

APPENDIX F

BLUEROOF INFORMATION

# BLUE ROOF PRELIMINARY DESIGN

## 8m<sup>2</sup>, 35-41 New Oxford Street, London

Prepared for:	Mason Navarro Pledge Ltd		
Issue status:	PRELIMINARY	Calc. Version	1.1
Project id:	7935	Revision:	0
Designed by:	MH	Design Date:	16/05/2016
Checked by:	DS	Check Date:	17/05/2016

### Brief

Target discharge rate of 5l/s for a 1 in 100 year storm event + 30% allowance for climate change.

There are 5 blue roof storage areas, each area receives rainfall from additional catchment areas.

Size of blue roof areas and catchment areas taken from 214312\_SK43\_ABG. Where catchment area feeds into two storage areas the flow is assumed to be split evenly between the two storage areas.

Rainfall ratio and M5-60 value taken from 214312 Drainage Statement Rev P1.

### Input Parameters - Rainfall Information

Return Period	100 years	As supplied by Client
Allowance for Climate Change	30 %	As supplied by Client
Rainfall ratio, R	0.44	From 214312 Drainage Statement Rev P1
M5-60 expected rainfall	20.7 mm/h	From 214312 Drainage Statement Rev P1

### Input Parameters - Roof Information

Catchment area	18 m <sup>2</sup>	As supplied by Client
Storage area	8 m <sup>2</sup>	As supplied by Client
Maximum allowable runoff	0.7 l/s	As supplied by Client

### Output - Rainfall Calculation

Duration	Rainfall (l/s/m <sup>2</sup> )	Storage Required (l/m <sup>2</sup> )	Time to Empty	Restricted Outflow (l/s)
5 mins	0.0626	25	0 hours and 10 minutes	0.6
<b>10 mins</b>	<b>0.0485</b>	<b>30</b>	<b>0 hours and 10 minutes</b>	<b>0.7</b>
15 mins	0.0388	27	0 hours and 10 minutes	0.6
30 mins	0.0250	17	0 hours and 10 minutes	0.5
1 hour	0.0152	10	0 hours and 10 minutes	0.3
2 hours	0.0088	7	0 hours and 10 minutes	0.2
4 hours	0.0051	6	0 hours and 0 minutes	0.1
6 hours	0.0037	6	0 hours and 0 minutes	0.1
10 hours	0.0025	5	0 hours and 0 minutes	0.0
24 hours	0.0012	5	0 hours and 0 minutes	0.0
48 hours	0.0007	5	0 hours and 0 minutes	0.0

### Notes:

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2. Further details on the design theories used in this illustrative design are available upon request from the ABG designer. The values given are indicative and correspond to nominal results obtained in our laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes without notice at any time.
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# BLUE ROOF PRELIMINARY DESIGN

## 37m<sup>2</sup>, 35-41 New Oxford Street, London

Prepared for:	Mason Navarro Pledge Ltd		
Issue status:	PRELIMINARY	Calc. Version	1.1
Project id:	7935	Revision:	0
Designed by:	MH	Design Date:	16/05/2016
Checked by:	DS	Check Date:	17/05/2016

### Brief

Target discharge rate of 5l/s for a 1 in 100 year storm event + 30% allowance for climate change.

There are 5 blue roof storage areas, each area receives rainfall from additional catchment areas.

Size of blue roof areas and catchment areas taken from 214312\_SK43\_ABG. Where catchment area feeds into two storage areas the flow is assumed to be split evenly between the two storage areas.

Rainfall ratio and M5-60 value taken from 214312 Drainage Statement Rev P1.

### Input Parameters - Rainfall Information

Return Period	100 years	As supplied by Client
Allowance for Climate Change	30 %	As supplied by Client
Rainfall ratio, R	0.44	From 214312 Drainage Statement Rev P1
M5-60 expected rainfall	20.7 mm/h	From 214312 Drainage Statement Rev P1

### Input Parameters - Roof Information

Catchment area	47 m <sup>2</sup>	As supplied by Client
Storage area	37 m <sup>2</sup>	As supplied by Client
Maximum allowable runoff	0.7 l/s	As supplied by Client

### Output - Rainfall Calculation

Duration	Rainfall (l/s/m <sup>2</sup> )	Storage Required (l/m <sup>2</sup> )	Time to Empty	Restricted Outflow (l/s)
5 mins	0.0626	21	0 hours and 20 minutes	0.5
10 mins	0.0485	31	0 hours and 30 minutes	0.7
15 mins	0.0388	34	0 hours and 40 minutes	0.7
<b>30 mins</b>	<b>0.0250</b>	<b>35</b>	<b>0 hours and 40 minutes</b>	<b>0.7</b>
1 hour	0.0152	27	0 hours and 30 minutes	0.6
2 hours	0.0088	15	0 hours and 20 minutes	0.4
4 hours	0.0051	9	0 hours and 10 minutes	0.3
6 hours	0.0037	7	0 hours and 10 minutes	0.2
10 hours	0.0025	6	0 hours and 0 minutes	0.1
24 hours	0.0012	5	0 hours and 0 minutes	0.1
48 hours	0.0007	5	0 hours and 0 minutes	0.0

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# BLUE ROOF PRELIMINARY DESIGN

## 19m<sup>2</sup>, 35-41 New Oxford Street, London

Prepared for:	Mason Navarro Pledge Ltd		
Issue status:	PRELIMINARY	Calc. Version	1.1
Project id:	7935	Revision:	0
Designed by:	MH	Design Date:	16/05/2016
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### Brief

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There are 5 blue roof storage areas, each area receives rainfall from additional catchment areas.

Size of blue roof areas and catchment areas taken from 214312\_SK43\_ABG. Where catchment area feeds into two storage areas the flow is assumed to be split evenly between the two storage areas.

Rainfall ratio and M5-60 value taken from 214312 Drainage Statement Rev P1.

### Input Parameters - Rainfall Information

Return Period	100 years	As supplied by Client
Allowance for Climate Change	30 %	As supplied by Client
Rainfall ratio, R	0.44	From 214312 Drainage Statement Rev P1
M5-60 expected rainfall	20.7 mm/h	From 214312 Drainage Statement Rev P1

### Input Parameters - Roof Information

Catchment area	98 m <sup>2</sup>	As supplied by Client
Storage area	19 m <sup>2</sup>	As supplied by Client
Maximum allowable runoff	1.3 l/s	As supplied by Client

### Output - Rainfall Calculation

Duration	Rainfall (l/s/m <sup>2</sup> )	Storage Required (l/m <sup>2</sup> )	Time to Empty	Restricted Outflow (l/s)
5 mins	0.0626	71	0 hours and 40 minutes	0.9
10 mins	0.0485	113	0 hours and 50 minutes	1.2
15 mins	0.0388	131	1 hour and 0 minutes	1.2
<b>30 mins</b>	<b>0.0250</b>	<b>143</b>	<b>1 hour and 0 minutes</b>	<b>1.3</b>
1 hour	0.0152	120	0 hours and 50 minutes	1.2
2 hours	0.0088	67	0 hours and 40 minutes	0.9
4 hours	0.0051	27	0 hours and 20 minutes	0.5
6 hours	0.0037	16	0 hours and 10 minutes	0.4
10 hours	0.0025	10	0 hours and 10 minutes	0.3
24 hours	0.0012	6	0 hours and 10 minutes	0.1
48 hours	0.0007	5	0 hours and 0 minutes	0.1

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# BLUE ROOF PRELIMINARY DESIGN

## 54m<sup>2</sup>, 35-41 New Oxford Street, London

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Issue status:	PRELIMINARY	Calc. Version	1.1
Project id:	7935	Revision:	0
Designed by:	MH	Design Date:	16/05/2016
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### Brief

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There are 5 blue roof storage areas, each area receives rainfall from additional catchment areas.

Size of blue roof areas and catchment areas taken from 214312\_SK43\_ABG. Where catchment area feeds into two storage areas the flow is assumed to be split evenly between the two storage areas.

Rainfall ratio and M5-60 value taken from 214312 Drainage Statement Rev P1.

### Input Parameters - Rainfall Information

Return Period	100 years	As supplied by Client
Allowance for Climate Change	30 %	As supplied by Client
Rainfall ratio, R	0.44	From 214312 Drainage Statement Rev P1
M5-60 expected rainfall	20.7 mm/h	From 214312 Drainage Statement Rev P1

### Input Parameters - Roof Information

Catchment area	129 m <sup>2</sup>	As supplied by Client
Storage area	54 m <sup>2</sup>	As supplied by Client
Maximum allowable runoff	1.0 l/s	As supplied by Client

### Output - Rainfall Calculation

Duration	Rainfall (l/s/m <sup>2</sup> )	Storage Required (l/m <sup>2</sup> )	Time to Empty	Restricted Outflow (l/s)
5 mins	0.0626	37	1 hour and 10 minutes	0.6
10 mins	0.0485	60	1 hour and 30 minutes	0.8
15 mins	0.0388	71	1 hour and 40 minutes	0.9
30 mins	0.0250	85	2 hours and 0 minutes	1.0
<b>1 hour</b>	<b>0.0152</b>	<b>86</b>	<b>2 hours and 0 minutes</b>	<b>1.0</b>
2 hours	0.0088	70	1 hour and 40 minutes	0.9
4 hours	0.0051	41	1 hour and 10 minutes	0.7
6 hours	0.0037	25	0 hours and 50 minutes	0.5
10 hours	0.0025	14	0 hours and 30 minutes	0.3
24 hours	0.0012	7	0 hours and 10 minutes	0.2
48 hours	0.0007	5	0 hours and 0 minutes	0.1

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# BLUE ROOF PRELIMINARY DESIGN

## 79m<sup>2</sup>, 35-41 New Oxford Street, London

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Project id:	7935	Revision:	0
Designed by:	MH	Design Date:	16/05/2016
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Rainfall ratio and M5-60 value taken from 214312 Drainage Statement Rev P1.

### Input Parameters - Rainfall Information

Return Period	100 years	As supplied by Client
Allowance for Climate Change	30 %	As supplied by Client
Rainfall ratio, R	0.44	From 214312 Drainage Statement Rev P1
M5-60 expected rainfall	20.7 mm/h	From 214312 Drainage Statement Rev P1

### Input Parameters - Roof Information

Catchment area	225 m <sup>2</sup>	As supplied by Client
Storage area	79 m <sup>2</sup>	As supplied by Client
Maximum allowable runoff	1.2 l/s	As supplied by Client

### Output - Rainfall Calculation

Duration	Rainfall (l/s/m <sup>2</sup> )	Storage Required (l/m <sup>2</sup> )	Time to Empty	Restricted Outflow (l/s)
5 mins	0.0626	44	1 hour and 50 minutes	0.7
10 mins	0.0485	72	2 hours and 30 minutes	0.9
15 mins	0.0388	87	2 hours and 50 minutes	1.0
30 mins	0.0250	108	3 hours and 10 minutes	1.1
<b>1 hour</b>	<b>0.0152</b>	<b>119</b>	<b>3 hours and 30 minutes</b>	<b>1.2</b>
2 hours	0.0088	111	3 hours and 20 minutes	1.1
4 hours	0.0051	83	2 hours and 40 minutes	1.0
6 hours	0.0037	58	2 hours and 10 minutes	0.8
10 hours	0.0025	32	1 hour and 20 minutes	0.6
24 hours	0.0012	11	0 hours and 30 minutes	0.3
48 hours	0.0007	7	0 hours and 10 minutes	0.2

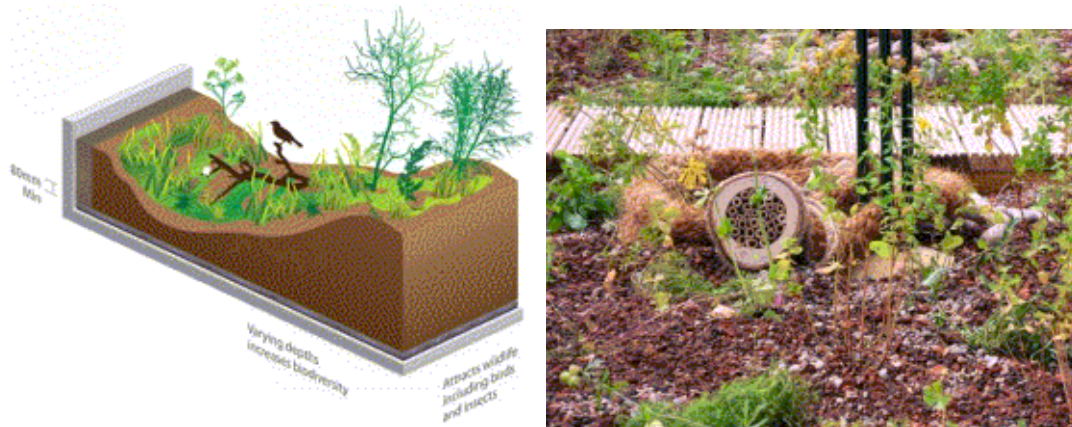
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## Green Roof Maintenance

### Biodiverse Roofs

Biodiverse roofs usually have an undulating, biodiverse growing medium (between 80 – 150mm depth), where the vegetation is provided either by selected wildflower/grasses seeds and/or plug plant species; and/or by self-colonisation of local fauna and flora. Habitats are often created with log/stone/sand piles, and by specific nesting boxes for insects, birds & bats, as required by local planning requirements, Biodiversity Action Plan (BAP), or project specific Ecology Reports.



An increased amount of dead vegetation is created by wildflower and grass mixes, which will need to be cut back and removed, reducing the bio-mass on the roof and encouraging germination from the dead flower heads. In the early Spring, the first signs of life returning to the vegetation on the roof are led by any grasses present, with other species following shortly thereafter.

General maintenance is normally carried out twice annually, during the Spring and Autumn months. However, additional maintenance maybe required, which will be dependant upon the location of the roof - such as the removal of weeds, seedlings, and accumulated leaf litter from overhanging trees.

The following points should be followed to help maintain the roof in a healthy condition, and to protect the validity of the ABG Warranty:

- Ensure the ABG's post installation, 'Green Roof Watering Establishment Guidance' has been followed. The roof will need to receive irrigation for at least 10 weeks after completion, and will require close attention over the first 4 weeks to ensure that the system is kept moist, without becoming over-saturated.
- Ensure safe access can be gained to the roof and that relevant Health and Safety procedures are followed when working at roof level. It is advised that the contractor should always seek proof of current maintenance for any roof access, fall arrest / restraint systems, prior to proceeding with the work on site.
- Remove all dead vegetation and debris from the roof and ensuring all outlets, gutters and downpipes are clear. Where the species mix incorporates wild flowers and grasses, it is recommended that all dead vegetation is mown/strimmed down, and the waste is removed from the roof and disposed off.
- Any vegetation which has encroached into drainage outlets, walkways and the vegetation barriers (pebbles) should be removed.

- Weeding a biodiverse roof is necessary to maintain a healthy roof, and all aggressive species of shrub/tree saplings and undesirable plants should be removed (e.g. Buddleia/Silver Birch). However, some weeds are helpful to the biodiversity of the roof, and considered only as an aesthetic problem. If considered excessive, they can be removed, ensuring that care is taken to follow specific instructions as to the type and species of vegetation removed.
- Areas of dead vegetation/bare patches can be easily repaired; and this is best done during the main growing seasons of March/April, or from late August until the end of September. Take plug plants (new) or vegetation cuttings from surrounding areas of healthy mature plants, and place on bare patches, pressing gently into the soil. A light sprinkling of sand mixed with compost should then be dressed over the affected area and watered to improve the uptake of the cuttings. If the vegetation is showing signs of distress, but has received regular rainfall, then the most likely problem is a lack of nutrient and a fertiliser should be applied.
- Plants will colonise in partial and full shade, and will generally be greener in colour and grow 'taller' in these locations. There will be a significant variance in the growth and colour between the plants growing in full or partial shade, and those exposed to full sunlight, and this should be recognised as a feature of the biodiversity of each individual roof.
- Remove the lids of all Inspection chambers, ensure that all rainwater outlets and downpipes are free from blockages, and that water can flow freely away. Clean any filters to outlets twice yearly, and replace every three years.
- It is generally not considered necessary to irrigate biodiverse roof systems; however, it is always advisable to ensure that there is a water supply point adjacent to any green roof, both to assist with general maintenance, and as a precaution against extreme drought conditions.
- Advise the Client immediately of the need to repair or renew any defects, as necessary.
  - o Ensure that any protective metal flashings and termination bars remain securely fixed in place.
  - o Examine all mastic sealant and mortar pointing for signs of degradation.
  - o Check that all promenade tiles and paving slabs are securely bedded into the roof surface, and are in good condition.
  - o Report signs of damage or degradation of the waterproofing immediately to the Client, in order that separate arrangements with the weather-proofing manufacturer can be made for further inspection/remedial work, as necessary.
  - o Ensure that any new items of plant/equipment on the roof are mounted on appropriate isolated slabs/support systems. Please seek prior advice from ABG Ltd, before any new installations.
  - o It is recommended that a maintenance record is kept by the Client to record visits, findings, work carried out, and provides an on-going record of the roof's performance.

If you require any additional information or advice, please contact ABG Ltd on 01484-354826 or at [building@abgltd.com](mailto:building@abgltd.com)





# **ABG bluerooF System 10/20/30 Year Warranty**

**Warranty Serial Number:**

**Contract/Building Name:**

**Building Owner:**

**Building Address:**

**Roof/Podium Area 1**

**Roof/Podium Area 2**

**Roof/Podium Area 3**

**Waterproofing Membrane System Type**

**& Install Team Name:**

**ABG bluerooF System Type**

**& ABG Approved Install Team Name:**

**Final Surface FinishType**

**& Install Team Name:**

**Date of Substantial Completion and Final Inspection:**

## **Details of the ABG bluerooF System:**

ABG Ltd ('ABG'), warrants to the owner of the building described above ("Owner"), that subject to the terms, conditions, and limitations stated herein, ABG will warranty the performance of the "ABG bluerooF System" for the Warranty period commencing with the date of substantial completion of the installation of the ABG bluerooF System.

This warranty applies to ABG bluerooF systems for which:

1. All work has been completed by ABG, or it's approved installer, for supply & installation of the ABG bluerooF System.
2. The underlying waterproofing system has been tested for water-tightness using electronic leak detection, and inspected and certified by the manufacturer or installer.
3. The waterproofing has been maintained in a protected condition between the time that the waterproofing has been installed and the ABG bluerooF System has been installed.
4. The installation of the ABG bluerooF System has been completed using an approved ABG installer and ABG supplied materials.
5. The Owner maintains the ABG bluerooF System in line with the ABG Operating & Maintenance (O&M) procedures provided on practical completion of the installation which will include regular scheduled inspections of the roof or podium area (including visual inspections of the ABG bluerooF restrictor chamber boxes), and appropriate care and maintenance of the final surface finishes for the duration of the warranty.
6. The Owner of the building provides safe access to all roof or podium areas where the ABG bluerooF Systems have been installed for the duration of the warranty and where appropriate has maintained safety systems incorporated into the building.
7. If the final surface finishes (including any vegetated/green roof, hard or soft landscaping, pavers, or ballasted finishes) have been supplied & installed by an ABG approved installer, then this warranty will apply to this additional buildup above the ABG bluerooF System.

Where ABG's approved installer has installed a vegetated/green roof final surface finish, ABG will warrant the vegetated cover performance to achieve and maintain a foliage coverage rate of seventy (70) percent for the duration of this warranty. The appropriate level of care, weeding, fertilization, and irrigation must be provided by the Owner, as required within the ABG O&M procedures.

## **TERMS, CONDITIONS, LIMITATIONS**

1. The Owner shall notify ABG on the first business day immediately following the discovery of a failure in the ABG bluerooF System, and confirm in writing within 10 working days.
2. If, on inspection by ABG, ABG determines that the identified failure in the ABG bluerooF System is caused by a defect then ABG shall affect repairs. The decision of ABG with respect to repairs shall be final and binding.
3. This warranty does not extend to conditions caused by, and ABG shall not be responsible for any damage caused by:
  - (a) Any act of negligence, accident, or misuse including, but not limited to, lack of maintenance, damage by other persons or trades, vandalism, falling objects, civil disobedience, or act of war, or:
  - (b) Vehicular, Pedestrian travel or recreational use, except in areas specifically designated for these purposes, or:
  - (c) Damage by a natural disaster including, but not limited to, earthquake, lightning, fire, hail, high winds, hurricane, tornado, flood, erosion, drought, acid rain, thermal shock or other acts of God, or:
  - (d) Damage caused by animals, birds, or insect or disease infestation, or:



- (e) Other building components, including cracking, building movement, settlement, deflection of roof deck, deterioration of walls, movement of metal work, water entry other than the roof, and defects in the materials used as a base under the roof, or:
- (f) Service to or maintenance of any roof top equipment or traffic of any nature on the roof except in designated areas, or:
- (g) Removal of any portion of the ABG **bluerroof** System, including any of the final surface finishes above the ABG **bluerroof**, and disturbance of the ABG **bluerroof** restrictor chamber boxes , without prior written approval by ABG, or:
- (h) Chemical attack, including but not limited to petroleum-based products, solvents, contaminants, chemical waste, exhaust or heat generated by mechanical units, deicing materials, fertilizers, herbicides and pesticides that are not approved by ABG, and alike, onto the final finished surface level, ABG **bluerroof** system, and waterproofing system, or:
- (i) A proscribed activity, including the failure to comply with Operating & Maintenance Plan, and any construction or installation subsequent to the installation of the ABG **bluerroof** system that has not been authorised in writing by ABG. The Owner must promptly notify ABG in writing of any proposed alterations, additions or changes of any kind that will affect the ABG **bluerroof** System, or:
- (j) Alterations or repairs made on or through the completed ABG **bluerroof** System, or objects such as but not limited to fixtures, equipment, or structures are placed on or attached to the completed ABG **bluerroof** System or the final surface finishes, without first obtaining written authorisation from ABG, or:
- (k) Failure by the Owner or their lessee to use reasonable care in maintaining the roof or podium area as described in the building or sites Operating & Maintenance plan, or:
- (l) Poor irrigation water quality, in particular reference to where vegetated/green roof final surface finishes are installed by the ABG nominated installer, or another contractor, or:
- (m) Deficient design applied to the ABG **bluerroof** System such as contact with incompatible materials and/or substrates, installation next to highly reflective surfaces without an irrigation system, exposure to heat below roof deck, such as from steam or hot water pipes, insufficient drainage design, or:
- (n) Any change of use of the roof or podium area, associated loading parameters, or changes in the final surface finishes, not discussed and approved by ABG prior to the commencement of these changes, or:
- (o) The Owner or their lessee fails to comply with every term and condition stated herein.

4. During the period of this warranty, ABG, its agents and employees, shall have free access to the roof or podium areas during regular business hours

5. No liability will be accepted for any disruption caused by any repair work.

6. ABG shall have no obligation under this warranty until all invoices for materials and services associated with the ABG **bluerroof** System, and where applicable for the final surface finishes, have been paid in full.

7. This warranty will apply only to installations where the final surface finishes have been agreed with ABG prior to installation; the maintenance is provided exclusively by an installer accepted by ABG; and an ABG **bluerroof** Maintenance Agreement, compliant with the Operating & Maintenance Plan, is in effect for the duration of the warranty.

8. Where present the appearance of the vegetated/green roof final surface finishes should be expected to change over the years. A process of natural succession will result in the botanical evolution of the vegetated/green roof cover. The future distribution of plants species cannot be accurately predicted. The long-term coverage of the vegetated cover can be guaranteed only in conjunction with an ABG **bluerroof** Maintenance Agreement required under this Warranty.

9. The Owner shall notify ABG in writing within 48 hours of discovering that any of the final surface finishes/coverage is insufficient, changed or damaged according to this warranty.

10. ABG's cumulative cost to repair or replace the ABG **bluerroof** System shall not exceed the original cost of the ABG **bluerroof** System (including only when applicable, costs for the final surface finishes when installed by an ABG approved installer).

11. ABG's failure at any time to enforce any of the terms or conditions stated herein shall not be construed to be a waiver of such provision.

12. All warranties set forth herein relating to the performance of the ABG **bluerroof** System, including without limitation, the warranty relating to any the final surface finishes, will be voided if the Owner fails to maintain an ABG **bluerroof** Maintenance Agreement with a contractor accepted by ABG for the duration of this warranty. The Owner shall supply copies of the executed ABG **bluerroof** Maintenance Agreement on demand as proof that the maintenance programme complies with the Operating & Maintenance Plan and includes regularly scheduled inspections, and appropriate care of both the ABG **bluerroof** System and the final surface finishes.

13. This warranty is extended solely and exclusively to the Owner of the Building at the time the ABG **bluerroof** System is installed. It does not extend nor is it otherwise assignable or transferable to any other party unless approved in advance and in writing by ABG.

NO REPRESENTATIVE OF ABG HAS AUTHORITY TO MAKE ANY REPRESENTATIONS OR PROMISES EXCEPT AS STATED HEREIN.

This Warranty is effective from: ..... For: .....years.

Signed for and on behalf of ABG Ltd: ..... Name: .....

Position: .....



# ABG bluroof

ABG **bluroof** provides attenuation capacity within the green roof or podium deck construction of a development. Utilising this space in this way means that the attenuation capacity required to meet SuDS best practice can be met without the requirement for land consuming ponds and retention basins or the challenges of constructing large subterranean geocellular storage tanks.

**bluroof** comprises a combined drainage and attenuation void within the roof structure and a roof outlet system designed to release the attenuated water at a controlled discharge rate as permitted in the planning consent of the site.

Designing a green roof in this way allows storage capacities suitable for up to a one in a hundred year storm event, plus an allowance (typically 30%) for the effects of climate change, to be achieved.

This stored water, as with a 'traditional' storage system, can be released at a controlled rate or even used as grey water or irrigation for the vegetation across the development.

The ABG **bluroof** System consists of two key components:

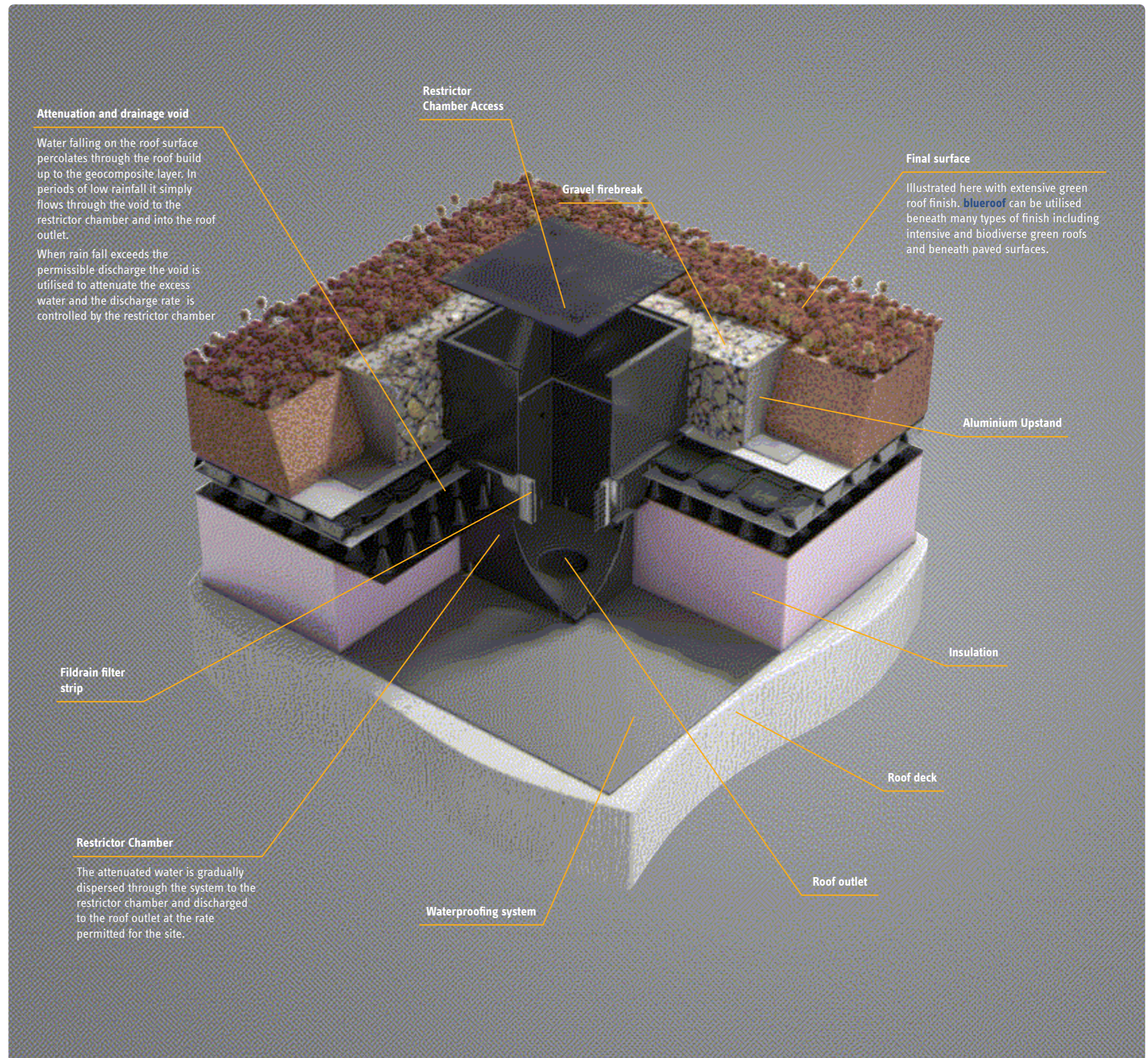
- A drainage geocomposite system with integral filter geotextiles and a series of restrictor chambers. Excess water not absorbed by the vegetation, filters through the green roof and builds up in to the drainage void formed by the geocomposite layers below.
- This water is gradually dispersed through the system to the restrictor chamber and discharged to the roof outlet at the rate permitted for the site.

The storm water attenuation requirements are met within the roof construction, therefore the need for underground storage can be eliminated. The benefits to the overall project include the removal of the excavated material, disruption on site, and the time and cost of installing an underground tank.

Placing the storage within the footprint of the building also has advantages in heavily urbanised developments where external space is at a premium and on site working space and materials storage is limited. This reduction in material movements also helps reduce the carbon footprint of the project.

**bluroof** is suitable for:

- Supermarkets
- Distribution centres
- Schools and colleges
- Shopping centres
- Underground car parks
- Housing
- Flats
- Office blocks



# Design Considerations

## Design Factors

As part of the design process ABG will develop response calculations to model the behavior of the roof during storm events. The information required is usually contained within the surface water run-off assessment for the specific site.

The modelling looks at a number of key factors including

- Required rate of discharge.
- Attenuation volume requirement.
- Time to completely discharge attenuated water from the roof structure.
- Roof type.

Rainfall depths for the specific site are calculated according to location, duration and return period (the number of times in set period a storm of that magnitude is likely to occur; 1 in 30 years and 1 in 100 years storms are usually considered). An allowance is also made for future climate change.

Rainfall and run-off should be considered simultaneously to give an actual representation of the **bluroof** behaviour under storm conditions.

## Design Capacity

Should attenuation reach its maximum level the restrictor chamber has a built in safety mechanism designed to release excess water into the drainage system. Design capacity will always come with a factor of safety allowing for additional capacity.

In reality, provided the **bluroof** is designed and maintained properly, its designed storage capacity will never be exceeded.

## Outlet Design

Traditional roof design tends to have a conservative approach when designing the rainwater outlets with usually more outlets installed than actually required. When designing a blue roof the restrictor chambers are an integral component in controlling the discharge of water from the roof and as such the number required is calculated exactly. Typically this may mean that less outlets are required, less outlets means less penetrations, less detailing and greatly reduces the potential of leaks occurring. The reduction in outlets also has a positive impact on both the construction time, costs

and service risers running through the building meaning the construction saves both time and money.

## Water Quality

Using the **bluroof** system has a positive impact on the quality of the water discharged. Before the water reaches the roof outlet it has already passed through several processes that remove particulates and pollutants including vegetation and growing medium (if the roof is green) and more importantly through at least two, in a basic system, layers of non-woven, needle punched geotextile whose filtration properties are well documented. The water is treated to such a degree that it reaches the level required in treatment train stage one allowing the water to be released from the roof directly into the river system

In a truly holistic design consideration should be given to using the attenuated water for secondary uses such as the irrigation of gardens and washing paths etc. The water could also be considered for grey water reuse applications although it may need to undergo a further treatment stage in order to do so.

## Structural Considerations

The introduction of a **bluroof** may have loading implications for the structure of the building. It is vital to consult a structural engineer at an early stage especially when designing for a SuDS solution where water will be stored within the roof structure. This will enable you to determine any constraints you may be under, although this is not as onerous as may be expected.

Traditional structural loadings in roof design take into account the dead weight of the roof structure, the materials used to construct it, plus an allowance for load applied by snow falling on the roof.

**bluroof** stores collected water across the entire area of the roof at a shallow depth, typically less than 100mm. At full capacity this would exert a maximum additional load of 1.0kN/m<sup>2</sup>.

In reality it is exceedingly unlikely that the roof will ever reach full capacity as it will start to drain as soon as it starts to rain and will continually drain throughout the storm event at the rate determined by the restrictor outlet.

When taking into account that there is no screed required to achieve a fall on the roof and construction tolerances

the additional design allowed for load is, in fact, usually negligible.

ABG Technical Department are able to advise on the loadings the roof will generate when fully charged.

## Waterproofing Design

A key element of any roofing system is the waterproofing. **bluroof** is compatible with all modern waterproofing materials (ABG recommend monolithic bonded systems). The selection of which waterproofing type is down to the type of roof construction and, to a degree, personal preference. As a concept **bluroof** is compatible with both warm and inverted roof constructions.

Once installed it is recommended that the waterproofing layer be electronically tested for integrity before being covered installation of the bluroof components commences.

Care should be taken during installation of subsequent layers however once the insulation is installed the waterproofing system is covered and protected from damage from further works during normal operations.

As with other roof types the waterproofing should be detailed to a height of 150mm higher than the final fill level.

ABG work with leading manufacturers and installers of waterproofing systems and can offer project specific advice and guidance to ensure the optimum solution is selected.

## Access and Maintenance

The British Standards Institution state that all new builds must provide access to the roof area to enable a minimum of two inspections per year. In achieving this compliance to working at height regulations must be considered. If a building is of a height which can cause an injury from a fall, including roofs under 2m, then edge protection is required.

The level of maintenance required is dependent on the final finish. Paved podium decks and extensive green roofs are relatively low maintenance where as intensive green roofs require maintenance like any garden.

Specific attenuation should be given to the **bluroof** elements such as the outlets which should be checked a minimum of twice annually.

As with any green roof the design should allow for the safe removal of materials from the roof

## Thermal Performance

**bluroof** needs to meet the building regulations required to achieve the thermal performance. At the moment, as with green roofs, the **bluroof** build up cannot be considered as part of the roof build up when calculating thermal performance so insulation specification must be done as per a traditional roof design.

It is recommended that the insulation material be extruded polystyrene (XPS) and not expanded polystyrene (EPS). EPS in contact with water degrades which will result in the roof losing thermal performance ultimately leading to the requirement for an expensive reroofing operation.

However, research shows that the introduction of layers of drainage, growing media and vegetation have an impact on the thermal performance and can offer additional benefits on the development including cost benefits and reducing the carbon footprint.

## Geography

Geographical location and orientation are an important part of designing a **bluroof**. Which area of the country, the amount of average rainfall in that area and the prevalent wind direction all affect the design and must be considered.

When using a vegetated finish the geographic location impacts the species selection with many species suitable for green roofs being specific to a region.

## Final Finishing

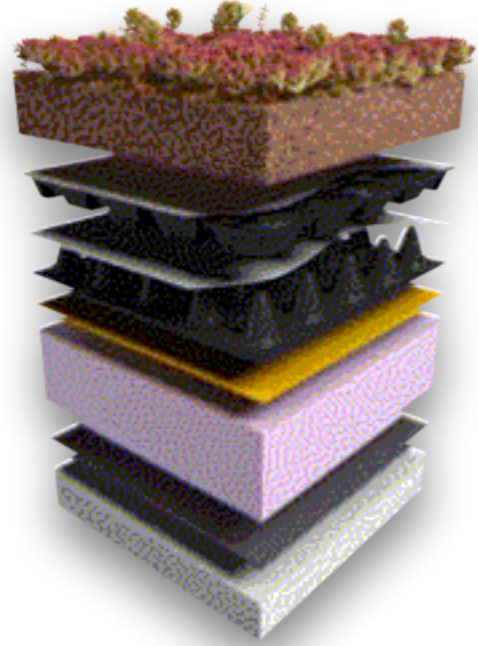
**bluroof** can be designed beneath all green roof types including extensive, intensive and biodiverse (brown). It is also suitable for use beneath paved or trafficked areas such as frequently used on podium decks. Suitable surfaces include permeable block paving, rubberised asphalt, ballasted etc. **bluroof** is also suitable for use with photovoltaic cells (PV).

The options are endless and comes down to the clients requirement for the final finish of the roof.

ABG Technical department are able to advise and assist with project specific design guidance to help meet the clients requirements.

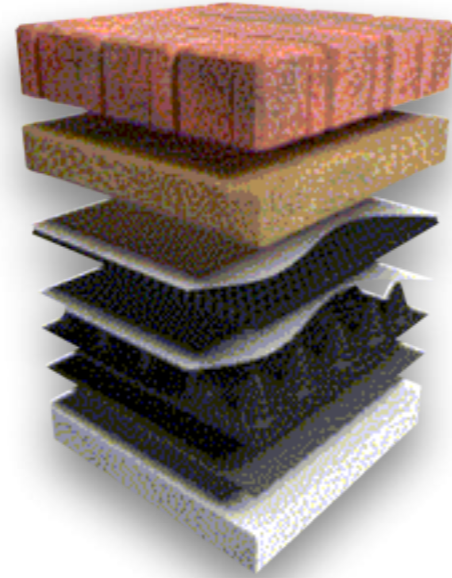
## Inverted Roof

In inverted roofs two layers of composite are used above the XPS insulation layer overlaid with a slimline separation membrane. In conjunction with a restrictor outlet chamber the two layers of composite provide a combined drainage and attenuation function across the roof area.



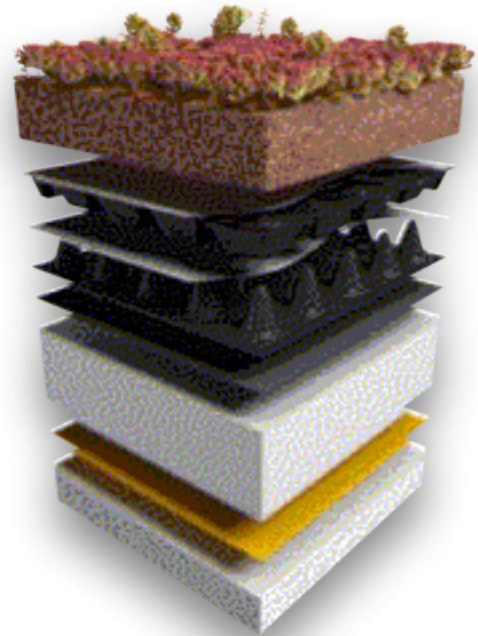
## Podium Deck

In podium deck construction typically the system utilises two layers of Deckdrain within the system. The upper layer forms a free flowing layer addressing drainage requirements during low flow whilst the layer beneath providing attenuation capacity during and after storm events.



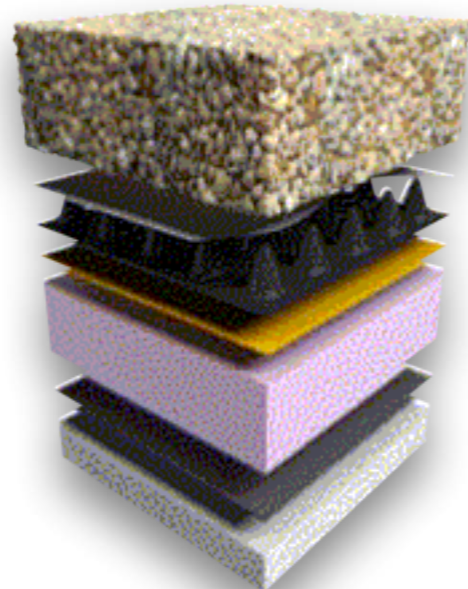
## Warm Roof

In warm roof construction the composites behave in much the same way as within the inverted roof construction with the whilst providing protection to the waterproofing system laid over the insulation.



## Ballasted Roof

In ballasted roof construction the void within the ballast provides additional attenuation capacity therefore negating the requirement for a second layer of composite. The composite provides the main attenuation void across the roof area.



# Roof Types

Like green roofs blue roofs are suitable for use on a wide range of substrates and are compatible with most modern waterproofing systems.

They are also flexible when it comes the roof build up being equally as effective on an uninsulated podium construction as they are within a warm or inverted roof construction

The illustrations on the left represent some of the more common roof build-ups with which the bluroof system can be used but they do not define its entire extent. The highly modular nature of the bluroof components mean that a system can be designed for most flat roofs and podium decks.

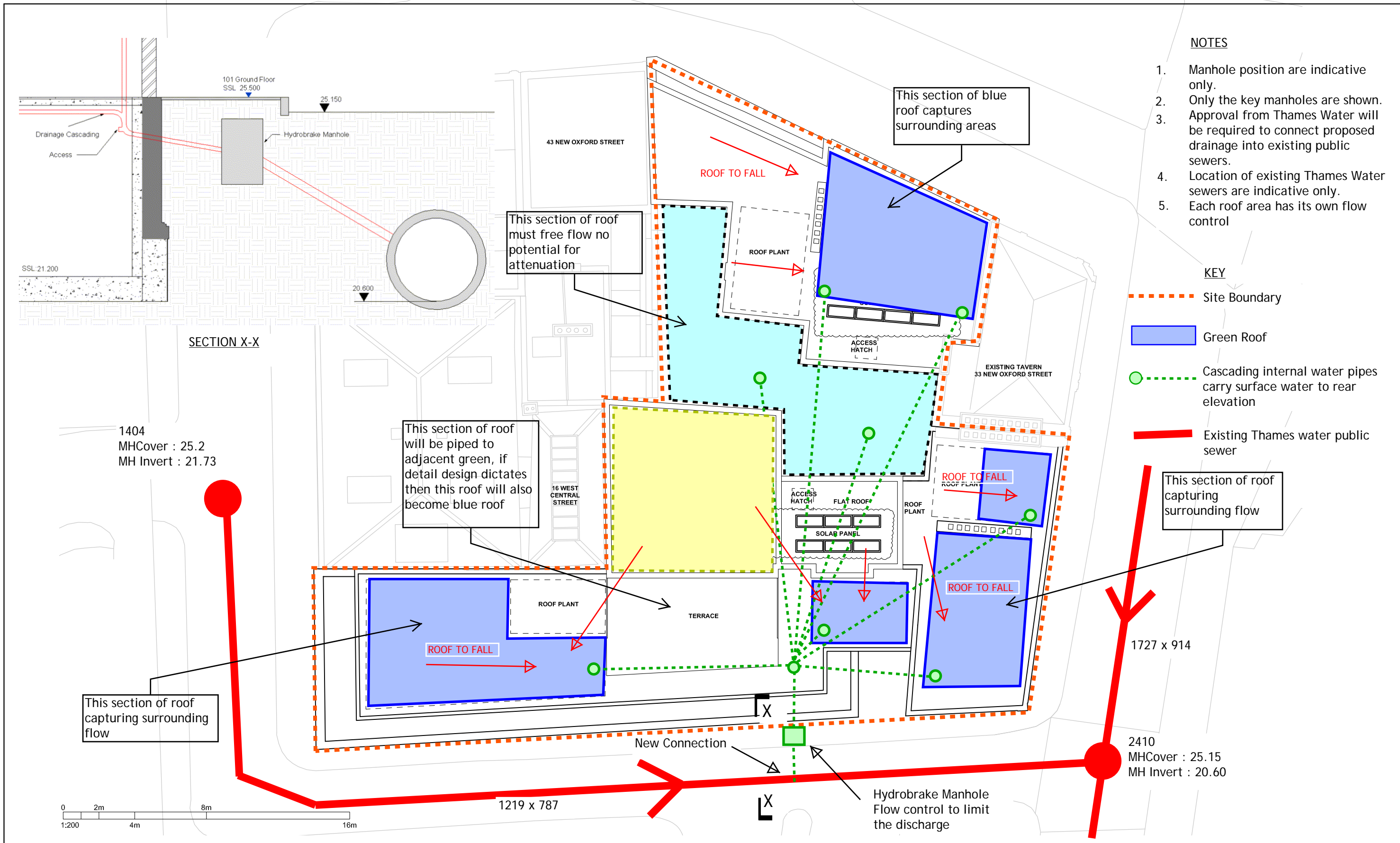
specific advice and guidance on individual project requirements is available through the ABG Technical Team who are happy to review your scheme and determine suitability.



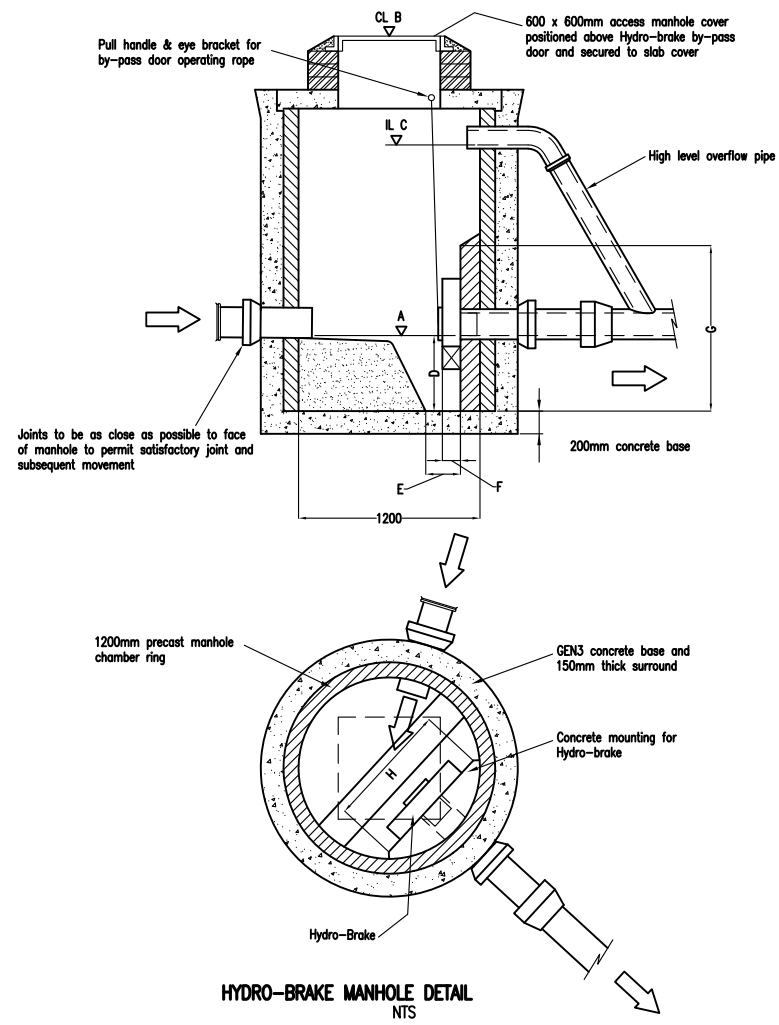
APPENDIX G

PROPOSED DRAINAGE DRAWINGS

Project		NEW OXFORD STREET		Job Ref		214312	
Section		PRELIMINARY DRAINAGE PLAN		Sheet no		SK	
By	Date	Chd by	Date	Revision	Date		
PS	20/04/16	SP					



Project		NEW OXFORD STREET		Job Ref		214312	
Section		PRELIMINARY DRAINAGE DETAILS		Sheet no		SK	
By	Date	Chd by	Date	Revision	Date		
PS	20/04/16	SP					





530140.000 E

530160.000 E

530180.000 E

530200.000 E

530220.000 E

DATE REVISIONS

NOV 2014	AREAS ADDED. SEE REVISION BOX.	A

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181440.000 N

181420.000 N

181440.000 N

530140.000 E

530160.000 E

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530200.000 E

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181440.000 N

181440.000 N

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181440.000 N

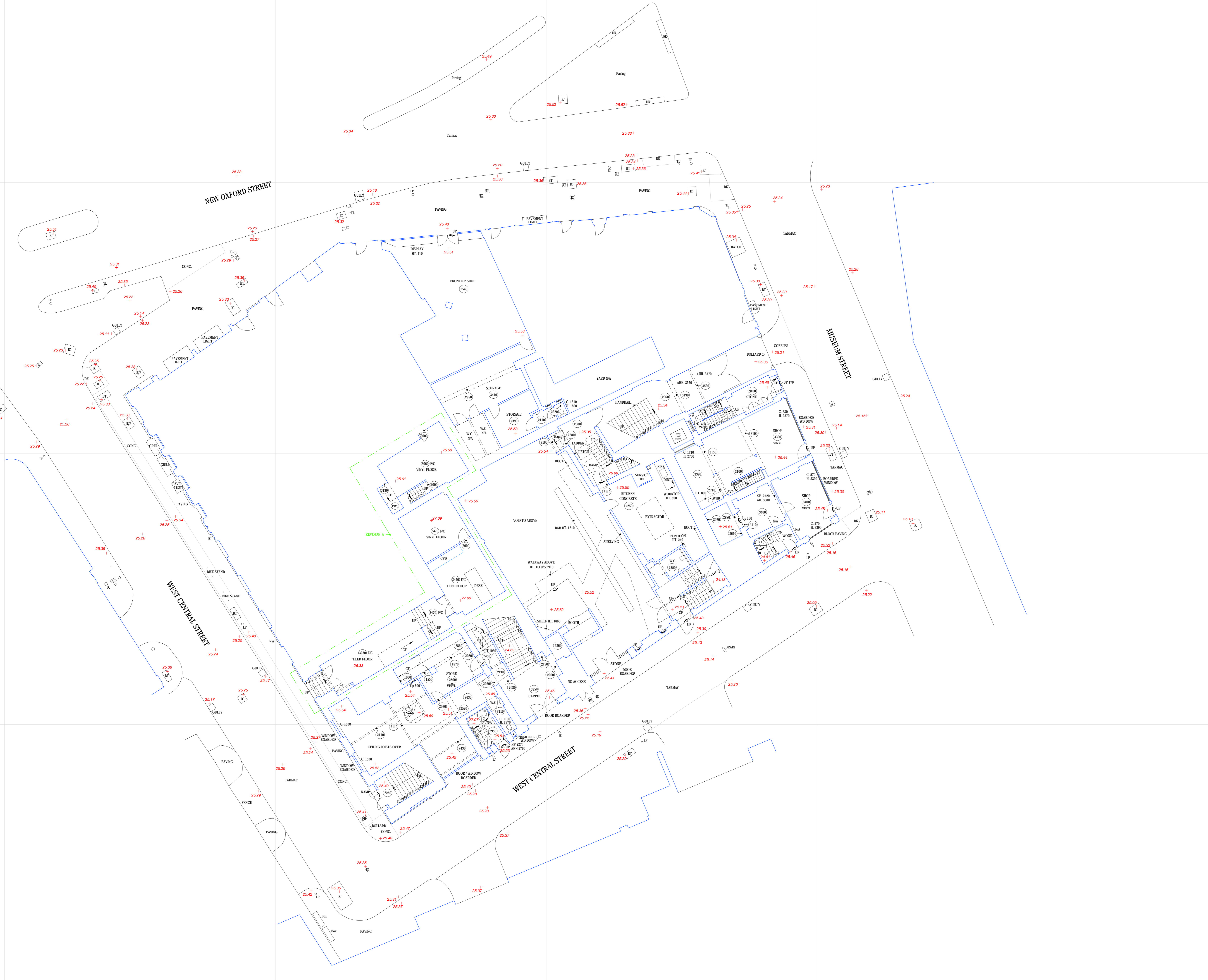
530140.000 E

530160.000 E

530180.000 E

530200.000 E

530220.000 E



**ABBREVIATIONS (WHERE APPLICABLE)**

AC	AIR CONDITIONING	N/A	NO ACCESS
B	BOLLARDS	OH	OVERHEAD
BE	BRICK ON EDGE CORNER	RAD	RADIATOR
BT	BRITISH TELECOM COVER	RL	ROOF LIGHT
CTV	CABLE TV COVER	RS	ROLLER SHUTTER
CF	CEILING FALL	RS	ROLLER STEEL JOIST
CL	COVER LEVEL	RSS	ROLLED STEEL JOIST
COFC	CONCRETE FINISH	RWB	RAIN WATER PIPE
CPD	CURBBOARD	SAR	SLOPING ASPHALT ROOF
CPF	CHOPPED FLOOR FINISH	SG	STRUCTURAL CEILING
CPS	CONCRETE PAVING SLABS	SGR	SLOPING GLASS ROOF
DK	DROP KEYS	SP	SOIL POST
DP	DOWN PIPE	SSR	SLOPING SLATE ROOF
ER	EARTH ROD	STR	SLOPING TILED ROOF
FAR	FLAT ASPHALT ROOF	SVP	SOIL & VENT PIPE
FB	FLOWER BED	TCE	TRAFFIC CONTROL BOX
FCC	FALSE CEILING	TL	TRAFFIC LIGHT
FH	FIRE HYDRANT	U	URNAL
FMR	FIRE MISC REEL	UP	VENT PIPE
G	GULLY	VTF	VINYL TILED FLOOR
GPD	TELECOM COVER	WC	TOILET
GV	GAS VALVE	W/B	WASH HAND BASIN
HD	HAND DRAIN	W/M	WATER METER VALVE
HL	HIGH LEVEL	W/CO	WATER STOP COCK
HT	HEIGHT	WT	WATER TANK
IC	INSPECTION COVER		
LL	LOW LEVEL		
LP	LAMP POST		

**LEGEND (WHERE APPLICABLE)**

---	LINE INDICATES OVERHEAD OR HIDDEN DETAIL
---	INDICATES CENTRE OF STEEL RAILING OR FENCE
C. 0.000	CALL HEIGHT TO OPENING FROM FINISHED FLOOR LEVEL
SP. 0.000	SPRING HEIGHT TO ARCH FROM GULL LEVEL
H. 0.000	HEAD HEIGHT TO OPENING FROM GULL LEVEL
+ 10.00	CROSS INDICATES POSITION OF LEVEL
DL 10.00	INDICATES POSITION OF DEDUCED LEVEL
(0.000)	INDICATES RELEVANT CEILING, BEAM OR SOFFIT HEIGHT
(0.000)	EXISTING TREE (SPREAD & HEIGHTS - NEAREST METRE)
G	GIRTH
H	HEIGHT
S	SPREAD

**PLEASE NOTE (WHERE APPLICABLE)**

1. THE ACCURACY OF THIS SURVEY DRAWING IS DEPENDENT UPON THE SCALE AT WHICH IT IS PRODUCED. USERS SHOULD NOT RESCALE THIS DRAWING WITHOUT WRITTEN CONSENT.
2. WHILE ALL REASONABLE CARE HAS BEEN TAKEN IN LOCATING THE UNDERGROUND SERVICES SHOWN ON THIS DRAWING, THE COMPLETENESS OR THE ACCURACY OF THE INFORMATION CANNOT BE GUARANTEED. USERS SHOULD VERIFY THEMSELVES WITH REGARD TO THE TYPE, SIZE AND ROUTE OF SERVICES BEFORE CONNECTIONS ARE AUTHORIZED.
3. THE ABILITY TO SCALE FROM THIS SURVEY DRAWING IS DEPENDENT ON THE STABILITY OF THE DRAWING MATERIAL. USERS SHOULD VERIFY, BY THE SCALE OF THE SURVEY ORIGIN, THE ACCURACY OF THE DRAWING MATERIAL PRIOR TO SCALING DIMENSIONAL INFORMATION.

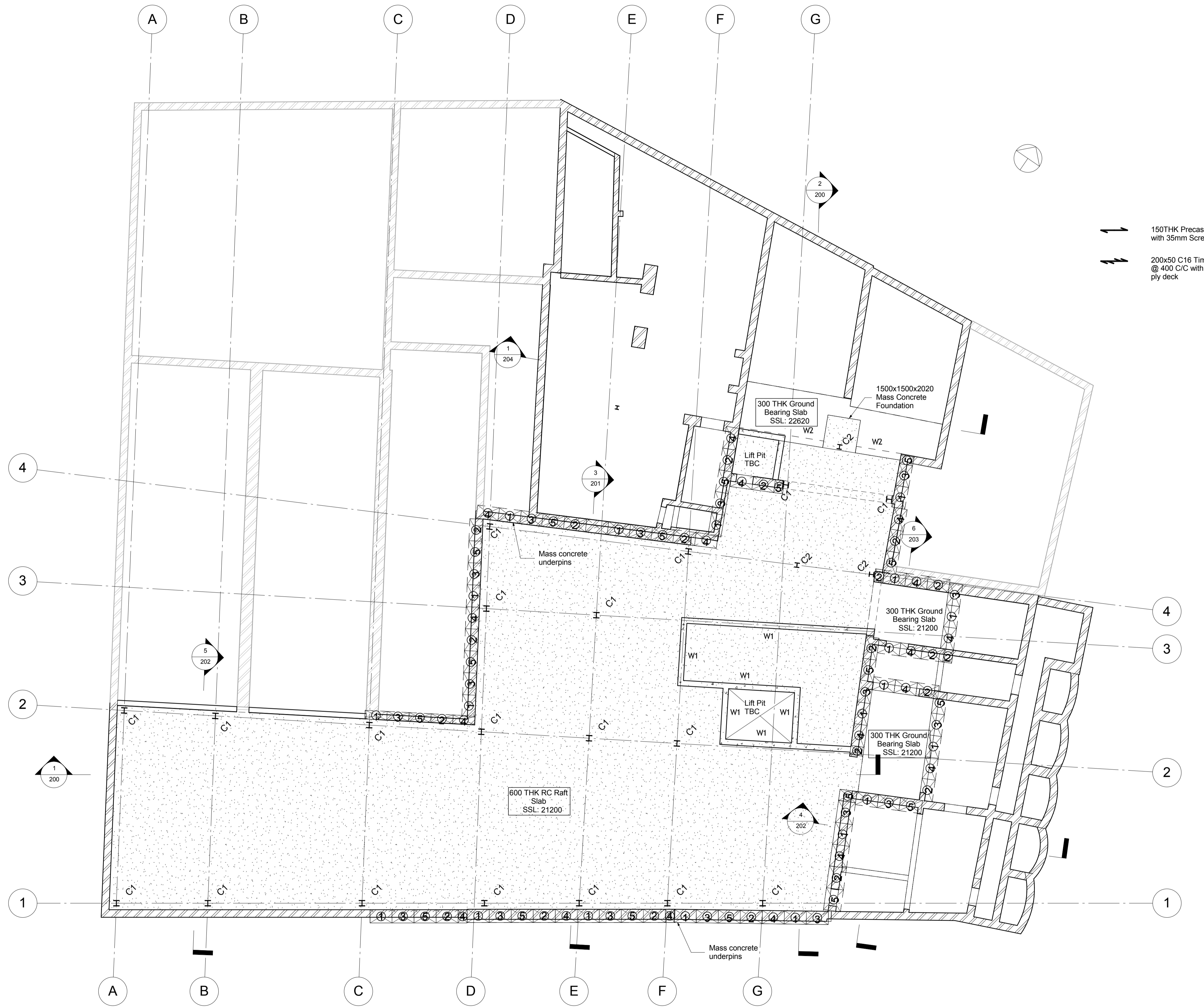
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 SURVEY STATION STN\_100  
 SEE COORDINATE TABLE ON DRAWING 8129101 FOR LOCATION  
**VALUE = 25.413m**

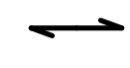

**TITLE**  
**GROUND FLOOR AND SITE PLAN**  
**PROJECT**  
**WEST CENTRAL STREET, LONDON WC1**  
**CLIENT**  
**DRIVERS JONAS DELOITTE**  
**SCALE** DRAWN DATE DRAWING REVISION  
**1:100@A0** M.G. SEP 2012 8129/08 A

**Michael Gallie & Partners**  
**RECORDING THE BUILT ENVIRONMENT™**  
 166@ Tower Bridge Road, London SE1 3LZ  
 020333 2401211 020333 2401169 020333 2401169

APPENDIX H

STRUCTURAL DRAWINGS



 150THK Precast Planks with 35mm Screed  
 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

- NOTES:
- MNP drawings are to be read in conjunction with relevant documents, specifications, architectural and services drawings, including approved building work drawings. The contractor should notify CA of any discrepancies between the structural drawings and specifications or other drawings.
  - Do not scale from the drawings or computer digital data. Only figured dimensions are to be used. Use written dimensions only. To check drawing has been printed to the intended scale this bar should be 50mm long @A1 or 25mm long @ A3
  - All dimensions are in millimeters unless noted otherwise.
  - All levels are in meters above ordnance datum unless noted otherwise.

STRUCTURAL WALL SCHEDULE	
Type Mark	Type

W1	250THK RC
W2	300THK RC
W3	600THK RC

STRUCTURAL BEAM SCHEDULE	
Type Mark	Type

B1	UB457x152x67
B2	UB533x210x101
B3	UB533x210x122
B4	UC203x203x52
B5	UB305x165x54
B6	UC152x152x37
B7	UB356x171x67
B8	UB457x152x82
B9	UB406x178x67
B10	UC305x305x118
BR1	CHS114.3x6 Bracing

STRUCTURAL COLUMN SCHEDULE	
Type Mark	Type

C1	UC254x254x73
C2	UC203x203x52
C3	UC152x152x37

P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS

REV	COMMENTS	DATE	CHK
-----	----------	------	-----

STATUS  
**ISSUED FOR INFORMATION**  
 Not For Construction



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 CONSULTING CIVIL & STRUCTURAL ENGINEERS  
 Bancroft Court Hitchin Hertfordshire SG5 1LH  
 Telephone: 01462 632012 Fax: 01462 632233  
 Email: office@mnp.co.uk www.mnp.co.uk

CLIENT  
**TRIANGLE INVESTMENT & DEVELOPMENT LTD.**

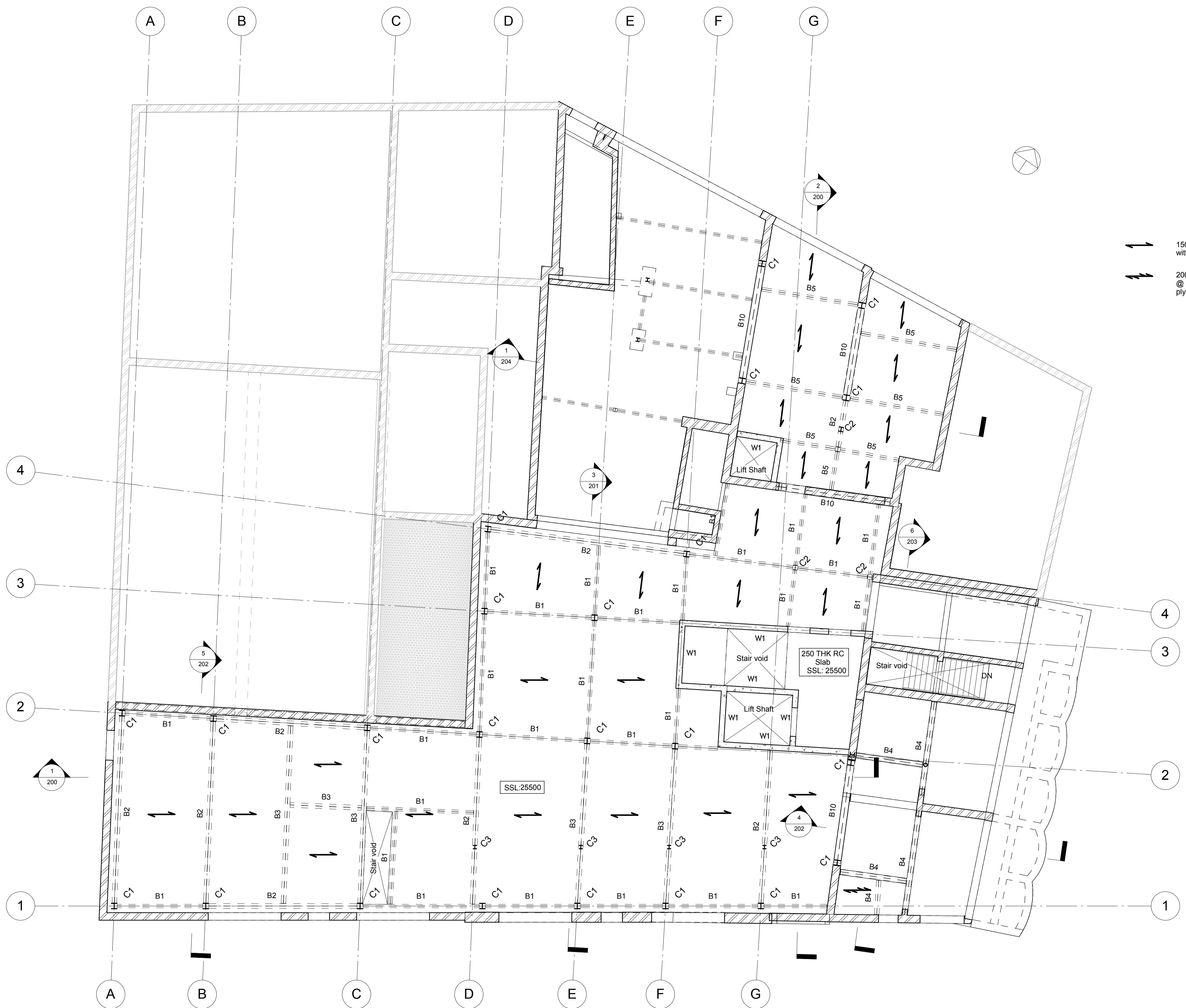
PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS LOWER GROUND FLOOR**

SCALE @ A1 As indicated DATE 04/09/2015

DRAWN BY PS CHECKED BY SP

JOB No: 214312 DRAWING No: 100 REV P3



150THK Precast Planks with 35mm Screed  
 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

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REV	COMMENTS	DATE	CHK

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CLIENT  
**TRIANGLE INVESTMENT & DEVELOPMENT LTD.**

PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS GROUND FLOOR**

SCALE @ A1  
 As indicated

DATE  
 04/09/2015

DRAWN BY  
 PS

CHECKED BY  
 SP

JOB No.  
 214312

DRAWING No.  
 101

REV  
 P3

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P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

**ISSUED FOR INFORMATION**  
Not For Construction

**mnp**  
mason navarro pledge  
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Bancroft Court Hitchin Hertfordshire SG5 1LH  
Telephone: 01462 632012 Fax: 01462 632233  
Email: office@mnp.co.uk www.mnp.co.uk

CLIENT  
**TRIANGLE INVESTMENT & DEVELOPMENT LTD.**

PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS  
MEZZANINE FLOOR**

SCALE @ A1  
As indicated

DATE  
04/09/2015

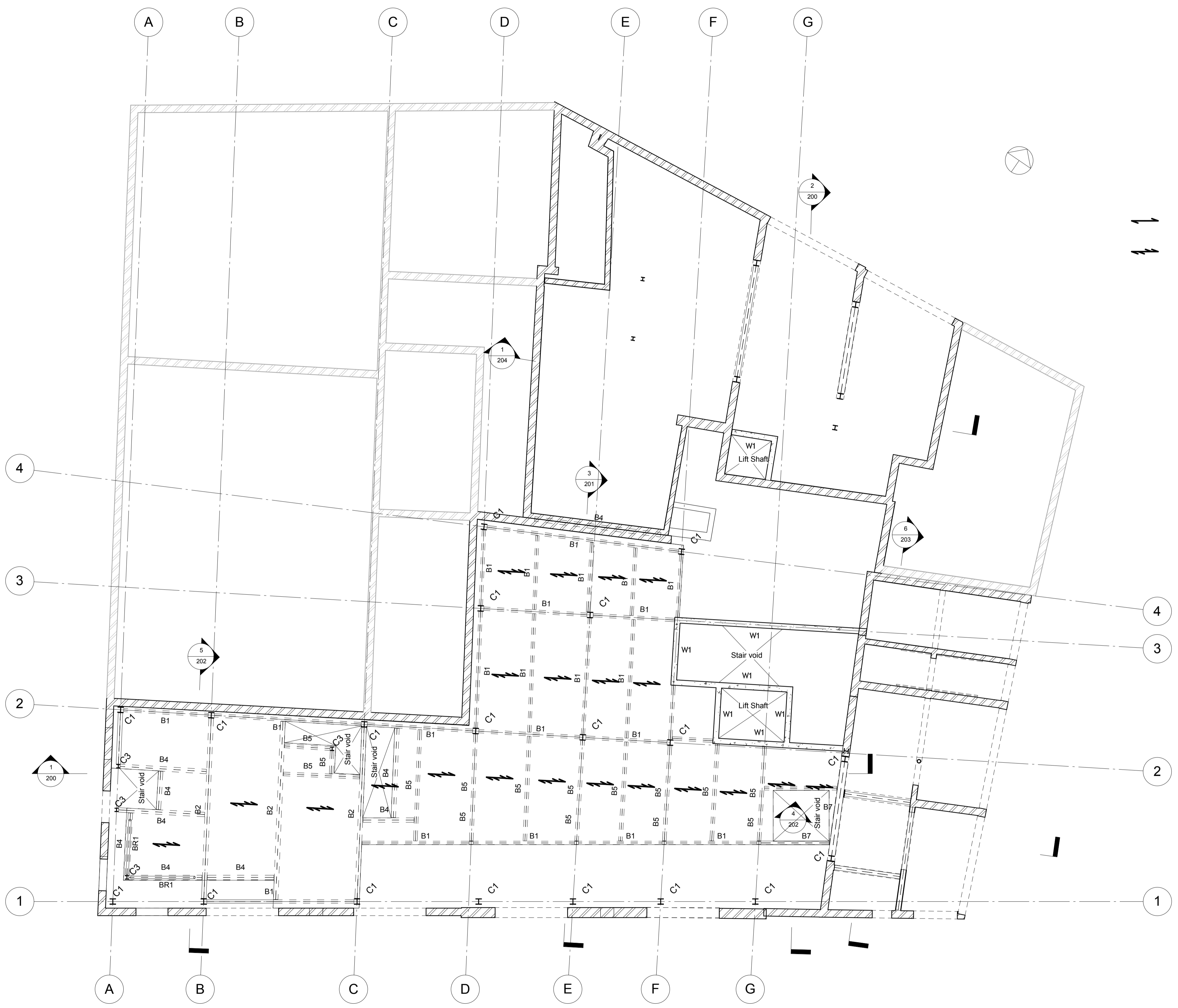
DRAWN BY  
PS

CHECKED BY  
SP

JOB No.  
214312

DRAWING No.  
102

REV  
P3



- 150THK Precast Planks with 35mm Screenshot
- 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

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CLIENT  
**TRIANGLE INVESTMENT & DEVELOPMENT LTD.**

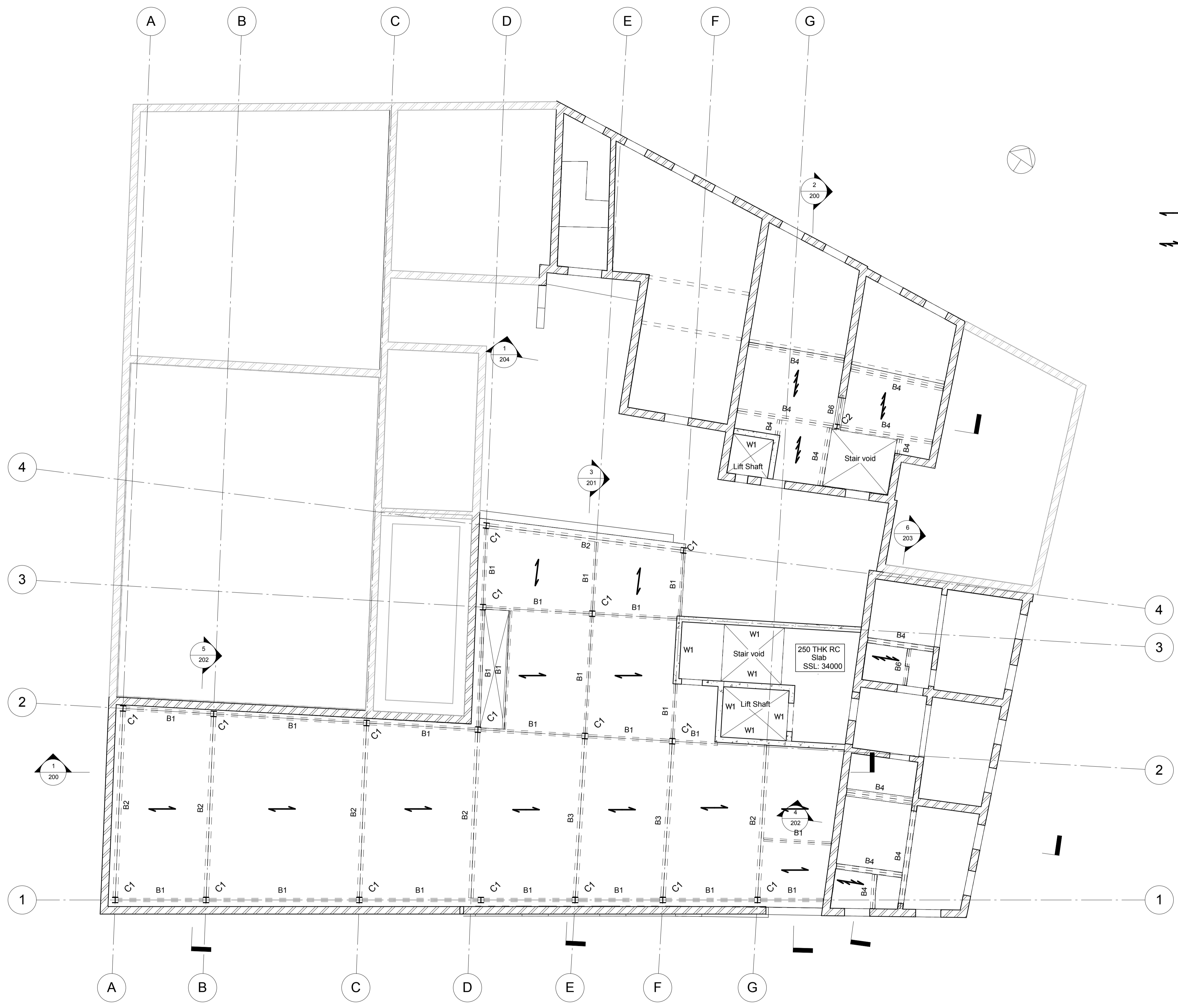
PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED  
 PLANS  
 FIRST FLOOR**

SCALE @ A1 As indicated	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3



- 1 150THK Precast Planks with 35mm Screed
- 2 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck



- 150THK Precast Planks with 35mm Screed
- 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

- NOTES:
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  - All dimensions are in millimeters unless noted otherwise.
  - All levels are in meters above ordnance datum unless noted otherwise.

**STRUCTURAL WALL SCHEDULE**

Type Mark	Type
W1	250THK RC
W2	300THK RC
W3	600THK RC

**STRUCTURAL BEAM SCHEDULE**

Type Mark	Type
B1	UB457x152x67
B2	UB533x210x101
B3	UB533x210x122
B4	UC203x203x52
B5	UB305x165x54
B6	UC152x152x37
B7	UB356x171x67
B8	UB457x152x82
B9	UB406x178x67
B10	UC305x305x118
BR1	CHS114.3x6 Bracing

**STRUCTURAL COLUMN SCHEDULE**

Type Mark	Type
C1	UC254x254x73
C2	UC203x203x52
C3	UC152x152x37

REV	COMMENTS	DATE	CHK
P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS

STATUS  
**ISSUED FOR INFORMATION**  
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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS SECOND FLOOR**

SCALE @ A1  
 As indicated

DATE  
 04/09/2015

DRAWN BY  
 PS

CHECKED BY  
 SP

JOB No.  
 214312

DRAWING No.  
 104

REV  
 P3

NOTES:

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STRUCTURAL WALL SCHEDULE

Type Mark	Type
W1	250THK RC
W2	300THK RC
W3	600THK RC

STRUCTURAL BEAM SCHEDULE

Type Mark	Type
B1	UB457x152x67
B2	UB533x210x101
B3	UB533x210x122
B4	UC203x203x52
B5	UB305x165x54
B6	UC152x152x37
B7	UB356x171x67
B8	UB457x152x82
B9	UB406x178x67
B10	UC305x305x118
BR1	CHS114.3x6 Bracing

STRUCTURAL COLUMN SCHEDULE

Type Mark	Type
C1	UC254x254x73
C2	UC203x203x52
C3	UC152x152x37

P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

STATUS  
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PROJECT  
**NEW OXFORD STREET**

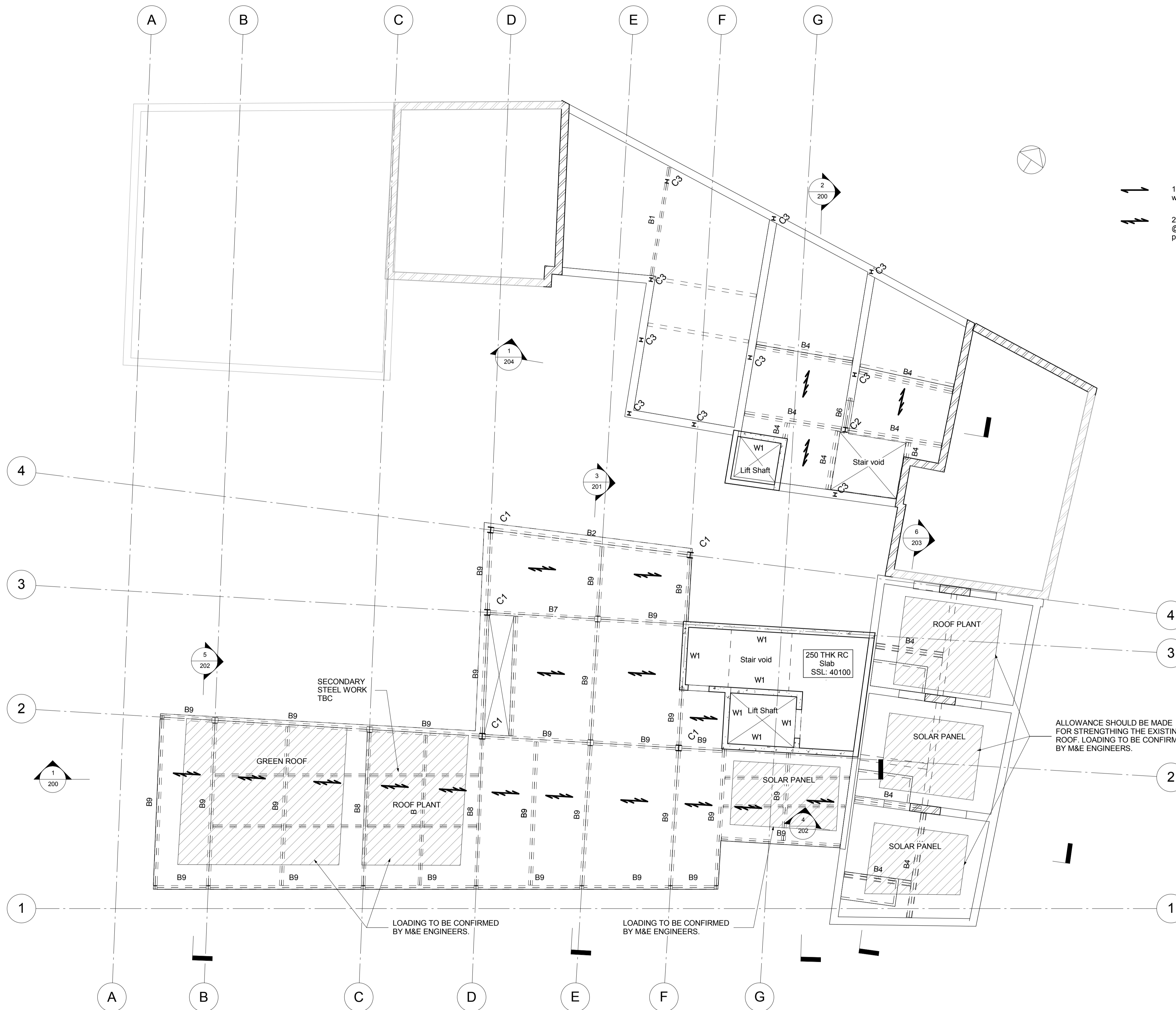
DRAWING TITLE  
**PROPOSED PLANS  
THIRD FLOOR**

SCALE @ A1 As indicated	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3



↑ 150THK Precast Planks with 35mm Screed  
⚡ 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck





- 1 150THK Precast Planks with 35mm Screed
- 2 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

- NOTES:
- MNP drawings are to be read in conjunction with relevant documents, specifications, architectural and services drawings, including approved building work drawings. The contractor should notify CA of any discrepancies between the structural drawings and specifications or other drawings.
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  - All levels are in meters above ordnance datum unless noted otherwise.

**STRUCTURAL WALL SCHEDULE**

Type Mark	Type
W1	250THK RC
W2	300THK RC
W3	600THK RC

**STRUCTURAL BEAM SCHEDULE**

Type Mark	Type
B1	UB457x152x67
B2	UB533x210x101
B3	UB533x210x122
B4	UC203x203x52
B5	UB305x165x54
B6	UC152x152x37
B7	UB356x171x67
B8	UB457x152x82
B9	UB406x178x67
B10	UC305x305x118
BR1	CHS114.3x6 Bracing

**STRUCTURAL COLUMN SCHEDULE**

Type Mark	Type
C1	UC254x254x73
C2	UC203x203x52
C3	UC152x152x37

REV	COMMENTS	DATE	CHK
P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS

STATUS  
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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS  
 FOURTH FLOOR**

SCALE @ A1  
 As indicated

DATE  
 04/09/2015

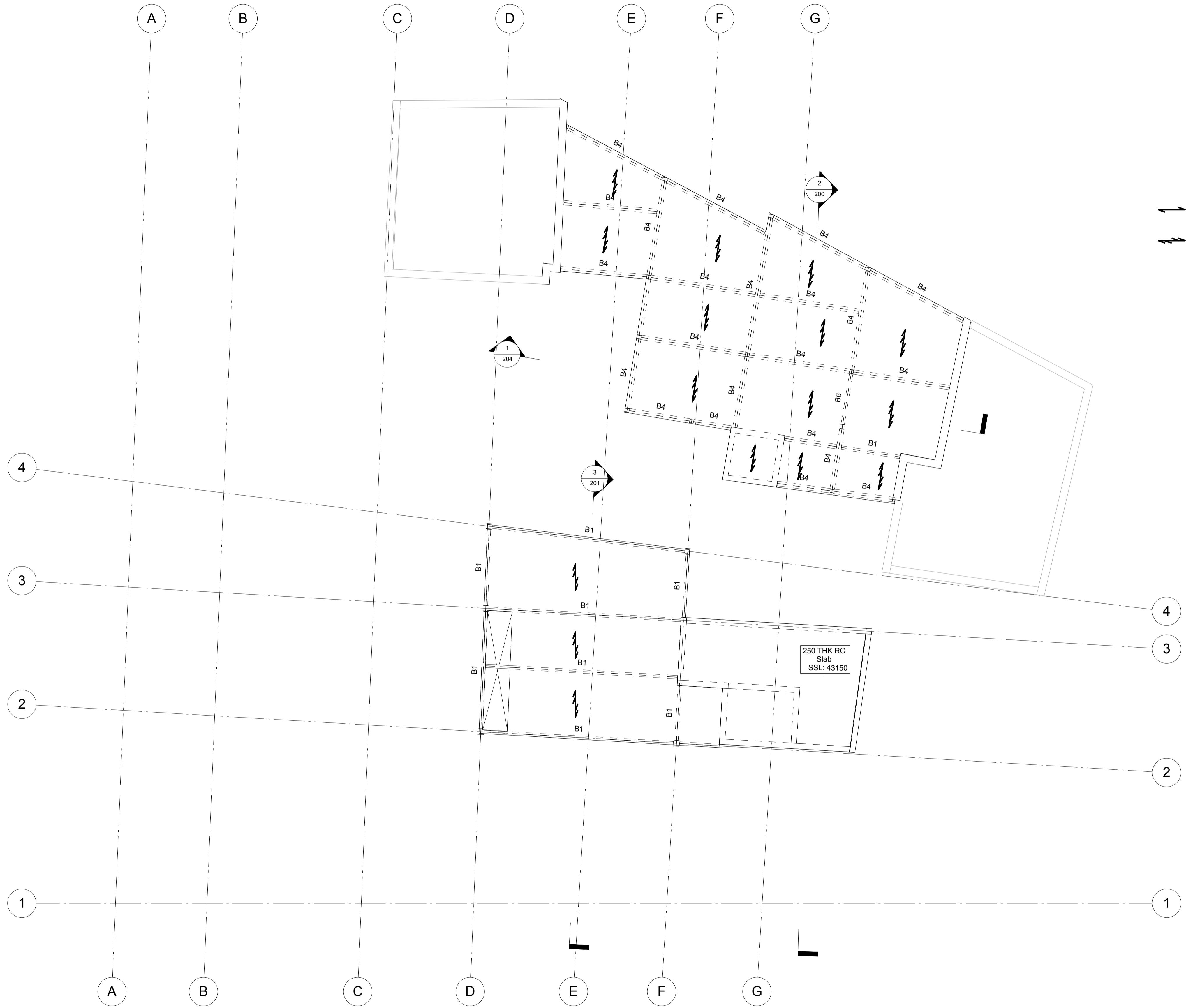
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JOB No.  
 214312

DRAWING No.  
 106

REV  
 P3



150THK Precast Planks with 35mm Screed  
 200x50 C16 Timber joist @ 400 C/C with 18mm ply deck

- NOTES:
- MNP drawings are to be read in conjunction with relevant documents, specifications, architectural and services drawings, including approved building work drawings. The contractor should notify CA of any discrepancies between the structural drawings and specifications or other drawings.
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**STRUCTURAL WALL SCHEDULE**

Type Mark	Type
W1	250THK RC
W2	300THK RC
W3	600THK RC

**STRUCTURAL BEAM SCHEDULE**

Type Mark	Type
B1	UB457x152x67
B2	UB533x210x101
B3	UB533x210x122
B4	UC203x203x52
B5	UB305x165x54
B6	UC152x152x37
B7	UB356x171x67
B8	UB457x152x82
B9	UB406x178x67
B10	UC305x305x118
BR1	CHS114.3x6 Bracing

**STRUCTURAL COLUMN SCHEDULE**

Type Mark	Type
C1	UC254x254x73
C2	UC203x203x52
C3	UC152x152x37

P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED PLANS ROOF**

SCALE @ A1  
 As indicated

DATE  
 04/09/2015

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 SP

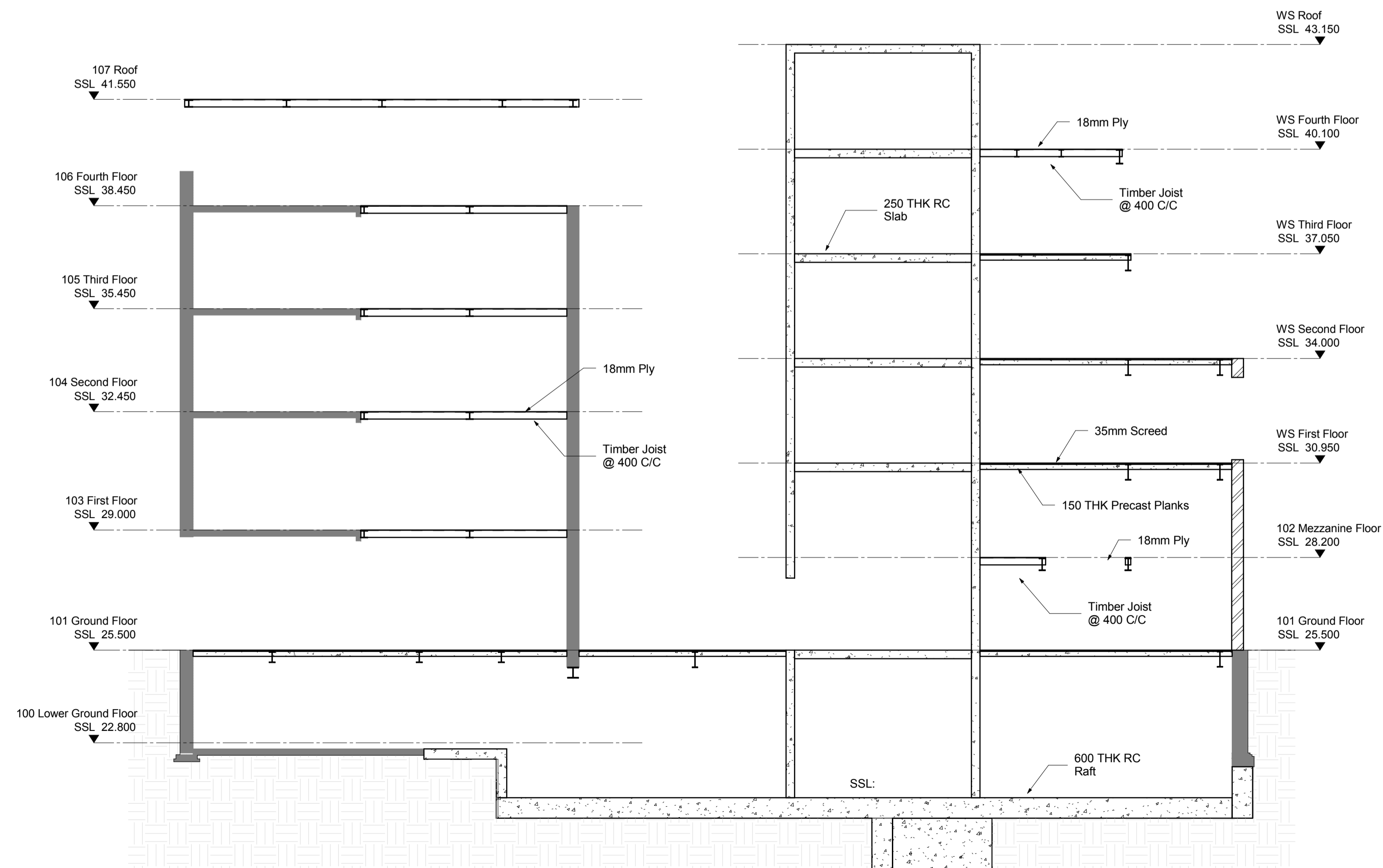
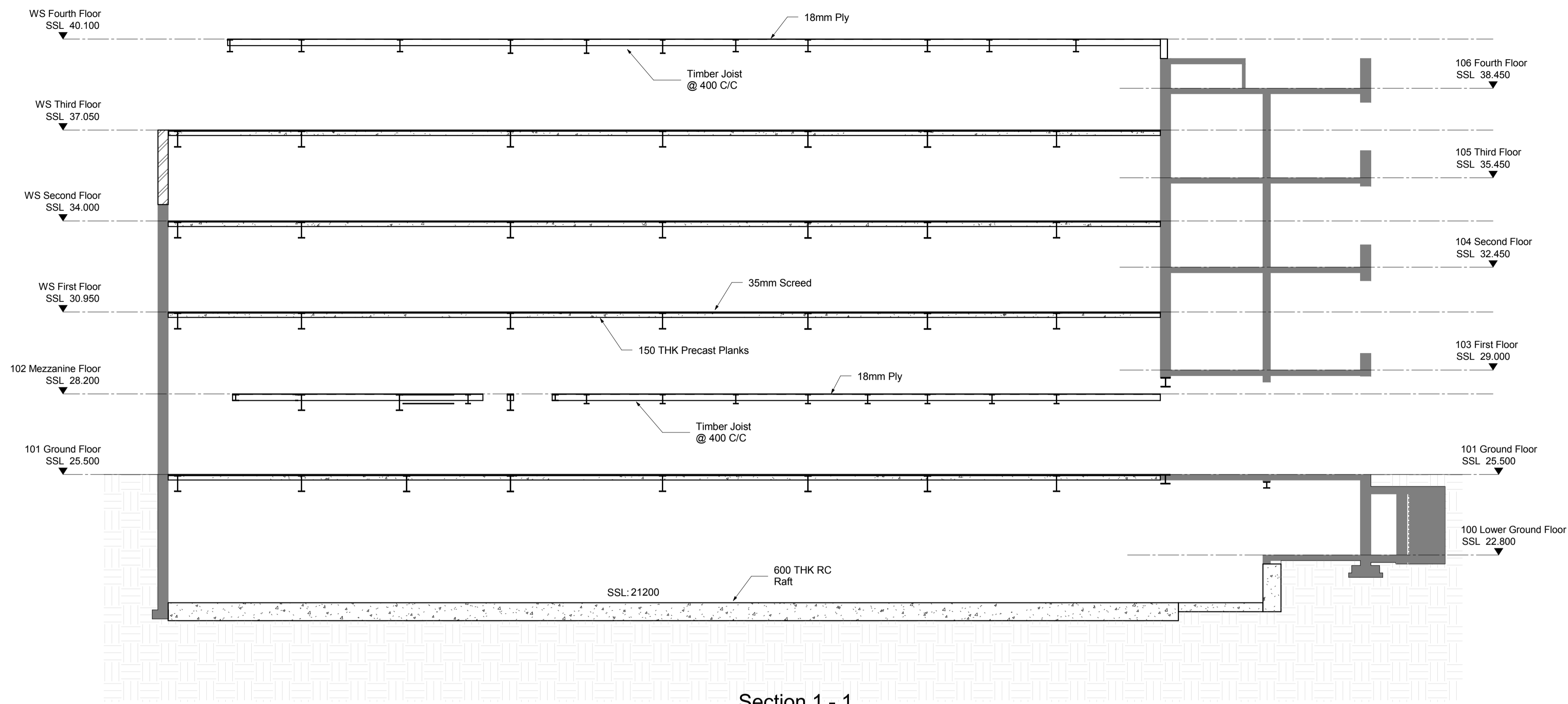
JOB No.  
 214312

DRAWING No.  
 107

REV  
 P3

NOTES:

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P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

STATUS  
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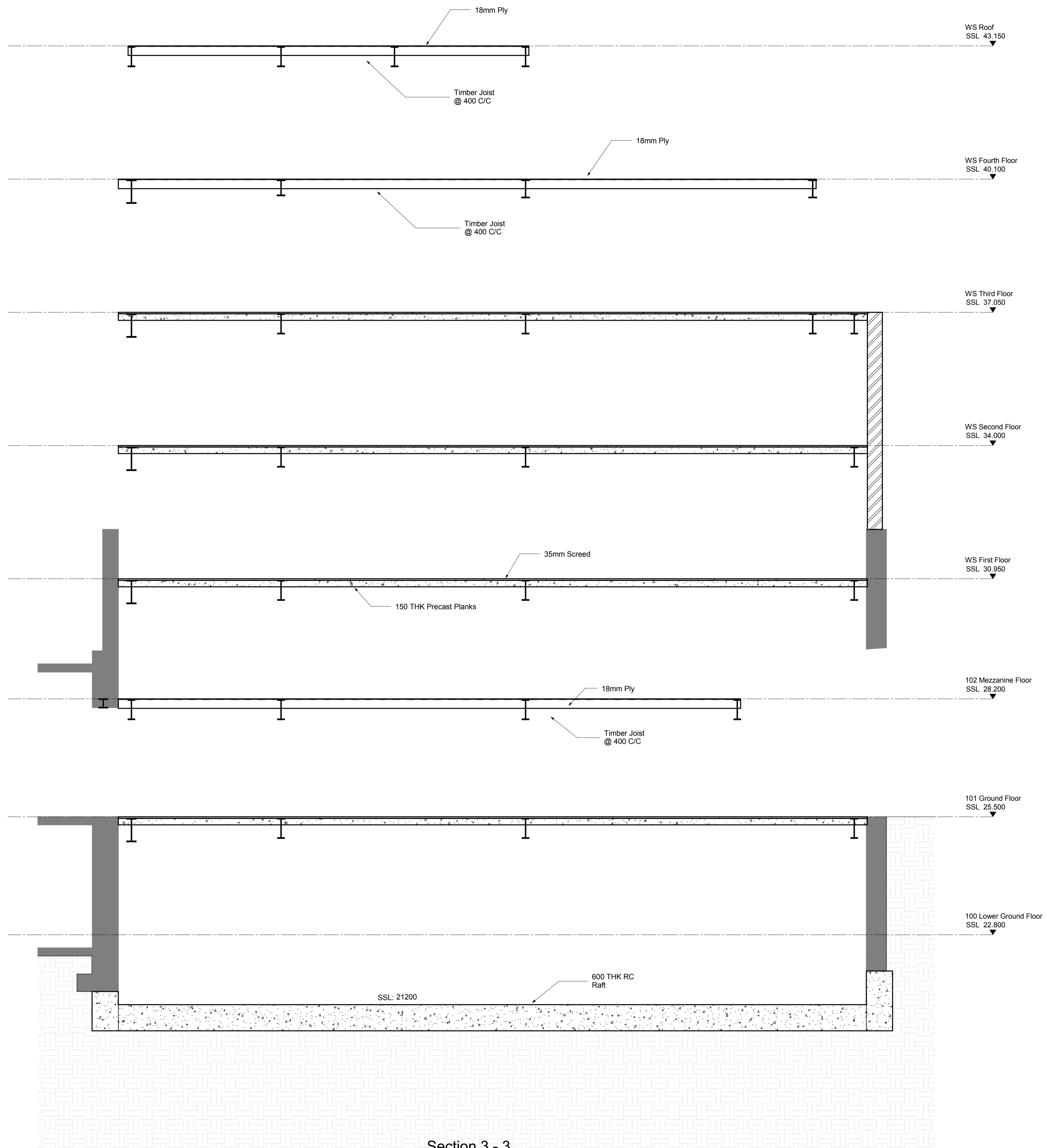
**mnp**  
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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED SECTIONS SHEET - 1**

SCALE @ A1 1 : 100	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3



Section 3 - 3  
( 1 : 50 )

NOTES:

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REV	COMMENTS	DATE	CHK
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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED SECTIONS SHEET - 2**

SCALE @ A1  
1 : 50

DATE  
04/09/2015

DRAWN BY  
PS

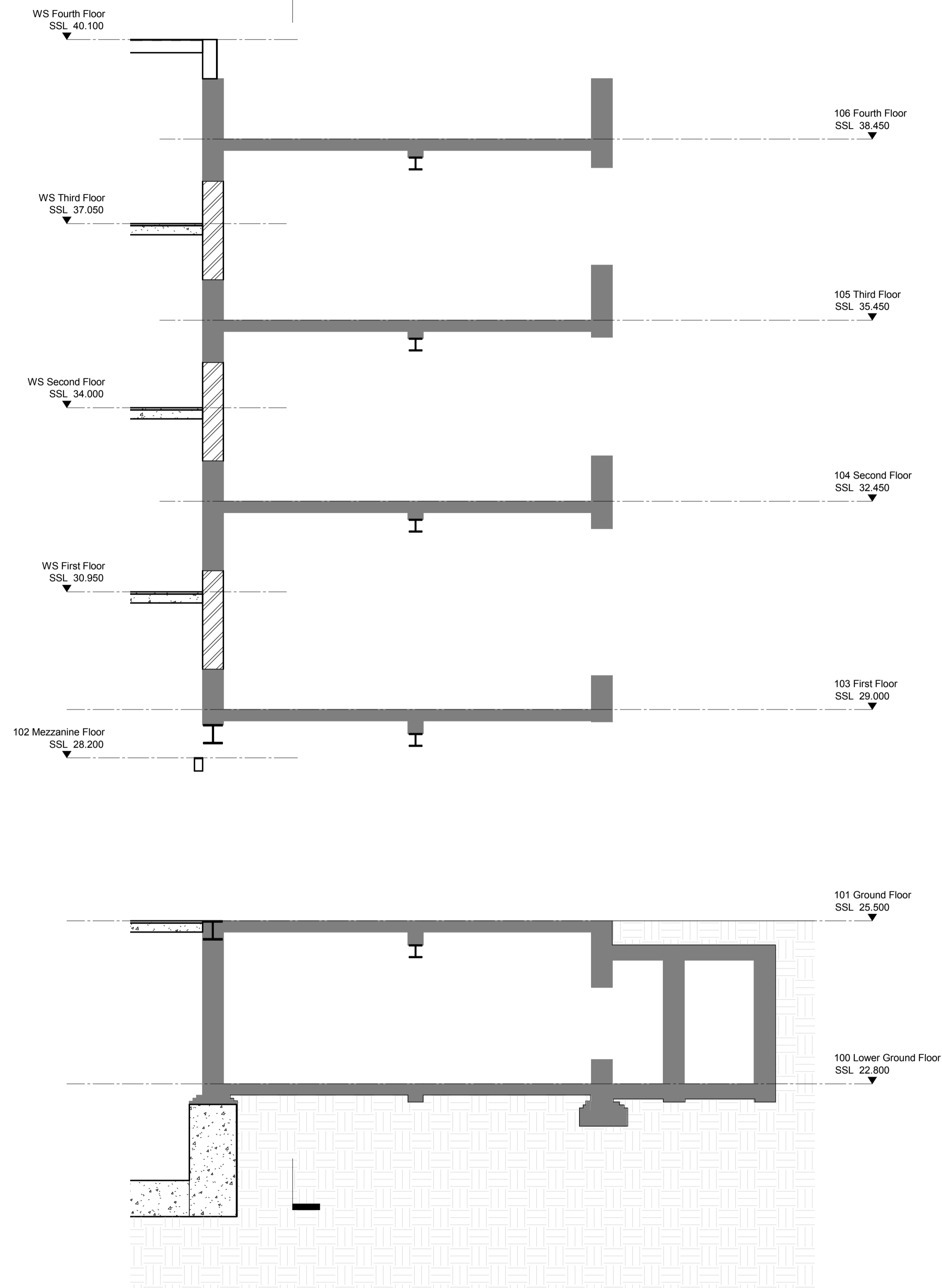
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JOB No.  
214312

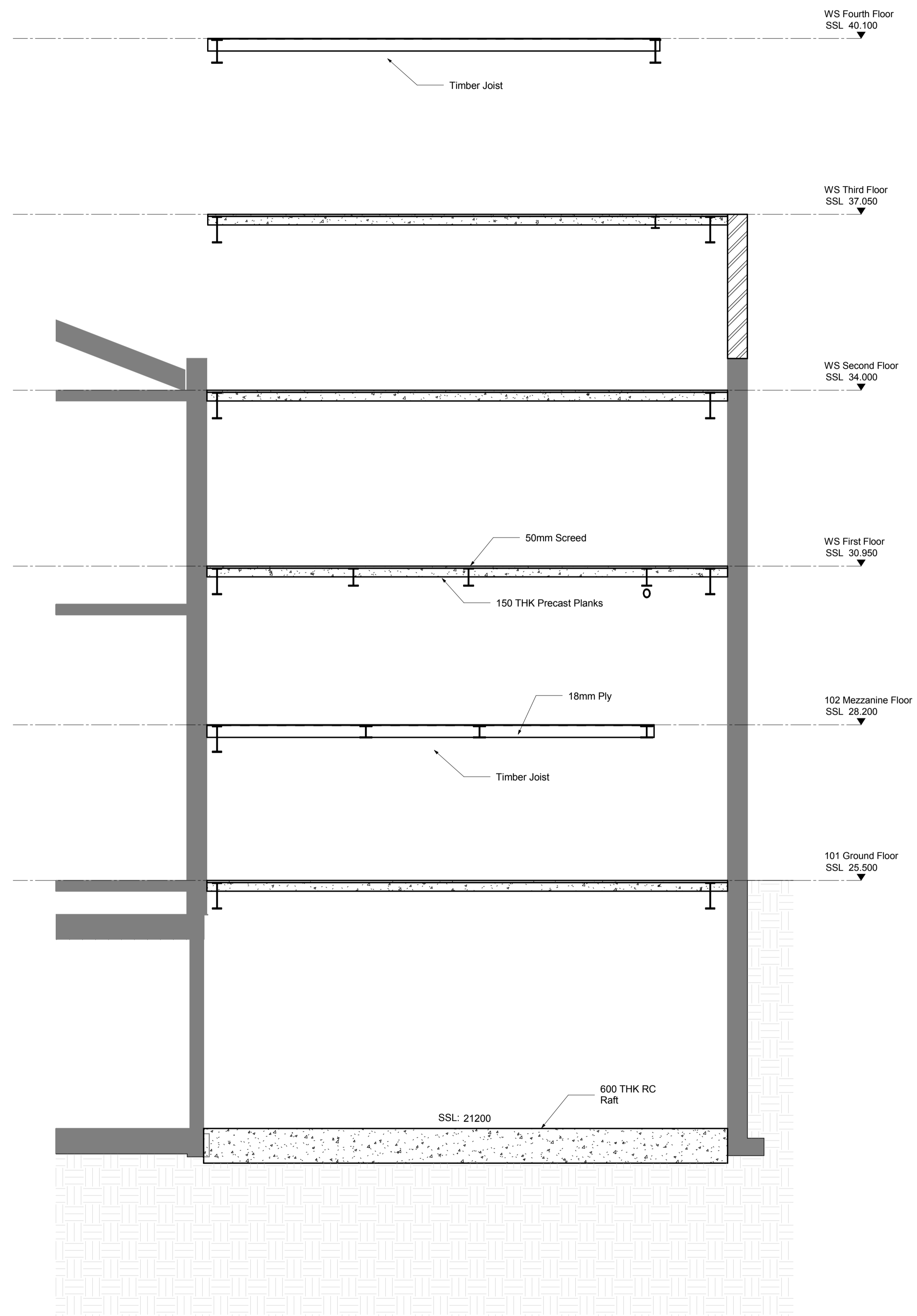
DRAWING No.  
201

REV  
P3

6  
203



Section 4 - 4  
( 1 : 50 )



Section 5 - 5  
( 1 : 50 )

NOTES:

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P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

STATUS  
**ISSUED FOR INFORMATION**  
Not For Construction

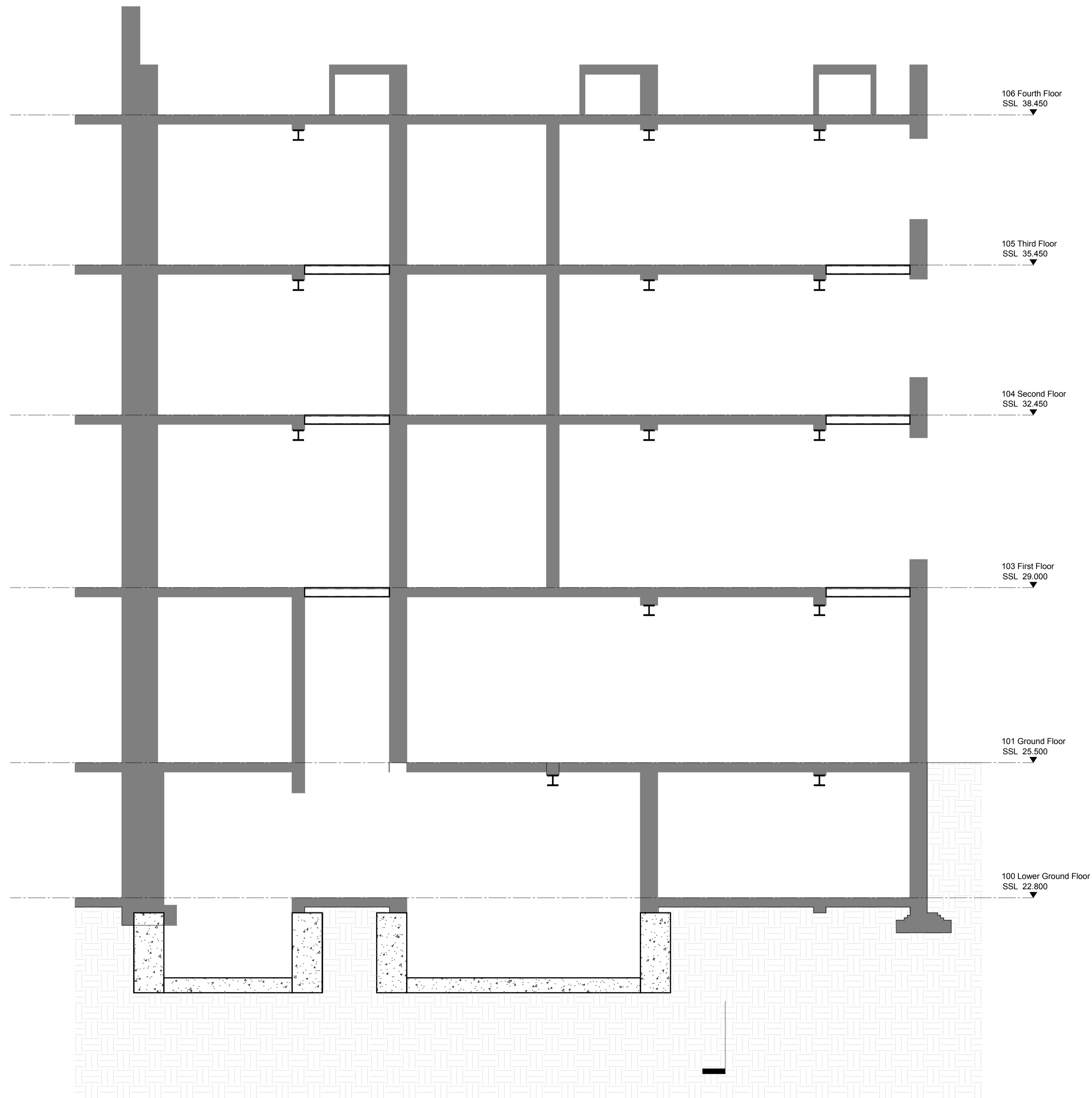
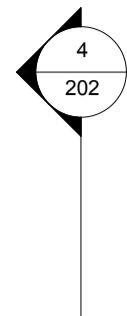
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**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED SECTIONS SHEET - 3**

SCALE @ A1 1 : 50	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3



Section 6 - 6  
( 1 : 50 )

NOTES:

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P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

STATUS  
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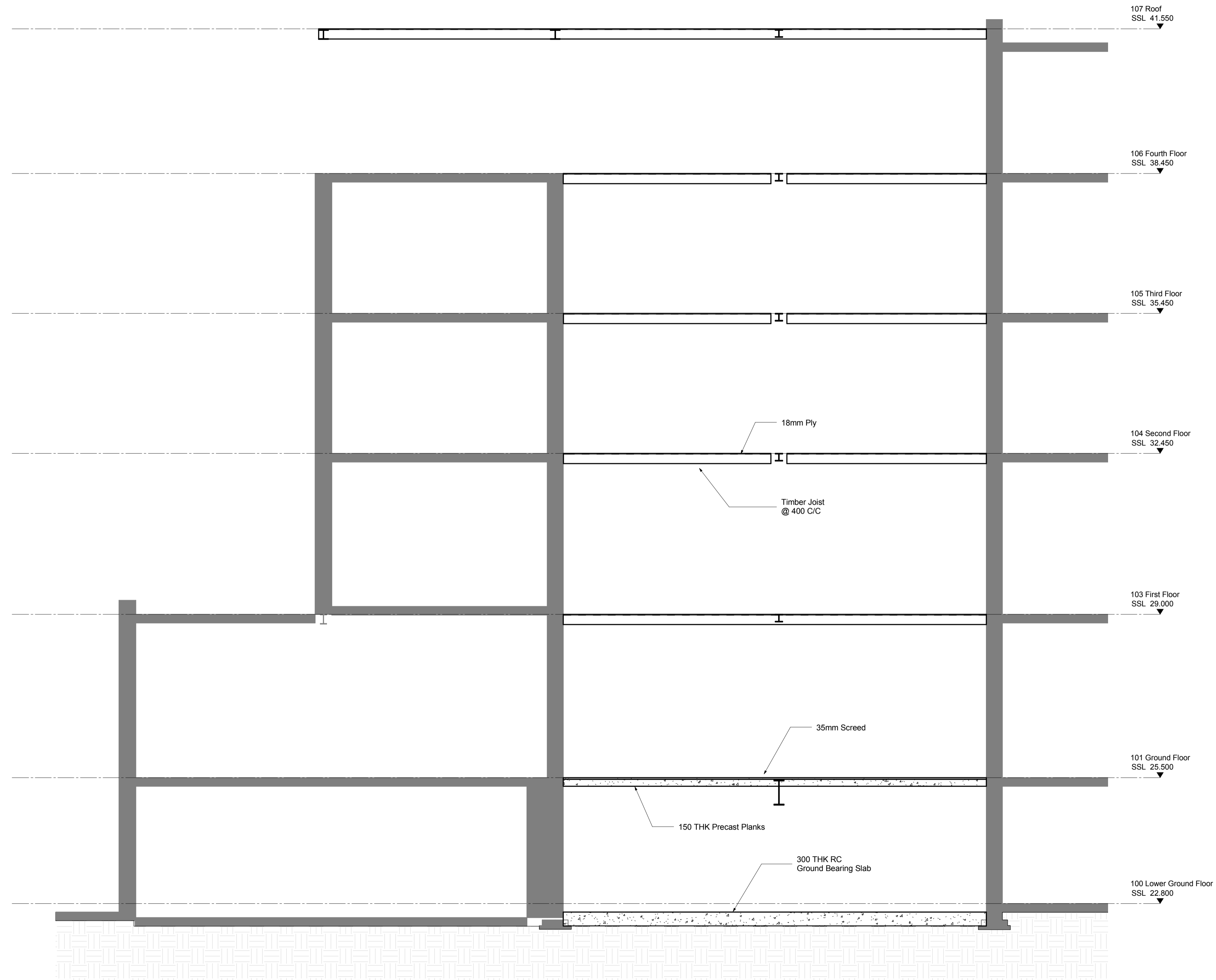
PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED SECTIONS SHEET - 4**

SCALE @ A1 1 : 50	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3

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Section 1 - 1  
(1 : 50)

P3	Issued For Planning	30/11/15	PS
P2	Issued For Information	17/11/15	PS
P1	Issued For Information	02/10/15	PS
REV	COMMENTS	DATE	CHK

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PROJECT  
**NEW OXFORD STREET**

DRAWING TITLE  
**PROPOSED SECTIONS SHEET - 5**

SCALE @ A1 1 : 50	DATE 04/09/2015
DRAWN BY PS	CHECKED BY SP
JOB No. 214312	REV P3