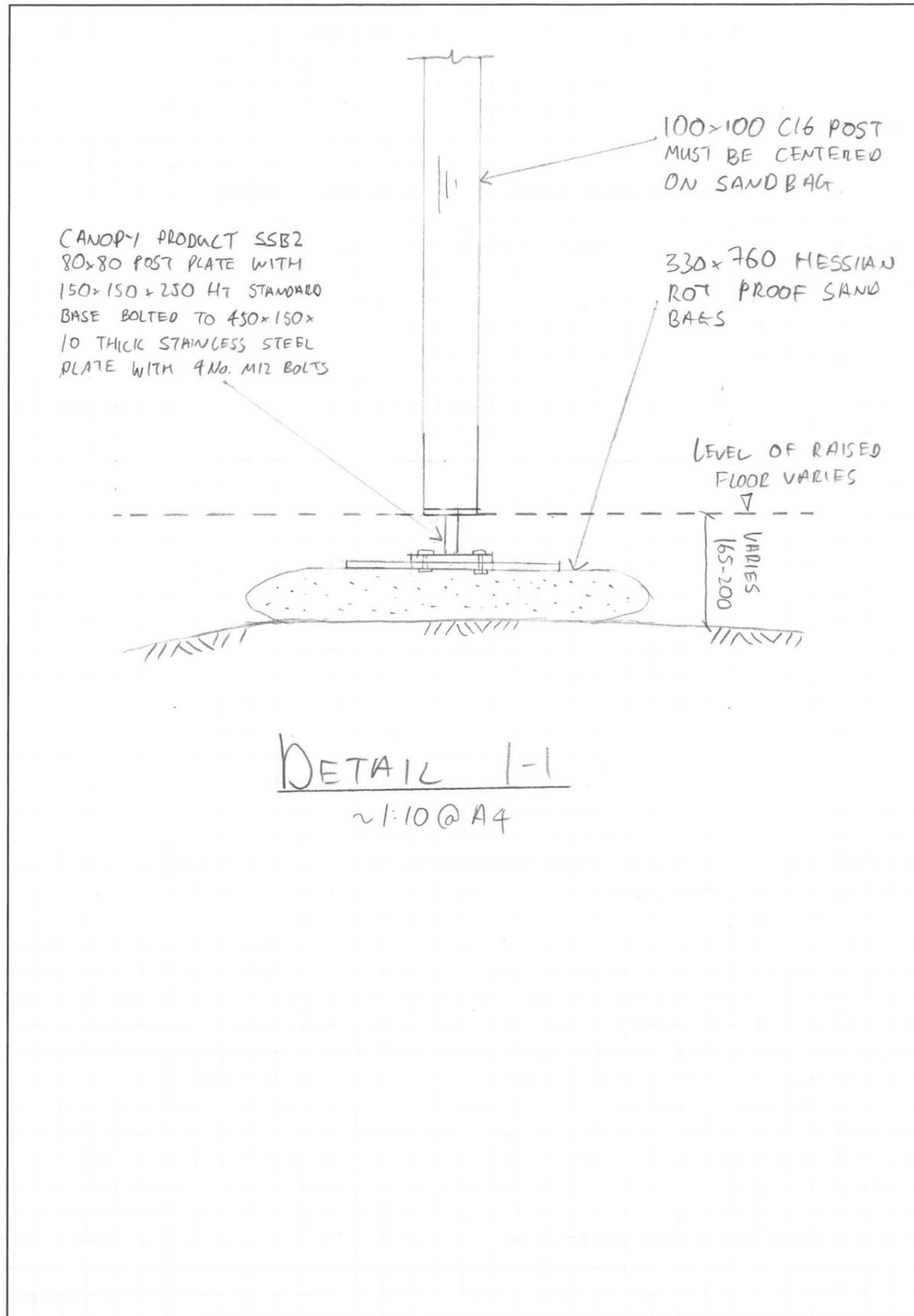
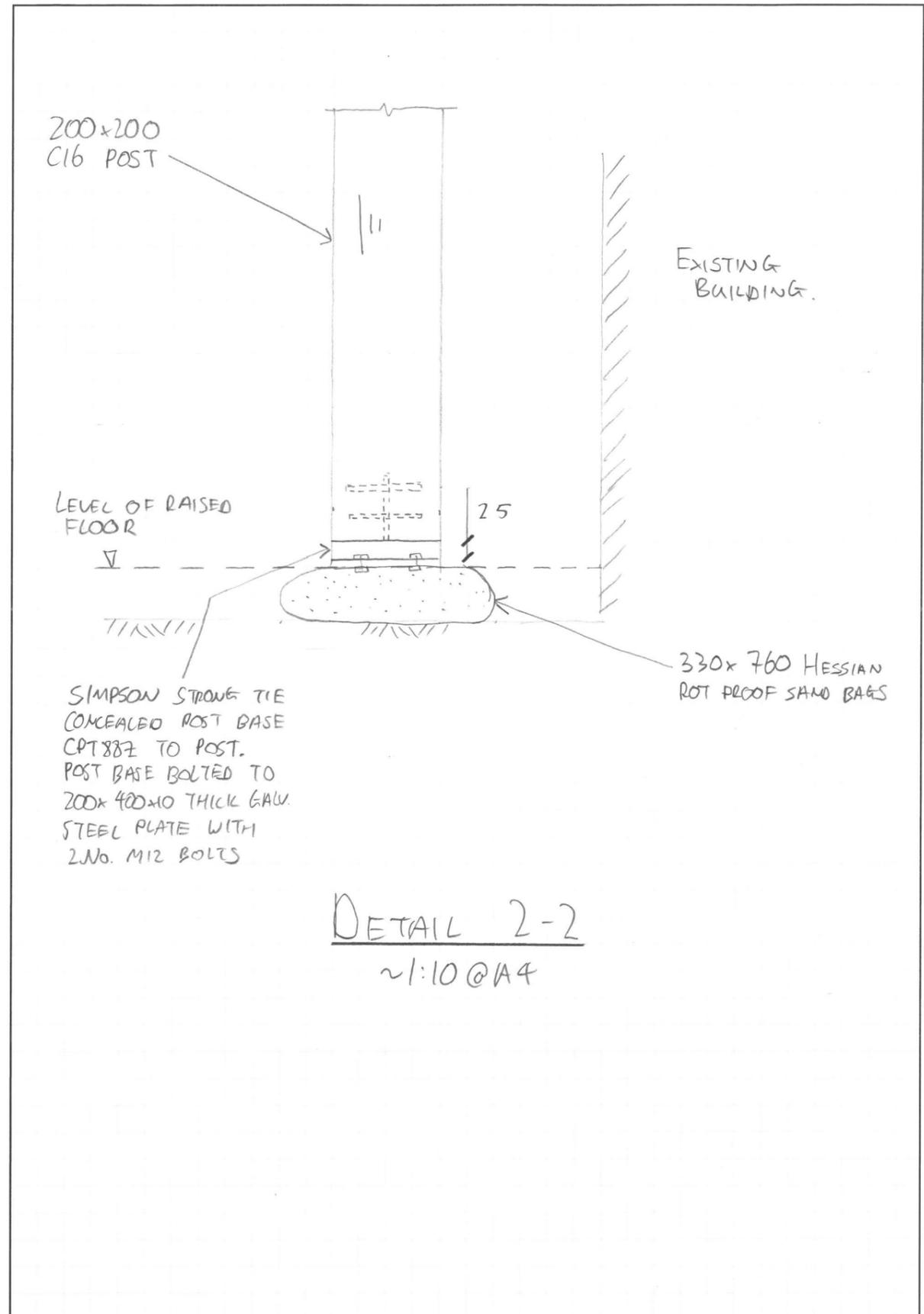


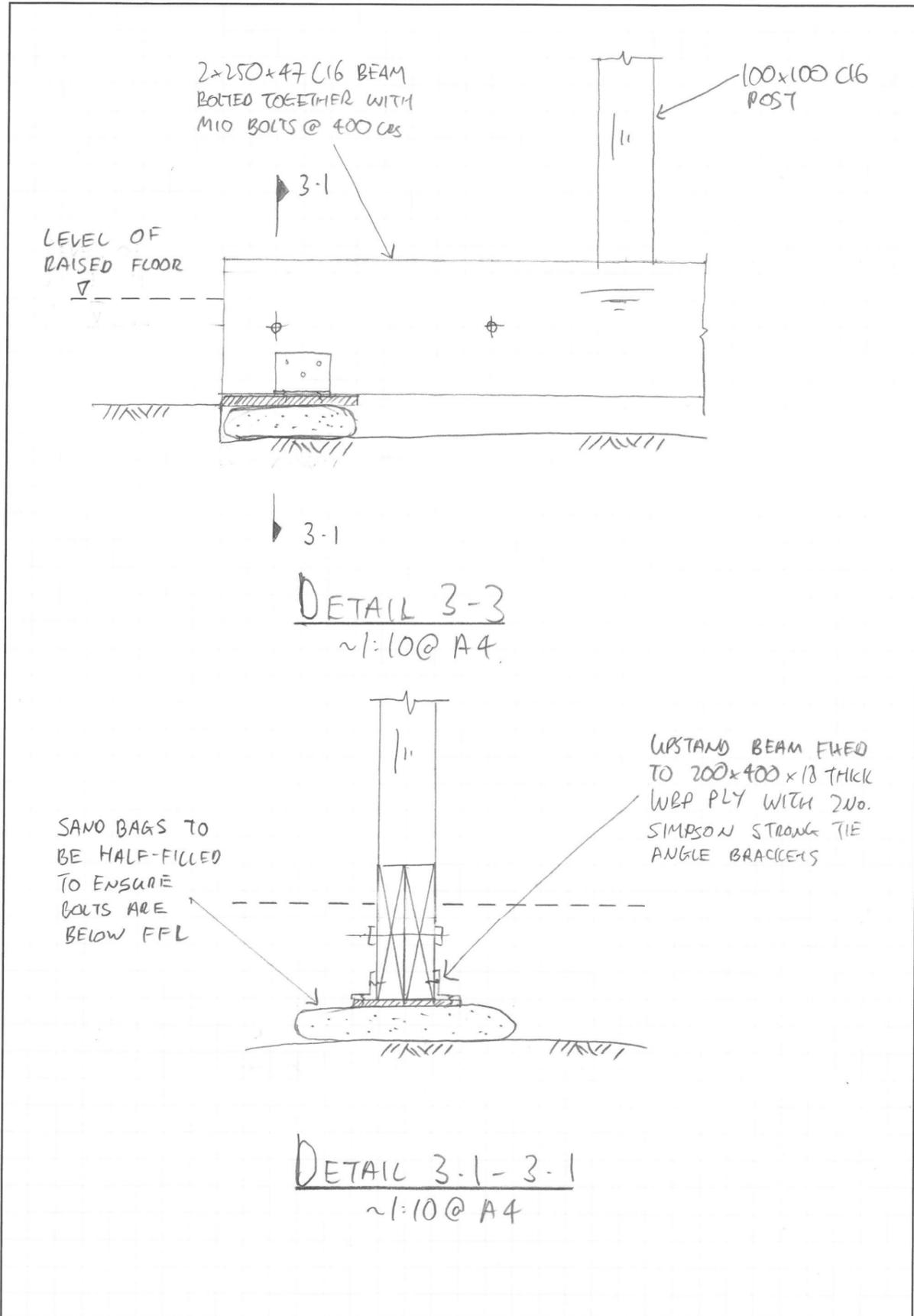
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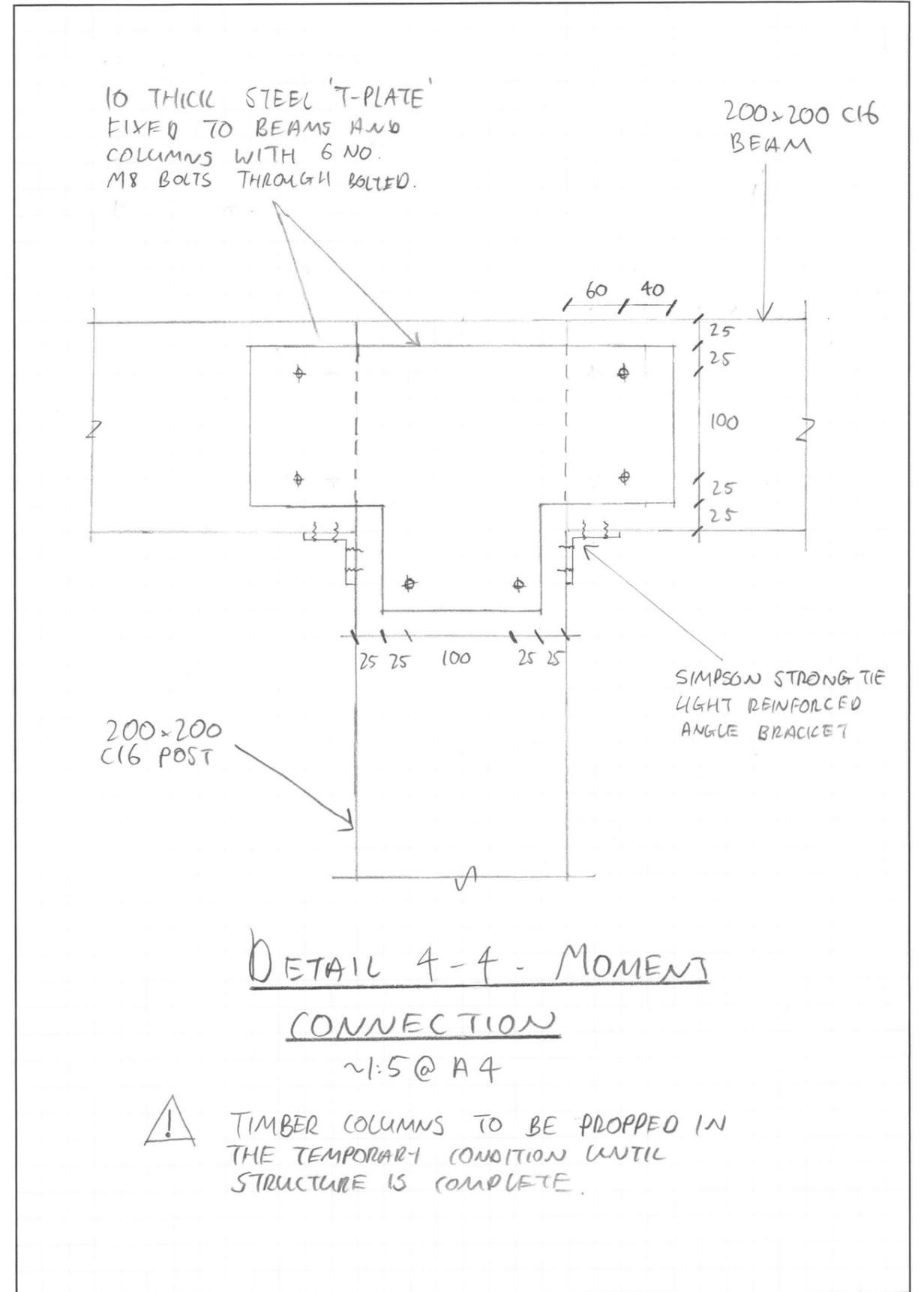
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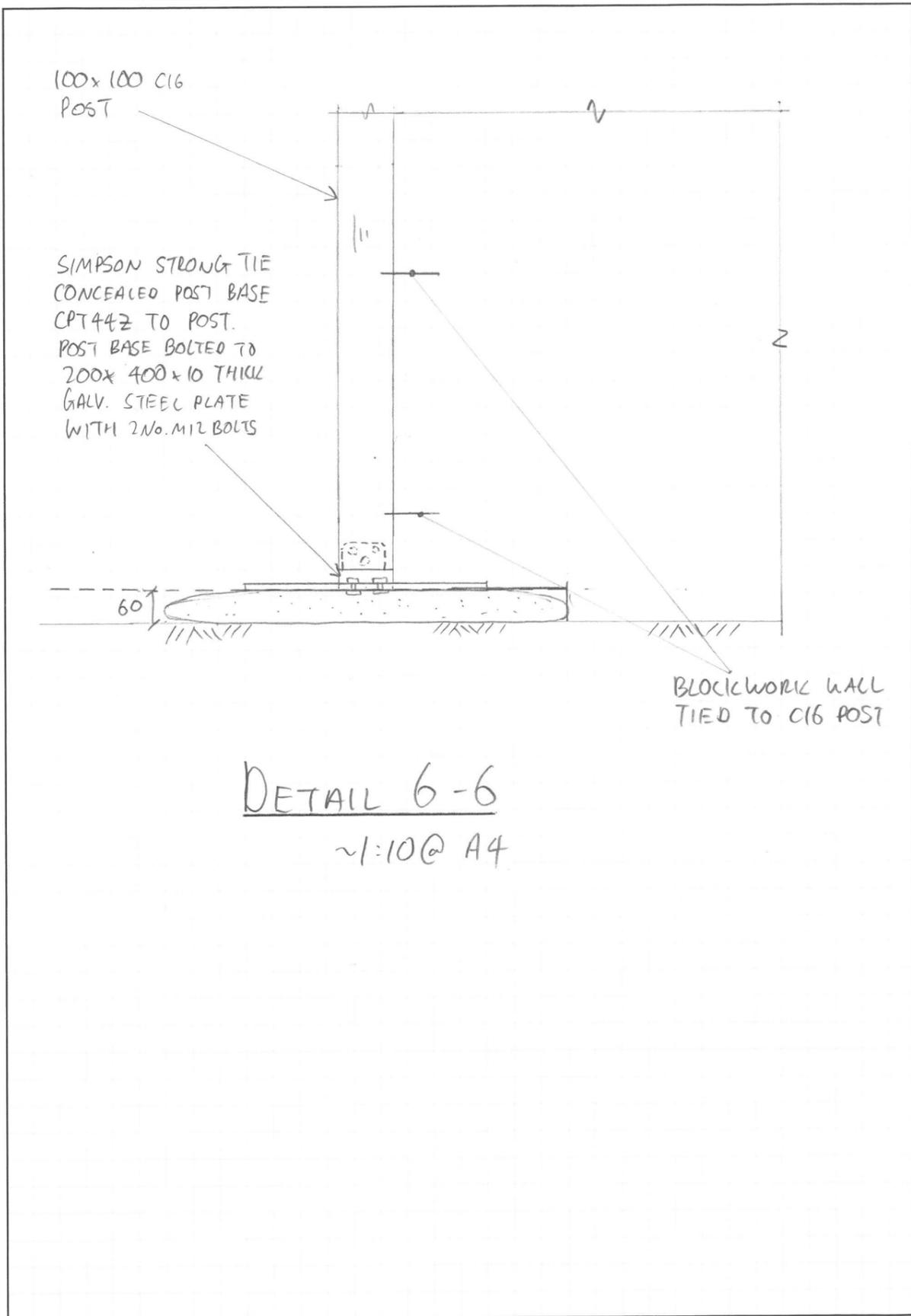
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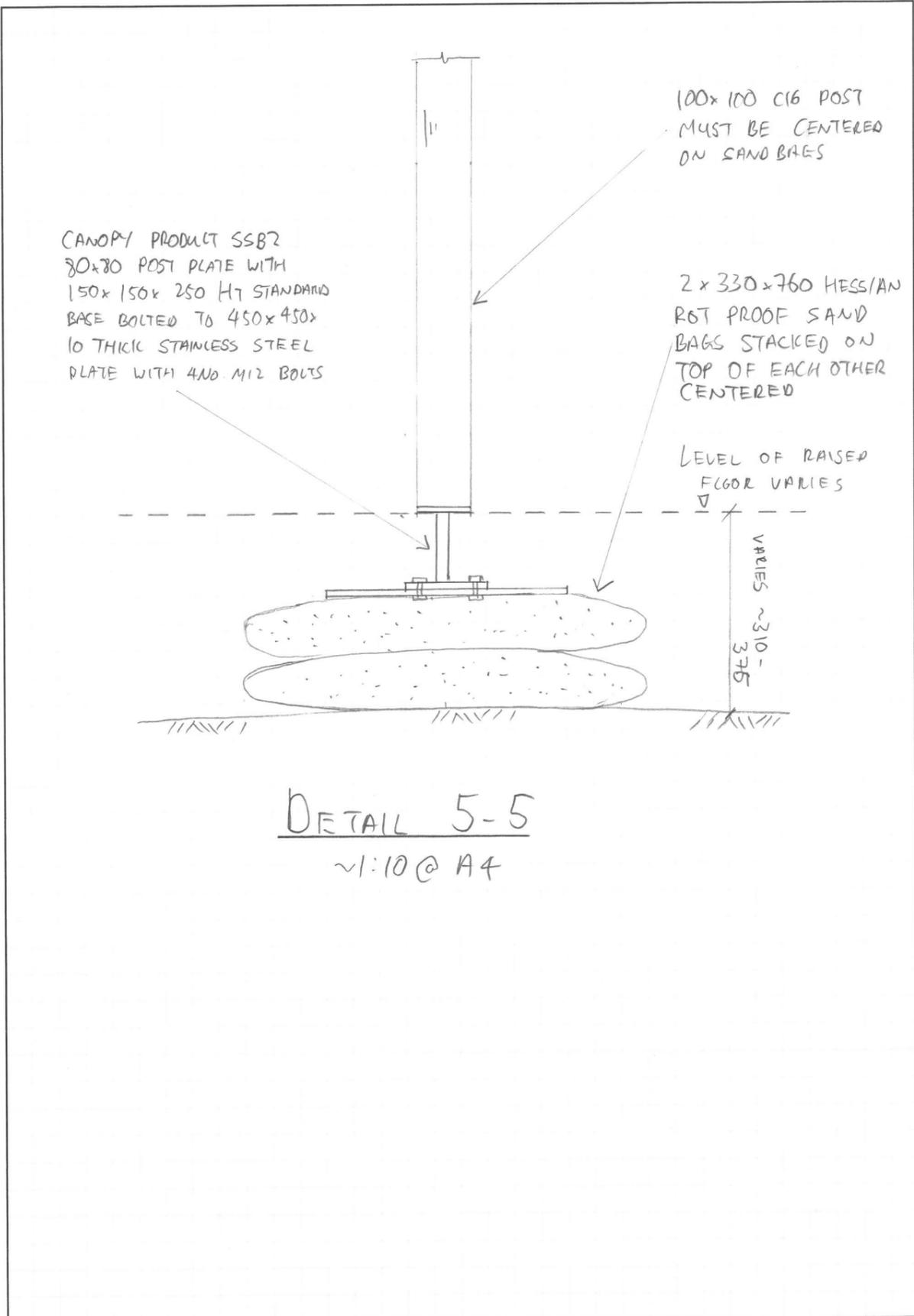
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**Key:**

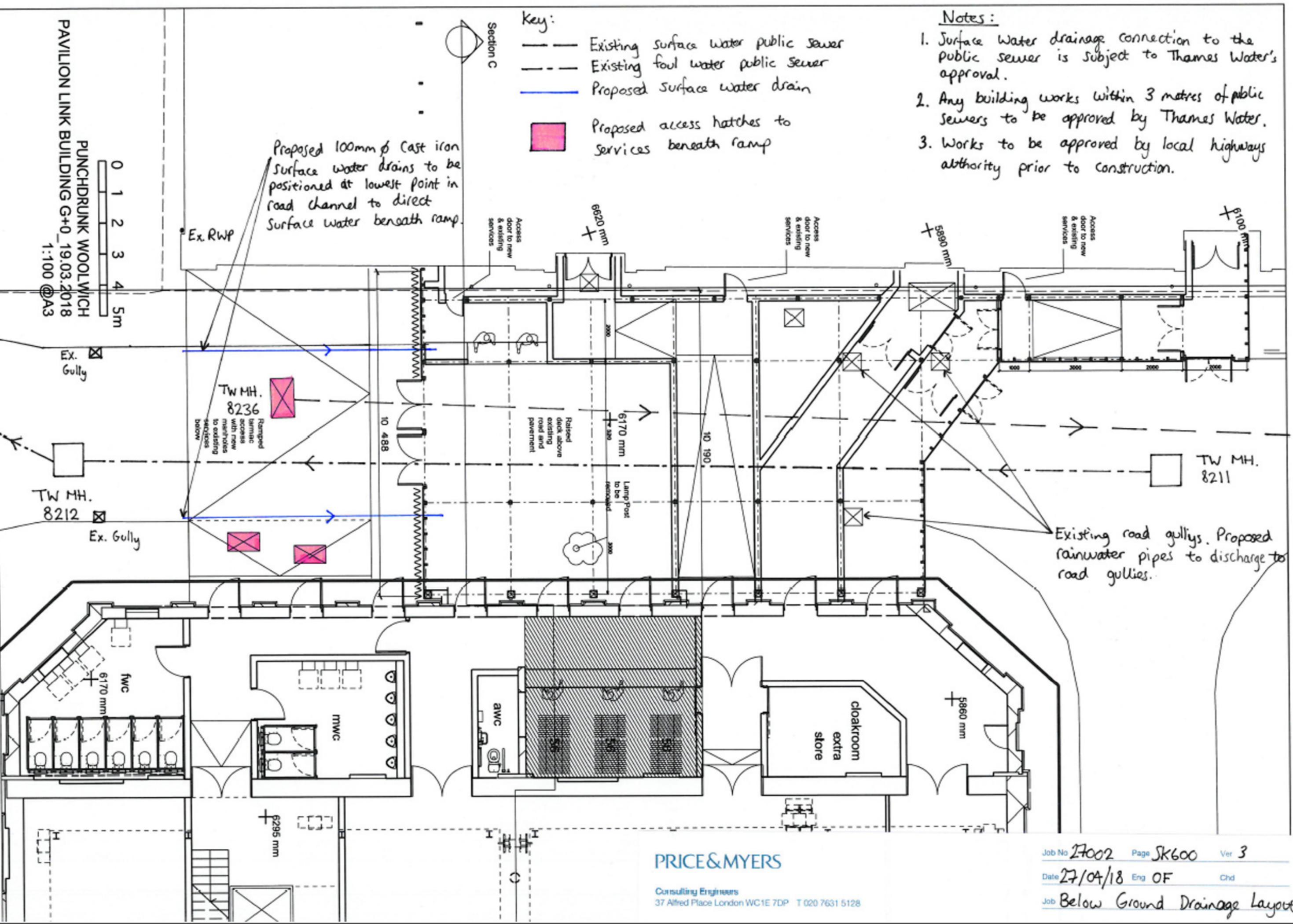
- Existing surface water public sewer
- - - Existing foul water public sewer
- Proposed surface water drain
- Proposed access hatches to services beneath ramp

**Notes:**

1. Surface water drainage connection to the public sewer is subject to Thames Water's approval.
2. Any building works within 3 metres of public sewers to be approved by Thames Water.
3. Works to be approved by local highways authority prior to construction.

Proposed 100mm  $\phi$  Cast iron surface water drains to be positioned at lowest point in road channel to direct surface water beneath ramp.

PUNCHDRUNK WOOLWICH  
PAVILION LINK BUILDING G+0\_19.03.2018  
1:100 @A3



Existing road gullies. Proposed rainwater pipes to discharge to road gullies.

**PRICE & MYERS**

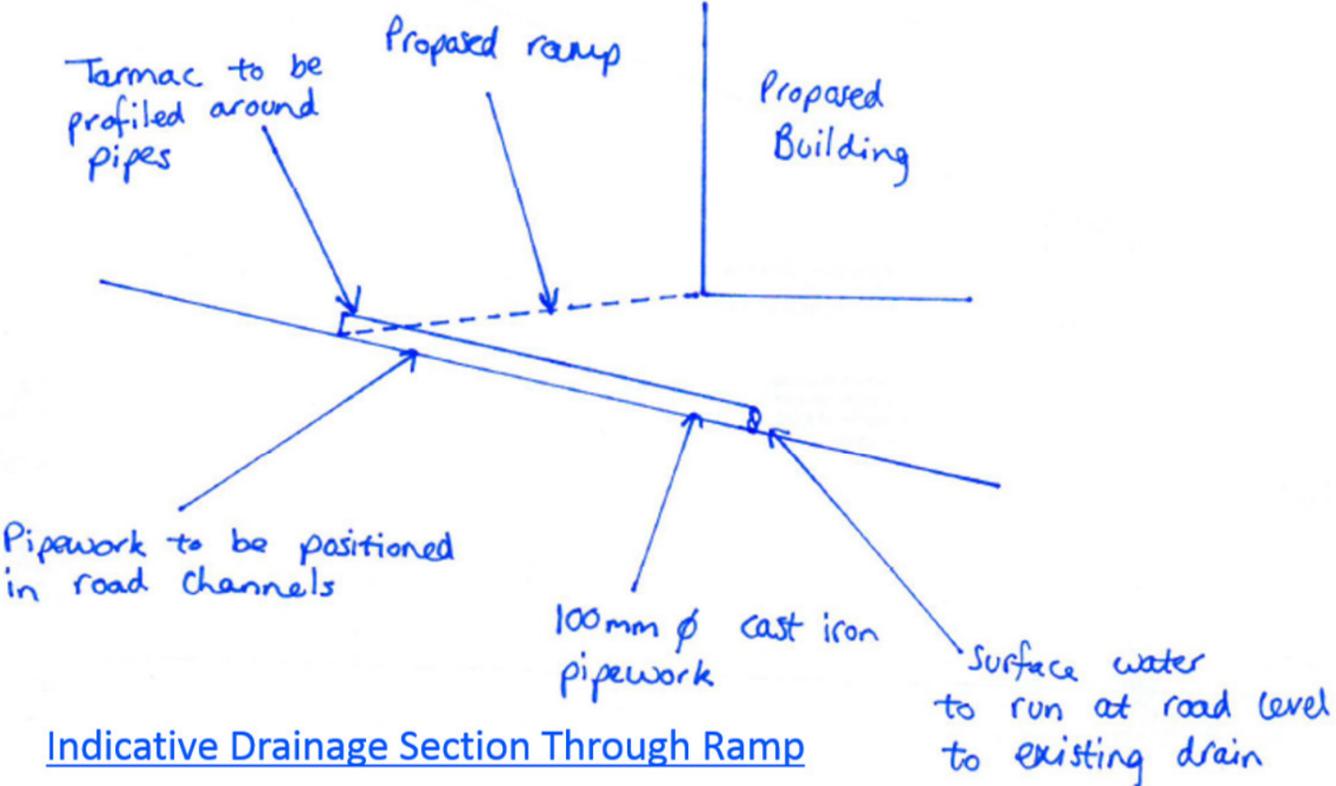
Consulting Engineers  
37 Alfred Place London WC1E 7DP T 020 7631 5128

Job No 27002 Page SK600 Ver 3

Date 27/04/18 Eng OF Chd

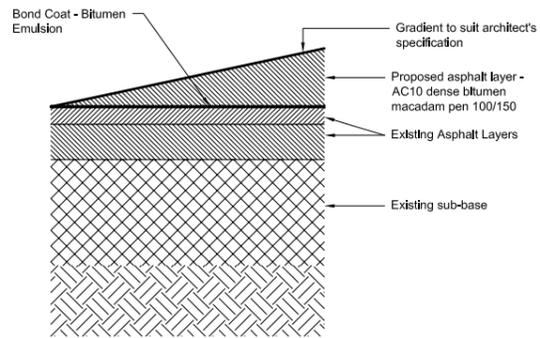
Job Below Ground Drainage Layout

27002 - SK601  
27/04/2018

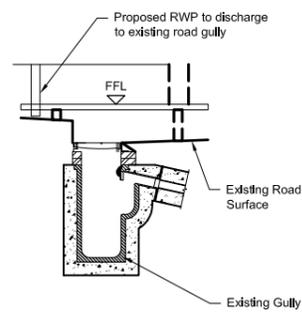


Notes :

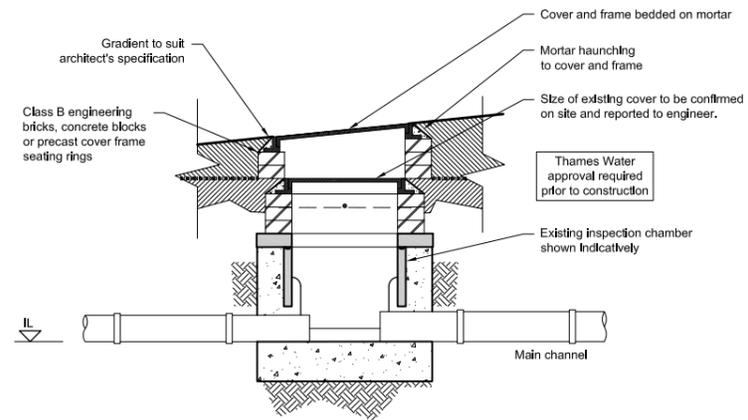
1. This drawing is to be read in conjunction with all relevant Architect's, Engineer's and specialists' drawings and specifications.
  2. Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check that this drawing has been printed to the intended scale this bar should be 50mm long @ A1 or 25mm long @ A3.
- 
3. Health & Safety :  
All specific drawing notes are to be read in conjunction with the project "Information Pack" and "Site Rules".



Ramp Construction Detail



Proposed RWP Drainage Detail



Existing Inspection Chamber with Raised Access Hatch - Section

2	27/04/18	OF	OF	Issued for Information
1	21/03/18	DLin	DLin	Issued for Information
Ver	Date	Drawn	Eng	Amendment

**WOOLWICH PUNCHDRUNK**

**DRAINAGE & ROAD CONSTRUCTION DETAILS**

Status  
**FOR INFORMATION**  
NOT FOR CONSTRUCTION

Drawn	DLin	Eng	DLin
Scales	NTS		
Drawing No	Ver		
27002-610	2		

## Appendix B- Fire Safety Strategy

# Report

## Fire Strategy

WOOLWICH BUILDINGS 17, 18 & 19  
For Punchdrunk

CONFIDENTIAL

Revision: 5.0  
Issued: 19 November 2019





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## 1 EXECUTIVE SUMMARY

A Fire Engineering Assessment has been undertaken to show the suitability of the proposed fire safety strategy for Buildings 17, 18 & 19, Woolwich Royal Arsenal complex in London, and compliance with the Performance Requirements of the Building Regulations.

The principal fire safety design guidance for the development is The Building Regulations 2000, Fire Safety – Approved Document B.

In general, the fire safety measures are provided in-line with the prescriptive recommendations in Approved Document B and British Standards. However, the strategy may also incorporate a number of deviations from the prescriptive provisions within these documents. The overall building design is considered to comply with the objectives of the relevant Performance Requirements and justification where required will be based on the assessment methodology outlined in the PD 7974 series of documents.

Buildings 17, 18 & 19 of the Woolwich Royal Arsenal complex form part of a larger Woolwich Creative District scheme that intends to convert a number of the formally military buildings into combined performance, exhibition and events spaces. The three Grade 2 listed buildings consist of existing warehouse and office accommodation. Building 17, originally a warehouse and cartridge factory has been extended in the 1980s with the 'Fire Power' structure between Buildings 17 and 18, and was used as a museum.

The Tenant intend to occupy all three buildings for up to five years to put on an immersive theatre performance, after which they will hand back Building 17 and 18 for further development and retain a permanent base in Building 19. As part of the five year performance proposals a temporary linking structure will be erected between Buildings 17 and 19 to allow audience circulation between the buildings.

As part of the shell and core works to the site Building 19 will be re-roofed and upgraded so that it is suitable for occupation by the Tenant. Essential repairs will also be undertaken within Buildings 17 and 18 in order to enable their use as performance spaces.

The main fit-out works proposed to the buildings include:

- Creation of the temporary linking structure between Building 19 and 17.
- Introducing a new mezzanine level to part of the Building 19 warehouse.
- Construction of new bar, public reception facilities, back of house offices and workshops within Building 19.
- Fit-out of the Tenant set through Buildings 17 and 19 for the immersive theatre performance.

The Fire Safety Strategy and Fire Engineering Assessment are detailed in the following sections of this report.

It is the responsibility of Designers, Contractors and Sub-contractors to ensure the design solution in this report is implemented in design documentation and constructed accordingly. This includes all normal and applicable guidance and codes of practice where variations from such are **NOT** explicitly covered within this report.

The assessment requires the implementation of the fire safety measures listed in this report and compliance with the relevant Building Regulations not assessed by this report.

It is noted that elements of the existing building may deviate from current prescriptive guidance. Where these non-compliances are within the scope of current project they will be addressed, however; it is expected that some existing deviations will remain which are outside of the scope of the project.



## 2 SCOPE OF THE PROJECT

### 2.1 General

This fire engineering assessment has been undertaken to show the suitability of the proposed fire safety systems within the buildings and compliance with the nominated Performance Requirements of the Building Regulations.

In addition to the Building Regulations, the Regulatory Reform (Fire Safety) Order 2005 requires a certain level of fire safety to be provided to all buildings. The Regulatory Reform (Fire Safety) Order is a risk assessment based legalisation, requiring regular risk assessment, including at occupation.

The client/building user must familiarise themselves with the proposed fire strategy, parts of which comply with the Performance Requirements rather than with prescriptive provisions of Approved Document B (ADB).

The goals of Approved Document B are to provide buildings occupants with an acceptable level of safety against the effects of fire. The only parts of Approved Document B that must be complied with are the Performance Requirements; the prescriptive provisions are deemed to satisfy the Performance Requirements. Where parts of this strategy deviate from the prescriptive provisions, the alternative solutions have been assessed and shown to comply with the relevant Performance Requirement.

### 2.2 General Objectives

#### 2.2.1 Introduction

The objectives of the performance assessment are to:

- Outline a fire safety strategy for the buildings;
- Assess the compliance of nominated design aspects with the Performance Requirements of the Building Regulations; and
- Consider alternate design solutions, to satisfy the relevant Performance Requirements of the Building Regulations.

#### 2.2.2 Building Regulations Objectives

The goals of the Building Regulations are:

- To ensure satisfactory provision of means of giving an alarm of fire and a satisfactory standard of means of escape for persons in the event of fire in a building (B1).
- That fire spread over the internal linings of buildings is inhibited (B2).
- To ensure the stability of buildings in the event of fire; to ensure that there is a sufficient degree of fire separation within buildings and between adjoining buildings; to provide automatic fire suppression where necessary; and to inhibit the unseen spread of fire and smoke in concealed spaces in buildings (B3).
- That external walls and roofs have adequate resistance to the spread of fire over the external envelope and that spread of fire from one building to another is restricted (B4).
- To ensure satisfactory access for fire appliances to buildings and the provision of facilities in buildings to assist fire-fighters in the saving of life of people in and around buildings (B5).

The fire safety guidance given in the Building Regulations are fully functional. Thus there is no obligation to adopt any particular solution contained in Approved Document B if it is intended to meet the relevant requirement (B1 – B5) in some other way.

### 2.3 Relevant Stakeholders

The development of the Fire Safety Strategy included consultation with the relevant stakeholders as identified in Table 2-1.

Table 2-1 - Relevant Stakeholders

Role	Organisation
Principal	The Tenant
Project Manager	Plann
Fire Authority	LFEPA
Architect	Haworth Tompkins
Fire Engineer	Norman Disney and Young

### 2.4 Information Sources

The main sources of information used in the compilation of this report were:

- The Building (Amendment) Regulations 2010. Fire safety Approved Document B Volume 2
- BS 9999 Code of practice for fire safety in the design, management and use of buildings
- ABTT Technical Standards for Places of Entertainment ('Yellow Book')
- Architectural drawings as listed in Table 2-2.
- Woolwich Creative Suite A Final Application Documents

Table 2-2 – Architectural Drawings

Drawing No.	Description	Revision
V13-GG-01	Proposed Ground Floor Plan_B17, 18 & 19	A
V13-GM-01	Proposed First Floor Plan_B17, 18 & 19	A

### 2.5 Limitations

The report does not provide guidance in respect of areas, which are used for bulk storage, processing of flammable liquids, explosive materials, multiple fire ignitions or for areas / fire safety systems which are subject to sabotage.

Norman Disney & Young have compiled this report based on the following activities:

- Discussions with parties listed in Table 2-1
- Review of available project information and drawings

Apart from where noted in the specific sections of this report, NDY have not verified any written and / or verbal information provided by other parties. In addition, the following work has not been undertaken:

- verification of the design
- checks of design calculations



In formulation of the findings contained herein, specific qualifications apply. Any application of the content of this report should be made taking into full account the following items:

- Observations of the buildings' fire safety systems and fire hazards listed in this report have been based on examination of documentation made available by the design team.
- Any change in the above information to suit future re-organisation or planning will require further assessment to confirm compliance with the intent of the objectives of this report.
- The report does not consider property damage; e.g. building and contents damage caused by fire, potential increased insurance liability and / or, loss of business continuity.
- Property insurers have not been consulted in the preparation of this report. Any insurer requirements over and above the recommendations of this report should be addressed by the client/building user.

It is the responsibility of the design team to ensure the strategy outlined in this report is implemented in design documentation and the finished building accordingly.

The strategy requires the implementation of the measures outlined in this report and compliance with the relevant and remaining prescriptive clauses of ADB not specifically mentioned in this report.

This strategy does not cover fire incidents arising from arson where fire is started in multiple locations or accelerant is used. Conventional building design only provides limited protection against malicious attack and large scale incendiary and multiple ignition sources can potentially overwhelm any fire safety systems. Strategies such as security, housekeeping and other management practices may be more effective than additional fire protection in addressing arson.

## 2.6 Liability

This report is applicable to the proposed development at Buildings 17, 18 & 19, Woolwich Royal Arsenal complex, London.

The fire engineering analysis contained in this report demonstrates that the level of life safety offered by the proposed fire safety strategy meets the performance required by the Performance Requirements of Building Regulations.

This report is prepared in good faith and with due care for information purposes only, and should not be relied upon as providing any warranty or guarantee. In particular, attention is drawn to the nature of the inspection and investigations undertaken and the limitations these impose in determining with accuracy the state of the building, its services, equipment and life safety.

Users of this report should not rely on any statements or representations contained within, but should undertake further and more detailed investigations to satisfy themselves as to the correctness of any statement or representation contained in this report.

Norman Disney & Young will not be held liable for any loss or damage resulting from any defect of the building, services, equipment or for any non compliance of the building, services or equipment with any legislative or operational requirement, whether or not such defect or non-compliance is referred to or reported upon in this report.

## 2.7 Revision History

REVISION	DATE ISSUED	COMMENT
1.0	8 <sup>th</sup> May 2018	Draft for Information / Comment
2.0	4 <sup>th</sup> Sept 2018	Incorporating Planning Comments
3.0	14 <sup>th</sup> June 2019	For AI Review
4.0	25 <sup>th</sup> Oct 2019	Final Draft Issue
5.0	19 <sup>th</sup> November 2019	Incorporating Comments



### 3 BUILDING DESCRIPTION

#### 3.1 General

Buildings 17, 18 & 19 of the Woolwich Royal Arsenal complex form part of a larger Woolwich Creative District scheme that intends to convert a number of the formally military buildings into combined performance, exhibition and events spaces. The three Grade 2 listed buildings consist of existing warehouse and office accommodation. Building 17, originally a warehouse and cartridge factory has been extended in the 1980s with the 'Fire Power' structure between Buildings 17 and 18, and was used as a museum.

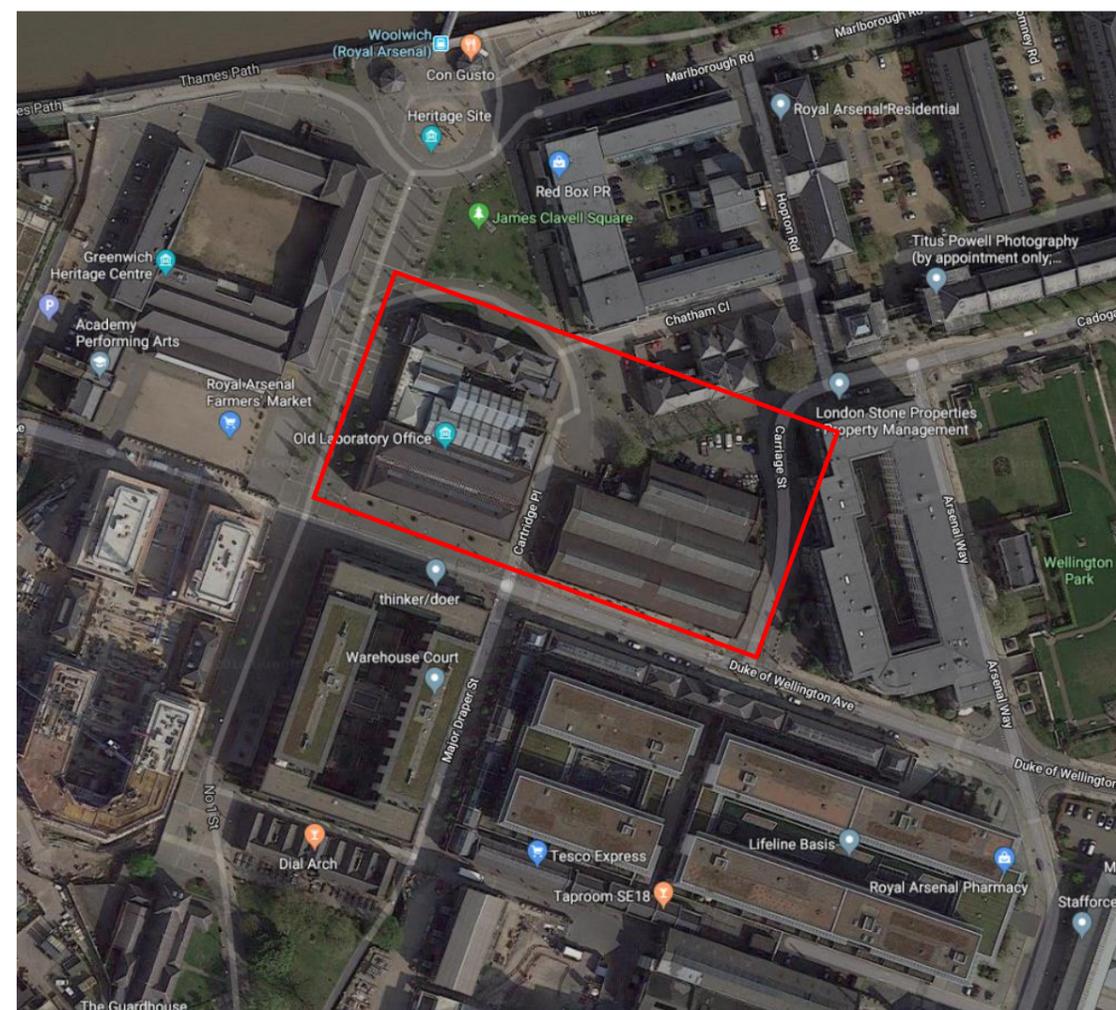
Buildings 17 and 19 are essentially single storey buildings that have had mezzanine levels constructed within them to increase the available floor space. Both 17 and 19 are of similar construction consisting of iron structures and brick facades with lightweight roofs containing roof lights. Building 18 consists of a ground and first floor constructed of load bearing brick.

The top most storeys of all three buildings are less than 5m above ground floor access level.

Refer to Table 3-1 and Figures 3-1 and 3-2 for further details of the site layout and building configuration.

**Table 3-1 – Summary of Proposed Site Usage**

Level / Area	Use
<b>Building 17</b>	
Ground Floor / Main Floor	Performance Space: The Tenant fit-out will include building of theatrical set and installation of associated technical installations e.g. lighting, sound and effects.
Ground Floor / 'Fire Power' Auditorium	Performance Space / Small Event Space: The Tenant fit-out will include building of theatrical set and installation of associated technical installations e.g. lighting, sound and effects.
Mezzanine / Main Floor	Performance Space: The Tenant fit-out will include building of theatrical set and installation of associated technical installations e.g. lighting, sound and effects.
<b>Building 18</b>	
Ground Floor	Back of House / small group or one to one performance: Minimal fit-out is expected within Building 18, room layouts will be unchanged, spaces may be 'made up' as part of the performance set.
1 <sup>st</sup> Floor	
<b>Building 19</b>	
Ground Floor / Main Floor	Performance Space: The Tenant fit-out will include building of theatrical set and installation of associated technical installations e.g. lighting, sound and effects.
Ground Floor / Bar	Part of the ground floor accommodation will be fitted out as the show bar for audience interaction and the sale and consumption of alcohol.
Mezzanine / Main Floor	Performance Space: The Tenant fit-out will include building of theatrical set and installation of associated technical installations e.g. lighting, sound and effects.
Ground / Back of House	Workshops / Creative Spaces: These areas will form the Tenant's main creative spaces and workshops for production of props and items for use within the theatrical set. Also the ground floor will contain the office reception toilets and some break out spaces.
Mezzanine / Back of House	Offices / Crew Areas: The mezzanine area is divided to provide office accommodation for the Tenant's production teams and administration. Also at this level some back of house areas will be provided for cast and crew.



**Figure 3-1 – Site Location Plan (image taken from Google Maps)**

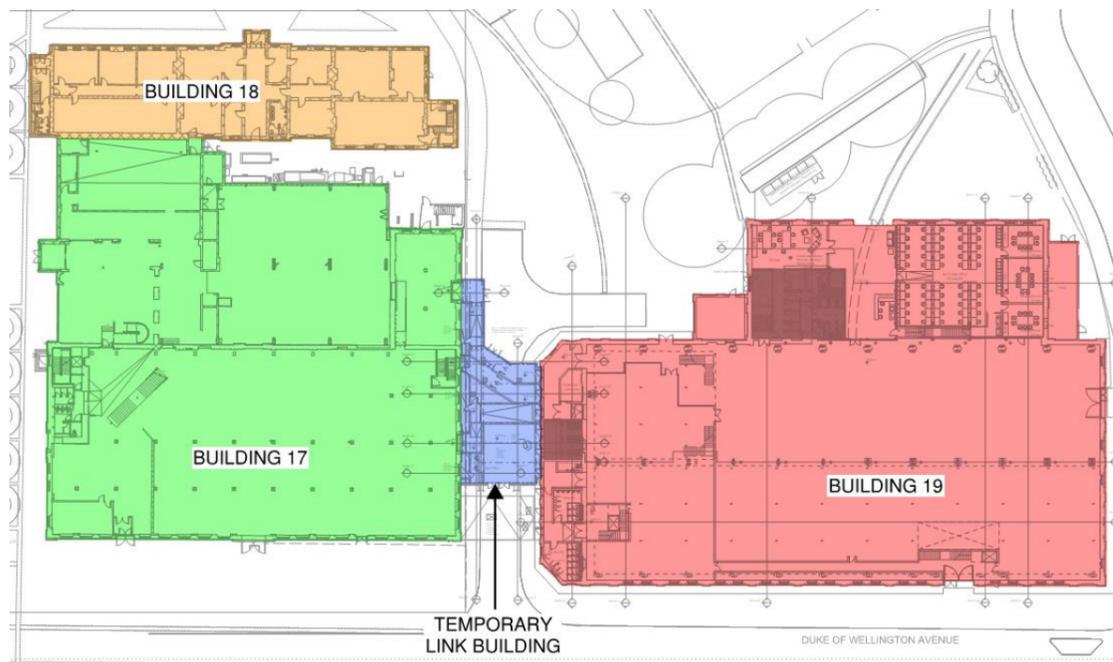


Figure 3-2 – Building Layout

## 4 OCCUPANT CHARACTERISTICS

Following consultation with the design team, we understand that the characteristics of the building population are as described below.

### 4.1 Occupancy Type

The occupants of Buildings 17-19 will include staff and performers who are inducted into the space and are familiar with the buildings layout and available escape routes. These occupants can be classed as Characteristic A in accordance with BS 9999.

As the building will be used for public performance there will also be a large audience occupancy made up of members of the public who are not familiar with the building. These occupants are classed as Characteristic B in accordance with BS 9999.

Sleeping accommodation is not provided on site and so Characteristic C occupants are not expected.

### 4.2 Physical and Mental Attributes

All occupants are expected to be awake and able to recognise and respond to an alarm signal in a rational way. Performances will be stewarded with suitably trained members of staff available throughout the buildings to assist members of the public in completing their evacuation.

There is not expected to be any sleeping risk on the premises.

There is not expected to be any dependent or highly dependent occupants at the premises who would require significant assistance in the event of an evacuation. Suitable provision will be made for the evacuation of disabled individuals where identified.

### 4.3 Numbers and Distribution

Occupant numbers for back of house areas have been calculated in accordance with:

- Floor space factors from Approved Document B Table C1 for the floor area (NIA),
- Distribution (via judgement), or
- A justified combination of the above.

Audience numbers and the occupancy of public spaces have been based upon discussions with the Tenant production team and where necessary will be limited by the available means of escape from a particular area.

The strategy as described within this document has considered an audience of up to 650 members of the public with 100 staff and performers, however; please note that through further discussion with the Tenant production team, design development and implementation of suitable management procedures it is expected that larger audiences of up to 1500 people may be accommodated across all three buildings. It is the intention for the space to be used as a flexible performance centre and therefore the specifics for each performance will be subject to review and the production of a suitable Fire Risk Assessment and Fire Safety Management Plan for the performance.

During performances the audience are given a timed entry into the venue and actively encouraged to distribute throughout the set. Significant concentrations of occupants are then controlled to specific areas for main performance sequences. This fire strategy has been developed on the basis that the largest audience group expected to occupy any single area will be 650 people.

The number of persons that are assumed to occupy the building is given in Table 4-1.



**Table 4-1 – Building Design Occupancies**

Building 17			
Area	Floor Area, m <sup>2</sup>	Floor Space Factor, m <sup>2</sup> /person	Max. Expected Design Occupancy
Ground Floor / Main Floor	1922	NA	750 <sup>[Note 1]</sup>
Ground Floor / 'Fire Power' Auditorium	494	NA	122 <sup>[Note 2]</sup>
Mezzanine / Main Floor	742	NA	229 <sup>[Note 2]</sup>
Building 18			
Area	Floor Area, m <sup>2</sup>	Floor Space Factor, m <sup>2</sup> /person	Max. Expected Occupancy
Ground Floor	590	NA	50 <sup>[Note 3]</sup>
1 <sup>st</sup> Floor	590	NA	50 <sup>[Note 3]</sup>
Building 19			
Area	Floor Area, m <sup>2</sup>	Floor Space Factor, m <sup>2</sup> /person	Max. Expected Occupancy
Ground Floor / Main Floor	1655	NA	750 <sup>[Note 1]</sup>
Ground Floor / Bar	439	NA	659 <sup>[Note 2]</sup>
Mezzanine / Main Floor	926	NA	250 <sup>[Note 2]</sup>
Mezzanine – Over Bar	260	NA	30 <sup>[Note 6]</sup>
Ground / Back of House	465	10 <sup>[Note 4]</sup>	47
Mezzanine / Back of House	557	6 <sup>[Note 5]</sup>	93

**Note 1:** Occupancy based upon max. audience numbers of 650 people plus up to 100 performers, stewards and other staff members that may be present. It is noted that the full audience capacity will be gathered in one location only for limited periods. The bar area is expected to be more heavily occupied after a performance. It is also noted that when the whole audience is gathered in a single space that other parts of the building will be sparsely occupied (staff only).

**Note 2:** Occupant numbers are limited by the capacity of available means of escape.

**Note 3:** Nominal number of occupants only considered at this stage. Building 18 will only be used for back of house areas at this stage. Further details to be developed by production team if these areas are ever used for performance spaces.

**Note 4:** Floor space factor considered representative of a creative workshop environment where areas will be dedicated to storage of materials and work benches etc.

**Note 5:** Typical office occupant densities used to represent the back of house production office and administrative functions.

**Note 6:** Audience numbers will be restricted in this area by Punchdrunk staff.

## 4.4 Risk Profiles

In accordance with BS 9999 the risk profiles for the buildings have been assessed by considering occupancy characteristics and likely fire growth rates.

### 4.4.1 Fire Growth Rates

The fire growth rates are chosen to be representative of actual fire situations involving different fire load materials.

Based on PD 7974 -1: 2003 – Application of fire safety engineering principles to the design of buildings, experiments on burning furniture, papers, computers and electronic equipment suggest **Medium** growth rates for the potential fire load in the offices and back of house areas.

All of the theatrical set, props and theatrical dress that is installed within the performance spaces is treated with fire retardant to reduce ignition potential and inhibit fire growth. It is therefore considered reasonable to assess the likely fire growth rates in the performance areas as **Medium** which would be representative of an evenly distributed mixed combustible fire load.

It is noted that in some smaller areas there will likely be hazards that could represent a greater fire risk such as within the workshops or store rooms, however; due to the relatively small area and low occupancies associated with these areas it is considered reasonable to assess the overall risk profiles for the buildings based upon the above and where a significant risk or hazard is identified these risks will be managed locally.

### 4.4.2 Occupancy Characteristics

As noted in 4.1 above the occupancy characteristics for the three buildings have been assessed as follows:

- Office and Back of House: Occupancy Characteristic **A**
- Performance Spaces and Bar: Occupancy Characteristic **B**

### 4.4.3 Risk Profile

The risk profiles for the buildings are summarised in Table 4-1.

**Table 4-2 – Risk Profiles**

Group	Occupancy Characteristic	Fire Growth Rate	Risk Profile
Office / Back of House	A	2 (Medium)	A2
Performance Spaces / Bar	B	2 (Medium)	B2



## 5 B1 – MEANS OF WARNING AND ESCAPE

### 5.1 Evacuation Strategy

It is proposed that the evacuation strategy for all buildings will be based on a simultaneous evacuation philosophy. Thus the fire alarm system will be configured such that all occupants in all three buildings (17-19) are evacuated at the same time in the event of a fire emergency.

### 5.2 Automatic Fire Detection and Alarm Systems

#### 5.2.1 System Category and Extent

It is recommended that a minimum Category L5 automatic fire detection and alarm system is provided for all three buildings as part of the development which will provide as a minimum smoke detection within all circulation areas and escape routes as well as all rooms accessed directly off these routes. Additional detection and / or manual call points may also be provided where necessary to support the proposed use of the building. The full scope of the Fire Detection and Alarm system installation to be further defined by the system designers in collaboration with the Punchdrunk production team.

Manual call points will be installed along the escape routes, at all storey exits and final exits from the building.

Where Buildings 17, 18 and 19 are provided with separate fire alarm panels it is recommended that these be linked via a common network to allow management and control of all these panels as a single system. At this stage it is proposed that the main control panel for the network be located within the back of house office reception in Building 19.

Base build fire detection and alarm systems will need to be extended and modified to provide detection in the temporary linking structure between building 17 and 19 and to accommodate internal layout modifications.

Interfaces for fire mode control of plant and other systems including interface to theatrical sound and lighting controls are recommended. Where electronic locking devices and/or door holders are provided along common escape routes these will be interfaced with the fire alarm system to ensure they release on activation of the alarm.

#### 5.2.2 Means of Warning

Electronic sounders will be provided throughout the buildings to sound an evacuation signal on activation of the system achieving the minimum required sound pressure levels in accordance with BS 5839-1.

Visual alarm devices will be provided to supplement audible alarm signals in areas in which the latter are likely to be ineffective. These include toilets and plant areas with high ambient sound levels.

It is recommended that an interface between the fire alarm system and the theatrical sound control be provided to allow for automatic switching off of the background audio during a performance in the event of a fire alarm activation.

#### 5.2.3 Investigation Period & Isolations

Due to the nature of the spaces being protected it will be necessary to isolate the smoke detection within performance spaces during a show to allow the use of theatrical smoke and haze effects that would otherwise create unwanted alarms on the system. To enable this it is recommended that a performance mode isolation switch is provided adjacent to the main fire control panel that can be used to isolate the smoke detection during a show.

It is noted that during show times there will be a significant number of people in the building including trained stewards, performers and other show staff such that a fire is very likely to be discovered during its stages and the alarm raised using the available manual call points.

All back of house areas and areas unaffected by the smoke and haze effects will be left operational.

Suitable procedures will be need to be developed with the Tenant in order to manage the use of this switch to ensure that the building is adequately protected outside of performance times. Where possible it is recommended that the system automatically defaults back to the non-performance mode operation after a set time to ensure that the system can't be left in performance mode indefinitely.

It is proposed that activation of a single smoke detector would initiate an investigation period to allow trained staff members to investigate the cause of the activation prior to sounding a full evacuation signal. A visual and audible warning will be provided at the main fire control panel only to alert staff to the activation. Typically this would require a member of staff to acknowledge the alarm within 60s which would allow a further period of up to 6 minutes (to be agreed with the Approvals Authorities) investigation time. Where the alarm is not cancelled within this period or where an additional device is activated the system would automatically escalate to a full evacuation signal.

### 5.3 Means of Escape Provisions

#### 5.3.1 General

The evacuation strategy for the buildings 17, 18 and 19 is based on a simultaneous evacuation philosophy. Thus the fire alarm system will be configured such that all occupants are evacuated at the same time in the event of a fire emergency.

Two main components of the evacuation strategy need to be considered:

- Horizontal Escape from the room or storey; and
- Vertical Escape via the stairs to a place of safety outside the building.

It should be noted that where exit and stair widths are discussed within this section of the report these are considered to be the minimum required to provide satisfactory means of escape in the event of a fire in the building and that in order to meet the requirements of other guidance documents such as Approved Document M (ADM) the minimum widths may need to be increased.

#### 5.3.2 Travel Distances

BS 9999 gives guidance on maximum travel distances in a single direction and for situations where more than one direction of escape is available. The travel distance limits are dependent on the risk profiles and can be extended where additional fire protection measures are provided.

Table 5-1 sets out the travel distance limitations to the nearest exit within the building:

**Table 5-1 – Travel Distance Limitations**

Use	Maximum Travel Distance <sup>(Note 2)</sup>	
	One-way Travel (m)	Two-way Travel (m)
Office and Back of House (A2)	22	55
Performance Spaces / Bar (B2) <sup>(Note 1)</sup>	18	45

**Note 1:** For the public areas and performance spaces the maximum travel distances given in Annex D of BS 9999 have been used.

**Note 2:** Where the internal layouts are unknown at this stage, direct distances should be adopted; direct distances are two thirds of the distances nominated in Table 5-1.



BS 9999 allows consideration of additional fire protection measures and/or high ceilings for the extension of acceptable travel distances. At this stage no additional allowances have been considered and it is the intention of the designers to achieve the base requirements given above. (To be further assessed as set design develops)

### 5.3.3 Inner Rooms

Inner room conditions are those where the only means of escape from a room is via another room (the access room). Inner rooms of inner rooms should not be created.

The proposed layout of the performance areas is expected to create a number of inner rooms within the larger spaces. Inner room conditions are acceptable where the following are provided:

- Occupancy of the inner room does not exceed 60 people.
- Escape from the inner room should not pass through more than 1 access room i.e. an inner room of an inner room is not acceptable (in this case an alternative means of escape should be provided).
- Escape travel distances must be within acceptable limits as given in Table 5-1.
- The access room must not be a place of special fire hazard.
- The access room should be fitted with an automatic fire detection and alarm system to give warning to occupants of the inner room.

Where possible all inner rooms should be provided with visual access into the main area i.e. windows and doorways.

### 5.3.4 Exit Widths

Generally, one (largest) exit should be discounted when assessing the maximum permitted exit capacity from each area. On a single escape route, the maximum population permitted is 60 persons and the exit discounting rule can be disregarded.

It is acceptable that exit doors be hung to swing against the direction of escape providing the numbers of people that might be expected to use the door at the time of a fire is not more than 60.

All doors used for means of escape from public areas should be fitted with suitable panic hardware.

The storey exit widths for the building are given in Table 5-2.

**Table 5-2 – Storey Exit Capacity**

Building 17				
Area	Max. Expected Design Occupancy	Available Exits [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
Ground Floor / Main Floor	750	17A	1100	268
		17C	1050	256
		17E	1200	293
		17F	1500	366
Ground Floor / 'Fire Power' Auditorium	122	17A	1100	268
		17B	800	122
Mezzanine / Main Floor	229 [Note 4]	17MA	1050	256
		17MB	1050	256

Building 18 [Note 3]				
Area	Max. Expected Occupancy	Available Exits [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
Ground Floor	50	18A	800	122
		18B	800	122
1 <sup>st</sup> Floor	50	18MA	800	122
		18MB	800	122
		18MC	800	122
Building 19				
Area	Max. Expected Occupancy	Available Exits [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
Ground Floor / Main Floor	750	19C	1600	390
		19E	1600	390
		19F	1600	390
Ground Floor / Bar	659 [Note 4]	17D	800 [Note 2]	122
		19A	800	122
		19B	800	122
		19C	1600	390
		19F	1200 [Note 2]	293
Mezzanine / Main Floor	250 [Note 4]	19MA	1200	293
		19MB	1200	293
		19MC	800	122
Mezzanine - Over Bar	30 [Note 5]	19MG	800	122
Ground / Back of House	47	19C	1600	390
		19D	800 [Note 2]	122
		19E	800 [Note 2]	122
Mezzanine / Back of House	93	19MD	800	122
		19ME	800	122
		19MF	800	122

**Note 1:** Please refer to the Fire Strategy drawings (Appendix A) for location of different exit references.

**Note 2:** Escape width limited by access via an internal door / corridor of smaller dimensions than the final exit.

**Note 3:** Available escape widths and capacities for Building 18 are to be further reviewed and agreed with the production team as the use of this area becomes more defined.

**Note 4:** Occupant numbers restricted by available stair/exit capacity.

**Note 5:** Occupant numbers managed by Punchdrunk staff.

### 5.4 Vertical Escape Provisions

Staircase discounting rules need to be applied as protected lobbies/corridors will not be provided to each escape stair at each level. To reflect a worst case escape scenario, the largest Stair serving any single area will be discounted when assessing the escape capacity for that area.



Each of the first / mezzanine floors is served by at least two stairs. All stairs except for the stairs to serve the proposed new mezzanine areas in Building 19 are existing and will not be altered by the proposed refurbishment works. The location of escape stairs is on the Fire Strategy drawings given in Appendix A.

The vertical escape capacities for each area are given in Table 5-3.

**Table 5-3 – Stair Escape Capacity**

Building 17				
Area	Max. Expected Design Occupancy	Available Stairs [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
Mezzanine / Main Floor	229 [Note 3]	17SA	1100	229
		17SB	1100	229
Building 18 [Note 2]				
Area	Max. Expected Occupancy	Available Stairs [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
1 <sup>st</sup> Floor	50	18SA	1100	229
		18SB	1100	229
		18SC	900	50 [Note 4]
Building 19				
Area	Max. Expected Occupancy	Available Stairs [Note1]	Clear Escape Width (mm)	Escape Capacity (no. people)
Mezzanine / Main Floor	250 [Note 3]	19SA	1200	250
		19SB	1200	250
Mezzanine - Over Bar	30	19SC	1200	250
Mezzanine / Back of House	93	19SD	1100	229
		19SE	1100	229
		19SF	1100	229

**Note 1:** Please refer to the Fire Strategy drawings (Appendix A) for location of different exit references.

**Note 2:** Available escape widths and capacities for Building 18 are to be further reviewed and agreed with the production team as the use of this area becomes more defined.

**Note 3:** Occupant numbers restricted by available stair capacity.

**Note 4:** Stair does not meet normally accepted minimum clear escape width of 1000mm therefore the capacity of this stair has been assumed to be not greater than 50 people.

Based upon the above assessment the available escape widths will be adequate to accommodate the expected maximum occupancies for the building. Please note that a number of assumptions have been made with regards occupant movements which will need to be reviewed and built into the performance management plans:

- Audiences will be distributed through the buildings and will only come together as a single group at key points in a performance and only in those areas where adequate means of escape is provided i.e. the main ground floor performance spaces in Building 17 or 19.
- The maximum allowable occupancies for certain areas will not be exceeded i.e. mezzanine levels and Fire Power auditorium.

- Where the maximum occupant numbers are in one area it is assumed that other areas will be nominally unoccupied, therefore merging flows at exits have not been considered when assessing the maximum escape capacity from these areas.
- Trained stewards, performers and other members of the Tenant team will be available to assist and direct the audience in the event of a fire evacuation. A detailed stewarding plan and evacuation procedures will be developed for each performance.

## 5.5 Merging Flow / Final Exit

Merging flows have been considered where ground floor storey exits share the final exit with Stair 19SB (exit identified as 19F on the fire plans).

The following calculation has assumed a maximum figure of 150 people using the ground floor exit (19F). This is considered to be reasonable on the basis that when the mezzanine is occupied the full audience capacity will be distributed throughout the buildings. As a worst-case scenario if we assume that 50% of the audience are within the ground floor area of building 19 and one of the three available exits is not available this would give 150 people using exit 19F to make their escape from ground floor.

The minimum final exit width from Stair 19SB is calculated in accordance with Figure 6a of BS 9999:

Required final exit width,  $W_{FE} = NX + 0.75 S_{up}$

N = no. of people served by the final level storey exit, 150 people

$S_{up}$  = stair width, 1200mm

X = minimum door width per person, 4.1mm

Therefore the minimum required final exit width for 19F has been calculated as **1515mm**. This exit is currently designed to achieve a minimum clear width of 1600mm.

No other final exits from stairs will merge with ground floor exits.

## 5.6 Disabled Evacuation

Disabled refuges will be located within all escape stairs to act as temporary refuge for any occupants requiring assistance to complete their escape from the building.

Refuges will be provided with Emergency Voice Communications (EVC) systems reporting to the main EVC panel located adjacent to the fire alarm control panel. Currently this is proposed to be within the office reception in Building 19.

Suitable evacuation procedures including carry down methods where appropriate will be developed with the Tenant team to ensure that a full controlled evacuation of the building can be achieved.

## 5.7 Signage

Exit signage will be provided throughout the building in accordance with BS ISO 3864-1 and BS 5499 Part 4.

Directional, action and identification signage will be provided throughout the building to:

- Illuminated exit signage to show the location of storey exits
- Outline the action to be taken in a fire alarm situation, or if a fire is discovered
- Show the location of fire safety measures
- Fire doors will be marked "FIRE DOOR KEEP SHUT" or "FIRE DOOR – DO NOT OBSTRUCT" where hold open devices are provided



## 5.8 Escape Lighting

Emergency lighting will be installed throughout the building in accordance with the requirements of ADB and BS 5266 Part 1. The provision of emergency lighting will cover the following areas:

- Ancillary accommodation normally accessible to the occupants
- All plant rooms
- Common escape routes
- Underground or windowless accommodation
- Open plan areas of more than 60m<sup>2</sup>
- All toilet accommodation with a floor area over 8m<sup>2</sup>

The emergency lighting must also be provided on sub-circuits to illuminate fire exits, exit routes (internal and external) exit signage, fire equipment, electrical panels and fire alarm panels.

Emergency lighting will be non-maintained within performance areas and automatically illuminate on activation of the fire detection and alarm system. House lights will also be programmed to come up to full luminance on activation of the fire alarm. Full details to be developed with the production team.

## B2 – INTERNAL FIRE SPREAD (LININGS)

Materials used for the surface linings of walls and ceilings will generally be selected to meet the classification requirements described in Table 33 of BS 9999 with respect to the materials reaction to fire properties.

Wall and ceiling linings will have the minimum classifications identified in Table 6-1:

Table 0-1 – Classification of Linings

Use	Location	National Class of Lining	European Class of Lining
Office and Back of House Areas	Small rooms (< 30m <sup>2</sup> )	3	D-s3,d2
	Other rooms	1	C-s3,d2
	Circulation space	0	B-s3,d2
Performance Spaces	All areas	0	B-s3,d2

Where possible all materials being introduced into the building as part of the set design should be of limited combustibility and where this can't be achieved they will be treated with a suitable fire retardant to reduce their ignition potential.

All timber used in the construction will be treated with a fire retardant to achieve a Class 0 reaction to fire performance.

Furnishings, fabrics and other decorative drapes or blinds provided should be non-combustible or conform to the requirements for classification type B in accordance with BS 5867-2.

A schedule of all materials and objects placed in a rooms / area will be kept to document what is in each room and how it has been treated to reduce its ignition potential.

Applied surface finishes will not cover any fire safety systems or signage and must not impede the flow of people through the escape routes.



## 6 B3 – INTERNAL FIRE SPREAD (STRUCTURE)

### 6.1 Elements of Structure and Compartmentation

Existing fire ratings of elements of structure i.e. existing iron frames and/or masonry construction are considered to be satisfactory and the level of fire protection should be maintained where works affect existing elements of structure. Where the fire rating of the existing elements can't be ascertained any reinstatement should be completed to achieve a minimum of 30mins fire resistance.

Where the top occupied storey of any of the buildings does not exceed 5m the recommended minimum period of structural fire resistance required is 30mins in accordance with BS 9999.

Maximum allowable compartment sizes have been assessed using Table 28 of BS 9999 for the relevant risk profiles in the buildings and are summarized in Table 6-1. The maximum proposed compartment sizes are within the limits recommended in BS 9999.

Table 6-1: Max. Compartment Sizes

Building	Height of Top Storey (m)	Risk Profile	Max. Allowable Compartment Size - BS9999 (m <sup>2</sup> )	Max. Compartment Floor Area Proposed (m <sup>2</sup> )
17	<18	B2	8000	2416
18	<18	B2	8000	590
19	<18	B2	8000	2094

All compartmenting elements will be provided to meet the minimum fire resistance periods identified below:

- 30 minutes protected escape corridors
- 30 minutes sub division wall of a protected corridor
- 30 minutes enclosing escape stairs
- 30 minutes separating performance areas from back of house (non-public)
- 60 minutes separating plant rooms

Compartment walls and fire resistant partitions will be constructed to provide a physical barrier to the passage of fire and the products of combustion. As such, these will remain imperforate throughout their height, form a seal with the structural slab or element of structure above and achieve the same or a greater level of fire resistance.

For further details of the proposed fire compartmentation please refer to the Fire Strategy Drawings in Appendix A.

### 6.2 Fire Doors

Doors forming part of a plant room enclosure will be FD30.

Doors forming part of the escape passageway, dead end escape corridor, escape stair or lobby enclosures will be FD30S.

**Note**, a suffix (S) is added for doors where restricted smoke leakage at ambient temperature is needed.

### 6.3 Concealed Spaces and Cavity Barriers

Concealed cavities are to be provided within cavity barriers in accordance with the recommendations given in Section 33 of BS 9999.

All voids will be provided with cavity barriers every 20 m where the class of exposed surface in the cavity is Class 0 or Class 1. If the exposed surfaces within the cavity do not achieve Class 0 or Class 1, then cavity barriers should be provided every 10 m.

Where any single room is not more than 40m in either direction, cavity barriers only need to be located at the line of the enclosing walls of the room, provided the exposed surfaces in the cavity have ratings of either Class 0 or Class 1.

Concealed cavities will not generally be created by the proposed fit-out works except where the new link building structure is located over the existing roadway. In this area there is a void running beneath temporary link building which also forms a drainage path and as such can not be provided with cavity barriers. It is proposed to fire rate the floor along the protected escape routes in the link building in lieu

### 6.4 Protection of Openings and Fire Stopping

All service penetrations through fire rated elements should be appropriately sealed in accordance with the recommendations given in Section 32 of BS 9999.

Typical fire stopping materials include:

- Cement mortar
- Gypsum-based plaster
- Cement-based or gypsum-based vermiculite/perlite mixes
- Glass fibre, crushed rock, blast furnace slag or ceramic-based products (with or without resin binders)
- Intumescent mastics

Systems used will be designed, installed, tested and maintained in full accordance with the relevant BS 476 standard.

Any ventilation ductwork will also need to be fire protected where it penetrates a compartmenting element. As ventilation ducts provide a potential route for fire spread through the duct consideration of how this will be fire stopped must also be made. Three basic methods should be considered:

- Protection using fire dampers
- Protection using fire resisting enclosures
- Protection using fire resisting ductwork

Where a ventilation duct serves more than one part of a compartmented or fire separated protected escape routes i.e. escape passageway and dead end escape corridor smoke detector operated fire dampers will be provided where ductwork enters each fire separated or smoke separated section of the escape routes.



## 7 B4 – EXTERNAL FIRE SPREAD

The works do not involve major modification to the external facades of the existing buildings. As the occupancy does not make the situation any less compliant it is considered that the existing provision of external fire protection will be adequate to achieve the Performance Requirements of the Building Regulations. The fire rating levels to the existing external facades will not be upgraded as part of the fit-out works.

### 7.1 Linking Structure

The new temporary linking structure forms a connection between buildings 17 and 19. To prevent fire spread between the two buildings via the linking building it is proposed to identify a compartment line separating the two buildings which will incorporate the existing masonry construction which forms the wall between building 19 and the lean to structure. Where means of escape from both buildings will pass through the linking structure these are to be enclosed in fire resisting construction as protected routes.

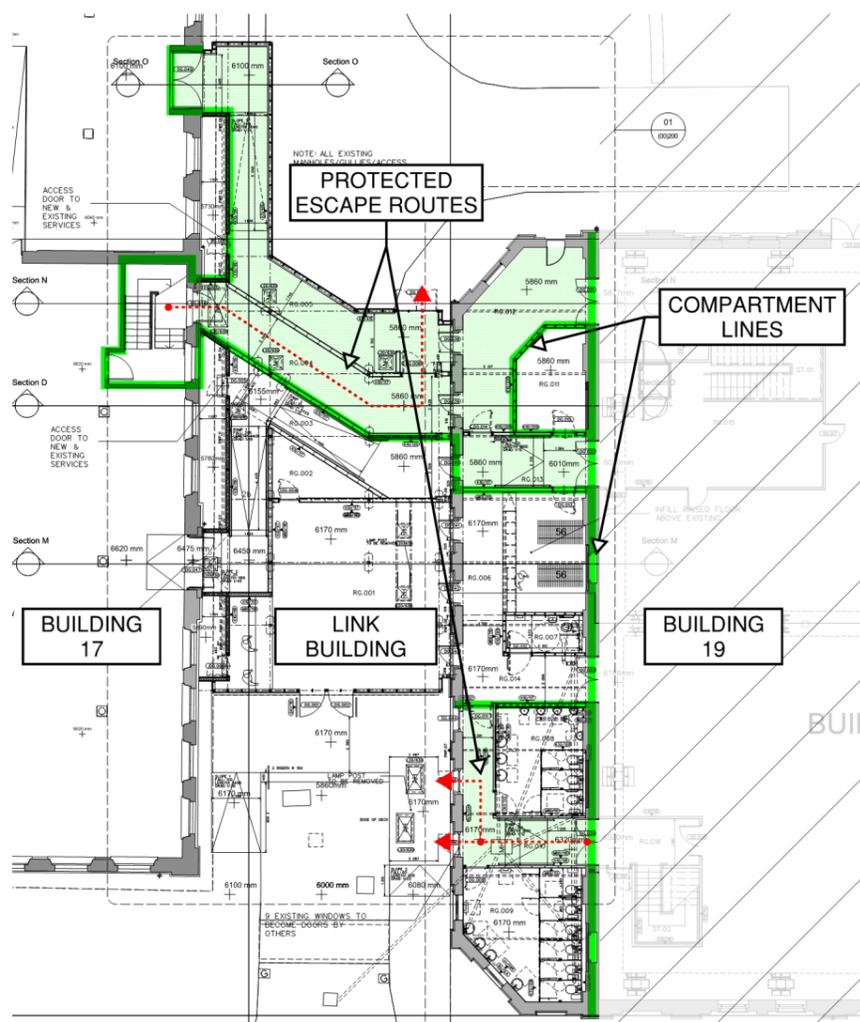


Figure 7-1: Link Building Layout

## 8 ACCESS AND FACILITIES FOR FIRE SERVICE

Please refer to Figure 8-1 for overview of Fire Services access to the buildings.

### 8.1 Fire Hydrants

The development site is well covered by the existing fire-hydrants on the surrounding roads. As such, the provision of an additional private hydrant will not be necessary.

### 8.2 Access to Buildings for Fire-fighting Purposes

Based on the height of the building (less than 5m), there is no requirement to make any specific provisions for fire-fighting shafts. It is also not proposed to alter the fire vehicle access on site; the existing building perimeter access will be retained as part of the development.

Vehicle access to the site is available along Duke of Wellington Avenue, Cartridge Street, No. 1 Street and James Clavell Square.

### 8.3 Fire fighting Mains/Vehicle Access

Internal Fire Fighting mains are not provided to any of the buildings.

Fire Service Vehicle access is available to 100% of the buildings perimeter.

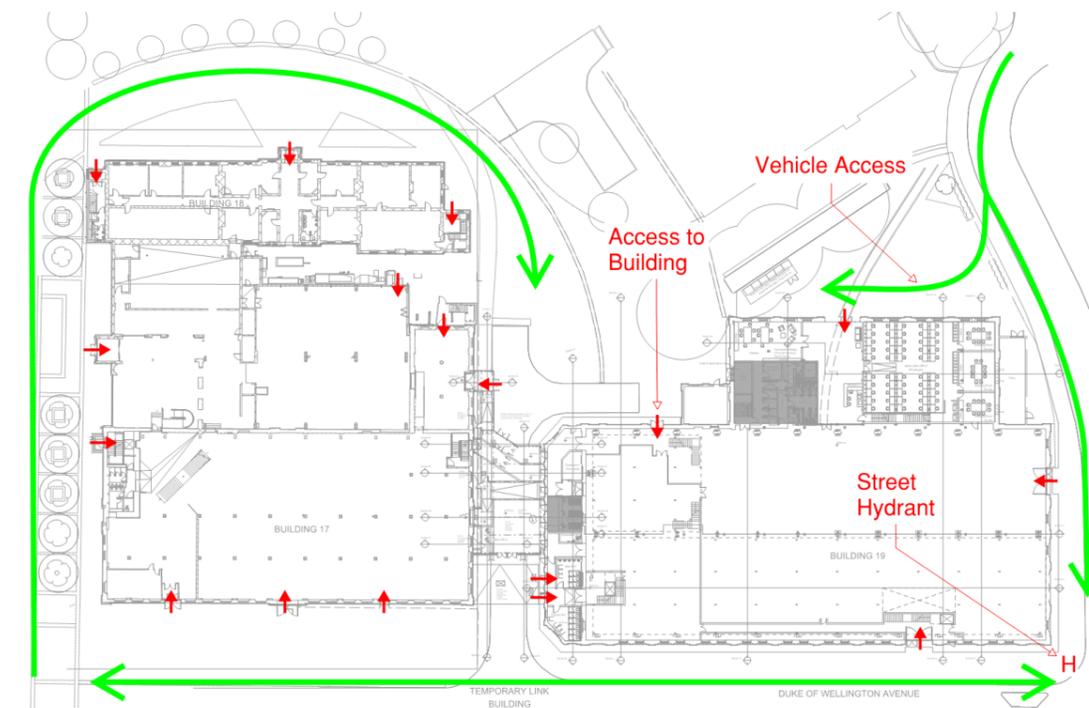


Figure 8-1: Fire Service Access



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#### 8.4 Portable Fire Fighting Equipment (PFFE)

Portable fire extinguishers will be provided that are suitable to the risk and will be distributed at key locations throughout the buildings such that it is not necessary for someone to travel more than 30m to reach the nearest extinguisher.

Water or foam fire extinguishers will be provided with CO<sub>2</sub> extinguishers provided in locations where there is a foreseeable risk of fire within electrical equipment.

All appointed Fire Wardens will be provided with basic fire extinguisher training so that they are confident in their use to tackle small fires.

#### AUTOMATIC SUPPRESSION SYSTEMS

Sprinkler protection will not be provided. It is not considered that suppression systems are required for the development to meet the life safety objective of the Building Regulations.