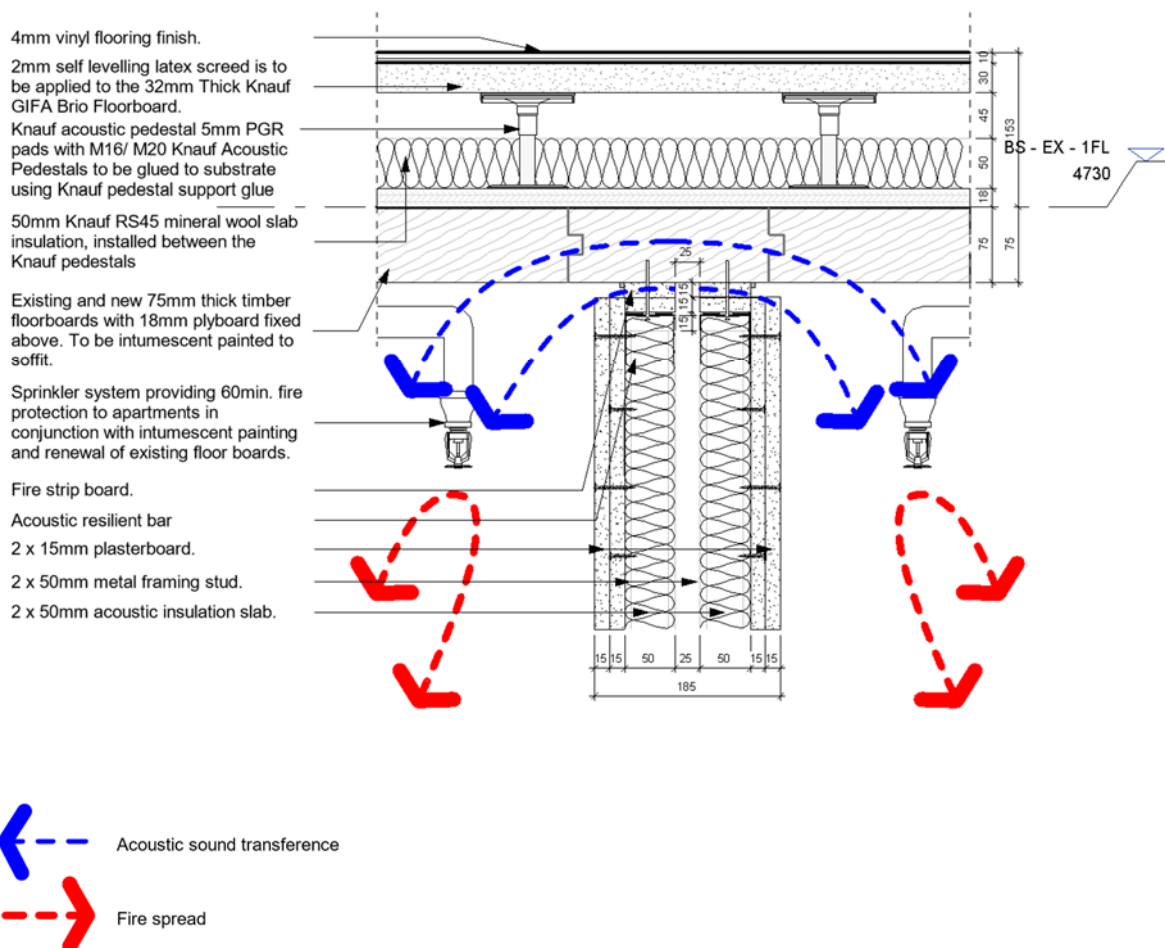


Fig. 5

6.2 Advantages

- Exposure of existing floorboards to the apartments.
- Approved and certified fire separation achieved.
- 18mm plyboard helps to deal with existing variation in levels across floors and impact noise resistance.

6.3 Disadvantages

- Intrusive, unapproved, uncertified and irreversible fire separation works:
 - Existing boards to be stripped back of existing failed paint.
 - Existing boards to be relayed with no gaps present
 - Existing boards under 65mm depth to be removed and replaced with new boards.
 - Top surface of existing boards to be levelled and gaps sealed with resin layer before plyboard fixed down.
 - Existing boards to be intumescent painted to underside.
 - Intumescent mastic to be applied to gaps between boards from below.
 - Installation of sprinkler system (if triggered will cause irreversible damage of historic fabric)
- Acoustic separation between apartments horizontally is still compromised due to flanking noise transference through the existing floorboards as well as the exposure of the deflection head. (Refer to acoustic report in **Appendices C1, C2, C4, C5** for further detailed breakdown)
- Shadow gap at vertical junctions where proposed meets existing cannot occur. (Refer to acoustic report in **Appendices C1 and C2** for further detailed breakdown)

6.4 Summary

This detail is the most onerous of all the options so far both in terms of works and building materials/ systems added.

Although this solution is an improvement to solution A acoustically, it still does not alleviate the concerns the acoustician has previously presented both in terms of flanking and penetration of sound to the exposed deflection head detail.

The most concerning issue with this approach is the fire related treatments involved in bringing the floor to a standard to serve as a separating compartment between apartments in conjunction with the installation of a fire sprinkler system. The fire treatment is such that it requires unavoidable and considerable intervention and removal to existing elements of the building. The sprinkler is seen to be a high-risk item due to potential damage to the historic fabric of the building if set off.

From a heritage aspect this solution removes a significant quantity of the existing fabric from the building, which is unnecessary upon review of the other options.

Further to the above options it is evident that this solution fails to satisfy the LBC, LA and Acousticians requirements. For a BR compliant and rentable approach, it is obvious that this solution would be un-acceptable both from an occupancy and heritage viewpoint.

7. Appendix

This document is to be read in conjunction with all other reports, schedules and drawings.

A1 - Technical Design Note - Structural Fire Design Review - Piccadilly Warehouse
Manchester - DA – 210512

Project name	Piccadilly Warehouse, Manchester	
Design note title	Structural Fire Design Review	
Document reference	FENG-18357	
Author	Darren Agnew	
Approved by	Ruirui Sun	
Revision	00	
Date	12 May 2021	

1. INTRODUCTION

Hydrock Fire has been engaged by Beech Design and Build to review the existing structural timber elements in relation to fire resistance for the Piccadilly Warehouse buildings (Mindel House and Bloom Street).

This design note will provide commentary on the reduction in size of the timber elements with regards to charring rate in accordance with 'EN 1995-1-2:2004 Eurocode 5: Design of Timber Structures Part 1-2: General - Structural Fire Design'.

Note: This design note does not consider the existing condition of the structural elements, detailed design of the connections, joints, etc. It is only to provide a charring rate calculation and inform the reduced member size assuming that the timber structure are in good conditions and the dimensions provided to Hydrock. The suitability of the products proposed to provide fire resistance will need to be confirmed as suitable to meet the required fire resistance. The assessment carried out in this design note is based on the information provided to Hydrock. Hydrock Fire takes no responsibility for the accuracy of the information.

2. BUILDING DESCRIPTION

The proposed residential re-development of Piccadilly Warehouse features two building, Mindel House and Bloom Street. Stair 1

Based on the historical nature and height to the access level of the apartments the required structural fire resistance to both buildings is 60 minutes. This design note will review the charring rate based on a 60 minute requirement for protection.

3. STRUCTURAL TIMBER

The existing structural timber elements are considered under the action of fire in accordance with Eurocode 5, using a worst-case charring rate of 0.8mm/min under standard fire exposure (worst-case notional charring rate for unprotected Softwood and Beech, Hardwood and LVL considering the effect of corner rounding and fissures), in line with Table 3.1 of EN 1995-1-2:2004.

When considering the intumescent paint a reduction of 25mm total has been assumed in accordance with information provided by Thermoguard. This will need to be confirmed with the manufacturer as the type of wood and test certification is not noted within their data sheet.

In this report two scenarios are considered: scenario 1 considers no intumescent paint, and scenario 2 considers the opaque varnish / paint applied on site.

3.1 Primary Beams

The Primary Beams as reported in the Hutton + Rostron Survey, note that the primary beams are 330mm x 280mm. As such a charring rate of 0.8mm/min has been applied over a 60-minute period, resulting in a reduction of 48mm from each exposed side.

The Hutton + Rostron survey also reports that charring and decaying could reduce the primary beams on the Fourth floor further. The full extent of this will need to be captured and reviewed by Thermoguard in order for the product to be verified for use.

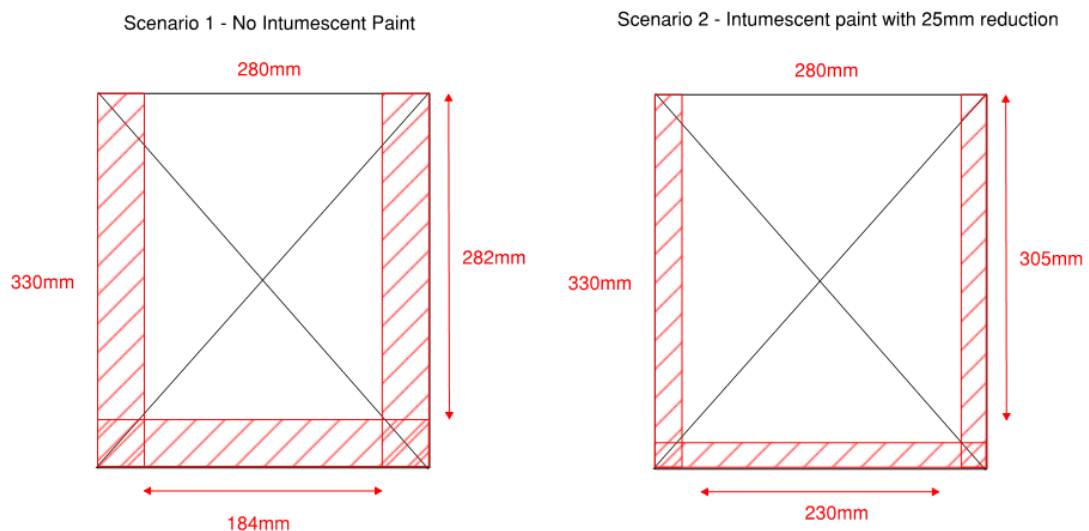


Figure 1 - Primary Beams (assuming no decay / charring)

With no provision of intumescent coating a 60-minute exposure to fire would result in a reduced beam size of 282mm x 184mm.

With the provision of Intumescent paint, the resulting beam size is 305mm x 230mm. The structural engineer should confirm the acceptability of these sizes post-fire.

3.2 Structural Floor

The floor is constructed of 75mm timber planks and as such will be subject to the action of fire from a single plane. As before with no intumescent paint a 48mm reduction will apply, and with the paint a 25mm reduction will apply.

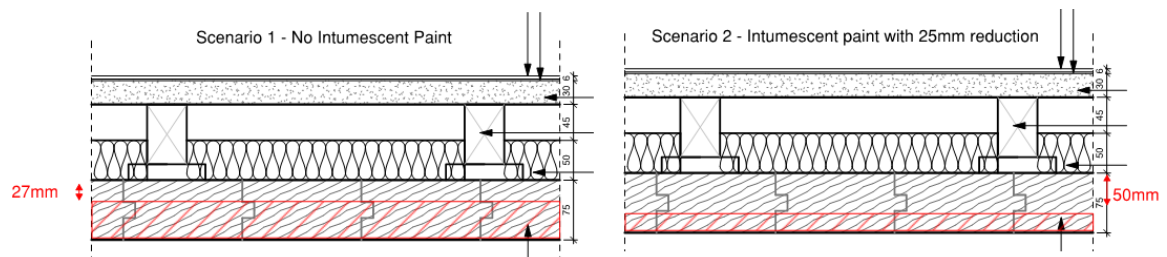


Figure 2 - Structural floor

The residual timber sizes after the action of fire for scenario 1 is 27mm, and 50mm for scenario 2. The structural engineer should confirm the acceptability of these sizes post-fire, also considering the provision of the additional boards above.

4. SUMMARY

The Structural Design Review undertaken within this document provides both the reduction of timber elements of structure under fire (60 minutes) with regards to unprotected and protected timber.

The residual size of these elements of structure should be further reviewed by the structural engineer to confirm whether or not the residual size and strength of these structural elements will perform safely.

Furthermore, the reduction to the timber when considering the intumescent protection is based on information provided by Thermoguard. This should be confirmed by the manufacturer in order to provide confidence in the proposed design.

Project name	Piccadilly Warehouse		
Design note title	Floor Compartmentation		
Document reference	18357-HYD-XX-XX-RP-FE-0002		
Author	Annie Flores		
Reviewed by	Darren Agnew		
Revision	00		
Date	12 November 2021	Approved	✓

1. INTRODUCTION

Hydrock are appointed by Beech Design & Build to provide fire engineering services for the proposed redevelopment of Piccadilly Warehouse, Manchester.

The project comprises two existing listed buildings, referred to as Bloom St and Mindel House, each to undergo a material change of use into a block of residential apartments.

1.1 Purpose of Technical Note

The purpose of this Technical Note is to outline the options available to Beech Design & Build to achieve a sufficient level of fire resistance to the existing floors in both Bloom St and Mindel House.

1.2 Basis of Technical Note

The Technical Note has been developed based on information and drawings provided to Hydrock by Beech Design & Build, as outlined in Table 1.

Table 1 Information on which the Technical Note is based

Description	Produced by	Reference	Date
Explanatory Notes, Half and One Hour Resistance Test, Thermoguard Timbercoat on Softwood Ceiling / Floor Joists and Wall Panelling	Thermoguard UK Ltd	-	March 2013
Small Scale Indicative Ad-Hoc Fire Resistance Test Utilising the General Test Methodology Specified in BS EN 1363-1:2012 on Six Panel Specimens	Exova Warringtonfire	359551	13 January 2016
Small Scale Indicative Ad-Hoc Fire Resistance Test Utilising the General Test Methodology Specified in BS EN 1363-1:2012 on a Range of Panel Specimens	Exova Warringtonfire	B361708	18 March 2016

1.3 Legislation

The development is subject to control under the restriction of the Building Regulations 2010 (as amended). The Technical Note will be written in accordance with BS9991:2015, with any additional guidance taken from other documents stated as and when used.

2. FIRE COMPARTMENTATION OF FLOORS

2.1 Compartment Floors

Fire compartmentation prevents the rapid spread of fire, and limits the damage to the property and the danger to occupants within the property. Compartment floors are horizontal components forming the enclosure of fire compartments, and should provide a minimum level of fire resistance equal to that of the elements of structure of the building. In the case of Piccadilly Warehouse, both blocks are required to have elements of structure with no less than 60 minutes fire resistance, therefore the compartment floors should also provide 60-minutes fire resistance.

Hydrock propose three options available to Beech Design and Build with regard to achieving an adequate level of fire resistance to the existing floor build-up of each block at Piccadilly Warehouse, i.e. minimum 60 minutes.

Option 1: Underdraw floors with plasterboard

Option 1 involves underdrawing the existing floors with plasterboard (achieving 60 minutes fire resistance). Option 1 is considered to be the simplest method to achieve compliance, as it is a tried and tested method of protecting structures.

Approval for the compliance of Option 1 will be guaranteed, pending plasterboard test certification.

Option 2: Replace damaged timber flooring and intumescent paint

Option 2 involves replacing the damaged areas of the floors, and providing intumescent paint to the timber. This will require the manufacturer to guarantee the system achieves the required 60 minutes fire resistance. It should be noted that current available fire testing information, there is a risk of approval based on the failure of the test. Notwithstanding, Thermoguard have provided a letter of reliance to confirm the suitability of the product.

Approval for the compliance of Option 2 is dependent on Thermoguard guaranteeing the system achieves 60 minutes fire resistance (with test information which conflicts the 60-minute letter of reliance).

Option 3: Provide sprinkler system and intumescent paint

Option 3 involves providing intumescent paint to the timber, replacing damaged areas of floor, and introducing a BS 9251:2021 sprinkler system, with a tank duration of 90 minutes. This would reduce the fire loads in each of the apartments and ancillary areas, for a reasonable duration (i.e. 90 minutes rather than 60 minutes, to account for worst-case scenario). This would allow the suppression to assist the protection of the structure, and also the Fire Service operations.

Option 3 is not a typical arrangement to achieve adequate fire resistance, however BS9991:2015 allows for a reduction in fire resistance to the structure of a building, based on an increased sprinkler duration (minimum structural fire resistance is 60 minutes).

TECHNICAL DESIGN NOTE



Approval for compliance of Option 3 is dependent on consultation with building control, and the local Fire Service.

Project name	Piccadilly Warehouse		
Design note title	Floor Compartmentation		
Document reference	18357-HYD-XX-XX-RP-FE-0002		
Author	Annie Flores		
Reviewed by	Darren Agnew		
Revision	00		
Date	12 November 2021	Approved	✓

1. INTRODUCTION

Hydrock are appointed by Beech Design & Build to provide fire engineering services for the proposed redevelopment of Piccadilly Warehouse, Manchester.

The project comprises two existing listed buildings, referred to as Bloom St and Mindel House, each to undergo a material change of use into a block of residential apartments.

1.1 Purpose of Technical Note

The purpose of this Technical Note is to outline the options available to Beech Design & Build to achieve a sufficient level of fire resistance to the existing floors in both Bloom St and Mindel House.

1.2 Basis of Technical Note

The Technical Note has been developed based on information and drawings provided to Hydrock by Beech Design & Build, as outlined in Table 1.

Table 1 Information on which the Technical Note is based

Description	Produced by	Reference	Date
Explanatory Notes, Half and One Hour Resistance Test, Thermoguard Timbercoat on Softwood Ceiling / Floor Joists and Wall Panelling	Thermoguard UK Ltd	-	March 2013
Small Scale Indicative Ad-Hoc Fire Resistance Test Utilising the General Test Methodology Specified in BS EN 1363-1:2012 on Six Panel Specimens	Exova Warringtonfire	359551	13 January 2016
Small Scale Indicative Ad-Hoc Fire Resistance Test Utilising the General Test Methodology Specified in BS EN 1363-1:2012 on a Range of Panel Specimens	Exova Warringtonfire	B361708	18 March 2016

1.3 Legislation

The development is subject to control under the restriction of the Building Regulations 2010 (as amended). The Technical Note will be written in accordance with BS9991:2015, with any additional guidance taken from other documents stated as and when used.

2. FIRE COMPARTMENTATION OF FLOORS

2.1 Compartment Floors

Fire compartmentation prevents the rapid spread of fire, and limits the damage to the property and the danger to occupants within the property. Compartment floors are horizontal components forming the enclosure of fire compartments, and should provide a minimum level of fire resistance equal to that of the elements of structure of the building. In the case of Piccadilly Warehouse, both blocks are required to have elements of structure with no less than 60 minutes fire resistance, therefore the compartment floors should also provide 60-minutes fire resistance.

Hydrock propose three options available to Beech Design and Build with regard to achieving an adequate level of fire resistance to the existing floor build-up of each block at Piccadilly Warehouse, i.e. minimum 60 minutes.

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Approval for the compliance of Option 1 will be guaranteed, pending plasterboard test certification.

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Option 3 is not a typical arrangement to achieve adequate fire resistance, however BS9991:2015 allows for a reduction in fire resistance to the structure of a building, based on an increased sprinkler duration (minimum structural fire resistance is 60 minutes).

TECHNICAL DESIGN NOTE



Approval for compliance of Option 3 is dependent on consultation with building control, and the local Fire Service.

A2 - Technical Design Note - Structural Engineer – Structural Floor - Piccadilly Warehouse



TITLE: **STRUCTURAL NOTE: Timber Floor Fire Check**

PROJECT: A3516 – Piccadilly Warehouse, Manchester

CLIENT: Manchester Design and Build

November 2021

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QUALITY MANAGEMENT

Document Ref. No.	A3516 – GMS – SN – 00001
Prepared by:	Matt Pimbley
Authorised by:	Graham Jones
Date:	November 2021
Project Number:	A3516
Revision:	B01

Revision	Suitability	Date	Description	By	Review

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 2.2 Timber Floor Planks 5

3.0 Conclusions and Recommendations 6

1.0 Introduction

The following structural note is based on a review of the timber floor members to both the Bloom St and Mindel House buildings, of the proposed Piccadilly Warehouse re-development project. The following checks and recommendations are based on the performance of the structural elements in a fire situation.

Fire affect analysis on the timber members has been carried out by Hydrock, a technical note confirming timber charring and reduction in a fire situation over 60 minutes, attached in Appendix A. Within these 60 minutes the floor structures should be capable of withstanding the required reduction without collapse. The following structural review is based on a structural safety and stability point of view and therefore deflection is not a consideration in this situation.

Timber sizes have been taken from timber specialists, Hutton + Rostron, report - 212-57 Bloom and Mindel SN2 2701-170421 CW PB – merged

2.0 Checks

2.1 Main Timber Beams

The main supporting members of the floor structure of these buildings are large timber members, spanning between original cast iron columns. We have carried out three checks as follows, the results of which are contained in Appendix B:

1. Typical Existing Primary Beam 330mm x 280mm (size taken from Hutton + Rostron report - 212-57 Bloom and Mindel SN2 2701-170421 CW PB – merged)
2. Typical Existing Primary Beam, with fire protection, reduced by 25mm, taken from the attached Hydrock report (see Appendix A), which suggests the 25mm reduction resulting in a maintained structural member of 305mm x 230mm.
3. 4th Floor Beams (previously charred) with 15mm reduction to each side and from the bottom of the members (15mm again taken from Hutton + Rostron report) therefore resulting in a 315mm x 250mm section. From this section size a further reduction of 25mm (as Hydrock report), resulting in a 290mm x 200mm section.

All situations pass **BUT** we would stress that when the charring is removed from the 4th floor beams, the members are all checked to be a min of the above noted dimensions, 315mm x 250mm.

2.2 Timber Floor Planks

There are numerous dips and worn areas to the timber floor planks throughout the buildings of Mindel House and Bloom St. Calculations have been carried out to confirm the minimum requirement of the timber plank thickness in a fire situation. These calculations are contained in Appendix C.

Again, the fire checks were based on the Hydrock report (Appendix A)

The following three checks were carried out:

1. Typical Existing Floor Planks 70mm x 195mm (size taken from Hutton + Rostron report - 212-57 Bloom and Mindel SN2 2701-170421 CW PB – merged)
2. Typical Existing Floor Planks, with fire protection, reduced by 25mm, taken from the attached Hydrock report (see Appendix A), which suggests the 25mm reduction from the underside in a fire situation, resulting in a maintained structural member of 45mm x 195mm.
3. Additional reduction check for existing dips and worn areas.

The checks found the in the fire reduction situation (2.) the floor planks were still structurally suitable in this temporary state. The third situation of the typical timber sized further reduced locally allowed the planks to be reduced by a further 5mm only.

3.0 Conclusions and Recommendations

With the fire protection recommended by the Hydrock report, which resulted in the specified reduction of timber members after the 60 minute fire situation, structural checks found both the main existing supporting timbers and floor planks would still be in a structurally stable state during this temporary state.

Checks on the charred 4th floor beams found these main structural members would still also be suitable in this temporary state, but on confirmation the previous charring of these members has only resulted in the specified dimensions, 315mm x 250mm, noted in the Hutton and Rostron report.

The checks on floor plank reduction, due to the existing dips and wearing of the original overall 70mm depth, found there was an allowance for a further 5mm reduction in these members ONLY. This resulted in an overall reduced member by 40mm in the temporary fire situation to 35mm x 195mm. It is therefore recommended remedial works will be required to any members where dips are found to be greater than 5mm in depth. It is recommended the following rules are checked, when carrying out a survey to confirm where further remedial works are required, the following are maximum allowable situations:

1. Holes that have previously been drilled through the planks up to a max of 30mm in diameter.
2. If there is an area where there is localised 'dipping' of a single plank, these should be limited to a maximum of 50mm across (diameter or square) but only has a max 5mm reduction to the centre.
3. However, if there are a number of the above scenarios (1. and/or 2.) along one length of a single plank these rules would not apply. Allowance for no more than 4 no holes at min 400mm spacing apart. And similar for the localised dipping in the plank.

APPENDIX A – HYDROCK REPORT

Project name	Piccadilly Warehouse, Manchester	
Design note title	Structural Fire Design Review	
Document reference	FENG-18357	
Author	Darren Agnew	
Approved by	Ruirui Sun	
Revision	00	
Date	12 May 2021	

1. INTRODUCTION

Hydrock Fire has been engaged by Beech Design and Build to review the existing structural timber elements in relation to fire resistance for the Piccadilly Warehouse buildings (Mindel House and Bloom Street).

This design note will provide commentary on the reduction in size of the timber elements with regards to charring rate in accordance with 'EN 1995-1-2:2004 Eurocode 5: Design of Timber Structures Part 1-2: General - Structural Fire Design'.

Note: This design note does not consider the existing condition of the structural elements, detailed design of the connections, joints, etc. It is only to provide a charring rate calculation and inform the reduced member size assuming that the timber structure are in good conditions and the dimensions provided to Hydrock. The suitability of the products proposed to provide fire resistance will need to be confirmed as suitable to meet the required fire resistance. The assessment carried out in this design note is based on the information provided to Hydrock. Hydrock Fire takes no responsibility for the accuracy of the information.

2. BUILDING DESCRIPTION

The proposed residential re-development of Piccadilly Warehouse features two building, Mindel House and Bloom Street. Stair 1

Based on the historical nature and height to the access level of the apartments the required structural fire resistance to both buildings is 60 minutes. This design note will review the charring rate based on a 60 minute requirement for protection.

3. STRUCTURAL TIMBER

The existing structural timber elements are considered under the action of fire in accordance with Eurocode 5, using a worst-case charring rate of 0.8mm/min under standard fire exposure (worst-case notional charring rate for unprotected Softwood and Beech, Hardwood and LVL considering the effect of corner rounding and fissures), in line with Table 3.1 of EN 1995-1-2:2004.

When considering the intumescent paint a reduction of 25mm total has been assumed in accordance with information provided by Thermoguard. This will need to be confirmed with the manufacturer as the type of wood and test certification is not noted within their data sheet.

In this report two scenarios are considered: scenario 1 considers no intumescent paint, and scenario 2 considers the opaque varnish / paint applied on site.

3.1 Primary Beams

The Primary Beams as reported in the Hutton + Rostron Survey, note that the primary beams are 330mm x 280mm. As such a charring rate of 0.8mm/min has been applied over a 60-minute period, resulting in a reduction of 48mm from each exposed side.

The Hutton + Rostron survey also reports that charring and decaying could reduce the primary beams on the Fourth floor further. The full extent of this will need to be captured and reviewed by Thermoguard in order for the product to be verified for use.

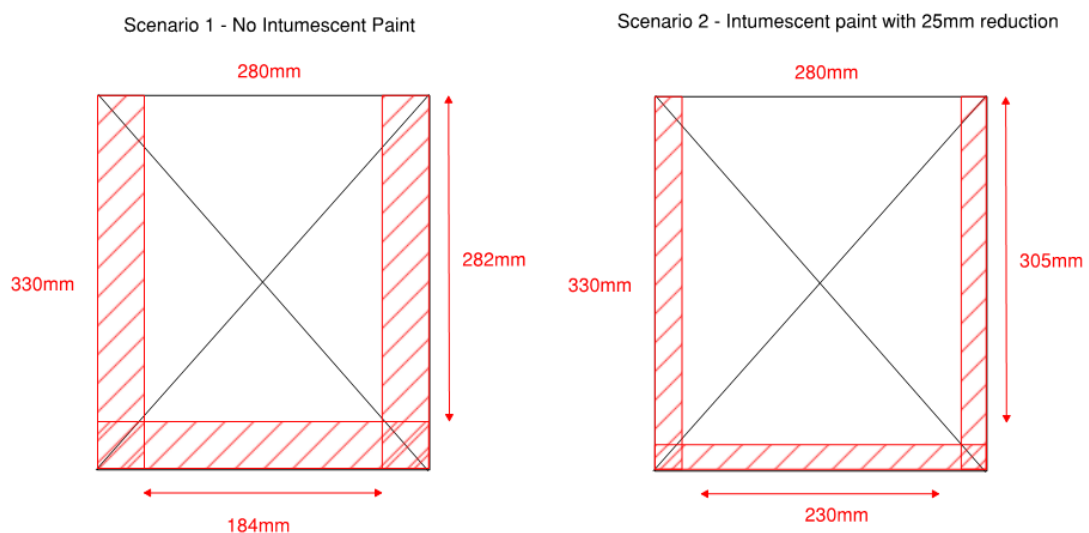


Figure 1 - Primary Beams (assuming no decay / charring)

With no provision of intumescent coating a 60-minute exposure to fire would result in a reduced beam size of 282mm x 184mm.

With the provision of Intumescent paint, the resulting beam size is 305mm x 230mm. The structural engineer should confirm the acceptability of these sizes post-fire.

3.2 Structural Floor

The floor is constructed of 75mm timber planks and as such will be subject to the action of fire from a single plane. As before with no intumescent paint a 48mm reduction will apply, and with the paint a 25mm reduction will apply.

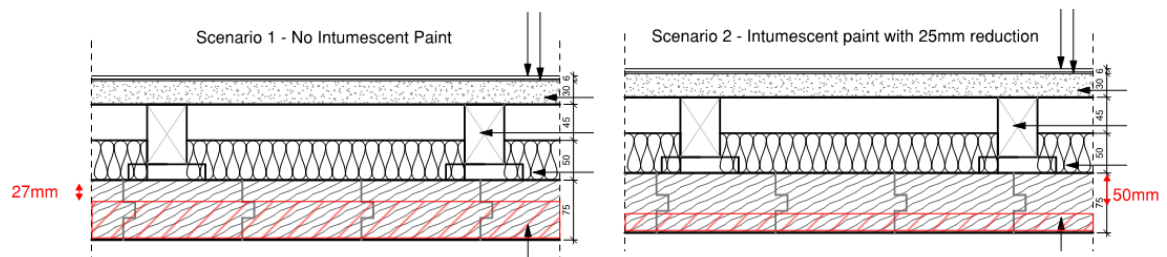


Figure 2 - Structural floor

The residual timber sizes after the action of fire for scenario 1 is 27mm, and 50mm for scenario 2. The structural engineer should confirm the acceptability of these sizes post-fire, also considering the provision of the additional boards above.

4. SUMMARY

The Structural Design Review undertaken within this document provides both the reduction of timber elements of structure under fire (60 minutes) with regards to unprotected and protected timber.

The residual size of these elements of structure should be further reviewed by the structural engineer to confirm whether or not the residual size and strength of these structural elements will perform safely.

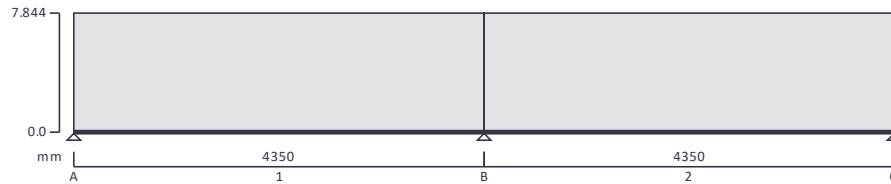
Furthermore, the reduction to the timber when considering the intumescent protection is based on information provided by Thermoguard. This should be confirmed by the manufacturer in order to provide confidence in the proposed design.

APPENDIX B – TYPICAL MAIN STRCUTURAL TIMBER BEAM CHECKS

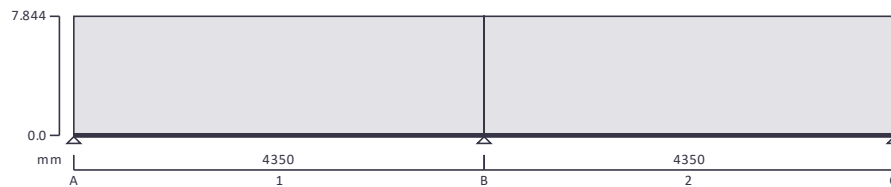
TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02

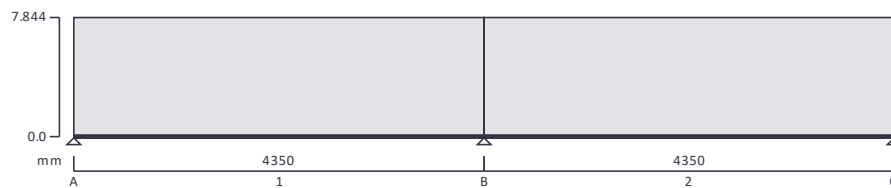
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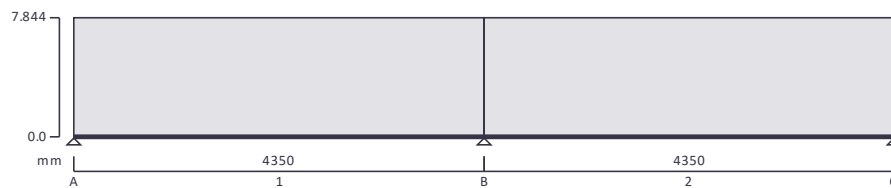
Load Envelope - Combination 2



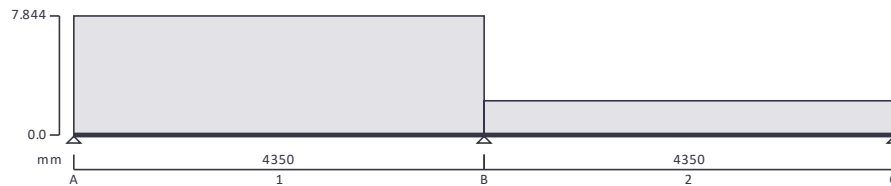
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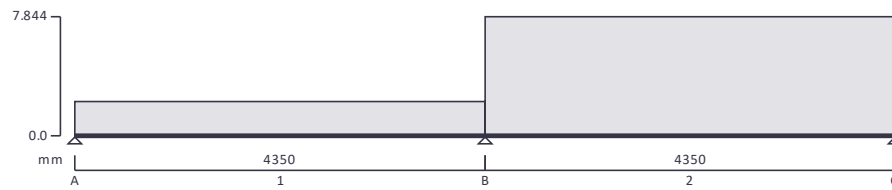
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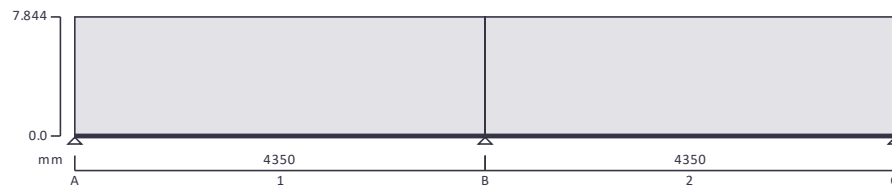
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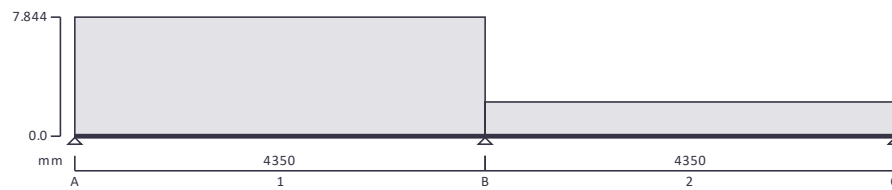
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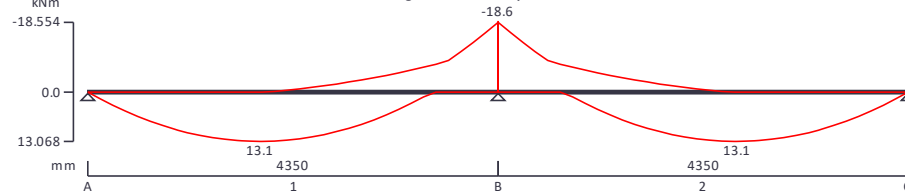
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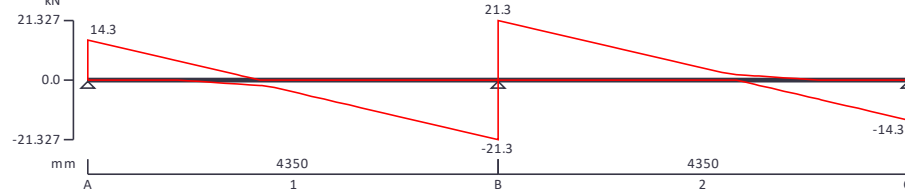
Load Envelope - Combination 8



Bending Moment Envelope



Shear Force Envelope



Applied loading

Beam loads

 2.5m x 0.75 kN/m²

Dead self weight of beam * 1

Dead full UDL 1.900 kN/m

Project				Job no.	
PW - Manchester Design + Build				A3516	
Calcs for				Start page no./Revision	
Fire Check - Primary Timber Beams				3	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
MP	07/05/2021	GJ	07/05/2021	GJ	07/05/2021

2.5m x 2.25 kN/m²

Imposed full UDL 5.600 kN/m

Load combinations

Load combination 1

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 2

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 3

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 4

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 5

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

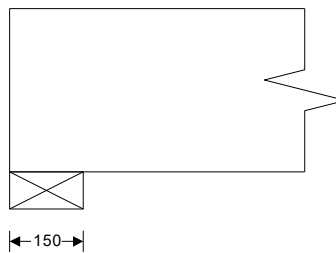
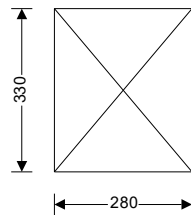
Imposed * 1.00

Load combination 6	Span 2	Dead * 1.00 Imposed * 0.00
	Support C	Dead * 1.00 Imposed * 1.00
	Support A	Dead * 1.00 Imposed * 0.00
	Span 1	Dead * 1.00 Imposed * 0.00
Load combination 7	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 1.00
	Support C	Dead * 1.00 Imposed * 1.00
	Support A	Dead * 1.00 Imposed * 1.00
Load combination 8	Span 1	Dead * 1.00 Imposed * 1.00
	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 1.00
	Support C	Dead * 1.00 Imposed * 1.00
	Support A	Dead * 1.00 Imposed * 1.00
	Span 1	Dead * 1.00 Imposed * 1.00
	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 0.00
	Support C	Dead * 1.00 Imposed * 0.00

Analysis results

Maximum moment	$M_{max} = 13.068 \text{ kNm}$	$M_{min} = -18.554 \text{ kNm}$
Design moment	$M = \max(\text{abs}(M_{max}), \text{abs}(M_{min})) = 18.554 \text{ kNm}$	
Maximum shear	$F_{max} = 21.327 \text{ kN}$	$F_{min} = -21.327 \text{ kN}$
Design shear	$F = \max(\text{abs}(F_{max}), \text{abs}(F_{min})) = 21.327 \text{ kN}$	
Total load on beam	$W_{tot} = 68.246 \text{ kN}$	
Reactions at support A	$R_{A_max} = 14.319 \text{ kN}$	$R_{A_min} = 2.139 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 3.661 \text{ kN}$	
Unfactored imposed load reaction at support A	$R_{A_Imposed} = 9.135 \text{ kN}$	
Reactions at support B	$R_{B_max} = 42.654 \text{ kN}$	$R_{B_min} = 27.429 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 12.204 \text{ kN}$	
Unfactored imposed load reaction at support B	$R_{B_Imposed} = 30.450 \text{ kN}$	
Reactions at support C	$R_{C_max} = 14.319 \text{ kN}$	$R_{C_min} = 2.139 \text{ kN}$
Unfactored dead load reaction at support C	$R_{C_Dead} = 3.661 \text{ kN}$	

Unfactored imposed load reaction at support C

 $R_{C_Imposed} = 9.135 \text{ kN}$


Timber section details

Breadth of sections

 $b = 280 \text{ mm}$

Depth of sections

 $h = 330 \text{ mm}$

Number of sections in member

 $N = 1$

Overall breadth of member

 $b_b = N \times b = 280 \text{ mm}$

Timber strength class

C18

Member details

Service class of timber

1

Load duration

Long term

Length of span 1

 $L_{s1} = 4350 \text{ mm}$

Length of span 2

 $L_{s2} = 4350 \text{ mm}$

Length of bearing

 $L_b = 150 \text{ mm}$

Section properties

Cross sectional area of member

 $A = N \times b \times h = 92400 \text{ mm}^2$

Section modulus

 $Z_x = N \times b \times h^2 / 6 = 5082000 \text{ mm}^3$
 $Z_y = h \times (N \times b)^2 / 6 = 4312000 \text{ mm}^3$

Second moment of area

 $I_x = N \times b \times h^3 / 12 = 838530000 \text{ mm}^4$
 $I_y = h \times (N \times b)^3 / 12 = 603680000 \text{ mm}^4$

Radius of gyration

 $i_x = \sqrt{I_x / A} = 95.3 \text{ mm}$
 $i_y = \sqrt{I_y / A} = 80.8 \text{ mm}$

Modification factors

Duration of loading - Table 17

 $K_3 = 1.00$

Bearing stress - Table 18

 $K_4 = 1.00$

Total depth of member - cl.2.10.6

 $K_7 = 0.81 \times (h^2 + 92300 \text{ mm}^2) / (h^2 + 56800 \text{ mm}^2) = 0.98$

Load sharing - cl.2.9

 $K_8 = 1.00$

Lateral support - cl.2.10.8

Ends held in position

Permissible depth-to-breadth ratio - Table 19

3.00

Actual depth-to-breadth ratio

 $h / (N \times b) = 1.18$
PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane)

 $\sigma_{c_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 = 2.200 \text{ N/mm}^2$

Applied bearing stress

 $\sigma_{c_a} = R_{B_max} / (N \times b \times L_b) = 1.016 \text{ N/mm}^2$
 $\sigma_{c_a} / \sigma_{c_adm} = 0.462$
PASS - Applied compressive stress is less than permissible compressive stress at bearing

Project PW - Manchester Design + Build				Job no. A3516	
Calcs for Fire Check - Primary Timber Beams				Start page no./Revision 6	
Calcs by MP	Calcs date 07/05/2021	Checked by GJ	Checked date 07/05/2021	Approved by GJ	Approved date 07/05/2021

Bending parallel to grain

Permissible bending stress

$$\sigma_{m_adm} = \sigma_m * K_3 * K_7 * K_8 = 5.705 \text{ N/mm}^2$$

Applied bending stress

$$\sigma_{m_a} = M / Z_x = 3.651 \text{ N/mm}^2$$

$$\sigma_{m_a} / \sigma_{m_adm} = 0.640$$

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress

$$\tau_{adm} = \tau * K_3 * K_8 = 0.670 \text{ N/mm}^2$$

Applied shear stress

$$\tau_a = 3 * F / (2 * A) = 0.346 \text{ N/mm}^2$$

$$\tau_a / \tau_{adm} = 0.517$$

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection

$$E = E_{min} = 6000 \text{ N/mm}^2$$

Permissible deflection

$$\delta_{adm} = \min(0.394 \text{ in}, 0.0033 * L_{s1}) = 10.008 \text{ mm}$$

Bending deflection

$$\delta_{b_s1} = 3.024 \text{ mm}$$

Shear deflection

$$\delta_{v_s1} = 0.361 \text{ mm}$$

Total deflection

$$\delta_a = \delta_{b_s1} + \delta_{v_s1} = 3.385 \text{ mm}$$

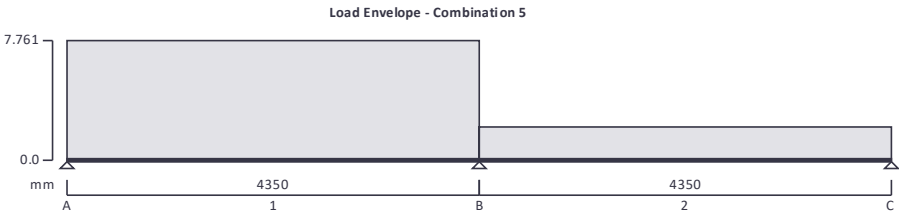
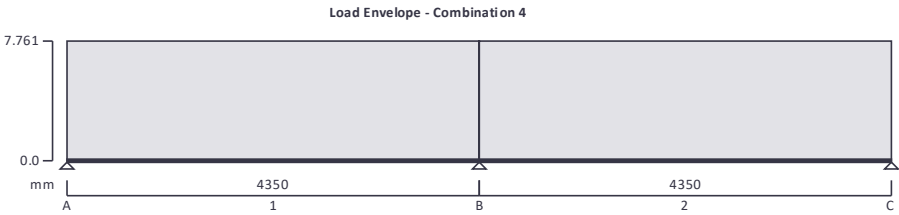
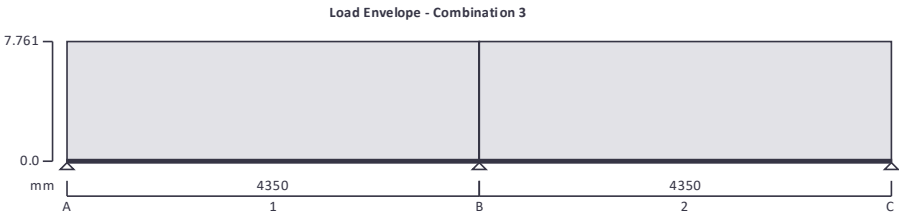
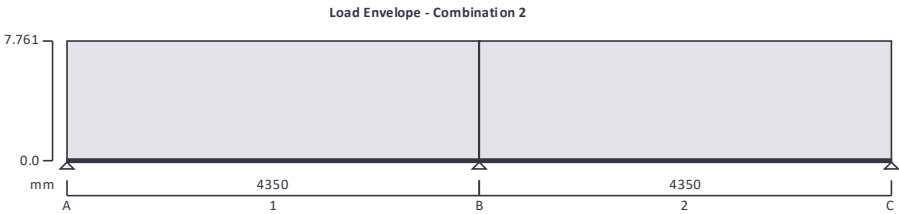
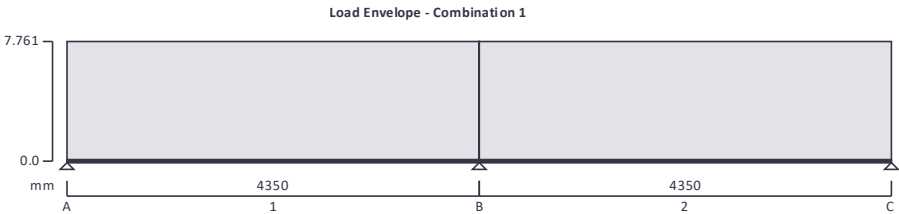
$$\delta_a / \delta_{adm} = 0.338$$

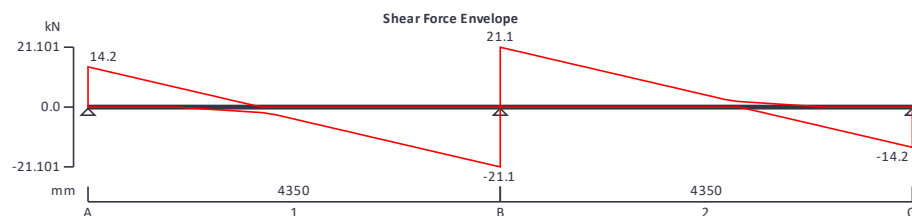
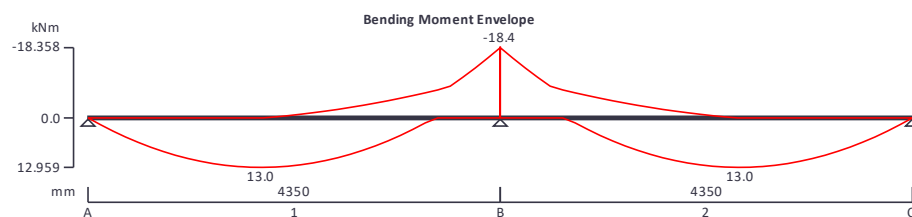
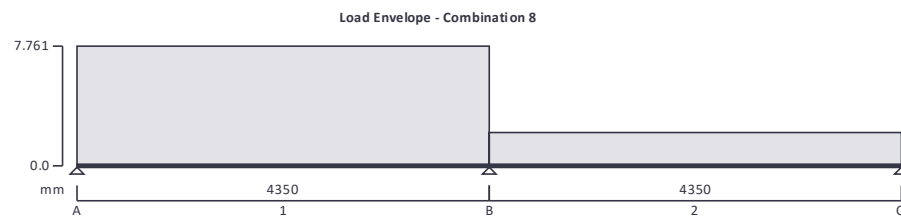
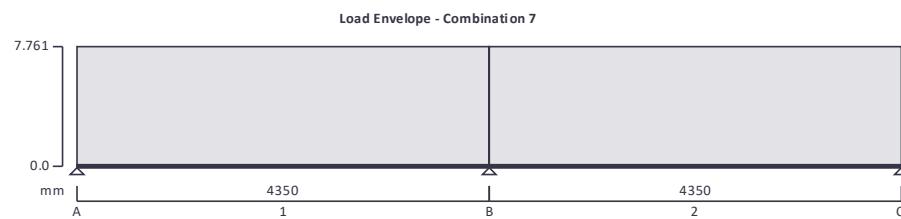
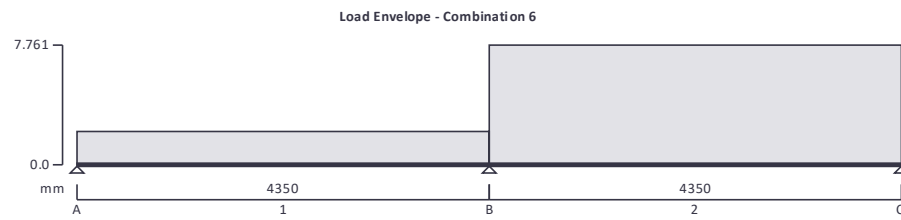
PASS - Total deflection is less than permissible deflection

TeklaTedds Graham Jones Associates 199 Monton Road Manchester M30 9PN	Project				Job no.	
	PW - Manchester Design + Build				A3516	
	Calcs for				Start page no./Revision	
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	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	MP	17/12/2021	GJ	07/05/2021	GJ	07/05/2021

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02





Applied loading

Beam loads

2.5m x 0.75 kN/m²

Dead self weight of beam × 1

Dead full UDL 1.900 kN/m

 Tekla Tedds Graham Jones Associates 199 Monton Road Manchester M30 9PN	Project				Job no.	
	PW - Manchester Design + Build				A3516	
	Calcs for				Start page no./Revision	
	Fire Check - Primary Timber Beams				3	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	MP	17/12/2021	GJ	07/05/2021	GJ	07/05/2021

2.5m x 2.25 kN/m2	Imposed full UDL 5.600 kN/m	
Load combinations		
Load combination 1	Support A	Dead × 1.00 Imposed × 1.00
	Span 1	Dead × 1.00 Imposed × 1.00
	Support B	Dead × 1.00 Imposed × 1.00
	Span 2	Dead × 1.00 Imposed × 1.00
Load combination 2	Support C	Dead × 1.00 Imposed × 1.00
	Support A	Dead × 1.00 Imposed × 1.00
	Span 1	Dead × 1.00 Imposed × 1.00
	Support B	Dead × 1.00 Imposed × 1.00
Load combination 3	Span 2	Dead × 1.00 Imposed × 1.00
	Support C	Dead × 1.00 Imposed × 1.00
	Support A	Dead × 1.00 Imposed × 1.00
	Span 1	Dead × 1.00 Imposed × 1.00
Load combination 4	Support B	Dead × 1.00 Imposed × 1.00
	Span 2	Dead × 1.00 Imposed × 1.00
	Support C	Dead × 1.00 Imposed × 1.00
	Support A	Dead × 1.00 Imposed × 1.00
Span 1	Dead × 1.00 Imposed × 1.00	
Load combination 5	Support B	Dead × 1.00 Imposed × 1.00
	Span 2	Dead × 1.00 Imposed × 1.00
	Support C	Dead × 1.00 Imposed × 1.00
	Support A	Dead × 1.00 Imposed × 1.00
Span 1	Dead × 1.00 Imposed × 1.00	

 Tekla Tedds Graham Jones Associates 199 Monton Road Manchester M30 9PN	Project				Job no.	
	PW - Manchester Design + Build				A3516	
	Calcs for				Start page no./Revision	
	Fire Check - Primary Timber Beams				4	
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	MP	17/12/2021	GJ	07/05/2021	GJ	07/05/2021

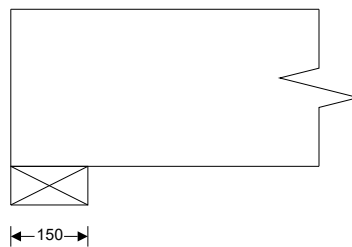
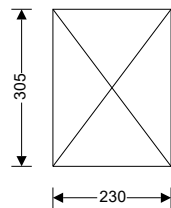
Load combination 6	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00
	Span 2	Dead × 1.00
		Imposed × 0.00
Load combination 7	Support C	Dead × 1.00
		Imposed × 1.00
	Support A	Dead × 1.00
		Imposed × 0.00
	Span 1	Dead × 1.00
		Imposed × 0.00
Load combination 8	Support B	Dead × 1.00
		Imposed × 1.00
	Span 2	Dead × 1.00
		Imposed × 1.00
	Support C	Dead × 1.00
		Imposed × 1.00
Load combination 8	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00
Load combination 8	Span 2	Dead × 1.00
		Imposed × 1.00
	Support C	Dead × 1.00
		Imposed × 1.00
	Support A	Dead × 1.00
		Imposed × 1.00
Load combination 8	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00
	Span 2	Dead × 1.00
		Imposed × 0.00
Load combination 8	Support C	Dead × 1.00
		Imposed × 0.00

Analysis results

Maximum moment	$M_{\max} = 12.959 \text{ kNm}$	$M_{\min} = -18.358 \text{ kNm}$
Design moment	$M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 18.358 \text{ kNm}$	
Maximum shear	$F_{\max} = 21.101 \text{ kN}$	$F_{\min} = -21.101 \text{ kN}$
Design shear	$F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 21.101 \text{ kN}$	
Total load on beam	$W_{\text{tot}} = 67.524 \text{ kN}$	

Tekla.Tedds Graham Jones Associates 199 Monton Road Manchester M30 9PN	Project				Job no.	
	PW - Manchester Design + Build				A3516	
	Calcs for				Start page no./Revision	
	Fire Check - Primary Timber Beams				5	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	MP	17/12/2021	GJ	07/05/2021	GJ	07/05/2021

Reactions at support A	$R_{A_max} = 14.183 \text{ kN}$	$R_{A_min} = 2.003 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 3.526 \text{ kN}$	
Unfactored imposed load reaction at support A	$R_{A_Imposed} = 9.135 \text{ kN}$	
Reactions at support B	$R_{B_max} = 42.203 \text{ kN}$	$R_{B_min} = 26.978 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 11.753 \text{ kN}$	
Unfactored imposed load reaction at support B	$R_{B_Imposed} = 30.450 \text{ kN}$	
Reactions at support C	$R_{C_max} = 14.183 \text{ kN}$	$R_{C_min} = 2.003 \text{ kN}$
Unfactored dead load reaction at support C	$R_{C_Dead} = 3.526 \text{ kN}$	
Unfactored imposed load reaction at support C	$R_{C_Imposed} = 9.135 \text{ kN}$	



Timber section details

Breadth of sections	$b = 230 \text{ mm}$
Depth of sections	$h = 305 \text{ mm}$
Number of sections in member	$N = 1$
Overall breadth of member	$b_b = N \times b = 230 \text{ mm}$
Timber strength class	C18

Member details

Service class of timber	1
Load duration	Long term
Length of span 1	$L_{s1} = 4350 \text{ mm}$
Length of span 2	$L_{s2} = 4350 \text{ mm}$
Length of bearing	$L_b = 150 \text{ mm}$

Section properties

Cross sectional area of member	$A = N \times b \times h = 70150 \text{ mm}^2$
Section modulus	$Z_x = N \times b \times h^2 / 6 = 3565958 \text{ mm}^3$
	$Z_y = h \times (N \times b)^2 / 6 = 2689083 \text{ mm}^3$
Second moment of area	$I_x = N \times b \times h^3 / 12 = 543808646 \text{ mm}^4$
	$I_y = h \times (N \times b)^3 / 12 = 309244583 \text{ mm}^4$
Radius of gyration	$i_x = \sqrt{I_x / A} = 88.0 \text{ mm}$
	$i_y = \sqrt{I_y / A} = 66.4 \text{ mm}$

Modification factors

Duration of loading - Table 17	$K_3 = 1.00$
Bearing stress - Table 18	$K_4 = 1.00$
Total depth of member - cl.2.10.6	$K_7 = 0.81 \times (h^2 + 92300 \text{ mm}^2) / (h^2 + 56800 \text{ mm}^2) = 1.00$
Load sharing - cl.2.9	$K_8 = 1.00$

Lateral support - cl.2.10.8

Ends held in position	
Permissible depth-to-breadth ratio - Table 19	3.00
Actual depth-to-breadth ratio	$h / (N \times b) = 1.33$

 Graham Jones Associates 199 Monton Road Manchester M30 9PN	Project				Job no.	
	PW - Manchester Design + Build				A3516	
	Calcs for				Start page no./Revision	
	Fire Check - Primary Timber Beams				6	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	MP	17/12/2021	GJ	07/05/2021	GJ	07/05/2021

PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane)

$$\sigma_{c_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 = \mathbf{2.200 \text{ N/mm}^2}$$

Applied bearing stress

$$\sigma_{c_a} = R_{B_max} / (N \times b \times L_b) = \mathbf{1.223 \text{ N/mm}^2}$$

$$\sigma_{c_a} / \sigma_{c_adm} = \mathbf{0.556}$$

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{5.811 \text{ N/mm}^2}$$

Applied bending stress

$$\sigma_{m_a} = M / Z_x = \mathbf{5.148 \text{ N/mm}^2}$$

$$\sigma_{m_a} / \sigma_{m_adm} = \mathbf{0.886}$$

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress

$$\tau_{adm} = \tau \times K_3 \times K_8 = \mathbf{0.670 \text{ N/mm}^2}$$

Applied shear stress

$$\tau_a = 3 \times F / (2 \times A) = \mathbf{0.451 \text{ N/mm}^2}$$

$$\tau_a / \tau_{adm} = \mathbf{0.673}$$

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection

$$E = E_{min} = \mathbf{6000 \text{ N/mm}^2}$$

Permissible deflection

$$\delta_{adm} = \min(0.394 \text{ in}, 0.0033 \times L_{s1}) = \mathbf{10.008 \text{ mm}}$$

Bending deflection

$$\delta_{b_s1} = \mathbf{4.613 \text{ mm}}$$

Shear deflection

$$\delta_{v_s1} = \mathbf{0.471 \text{ mm}}$$

Total deflection

$$\delta_a = \delta_{b_s1} + \delta_{v_s1} = \mathbf{5.084 \text{ mm}}$$

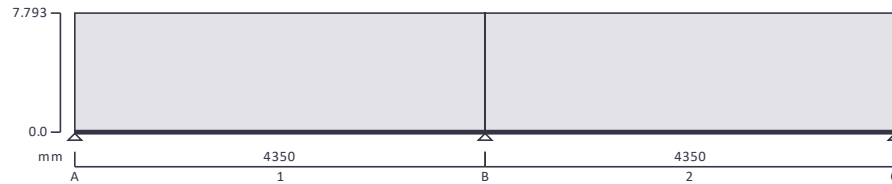
$$\delta_a / \delta_{adm} = \mathbf{0.508}$$

PASS - Total deflection is less than permissible deflection

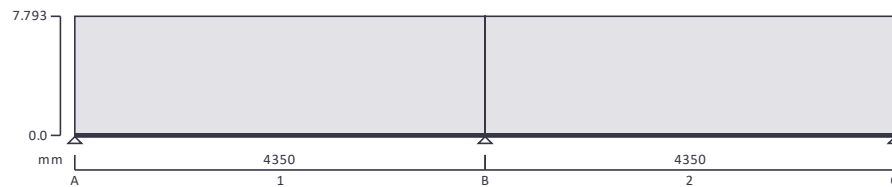
TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02

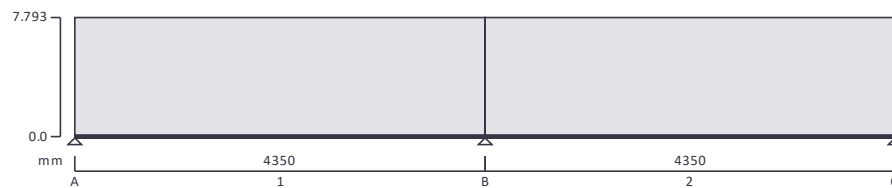
Load Envelope - Combination 1



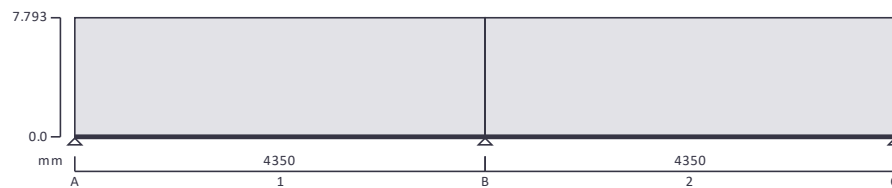
Load Envelope - Combination 2



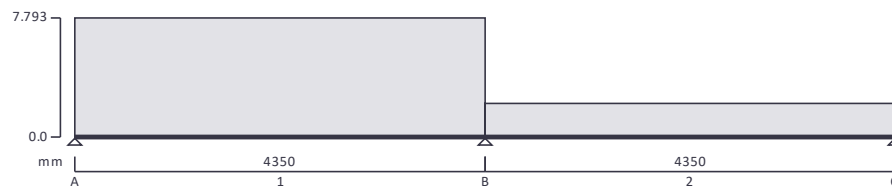
Load Envelope - Combination 3

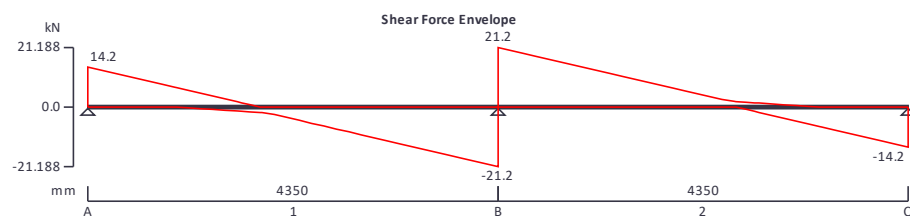
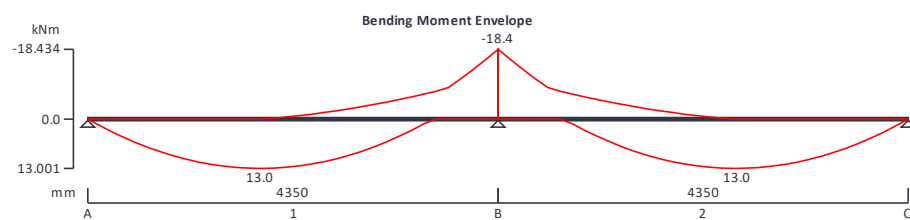
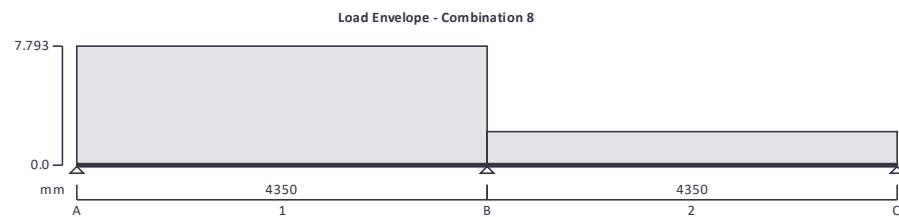
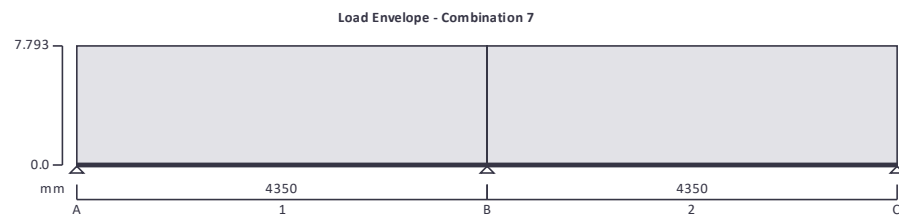
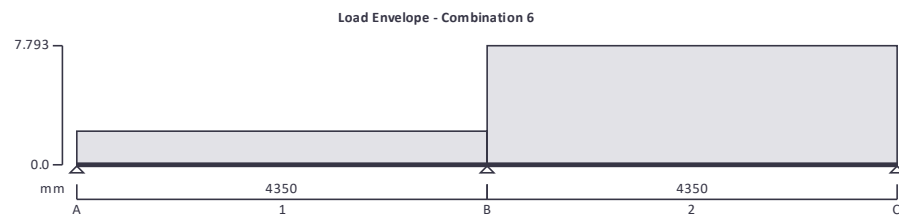


Load Envelope - Combination 4



Load Envelope - Combination 5





Applied loading

Beam loads

 2.5m x 0.75 kN/m²

Dead self weight of beam * 1

Dead full UDL 1.900 kN/m

Project				Job no.	
PW - Manchester Design + Build				A3516	
Calcs for				Start page no./Revision	
Fire Check - Primary Timber Beams				3	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
MP	07/05/2021	GJ	07/05/2021	GJ	07/05/2021

2.5m x 2.25 kN/m²

Imposed full UDL 5.600 kN/m

Load combinations

Load combination 1

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 2

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 3

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 4

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

Imposed * 1.00

Span 2

Dead * 1.00

Imposed * 1.00

Support C

Dead * 1.00

Imposed * 1.00

Load combination 5

Support A

Dead * 1.00

Imposed * 1.00

Span 1

Dead * 1.00

Imposed * 1.00

Support B

Dead * 1.00

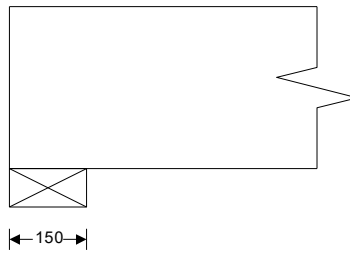
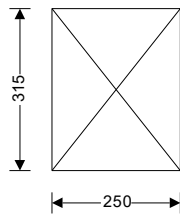
Imposed * 1.00

Load combination 6	Span 2	Dead * 1.00 Imposed * 0.00
	Support C	Dead * 1.00 Imposed * 1.00
	Support A	Dead * 1.00 Imposed * 0.00
	Span 1	Dead * 1.00 Imposed * 0.00
	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 1.00
Load combination 7	Support C	Dead * 1.00 Imposed * 1.00
	Support A	Dead * 1.00 Imposed * 1.00
	Span 1	Dead * 1.00 Imposed * 1.00
	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 1.00
	Support C	Dead * 1.00 Imposed * 1.00
Load combination 8	Support A	Dead * 1.00 Imposed * 1.00
	Span 1	Dead * 1.00 Imposed * 1.00
	Support B	Dead * 1.00 Imposed * 1.00
	Span 2	Dead * 1.00 Imposed * 0.00
	Support C	Dead * 1.00 Imposed * 0.00

Analysis results

Maximum moment	$M_{max} = 13.001 \text{ kNm}$	$M_{min} = -18.434 \text{ kNm}$
Design moment	$M = \max(\text{abs}(M_{max}), \text{abs}(M_{min})) = 18.434 \text{ kNm}$	
Maximum shear	$F_{max} = 21.188 \text{ kN}$	$F_{min} = -21.188 \text{ kN}$
Design shear	$F = \max(\text{abs}(F_{max}), \text{abs}(F_{min})) = 21.188 \text{ kN}$	
Total load on beam	$W_{tot} = 67.803 \text{ kN}$	
Reactions at support A	$R_{A_max} = 14.236 \text{ kN}$	$R_{A_min} = 2.056 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 3.578 \text{ kN}$	
Unfactored imposed load reaction at support A	$R_{A_Imposed} = 9.135 \text{ kN}$	
Reactions at support B	$R_{B_max} = 42.377 \text{ kN}$	$R_{B_min} = 27.152 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 11.927 \text{ kN}$	
Unfactored imposed load reaction at support B	$R_{B_Imposed} = 30.450 \text{ kN}$	
Reactions at support C	$R_{C_max} = 14.236 \text{ kN}$	$R_{C_min} = 2.056 \text{ kN}$
Unfactored dead load reaction at support C	$R_{C_Dead} = 3.578 \text{ kN}$	

Unfactored imposed load reaction at support C

 $R_{C_Imposed} = 9.135 \text{ kN}$


Timber section details

Breadth of sections

 $b = 250 \text{ mm}$

Depth of sections

 $h = 315 \text{ mm}$

Number of sections in member

 $N = 1$

Overall breadth of member

 $b_b = N \times b = 250 \text{ mm}$

Timber strength class

C18

Member details

Service class of timber

1

Load duration

Long term

Length of span 1

 $L_{s1} = 4350 \text{ mm}$

Length of span 2

 $L_{s2} = 4350 \text{ mm}$

Length of bearing

 $L_b = 150 \text{ mm}$

Section properties

Cross sectional area of member

 $A = N \times b \times h = 78750 \text{ mm}^2$

Section modulus

 $Z_x = N \times b \times h^2 / 6 = 4134375 \text{ mm}^3$
 $Z_y = h \times (N \times b)^2 / 6 = 3281250 \text{ mm}^3$

Second moment of area

 $I_x = N \times b \times h^3 / 12 = 651164062 \text{ mm}^4$
 $I_y = h \times (N \times b)^3 / 12 = 410156250 \text{ mm}^4$

Radius of gyration

 $i_x = \sqrt{I_x / A} = 90.9 \text{ mm}$
 $i_y = \sqrt{I_y / A} = 72.2 \text{ mm}$

Modification factors

Duration of loading - Table 17

 $K_3 = 1.00$

Bearing stress - Table 18

 $K_4 = 1.00$

Total depth of member - cl.2.10.6

 $K_7 = 0.81 \times (h^2 + 92300 \text{ mm}^2) / (h^2 + 56800 \text{ mm}^2) = 0.99$

Load sharing - cl.2.9

 $K_8 = 1.00$

Lateral support - cl.2.10.8

Ends held in position

Permissible depth-to-breadth ratio - Table 19

3.00

Actual depth-to-breadth ratio

 $h / (N \times b) = 1.26$
PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane)

 $\sigma_{c_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 = 2.200 \text{ N/mm}^2$

Applied bearing stress

 $\sigma_{c_a} = R_{B_max} / (N \times b \times L_b) = 1.130 \text{ N/mm}^2$
 $\sigma_{c_a} / \sigma_{c_adm} = 0.514$
PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress

$$\sigma_{m_adm} = \sigma_m * K_3 * K_7 * K_8 = 5.767 \text{ N/mm}^2$$

Applied bending stress

$$\sigma_{m_a} = M / Z_x = 4.459 \text{ N/mm}^2$$

$$\sigma_{m_a} / \sigma_{m_adm} = 0.773$$

PASS - Applied bending stress is less than permissible bending stress**Shear parallel to grain**

Permissible shear stress

$$\tau_{adm} = \tau * K_3 * K_8 = 0.670 \text{ N/mm}^2$$

Applied shear stress

$$\tau_a = 3 * F / (2 * A) = 0.404 \text{ N/mm}^2$$

$$\tau_a / \tau_{adm} = 0.602$$

PASS - Applied shear stress is less than permissible shear stress**Deflection**

Modulus of elasticity for deflection

$$E = E_{min} = 6000 \text{ N/mm}^2$$

Permissible deflection

$$\delta_{adm} = \min(0.394 \text{ in}, 0.0033 * L_{s1}) = 10.008 \text{ mm}$$

Bending deflection

$$\delta_{b_s1} = 3.868 \text{ mm}$$

Shear deflection

$$\delta_{v_s1} = 0.421 \text{ mm}$$

Total deflection

$$\delta_a = \delta_{b_s1} + \delta_{v_s1} = 4.290 \text{ mm}$$

$$\delta_a / \delta_{adm} = 0.429$$

PASS - Total deflection is less than permissible deflection

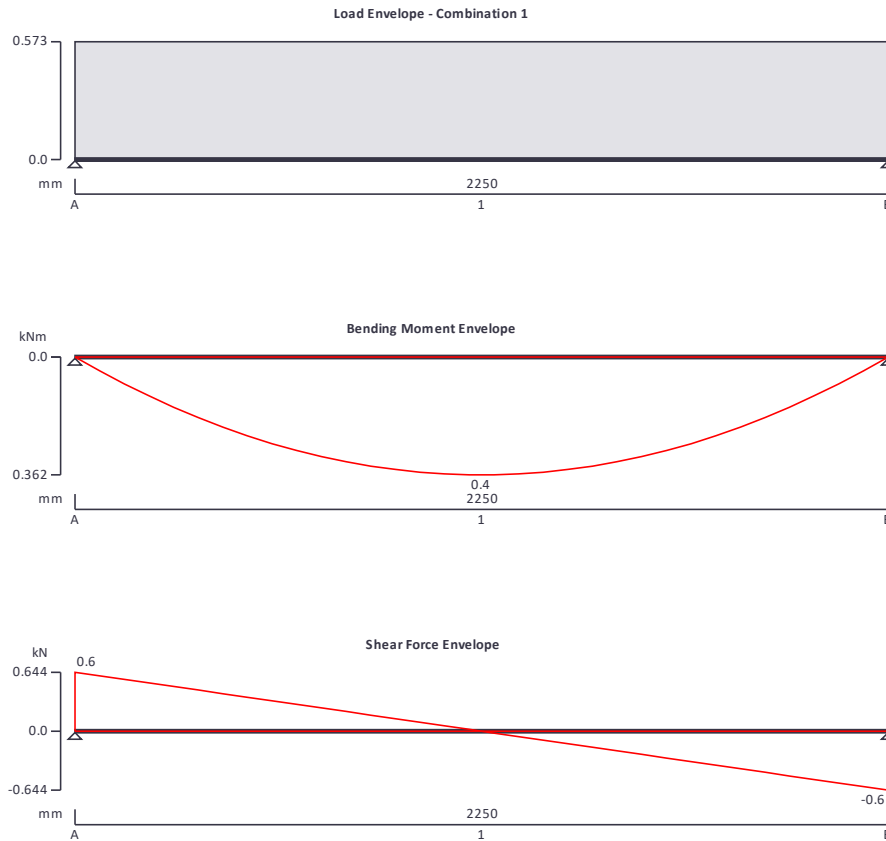
APPENDIX C – TYPICAL STRCUTURAL TIMBER FLOOR PLANK CHECKS

Calculation sheet

Project	Calculations for		
Project No.	Approved	Sheet	1
Made by	MP	Date	14/05/2021
		Revision	

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02



Applied loading

Beam loads

Dead full UDL 0.100 kN/m
 Imposed full UDL 0.440 kN/m
 Dead self weight of beam * 1

Load combinations

Load combination 1

Support A	Dead * 1.00 Imposed * 1.00
Span 1	Dead * 1.00 Imposed * 1.00
Support B	Dead * 1.00 Imposed * 1.00

Analysis results

Maximum moment	$M_{\max} = 0.362 \text{ kNm}$	$M_{\min} = 0.000 \text{ kNm}$
Design moment	$M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 0.362 \text{ kNm}$	
Maximum shear	$F_{\max} = 0.644 \text{ kN}$	$F_{\min} = -0.644 \text{ kN}$
Design shear	$F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 0.644 \text{ kN}$	
Total load on beam	$W_{\text{tot}} = 1.289 \text{ kN}$	

Calculation sheet

Project	Calculations for		
Project No.	Approved	Sheet	2
Made by	MP	Date	14/05/2021
		Revision	

Reactions at support A

$R_{A_max} = 0.644 \text{ kN}$

$R_{A_min} = 0.644 \text{ kN}$

Unfactored dead load reaction at support A

$R_{A_Dead} = 0.149 \text{ kN}$

Unfactored imposed load reaction at support A

$R_{A_Imposed} = 0.495 \text{ kN}$

Reactions at support B

$R_{B_max} = 0.644 \text{ kN}$

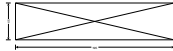
$R_{B_min} = 0.644 \text{ kN}$

Unfactored dead load reaction at support B

$R_{B_Dead} = 0.149 \text{ kN}$

Unfactored imposed load reaction at support B

$R_{B_Imposed} = 0.495 \text{ kN}$

**Timber section details**

Breadth of sections

$b = 195 \text{ mm}$

Depth of sections

$h = 45 \text{ mm}$

Number of sections in member

$N = 1$

Overall breadth of member

$b_b = N \times b = 195 \text{ mm}$

Timber strength class

$C18$

Member details

Service class of timber

1

Load duration

Long term

Length of span

$L_{s1} = 2250 \text{ mm}$

Length of bearing

$L_b = 100 \text{ mm}$

Section properties

Cross sectional area of member

$A = N \times b \times h = 8775 \text{ mm}^2$

Section modulus

$Z_x = N \times b \times h^2 / 6 = 65812 \text{ mm}^3$

$Z_y = h \times (N \times b)^2 / 6 = 285188 \text{ mm}^3$

Second moment of area

$I_x = N \times b \times h^3 / 12 = 1480781 \text{ mm}^4$

$I_y = h \times (N \times b)^3 / 12 = 27805781 \text{ mm}^4$

Radius of gyration

$i_x = \sqrt{I_x / A} = 13.0 \text{ mm}$

$i_y = \sqrt{I_y / A} = 56.3 \text{ mm}$

Modification factors

Duration of loading - Table 17

$K_3 = 1.00$

Bearing stress - Table 18

$K_4 = 1.00$

Total depth of member - cl.2.10.6

$K_7 = 1.17$

Load sharing - cl.2.9

$K_8 = 1.00$

Lateral support - cl.2.10.8

Ends held in position and members held in line, as by purlins or tie rods at centres not more than 30 times the breadth of the member

Permissible depth-to-breadth ratio - Table 19

4.00

Actual depth-to-breadth ratio

$h / (N \times b) = 0.23$

PASS - Lateral support is adequate**Compression perpendicular to grain**

Permissible bearing stress (no wane)

$\sigma_{c_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 = 2.200 \text{ N/mm}^2$

Applied bearing stress

$\sigma_{c_a} = R_{A_max} / (N \times b \times L_b) = 0.033 \text{ N/mm}^2$

$\sigma_{c_a} / \sigma_{c_adm} = 0.015$

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Calculation sheet

Project	Calculations for		
Project No.	Approved	Sheet	3
Made by	Date	Revision	

MP

14/05/2021

Bending parallel to grain

Permissible bending stress

$$\sigma_{m_adm} = \sigma_m * K_3 * K_7 * K_8 = \mathbf{6.786 \text{ N/mm}^2}$$

Applied bending stress

$$\sigma_{m_a} = M / Z_x = \mathbf{5.507 \text{ N/mm}^2}$$

$$\sigma_{m_a} / \sigma_{m_adm} = \mathbf{0.811}$$

PASS - Applied bending stress is less than permissible bending stress**Shear parallel to grain**

Permissible shear stress

$$\tau_{adm} = \tau * K_3 * K_8 = \mathbf{0.670 \text{ N/mm}^2}$$

Applied shear stress

$$\tau_a = 3 * F / (2 * A) = \mathbf{0.110 \text{ N/mm}^2}$$

$$\tau_a / \tau_{adm} = \mathbf{0.164}$$

PASS - Applied shear stress is less than permissible shear stress**Deflection**

Modulus of elasticity for deflection

$$E = E_{min} = \mathbf{6000 \text{ N/mm}^2}$$

Permissible deflection

$$\delta_{adm} = \min(0.551 \text{ in}, 0.003 * L_{s1}) = \mathbf{6.750 \text{ mm}}$$

Bending deflection

$$\delta_{b_s1} = \mathbf{21.511 \text{ mm}}$$

Shear deflection

$$\delta_{v_s1} = \mathbf{0.132 \text{ mm}}$$

Total deflection

$$\delta_a = \delta_{b_s1} + \delta_{v_s1} = \mathbf{21.643 \text{ mm}}$$

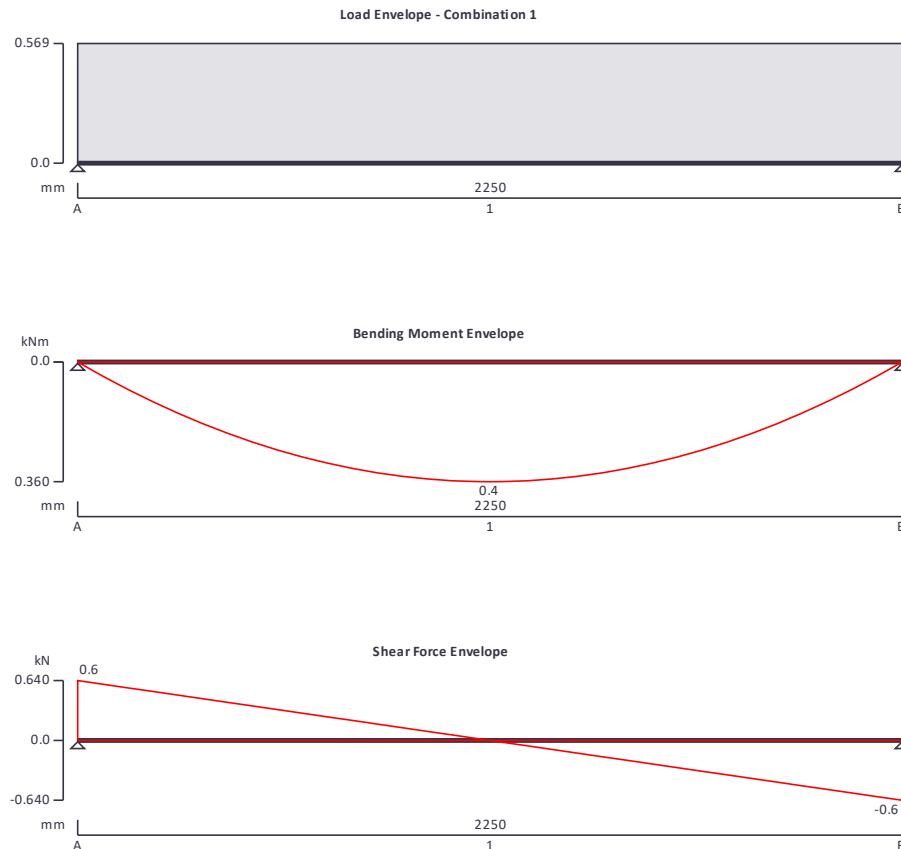
$$\delta_a / \delta_{adm} = \mathbf{3.206}$$

FAIL - Total deflection exceeds permissible deflection

 GM Structures Manchester	Project PW - Manchester Design and Build				Job no. A3516	
	Calculations for Floor Planks Check (Fire + Add Reduc)				Sheet/Revision 1	
	Made by MP	Date 20/12/2021	Checked by GJ	Checked date 14/5/2021	Approved GJ	Approved date 14/5/2021

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02



Applied loading

Beam loads

Dead full UDL 0.100 kN/m
Imposed full UDL 0.440 kN/m
Dead self weight of beam $\times 1$

Load combinations

Load combination 1

Support A	Dead $\times 1.00$ Imposed $\times 1.00$
Span 1	Dead $\times 1.00$ Imposed $\times 1.00$
Support B	Dead $\times 1.00$ Imposed $\times 1.00$

Analysis results

Maximum moment	$M_{\max} = 0.360$ kNm	$M_{\min} = 0.000$ kNm
Design moment	$M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 0.360$ kNm	
Maximum shear	$F_{\max} = 0.640$ kN	$F_{\min} = -0.640$ kN
Design shear	$F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 0.640$ kN	
Total load on beam	$W_{\text{tot}} = 1.280$ kN	

 GM Structures Manchester	Project PW - Manchester Design and Build				Job no. A3516	
	Calculations for Floor Planks Check (Fire + Add Reduc)				Sheet/Revision 2	
	Made by MP	Date 20/12/2021	Checked by GJ	Checked date 14/5/2021	Approved GJ	Approved date 14/5/2021

Reactions at support A

$$R_{A_max} = 0.640 \text{ kN}$$

$$R_{A_min} = 0.640 \text{ kN}$$

Unfactored dead load reaction at support A

$$R_{A_Dead} = 0.145 \text{ kN}$$

Unfactored imposed load reaction at support A

$$R_{A_Imposed} = 0.495 \text{ kN}$$

Reactions at support B

$$R_{B_max} = 0.640 \text{ kN}$$

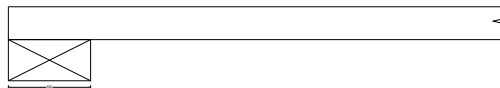
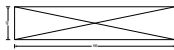
$$R_{B_min} = 0.640 \text{ kN}$$

Unfactored dead load reaction at support B

$$R_{B_Dead} = 0.145 \text{ kN}$$

Unfactored imposed load reaction at support B

$$R_{B_Imposed} = 0.495 \text{ kN}$$



Timber section details

Breadth of sections

$$b = 195 \text{ mm}$$

Depth of sections

$$h = 40 \text{ mm}$$

Number of sections in member

$$N = 1$$

Overall breadth of member

$$b_b = N \times b = 195 \text{ mm}$$

Timber strength class

$$\text{C18}$$

Member details

Service class of timber

$$1$$

Load duration

$$\text{Short term}$$

Length of span

$$L_{s1} = 2250 \text{ mm}$$

Length of bearing

$$L_b = 100 \text{ mm}$$

Section properties

Cross sectional area of member

$$A = N \times b \times h = 7800 \text{ mm}^2$$

Section modulus

$$Z_x = N \times b \times h^2 / 6 = 52000 \text{ mm}^3$$

$$Z_y = h \times (N \times b)^2 / 6 = 253500 \text{ mm}^3$$

Second moment of area

$$I_x = N \times b \times h^3 / 12 = 1040000 \text{ mm}^4$$

$$I_y = h \times (N \times b)^3 / 12 = 24716250 \text{ mm}^4$$

Radius of gyration

$$i_x = \sqrt{I_x / A} = 11.5 \text{ mm}$$

$$i_y = \sqrt{I_y / A} = 56.3 \text{ mm}$$

Modification factors

Duration of loading - Table 17

$$K_3 = 1.50$$

Bearing stress - Table 18

$$K_4 = 1.00$$

Total depth of member - cl.2.10.6

$$K_7 = 1.17$$

Load sharing - cl.2.9

$$K_8 = 1.00$$

Lateral support - cl.2.10.8

Ends held in position and members held in line, as by purlins or tie rods at centres not more than 30 times the breadth of the member

Permissible depth-to-breadth ratio - Table 19

$$4.00$$

Actual depth-to-breadth ratio

$$h / (N \times b) = 0.21$$

PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane)

$$\sigma_{c_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 = 3.300 \text{ N/mm}^2$$

Applied bearing stress

$$\sigma_{c_a} = R_{A_max} / (N \times b \times L_b) = 0.033 \text{ N/mm}^2$$

$$\sigma_{c_a} / \sigma_{c_adm} = 0.010$$

PASS - Applied compressive stress is less than permissible compressive stress at bearing

 GM Structures Manchester	Project PW - Manchester Design and Build				Job no. A3516	
	Calculations for Floor Planks Check (Fire + Add Reduc)				Sheet/Revision 3	
	Made by MP	Date 20/12/2021	Checked by GJ	Checked date 14/5/2021	Approved GJ	Approved date 14/5/2021

Bending parallel to grain

Permissible bending stress

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{10.179 \text{ N/mm}^2}$$

Applied bending stress

$$\sigma_{m_a} = M / Z_x = \mathbf{6.925 \text{ N/mm}^2}$$

$$\sigma_{m_a} / \sigma_{m_adm} = \mathbf{0.680}$$

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress

$$\tau_{adm} = \tau \times K_3 \times K_8 = \mathbf{1.005 \text{ N/mm}^2}$$

Applied shear stress

$$\tau_a = 3 \times F / (2 \times A) = \mathbf{0.123 \text{ N/mm}^2}$$

$$\tau_a / \tau_{adm} = \mathbf{0.123}$$

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection

$$E = E_{min} = \mathbf{6000 \text{ N/mm}^2}$$

Permissible deflection

$$\delta_{adm} = \min(0.551 \text{ in}, 0.003 \times L_{s1}) = \mathbf{6.750 \text{ mm}}$$

Bending deflection

$$\delta_{b_s1} = \mathbf{30.433 \text{ mm}}$$

Shear deflection

$$\delta_{v_s1} = \mathbf{0.148 \text{ mm}}$$

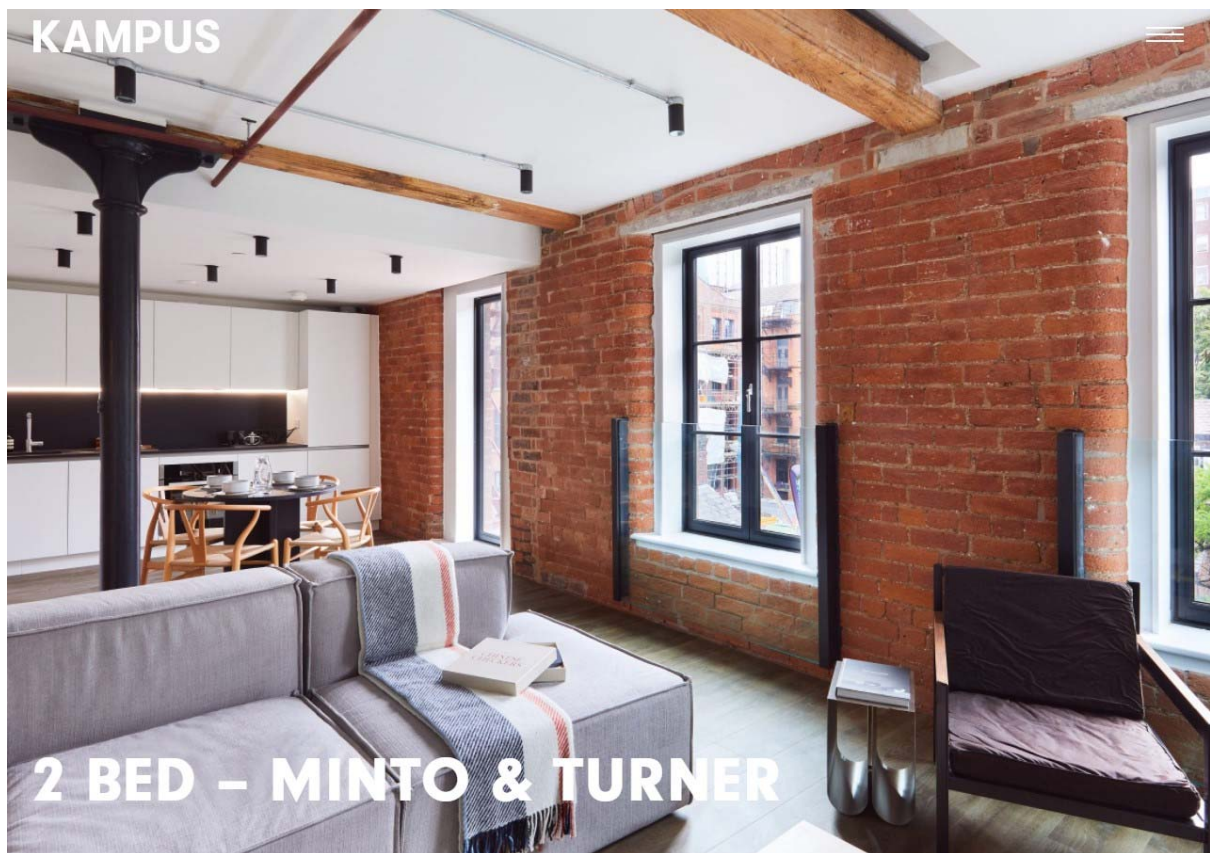
Total deflection

$$\delta_a = \delta_{b_s1} + \delta_{v_s1} = \mathbf{30.581 \text{ mm}}$$

$$\delta_a / \delta_{adm} = \mathbf{4.531}$$

FAIL - Total deflection exceeds permissible deflection

B1 - Kampus – Two listed buildings on Chorlton Street converted into residential apartments



B2 – 47 Peter Street – A listed building converted into a hotel



C1 - 16044-M004-A – Acoustic Review on Details

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Memo: M004-A

Date: 19 January 2018

Project: 16044

Pages: 4

From: Alastair Plail

Reviewer: Matthew Robinson

Mindel House & 11 Bloom Street, Manchester

Further comments on compliance with the Building Regulations

Further to the receipt of the revised scheme drawings on 11 January, our further comments in relation to the compliance of the scheme with the Building Regulations are provided below.

It is understood that the conservation officer has commented on our previous advice in relation to the internal sound insulation between apartments, with the following pertinent comment being provided:

'New internal walls should remain clear of the window reveals and the proposed large bulk head feature proposed on party walls (Drawing 501A) is unacceptable.'

Performance requirements

The performance requirements for separating walls are set out in Approved Document E 2003 Edition (including all amendments up to 2015) of the Building Regulations 2010, referred to in this report as ADE2003.

The on-site airborne sound insulation performance requirement of ADE2003 for dwellings formed by a material change of use is $D_{nT,w} + C_{tr}$ 43 dB. This would apply to all floors and walls separating apartments and adjacent spaces however as building is a historic building (Grade II listed), the Building Regulations states:

'In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.'

The floors are also required to achieve an impact sound insulation requirement of $L'_{nT,w}$ 64 dB.

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Floors

From the drawings, it is understood that the following floor build-up is proposed:

- Floor finish
- 20 mm screedboard (assumed to have a density of $\geq 1100 \text{ kg/m}^3$)
- 50 mm underfloor heating insulation
- 8 mm 'acoustic fleece' (assumed to be a resilient layer)
- 18 mm plywood
- 85 mm timber battens with 50 mm mineral fibre insulation (assumed density of 30 – 60 kg/m^3) in between
- Existing 75 mm timber floor.

The proposed build-up is expected to fall short of the $D_{nT,w}+C_{tr}$ 43 dB sound insulation performance requirement.

To increase the vertical sound insulation provided by the build-up in line with the requirements, it is recommended that the timber battens be mounted on a resilient element (ie, resilient cradle and batten system).

Based on this being provided, the 'acoustic fleece' element may be omitted from the build-up. The resilient batten can instead be relied upon to meet the impact sound insulation requirement between apartments.

Partitions

The GA plans indicate an overall zone of 150 mm for the separating walls between apartments. The proposed construction is not known, however the performance provided by a drywall with this thickness would only be expected to be capable of meeting the required sound insulation performance when all flanking sound transmission paths are well controlled.

It is recommended that a twin stud construction with an enhanced partition zone of 250 mm be provided between apartments due to the following considerations:

- This zone would allow for a partition construction which meets the requirements of ADE 2003 through the partition
- By controlling horizontal sound transmission via the partition itself, this would allow for a greater contribution of sound transmission via the weak interface at the head of the partition which is discussed further below.

An example partition construction is 2 x 15 mm Soundbloc (or equivalent) to both sides of independent twin studs with ≥ 50 mm mineral fibre insulation provided in the cavity (250 mm overall thickness).

Interface details

Flanking sound transfer via external walls

The existing facade construction for both buildings is a minimum of 400 mm masonry (assuming a density of at least 1605 kg/m^3). This would typically provide sufficient flanking sound insulation provided that the floor construction is well sealed to the facade.

Where internal linings are to be provided, these should be broken at the line of the internal partitions. This is shown in the details received.

Flanking sound transfer via floors

Partition base

As set out in memo M003-A, the floated floor construction given above should be individual to each apartment with the party wall construction built off the existing 75 mm timber base floor.

There should be a resilient flanking strip between the edge of each floated floor where it interfaces with the party wall construction.

Partition head

A bulkhead detail was previously recommended in memo M003-A in order to control noise transfer via the head at the partition where it interfaces with the existing timber floor. As noted above, the conservation officer has deemed this to be unacceptable.

Without the bulkhead, there is a risk that the weakness at the exposed partition head would reduce the laboratory to site tolerance of the partition and limit the overall performance of the partition. The following measures are therefore recommended to provide the highest practicable sound insulation to the separating partitions without the installation of bulkheads:

- Provide a party wall construction with a minimum zone of 250 mm as discussed above
- Provide 3 mm steel angles at the head of the partition as shown in Figure 1.

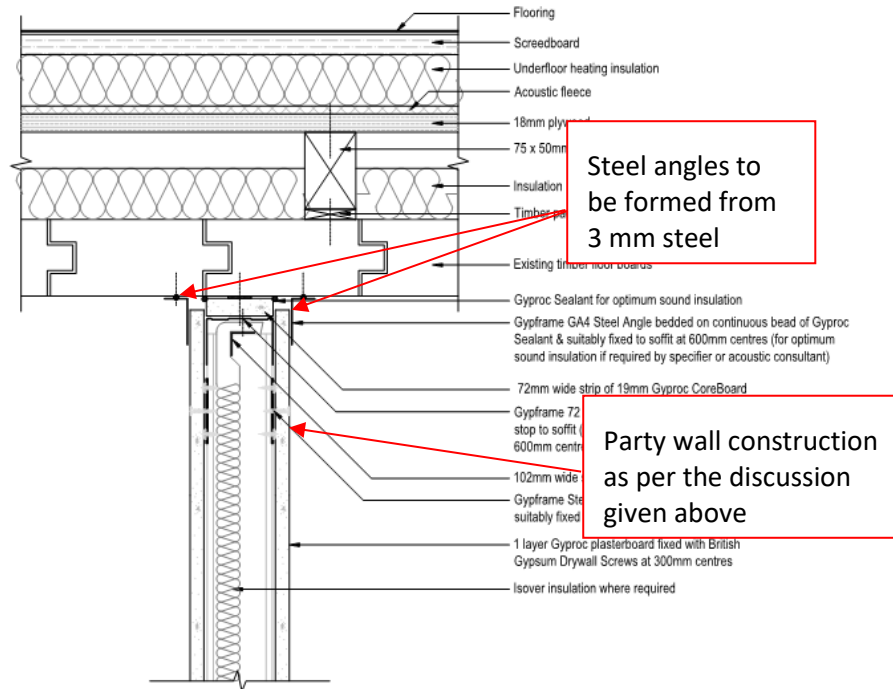


Figure 1 Party wall head detail

Recommendations

To summarise, the following measures are recommended to control the internal sound insulation between apartments in line with the requirements of ADE 2003:

- Provide an enhanced party wall construction with an overall zone of 250 mm
- Provide 3 mm steel angles to both sides of the party walls at the head
- Support the floor battens on a resilient cradle/strip and provide a resilient flanking strip at the edge of each floated floor.

Without providing bulkheads to the separating partition head detail the laboratory to site tolerance of the partition will be reduced. Due to this the overall performance of the separating partition would be limited and there is a risk that the performance of $D_{nT,w} + C_{tr}$ 43 dB is not achieved. Therefore, it is recommended that early on-site mock-up testing is carried out in order to determine the achievable sound insulation performance for the Building Regulations submission.

Based on the measured sound insulation performance a benchmark performance could be set which would allow any potential workmanship issues throughout the scheme to be identified.

C2 - 21013-M002-A - Acoustic Review on Details

Memo: M002-A

Date: 6 September 2021

Project: 21013

Pages: 8

From: Daniel Shaw

Reviewer: Matthew Robinson

Mindel House & 11 Bloom Street, Manchester

Internal sound insulation review

This memo sets out a review of internal sound insulating partitions and floors between apartments.

A summary of the key recommendations is provided below:

- The mineral fibre insulation to separating partitions between apartments should be increased to a minimum of 50 mm.
- The separating partition uses resilient bars and there are significant risks relating to workmanship and structure-borne noise transfer that need to be considered.
- The separating floor construction is not expected to consistently meet the sound insulation performance requirement. Options for increasing the performance are provided.
- It is proposed to expose the underside of the existing floorboards. This will lead to significant flanking sound transmission via the head of the separating partitions. Either ceilings, a bulkhead or a structural break in the existing floorboard at the line of the partition are recommended.
ADE2003 does allow a relaxation for listed buildings, so if the recommended enhancements cannot be accommodated the partition performance should be maximised by using a twin stud partition with a 250 mm overall depth.
- For interfaces between the separating partition and the curtain walling, the proposed plasterboard linings should continue to cover the mullions on both sides. Alternatively metal over cladding could be used.

Acoustic performance requirements

ADE2003 specifies under requirement E1 that the minimum performance standards for airborne and impact sound insulation must be achieved to demonstrate compliance with the Building Regulations, these standards are set out in Table 1.

Table 1 Minimum sound insulation performances for separating elements between flats in line with ADE2003

	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<i>Material change of use dwelling-houses and flats:</i>		
Walls	43	-
Floors and Stairs	43	64

However, as Mindel House and 11 Bloom Street are Grade II listed, ADE 2003 states the following with reference to listed buildings:

'In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.'

ADE2003 specifies under requirement E2 that the minimum performance standard for airborne sound insulation of R_w 40 dB must be achieved by internal walls (not containing a door) and floors to demonstrate compliance with the Building Regulations.

Comments on partition constructions

The separating wall construction consists of:

- 2 x 15 mm dense plasterboard
- 25 mm resilient bar
- 70 mm metal stud containing 25 mm mineral fibre insulation
- 2 x 15 mm dense plasterboard

The above construction is similar to British Gypsum reference A316008, which requires 50 mm mineral fibre insulation within the cavity to achieve a tested performance of R_w+C_{tr} 53 dB. This would allow a 10 dB tolerance to account for site conditions and still meet minimum sound insulation performance requirements. As such, the insulation should be increased to 50 mm.

The proposed separating partitions would not control structure-borne sound between apartments to the same degree a staggered or twin-stud partition would. As such if this partition were used furniture, cupboards, plumbing, fixtures and fittings should not be rigidly fixed to partition as there would be an increased risk of causing disturbance in adjacent apartments. There are potential fixing issues with use of drywalls containing acoustic studs that should be noted. Key issues are:

- Workmanship – There have been a number of instances where resilient bars have been incorrectly installed, with screws bridging the resilient bar, which negates the performance benefit of the resilient bar and would compromise the sound insulation performance of the wall.
- Fixing built-in furniture – Typically fixing built-in furniture (eg, kitchen cupboards) is difficult as this would require patressing which is located behind the plasterboard and between the resilient bar (in order to not increase the overall depth). Additionally there is an added risk that in fixing these items, screws may bridge the resilient bars.

Comments on floor constructions

The floor construction is understood to consist of:

- 4 mm Karndean Luxury Vinyl Tile (LVT)
- 2 mm latex screed
- 32 mm GIFA panel (density $\geq 1500 \text{ kg/m}^3$)
- 75 x 50 mm timber battens on resilient cradles, with mineral fibre insulation between the battens
- 75 mm existing timber floorboards

This construction is expected to provide a site performance of $D_{nT,w} + C_{tr}$ 41-43 dB, and would not be expected to consistently meet the sound insulation performance requirements. As such it is recommended that one of these options is provided:

- Provide additional boarding to the top of the floating floor. A minimum of 18 mm plywood (density $\geq 650 \text{ kg/m}^3$) would be needed.
- Provide a ceiling consisting of 2 x 12.5 mm standard plasterboard, minimum 100 mm cavity containing a minimum 50 mm mineral fibre within the cavity.
It isn't clear how the floorboards are supported based on the drawings, but a this could be provided between the joists in order to keep exposed original features. This would also assist in controlling flanking sound transmission via the existing floorboards (see following section).

Additionally the resilient cradles should be specified so that the floating floor provides a minimum improvement in impact sound insulation of ΔL_w 17 dB.

Comments on separating partition interface details

External wall interface

The external wall interface uses a deflection detail with 3 mm steel angles covering the joint, as shown below in Figure 1. This is expected to be suitable provided it is well sealed based on the facade comprising a minimum of 200 mm solid brickwork.

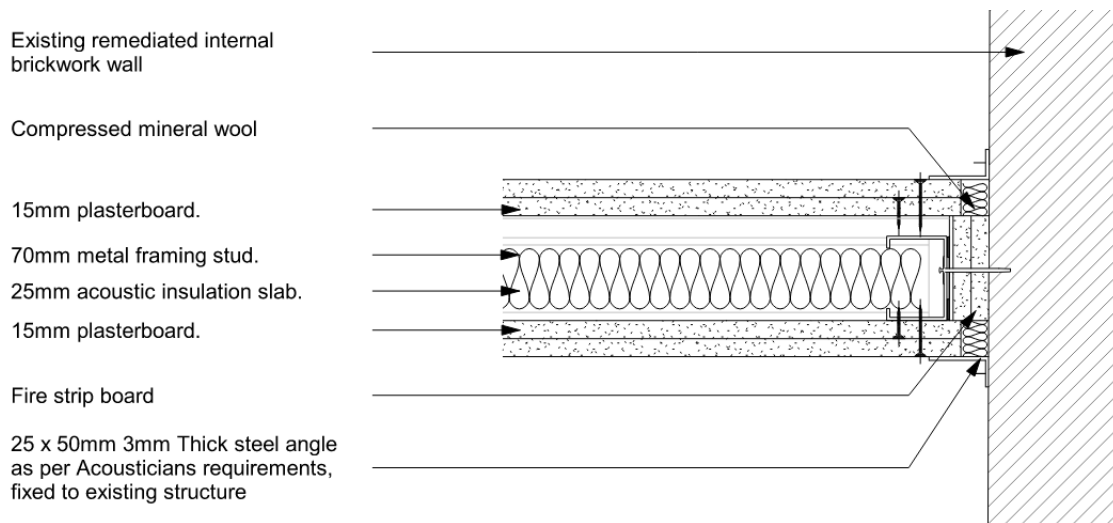


Figure 1 Excerpt of drawing 061_508_SHADOW GAP DETAIL_20.08.21 – Separating partition interface with external wall

Separating partition head detail

The head detail for the separating partition is a similar deflection detail with metal angles covering the gap. This is expected to be suitable in itself, however, flanking sound transmission via the floorboards is a significant concern, limiting of the separating partition sound insulation performance to around $D_{nT,w} + C_{tr}$ 40 dB.

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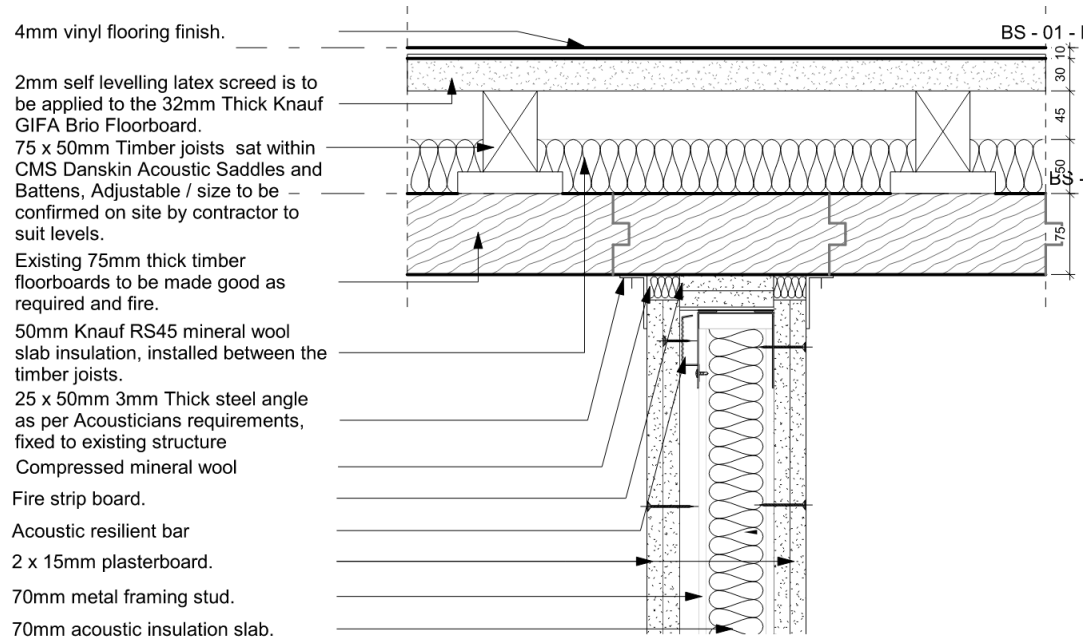


Figure 2 Excerpt from drawing 061_508_SHADOW GAP DETAIL_20.08.21 – a separating partition head detail

One of the following options should be adopted if possible:

- Provide a suspended ceiling consisting of 2 x 12.5 mm standard plasterboard or equivalent to both sides or a structural break in the floorboards.
- It is understood to be the intention to expose the underside of floorboards. If this is the case there would need to be a structural break in the floorboards which does not compromise the vertical sound insulation.
- Provide a bulkhead either side of the partition comprising 2x15 mm dense plasterboard, 50 mineral fibre within the bulkhead (minimum density 30 kg/m³) and extend at least 300 mm either side of the party wall and 300 mm below the existing floorboards.

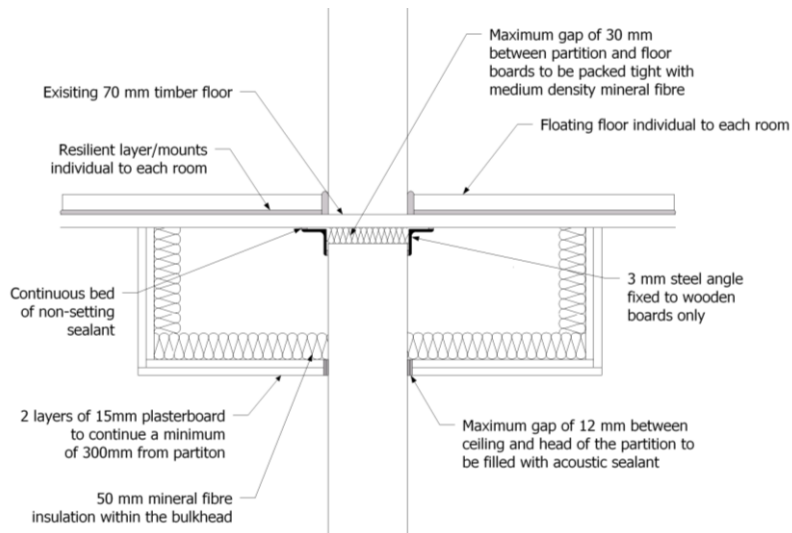


Figure 3 Example sketch detail – Party wall/floor interface detail

Without one of the enhancements listed, there is a risk that the weakness at the exposed partition head would reduce the laboratory to site tolerance of the partition and limit the overall performance of the partition. It is recommended that to provide the highest practicable sound insulation to the separating partitions without the installation of bulkheads a twin stud separating partition construction is provided (2x15 mm dense plasterboard to both sides of independent twin studs with 50 mm mineral fibre insulation provided in the cavity, 250 mm overall thickness).

Separating partition base detail

The base detail for the party wall as shown in Figure 4 looks to suitably control flanking sound transmission, provided that the flanking strips are installed correctly and also installed around any other elements which are connected to the structural floor.

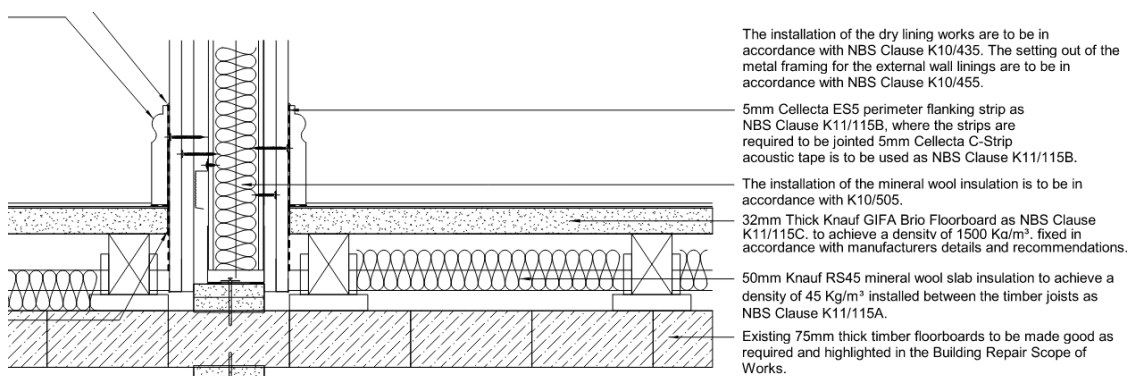


Figure 4 Excerpt from drawing 013-MDB-BS-ZZ-DT-A-2201 – Separating partition base detail

Comments on separating floor interface details

External wall interface

As the floor is of lightweight construction, the interface with the external wall as shown in Figure 5 is expected to be suitable provided any gaps for structural elements are well sealed.

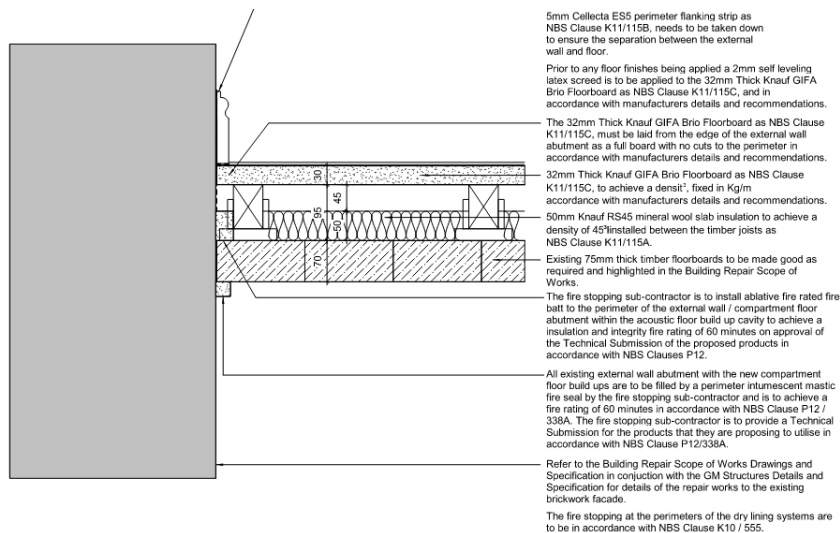


Figure 5 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2201 – Separating floor interface with external wall

Comments on curtain wall interface details

External wall interface

The proposed interface with the curtain wall as shown in Figure 6 is expected to be borderline with the requirements for separating partitions. It is recommended that the overboarding extends to cover the mullions. Alternatively, metal over cladding of equivalent surface density could be used to improve the flanking sound transmission performance.

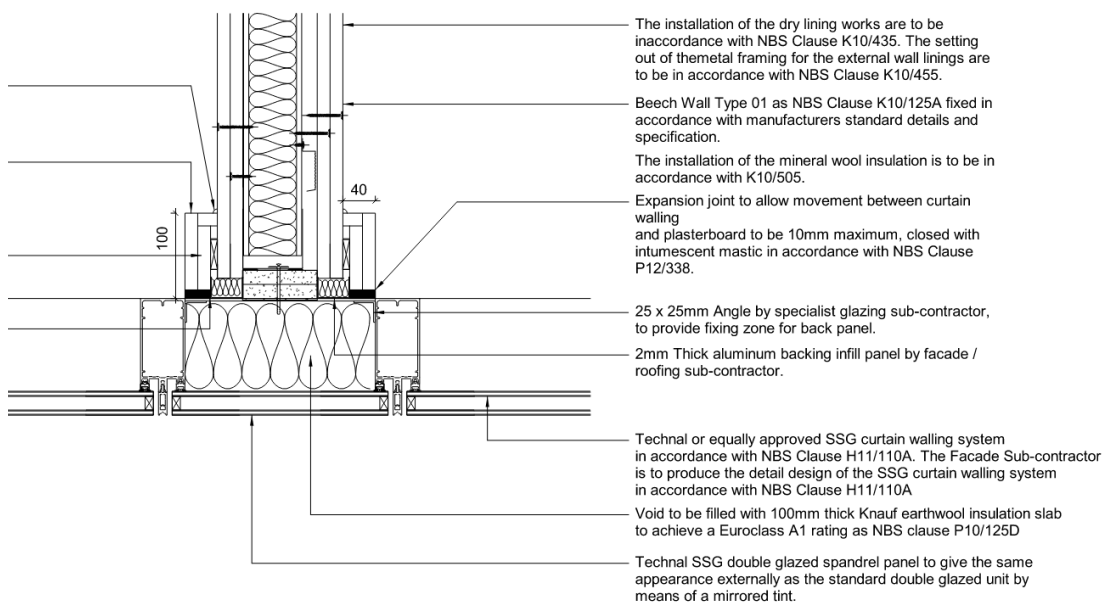


Figure 6 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2200 – Separating partition interface with curtail walling

C3 - 21013-M002-B – Acoustic Review on Details

Memo: M002-B

Date: 13 September 2021

Project: 21013

Pages: 5

From: Daniel Shaw

Reviewer: Matthew Robinson

Mindel House & 11 Bloom Street, Manchester

Internal sound insulation review

This memo sets out a review of internal sound insulating partitions and floors between apartments.

A summary of the key recommendations is provided below:

- The separating partition uses resilient bars and there are significant risks relating to workmanship and structure-borne noise transfer that need to be considered.
- For interfaces between the separating partition and the curtain walling, the proposed plasterboard linings should continue to cover the mullions on both sides. Alternatively, metal over cladding could be used.

Acoustic performance requirements

ADE2003 specifies under requirement E1 that the minimum performance standards for airborne and impact sound insulation must be achieved to demonstrate compliance with the Building Regulations, these standards are set out in Table 1.

Table 1 Minimum sound insulation performances for separating elements between flats in line with ADE2003

	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<i>Material change of use dwelling-houses and flats:</i>		
Walls	43	-
Floors and Stairs	43	64

However, as Mindel House and 11 Bloom Street are Grade II listed, ADE 2003 states the following with reference to listed buildings:

'In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.'

ADE2003 specifies under requirement E2 that the minimum performance standard for airborne sound insulation of R_w 40 dB must be achieved by internal walls (not containing a door) and floors to demonstrate compliance with the Building Regulations.

Comments on partition constructions

The separating wall construction consists of:

- 2 x 15 mm dense plasterboard
- 25 mm resilient bar
- 70 mm metal stud containing 50 mm mineral fibre insulation
- 2 x 15 mm dense plasterboard

The above construction is similar to British Gypsum reference A316008, which achieves a tested performance of $R_w + C_{tr}$ 53 dB. This would allow a 10 dB tolerance to account for site conditions and still meet minimum sound insulation performance requirements.

The proposed separating partitions would not control structure-borne sound between apartments to the same degree a staggered or twin-stud partition would. As such if this partition were used furniture, cupboards, plumbing, fixtures and fittings should not be rigidly fixed to partition as there would be an increased risk of causing disturbance in adjacent apartments. There are potential fixing issues with use of drywalls containing acoustic studs that should be noted. Key issues are:

- Workmanship – There have been a number of instances where resilient bars have been incorrectly installed, with screws bridging the resilient bar, which negates the performance benefit of the resilient bar and would compromise the sound insulation performance of the wall.
- Fixing built-in furniture – Typically fixing built-in furniture (eg, kitchen cupboards) is difficult as this would require patressing which is located behind the plasterboard and between the resilient bar (in order to not increase the overall depth). Additionally, there is an added risk that in fixing these items, screws may bridge the resilient bars.

Comments on floor constructions

The floor construction is understood to consist of:

- 4 mm Karndean Luxury Vinyl Tile (LVT)

- 2 mm latex screed
- 32 mm GIFA panel (density $\geq 1500 \text{ kg/m}^3$)
- 75 x 50 mm timber battens on resilient cradles, with mineral fibre insulation between the battens
- 18 mm plywood boarding (density $\geq 650 \text{ kg/m}^3$)
- 75 mm existing timber floorboards
- 2 x 15 mm Knauf Soundshield Plus boards on 25 mm lining channels filled with mineral fibre insulation.

This construction is expected to provide a site performance of $D_{nT,w}+C_{tr}$ 42-45 dB, and would be expected to meet the sound insulation performance requirements.

The resilient cradles should be specified so that the floating floor provides a minimum improvement in impact sound insulation of ΔL_w 17 dB.

Comments on separating partition interface details

External wall interface

The external wall interface uses a deflection detail with 3 mm steel angles covering the joint, as shown below in Figure 1. This is expected to be suitable provided it is well sealed based on the facade comprising a minimum of 200 mm solid brickwork.

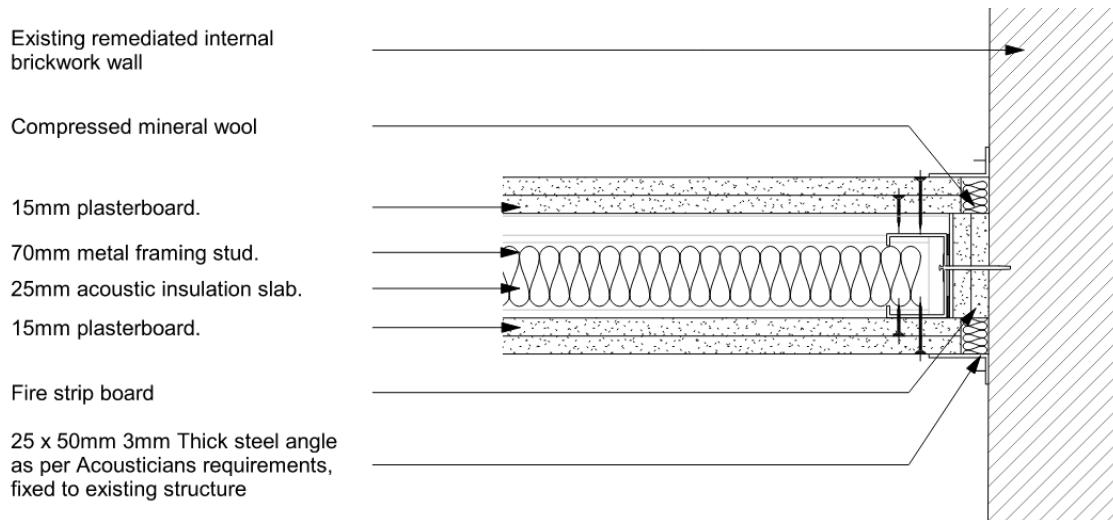


Figure 1 Excerpt of drawing 061_508_SHADOW GAP DETAIL_20.08.21 – Separating partition interface with external wall

Separating partition head and base detail

The head detail for the separating partition is a deflection detail with a double plasterboard ceiling to both sides. This is expected to be suitable in itself. The base detail is also expected to

be suitable provided flanking strips are installed correctly and also installed around any other elements which are connected to the structural floor.

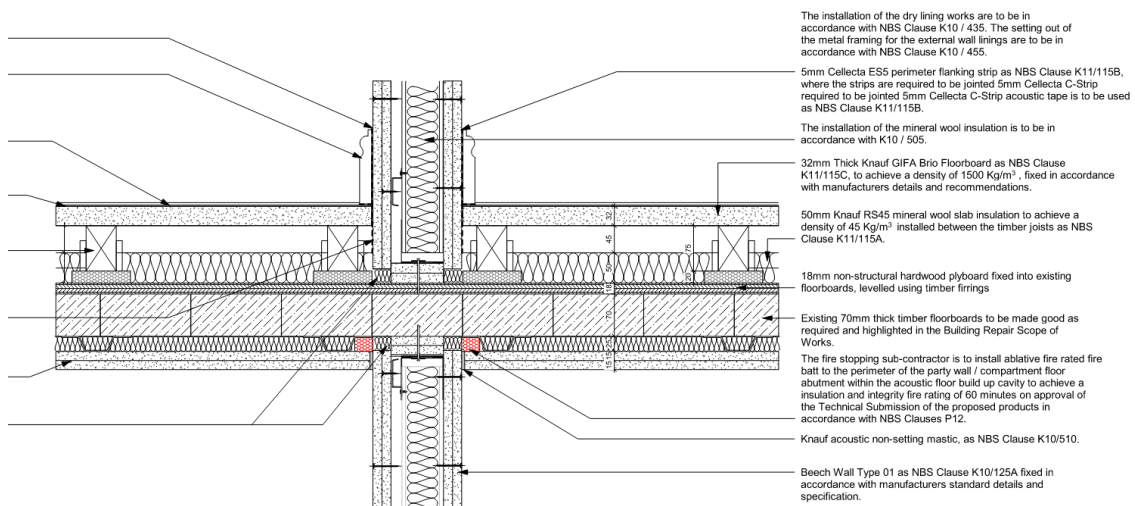


Figure 2 Excerpt from drawing 013-MDB-BS-ZZ-DT-A-2200– a separating partition head and base detail

Comments on separating floor interface details

External wall interface

As the floor is of lightweight construction, the interface with the external wall as shown in Figure 3 is expected to be suitable provided any gaps for structural elements are well sealed.

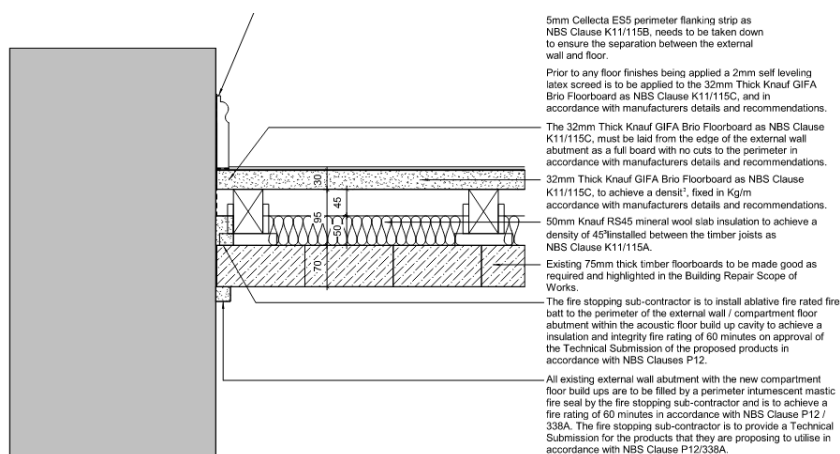


Figure 3 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2201 – Separating floor interface with external wall

Comments on curtain wall interface details

External wall interface

The proposed interface with the curtain wall as shown in Figure 4 is expected to be borderline with the requirements for separating partitions.

Given that both buildings are listed, this performance may be acceptable given the control of other flanking elements. However, given this is a new-build element it is recommended that the overboarding extends to cover the mullions. Alternatively, metal over cladding of equivalent surface density could be used to improve the flanking sound transmission performance.

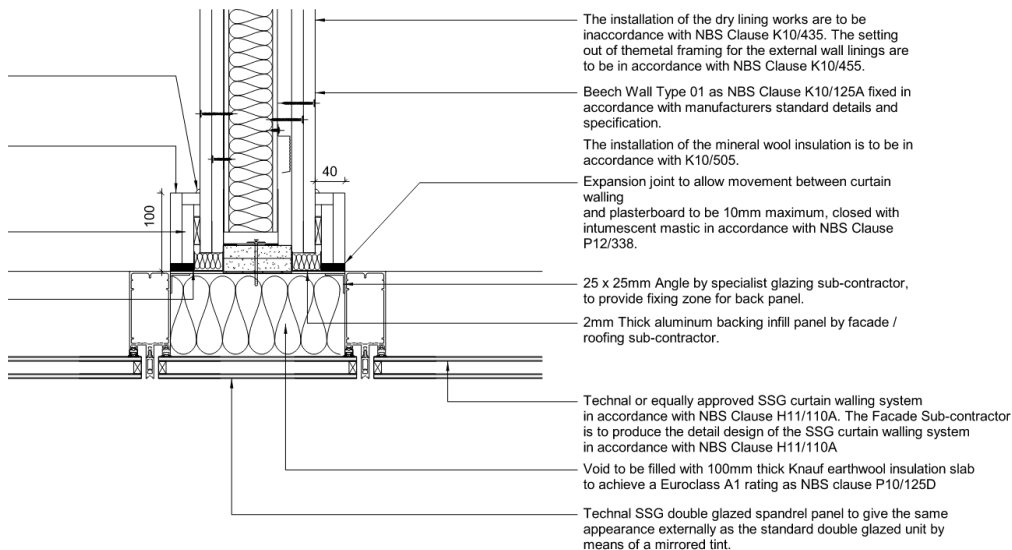


Figure 4 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2200 – Separating partition interface with curtail walling

C4 - 21013-M002-C – Acoustic Review on Details

Memo: M002-C

Date: 28 September 2021

Project: 21013

Pages: 5

From: Daniel Shaw

Reviewer: Matthew Robinson

Mindel House & 11 Bloom Street, Manchester

Internal sound insulation review

This memo sets out a review of internal sound insulating partitions and floors between apartments.

A summary of the key recommendations is provided below:

- If acoustic ceilings or metal angles are removed from party wall head details, the airborne sound insulation performance may be borderline with the standard requirement and may reduce the acoustic quality of the scheme.
- For interfaces between the separating partition and the curtain walling, the proposed plasterboard linings should continue to cover the mullions on both sides. Alternatively, metal over cladding could be used.

Acoustic performance requirements

ADE2003 specifies under requirement E1 that the minimum performance standards for airborne and impact sound insulation must be achieved to demonstrate compliance with the Building Regulations, these standards are set out in Table 1.

Table 1 Minimum sound insulation performances for separating elements between flats in line with ADE2003

	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<i>Material change of use dwelling-houses and flats:</i>		
Walls	43	-
Floors and Stairs	43	64

However, as Mindel House and 11 Bloom Street are Grade II listed, ADE 2003 states the following with reference to listed buildings:

'In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.'

ADE2003 specifies under requirement E2 that the minimum performance standard for airborne sound insulation of R_w 40 dB must be achieved by internal walls (not containing a door) and floors to demonstrate compliance with the Building Regulations.

Comments on partition constructions

The options for separating wall construction consist of:

- 2 x 15 mm dense plasterboard
- 50 mm twin metal studs separated by 10-25 mm
- 25 mm mineral fibre insulation within each stud
- 2 x 15 mm dense plasterboard

These constructions result in an overall partition depth of 170-189 mm. The above constructions achieve tested performances of $R_w + C_{tr}$ 54-59 dB, which would allow at least a 10 dB tolerance to account for site conditions and still meet minimum sound insulation performance requirements.

Comments on floor constructions

The floor construction is understood to consist of:

- 4 mm Karndean Luxury Vinyl Tile (LVT)
- 2 mm latex screed
- 32 mm GIFA panel (density $\geq 1500 \text{ kg/m}^3$)
- 75 x 50 mm timber battens on resilient cradles, with mineral fibre insulation between the battens
- 18 mm plywood boarding (density $\geq 650 \text{ kg/m}^3$)
- 75 mm existing timber floorboards
- 2 x 15 mm Knauf Soundshield Plus boards on 25 mm lining channels filled with mineral fibre insulation.

This construction is expected to provide a site performance of $D_{nT,w}+C_{tr}$ 42-45 dB, and would be expected to meet the sound insulation performance requirements.

The resilient cradles should be specified so that the floating floor provides a minimum improvement in impact sound insulation of ΔL_w 17 dB.

Comments on separating partition interface details

Partition interfaces are shown below for party walls with resilient bars – this has since been changed to twin-stud constructions and as such are indicative only.

External wall interface

The external wall interface uses a deflection detail with 3 mm steel angles covering the joint, as shown below in Figure 1. This is expected to be suitable provided it is well sealed based on the facade comprising a minimum of 200 mm solid brickwork.

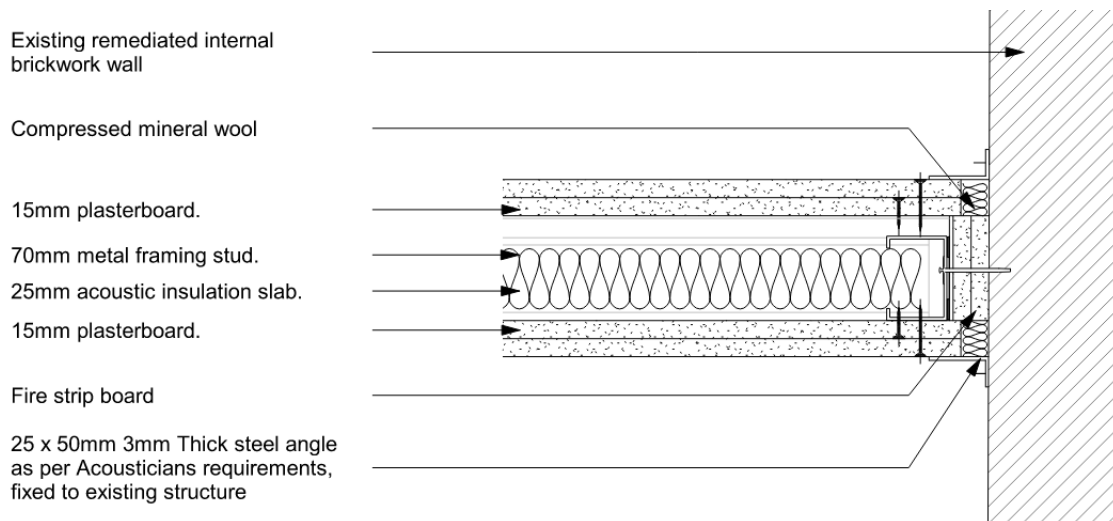


Figure 1 Excerpt of drawing 061_508_SHADOW GAP DETAIL_20.08.21 – Separating partition interface with external wall

Separating partition head and base detail

The head detail for the separating partition is a deflection detail with a double plasterboard ceiling to both sides. This is expected to be suitable as shown.

If the plasterboard ceiling is omitted, ideally the deflection detail should be covered by metal angles. However, there is significant tolerance within the partition performance itself to allow a reduced flanking performance at the head detail for twin-stud partitions.

The base detail is also expected to be suitable provided flanking strips are installed correctly and also installed around any other elements which are connected to the structural floor. Steel angles to the base detail would not be necessary.

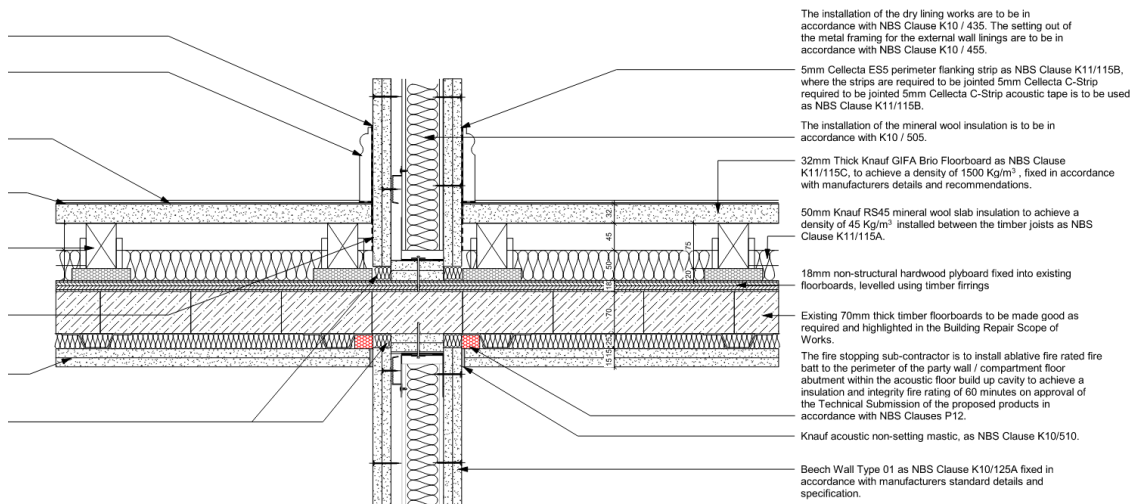


Figure 2 Excerpt from drawing 013-MDB-BS-ZZ-DT-A-2200– a separating partition head and base detail

Comments on separating floor interface details

External wall interface

As the floor is of lightweight construction, the interface with the external wall as shown in Figure 3 is expected to be suitable provided any gaps for structural elements are well sealed.

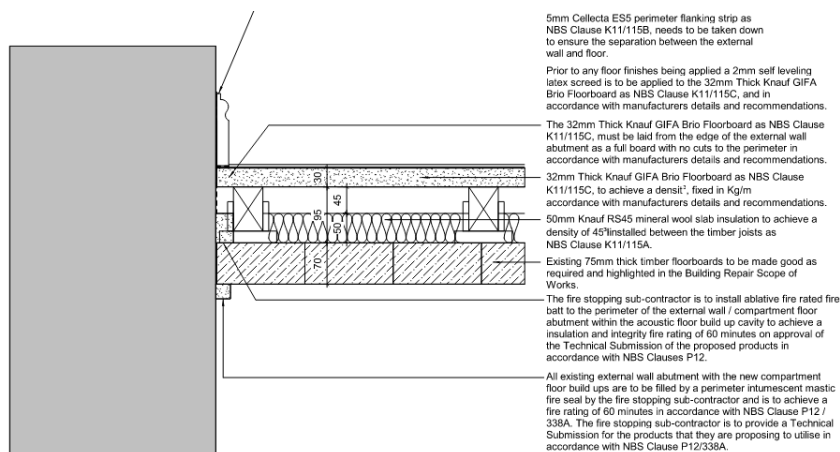


Figure 3 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2201 – Separating floor interface with external wall

Comments on curtain wall interface details

External wall interface

The proposed interface with the curtain wall as shown in Figure 4 is expected to be borderline with the requirements for separating partitions.

Given that both buildings are listed, this performance may be acceptable given the control of other flanking elements. However, given this is a new-build element it is recommended that the overboarding extends to cover the mullions. Alternatively, metal over cladding of equivalent surface density could be used to improve the flanking sound transmission performance.

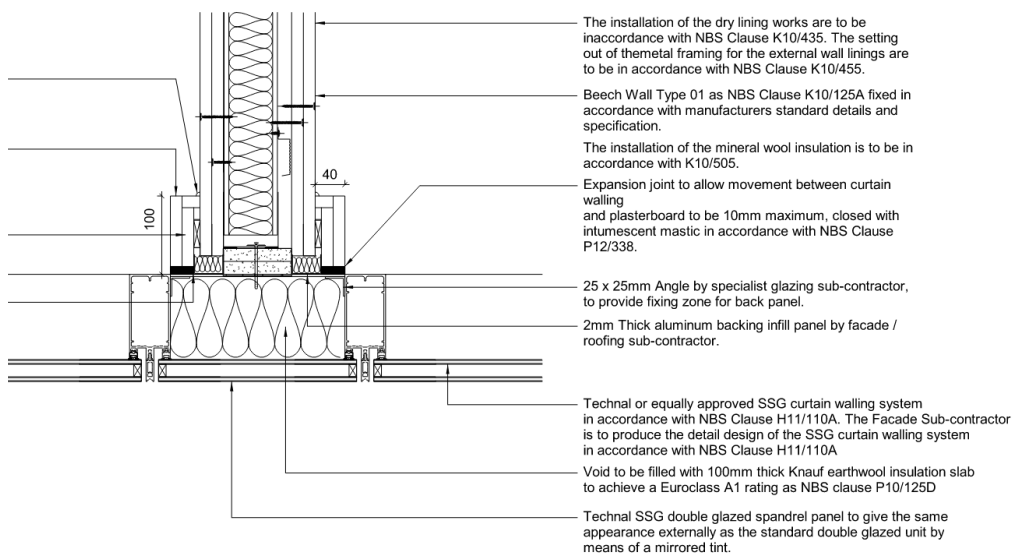


Figure 4 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2200 – Separating partition interface with curtail walling

C5 - 21013-M002-D – Acoustic Review on Details

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Memo: M002-D

Date: 18 October 2021

Project: 21013

Pages: 7

From: Daniel Shaw

Reviewer: Matthew Robinson

Mindel House & 11 Bloom Street, Manchester

Internal sound insulation review

This memo sets out a review of internal sound insulating partitions and floors between apartments.

A summary of the key recommendations is provided below:

- If acoustic ceilings or metal angles are removed from party wall head details, the airborne sound insulation performance may be borderline with the standard requirement and may reduce the acoustic quality of the scheme.
- The partition head detail is currently shown abutting the plasterboard ceiling. It should break the plasterboard and be mounted directly to the floorboards above.
- For interfaces between the separating partition and the curtain walling, the proposed plasterboard linings should continue to cover the mullions on both sides. Alternatively, metal over cladding could be used.

Acoustic performance requirements

ADE2003 specifies under requirement E1 that the minimum performance standards for airborne and impact sound insulation must be achieved to demonstrate compliance with the Building Regulations, these standards are set out in Table 1.

Table 1 Minimum sound insulation performances for separating elements between flats in line with ADE2003

	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<i>Material change of use dwelling-houses and flats:</i>		
Walls	43	-
Floors and Stairs	43	64

However, as Mindel House and 11 Bloom Street are Grade II listed, ADE 2003 states the following with reference to listed buildings:

'In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.'

ADE2003 specifies under requirement E2 that the minimum performance standard for airborne sound insulation of R_w 40 dB must be achieved by internal walls (not containing a door) and floors to demonstrate compliance with the Building Regulations.

Comments on partition constructions

The options for separating wall construction consist of:

- 2 x 15 mm dense plasterboard
- 50 mm twin metal studs separated by 10-25 mm
- 25 mm mineral fibre insulation within each stud
- 2 x 15 mm dense plasterboard

These constructions result in an overall partition depth of 170-189 mm. The above constructions achieve tested performances of R_w+C_{tr} 54-59 dB, which would allow at least a 10 dB tolerance to account for site conditions and still meet minimum sound insulation performance requirements.

Comments on floor constructions

The floor construction is understood to consist of:

- 4 mm Karndean Luxury Vinyl Tile (LVT)
- 2 mm latex screed
- 32 mm GIFA panel (density $\geq 1500 \text{ kg/m}^3$)
- Knauf acoustic pedestal PGR pads with M16/M20 Knauf Acoustic Pedestals forming 95 mm cavity containing 50 mm RS45 mineral wool slab insulation
- 18 mm plywood boarding (density $\geq 650 \text{ kg/m}^3$)
- 75 mm existing timber floorboards
- 2 x 15 mm Knauf Soundshield Plus boards on 25 mm lining channels filled with mineral fibre insulation.

This construction is expected to provide a site performance of $D_{nT,w}+C_{tr}$ 42-45 dB, and would be expected to meet the sound insulation performance requirements.

The acoustic pedestals and pads should be specified so that the resilient floor provides a minimum improvement in impact sound insulation of ΔL_w 17 dB.

Comments on separating partition interface details

Partition interfaces are shown below for party walls with resilient bars – this has since been changed to twin-stud constructions and as such are indicative only.

External wall interface

The external wall interface uses a deflection detail with 3 mm steel angles covering the joint, as shown below in Figure 1. This is expected to be suitable provided it is well sealed based on the facade comprising a minimum of 200 mm solid brickwork.

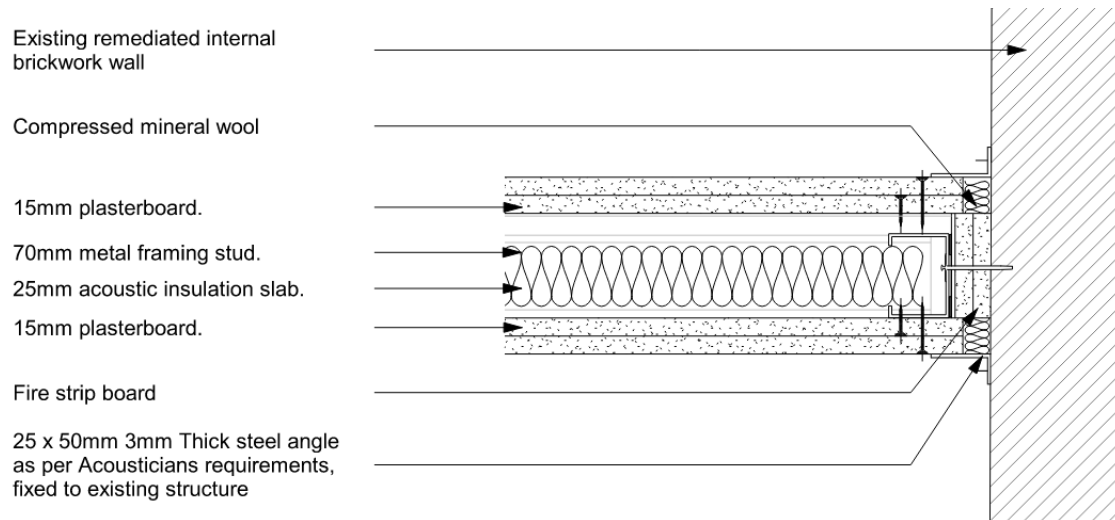


Figure 1 Excerpt of drawing 061_508_SHADOW GAP DETAIL_20.08.21 – Separating partition interface with external wall

Separating partition head and base detail

The head detail for the separating partition is a deflection detail with a double plasterboard ceiling to both sides. The partition head should break the plasterboard ceiling and be mounted from the timber floorboards above, with the plasterboard ceiling being individual to each apartment.

If the plasterboard ceiling is omitted, or if the deflection head is mounted directly from the plasterboard as shown, ideally the deflection detail should be covered by metal angles. However, there is significant tolerance within the partition performance itself to allow a reduced flanking performance at the head detail for twin-stud partitions.

The base detail is also expected to be suitable provided flanking strips are installed correctly and also installed around any other elements which are connected to the structural floor. Steel angles to the base detail would not be necessary.



Comments on separating floor interface details

External wall interface

As the floor is of lightweight construction, the interface with the external wall as shown in Figure 3 is expected to be suitable provided any gaps for structural elements are well sealed.

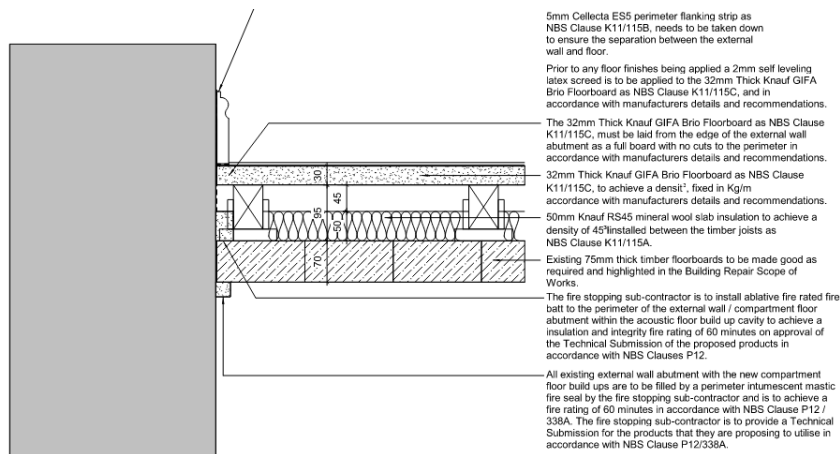


Figure 3 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2201 – Separating floor interface with external wall

Comments on curtain wall interface details

External wall interface

The proposed interface with the curtain wall as shown in Figure 4 is expected to be borderline with the requirements for separating partitions.

Given that both buildings are listed, this performance may be acceptable given the control of other flanking elements. However, given this is a new-build element it is recommended that the overboarding extends to cover the mullions. Alternatively, metal over cladding of equivalent surface density could be used to improve the flanking sound transmission performance.

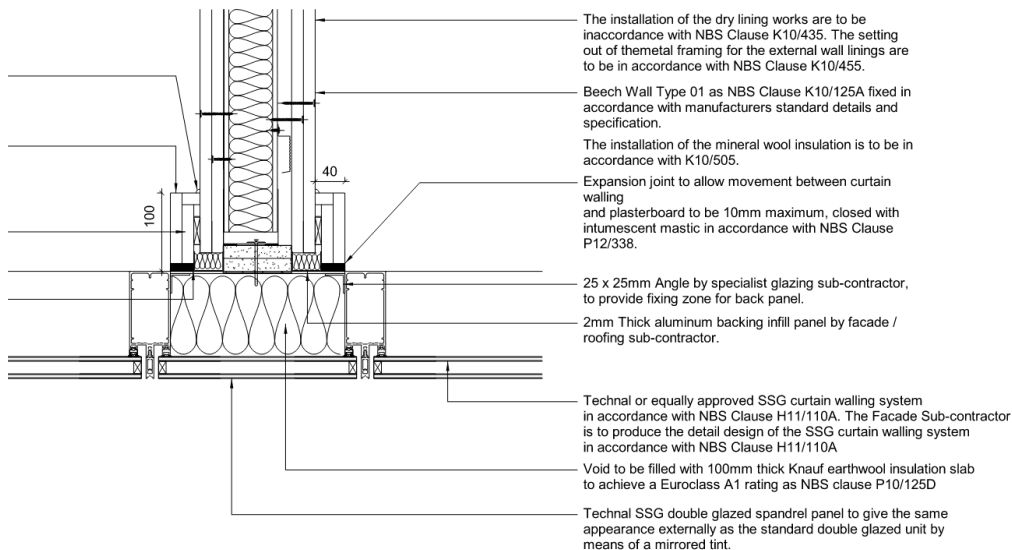
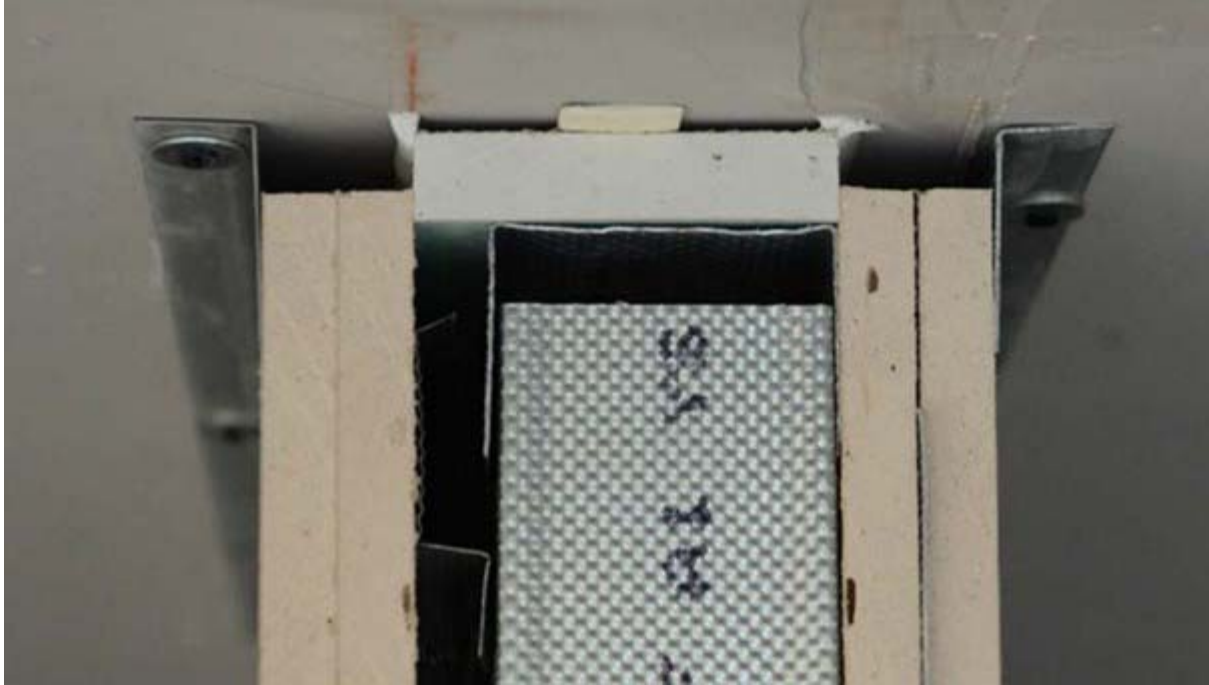


Figure 4 Excerpt of drawing 013-MDB-BS-ZZ-DT-A-2200 – Separating partition interface with curtail walling

D1 – Metal Trim Image



E1 – P22016 - 11 Bloom Street - MBS-01 – MBS-05**GROUND FLOOR:**

FLOOR AREA = 301m²
AREAS <65mm = 14 m²
FLOORBOARDS TO BE REMOVED = 25m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = **8.3%**

1ST FLOOR:

FLOOR AREA = 354m²
AREAS <65mm = 27.3m²
FLOORBOARDS TO BE REMOVED = 66 m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = **19 %**

2ND FLOOR:

FLOOR AREA = 387m²
AREAS <65mm = 11.25m²
FLOORBOARDS TO BE REMOVED = 50m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = **13%**

3RD FLOOR:

FLOOR AREA = 398m²
AREAS <65mm = 29.3m²
FLOORBOARDS TO BE REMOVED = 95m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = **24%**

4TH FLOOR: (DISCOUNTED IN TOTAL CALC AS FLOORBOARDS ARE NEW)

FLOOR AREA = 395m²
AREAS <65mm = 0 m²
FLOORBOARDS TO BE REMOVED = 0m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = 0%

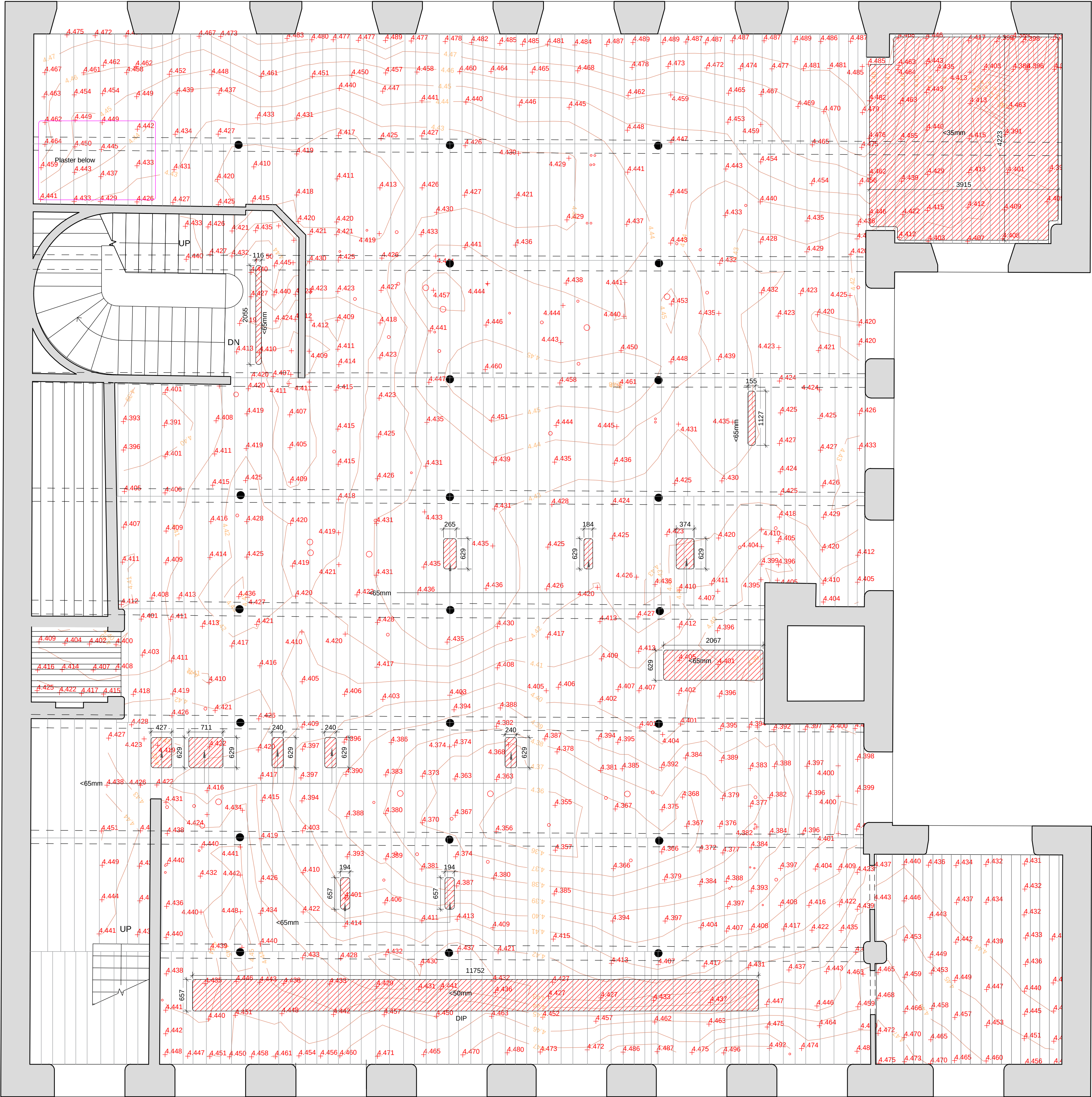
TOTAL:

FLOOR AREAS = 1,437m²
AREAS <65mm = 81.85 m²
FLOORBOARDS TO BE REMOVED = 236m²
% OF TOTAL FLOORBOARDS TO BE REMOVED = **16.4%**

[illegible]

SiteScan
Information to build on

DRAWN BY GW	CHECKED BY NG	DATE 10/03/22
SCALE (@ A1) 1 : 50	PROJECT NUMBER P22016	
DRAWING NUMBER MBS-01		REV A



1st Floor
1 : 50

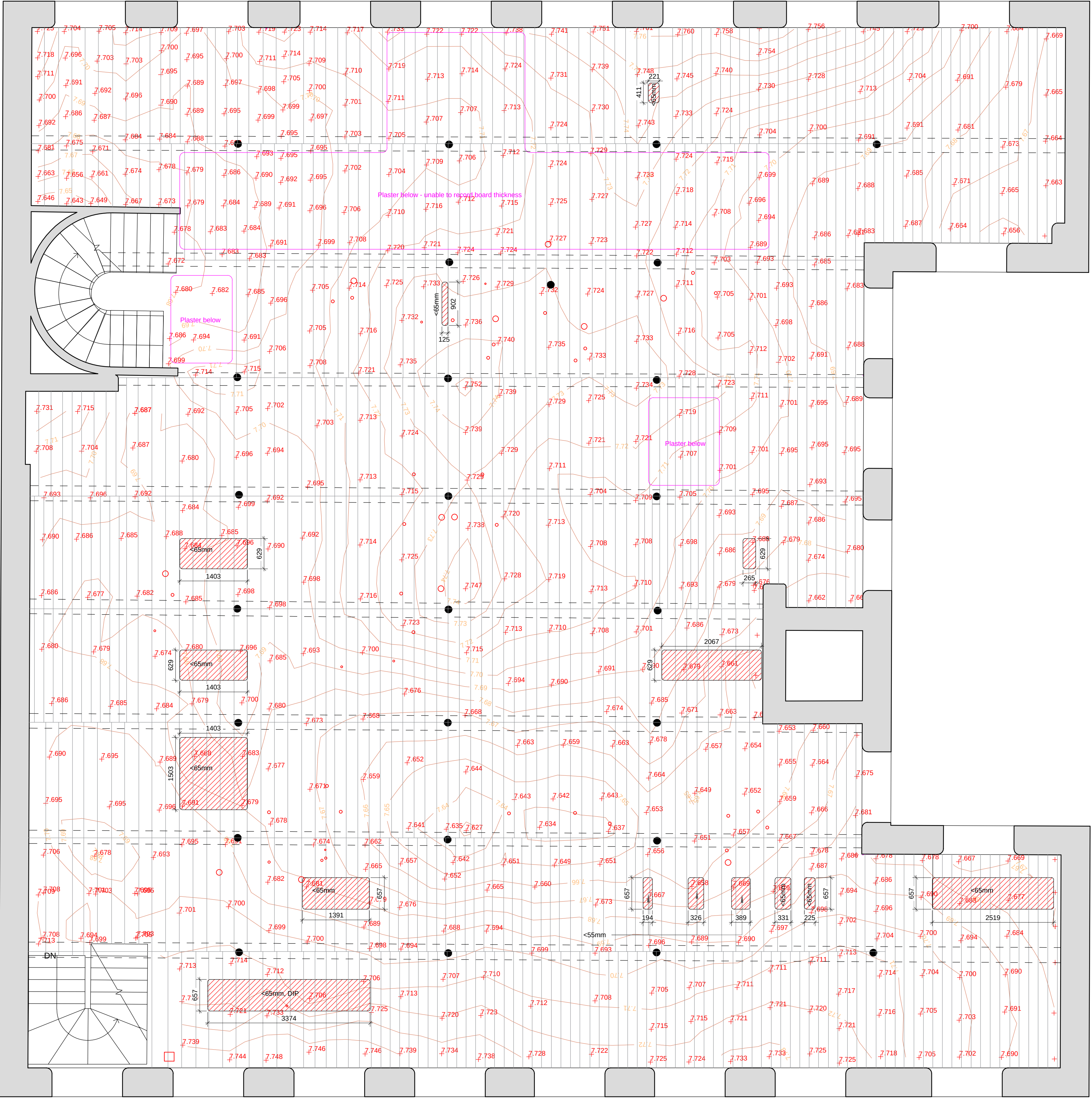
- FLOOR PENETRATION
- AREA OF CONCERN
- UNABLE TO SURVEY

Rev	Description	Date
A	Initial issue	10/03/22
	Beam positions & dimensions added	05/04/22

SUITE 5 VITA HOUSE
FISH QUAY
NORTH SHIELDS
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T: 0191 257 2911
www.sitescanltd.com

SiteScan
Information to build on

PROJECT		
11 Bloom Street		
TITLE		
1st Floor		
CLIENT		
Beech Design & Build		
DRAWN BY GW	CHECKED BY NG	DATE 10/03/22
SCALE (@ A1) 1 : 50		PROJECT NUMBER P22016
DRAWING NUMBER MBS-02		REV A



2nd Floor
1 : 50

- FLOOR PENETRATION
- AREA OF CONCERN
- UNABLE TO SURVEY

Rev	Description	Date
A	Initial issue	10/03/22
	Beam positions & dimensions added	05/04/22

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Information to build on

PROJECT		
11 Bloom Street		
TITLE		
2nd Floor		
CLIENT		
Beech Design & Build		
DRAWN BY GW	CHECKED BY NG	DATE 10/03/22
SCALE (@ A1) 1 : 50		PROJECT NUMBER P22016
DRAWING NUMBER MBS-03		REV A



3rd Floor
1 : 50

- FLOOR PENETRATION
- AREA OF CONCERN
- UNABLE TO SURVEY

Rev	Description	Date
A	Initial issue	10/03/22
	Beam positions & dimensions added	05/04/22

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Information to build on

PROJECT		
11 Bloom Street		
TITLE		
3rd Floor		
CLIENT		
Beech Design & Build		
DRAWN BY GW	CHECKED BY NG	DATE 10/03/22
SCALE (@ A1) 1 : 50		PROJECT NUMBER P22016
DRAWING NUMBER MBS-04		REV A



- [illegible]



SiteScan
Information to build on

11 Bloom Street

4th Floor

Beech Design & Build

DATE
10/03/22

PROJECT NUMBER
P22016

EV	
A	

E2 – P22016 – Mindel House - MBS-07 – MBS-10

GROUND FLOOR: (DISCOUNTED IN TOTAL CALC AS FLOORBOARDS COVERED)

FLOOR AREA	= N/A
AREAS <65mm	= N/A
FLOORBOARDS TO BE REMOVED	= N/A
% OF TOTAL FLOORBOARDS TO BE REMOVED	= N/A

1ST FLOOR:

FLOOR AREA	= 259m ²
AREAS <65mm	= 21.4m ²
FLOORBOARDS TO BE REMOVED	= 56m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 21 %

2ND FLOOR:

FLOOR AREA	= 295m ²
AREAS <65mm	= 38.6m ²
FLOORBOARDS TO BE REMOVED	= 108m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 36%

3RD FLOOR:

FLOOR AREA	= 254m ²
AREAS <65mm	= 95.3m ²
FLOORBOARDS TO BE REMOVED	= 157m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 61%

4TH FLOOR:

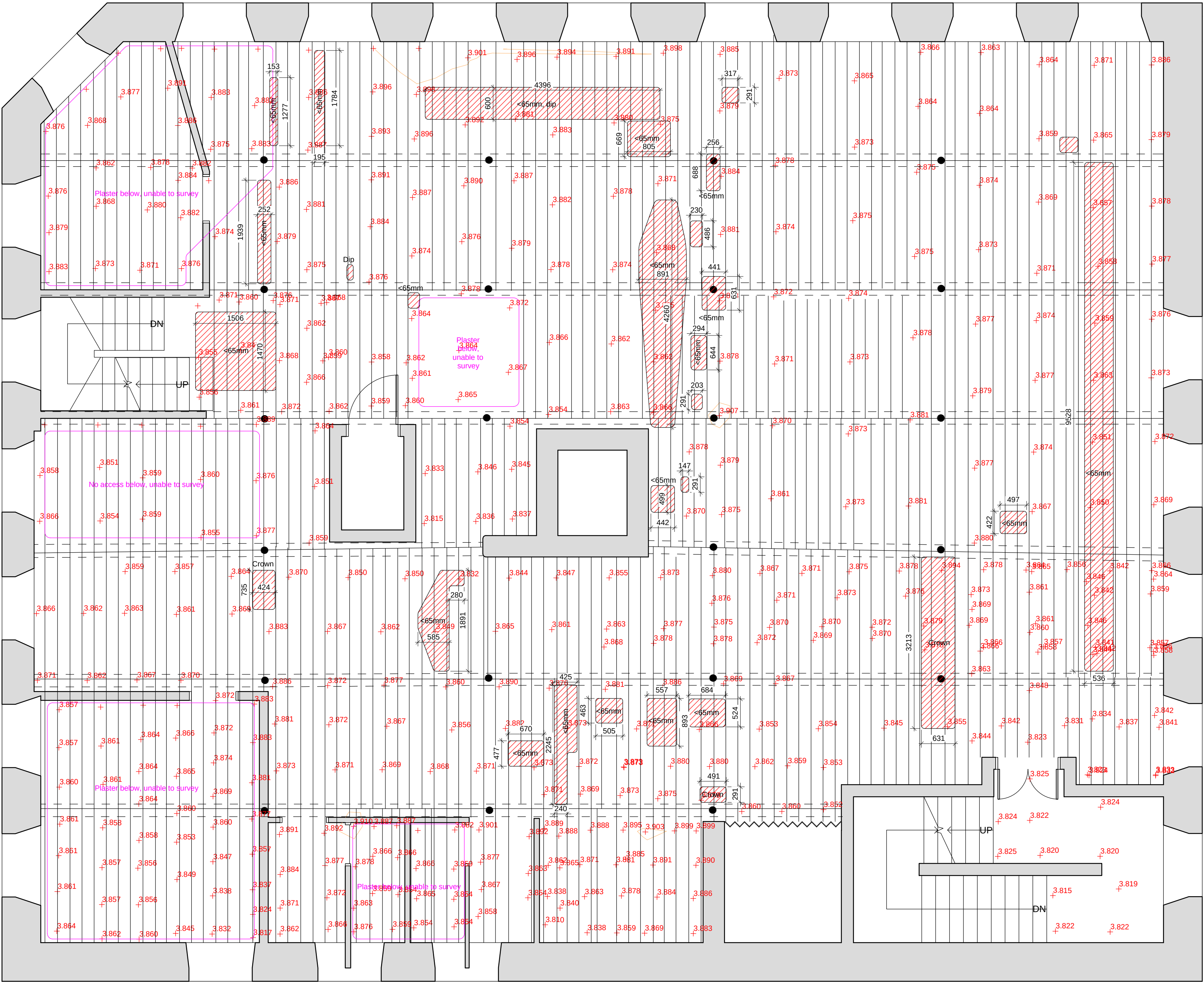
FLOOR AREA	= 147m ²
AREAS <65mm	= 24m ²
FLOORBOARDS TO BE REMOVED	= 60m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 40%

TOTAL: SURVEYED FLOOR AREAS

SURVEYED FLOOR AREAS	= 955m ²
AREAS <65mm	= 179m ²
FLOORBOARDS TO BE REMOVED	= 381m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 40%

TOTAL:

FLOOR AREA	= 1,236m ²
AREAS <65mm	= 179m ²
FLOORBOARDS TO BE REMOVED	= 381m ²
% OF TOTAL FLOORBOARDS TO BE REMOVED	= 30%



1st Floor
1 : 50

- FLOOR PENETRATION
- AREA OF CONCERN
- UNABLE TO SURVEY

Rev	Description	Date

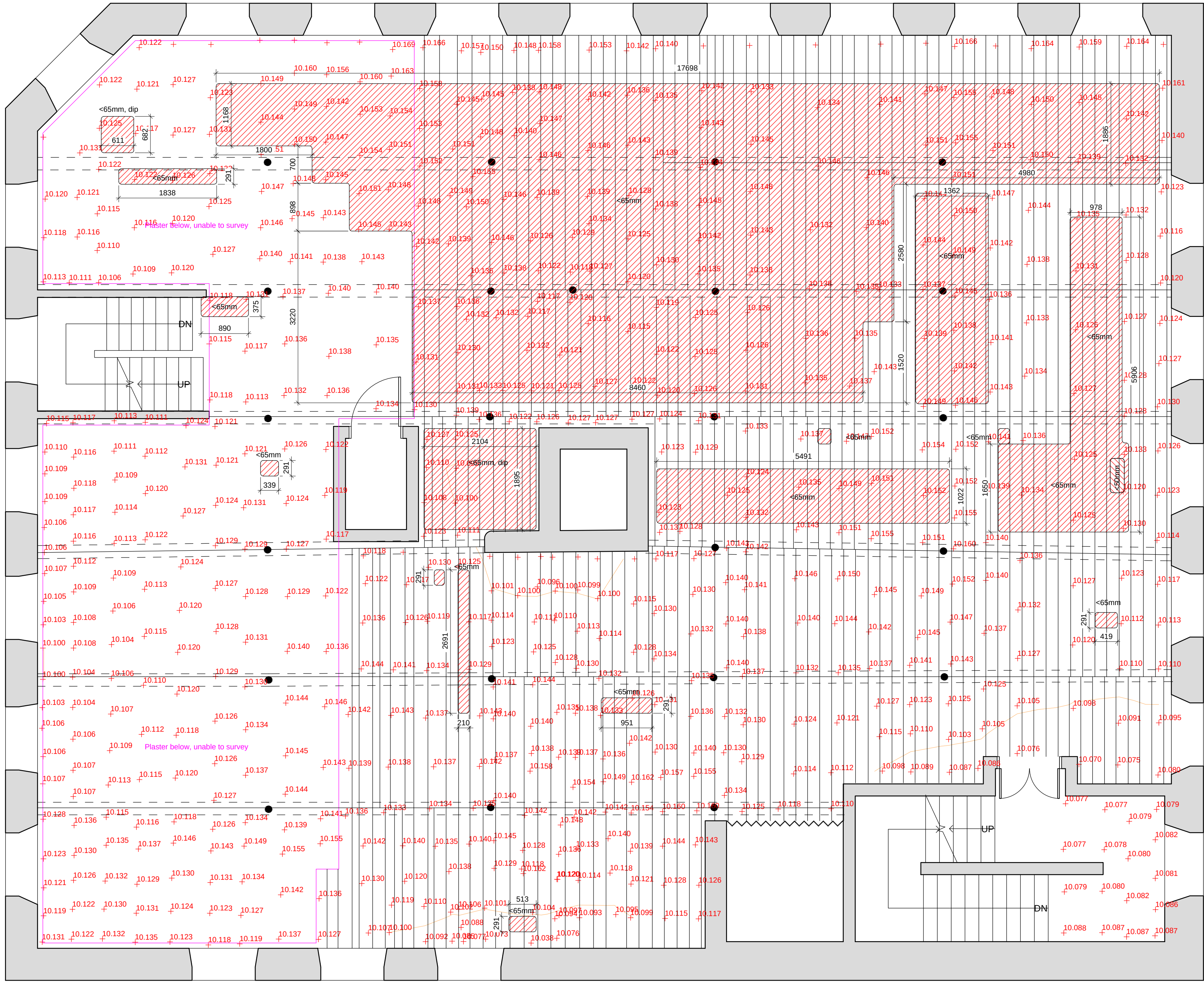
SUITE 5 VITA HOUSE
FISH QUAY
NORTH SHIELDS
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T: 0191 257 2911
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**SiteScan**
Information to build on

PROJECT		
10 Minshull Street		
TITLE		
1st Floor		
CLIENT		
Beech Design & Build		
DRAWN BY GW	CHECKED BY NG	DATE 05/04/22
SCALE (@ A1) 1 : 50	PROJECT NUMBER P22016	
DRAWING NUMBER MBS-07		REV



PROJECT			
2010 Minshull Street			
TITLE			
2nd Floor			
CLIENT			
Beech Design & Build			
DRAWN BY GW		CHECKED BY NG	
		DATE 05/04/22	
SCALE (@ A1) 1 : 50		PROJECT NUMBER P22016	
DRAWING NUMBER			REV
MBS-08			



3rd Floor
1 : 50

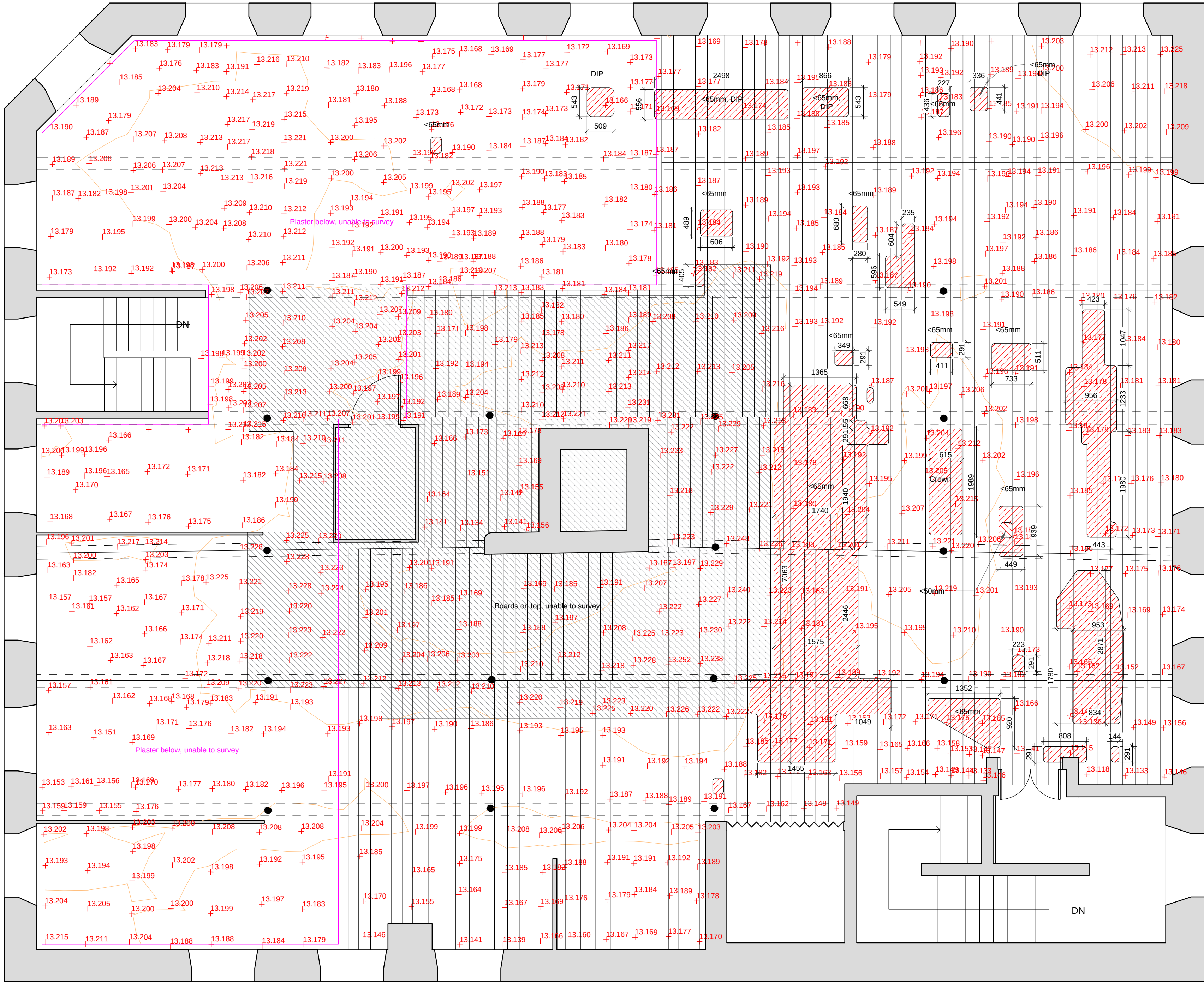
- FLOOR PENETRATION
- AREA OF CONCERN
- UNABLE TO SURVEY

Rev	Description	Date

SUITE 5 VITA HOUSE
FISH QUAY
NORTH SHIELDS
NE30 1JA
T: 0191 257 2911
www.sitescanltd.com

SiteScan
Information to build on

PROJECT		
10 Minshull Street		
TITLE		
3rd Floor		
CLIENT		
Beech Design & Build		
DRAWN BY GW	CHECKED BY NG	DATE 05/04/22
SCALE (@ A1) 1 : 50		PROJECT NUMBER P22016
DRAWING NUMBER MBS-09		REV



4th Floor
1 : 50

FLOOR PENETRATION

AREA OF CONCERN

UNABLE TO SURVEY

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SUITE 5 VITA HOUSE
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Information to build on

PROJECT

10 Minshull Street

TITLE

4th Floor

CLIENT

Beech Design & Build

DRAWN BY
GW

CHECKED BY
NG

DATE
05/04/22

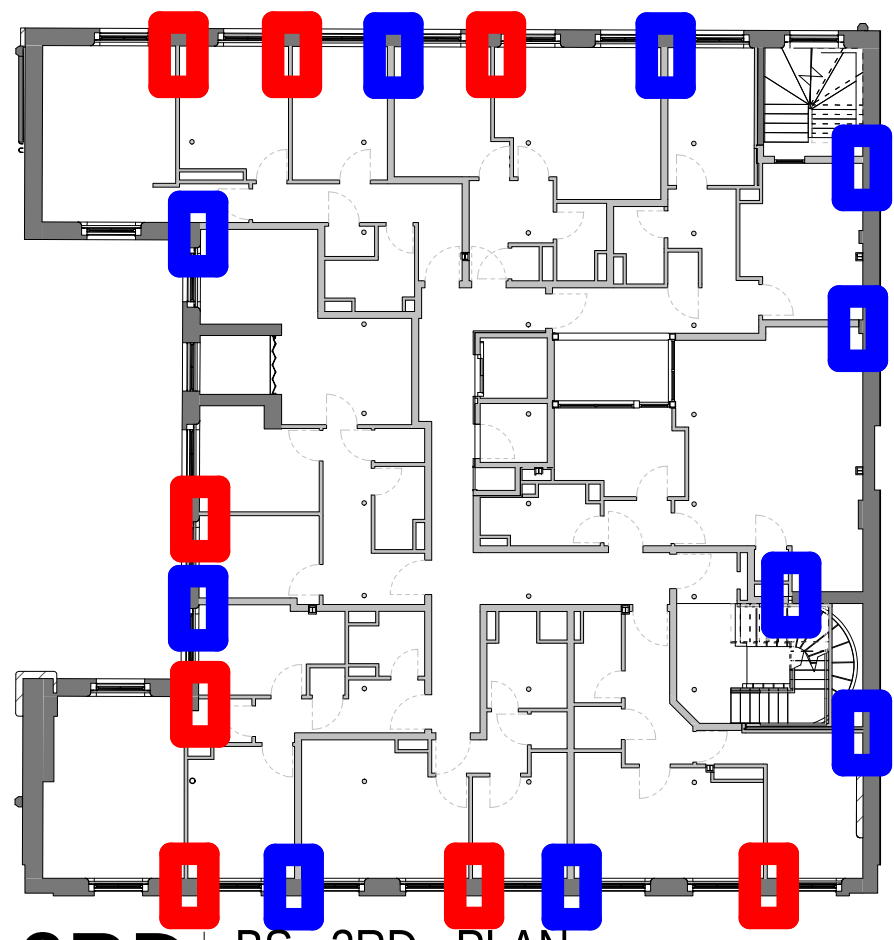
SCALE (@ A1)
1 : 50

PROJECT NUMBER
P22016

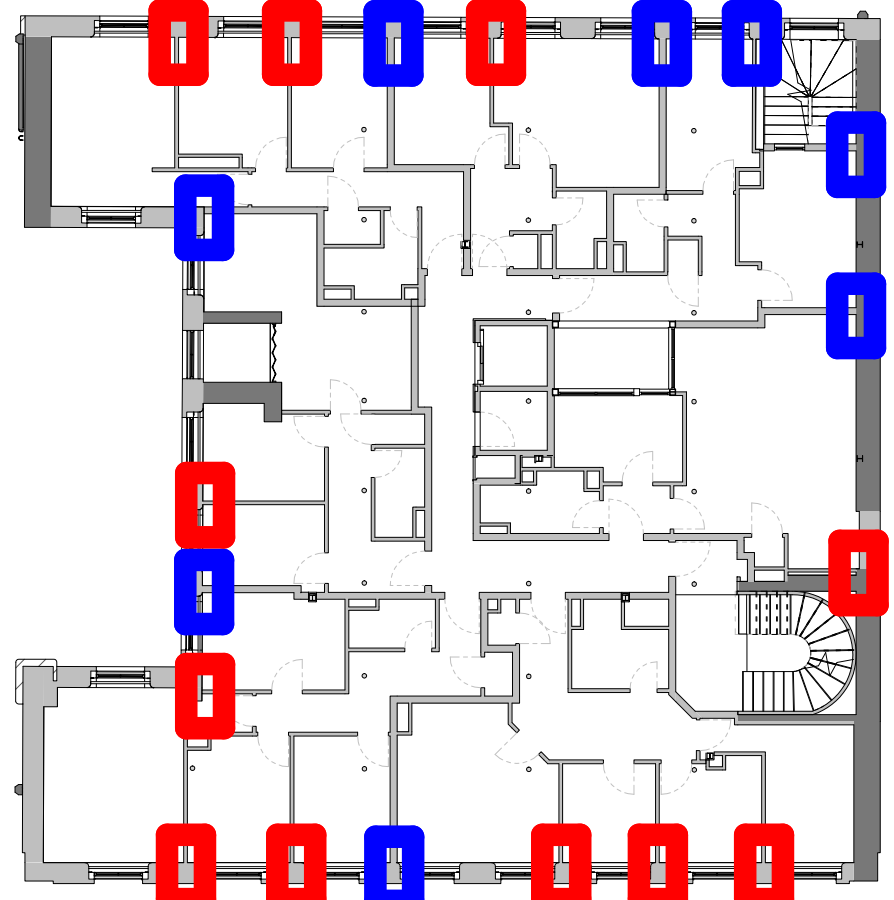
DRAWING NUMBER
MBS-10

REV

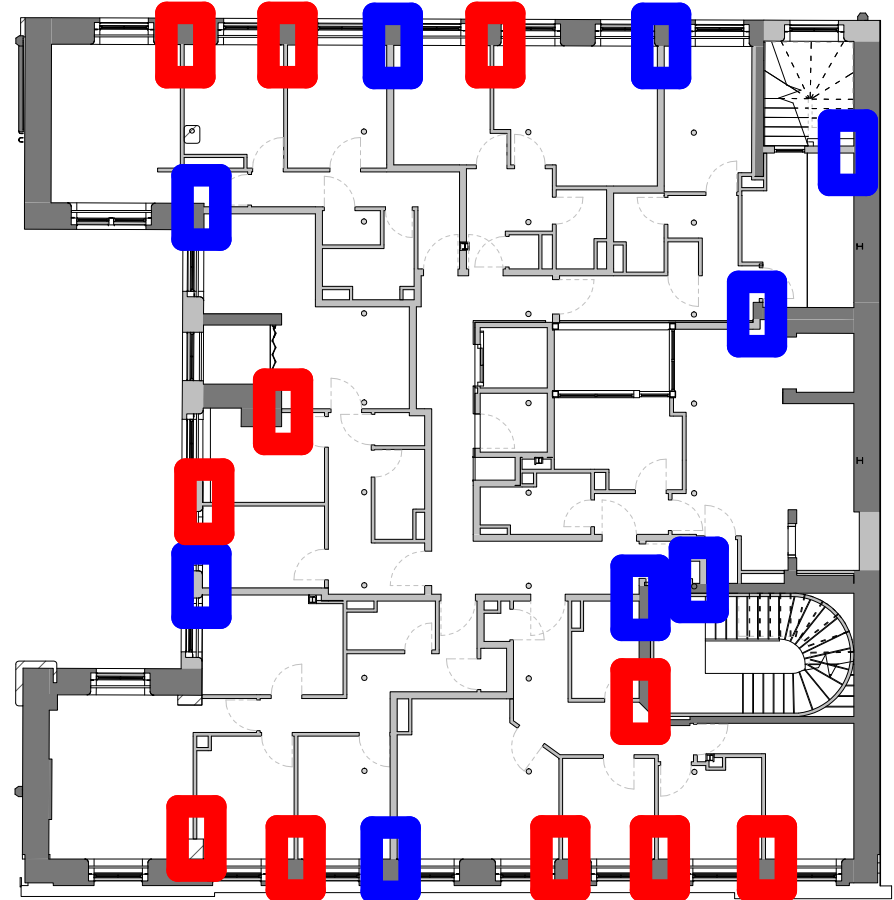
F – DRAWING 061_508_D – 11 Bloom Street & Mindel House Shadow Gap Detail



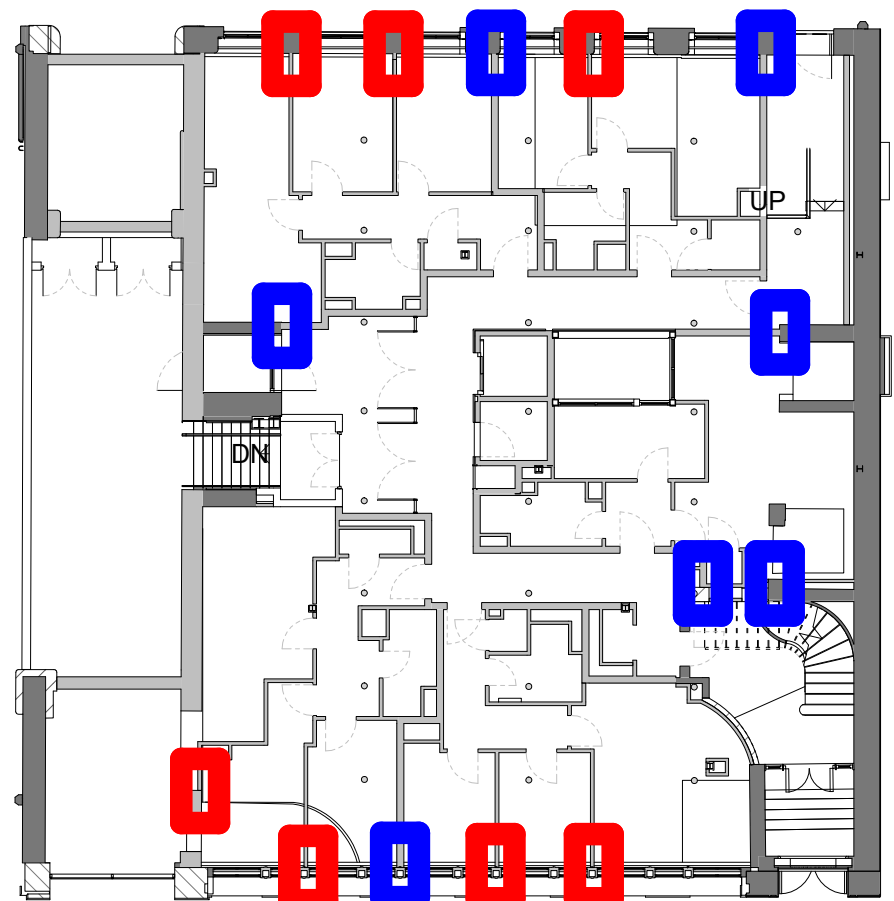
3RD BS - 3RD - PLAN



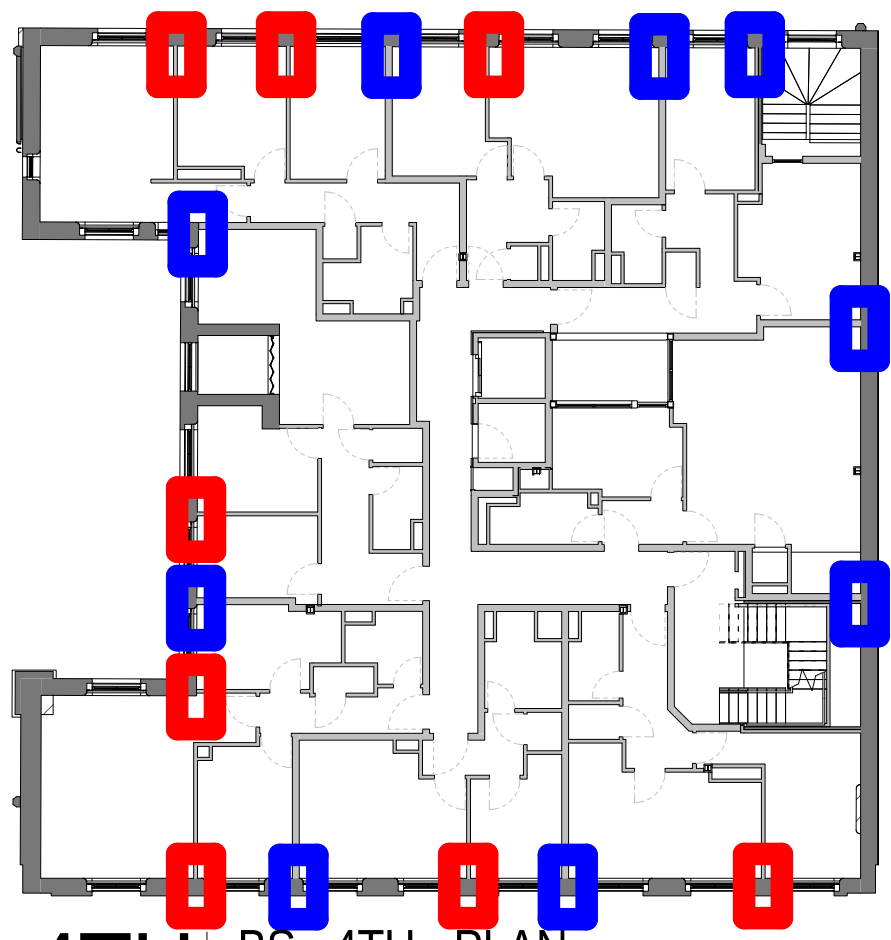
2ND BS - 2ND - PLAN



1ST BS - 1ST - PLAN

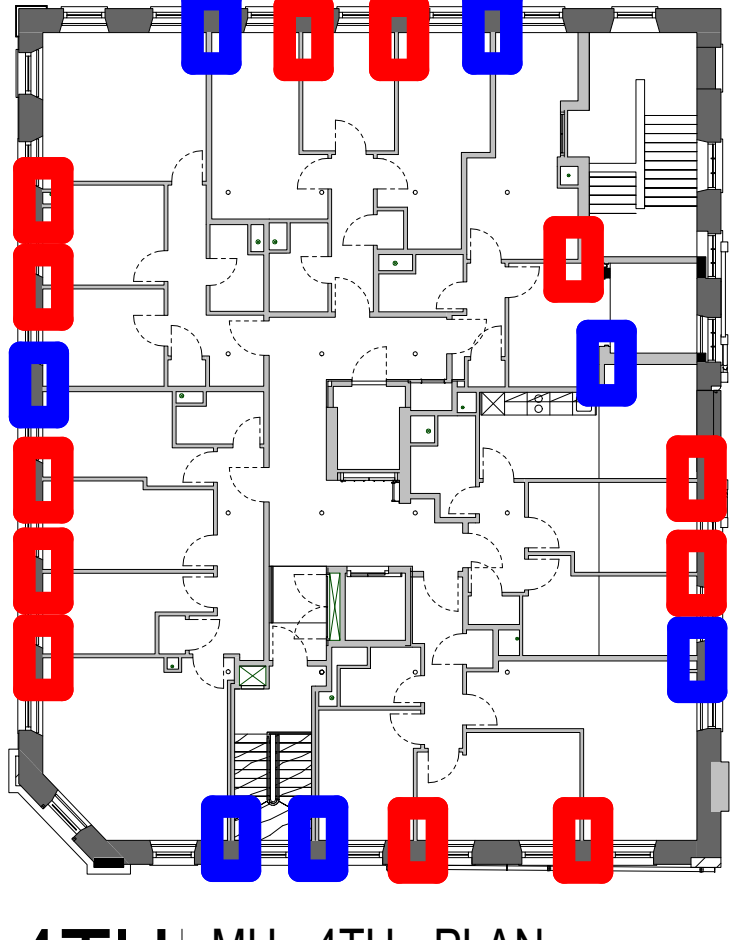


GF BS - GF - PLAN

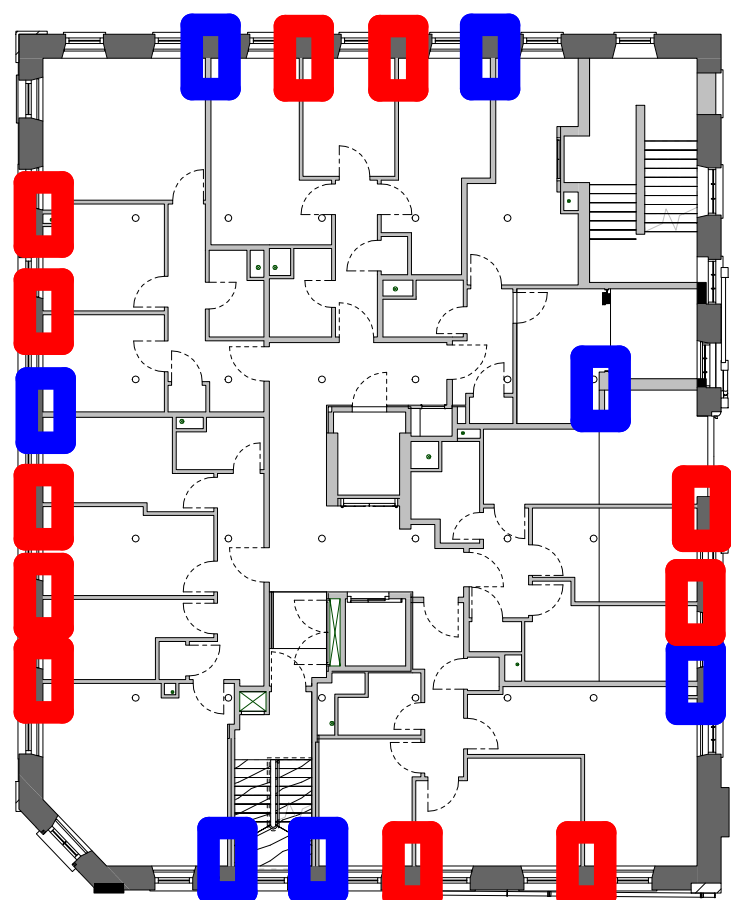


4TH BS - 4TH - PLAN

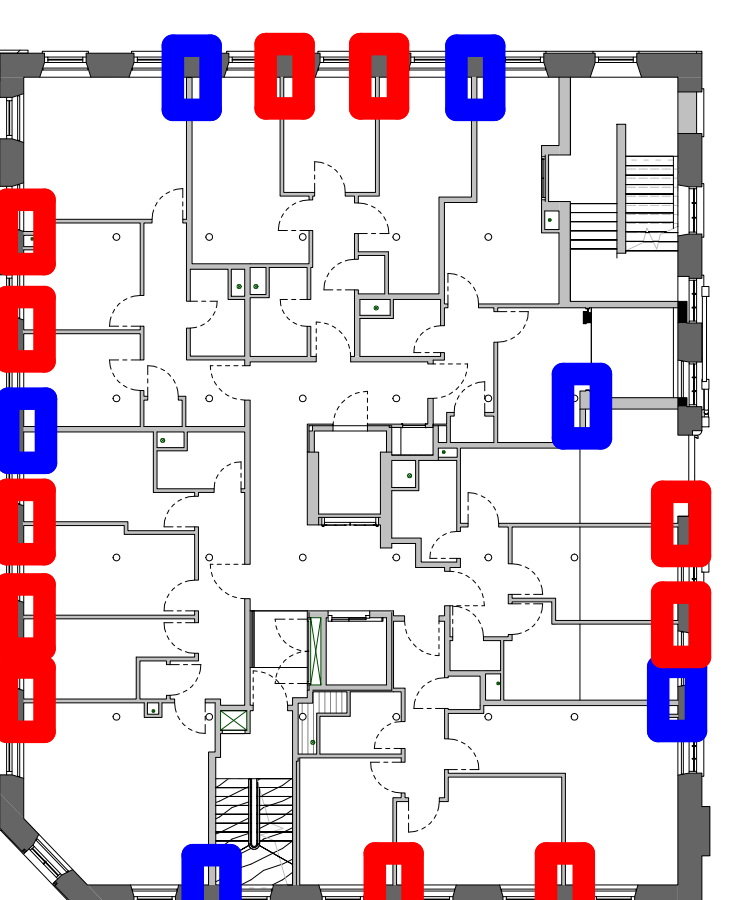
BLOOM STREET



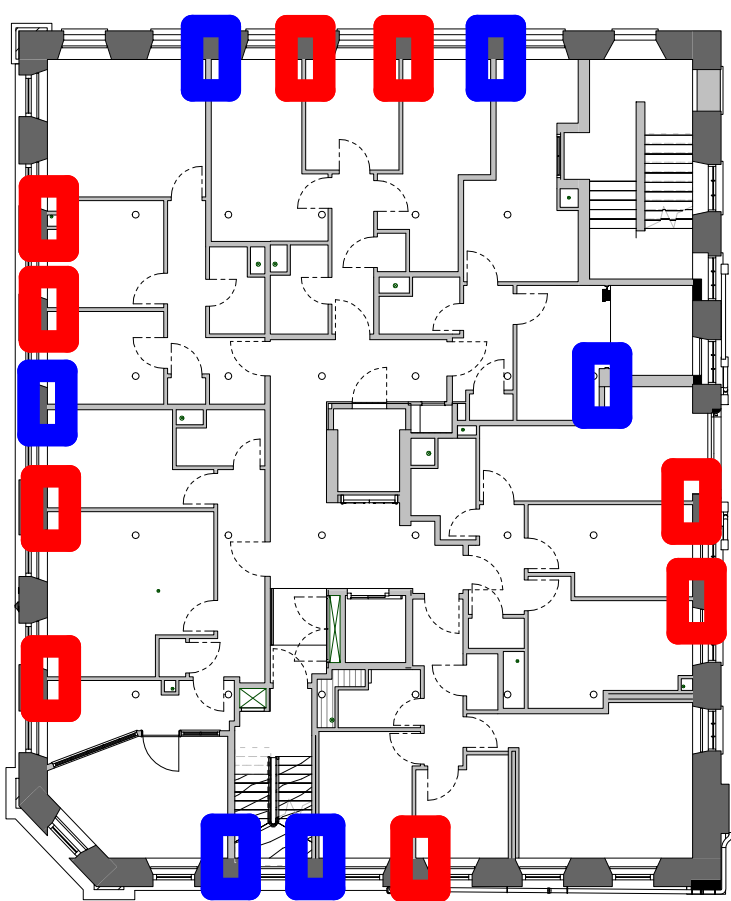
4TH MH - 4TH - PLAN



3RD MH - 3RD - PLAN

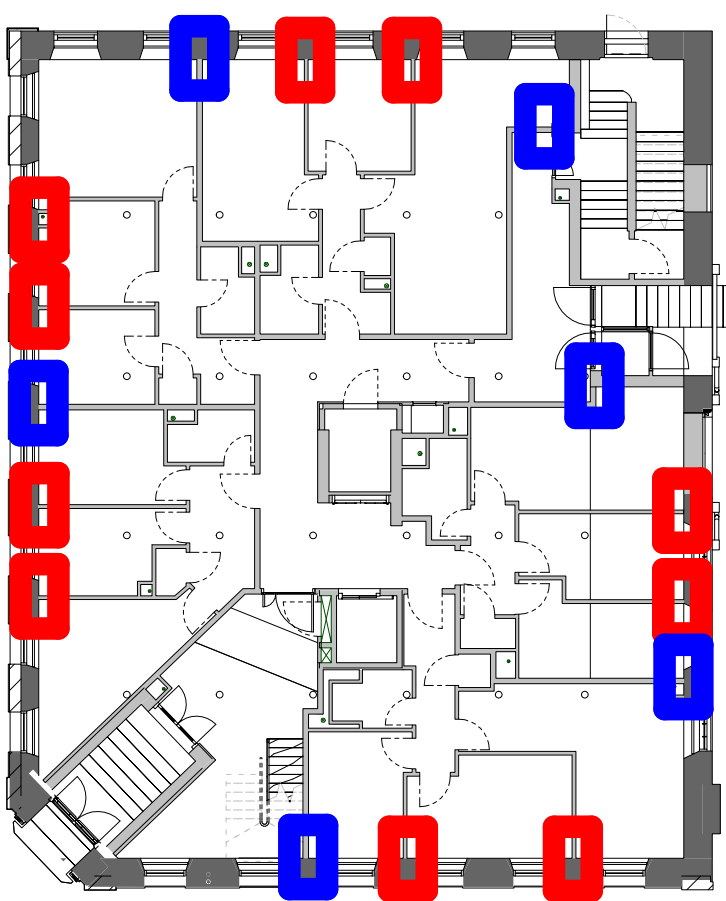


2ND MH - 2ND - PLAN



1ST MH - 1ST - PLAN

MINDEL HOUSE



GF MH - GF - PLAN

15mm shadow gap between existing timber and new plasterboard.

15mm plasterboard.

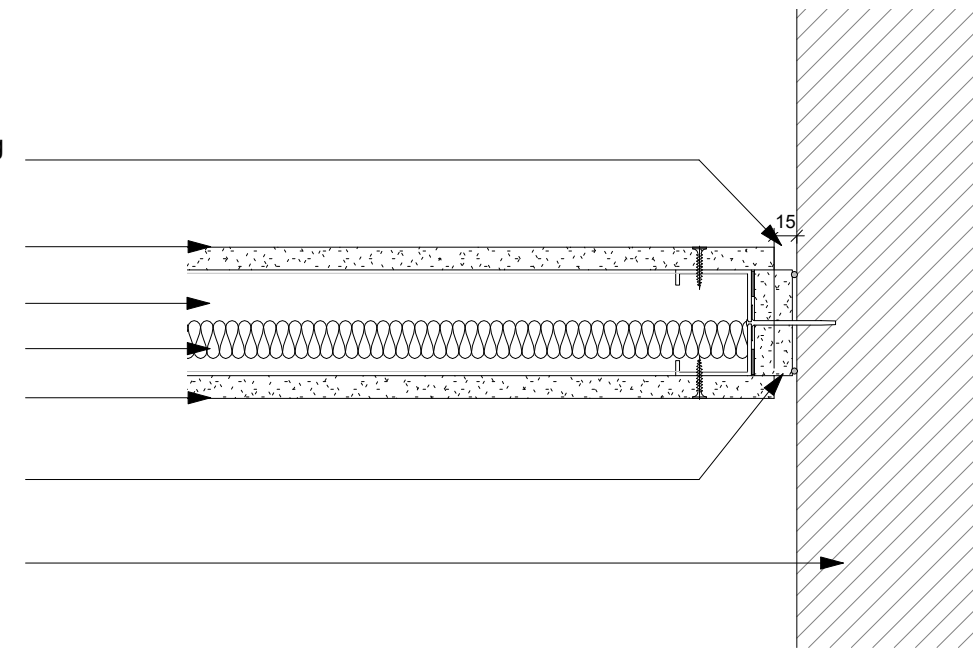
70mm metal framing stud.

25mm acoustic insulation slab.

15mm plasterboard.

Fire strip board

Existing remediated internal brickwork wall



1 INTERNAL APARTMENT WALL PLAN DETAIL

4mm vinyl flooring finish.

2mm self levelling latex screed is to be applied to the 32mm Thick Knauf GIFA Brio Floorboard.

Knauf acoustic pedestal 5mm PGR pads with M16/ M20 Knauf Acoustic Pedestals to be glued to substrate using Knauf pedestal support glue

50mm Knauf insulation acoustic roll - Glass mineral wool, installed between the Knauf pedestals.

Existing 75mm thick timber floorboards with 18mm plyboard fixed above.

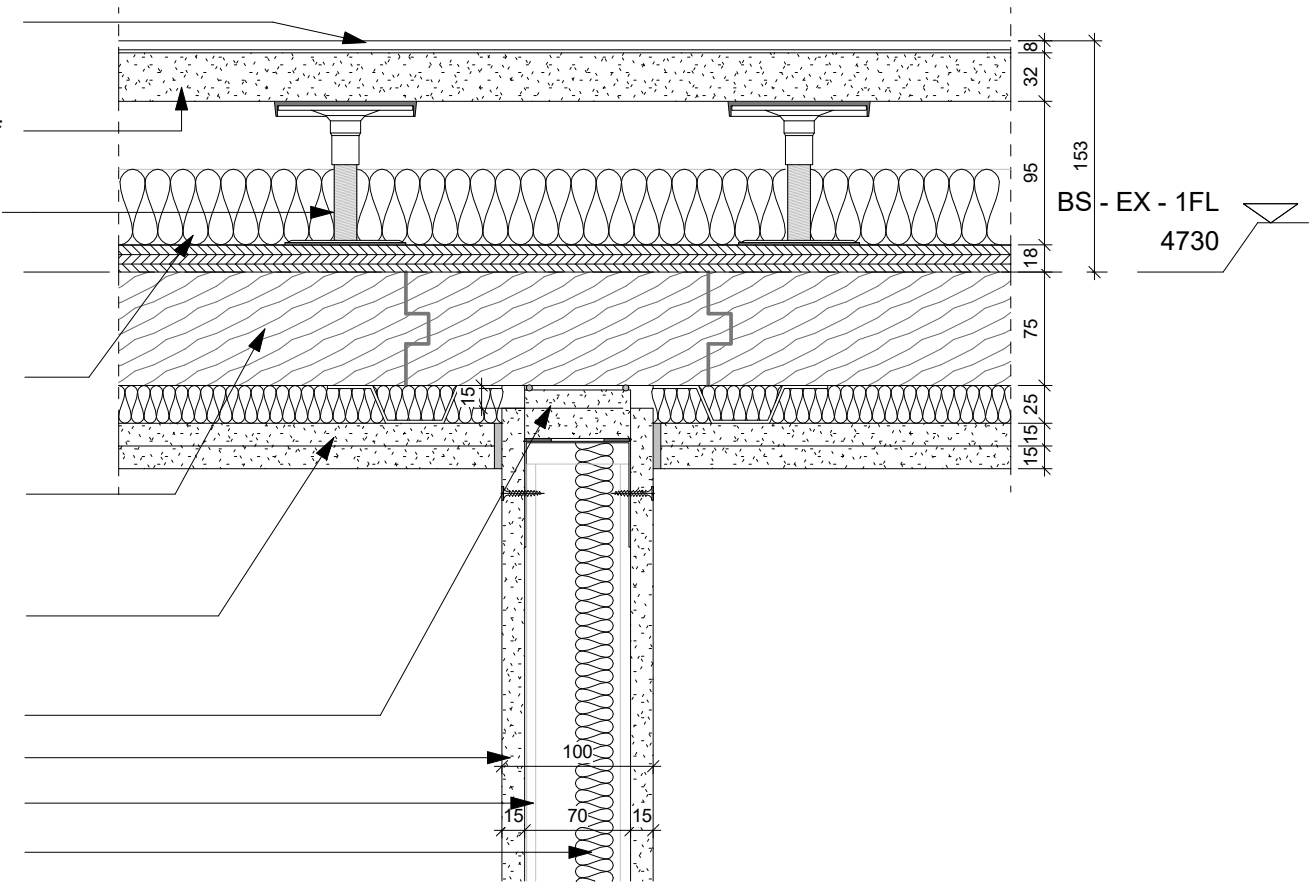
2 x 15mm fire plaster board to achieve 60min rating, supported by top hat section with acoustic insulation in cavity

Fire strip board

15mm plasterboard.

70mm metal framing stud.

25mm acoustic insulation slab.



2 INTERNAL APARTMENT WALL HEAD SECTION DETAIL

Existing remediated internal brickwork wall

2 x 15mm plasterboard.

50mm metal framing stud.

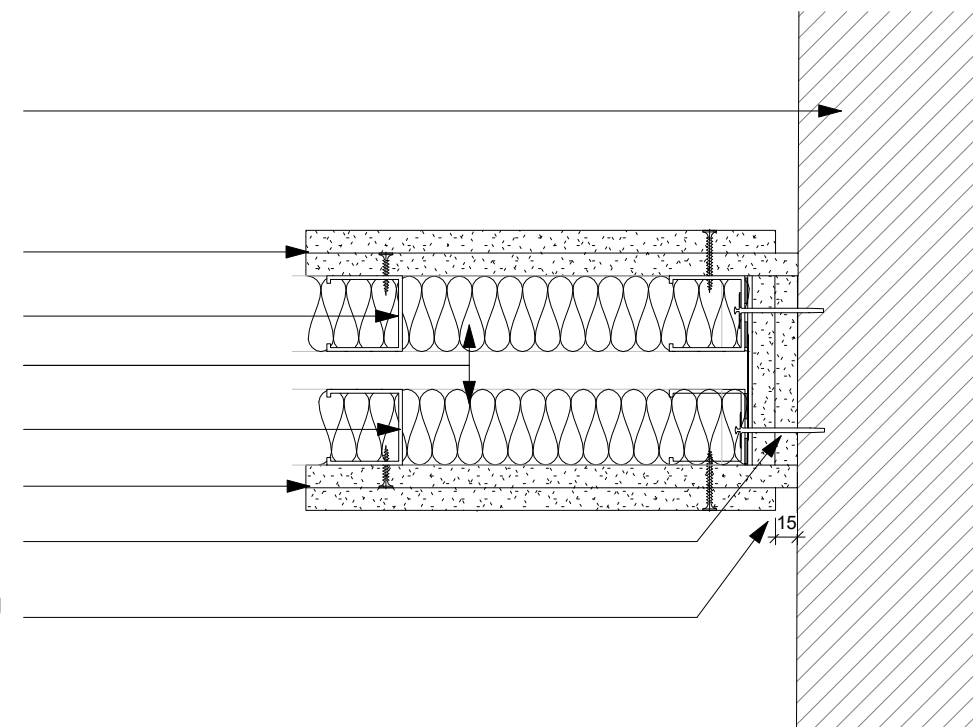
50mm acoustic insulation slab.

50mm metal framing stud.

2 x 15mm plasterboard.

Fire strip board

15mm shadow gap between existing timber and new plasterboard.



3 PARTY WALL PLAN DETAIL

4mm vinyl flooring finish.

2mm self levelling latex screed is to be applied to the 32mm Thick Knauf GIFA Brio Floorboard.

Knauf acoustic pedestal 5mm PGR pads with M16/ M20 Knauf Acoustic Pedestals to be glued to substrate using Knauf pedestal support glue

50mm Knauf Knauf insulation acoustic roll - Glass mineral wool, installed between the Knauf pedestals.

Existing 75mm thick timber floorboards with 18mm plyboard fixed above.

2 x 15mm fire plaster board to achieve 60min rating, supported by top hat section with acoustic insulation in cavity

Fire batt

Compressed mineral wool

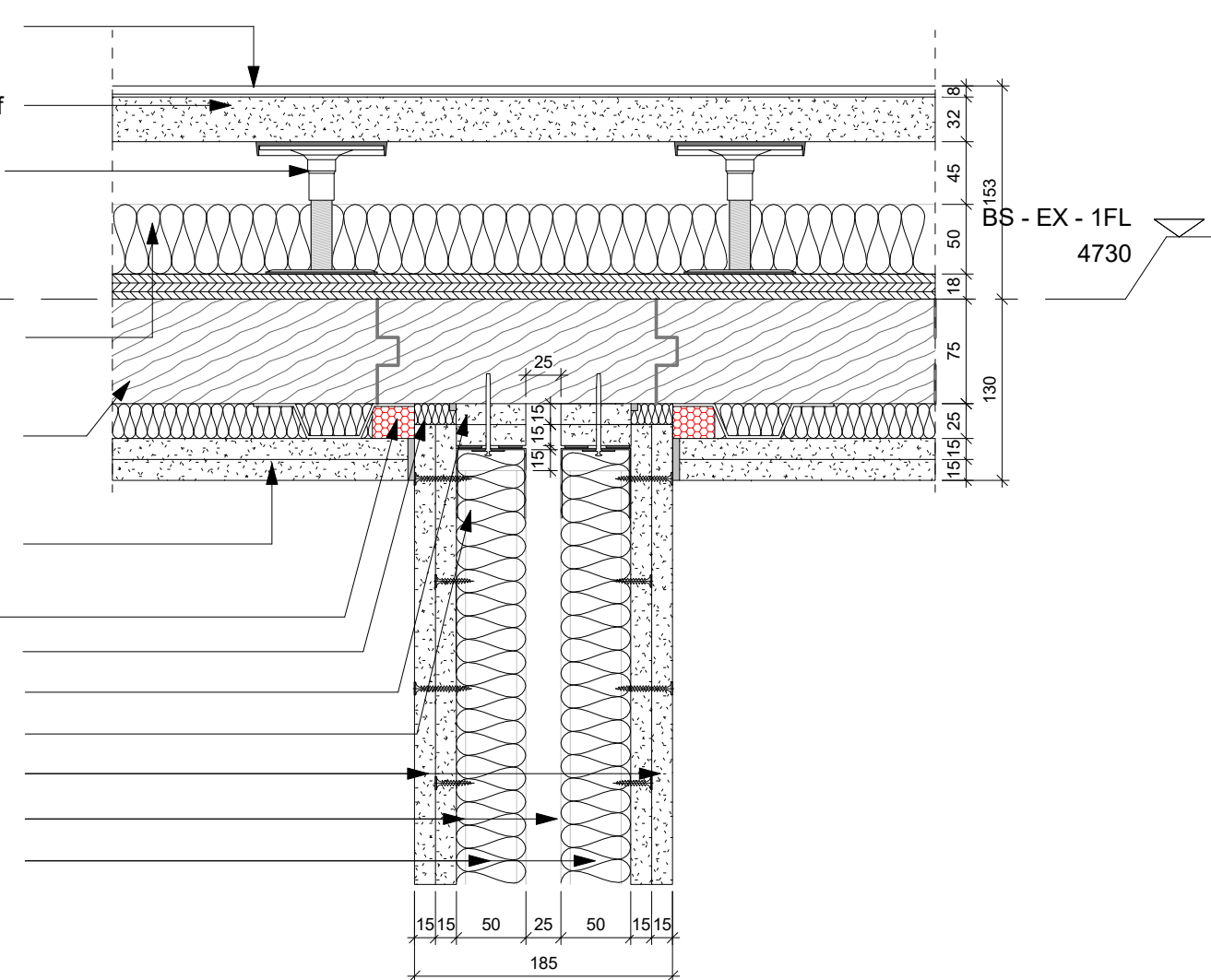
Fire strip board.

Acoustic resilient bar

2 x 15mm plasterboard.

2 x 50mm metal framing stud.

2 x 50mm acoustic insulation slab.



4 PARTY WALL HEAD SECTION DETAIL

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED
2. ALL LEVELS ARE IN METRES UNLESS OTHERWISE STATED
3. DIMENSIONS ARE NOT TO BE SCALED FROM THE DRAWING
4. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS 1991 (INCLUDING AMENDMENTS) AND ALL RELEVANT BRITISH STANDARDS/CODES OF PRACTICE
5. CONTRACTOR IS RESPONSIBLE FOR THE CORRECT SETTING OUT OF THE WORKS ON SITE. ALL DIMENSIONS TO BE CHECKED PRIOR TO FABRICATION OF MATERIALS
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND SPECIFICATIONS
7. THIS DRAWING SHALL NOT BE DUPLICATED WITHOUT THE EXPRESS WRITTEN PERMISSION OF BEECH DESIGN AND BUILD LIMITED

D	Issued for conditions release	NP	07-04-22
C	Issued for conditions release	LD	20-08-21
B	Issued for conditions release	JK	12-03-21
A	Issued for planning	JK	08-11-19

Rev	Description	By	Date
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PICCADILLY WAREHOUSE

PROJECT:

11 BLOOM STREET AND MINDEL HOUSE SHADOW GAP DETAIL

DRAWING

PLANNING

DRAWING STATUS:

DRAWN JK | CHECKED MB

SCALE @ A1 As indicated | DATE: OCT 2019

061_508

DRAWING NUMBER:

D REV