MOMENTUM
structural engineers

Air Studios

Structural engineering
RIBA Stage 3 report

December 2019 . 4268 . 00

Third Floor . 30-32 Westgate Buildings . Bath BA1 1EF . 01225 444194
103 Timber Yard . Drysdale Street . London N1 6ND . 020 77396939
www.momentumengineering.com

Background

This document has been prepared for the sole benefit, use and information of Air Studios for the purposes set out in the following pages.

The liability of Momentum Consulting Engineers Ltd in respect of the information contained in the document will not extend to any third party.

Author
M Politi

Checker
M Hutchison

Issue History

Rev.	Date	Comments
00	11.12.19	First issue

Contents

1.0 Introduction 3

2.0 Site appraisal 3
2.1 Site address and location 3
2.2 Desktop study 3

3.0 Structural engineering proposals 3
3.1 Introduction 3
3.2 Existing structures 3
3.3 Proposed structures 3
3.4 Load takedown 4
3.5 Construction sequence 4

4.0 Underground drainage proposals 4
4.1 Existing foul and surface water drainage 4
4.2 Foul water proposals 4
4.3 Surface water proposals 5
4.4 Recommendations 5

5.0 Design Criteria 5
5.1 Outline material specification 5
5.2 Loading 5
5.3 Durability and corrosion 5
5.4 Movement and tolerances 5
5.5 Temperature and shrinkage 5
5.6 Fire protection 5
5.7 Robustness 5
5.8 Dynamics and vibration 5
5.9 CDM Risks 5
5.10 Standard references 6

Appendix A - Structural drawings 7

Appendix B - Underground drainage drawings 8

1.0 Introduction

Momentum have been working with BrightSpace Architects and the rest of the design team to develop structural and civil design proposals to RIBA Stage 3 for the alterations to Air Studios.

The focus of this report is the civil and structural works associated with the proposed works. This report presents an outline of the development site, along with commentary on the Stage 3 designs for the substructure and superstructure of the proposed buildings. It is a working document and will be updated and reviewed throughout the design phase of the project.

2.0 Site appraisal

2.1 Site address and location

This project consists of construction of a new entrance structure at Air Studios in Hampstead, London

Site Address
Air Studios
Lyndhurst Hall
Lyndhurst Road
Hampstead
London
NW3 5NG

Approximate Grid Reference

OS X (Eastings)	526987
OS Y (Northings)	185365

2.2 Desktop study

Site history
Historical research indicates the original church was constructed in the 1880s.

The infill entrance structure was completed in the 1990s.

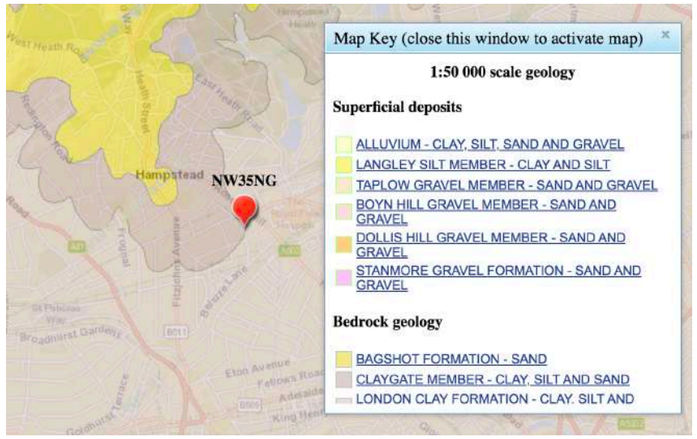
Geology
From the British Geological Survey maps the site is located on the border between London Clay Formation and Claygate member.

No superficial deposits were noted.

Hydrology
From Environment Agency maps the site is located in an area of low flood risk from rivers, surface water or reservoirs.

UXO records
Risk mapping for UXO's has placed the site in a low risk area. In a low risk area works can normally proceed without any special precautions.

Foundation design
It is assumed the existing RC ground floor slab will be retained as far as possible. Certain areas will need to be broken out and reformed in order to install new drainage connections.



Where new suspended structures are being added to the existing structures the current assumption is that these can be supported in the existing foundations. Refer to section 3.4.

Further investigative work will be required at the next stage to ascertain the following:

- Depth and condition of existing RC ground floor slab.
- Depth and width of existing masonry foundations.

3.0 Structural engineering proposals

3.1 Introduction

The structural proposals for the building have been developed in co-ordination with the design team.

The proposed alterations include removal of the existing glazed roof and replacement with a new one, introduction of a new first floor and rearrangement of internal spaces at existing ground and first level of the building.

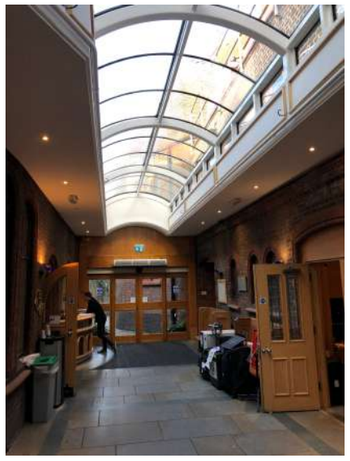
Refer to Appendix A for Structural drawings.

3.2 Existing structures

Air Studios have been operating in Lyndhurst Hall since 1992. Lyndhurst Hall construction, formerly the Rosslyn Grove Congregational Church, dates back to the 1880's.

The area of interest does not include the recording studios themselves but comprises the ground and first floor with glazed infill between Lyndhurst Hall and Lyndhurst Cottage. The building provides facilities that support the operation of the recording studios, such as reception, kitchen and restaurant, storage areas, offices and toilets.

The existing structure will be retained, refurbished and reused as part of the new development. These are discussed in more detail below.



3.3 Proposed structures

The proposed works involve demolition of the existing 1990's glazed infill and brick wall infill between Lyndhurst Hall and Lyndhurst Cottage and replacement with a new slim glazed roof. The new roof will be constructed at two levels, a lower one above the ground floor and a higher one above the first floor.

Construction of a new first floor is proposed, to provide additional space for a dining area. The floor will be located above the existing foyer. Access to the new floor will be achieved through the existing stair next to the reception that leads to the first floor.

A new slab at intermediate level and a stair will be also created to the east of the building, which will provide access to the new floor. Double height space will be created between the new glazed roof and the ground floor in the middle of the plan.

Access to the intermediate slab will be achieved through a new opening in the original masonry wall. A second opening on the wall will be done to allow access between the existing and the proposed first floor.

The proposed works also include general reorganising and refurbishment of the additional spaces on the ground and first floor, such as office and storage areas and WCs.

Ground floor slabs
The existing RC ground floor slab will be partially preserved. It will need to be locally broken out and rebuilt in order to introduce new drainage connections.

Suspended slabs
Typically suspended slabs will be formed from 152x152x37 UC steel beams spanning between the load bearing masonry walls, 150x75mm timber joists spanning between the steel beams at 600mm centres and ply decking. The same scheme will be followed for the construction of the intermediate level stair landing slab.

Due to the loading from the beams it is not feasible to use removable mechanical anchors directly into the masonry. Two connection options have been provided: 1) install a RC padstone with resin anchors or 2) install a steel shelf angle into the masonry. In both options the connections could be removed at a later date.

The timber joists will be fixed to the masonry through a 150x50mm timber wall plate that runs the perimeter of the stair landing slab.

Openings
The two new openings in the masonry wall will be created using a steel box section lintel with bricks on either side to match the existing wall. The lintels can be flat or arched to suit architects requirements.

Roof structures
Lower and higher level glazed roofs to be done by a specialist glazing contractor. Lower roof to provide a walkable gutter for cleaning and maintenance purposes. The roof structure will typically be supported off existing masonry by a continuous wall plate around the perimeter of the roof.

3.4 Load takedown

Conservatively, the load takedown has been calculated for the wall on the east side of the entrance.

Load types

350mm thick masonry wall

DL	density of masonry		= 22 kN/m³
	height of wall		= 6.5 m
	UDL (on elevation)	= 0.35 x 22 x 6.5	= 50.1 kN/m

Existing roof

DL	double glazed unit	= 2 x 0.006 x 25	= 0.3 kN/m²
	flange fixed glass louvres	= 25 x 0.005	= 0.125 kN/m²
	1.8mm code 4 lead flashing	= 0.0018 x 114	= 0.2 kN/m²
	10mm MDF painted	= 0.01 x 8	= 0.08 kN/m²
	2 x 12.5mm plasterboard	= 2 x 12.5 x 9	= 0.23 kN/m²
	total		= 0.95 kN/m²
LL	no access - repair and maintenance		= 0.6 kN/m²

Existing suspended first floor

DL	boards, joists, finishes	= 1.2 kN/m²
LL	assembly area with fixed seating	= 4 kN/m²

Plant floor

DL		= 1.2 kN/m²
LL		= 4 kN/m²

Proposed suspended first floor

DL	boards, joists, finishes		= 1.0 kN/m²
	steel beams	= 0.37 x 4/2.25	= 0.713 kN/m
LL	assembly area without fixed seating		= 5 kN/m²

Proposed roof

DL	double glazing	= 1 kN/m²
LL	no access - repair and maintenance	= 0.6 kN/m²

Existing loads

DL	masonry wall		= 50.1 kN/m
	existing roof	= 0.95 x 2	= 1.9 kN/m
	existing first floor	= 1.2 x 2.5	= 3 kN/m
	plant floor	= 1.2 x 2.5	= 3 kN/m
LL	no access - repair and maintenance	= 0.6 x 2	= 1.2 kN/m
	assembly area with fixed seating	= 4 x 2.5	= 10 kN/m
	plant	= 4 x 2.5	= 10 kN/m
	total		= 79.2 kN/m

Proposed loads

DL	proposed suspended floor	= 1.7 x 2 +0.7	= 4.1 kN/m
	proposed roof	= 1.0 x 2	= 2.0 kN/m
LL	assembly area without fixed seating	= 5 x 2	= 10 kN/m
	no access - repair and maintenance	= 0.6 x 2	= 1.2 kN/m
	total		= 17.3 kN/m

Load summary

Load types	Existing loads (kN/m)	Proposed loads (kN/m)
Masonry wall	50.1	50.1
Existing roof	3.1	-
Existing first floor	13.0	13.0
Existing plant floor	13.0	13.0
Proposed roof	-	3.2
Proposed first floor	-	13.4
Total	79.2	92.7
% load increase	-	**17.0**

Foundation is assumed to be 0.7m wide brick corbeled foundation, same as the one of Lyndhurst Hall, as it can be seen on existing drawings of the building complex.

Bearing of 0.7m wide brick corbeled foundation = 79.2/(0.7 x 1) = 113 kN/m² (London clay typically 150 kN/m²)

The above loading assessment is indicative at this stage due to the unknowns. Once further opening up works have been carried out and details of the existing structure have been ascertained the assessment can be refined.

Comments and observations:

- Typically a 10% increase in bearing foundation loading is acceptable. There may be scope for increasing this based on knowledge of existing foundation widths and bearing material. Due to the age of the structure much of the settlement will have already occurred, thereby increasing allowable bearing pressures.
- Additional superstructure designs should be kept as lightweight as possible at this stage in order to avoid the risk of having to underpin the existing foundations.
- Due to the cost, time and materials involved, underpinning the existing walls will be considered the last option.

3.5 Construction sequence

The building substructure and superstructure have been designed to allow the construction to take place within the relatively limited site constraints. Prefabricated element sizes and weights will be limited to suit crane locations and reaches. Each contractor is likely to have their own preferred method of construction and construction sequence.

Outlined below is a presumed construction sequence:

- Demolish existing entrance superstructure.
- Break out existing slabs and install drainage.
- Reform RC slab and reinstate waterproofing.
- Install glazed roof structure sequentially from south to north using tele-handler or mobile crane.
- Create new openings in masonry wall and install lintels.
- Install intermediate landing slab and first floor structure sequentially from south to north using a tele-handler.
- Form building envelope.

4.0 Underground drainage proposals

4.1 Existing foul and surface water drainage

Although no intrusive survey has yet been carried out it is assumed that the existing below ground drainage network is a combined system. A CCTV survey of the existing below ground drainage system should be carried out. This will indicate how the existing facilities and rainwater downpipes are connected to the system. A CCTV survey should also indicate any defects such as damages or blockages and their need to be repaired.

The external face of the wall to the existing disabled toilet appears to be suffering from damp caused by ponding. This should be investigated further.

Drawn information currently provided contains contradicting manhole locations therefore further survey work will be required within the existing building to ascertain locations and condition of these and drain routes under the building.

4.2 Foul water proposals

The existing drainage system may need to be adapted to suit connection points from the new works. Additional facilities adjacent to the existing female toilets are

proposed and a new drain route connecting into the existing system will need to be considered.

The existing systems will need to be assessed for any increase in discharge rates.

It is assumed that the increase in peak foul rate is negligible at this point as Momentum have not been given the proposed discharge rates by the MEP consultants.

4.3 Surface water proposals

There should be no increase in surface water runoff from roof structures as there will be no increase in impermeable area. Discharge rate to the sewer will therefore not increase however a pre-development enquiry will be made to relevant water authorities at the next stage of the project to clarify if this is an acceptable approach.

Drainage channel connected to the existing network should be considered in order to avoid future issues with damp caused by ponding.

Rainwater downpipes will require co-ordination with the new roof structures in order to re-connect into the existing system. The MEP consultants should advise on this element of the design and co-ordinate with the below ground drainage.

4.4 Recommendations

It is recommended the following work will be required during the next stage of the project :

- Further survey work should be carried out to establish the current condition.
- Confirmation of flow rates from MEP consultants.
- Confirmation of all foul discharge points and rainwater downpipes.
- Submission of proposals in order to obtain relevant local authority consents.

5.0 Design Criteria

5.1 Outline material specification

- All steelwork to be minimum grade S355 unless noted otherwise.
- Timber typically to be GL28L from sustainable FSC sources.
- Reinforced concrete to be a designed mix grade c32/40 or equivalent.
- Cement substitutes to be used where possible.
- Reinforcement to be generally high strength bars (fy=500 N/mm²)

5.2 Loading

Dead loads
All permanent (dead) loads are to be derived from BS EN 1991-1-1:2002 and the UK National Annex. General actions. Further allowances will be made for loadings from vertical structure, cladding, etc. Loading indicative and subject to change as the design develops.

Live loads
All imposed floor loads on this structure are to be derived from BS EN 1991-1-1:2002 and the UK National Annex. General actions.

Area	Area load in kN/m²
Plant	7.5
Assembly area without fixed seating	5.0
Stairs/corridors/circulation	4.0
Toilets/offices/kitchens	3.0
Roof (no access)	0.6

Snow loads
Snow loading will be assessed in accordance with BS EN 1991-1-3:2003 and the UK National Annex. Final snow and drifting loads will be ascertained once the final roof shape has been developed, including allowances for roof slope, steps in level and parapets.

Wind loads
Wind loading will be assessed in accordance with BS EN 1991-1-4:2005 and the UK National Annex. The following output is from Breve software.

5.3 Durability and corrosion

The design life of the building prior to significant maintenance is assumed to be 50 years. The environmental conditions associated with the site location, setting and exposure shall be taken into consideration.

The life to first maintenance should reflect ease of access, upgrade and maintenance regimes. Concealed structures should be designed not to require maintenance during the life of the building.

The steel structural elements are designed for the durability requirements of BS EN 1993. The corrosion protection for the structural steelwork will be dependent on the location of the steel elements within the building. Any paint systems used for fire protection will be compatible with the corrosion protection system to the steelwork.

5.4 Movement and tolerances

Building tolerances are to be in accordance with steel and concrete specifications for the project in addition to the National Structural Steelwork Specification and National Structural Concrete Specifications. The permitted deviations will not exceed 10mm in all cases.

Steelwork deflections are generally in accordance with BS EN 1993-1-1:2005 and BS EN 1994-1-1:2004

Lateral deflection due to horizontal loading will generally be limited to a maximum of:

- height/300 at any one floor,
- height/500 over the full height of the building.
- <10mm where new structure connects to existing masonry walls.

In certain circumstances, e.g. around glazing, a finite limit to suit cladding/glazing will have to be used.

5.5 Temperature and shrinkage

The effects of expansion and contraction due to maximum and minimum shade temperatures to BS EN 1991-1-5.

- Min. = -10 °C
- Max. = +30 °C

Where elements are exposed to the sun directly or under glass, further guidance should be sought.

5.6 Fire protection

The fire resistance period for the structure is assumed to be 60mins. Please refer to further guidance in the architect's information and Annex A of Part B of the Building regulations.

Typically steel will be fire protected by boxing out. Where necessary steel frame elements will be protect by intumescent coating or encased in concrete to protect from fire.

For timber structures further specialist guidance on fire protection will be required.

5.7 Robustness

The following provisions for robustness will be made in accordance with Building Regulations Approved Document A3 Disproportionate Collapse. The building is considered as Class 2b.

5.8 Dynamics and vibration

Typically, limitation on the dynamic response for all floors will ensure they achieve:

- Natural frequency greater than 4Hz.
- Response factor less than 8.

Relevant studies will be progressed for the intended use and the proposed structural solution designed to suit.

5.9 CDM Risks

Foreseeable and unusual hazards and risks have been considered during the course of the structural design work as part of Construction Design and Management Regulations. Notes regarding the main risks have been noted below. Other risks have been highlighted on the relevant drawings.

The Contractor's normal health and safety obligations will still apply.

Demolition of existing entrance structures

The part demolition of existing structures within the entrance area will require temporary propping. The contractor will need to be experienced with working on and around partly retained existing structures.

Construction adjacent to existing buildings

The new structures will be constructed within the courtyard of an existing building. There will be risks working close to existing structures.

Cranage

It is assumed at this stage the steel frame and any prefabricated elements will be craned into position. Any cranage is likely to required lifting over and adjacent to existing structures. The contractor will need to develop suitable method statements for this work.

5.10 Standard references

The structure will be designed to the requirements of the following standards and associated references:

- BS EN 1991-1-1:2002 and the UK National Annex. General actions - self weight and imposed loads.
- BS EN 1991-1-3:2003 and the UK National Annex. General actions - snow loads.
- BS EN 1991-1-4:2005 and the UK National Annex. General actions - wind actions.
- BS EN 1991-1-6:2005 and the UK National Annex. General actions - actions during execution.
- BS EN 1992-1-1:2004 and the UK National Annex. Design of concrete structures.
- BS EN 1993-1-1:2005 and the UK National Annex. Design of steel structures.
- BS EN 1994-1-1:2004 and the UK National Annex. Design of composite steel and concrete structures.
- BS EN 1995-1-1:2004 and the UK National Annex. Design of timber structures General.
- BS EN 1997-1:2004 and the UK National Annex. Geotechnical design.

Appendix A - Structural drawings

Project Title
Air Studios

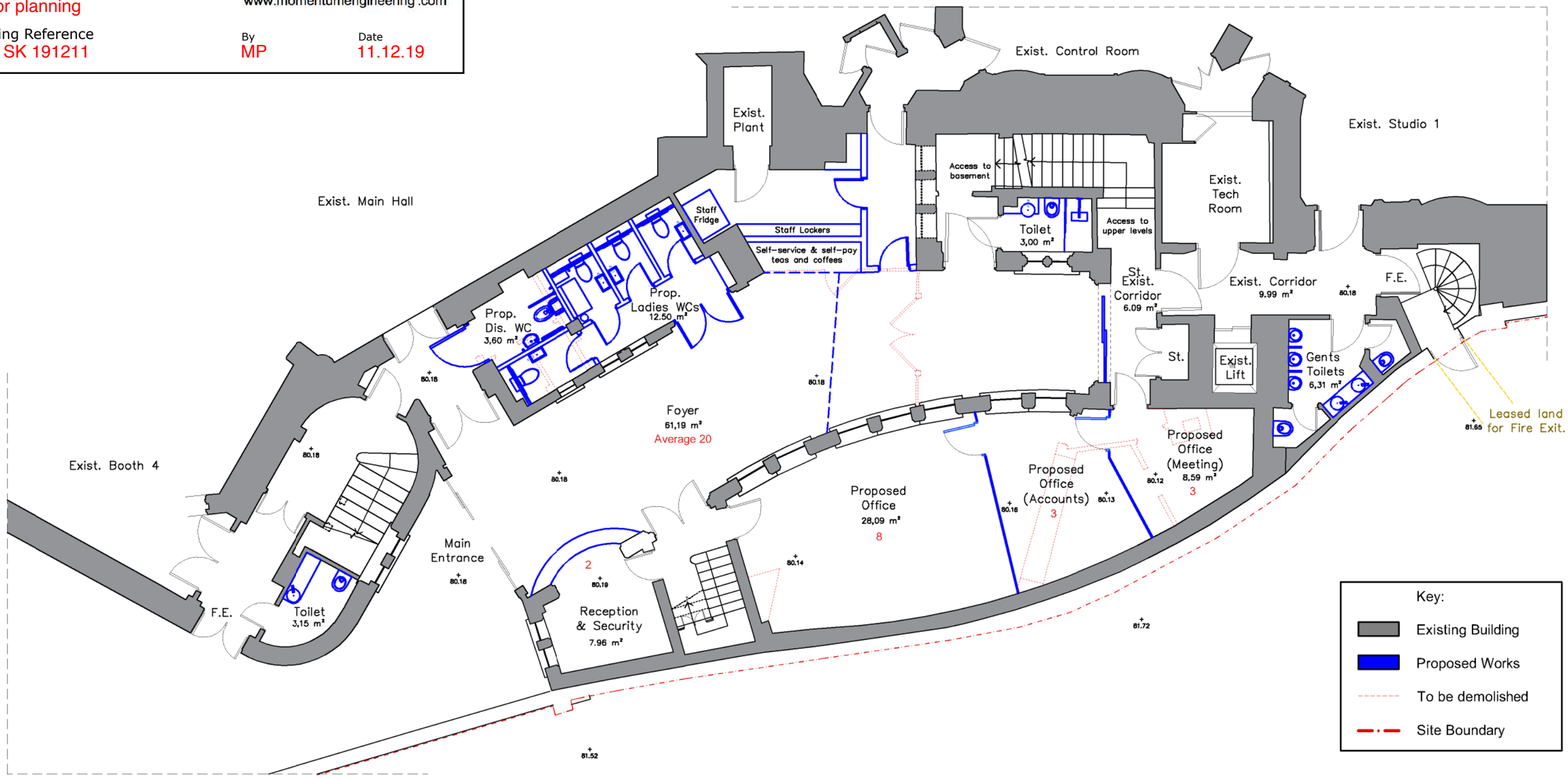
Drawing Title
GA for planning

Drawing Reference
4268 SK 191211

MOMENTUM
structural engineers
Bath 01225 444194 | London 020 7739 6939
www.momentumengineering.com

By MP

Date 11.12.19



Key:
- Existing Building
- Proposed Works
- To be demolished
- Site Boundary

Sources: OS Survey from Siteline dated 05/06/2019, received 31/07/2019./ Ordnance Survey from Promap received 10/07/2019. License Number 10022432

0 1 2 3 4 5m

Scale 1:100

Proposed Ground Floor Plan

Notes:
- All drawings are subect to Planning and Building Control consent.
- The details shown as for design intent purposes only and are subject to further design development wtl suppliers and sub-contracters
- Proposals subject tconsultation and approval from Local Authority Building Control or an Approved Inspector
- All setting out dimensions should be checked on-site prior to construction and any discrepancies and/omissions should be reported to the Architect immediately

Rev.	Date	Details	Drawn	Chckd

Rev.	Date	Details	Drawn	Chckd

Drawn By: NT
Project No: 19019
Date: 27/11/2019
Scale: 1:100 @A3
Checked By: LV
Dwg No: P015
Date: 27/11/2019
Rev:

Issued for: PLANNING

Project/Client: Air Studios Lyndhurst Hall Hampstead, London

Drawing: Proposed Ground Floor Plan

BrightSPACE architects
27 Glasshouse Studios, Fryern Court Road, Fordingbridge, Hampshire, SP6 1QX
T: (01425) 655806 www.brightspacearchitects.com

Project Title
Air Studios

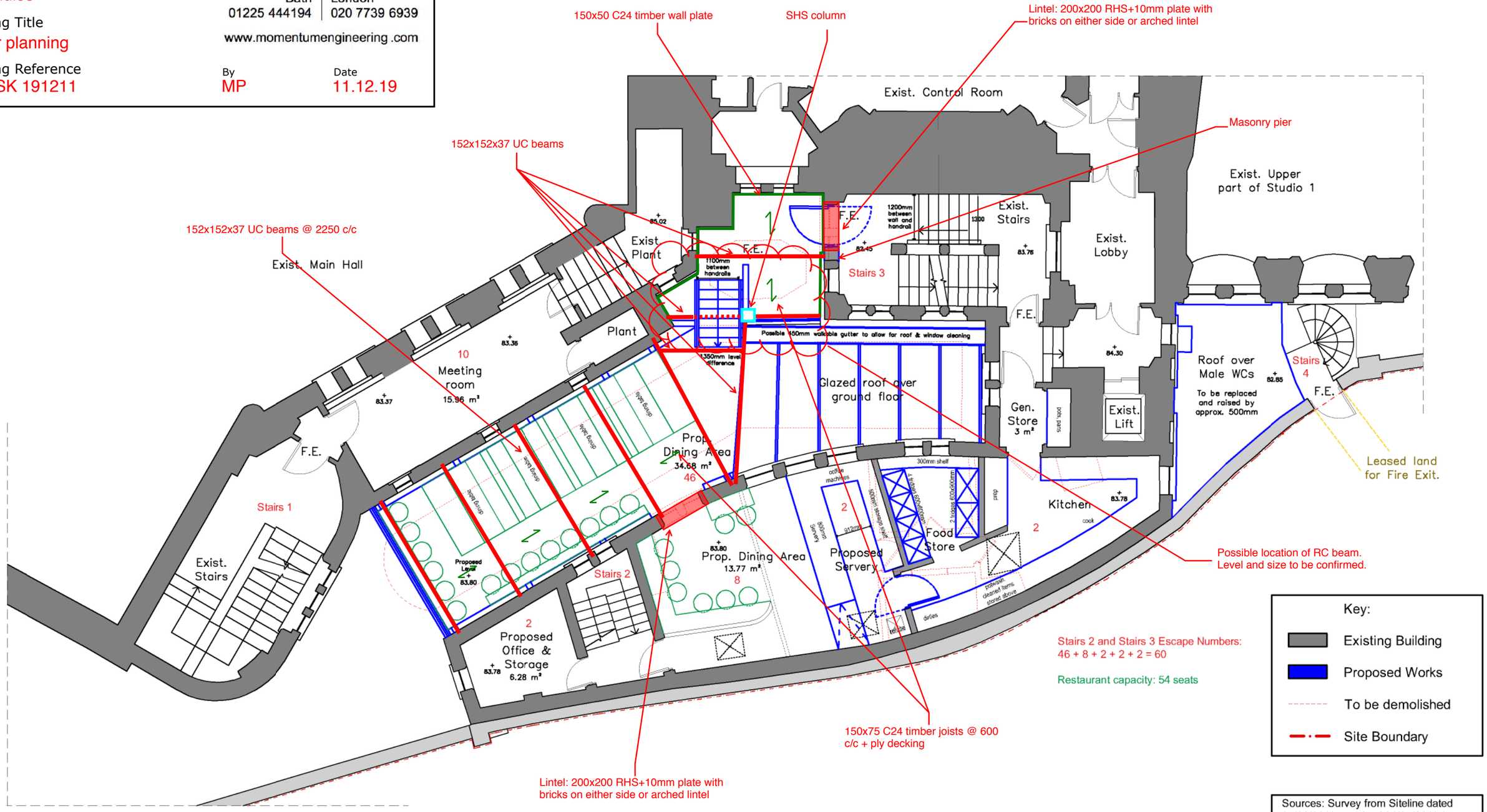
Drawing Title
GA for planning

Drawing Reference
4268 SK 191211

MOMENTUM
structural engineers
Bath | London
01225 444194 | 020 7739 6939
www.momentumengineering.com

By
MP

Date
11.12.19



Proposed First Floor Plan

Notes:
- All drawings are subject to Planning and Building Control consent.
- The details shown as for design intent purposes only and are subject to further design development withsuppliers and sub-contracters
- Proposals subject to:consultation and approval from Local Authority Building Control or an Approved Inspector
- All setting out dimenions should be checked on-site prior to construction and any discrepancies and/ornissions should be reported to the Architect immediately

Rev.	Date	Details	Drawn	Chckd

Rev.	Date	Details	Drawn	Chckd

Drawn By: NT
Project No: 19019
Date: 27/11/2019
Scale: 1:100 @A3
Checked By: LV
Dwg No: P016
Date: 27/11/2019
Rev:

Issued for: PLANNING

Project/Client: Air Studios Lyndhurst Hall Hampstead, London

Drawing: Proposed First Floor Plan

BrightSPACE architects
27 Glasshouse Studios, Fryern Court Road, Fordingbridge, Hampshire, SP6 1QX
T: (01425) 655806
www.brightspacearchitects.com

Project Title
Air Studios

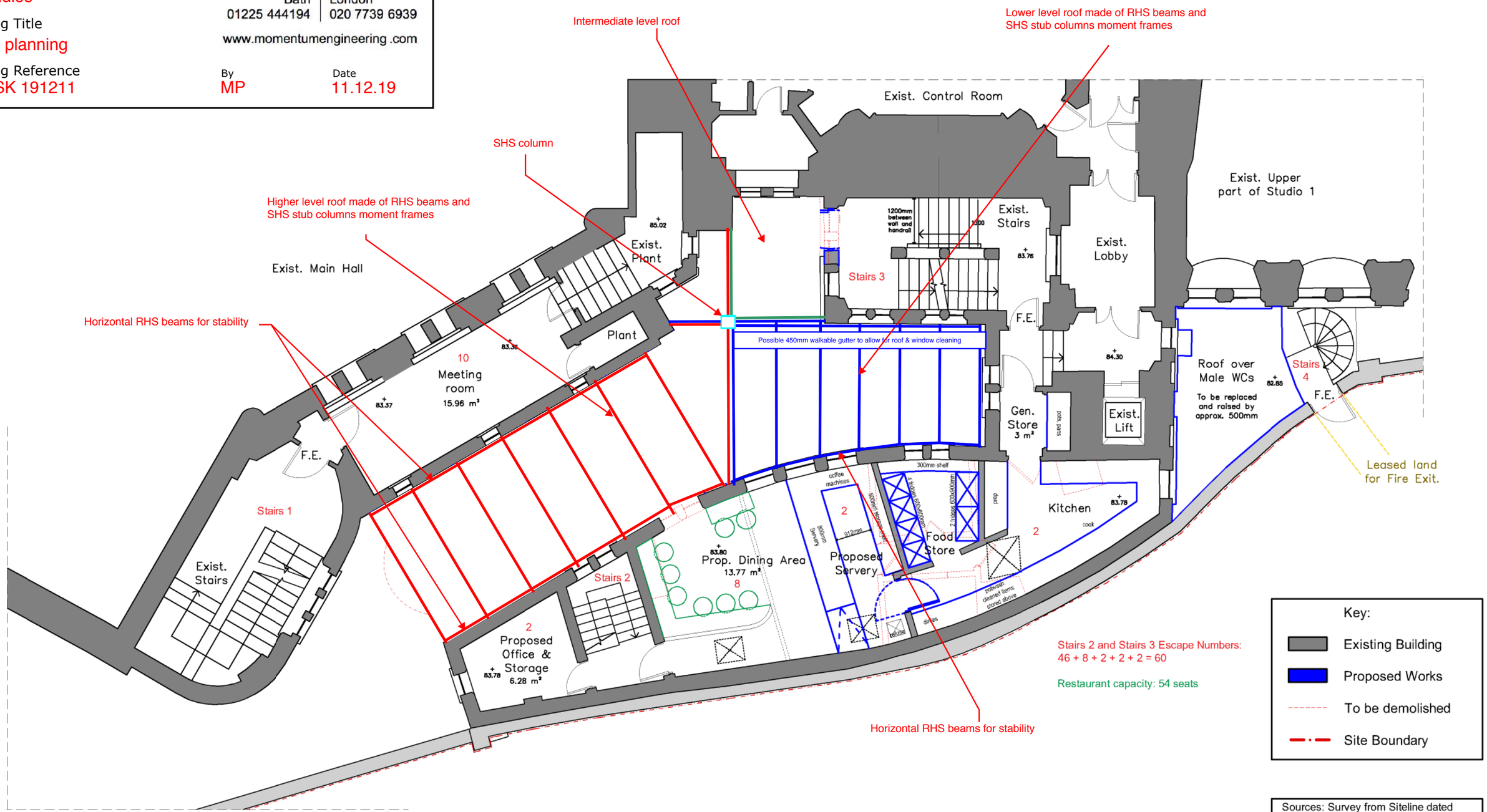
Drawing Title
GA for planning

Drawing Reference
4268 SK 191211

MOMENTUM
structural engineers
Bath 01225 444194 | London 020 7739 6939
www.momentumengineering.com

By MP

Date 11.12.19



Stairs 2 and Stairs 3 Escape Numbers:
46 + 8 + 2 + 2 + 2 = 60

Restaurant capacity: 54 seats

Key:
- Existing Building
- Proposed Works
- To be demolished
- Site Boundary

Sources: Survey from Siteline dated 05/06/2019, received 31/07/2019./ Ordnance Survey from Promap received 10/07/2019. License Number 10022432

0 1 2 3 4 5m

Scale 1:100

Proposed Roof Plan

Notes:
- All drawings are subject to Planning and Building Control consent.
- The details shown ae for design intent purposes only and are subject to further design development withsuppliers and sub-contracters
- Proposals subject to:onsultation and approval from Local Authority Building Control or an Approved Inspector
- All setting out dimenions should be checked on-site prior to construction and any discrepancies and/omissions should be reported to the Architect immediately

Rev.	Date	Details	Drawn	Chckd

Rev.	Date	Details	Drawn	Chckd

Drawn By: NT
Date: 27/11/2019
Checked By: LV
Date: 27/11/2019
Project No: 19019
Scale: 1:100 @A3
Dwg No: P016
Rev:

Issued for: PLANNING

Project/Client: Air Studios Lyndhurst Hall Hampstead, London

Drawing: Proposed First Floor Plan

BrightSPACE architects
27 Glasshouse Studios, Fryern Court Road, Fordingbridge, Hampshire, SP6 1QX
T: (01425) 655806
www.brightspacearchitects.com

Project Title
Air Studios

Drawing Title
GA for planning

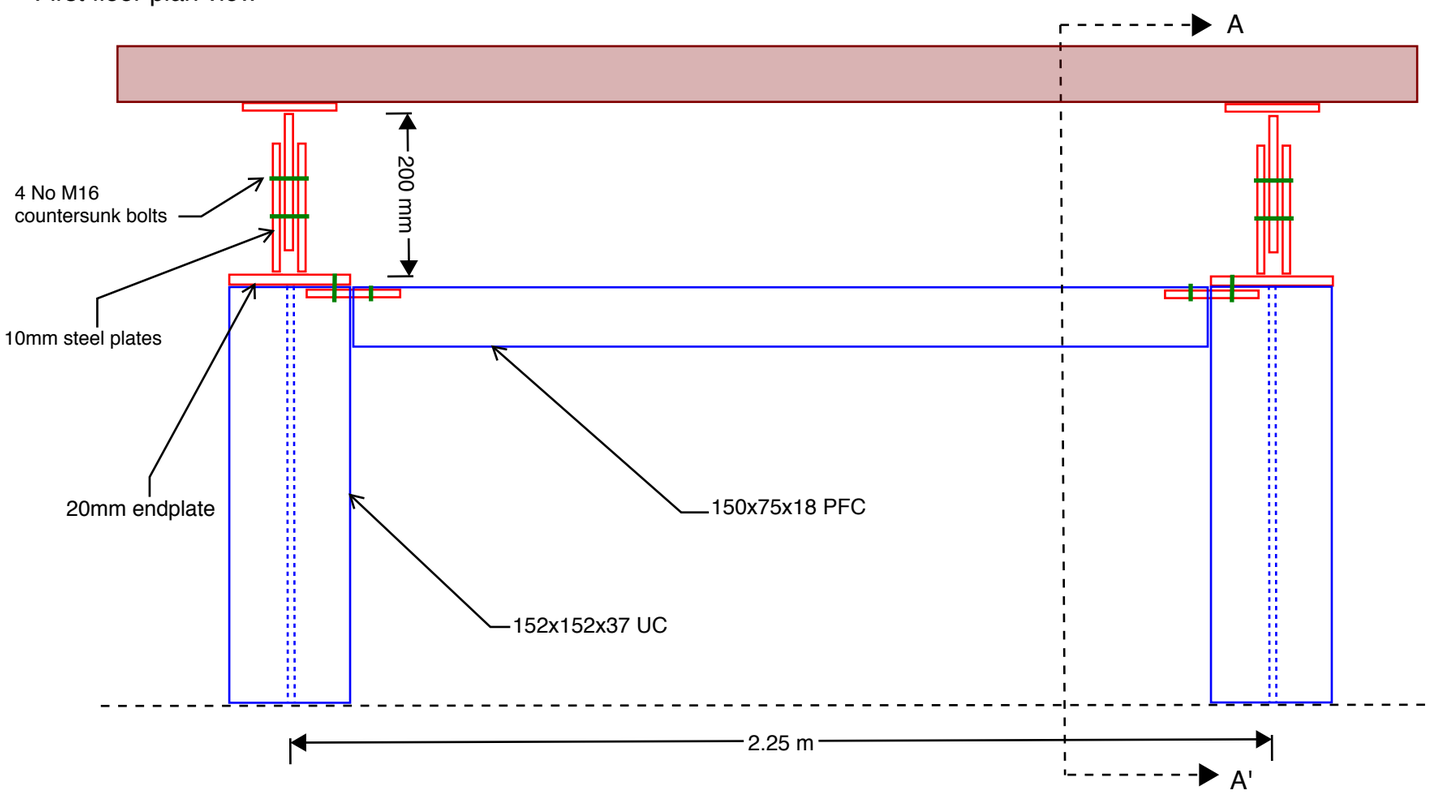
Drawing Reference
4268 SK 191211

MOMENTUM structural engineers
Bath 01225 444194 | London 020 7739 6939
www.momentumengineering .com

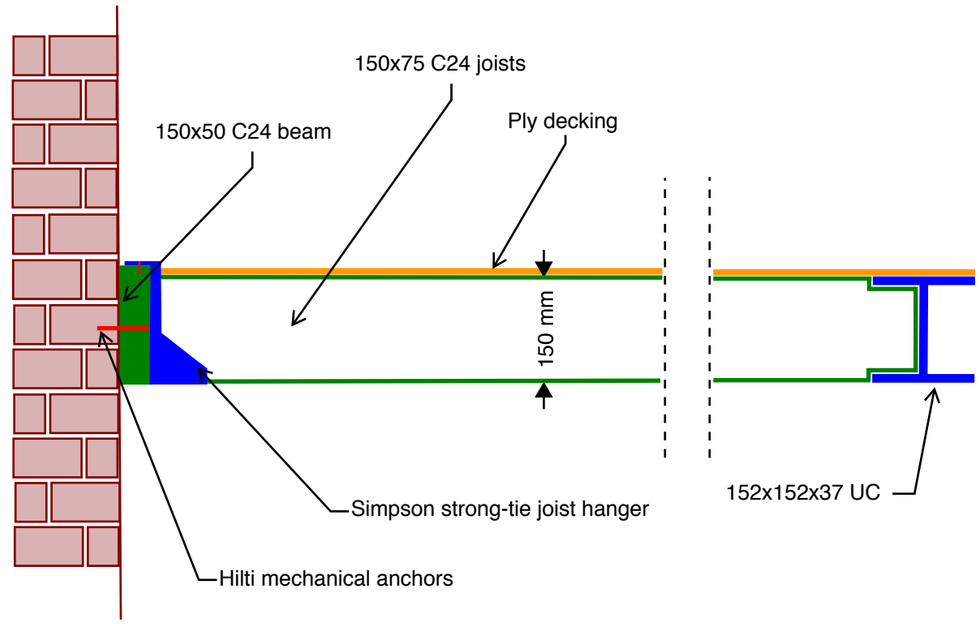
By MP

Date 11.12.19

First floor plan view

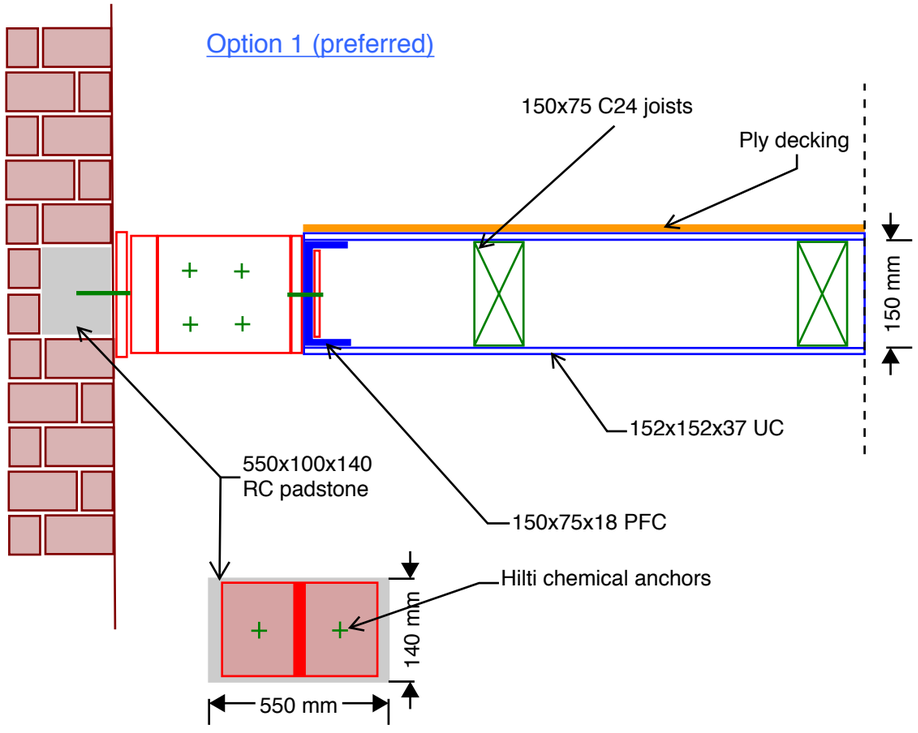


Stair landing - joists connection detail



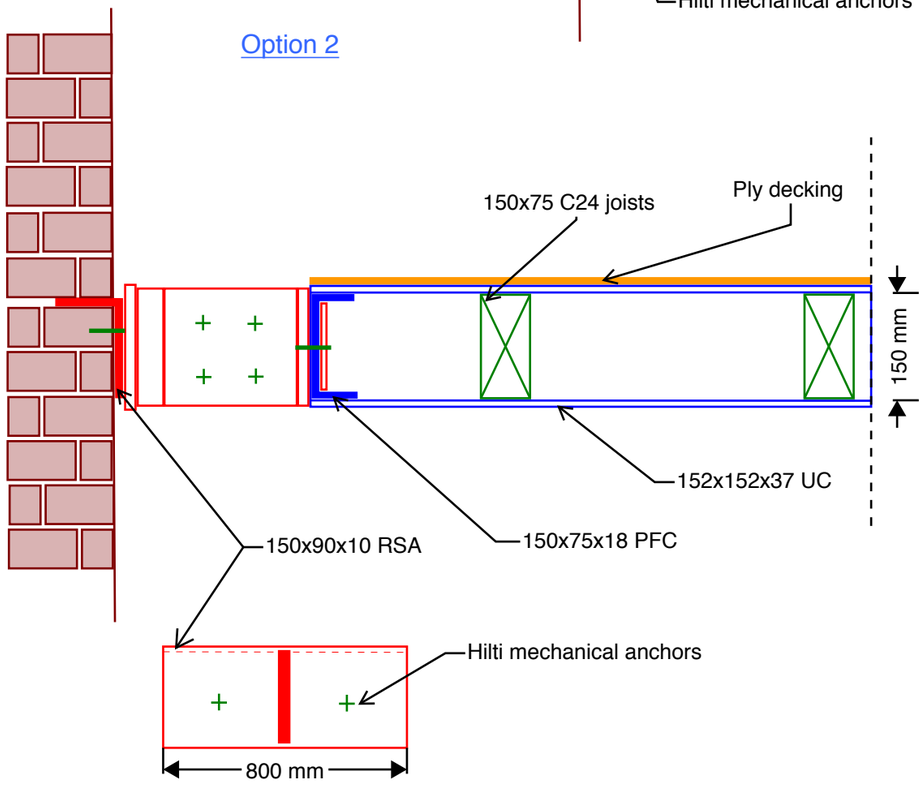
Section AA'

Option 1 (preferred)

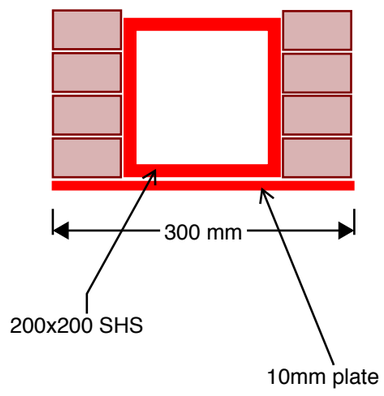


Section AA'

Option 2

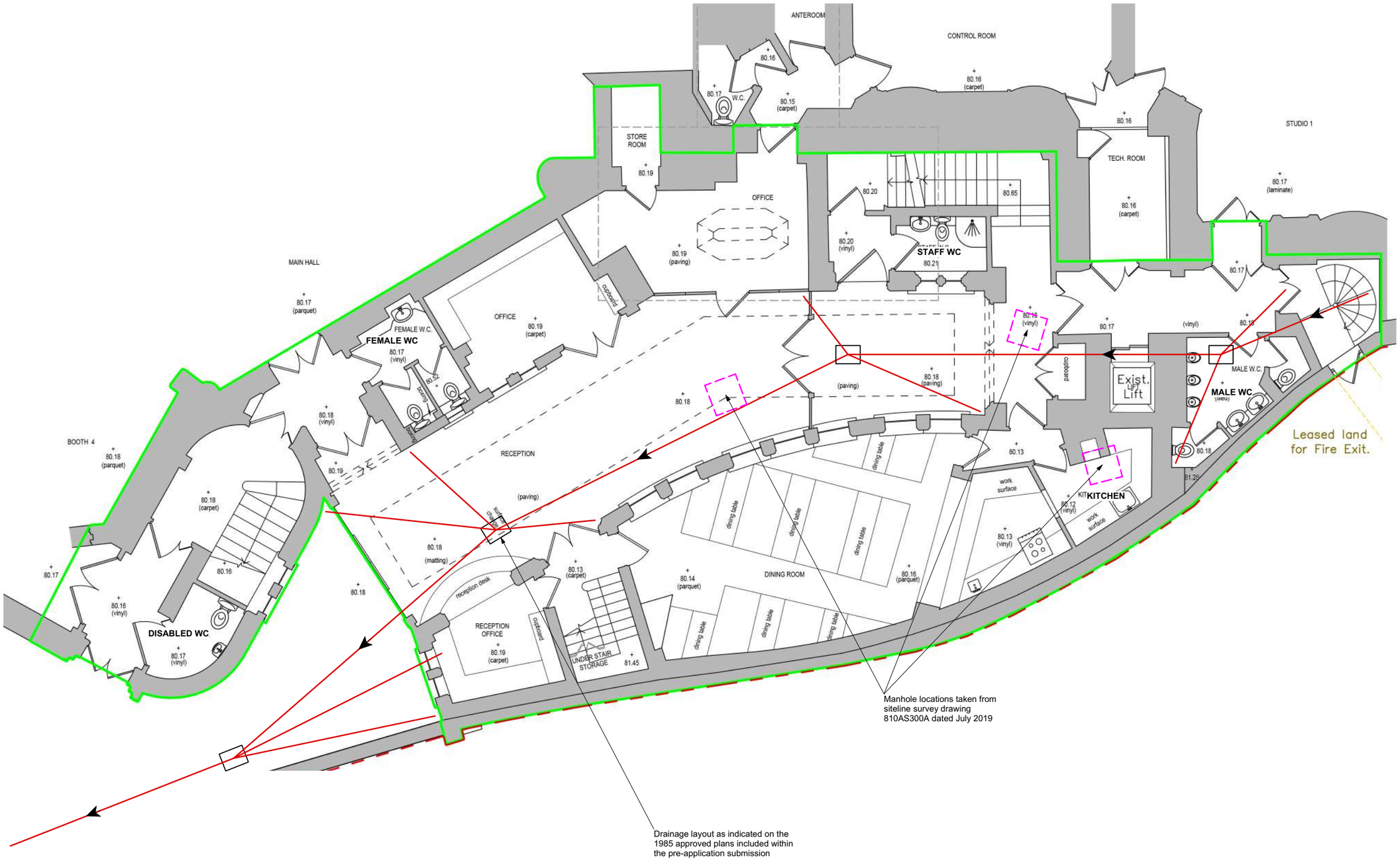


Lintel detail



Appendix B - Underground drainage drawings

A3



GA Plan . Existing

1:100 at A3

NOT FOR CONSTRUCTION

Rev	Date	By
00	11.12.19	dp

Work Stage - ACE / (RIBA)
Stage 2

Reason For Issue
For Information

Project Title
Air Studios
Lyndhurst Hall
Hampstead
Line 4London

Client
Air Studios

Architect
BrightSPACE Architects

Drawing Title
GA Plan
Below Ground Drainage
Existing

Date
Dec 2019

Drawn by
dp

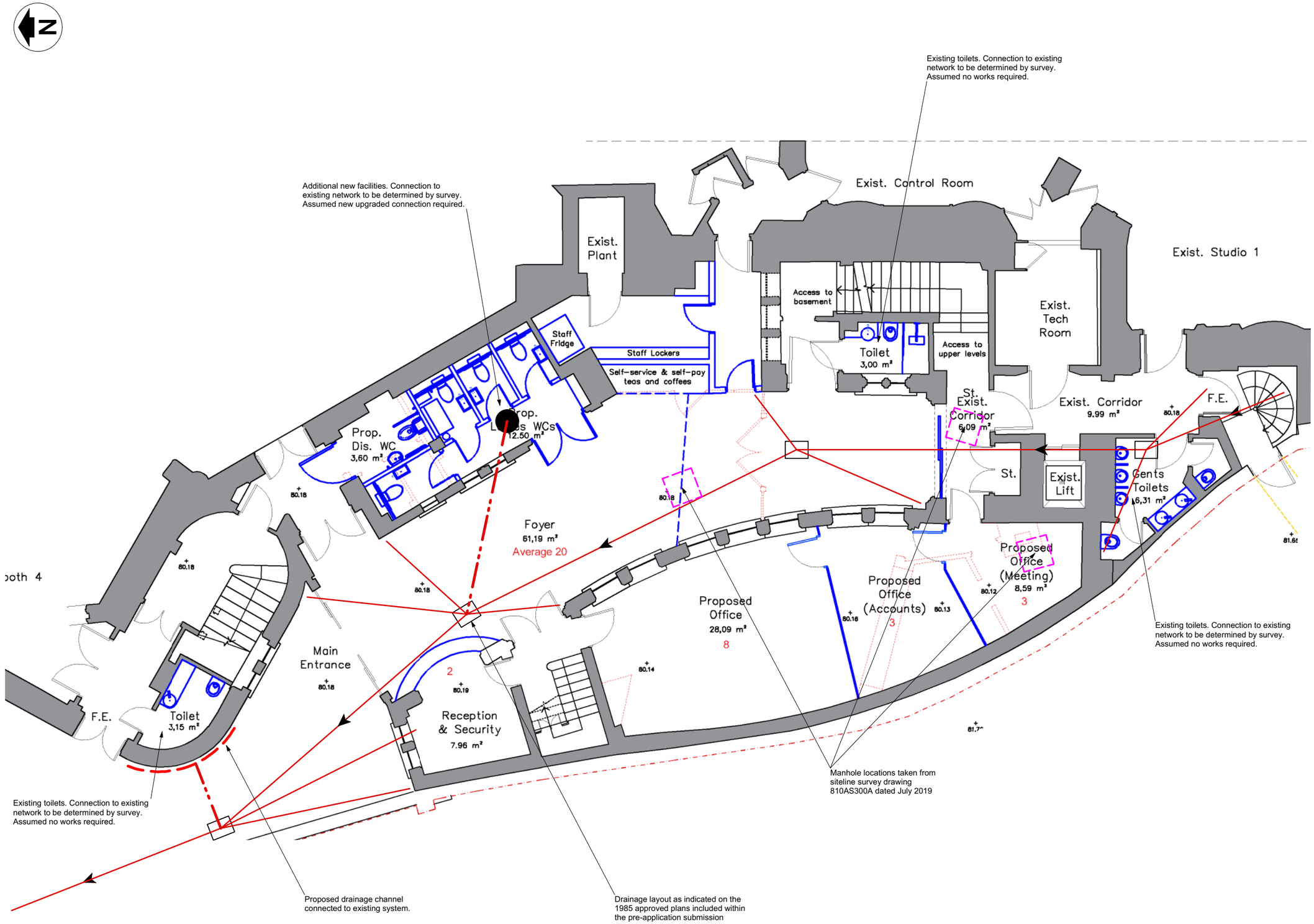
Scale at A3
1:100

Checked by
MH

MOMENTUM
structural engineers
Bath 01225 444194 | London 020 7739 6939
www.momentumengineering.com

Project No. 4268 | Drawing Ref. 600 | Revision 00

A3



GA Plan . Proposed

1:100 at A3

NOT FOR CONSTRUCTION

Rev	Date	By
00	11.12.19	dp

Work Stage - ACE / (RIBA)
Stage 2

Reason For Issue
For Information

Project Title
Air Studios
Lyndhurst Hall
Hampstead
Line 4London

Client
Air Studios

Architect
BrightSPACE Architects

Drawing Title
GA Plan
Below Ground Drainage
Proposed

Date
Dec 2019

Drawn by
dp

Scale at A3
1:100

Checked by
MH

MOMENTUM
structural engineers
Bath 01225 444194 | London 020 7739 6939
www.momentumengineering.com

Project No. 4268 | Drawing Ref. 601 | Revision 00