Camden Mixed Development Limited

GRAND UNION HOUSE

Structural Stage 2 Report

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Grand Union House is an existing mixed-use reinforced concrete building built in the 1980s along Kentish Town Road in Camden. Before then, the building used to house a large bakery that dated back to 1924.

The current building originally consisted of ground floor undercroft car parking, workshops and a small crèche to the south (16 Kentish Town Road). The workshops and creche have been converted into offices and two commercial units have been introduced.

The existing office building is a three storey reinforced concrete frame with a steel roof while 16 Kentish Town Road is a single storey construction. The basement of the office building is used as a car park for Sainsbury's and is to be retained and kept operational with minimal disruption during the construction of the proposed scheme.

The scheme was previously submitted for planning in 2018.

In 2020 a new scheme was developed. This broadly maintains the same concepts as the 2018 scheme with a few modifications:

- The Ground Floor is being converted from car parking to offices and commercial uses
- The Mezzanine floor extent has been updated
- The roof plan layout has been updated and the saw tooth shape in elevation has been removed.

Similar to the 2018 scheme, the new scheme consists of two buildings: a commercial building which utilises as much of the existing concrete frame as possible while increasing the number of stories and a residential building to the south where 16 Kentish Town Road is.

The commercial building is to have offices starting at Ground Floor and going up to the new Level 04. The residential building consists of three residential floors and commercial space at ground level.

The scheme requires the demolition of the existing roof and mezzanine floor and part of the Level 01 slab to the south where a new concrete core is being introduced.

The new 2020 scheme has been developed in line with RIBA Stage 2 in preparation for a new planning application.

1.2 PURPOSE OF REPORT

The purpose of this report is to record the development of the design through to the end of Stage 2, identifying assumptions, recording key design decisions and providing a platform for the on-going development of the design.

This report describes the current 2020 scheme as 'the scheme'. Reference to previous schemes is limited to only where specifically relevant.

2 THE SITE

2.1 LOCATION AND BOUNDARIES

The existing building was designed and constructed in the late 1980s as part of a large campus development that consists of:

- A Sainsbury's supermarket and atrium fronting Camden Road
- The workshops and crèche buildings alongside Kentish Town Road.
- A residential terrace beside the Grand Union Canal.
- A basement car park over most of the site.

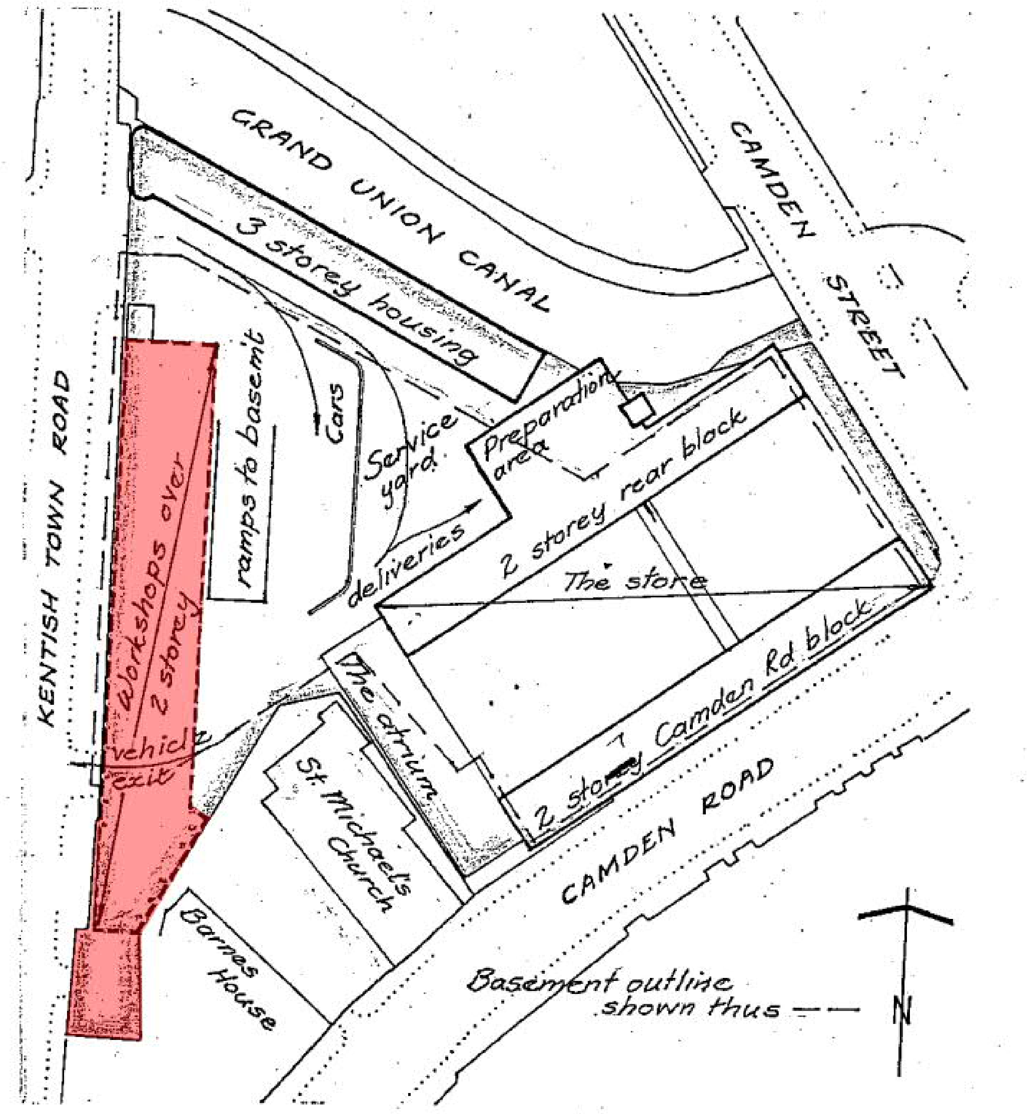


Figure 2-1 - The existing building highlighted on the site

2.2 SITE SURVEY

A survey of the existing building was undertaken by Plowman Craven in May 2017. The survey did not include the UKPN room.

A condition survey was undertaken by Watkinson + Cosgrave in May 2015. Key notes as shown below suggest the existing RC frame is generally in sound condition and suitable for re-use.

Concrete structure generally

"…our visual inspection revealed no evidence of significant cracking, deflection or other distress to the superstructure that would indicate failure of the foundation…"

and

"…there were no signs of cracking or deformation of the frameworks within the building…the exposed concrete is...in generally sound condition but no cover meter testing or testing for carbonation of the concrete was undertaken and in consideration of its age, it is recommended that such further investigation should be made in order to ascertain the exact condition of the concrete."

Columns

"…structural columns adjacent to the service road have evidence of localised vehicle impact and it should be confirmed that this has not affected the structural integrity. Consideration should also be given to providing local means of protection to the affected columns."

Asbestos

"Given the dates of construction it is possible that asbestos containing materials are present."

No asbestos documentation was forthcoming on site and it was recommended that the client's solicitors ascertain whether it exists and "…if not that a specialist be commissioned to undertake a detailed asbestos survey and to prepare an asbestos register."

2.3 KEY DEVELOPMENT CONSTRAINTS

The new development is to minimise any impact to Sainsbury's store operations. This means minimising any works in the basement car park and to allow deliveries in and out of the service yard. The design of the proposed scheme achieves this by:

- Retaining the existing RC structure from basement to Level 01 to allow the Sainsbury car park to remain operational during the construction works;
- Adopting a lightweight structural frame above Level 01 enabling additional storeys to be added without wholesale strengthening to the retained structure and foundations. The CLT floor panels allow the frame to be constructed more quickly than traditional methods to minimise construction time.
- Retaining the Level 01 structure allows the bridge structure over the delivery yard exit to act as a crash deck.
- An existing live below ground substation located immediately south of the bridge must be preserved and remain operational at all times.

2.4 EXISTING STRUCTURES/ DEMOLITION

The existing top storey/roof, mezzanine and part of the Level 01 structure south of the core is to be demolished. These areas are highlighted on WSP drawings GUH-WSP-DE-0M-DR-S-200101, GUH-WSP-DE-01-DR-S-200101 and GUH-WSP-DE-04-DR-S-200101.

One column to the north requires demolishing and replacing with a steel section to load the basement column concentrically. This is shown on GUH-WSP-00-00-DR-S-130101.

A column on the eastern elevation may need to be demolished and replaced depending on what the structural investigation works (see section 2.6) reveal the corbel/transfer detail to be. The column in question is highlighted on GUH-WSP-00-ZZ-DR-S-200303.

A new primary core (stairs and lifts) is proposed at the southern end of the office building. This will require local breaking out / demolition of the ground floor and first floor structure to enable the new core and its associated foundations to be constructed. Three new columns (plus two posts that support the mezz floor only) at Ground Floor are also required as part of this reframing that will also require local breaking out to form their foundations. Anticipated works are described in DDN S-010 Rev A.

At the far southern end the existing single storey building will be demolished to make way for the proposed residential block.

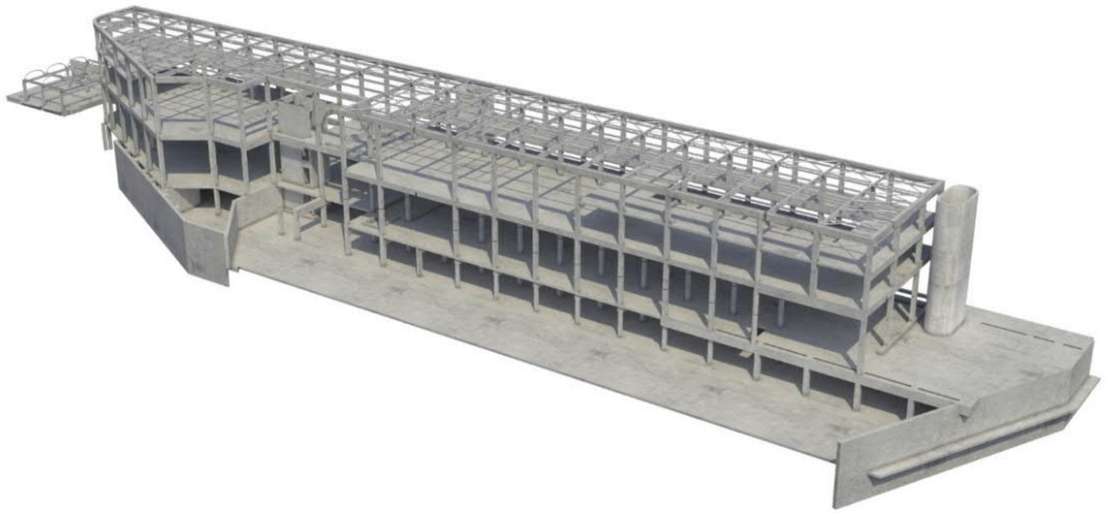


Figure 2-2 - A 3D model of the existing building constructed from record and survey information

Figure 2-3 - A 3D model of the existing building highlighting the structure to be demolished in red

2.5 STRUCTURAL INVESTIGATION WORKS – GEOTECHNICAL CONSIDERATIONS

A preliminary geo-environmental risk assessment (desk-study) has been produced by WSP (ref: WSP, "Grand Union House – Preliminary Geo-Environmental Risk Assessment (Desk Study)", First Issue, June 2018. This document highlights environmental and geotechnical risks and considerations, predominantly with respect to ground conditions.

A site-specific investigation is required to confirm the ground profile, engineering parameters, contamination levels to the south of the site and groundwater regime beneath the site. WSP has prepared the Site Investigation Specification (ref: WSP, "Grand Union House – Site Investigation Specification", Revision 1, June 2018) so the SI can be procured.

The strategy is to re-use the current foundations beneath the office building. New foundations are required for the new core and three columns (plus two posts that support the mezz floor only) at the southern end of the office building. Pad foundations are proposed. These will need to be founded on suitable strata at a similar formation to the current foundations. The geotechnical engineer will need to review the short and long term settlements from the demolition and construction works from the change in loads and check the foundations have an appropriate allowable bearing pressure and factor of safety for the new development.

The client will need to obtain the relevant insurance for the new building to be supported on the historical foundations.

The new residential building and south office core will require new foundations. A site investigation will be required so these can be designed. The differential settlements between the old and the new structure will need to be assessed to ensure they are within the structural tolerances.

The following further works will be required:

- An enabling works package should be allowed to remove all obstructions. This is likely to only be relevant in the southern area of the site where new foundation will be required for the residential building and new south office core;
- A site investigation will be required to confirm the ground and groundwater regime beneath the site;
- A Ground Investigation Report (GIR) will be required in accordance with the Eurocodes;
- A Geotechnical Design Report (GDR) will be required in accordance with the Eurocodes for the foundation design;
- A risk assessment will need to be completed to confirm the structures / assets at risk from ground movements and which assets will require a Ground Movement Assessment (GMA) to be completed. Liaison with the adjacent asset holders will be required to discuss ground movements, monitoring strategy, and any remedial measures required or Monitoring Action Plans (MAP) which will be required to be implemented during the works. The listed buildings on site will also need to be accounted. The critical structures are likely to be:
  - **i.** LUL assets
  - **ii.** Party Wall Structures
- Early liaison with Thames Water is recommended. Particularly associated with the unknown sewer present on the historical foundation drawing.
- Early liaison with the party wall engineer is recommended to determine their ground movement assessment, monitoring and condition survey requirements.
- Early liaison with TFL is recommended to determine their correlation survey, ground movement assessment, monitoring and condition survey requirements.

Based on the information contained within this report, and with due regard to the geotechnical aspects of the proposed development, it is the opinion of WSP that the site represents a **LOW / MEDIUM** risk with respect to development issues.

2.6 STRUCTURAL INVESTIGATION WORKS – STRUCTURAL CONSIDERATIONS

A Structural Investigation Specification will be produced at the start of Stage 3. It is necessary to carry out intrusive and non-instructive investigations of the structural frame and foundations for the following reasons:

2.6.1 TO PROVE THE ACCURACY OF THE RECORD INFORMATION

The current assessment of the structural capacity of the existing frame is based on a set of record drawings and a report. During this design stage it has been discovered that even Construction Issue record drawings do not always reflect what has actually been constructed on site. In addition, the record information is incomplete and an educated guess has had to be made when producing existing structure GAs at this design stage. Any missing/incomplete information has generally been highlighted on the Structural Stage 2 set of drawings and include the following:

- The central half of the building's foundation plans are missing. We have interpolated what the likely size of the pad footings are based on the column and pad sizes from the plans we do have either side of the area of missing information. To the south, the drawings show conflicting information on the position of a pad foundation.
- Only the northern third of the ground floor structural plan is available. We have interpolated what the remaining two thirds are based on an existing column schedule and the Plowman Craven survey. To the South, the drawings show conflicting information on the position of two columns. A corbel detail or transfer is implied on the eastern elevation but no details on it are available.
- The 1st floor bridge structure has clearly changed since the construction issue drawings or has been modified afterward. A column position to the North has also changed.
- Column reinforcement information is incomplete.

A structural survey is therefore required to prove that the record information is generally correct where there are no differences between them and what has been built and to investigate the differences and confirm that our assumptions of the missing information were correct.

2.6.2 TO ASSESS THE CURRENT CONDITION OF THE CONCRETE FRAME

The condition of the concrete frame and its suitability for increased service life needs to be assessed considering the investment that is to be made into redeveloping the building. The majority of the concrete frame to be re-used is generally exposed and is in an environment with a BE EN ISO 12944: Part 2 and SIO 9223 corrosivity risk category of **C3 – MEDIUM.**

The durability and condition of the current concrete and its ability to continue to provide protection to the internal reinforcement steel as well as the condition of said reinforcement is critical to ensuring that the existing structure is suitable for an increased service life.

2.7 RETAINED INFRASTRUCTURE AND SERVICES

The Northern Line runs below Kentish Town Road, and the Fleet Storm Relief Sewer runs below Camden Street but remote from the site. An oval brick sewer crosses the side to the south, passing below existing foundations.

2.8 HISTORIC USE OF SITE

The site has been developed for various uses over the years and from 1924 to 1984 was a major bakery. Demolition of the bakery buildings was completed during the winter of 1986/7.

3 SUBSTRUCTURE

3.1 RETAINED BASEMENT WALLS

The existing basement wall is likely to be reinforced concrete but its thickness, reinforcement and concrete specification and grade are unknown.

The record information suggests that the majority of the walls along Kentish Town Road pre-date the current building and were originally constructed for the bakery. A visual inspection revealed these walls to be in poor aesthetic condition and that parts of the wall have water ingress.

A new wall was constructed along the rear of the UKPN room on gridline W07 and sits on a two metre wide strip footing. It is possible that this wall is retaining soil and/or backfill to the south.

3.2 BASEMENT SLAB

An existing reinforced concrete raft approximately 750mm thick formed the foundations to the old bakery. The record information suggests that 'infill concrete' was cast over the full plan area of the raft, however its thickness is unknown and will be confirmed by the Geotechnical Site Investigation Specification survey (section 2.5) and the Structural Investigation Specification survey (section 2.6).

3.3 GROUND FLOOR

The existing ground floor structure is generally a 250mm thick reinforced concrete slab spanning between downstand beams. The record information suggests that the road slab leading in/out of the service yard is 300mm thick. There are no finishes to the external road slabs. Therefore, no new finishes can be added to the structure.

3.4 BASEMENT WATERPROOFING

3.4.1 WATERPROOFING GRADE

British Standard BS8102 (Protection of structures against water from the ground), defines three grades of basement waterproofing depending on use:

Table 3-1 - Waterproofing Grades

Use	BS 8102 Grade	Performance level
Car Parking and plant rooms areas (excluding electrical rooms)	1	Some seepage and damp areas tolerable, dependent on the intended use. Local drainage might be necessary to deal with seepage
Plant rooms requiring a dryer environment and storage area	2	No water penetration acceptable Damp areas tolerable; ventilation might be required
Ventilated residential and commercial areas (habitable space)	3	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

In general, given that the basement and its use is to be retained, the existing waterproofing should achieve a Grade 1 suitable for car parking.

The UKPN room in the basement should achieve a Grade 3 considering the electrical nature of the plant within. The room is ventilated but the extent of the room's waterproofing performance level is currently unknown.

We recommend the basement car park and UKPN room are inspected and that the client and rest of the design team are happy that the current performance of the basement is acceptable.

4 FOUNDATIONS

4.1 FOUNDATION DESIGN PRINCIPLES

The existing structural concrete frame columns are supported on RC pad footings. The record information indicates that the footings were cast directly on top of the older raft foundation that was left in place with the intention that the load passes through the original raft foundation to the bearing strata.

The proposed office building has the same column grid as the existing building, therefore the intention is to re-use the existing foundations.

At the southern end of the office building, where a new core is proposed, a new 600mm thick RC raft foundation will be required. Three new columns are also required in this area that will also need new pad foundations. The extent of these new foundations are shown on drawing GUH-WSP-00-B1-DR-S-160101.

It is assumed that the existing foundations in this area are at the same level as the foundations in the basement car park in order to reach a suitable bearing strata and that they were then back-filled with loose material to the underside of the ground floor slab.

The new foundations for the new core and columns to the south of the building will also need to be founded at a similar level (circa +22.0m AOD). Deep excavations will be necessary to reach the formation level. Sheet piles are likely to be required to form the excavation for the new foundations.

New foundations are also required for the residential building. The foundations will comprise of ground-bearing strip footings bearing on suitable strata with a suspended RC slab forming the Ground Floor. It is assumed these foundations would need to be founded at a similar formation level. This will be verified from the SI.

The record information has been used to estimate the capacity of the existing foundations. However, since it is incomplete and conflicting in parts, radar and intrusive surveys will be required to determine what has been constructed on site.

4.2 PRELIMINARY ASSESSMENT OF ALLOWABLE BEARING PRESSURES

A site investigation report conducted at the time of the design of the existing building recommended a safe bearing pressure of 200 kN/m². However, the record information states that taking into account both loading and settlement criteria, an allowable soil bearing pressure of 150 kN/m² was adopted for design of the pad and strip footings. This value shall be adopted as the allowable bearing pressure for the current design.

The capacity of the foundations has been calculated assuming a 45 deg spread through the raft with an assumed depth of 750mm to mobilise a wider foundation base.

The depth of the original raft will need to be verified during the SI to substantiate these design assumptions.

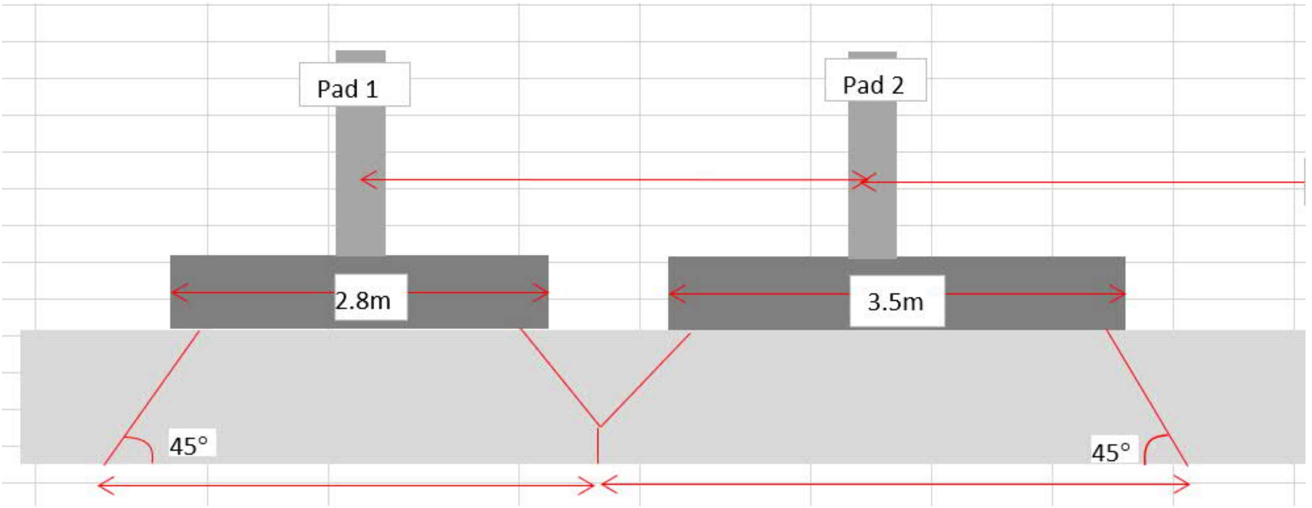


Figure 4-1 - Pad foundation detail

4.3 EXISTING FOUNDATIONS

4.3.1 RE-USE OF EXISTING FOUNDATIONS

AS described in Section 4.1, the foundation strategy for the new building is to re-use the existing pad and strip footings within the bounds of the Sainsbury's car park and UKPN room without modification.

4.3.2 BENEFITS OF FOUNDATIONS RE-USE

There are considerable economic, programming and sustainability benefits to be gained by re-using the existing foundations. Benefits that will arise are listed below:

- Reduction in the construction programme;
- Less demolition required to columns supporting superstructure over;
- Less risk arising from obstructions in the ground;
- Lower foundation costs;
- Ground congestion would be minimised. This is important for the very long term future and value of the site;
- Preservation of archaeology: by minimising new ground works the risk to any existing archaeology is reduced;
- Reduction of new foundation works and therefore of embodied energy.

4.3.3 BRE CONSIDERATIONS FOR THE RE-USE OF FOUNDATIONS

Considerations for the re-use of foundations will need to include the following items;

- Quality of design information on the existing foundations;
- Integrity of the existing foundations;

- Design responsibility and insurances;
- Impact of demolition of the existing building on the foundations;
- Load carrying capacity of the existing pads

4.3.4 RISKS AND RISK MITIGATION

Various measures should be put in place to mitigate the risks associated with this approach:

- Involvement and acceptance of the client and the client's insurers
- Involvement and acceptance of the approach by the District Surveyor
- A site investigation should be carried out to verify soil design parameters to confirm the geotechnical capacity of the existing footings.

It is considered that the above items can be addressed through well established procedures. The record information is comprehensive and there is no requirement for additional basement area. It is therefore cost effective to re-use the existing basement walls and existing footings for the new development.

5 SUPERSTRUCTURE

5.1 OFFICE BUILDING

5.1.1 INTRODUCTION

The basement, Ground Floor and Level 01 slab are all to be retained as described earlier in this report. The existing roof and mezzanine floors will be demolished down to Level 01 slab level and replaced with three new floors (Level 02 to 04) plus roof. The new frame will spring off the Level 01 slab with all columns and core walls located on the existing column grid to ensure the original load paths remain unchanged.

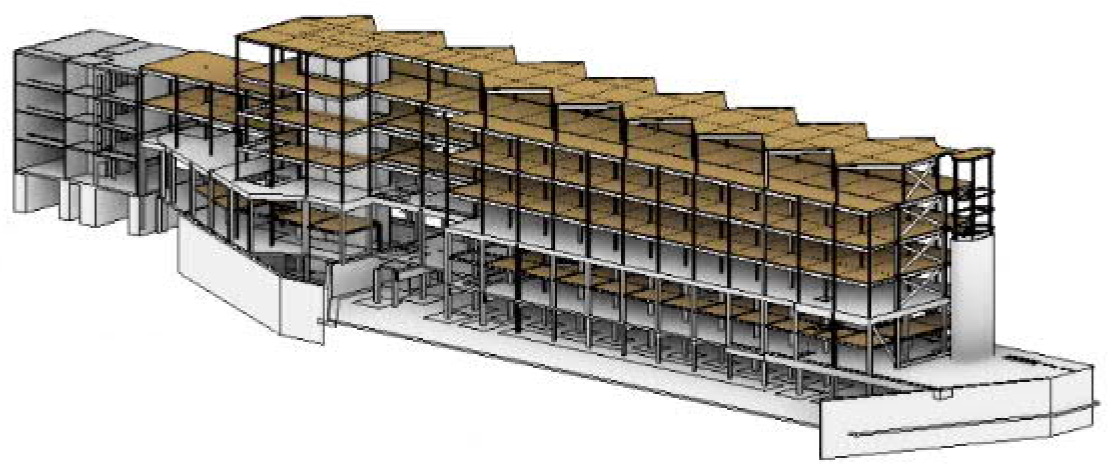


Figure 5-1 - 3D view of proposed structural frame

5.1.2 TYPICAL OFFICE FLOOR CONSTRUCTION

The new office building comprises three new stories plus roof. The new superstructure is a steel frame with Cross Laminated Timber (CLT) floors. CLT has been chosen to keep the new building weight to a minimum to ensure the existing foundations are not overloaded. CLT also provides a desirable soffit finish allowing exposed soffits without suspended ceilings.

The existing building column grid will be maintained. The typical grid spacing longitudinally is 4.8m centres (north-south). Across the building width (east-west) it is divided into three bays, two edge bays of 4.2m span and a central bay of 7.2m span.

Steel beams need to have a minimum 150mm wide flanges to provide a safe bearing width for the CLT floor planks. For the 7.2m central span, a 406x178 UB is provided. Web openings are provided to allow services to pass through. For the shorter edge bays, service web openings are not required for services distribution so lighter 356x171UB beams can be adopted. Refer to Section 5.1.11 for further explanation regarding services distribution.

The CLT floor spans east-west typically. A 160mm thick CLT plank is required for the typical 4.8m span. A deeper CLT floor is required in local areas with increased floor loads e.g. the roof terraces and plant rooms. The CLT floor planks must be mechanically connected to the beams to provide adequate diaphragm action. This will be discussed in Section 5.1.3.

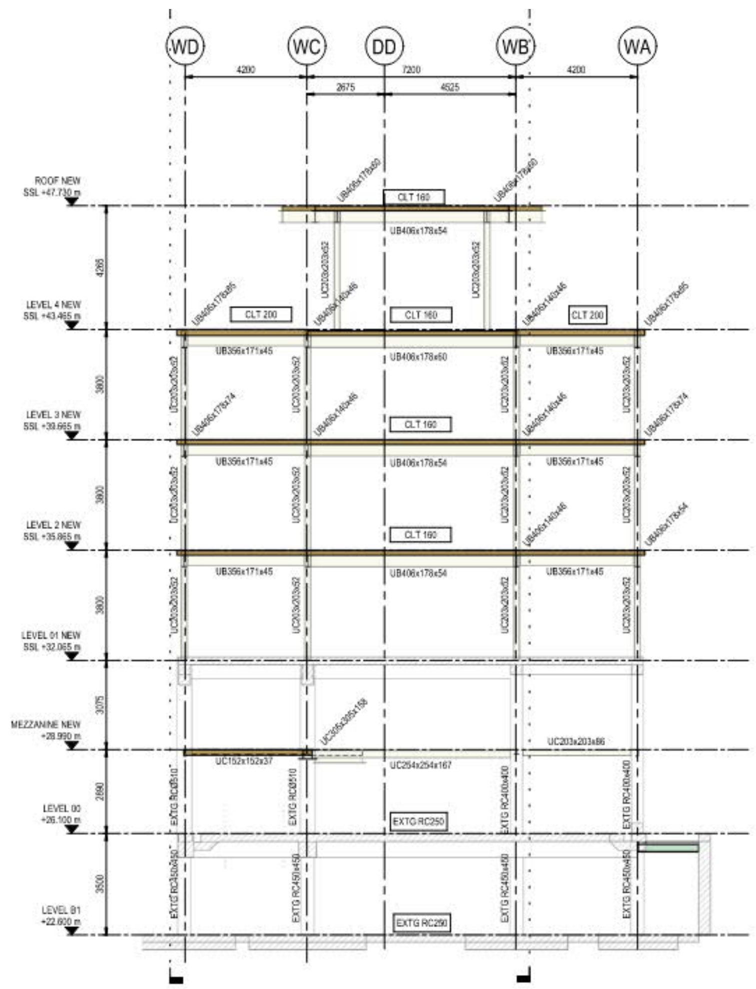


Figure 5-2 - Typical building cross-section

5.1.3 OFFICE BUILDING STABILITY

The office building is a ‘braced’ frame whereby the lateral stability is provided by a combination of a new southern RC core and braced steel frames at the north gable end and around the central staircase. The new southern core consists of RC shear walls around the new lift shafts and risers. This is discussed in more detail in Section 5.1.9.

Stability of the top floor/roof is provided by portal frame action with alternate bays acting as a goal post frame.

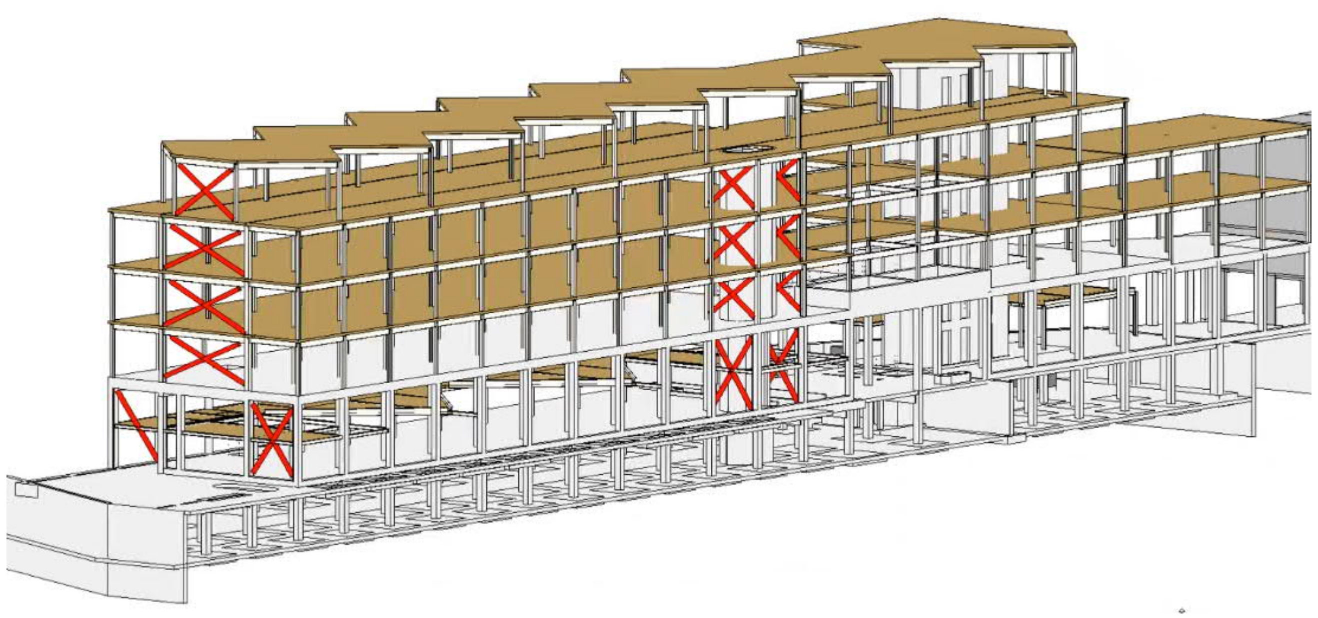


Figure 5-3 - Lateral stability/bracing system

Wind loads acting on the building are transferred to the floor slabs from the cladding via the cladding brackets. The CLT floor slabs act as stiff diaphragms to transfer the in-plane wind loads to the core and vertical braces. The CLT floor planks must be mechanically fixed to the steel beams to ensure diaphragm action. Regular fixings through the bottom flange /shelf plate into the CLT planks will be provided to achieve this.

The new southern core comprises 200mm thick RC walls. The diagonal cross bracing is typically 250SHS struts. The north gable end of the building is cross-braced in the middle bay from Level 01 to Roof. Below Level 01, the bracing transfers to the two edge bays to make space for door openings in the middle bay at Ground Floor. Door and window openings are positioned to avoid the diagonal bracing members.

At ground floor the wind horizontal base shear forces distribute through the existing ground floor slab and into the existing cores and perimeter basement walls. The additional loads on the foundations due to wind loads remain within the capacity of the existing foundations.

5.1.4 ROOF

The top storey sets back with a zig-zag east and west elevation as shown in Fig 5.4 creating individual triangular external roof terrace pods.

The columns that support the roof step in from the typical column grid and transfer off the floor beams at Level 04. These beams are therefore slightly heavier than on the floors below to support the additional point loads from the roof frame.

The roof slab comprises 160mm thick CLT planks and supports a green roof and PV panels. The roof is only accessible for maintenance.

Figure 5-4 - Main roof plan

5.1.5 EXTERNAL TERRACES

External terraces are created at Level 04 by the set back roof along the east and west elevations as described in Section 5.1.4. Due to the increased loads for landscaping and communal terrace live loads, a thicker CLT floor is required. A 200mm CLT floor is required between grids WA-WB and WC-WD. The typical build-up for the terraces is as shown in Figure 5.5. It is critical the landscape loading agreed is not exceeded on these terraces.

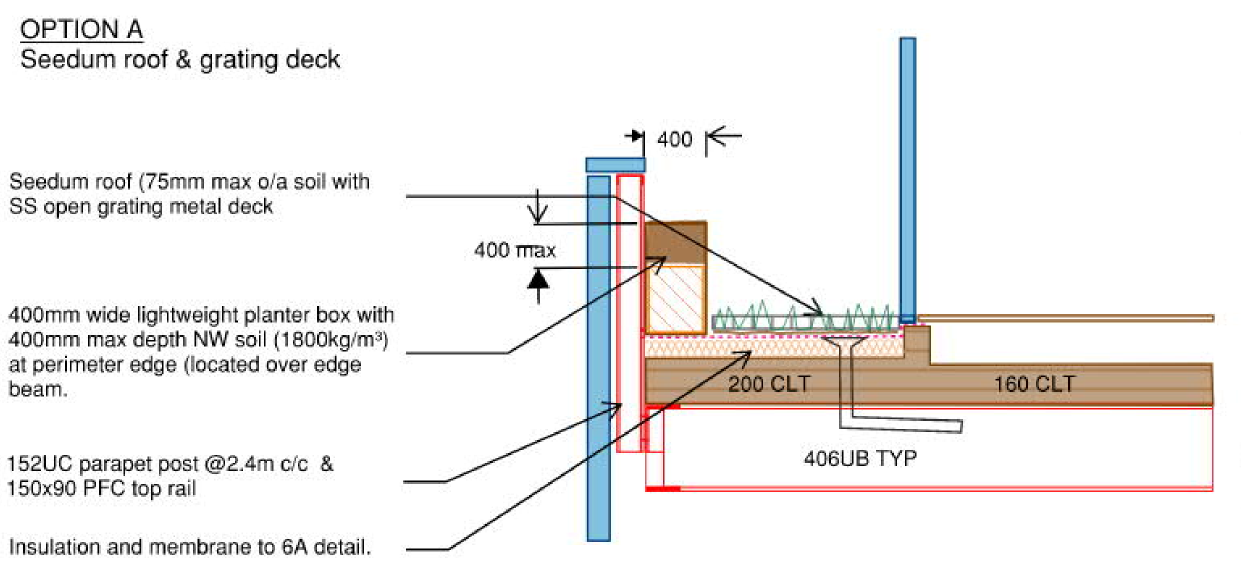


Figure 5-5 - Level 04 typical terrace build-up

There is also an external terrace at Level 03 at the southern end of the building as shown in Figure 5.5 above. The CLT floor at this location is 220mm thick to account for the increased loads from landscaping, large trees and communal terrace live loads.

At Level 01 at the southern end of the building, there is a non-accessible roof garden on the east elevation. This roof garden is constructed on the existing Level 01 RC slab and therefore the load that can be accommodated is limited by the existing loading allowances/capacity. This roof garden can support 600mm of light-weight soil and a live load of only 0.6kN/m^2 to allow for maintenance access.

It should be noted that this space cannot be converted into an accessible terrace as the existing structure would not be capable of supporting the additional loads.

5.1.6 COLUMNS

The columns forming the braced bays/cores are typically 254UC and 305UC. All other columns are gravity only columns and therefore only attract nominal pin-end connection moments. The gravity columns are typically 203UC.

Strengthening to some of the existing concrete columns is discussed in Section 5.1.12.

5.1.7 MEZZANINE (LEVEL OO M)

A new mezzanine floor is introduced at Ground Floor in the north part of the office building. The new mezzanine floor will provide additional office space and the two wings on the north and south of the building are for plant and auxiliary use.

There is insufficient headroom for the mezzanine floor construction to follow the typical floor arrangement i.e. floor beams directly beneath the CLT floors. A 'Slimflor' style arrangement is proposed using shallower UC sections with a shelf plate welded to the bottom flange to support the CLT floor planks allowing the beams to be nested within the floor depth as shown in Figure 5.6:

The mezzanine CLT slab is 160mm thick typically for office areas and 200mm thick in the plant rooms. Deeper long span beams at the perimeter protrude into the raised floor zone.

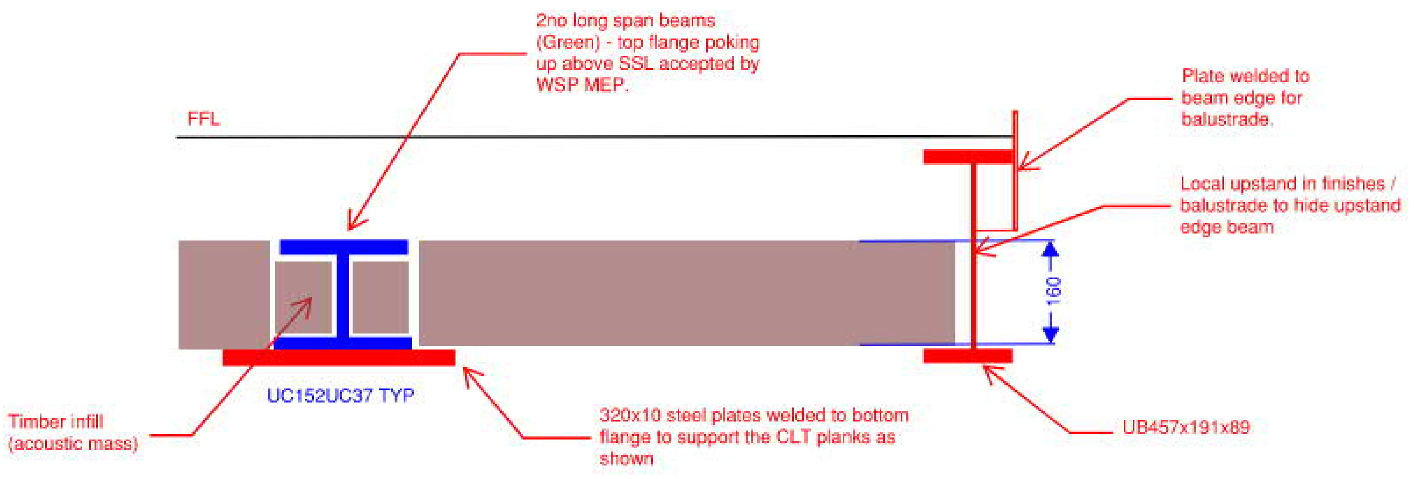


Figure 5-6 - Typical section through mezzanine structure

5.1.8 ATRIUM GARDEN

At Level 01, above the bridge (between grids WA-WB and W7-W10), a triple height atrium greenhouse space is proposed.

New RC upstand beams will be used to strengthen the existing structure at that level in order to support the additional load from 1100mm light-weight soil and large trees as shown in Figure 5.7:

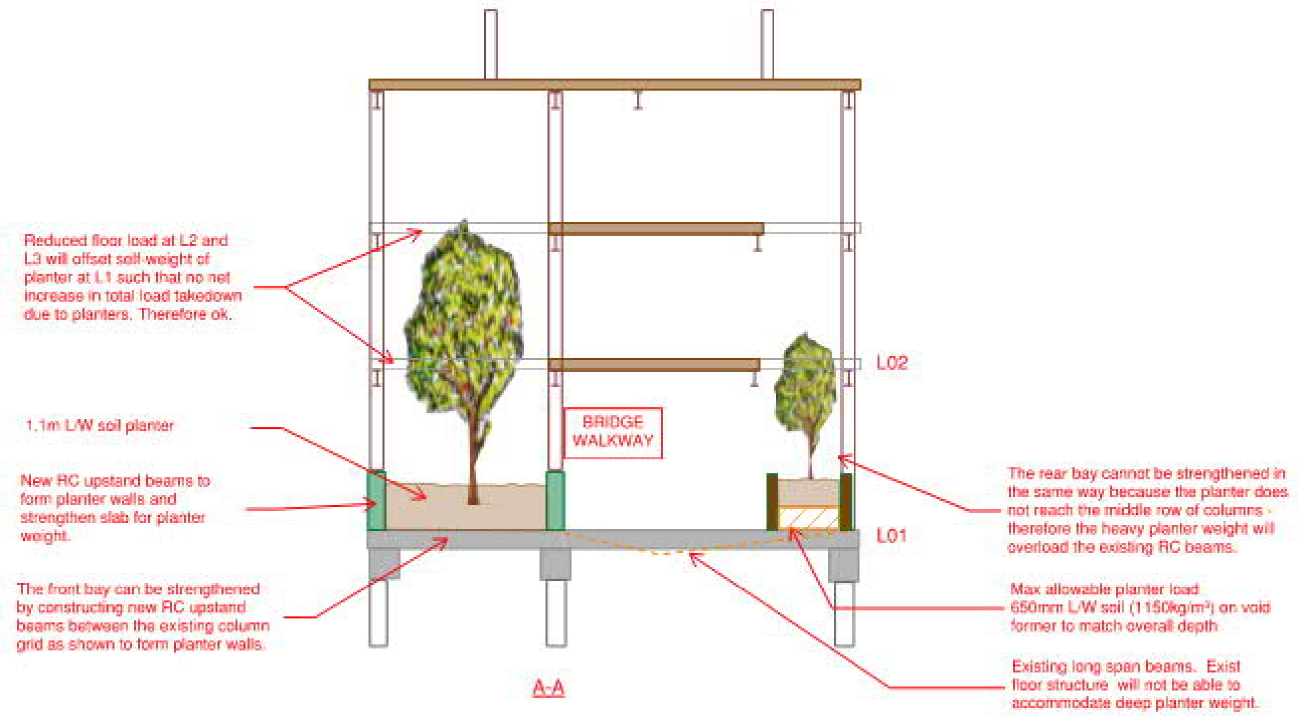


Figure 5-7 - Level 01 Atrium internal garden

At Level 01, the north side of the bridge structure is a longitudinal movement joint. However, it appears to have been modified or changed since it was construction-issue record drawing. The effect of this modification and the movement joint on the stability of the frame is to be investigated on site during the survey works.

A movement joint is not considered necessary for the new steel frame building so it is preferable to omit the movement joint altogether. This could be achieved by connecting a steel plate across the joint. This will be investigated further after the site survey/investigation.

5.1.9 SOUTH CORE

At the south end of the office building, a new lift and stair core is proposed. RC walls will form the main core around the lift shafts and risers. Walls are 200mm thick above ground and 300mm thick below ground. The adjacent stair will be framed in steel.

The existing RC structure will be retained up to and including Level 01. Openings in the Ground Floor and Level 01 slab will need to be formed to allow the core to be constructed. At Ground Floor an oversized opening will be required to allow the core foundation to be constructed. Temporary sheet pile formwork will be required to retain the excavation down to formation level. The Level 01 floor beams and slab will require propping until the slab is re-connected onto the new RC core. Refer to DDN S-010 Rev A for outlined requirements.

Three new columns are also required in this area to support the rear (eastern) edge of the building as the massing steps back at Level 01. Two new additional posts are required to support the mezzanine floor edges on grids W02 and W04. These posts will be supported on the same new foundations for the three new columns discussed above.

Levels 02, 03 and 04 will be steel and CLT construction as described earlier in the report.

The temporary work to facilitate the breaking out and propping of the existing structure to form the new core and columns will be challenging logistically and will likely be on the critical path. An option of installing mini piles in lieu of deep excavations to a suitable bearing formation is worth considering once the SI has been concluded and the ground conditions are known.

5.1.10 CLADDING INTERFACE

A curtain wall system will be adopted where the cladding is hung from the structure at each floor with each floor supporting a single storey of façade. The façade shall transfer only vertical and horizontal loads to the structure. The perimeter beams have not been designed for any torsional loads from the cladding system. Cladding will be supported on a plate bolted or screwed into the CLT floor panels. Cladding shall not be connected to bottom flanges of perimeter beams.

Perimeter/edge beams supporting cladding for the commercial building will be designed to ensure that the mid-span deflection due to live load does not exceed the values given in Section 7.7, typically 5mm.

It should be noted that this is an onerous deflection criteria well in excess of typical L/500 (max 12mm) deflection criteria for most curtain wall. This should be reviewed in stage 3 to see if a relaxed deflection limit can be considered which may allow edge beams to be reduced.

5.1.11 MEP SERVICES INTEGRATION

The services distribution typically occurs in the raised floor but also at high level.

For Levels 02-04 of the office building, web openings through the steel beams will be provided for comms and VRF pipes. The main longitudinal distribution route will be down the central 7.2m bay and branching off into each edge bay. Additional openings 200x600wide are also provided through the beams on gridlines WB and WC. The web openings in the central bay beams will be similar to that shown in Figure 5-8.

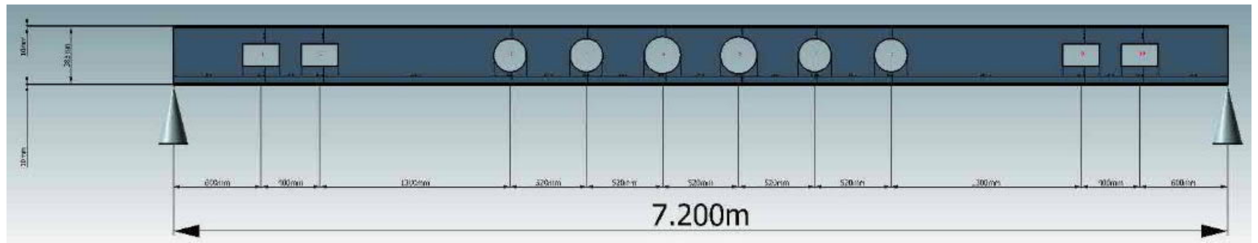


Figure 5-8 - Typical MEP openings through middle bay beam

5.1.12 EXISTING COLUMN STRENGTHENING

The existing RC columns up to the underside of Level 01 will be retained to support the existing Level 01 slab. The columns that form part of the lateral stability system (7no total), will need to be strengthened. It is proposed to strengthen these columns by bolting 2no PFC 380x100x54 (channels), one to each side of the column up their entire height. For the corner columns, only a single PFC is required fixed to the internal face so it will not compromise the cladding zone. This strengthening method will also assist the connection to the steel bracing as this can be a simple steel to steel connection.

One further column beneath the bridge may require strengthening – it is very close to capacity at present. As this column is external and exposed, a different strengthening method will be required. If required, we propose to increase the concrete sectional area applying additional 50mm of concrete all round with a rebar wrapping mesh.

No further strengthening to any existing columns is required.

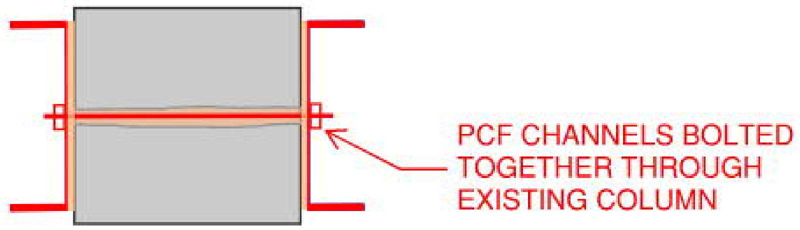


Figure 5-9 – Strengthening to existing Ground Floor columns

An existing column (EX23) is to be demolished and replaced by a concrete encased steel column nearby on gridline WC/22. This is necessary to load the column below concentrically since the transfer beam supporting the existing column above does not have sufficient capacity to support the new structure.

A new concrete encased steel column is also to be introduced on gridline WD/21 to eliminate the need for a transfer beam. New concrete encased steel columns are also to be introduced on gridlines WD/12 and WC/12 for the same reason. These will also sit directly above existing columns in the basement.

The existing external stair case at the north end will be extended up to service Level 04.

5.1.13 EXTERNAL WORKS

Along the Kentish Town Rd street elevation there is a row of Luxcrete glass pavement lights originally used as smoke extract. It has been confirmed by J Sainsbury that they are no longer required for smoke extract. It is proposed to remove the panels and replace them with sunken planters. The planters will either be formed in insitu concrete or a prefab steel/GRC planter box. This detail will be further developed at the next stage.

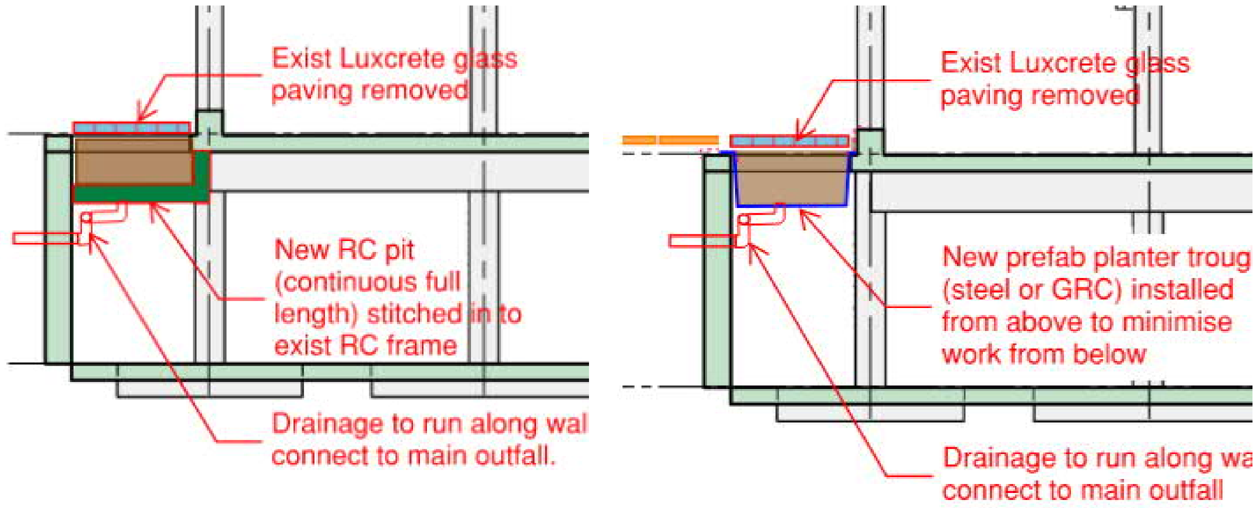


Figure 5-10 – Pavement light planter infills

5.2 RESIDENTIAL BUILDING

At the southern end of the site, a new small three storey residential block will be constructed. The building will house residential apartments at Levels 01, 02 and 03 and retail and utility space at Ground Floor.

Due to the size and layouts, this building lends itself well to a one-way spanning structural solution. A precast concrete solution is proposed for this building which will provide inherent thermal and acoustic performance along with a good quality surface finish. This form of construction will allow rapid construction along with the benefits of offsite manufacturing.

The typical floors will be 150mm thick Hollowcore Omnia planks that span a max. 7.2m one way between precast concrete walls. As the building is small the floor planks will provide adequate diaphragm action without the need for a structural topping.

The load bearing walls are at the sides (north and south) with the floor spanning north – south from the central core. The front and rear elevations will be clad in a rain screen façade. The façade will be hung from each floor.

The balconies are also formed in precast Hollowcore planks with a thermal break between the internal and external space to achieve the required thermal separation.

The flat roof will support an integrated blue roof and PV panels. The roof is maintenance access only.

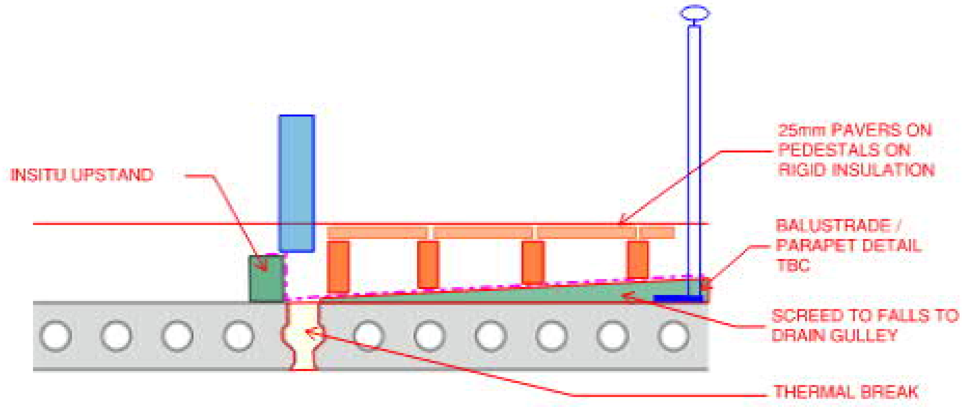


Figure 5-11 - Residential building balcony threshold detail

At Level 01, the balconies form the roof to the retail space below and therefore a step in the slab is required to suit the external insulation depth requirements as shown in Figure 5-12 below:

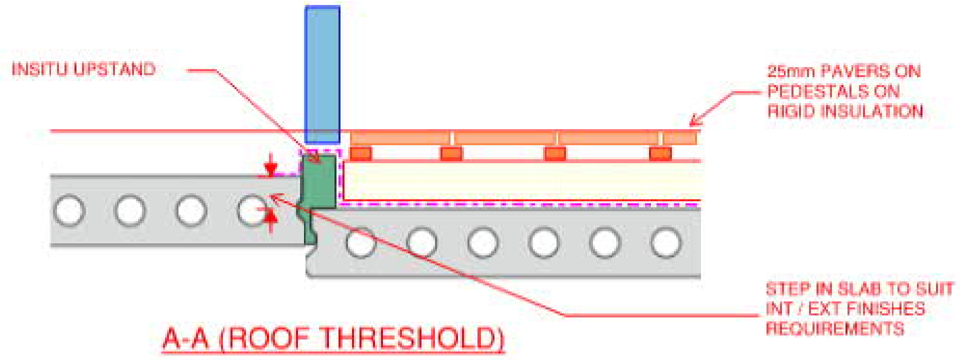


Figure 5-12 - Residential building Level 01 roof detail

At Ground Floor where a more open space is required, some of the walls are transferred onto concrete piers with downstand beams.

The Ground Floor slab is a suspended 250mm thick in-situ RC slab that spans one way between ground-bearing strip footings which are located below each of the load-bearing walls from the superstructure.

5.2.1 RESIDENTIAL BUILDING STABLITY

The lateral stability for the residential building is provided by a central PC core. The precast concrete walls are placed around the staircase and lift shaft. The concrete slabs at each level act as a diaphragms and transfer the lateral loads from the cladding to the central core, which in turn carries the loads down to the foundations.

6 SUSTAINABILITY

6.1 SITE OPPORTUNITIES

6.1.1 REUSE OF EXISTING BUILDING

The re-use of as much of the existing structure as possible has been considered during the design phase.

6.1.2 REUSE OF FOUNDATIONS

The design of the new structural elements has been undertaken with a view to re-use existing foundations wherever possible.

6.2 DESIGN OPPORTUNITIES

The design of the structural systems has been developed embracing the following principles:

- → Develop the concept to provide flexible space that can extend the life of the building and enhance the building users' experience.
- → Design structures economically to minimise embodied carbon
- → Optimise loading criteria - no overdesign
- → Specify high levels of recycled material content (structural steelwork, reinforcement, recycled aggregates, cement replacement) and low impact materials
- → Consider future demolition and recycling opportunities.

6.3 MATERIAL SELECTION AND SPECIFICATION

Material has been selected and will be specified with a focus on the following:

- → Economic use of material - no over specification of applicable loads or structural material grades
- → Use of recycled materials
- → Use of locally sourced material
- → Minimised site waste

6.3.1 STEELWORK

Although steel production uses a large amount of energy and structural steelwork contains significant embodied carbon, it is also highly recyclable and it is possible to design very efficiently in steelwork to minimise the quantity of material specified and minimise waste generated.

Structural steel frames are also relatively lightweight in comparison to concrete frames and consequently lead to less heavy foundation solutions.

6.3.2 RECYCLING & RE-USE

Structural steelwork in the UK typically contains 40-45% recycled material however enhancing specifications to improve the recycled content of steelwork has questionable environmental benefits.

Global consumption of steel continues to rise, mainly as a consequence of industrialisation in the developing world and demand for new steel exceeds the supply of scrap steel by a factor of around two therefore it is not currently possible for all new steel to be produced entirely from scrap. While this remains the case, there is no net environmental benefit in specifying recycled steel in preference to primary steel with a lower recycled content.

Instead, we consider that a more sustainable approach is to specify steel products that are readily recoverable and recyclable. Structural steelwork used in buildings is typically over 94 per cent recoverable and 99 per cent recyclable.

Table 2 outlines typical recycling/recovery rates (2006)

	Structural Sections	Purlins and Rails	Cladding	Composite Floor Decking	Reinforcement	Internal Non-Structural Steel
Recycling %	86	89	79	79	91	85
Re-use %	13	10	15	6	1	2
Total %	99	99	94	85	92	87

Table 2 Re-Use and Recycling of Steel (from SCI)

Responsible sourcing- There are currently only 2 accredited fabricators.

Steelwork will be specified to be sourced in accordance with BES 6001 level "Pass" or equivalent.

6.3.3 LOCAL SOURCING

Local sourcing of steelwork will be investigated.

6.3.4 CONCRETE

Cement replacement

Portland cement is the most energy intensive component of concrete (accounting for ~7% of global CO_2 emissions

Cementitious waste products (produced as by-products of the steel and energy industries) such as Pulverised Fuel Ash (PFA) and Ground Granulated Blastfurnace Slag (GGBS) provide less energy intensive products that can be used to replace up to 80% of the Portland cement content of concrete (depending on the application) and increased use of these products will reduce the embodied energy of the concrete.

GGBS is produced as a by-product during the manufacturing of steel in a blast furnace and is readily available throughout the UK. PFA is a fine ash precipitated from the exhaust gases produced at power stations by the combustion of pulverised coal. It is also readily available throughout the UK.

The use of cement replacement has been investigated and the findings can be summarised as follow:

- 50% Ground granulated blast furnace slag (GGBS) can reduce Embodied CO2 by over 40%
- 30% fly ash (FA) can reduce Embodied CO2 by over 20%
- Limestone fines can reduce Embodied CO2 by 15%
- Achievable % cement replacement linked to striking times and impact on programme
- Typically achievable % cement replacement in the UK at this time 50% (predominantly GGBS) but can be increased in some applications
- There are many positives and negatives associated with the use of GGBS and PFA, these are listed in the table below and are compared to Portland cement (OPC):

Table 3

Property	GGBS	PFA
Water Content	Slight reduction, 0.5-1.0% per 10%of ggbs	Considerable reduction, 3% per 10% of pfa
Workability	Improved	Improved
Setting Time	Slightly increased	Slightly increased
Strength	Lower early age and 28 day strength for a given cement content. Higher final strength	Lower early age and 28 day strength for a given cement content. Higher final strength. Advisable to increase PFA content (mass) by 10%
Appearance	Lighter in colour. Good finish	Inconsistent dark patches. Not good for high specification exposed finishes
Heat of Hydration	Considerably reduced. 50% min ggbs for large pours	Considerably reduced. 35% min (50% max) pfa for large pours
Chloride ion ingress	Very good resistance generally. For severe cases (marine or de-icing salts) 50% min ggbs recommended	Better than OPC but not as good as ggbs. 30% min pfa.
Creep	Lower creep values if cured well.	Lower creep values if cured well.

In terms of cement replacement that should be specified we would recommend 50% as a minimum and we would seek to explore the potential to increase this proportion as the design is developed.

Looking into the different elements, and weighing up the pros and cons of the use of GGBS versus PFA it was possible to establish that GGBS is an improved replacement and the table below states which elements GGBS is going to be specified for use with:

Table 4

Element	Using GGBS?
Foundations	Yes
Slabs	Yes
Walls	Yes
Columns	Yes
Beams	Yes

Aggregates

Concrete aggregates in the UK are commonly obtained by quarrying and marine dredging and at the same time much demolition waste can end up in landfill. The environmental impact of these processes can be reduced by substituting recycled or secondary aggregates as part of the concrete mix.

The use of Recycled Concrete Aggregate (RCA), Recycled Masonry (RA) and industrial by–products such as China Clay Waste has been investigated and the findings can be summarised as follow:

- 15% of UK aggregates are transported by rail and ship/barge
- Average road delivery distance is 38km
- Recycled aggregates can be a lower carbon option if sourced less than 15km (10 miles) from site
- Recycled and secondary aggregates comprise 25 % total UK market (highest in Europe)
- British Standards recommend 20% without need for testing
- Use of 25% recycled aggregates attains 1 BREEAM point (BREEAM 2008)

- More potential for use in non-structural elements, piling mat, sub-base, foundations and elements where large deflections are not anticipated.
- The lightweight aggregates used in the superstructure metal deck slabs are produced from industrial by-products hence are considered entirely recycled.
- Testing and certification of aggregates for high grade uses is not widely practiced and can result in procurement issues.

In the context of this development the opportunity to recycle demolition material on site will be modest due the limited amount of demolition required.

In terms of % recycled aggregate that should be specified we would recommend 25% as a minimum and we would seek to explore the potential to increase this proportion as the design is developed.

Responsible sourcing

Concrete will be specified to be sourced in accordance with BES 6001 level “Good” or equivalent.

Reinforcing steel

Reinforcing steel in UK typically contains 90-95% recycled material. Enhancing specifications to improve the recycled content of steelwork has questionable environmental benefits.

Global consumption of steel continues to rise, mainly as a consequence of industrialisation in the developing world and demand for new steel exceeds the supply of scrap steel by a factor of around two therefore it is not currently possible for all new steel to be produced entirely from scrap. While this remains the case, there is no net environmental benefit in specifying recycled steel in preference to primary steel with a lower recycled content.

Reinforcing steel in UK typically contains 90-95% recycled material. As discussed in the above section on steelwork enhancing specifications to improve the % recycled content of steel has questionable environmental benefits and consequently we would not recommend special provision for this is made in the specification.

Responsible sourcing

Reinforcement will be specified to be sourced in accordance with BES 6001 level “Good”, Eco-reinforcement or equivalent.

Local sourcing

Local sourcing of reinforcement will be investigated.

6.3.5 TIMBER

Responsible sourcing

Timber will be specified to be Forest Stewardship Council (FSC) Certified or equivalent.

Local sourcing

Local sourcing of timber will be investigated.

7 DESIGN CRITERIA

7.1 DESIGN LIFE

The 'design working life' for the 'structure' (structural frame and main structural elements) is 50 years. This is in accordance with Eurocode 'Category 4' buildings – as recommended in Table NA.2.1 of the UK National Annex to BS EN 1990:2002.

'Design working life' is the notional figure for the statistical determination of applied loadings. The expected real life of a Category 4 building would be well in excess of 50 years, particularly if it is maintained and protected from the weather. The only higher Eurocode design life category is 'Category 5' – which is for 'monumental building structures' (eg, civic buildings and museums), highway & railway bridges and 'other civil engineering structures' (eg, underground stations and docks).

Some specified structural elements, such as exposed steelwork and concrete wearing surfaces, will require periodic inspection and maintenance in order to ensure serviceable life for at least 50 years. Superstructure elements which are not easily accessible, such as steelwork in external cavity walls, will be designed with generous corrosion protection - to provide in excess of 50 year life for the predicted environmental conditions.

Substructures will be designed for the 'Intended working life at least 50 years' designation in the requisite substructure Eurocodes. This is likely to provide well in excess of 50 years' real life for the predicted environmental conditions. However, where the consequence of deterioration of structural elements is deemed to be very significant, such as for perimeter retaining walls which support superstructure, those elements will be designed for the 'Intended working life at least 100 years' designation in the requisite substructure Eurocodes.

Some structural elements, such as those with concrete wearing surfaces and corrosion protection will require periodic inspection and maintenance. Steelwork members that are inaccessible and not easily maintained will be designed for the loss of steel section over the 50 year life of the building.

Steelwork members that are inaccessible and not easily maintained will be designed for the loss of steel section over the 50 year life of the building.

The substructure perimeter retaining walls will be checked for design life in accordance with BS 8500-1: 2002, and satisfy this standard for the most onerous structural performance level, being a structure of long service life (more than 100 years).

7.2 ROBUSTNESS

The overriding principle of the building regulations is the concept of robustness. This is defined in EN 1991-1-7 as "the ability of a structure to withstand events like fire, explosions, impact or the consequences of human error without being damaged to an extent disproportionate to the original cause".

The building classification to Approved Document A of the Building Regulations is defined as a Class 2B for the commercial building, and for this classification effective robustness will be developed by providing effective horizontal ties together with effective vertical ties in the structural system.

The provision of vertical and horizontal ties will ensure that in the event of an accident the building will not suffer collapse to an extent disproportionate to the cause.

To satisfy the requirements for a Consequence Class 2B building, structural ties will be provided. These will include:

- Horizontal ties at each level to secure both internal and perimeter elements into the floor and roof level structures: beam-column and beam-beam connections will be detailed for the appropriate tensile forces and a suitable detail will be provided around the perimeter of the building to ensure that beams are tied into the floorplates.
- Vertical ties to ensure that columns are continuous from foundation to roof level: stanchions will be continuous through all beam-stanchion connections and splices will be checked to ensure that they have sufficient tensile capacity.

For the residential building, the building classification to Approved Document A of the Building Regulations is defined as a Class 2A. For this classification effective robustness will be developed by providing effective horizontal ties in the structural system.

The provision of horizontal ties will ensure that in the event of an accident the building will not suffer collapse to an extent disproportionate to the cause.

To satisfy the requirements for a Consequence Class 2A building, structural ties will be provided. These will include horizontal ties at each level to secure both internal and perimeter elements into the floor and roof level structures: wall to slab connections will be detailed for the appropriate tensile forces

7.3 EXECUTION CLASS

BS EN 1090-2 gives the technical requirements for the fabrication and erection of steel structure. The selection of the appropriate execution class provides a level of reliability against failure of the structure or a component within it that is matched to the consequence of its failure.

It sets the principle that a structure, or a part of it, can contain components with different consequence classes and hence different execution classes can be applied to different components.

In the UK, structures which fall under Building Regulations Class 3 for disproportionate collapse, generally fall into Consequence Class 3 (CC3) and hence Execution Class 3 (EXC3).

For EXC3, BS EN 1090 Annex A.3 distinguishes between some requirements to be applied to the structure as a whole – these mainly apply to QA systems and procedures - and others which can be selected on a component-by-component or a connection detail-by-detail basis.

The reality of a multi-storey building which falls into CC3 is that the general floor beams do not need to be fabricated to a higher standard but the columns, lateral load resisting systems and any transfer structures should be i.e. the vertical and lateral load carrying elements are more critical than the typical floor beams.

To this end the following approach will be adopted for this project:

1. All quality documentation, inspection documents, traceability and marking must follow the requirements of EXC3.

2. All columns, transfer beams, spreader beams and any members forming part of the lateral load resisting system and any welded attachments to these elements must follow the requirements of EXC3.
3. All other primary structural members can follow the requirements of EXC2.
4. All secondary structures such as staircases, plant support gantries etc should be fabricated to EXC2.

7.4 DESIGN LOADS

7.4.1 NEW BUILDING LOADS

The new building has been designed for the following permanent super-imposed dead loads and variable loads:

Ground Floor Office

- Raised floor = 0.50 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 1.00 kN/m²

LIVE LOAD (office + LW partitions) = 3.50 kN/m²

Ground Floor Retail

- Raised floor = 0.50 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 1.00 kN/m²

LIVE LOAD (retail) = 4.00 kN/m²

Ground Floor Sainsbury's Access Route

- No finishes = 0.00 kN/m

TOTAL SDL = 0.00 kN/m²

LIVE LOAD (large vehicle access) = 14.50 kN/m²

Mezzanine Office

- Ceiling/Services = 0.50 kN/m²
- Raised floor = 0.35 kN/m²

TOTAL SDL = 0.85 kN/m²

LIVE LOAD (office + LW partitions) = 3.50kN/m²

Mezzanine Plantrooms

- No finishes = 0.00 kN/m²

TOTAL SDL = 0.00 kN/m²

LIVE LOAD (plant) = 7.50 kN/m²

Level 01 Office

- Raised floor = 0.50 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 1.00 kN/m²

LIVE LOAD (office + LW partitions) = 3.50 kN/m²

Level 01 Greenhouse

- 1100mm LW soil = 12.70 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 13.20 kN/m²

LIVE LOAD (communal space) = 4.00 kN/m²

Level 01 Picture Garden (non accessible)

- 600mm LW soil = 6.90 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 7.40 kN/m²

LIVE LOAD (maintenance access only) = 0.60 kN/m²

Typical Office (Level 02 and above)

- Ceiling/Services/Raised floor = 1.00 kN/m²
- Acoustic build-up = 0.55 kN/m²

TOTAL SDL = 1.55 kN/m²

LIVE LOAD (office + LW partitions) = 3.50kN/m²

3rd Floor Rooftop Garden

- 1100mm LW soil = 12.70 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 13.20 kN/m²

LIVE LOAD (communal terrace) = 4.00 kN/m²

4th Floor Terrace

- 75mm sedum roof = 1.35 kN/m²
- Insulation/membrane/steel grating = 0.30 kN/m²
- Ceiling/services = 0.50 kN/m2

TOTAL SDL = 2.15 kN/m²

LIVE LOAD (communal terrace) = 4.00 kN/m²

Office Roof

- Sedum roof and PV panels = 1.55 kN/m²

TOTAL SDL = 1.55 kN/m²

LIVE LOAD (maintenance access only) = 0.60 kN/m²

Residential Typical Floor

- Raised floor/services/ceiling = 1.10 kN/m²

TOTAL SDL = 1.10 kN/m²

LIVE LOAD (residential + LW partitions) = 2.50 kN/m²

Residential Roof

- Membrane/insulation/services = 0.60kN/m²
- Green/Blue Roof = 1.00 kN/m²
- PV Panels = 0.50 kN/m²

TOTAL SDL = 2.10 kN/m²

LIVE LOAD (roof plant) = 7.50 kN/m²

Residential Ground Floor (Retail & BOH)

- Raised floor = 0.50 kN/m²
- Ceiling/Services = 0.50 kN/m²

TOTAL SDL = 1.00 kN/m²

LIVE LOAD (retail) = 4.00 kN/m²

7.4.2 EXISTING BUILDING LOADS

The record information indicates that the existing structure has been designed to the following variable loads.

Workshop floor (Level 01)	7.50 kN/m²
Mezzanine	7.50 kN/m²
Roof	0.75 kN/m²
Service yard (300mm thick slabs)	14.5 kN/m²
Car park	2.50 kN/m²
Basement slab (non-plant areas)	2.50 kN/m²

7.4.3 CLADDING LOADS

Loading due to cladding has been assumed as follows and is to be confirmed in Stage 3:

- Unitised curtain walling 1.20 kN/m²

7.4.4 WIND LOADS

Wind loads acting on the main building frame and the various elements of cladding will be determined in accordance with the requirements of BS EN 1991-1-4 assuming the following:

Basic wind velocity	V_b	=21.4m/s
Altitude factor	C_{alt}	= 1.0
Direction factor	C_{dir}	= 1.0
Seasonal factor	Cseas	= 1.0
Probability factor	Sp	= 1.0

Building acceleration will be limited to 25mg for a 10 year return for the commercial occupancy.

Building acceleration will be limited to 12mg for a 10 year return for the residential occupancy.

7.4.5 NOTIONAL HORIZONTAL LOADS

The building will be designed to resist notional lateral loads applied at each floor simultaneously as stipulated in BS EN 1991-1. This load is applied in addition to wind loads.

7.5 FIRE RESISTANCE

7.5.1 FIRE RESISTANCE PERIODS

The following BS 476 fire resistance periods have been adopted in the design of the building:

- Office superstructure CLT floor panels — 1 hour
- Superstructure beams and columns — 1 hour
- Substructure and existing structure generally — 2 hours
- Residential columns, floor slabs, beams and walls — 1 hour

All required periods of fire resistance for structural elements are to be confirmed by the Fire Engineering consultants.

7.5.2 METHOD OF FIRE PROTECTION

The CLT panels have inherent fire protection and the panels have been sized to achieve 60min fire resistance without any additional fire protection.

The steel frame is visually exposed and therefore intumescent paint is the most appropriate method of protection.

Fire protection will be achieved in in-situ/precast concrete construction by the specification of member size and concrete cover to the main reinforcement to achieve compliance with BS EN 1992-1-2.

7.6 LIGHTNING PROTECTION

The main column reinforcement or structural steel columns will be used as part of the down conductor in the lightning protection system. Testing points will need to be cast into the structure at appropriate locations.

7.7 SERVICEABILITY

7.7.1 DEFLECTION

Slab edge deflections

For the commercial building, deflection of the edge beams (due to variable loads) is generally limited to 5mm due to the stringent deflection requirement of the cladding.

For the residential building, deflection of the slab edge/edge beams is limited to span/500 based on a load history analysis differential case.

Internal deflections

Deflection of the internal floor beams is considered in three stages:

- Permanent load deflection due to self-weight of structure
- Superimposed permanent loads due to permanent dead load (ceiling, floor and services)
- Variable load deflections due to live loads which may be transient.

Where the steel floor beams deflect more than 10mm due to the design permanent loads, they will be pre-cambered to remove approximately 85% of the design permanent load deflection.

The space available for building services will only be affected by the deflections which take place prior and during the installation of the ceiling and the raised floor. This is conservatively taken as the combined deflection due to permanent loads and superimposed permanent loads. Thereafter the ceiling and raised floor will deflect with the structure as the variable loads are applied.

The variable load deflection criterion for all internal beams not supporting cladding is span/360.

The total deflection criterion for all internal beams not supporting cladding is span/250.

7.7.2 CRACK WIDTHS

- Superstructure & substructure crack width limit generally: 0.4mm
- Basement watertight wall and slab crack width limit: 0.1mm

7.7.3 FOUNDATION MOVEMENT

Differential settlement

A settlement assessment will be undertaken during the detailed design phase to establish the differential movements beneath the foundations.

7.7.4 SWAY

Overall sway

The deflection of the building due to design wind load is limited to H/500, where H is the building height.

Sway deflection of any one storey

The deflection of each storey, to be accommodated by the perimeter cladding, is limited to h/400 where h is the storey height.

7.7.5 VIBRATION

The deflection of floor structures is influenced by the floor stiffness and mass, which also determines the frequency of the floor-plate. The frequency behaviour can affect the resonant behaviour of the floor and ultimately the comfort level of occupants, so it is considered carefully in the design of the structure. Floor structures will be designed in accordance with the following minimum requirements:

- Individual beam natural frequency: 3.5 Hz minimum
- System frequency: 3.0 Hz minimum

7.8 DESIGN STANDARDS AND REFERENCE DOCUMENTS

STATUTORY CODES OF PRACTICE

The structural design complies with the Building Regulations 2004. This is achieved by complying with the Eurocodes as 'approved documents' and the relevant national annex. The codes of practice used in design are:

BASIS OF DESIGN

BS EN 1990: Basis of structural design

LOADING

BS EN 1991-1-1: General actions. Densities, self-weight, imposed loads for buildings
BS EN 1991-1-2: General actions. Actions on structures exposed to fire
BS EN 1991-1-3 General actions. Snow loads
BS EN 1991-1-4 General actions. Wind actions
BS EN 1991-1-5 General actions. Thermal actions
BS EN 1991-1-6 General actions. Actions during execution
BS EN 1991-1-7 General actions. Accidental actions
BS EN 1991-3 Actions induced by cranes and machines
PD 6688-1-2 Background paper to the UK national Annex to BS EN 1991-1-2
PD 6688-1-4 Background information to the National Annex to BS EN 1991-1-4 and additional guidance
PD 6688-1-7 Background paper to the UK National Annex to BS EN 1991-1-7

CONCRETE DESIGN

BS EN 1992-1-1: General rules and rules for buildings
BS EN 1992-1-2: General rules. Structural fire design
BS EN 1992-3: Liquid retaining and containing structures
PD 6687: Background paper to the UK National Annexes to BS EN 1992-1
BS 8102: Code of practice for protection of below ground structures against water from the ground
BS 8500: Concrete – Complementary standard to BS EN 206-1

STEEL DESIGN

BS EN 1993-1-1: General rules and rules for buildings.
BS EN 1993-1-2: General rules. Structural fire design.
BS EN 1993-1-5: Plated structural elements.
BS EN 1993-1-8: Design of joints
BS EN 1993-1-10: Material toughness and through-thickness properties.
BS EN 1993-1-11: Design of structures with tension components
PD 6695-1-10: Recommendations for the design of structures to BS EN 1993-1-10

COMPOSITE STEEL AND CONCRETE DESIGN

BS EN 1994-1-1: General rules and rules for buildings
BS EN 1994-1-2: General rules. Structural fire design

MASONRY DESIGN

BS EN 1996-1-1: General rules for reinforced and unreinforced masonry structures
BS EN 1996-1-2: General rules. Structural fire design
BS EN 1996-2: Design considerations, selection of materials and execution of masonry
BS EN 1996-3: Simplified calculation methods and simple rules for masonry structures
PD 6697: Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2

GEOTECHNICAL DESIGN

BS EN 1997-1:2004: General rules

EXECUTION STANDARDS

The following documents are referred to in relation to the execution of the works:

ICE Specification for piling and embedded retaining walls
BS EN 12699: Execution of special geotechnical work – Displacement Piles
BS EN 1536: Execution of special geotechnical work – Bored Piles
BS EN 1090-1: Execution of steel structures and aluminium structures
BS EN 1090-2 Technical requirements for the execution of steel structures and aluminium structures
BS EN 13670: Execution of concrete structures
National structural steelwork specification for building construction.
National structural concrete specification for building construction.

DESIGN REFERENCES

Other publications used include:

IStructE/ConSoc: Standard method of detailing structural concrete
CIRIA: Design of Shear Wall Buildings CIRIA Report 102
CIRIA: Design for Movement in Buildings, CIRIA Technical Note 107
CIRIA: New paint systems for the protection of construction steelwork, CIRIA Report 174
CIRIA: Early age thermal crack control in concrete, CIRIA C660
SCI: Design of floors for vibration: A new approach P354
SCI: Design of composite beams with large web openings, P355

7.9 MATERIAL PROPERTIES

STEEL GRADES

Grade S355 in accordance with BS EN 10 025 parts 2 to 6, BS EN 10210-1 and BS EN 10219-1.

CONCRETE GRADES

The following concrete grades and cement replacement will be used.

Table 7-1 – Concrete Grades

Location	Compressive Strength Class (Cylinder/Cube) Minimum	Cement Replacement % Minimum GGBS
Concrete generally	**C32/40**	30%

GROUT

Grout for post-tensioning, around anchor bolts and under base plates is to be a non-shrink or expansive grout.

REINFORCEMENT

Reinforcement type 'H': grade 500, deformed type B conforming to BS4449.

Fabric reinforcement conforming to BS4483.

TIMBER

Timber Grade: C24

8 APPROVALS

8.1 ASSET PROTECTION

Various stakeholders have strategic assets in the proximity of the site or even inside the footprint of the site to be developed. Each stakeholder will be engaged in consultations in order to arrive to an agreement and eventually to a sign off of our design with the ultimate view of achieving results for our client while satisfying the stakeholder need for asset protection.

8.1.1 LONDON UNDERGROUND

For works over, under or adjacent to the London Underground Limited (LUL) operational railways and to all LUL assets, a set of procedures and approval processes have to be followed. These procedures are set in the "LUL standards 1-538-ASSURANCE" document.

Following the submission by the project manager of a risk based assurance plan for the proposed changes, a Conceptual Design Statement (CDS) will be issued to LUL in order to obtain approval in principle (AIP). The CDS outlines the details for the scheme and will need to be signed off by a checking engineer which could be an Independent Design Organization for complex engineering works.

Following approval of the CDS the full design and detailing of the project will be progressed resulting in construction issue drawings, documents and calculations.

Part of the approval process is to agree on monitoring procedures which are expected due to the nature of the works involved.

8.1.2 THAMES WATER

In February 2015 Thames Water released a document titled "Guidance for Working Near our Assets" which affects the majority of the London projects.

Thames Water (TW) are interested in certain activities within 15m of their assets, sewers and water mains typically. These activities include demolition, piling, excavation, new construction, dewatering, tunnelling and the placing of heavy loads (cranes, abnormal loads etc).

If the development activity is within 15m of their asset and is deemed to pose a risk then we are expected to provide an Engineering Impact Assessment, pre and post work surveys and results of monitoring of vibration and ground movements.

During the next phase of the design we will contact TW to assess constraints into our design.

8.2 DESIGN APPROVAL

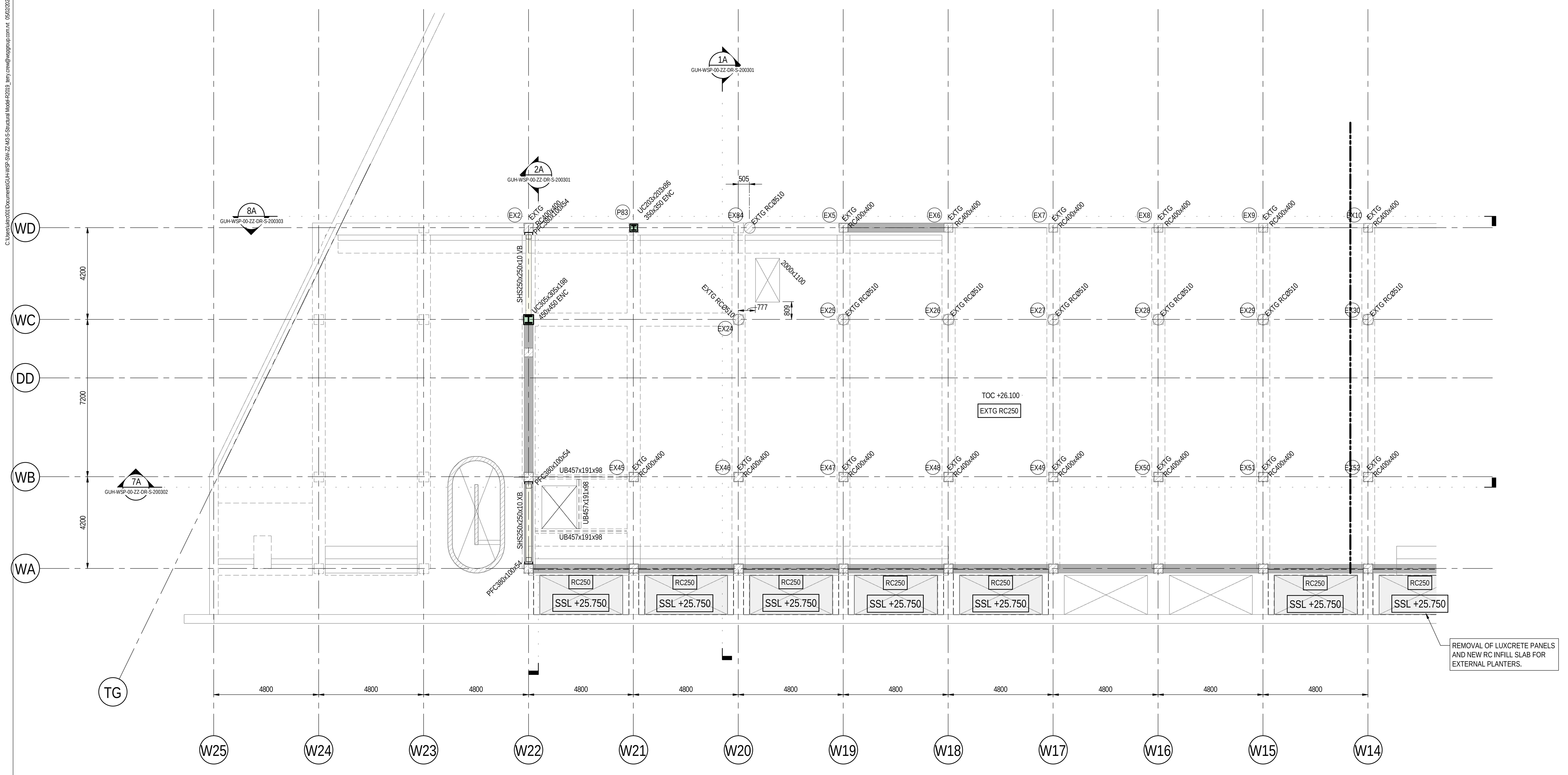
8.2.1 BUILDING CONTROL

Calculations for the design of the structure will be submitted to the Approved Inspector for approval to suit the design and construction programme.

The report on fire engineering of the main structure will be submitted to the Approved Inspector with the main fire strategy report.

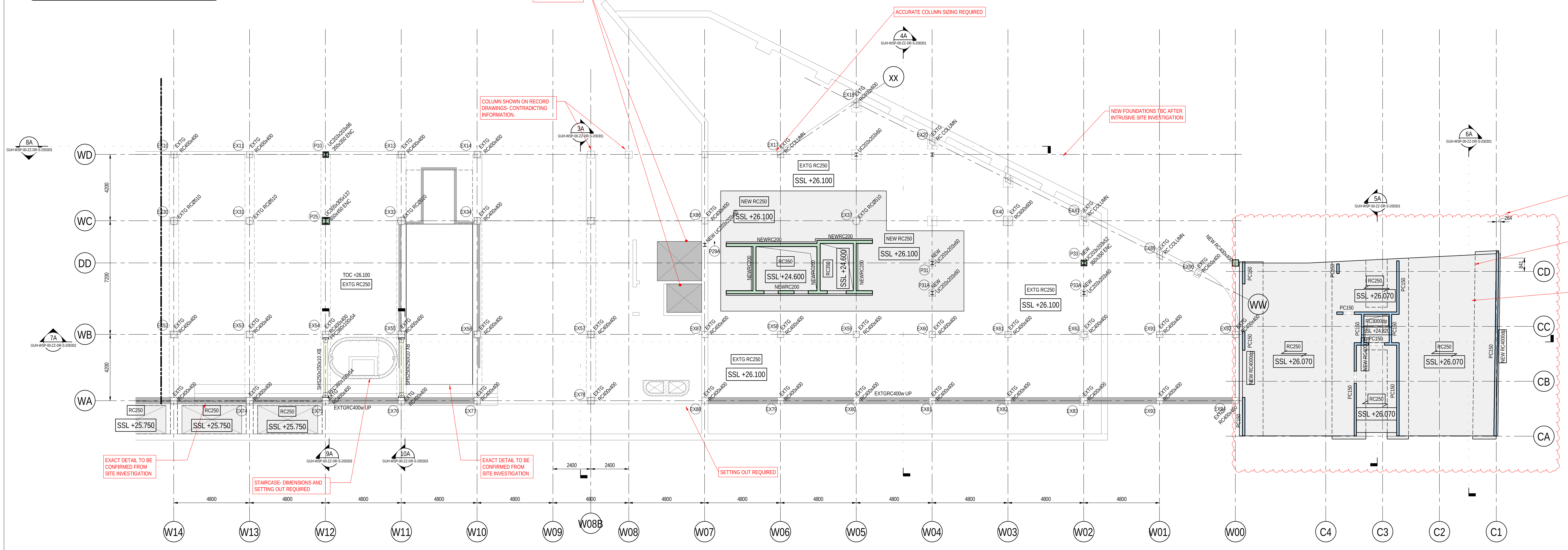
APPENDIX A

STAGE 2 STRUCTURAL DRAWINGS



LEVEL 00- WEST SIDE GA (PROPOSED)

1 : 100



LEVEL 00- EAST SIDE GA (PROPOSED)

1 : 100

DO NOT SCALE

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES AND ENGINEERS DRAWINGS TOGETHER WITH RELEVANT SPECIFICATIONS.
2. DIMENSIONS ARE NOT TO BE SCALED FROM THIS DRAWING.
3. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOL LEGEND REFER TO DRAWING GUH-WSP-00-00-DR-S-020100.
4. UNLESS NOTED OTHERWISE STRUCTURAL STEELWORK SHALL BE GRADE S355 TO BS EN 10 025, BS EN 10 113 AND BS EN 10 210. ALL STEEL SHALL BE OF WELDABLE QUALITY. ALL BOLTS SHALL BE GRADE 8.8 UNLESS NOTED OTHERWISE.

THIS DRAWING HAS BEEN CREATED USING INCOMPLETE RECORD INFORMATION AND A SURVEY. IT IS INTENDED TO ASSIST THE CONTRACTOR AND IS NOT COMPREHENSIVE AND ITS ACCURACY CANNOT BE GUARANTEED.

BASED ON DIFFERENCES BETWEEN THE SURVEY AND RECORD INFORMATION, IT IS CLEAR THAT THE STRUCTURE CHANGED DURING THE CONSTRUCTION PHASE - EVEN FROM CONSTRUCTION ISSUE RECORD DRAWINGS.

BEFORE PROCEEDING WITH THE WORK THE CONTRACTOR IS TO VERIFY THE INFORMATION BY UNDERTAKING ADDITIONAL INVESTIGATIONS AS REQUIRED AND IS TO NOTIFY THE DESIGN TEAM OF ANY DIFFERENCES.

KEY TO HEALTH & SAFETY SYMBOLS

WARNING RISK
INDICATES A RESIDUAL RISK AS A WARNING.

COMPULSORY RISK
INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.

PROHIBITIVE RISK
INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.

INFORMATION RISK
INDICATES A RESIDUAL RISK FOR INFORMATION.

TEMPORARY STABILITY OF THE STRUCTURE: THE BUILDINGS HAVE BEEN DESIGNED BASED ON THE PERMANENT CONDITION ONLY; THE CONTRACTOR WILL HAVE TO MAKE AN ASSESSMENT OF THE TEMPORARY STABILITY OF THE BUILDINGS BASED ON THEIR SPECIALIST CONSTRUCTION KNOWLEDGE AND INTENDED CONSTRUCTION SEQUENCE.

STABILITY OF EXCAVATIONS. ACCORDING TO RECORD INFORMATION, GROUNDWATER IS RELATIVELY HIGH ACROSS THE SITE. THIS POSES A SIGNIFICANT RISK TO THE STABILITY OF ANY OPEN EXCAVATIONS.

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

wsp
WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

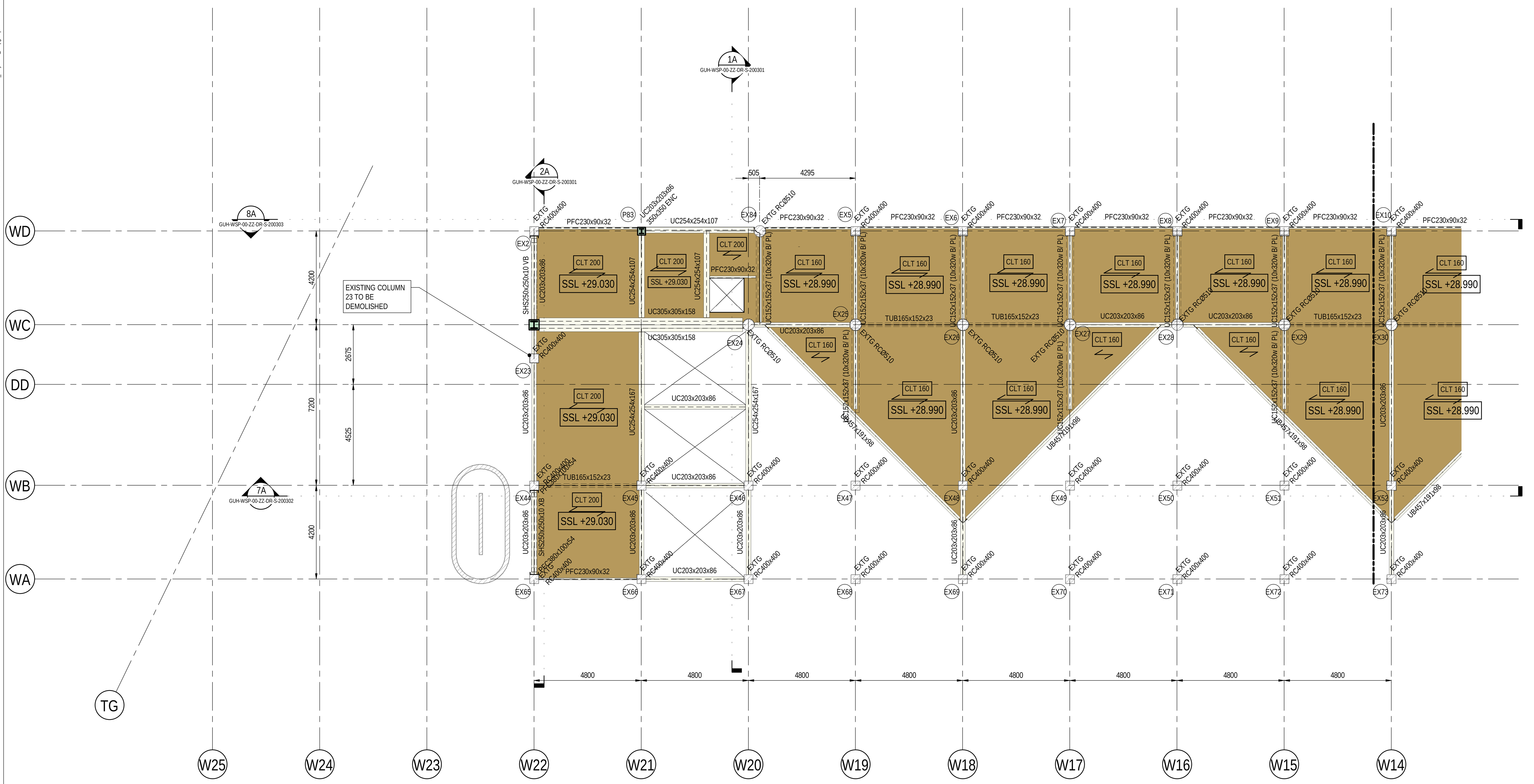
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED L00 GENERAL ARRANGEMENT

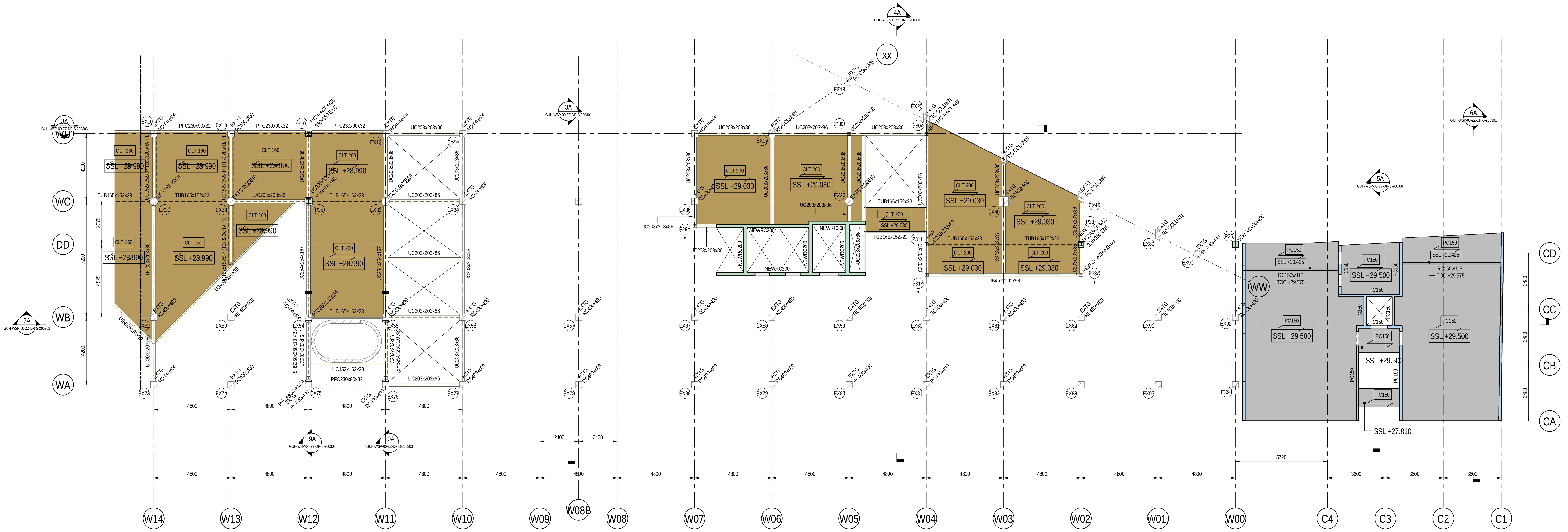
SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-00-DR-S-130101 REV: P03



MEZZANINE- WEST SIDE GA (PROPOSED)

1 : 100



MEZZANINE- EAST SIDE GA (PROPOSED)

1 : 100

DO NOT SCALE

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4. UNLESS NOTED OTHERWISE, BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS ARE PINNED CONNECTIONS ON THIS MEZZANINE LEVEL.
5. UNLESS NOTED OTHERWISE STRUCTURAL STEELWORK SHALL BE GRADE S355 TO BS EN 10 025, BS EN 10 113 AND BS EN 10 210. ALL STEEL SHALL BE OF WELDABLE QUALITY. ALL BOLTS SHALL BE GRADE 8.8 UNLESS NOTED OTHERWISE.

KEY TO HEALTH & SAFETY SYMBOLS

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COMPULSORY RISK
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REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

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http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

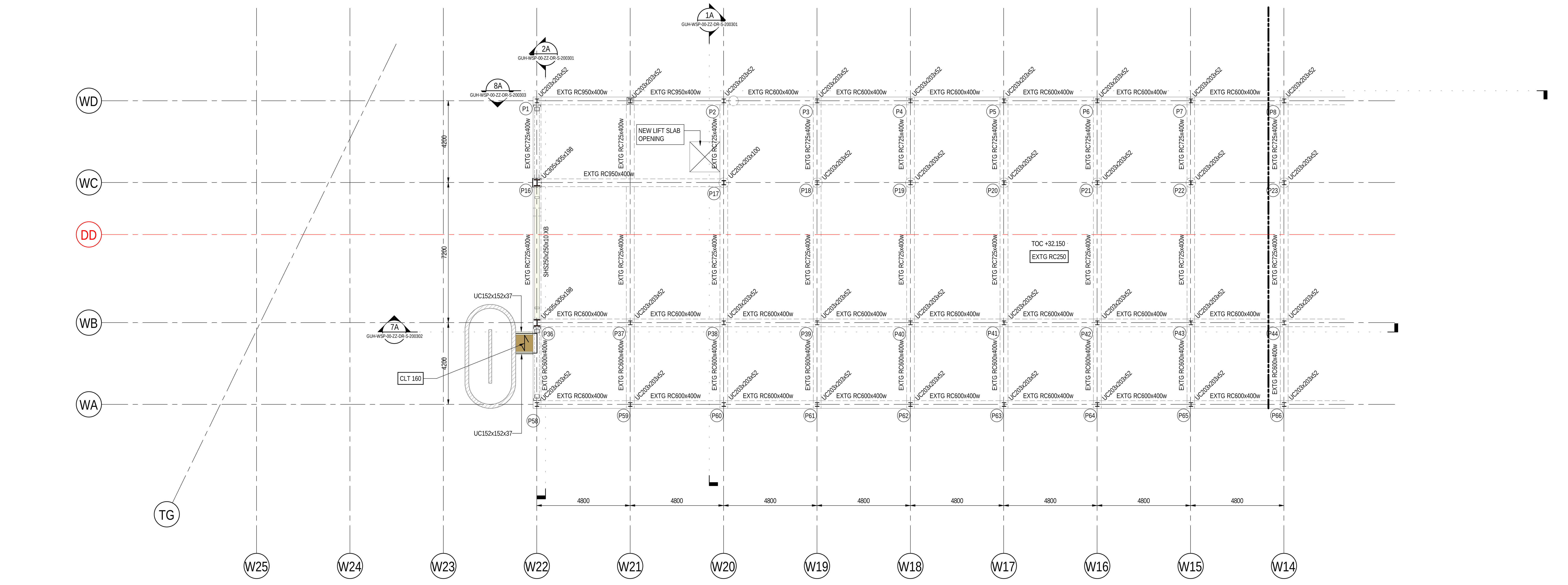
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED MEZZANINE GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-0M-DR-S-200101 REV: P03



LEVEL 01- WEST SIDE GA (PROPOSED)
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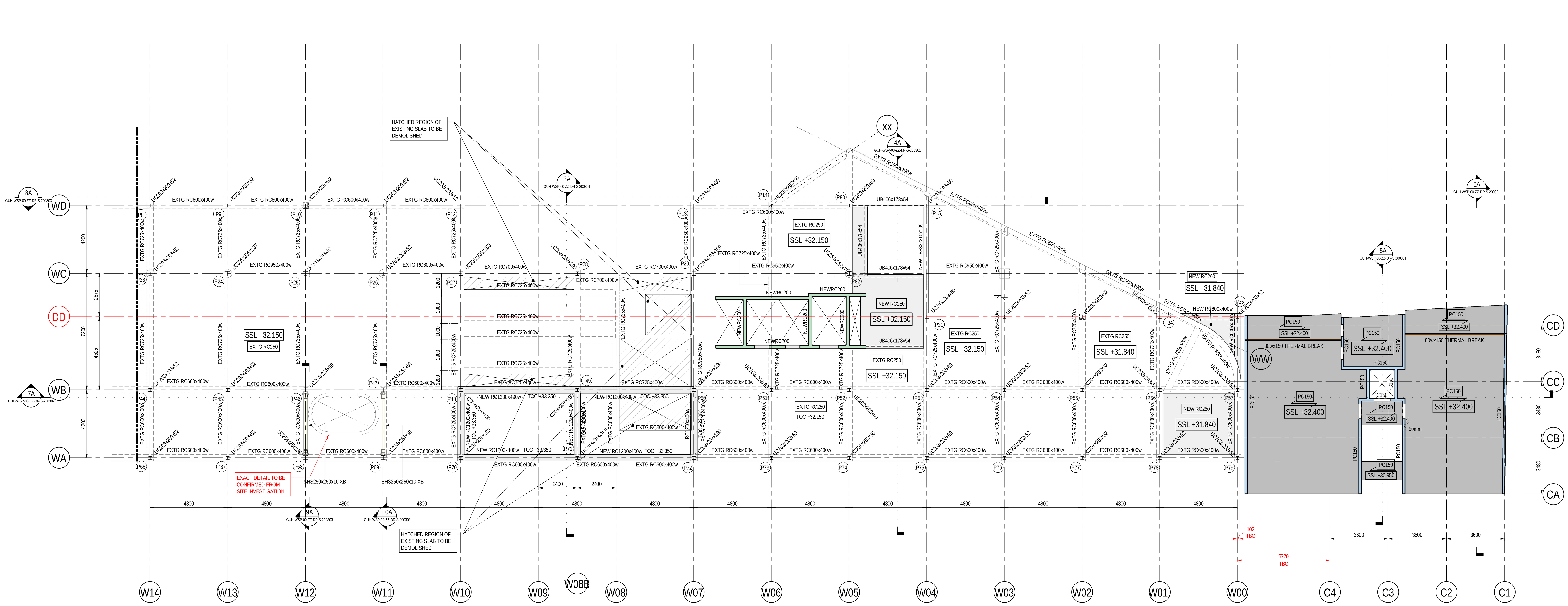

LEVEL 01- EAST SIDE GA (PROPOSED)
1 : 100

DO NOT SCALE

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5. UNLESS NOTED OTHERWISE, BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS ARE MOMENT CONNECTIONS.
6. BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS NOTATED WITH A 'P' ARE PINNED CONNECTIONS.
7. 160 CLT PANELS TO BE GRADE 24, L5s-2. FOUR LAYERS TO BE IN SPAN DIRECTION AND ONE LAYERS TRANSVERSE. MIDDLE LAYER TO BE TRANSVERSE. COVER LAYERS IN PAIRS IN SPAN DIRECTION.

KEY TO HEALTH & SAFETY SYMBOLS

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COMPULSORY RISK
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PROHIBITIVE RISK
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INFORMATION RISK
INDICATES A RESIDUAL RISK FOR INFORMATION.

THE DESIGN ASSUMES SIMPLE CONNECTIONS IN SOME LOCATIONS IN THE CORE AREA AND PART OF THE SAW-TOOTH ROOF. THE STEELWORK FABRICATOR IS THEREFORE REQUIRED TO DETAIL THE FIN-PLATE IN THE CONNECTION IN SUCH A WAY AS TO ENSURE THE BEAM IS ABLE TO ROTATE WITHOUT THE DEVELOPMENT OF ADVERSE LOAD CONNECTIONS IN THE DETAIL; THE DETAIL DEVELOPED MUST ALLOW THE BEAM TO ROTATE, WHILST ALLOWING THE FULL DESIGN LOADS TO BE REALISED.

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P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

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http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

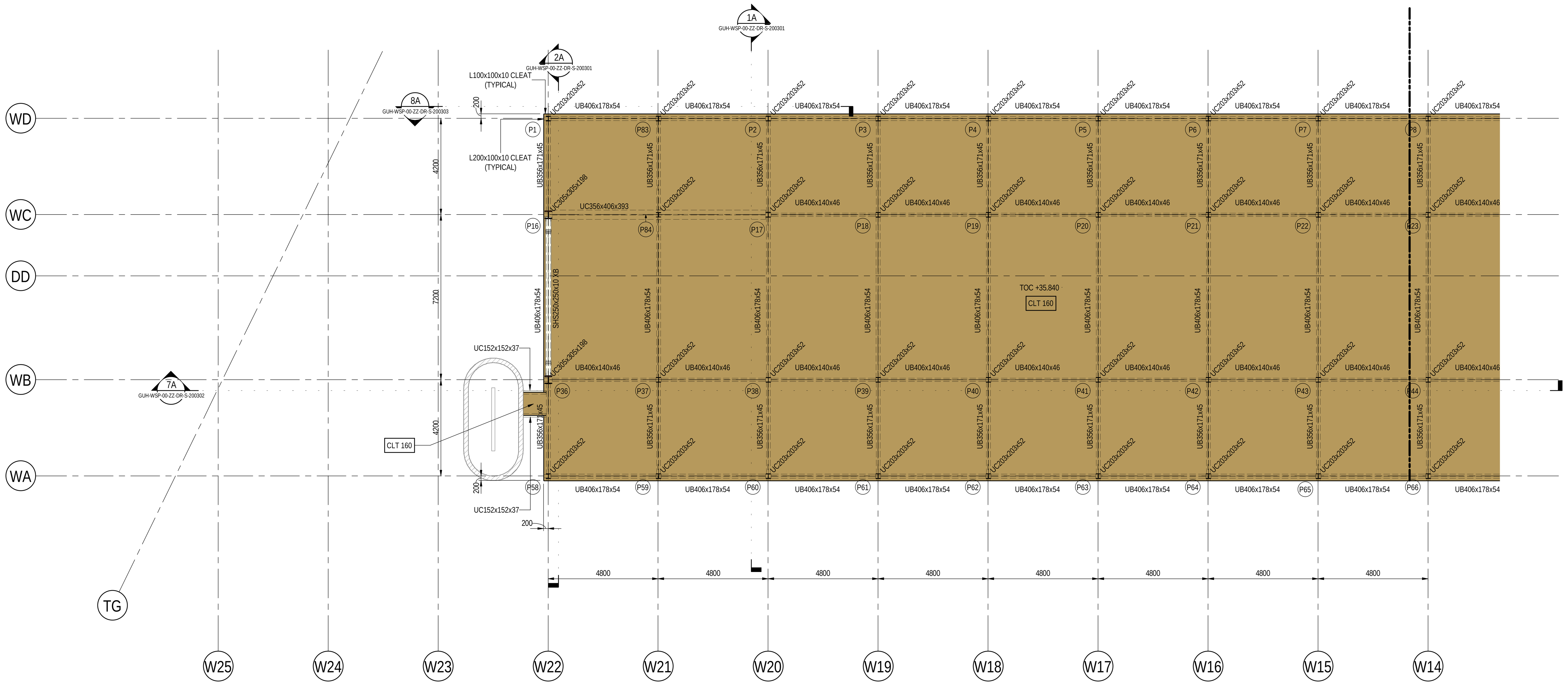
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED L01 GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-01-DR-S-200101 REV: P03



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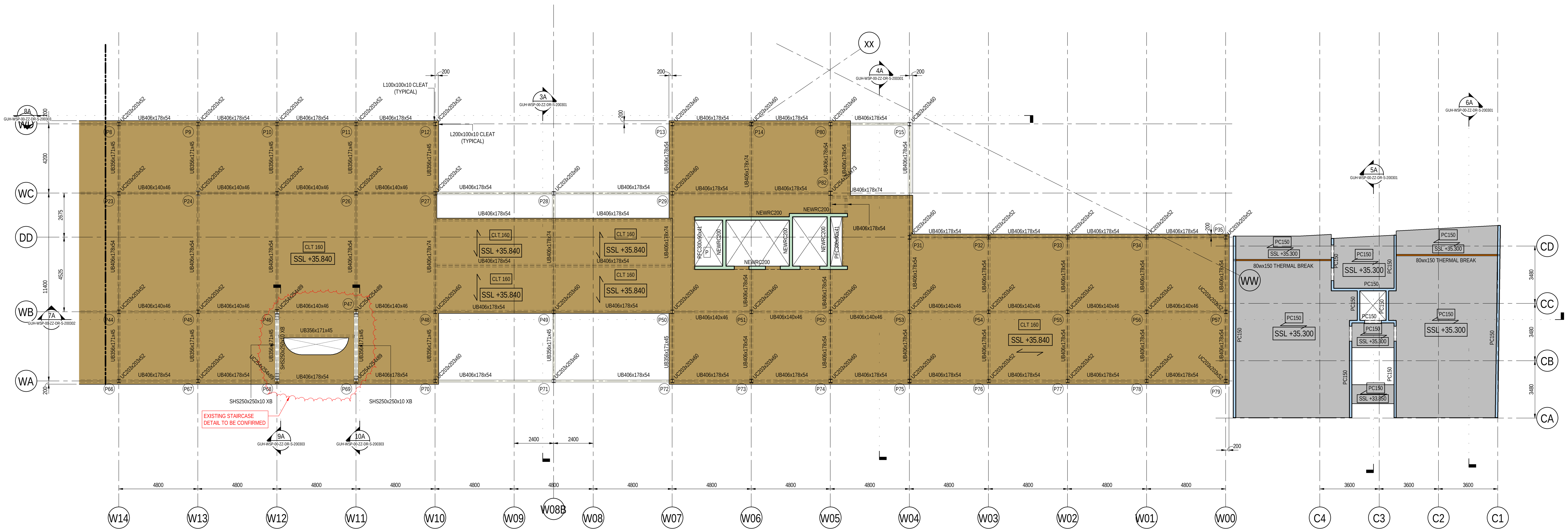

LEVEL 02- EAST SIDE GA (PROPOSED)
1 : 100

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7. 160 CLT PANELS TO BE GRADE 24, L5s-2. FOUR LAYERS TO BE IN SPAN DIRECTION AND ONE LAYERS TRANSVERSE. MIDDLE LAYER TO BE TRANSVERSE. COVER LAYERS IN PAIRS IN SPAN DIRECTION.

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P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

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http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED L02 GENERAL ARRANAGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
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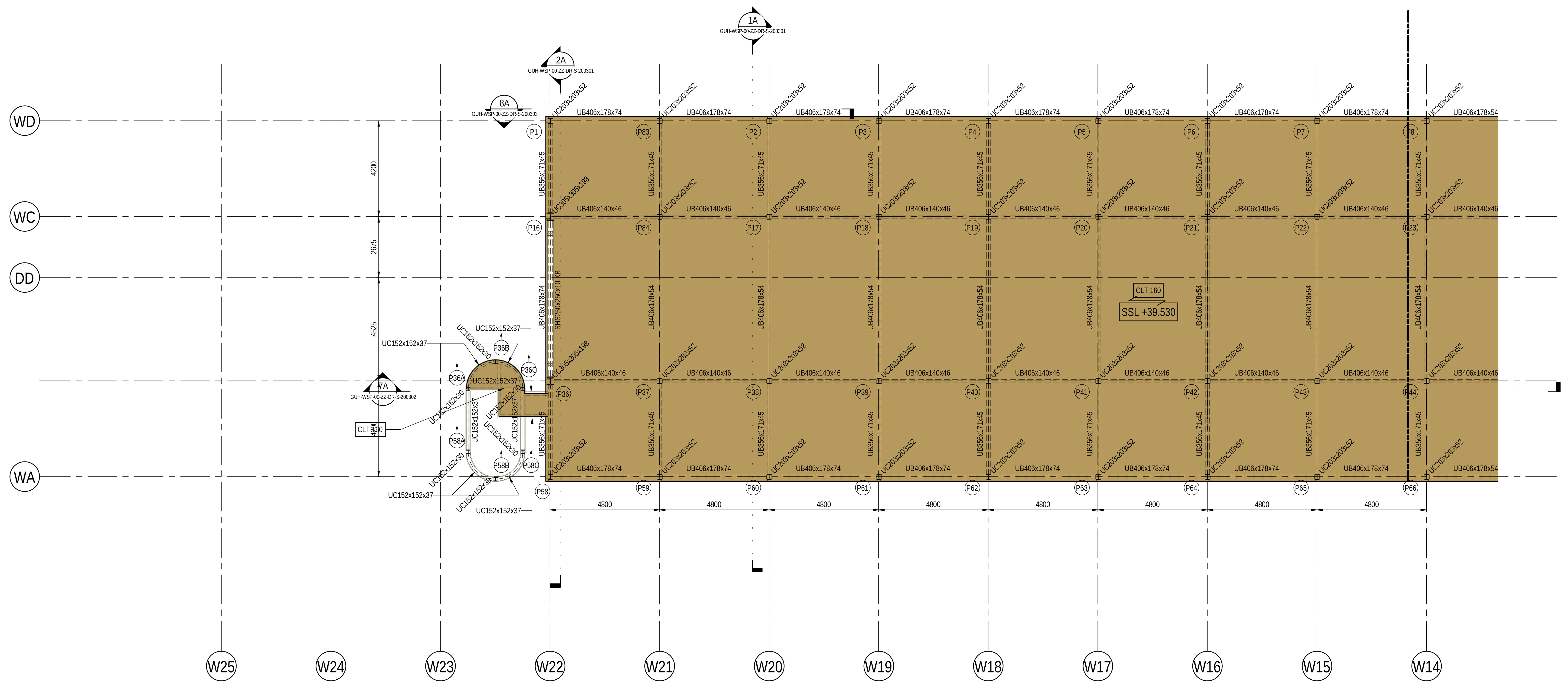
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-02-DR-S-200101 REV: P03



LEVEL 03-WEST SIDE GA (PROPOSED)

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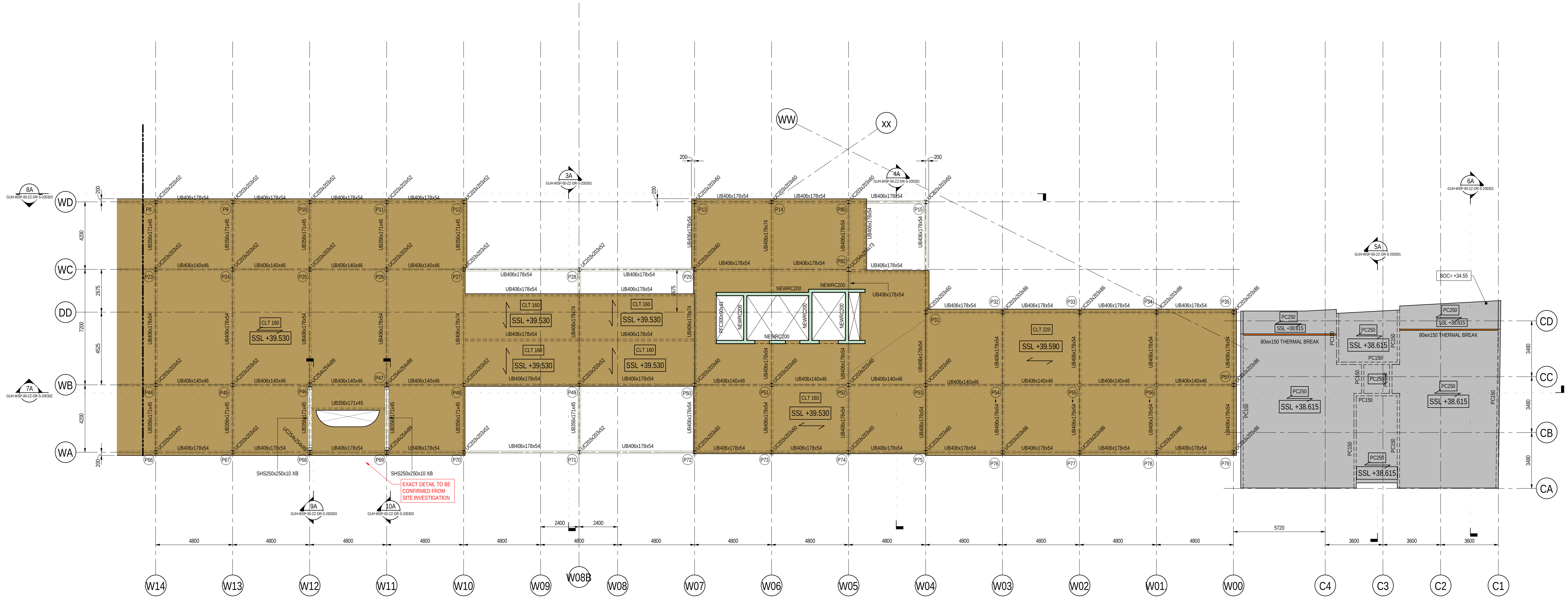

LEVEL 03- EAST SIDE GA (PROPOSED)

1 : 100

DO NOT SCALE

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   MIDDLE LAYER TO BE TRANSVERSE. COVER LAYERS IN PAIRS IN SPAN DIRECTION.
8. 220 CLT PANELS TO BE GRADE 24, L7s-2. FIVE LAYERS TO BE IN SPAN DIRECTION AND TWO LAYERS TRANSVERSE.
   MIDDLE LAYER TO BE IN SPAN DIRECTION. COVER LAYERS IN PAIRS IN SPAN DIRECTION. TRANSVERSE LAYERS TO SEPARATE MIDDLE AND COVER LAYERS.

KEY TO HEALTH & SAFETY SYMBOLS

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REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

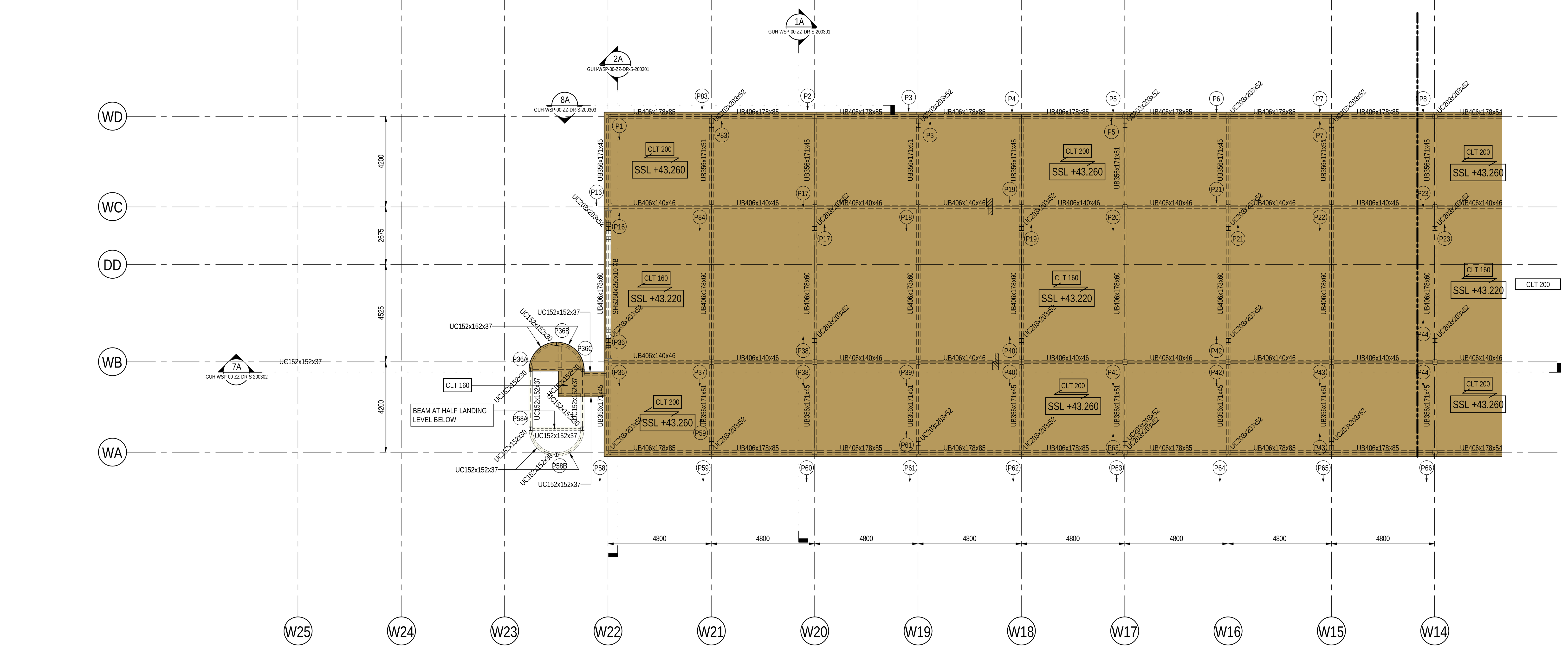
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED L03 GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-03-DR-S-200101 REV: P03



LEVEL 04- WEST SIDE GA (PROPOSED)

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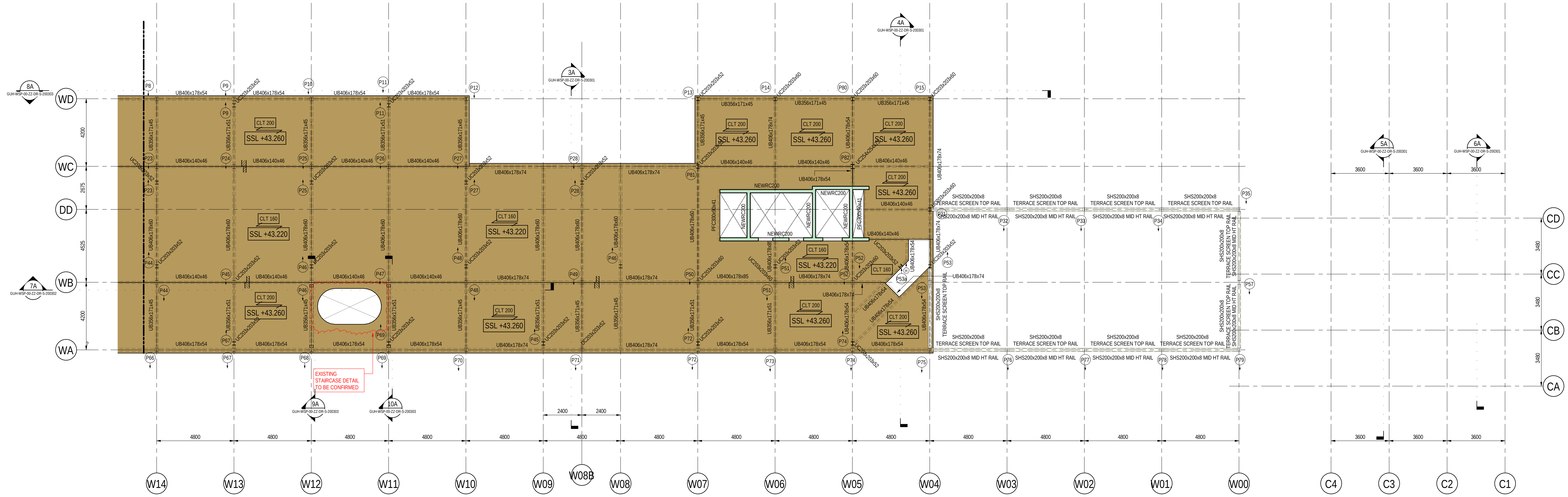

LEVEL 04- EAST SIDE GA (PROPOSED)

1 : 100

DO NOT SCALE

NOTES:

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6. BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS NOTATED WITH A 'P' ARE PINNED CONNECTIONS.
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8. 220 CLT PANELS TO BE GRADE 24, L7s-2. FIVE LAYERS TO BE IN SPAN DIRECTION AND TWO LAYERS TRANSVERSE. MIDDLE LAYER TO BE IN SPAN DIRECTION. COVER LAYERS IN PAIRS IN SPAN DIRECTION. TRANSVERSE LAYERS TO SEPARATE MIDDLE AND COVER LAYERS.

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THE DESIGN ASSUMES SIMPLE CONNECTIONS IN SOME LOCATIONS IN THE CORE AREA AND PART OF THE SAW-TOOTH ROOF. THE STEELWORK FABRICATOR IS THEREFORE REQUIRED TO DETAIL THE FIN-PLATE IN THE CONNECTION IN SUCH A WAY AS TO ENSURE THE BEAM IS ABLE TO ROTATE WITHOUT THE DEVELOPMENT OF ADVERSE LOAD CONNECTIONS IN THE DETAIL; THE DETAIL DEVELOPED MUST ALLOW THE BEAM TO ROTATE, WHILST ALLOWING THE FULL DESIGN LOADS TO BE REALISED.

TEMPORARY STABILITY OF THE STRUCTURE: THE BUILDINGS HAVE BEEN DESIGNED BASED ON THE PERMANENT CONDITION ONLY; THE CONTRACTOR WILL HAVE TO MAKE AN ASSESSMENT OF THE TEMPORARY STABILITY OF THE BUILDINGS BASED ON THEIR SPECIALIST CONSTRUCTION KNOWLEDGE AND INTENDED CONSTRUCTION SEQUENCE.

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

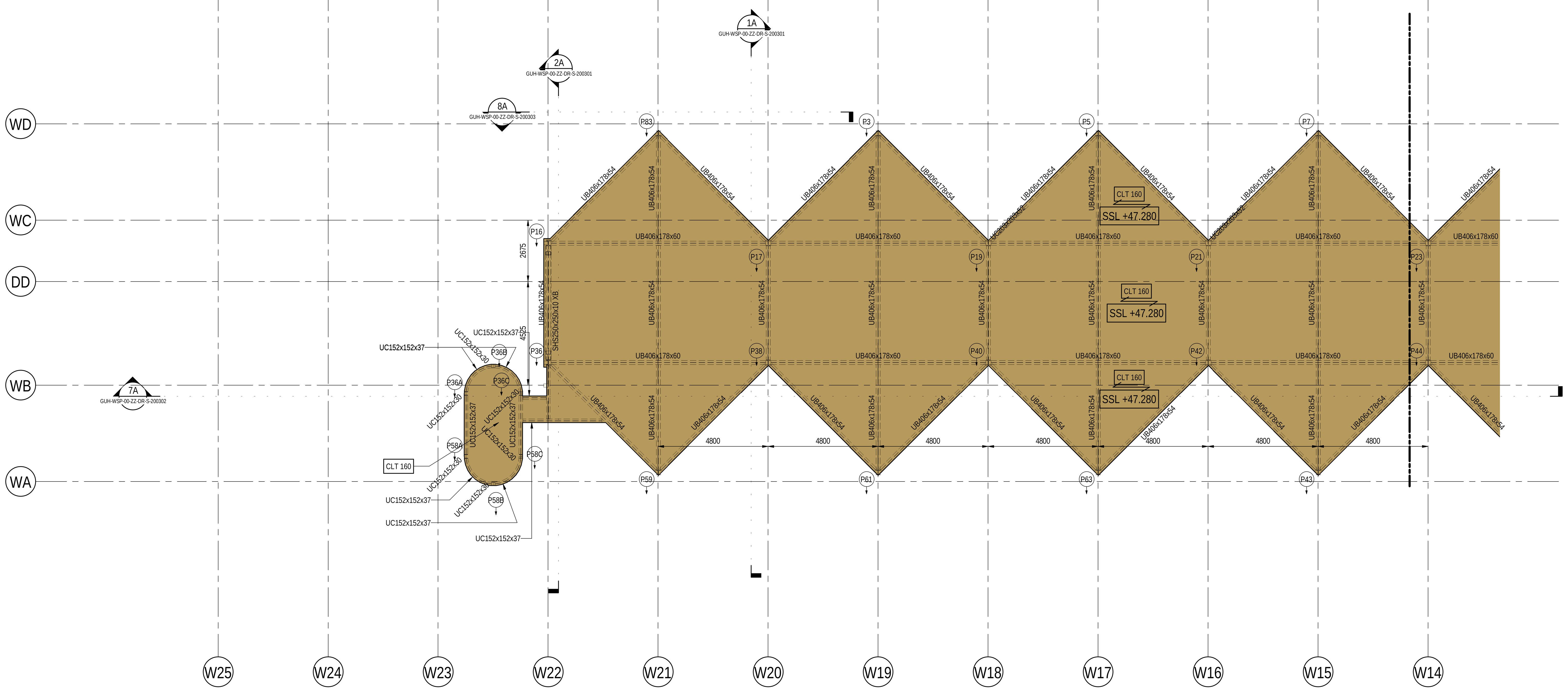
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED L04 GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-04-DR-S-200101 REV: P03



ROOF- EAST SIDE GA (PROPOSED)

1 : 100

ROOF- WEST SIDE GA (PROPOSED)

1 : 100

DO NOT SCALE

NOTES:

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3. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOL LEGEND REFER TO DRAWING GUH-WSP-00-00-DR-S-020100.
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KEY TO HEALTH & SAFETY SYMBOLS

WARNING RISK
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COMPULSORY RISK
INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.

PROHIBITIVE RISK
INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.

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P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED ROOF GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-05-DR-S-200101 REV: P03

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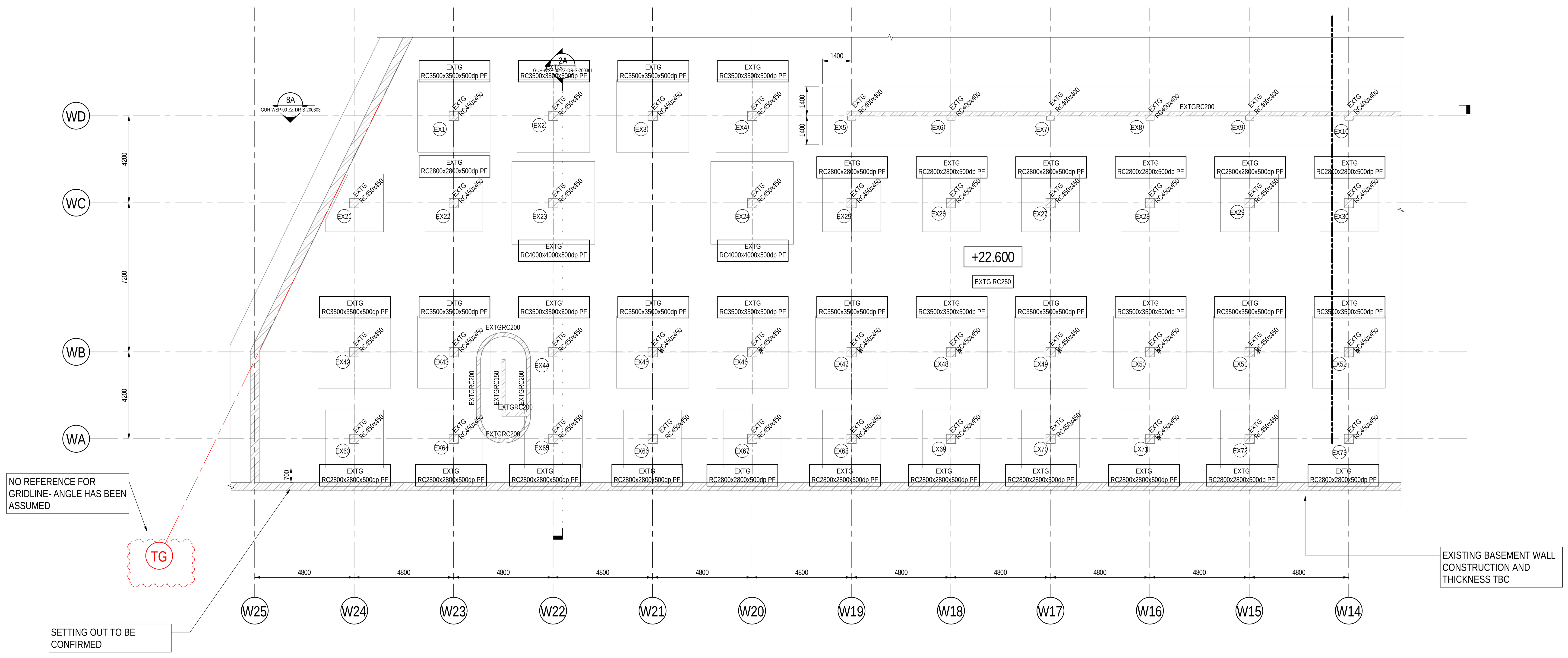


LEVEL B1- WEST SIDE GA (EXISTING) Copy 1
1 : 100

THIS DRAWING HAS BEEN CREATED USING INCOMPLETE RECORD INFORMATION AND A SURVEY. IT IS INTENDED TO ASSIST THE CONTRACTOR AND IS NOT COMPREHENSIVE AND ITS ACCURACY CANNOT BE GUARANTEED.

BASED ON DIFFERENCES BETWEEN THE SURVEY AND RECORD INFORMATION, IT IS CLEAR THAT THE STRUCTURE CHANGED DURING THE CONSTRUCTION PHASE - EVEN FROM CONSTRUCTION ISSUE RECORD DRAWINGS.

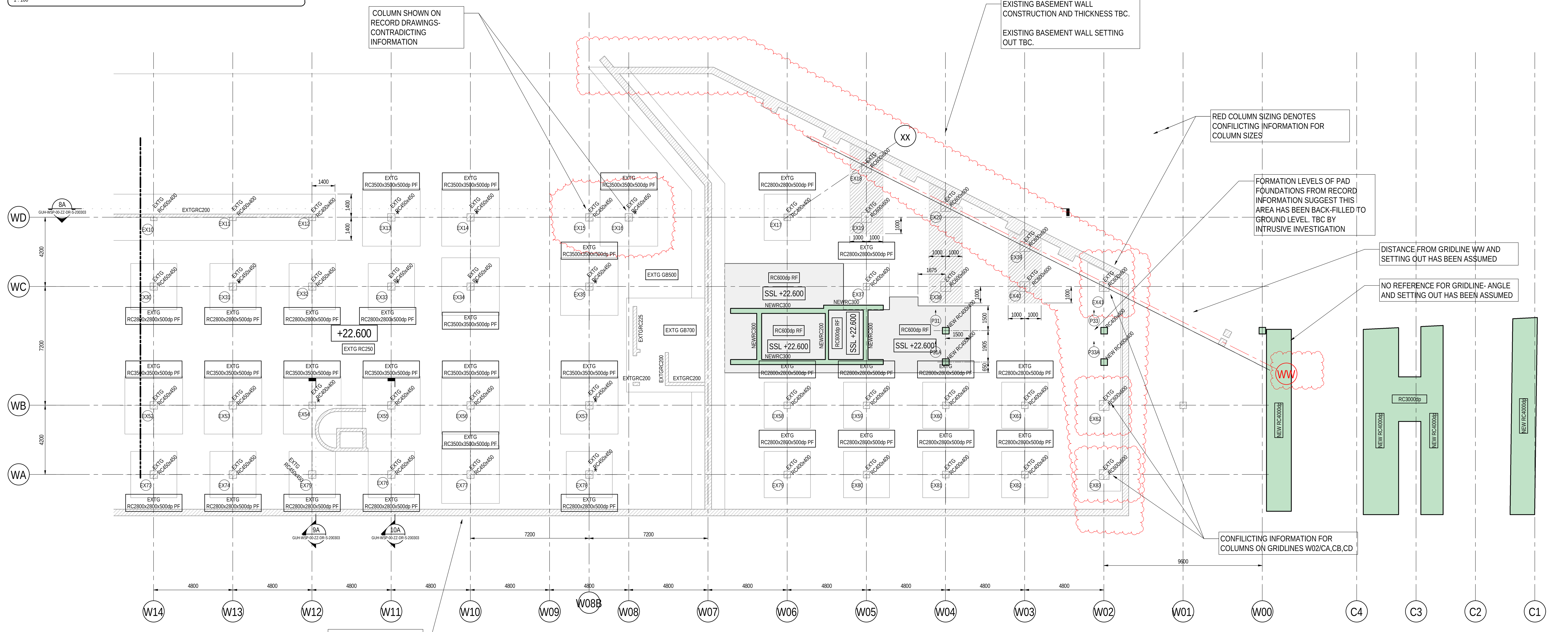
BEFORE PROCEEDING WITH THE WORK THE CONTRACTOR IS TO VERIFY THE INFORMATION BY UNDERTAKING ADDITIONAL INVESTIGATIONS AS REQUIRED AND IS TO NOTIFY THE DESIGN TEAM OF ANY DIFFERENCES.

EXISTING PAD FOUNDATIONDS AS SHOWN ARE FOUNDED DIRECTLY ON ORIGINAL RC RAFT FOUNDATION MIN 750mm THICK (TO BE CONFIRMED BY STRUCTURAL INVESTIGATION) APPLIED FOUNDATION LOAD DISTRIBUTES THROUGH 750mmTHK RAFT AT 45 DEG ANGLE TO MOBILISE WIDER EFFECTIVE BASE AREA.

KEY TO HEALTH & SAFETY SYMBOLS

- WARNING RISK — INDICATES A RESIDUAL RISK AS A WARNING.
- COMPULSORY RISK — INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.
- PROHIBITIVE RISK — INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.
- INFORMATION RISK — INDICATES A RESIDUAL RISK FOR INFORMATION.

* DENOTES- COLUMN REINFORCEMENT DATA NOT AVAILABLE FROM RECORD INFORMATION.



EXISTING BASEMENT WALL CONSTRUCTION AND THICKNESS TBC

LEVEL B1- EAST SIDE GA (EXISTING) Copy 1
1 : 100

P01	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

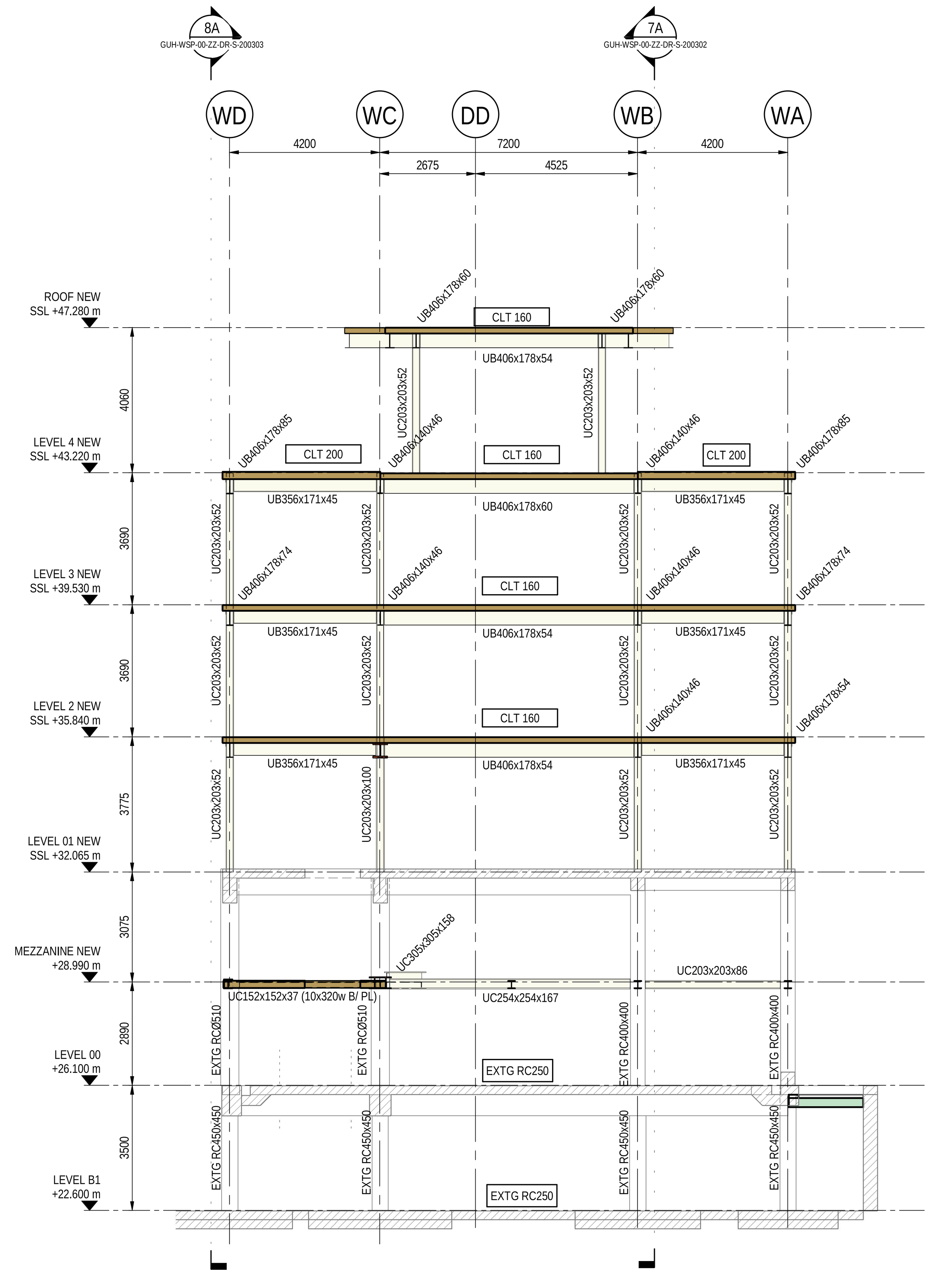
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED FOUNDATION GENERAL ARRANGEMENT

SCALE @ A0: AS NOTED	CHECKED: MC		APPROVED: MC
PROJECT NUMBER: 70075698	DESIGNED: AT	DRAWN: TRC	DATE: FEBBRUARY 2021

DRAWING No: GUH-WSP-00-B1-DR-S-160101 — REV: P01



SECTION 1A
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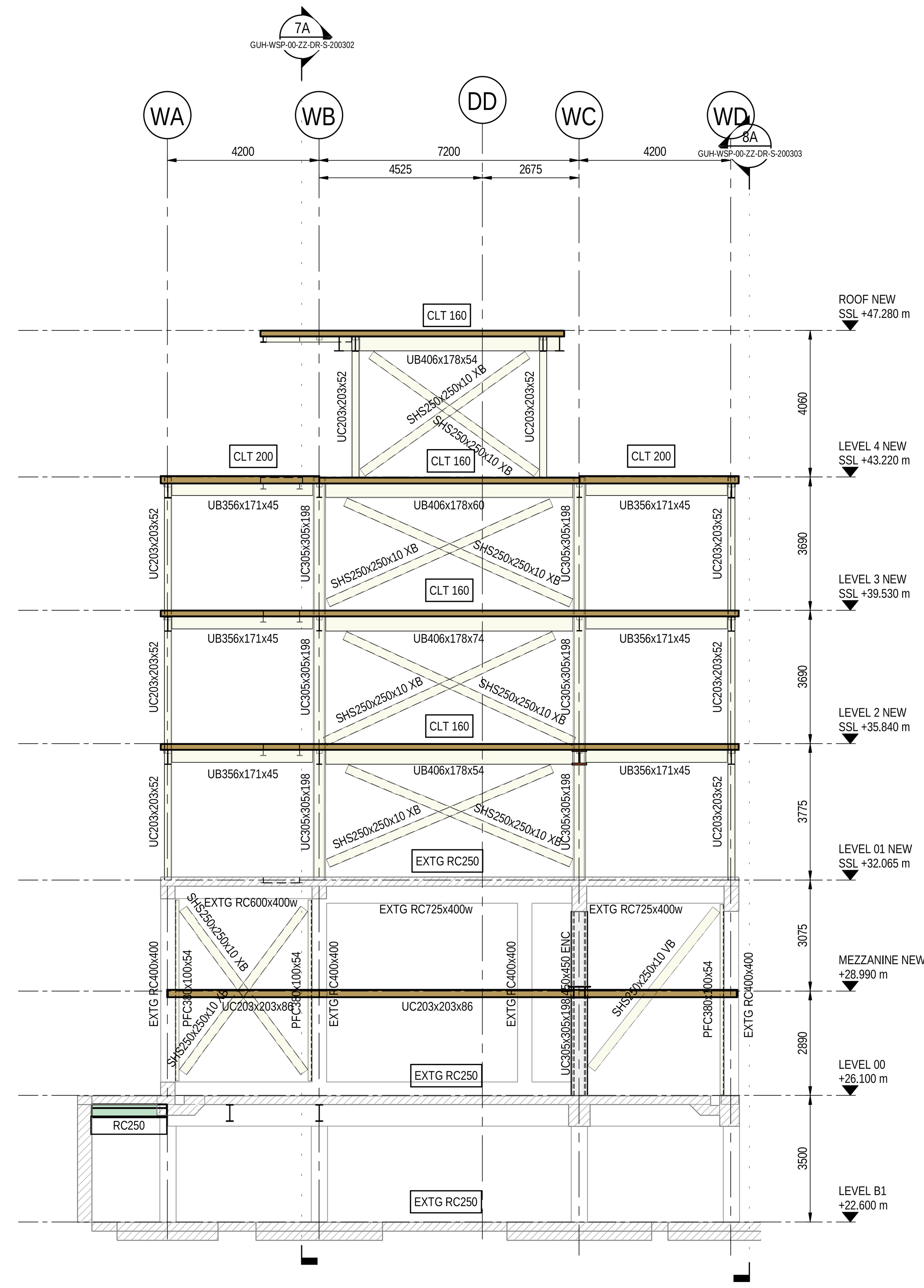
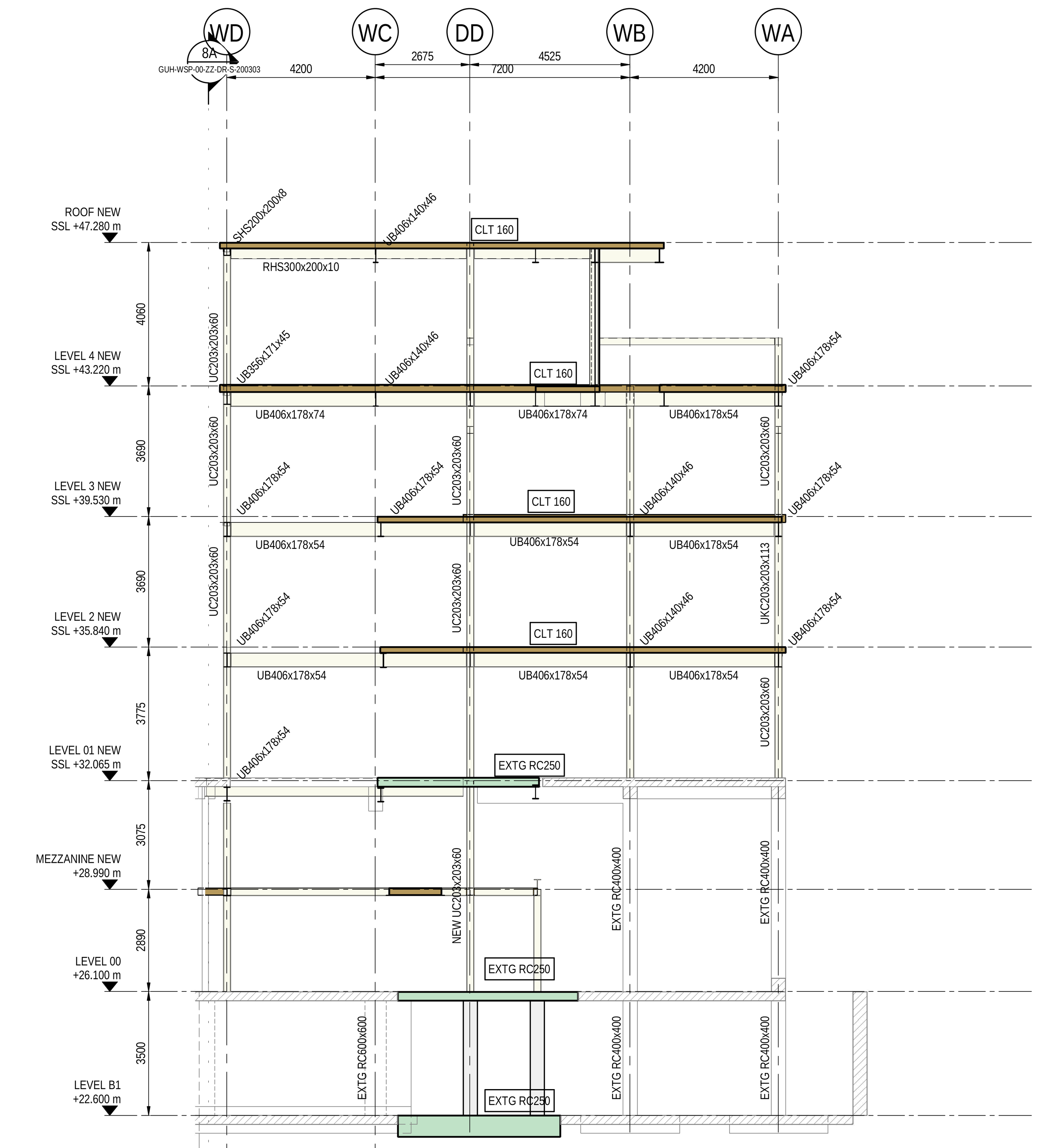
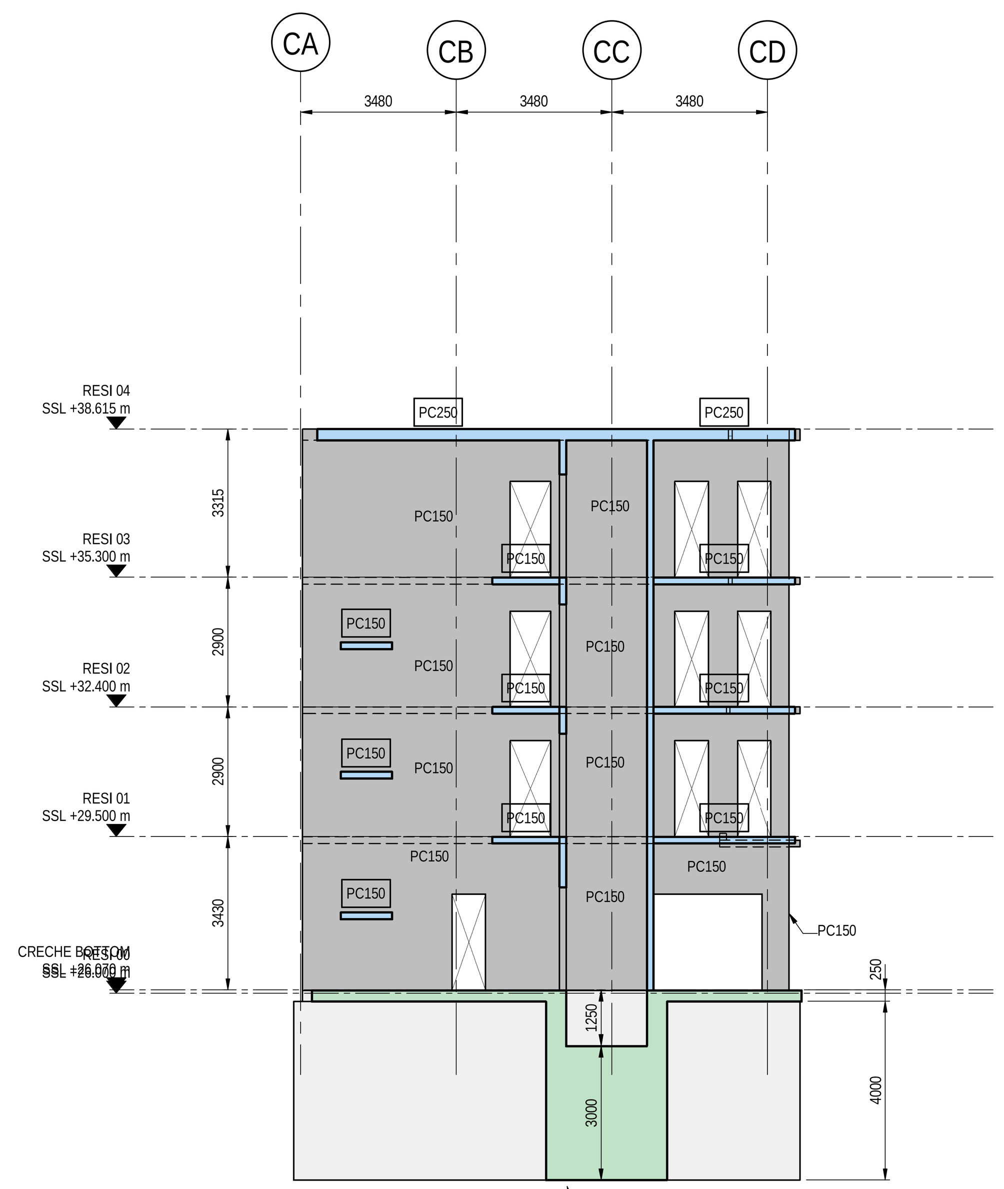


SECTION 2A
1 : 100 GUH-WSP-00-00-DR-S-130101

SECTION 3A
1 : 100 GUH-WSP-00-00-DR-S-130101

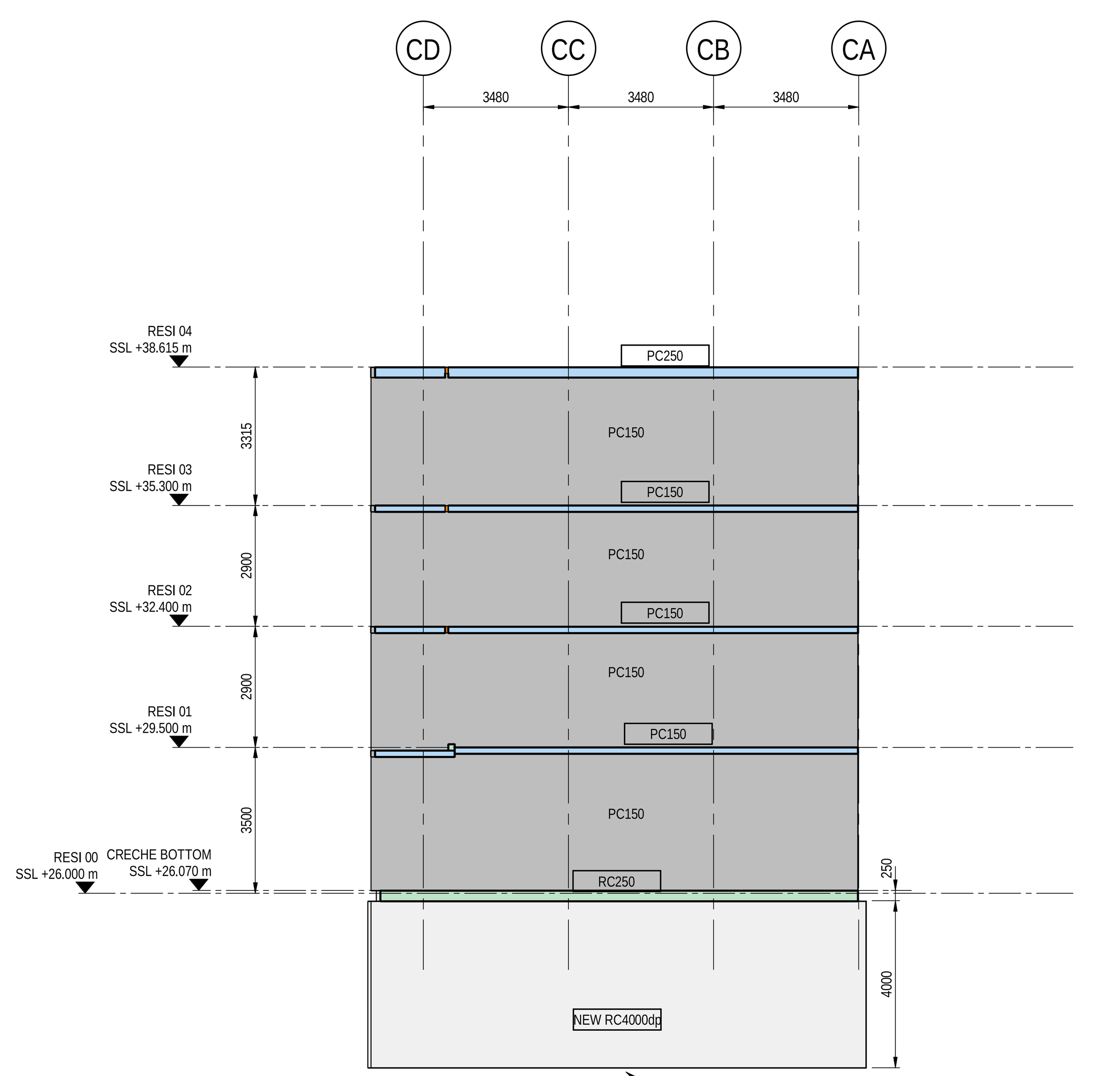


SECTION 4A
1 : 100 GUH-WSP-00-00-DR-S-130101



COMPETENT STRATA FOR SUPPORTING THE RESIDENTIAL BUILDING IS ASSUMED TO BE AT THE SAME LEVEL AS THE OFFICE BUILDING (BASEMENT LEVEL). SI INVESTIGATION IS REQUIRED IN ORDER TO CONFIRM THE DEPTH AT WHICH THE FOUNDATIONS CAN BE BUILT.

SECTION 5A
1 : 100 GUH-WSP-00-00-DR-S-130101



COMPETENT STRATA FOR SUPPORTING THE RESIDENTIAL BUILDING IS ASSUMED TO BE AT THE SAME LEVEL AS THE OFFICE BUILDING (BASEMENT LEVEL). SI INVESTIGATION IS REQUIRED IN ORDER TO CONFIRM THE DEPTH AT WHICH THE FOUNDATIONS CAN BE BUILT.

SECTION 6A
1 : 100 GUH-WSP-00-00-DR-S-130101

DO NOT SCALE

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KEY TO HEALTH & SAFETY SYMBOLS

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P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

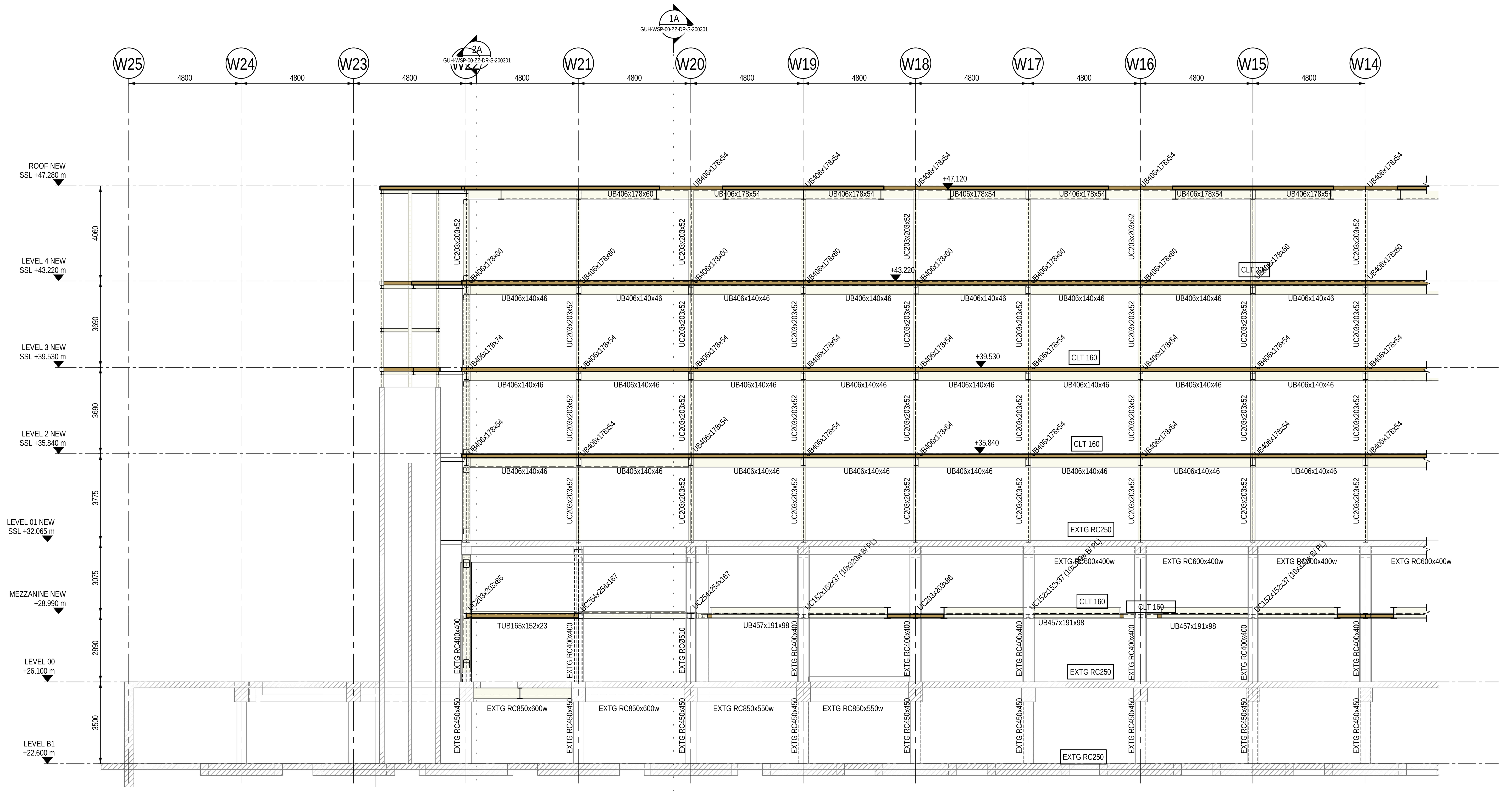
PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED SECTIONS SHEET 1 OF 3

SCALE @ A0:	CHECKED:	APPROVED:
AS NOTED	ASW	ASW

PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-ZZ-DR-S-200301 REV: P03



SECTION 7A
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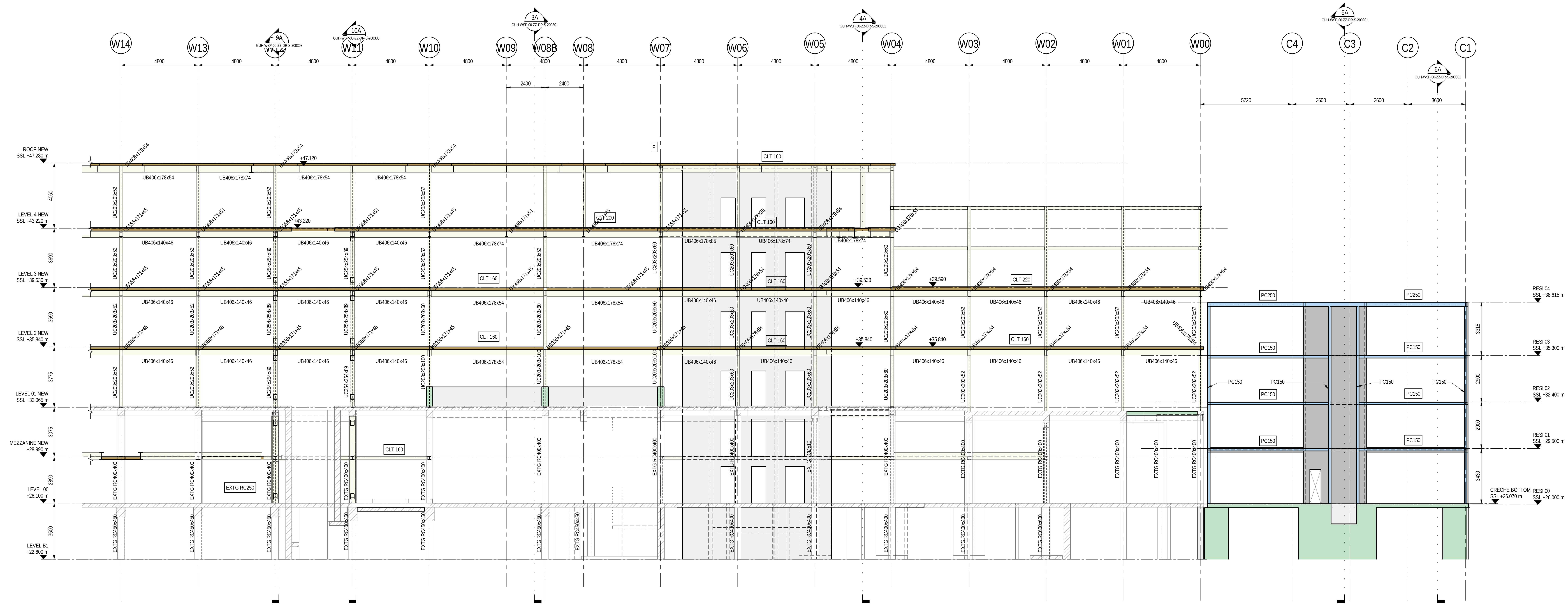

SECTION 7A CNT'D
1 : 100 GUH-WSP-00-ZZ-DR-S-200303

DO NOT SCALE

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P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

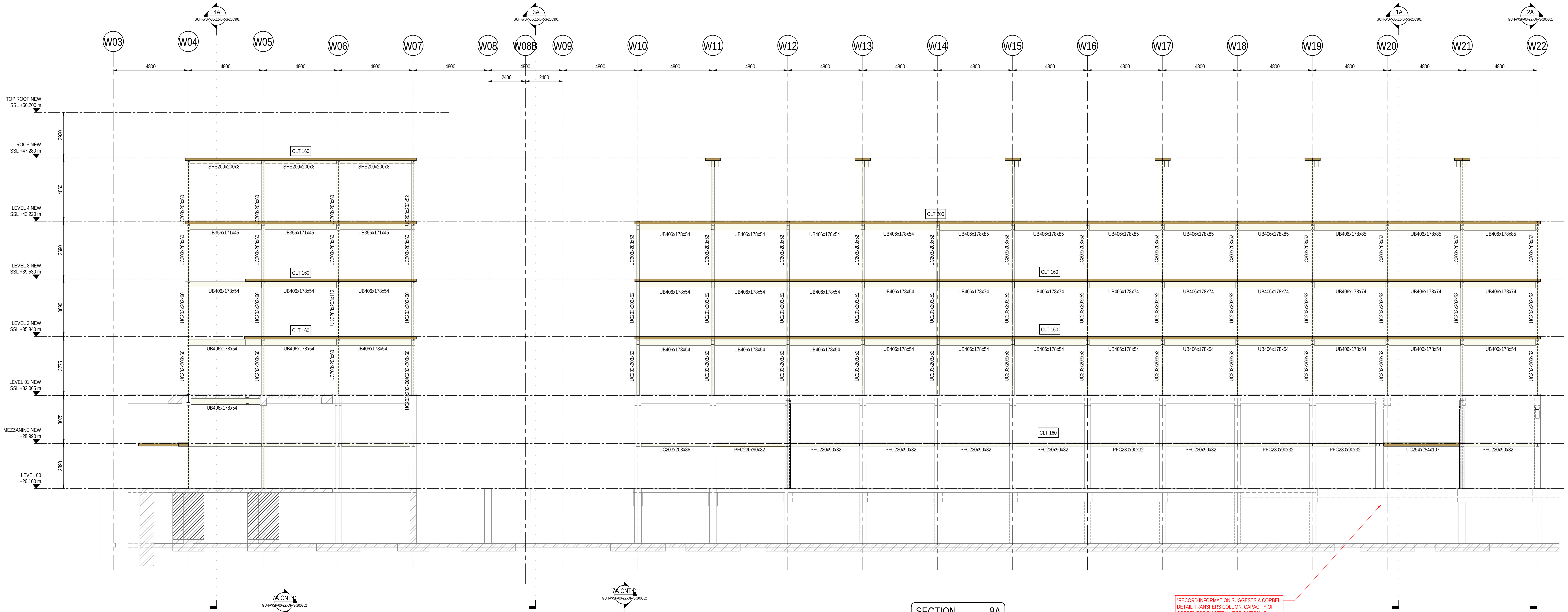
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED SECTIONS SHEET 2 OF 3

SCALE @ A0: AS NOTED	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: SEPTEMBER 2018

DRAWING No: GUH-WSP-00-ZZ-DR-S-200302 REV: P03



SECTION 8A
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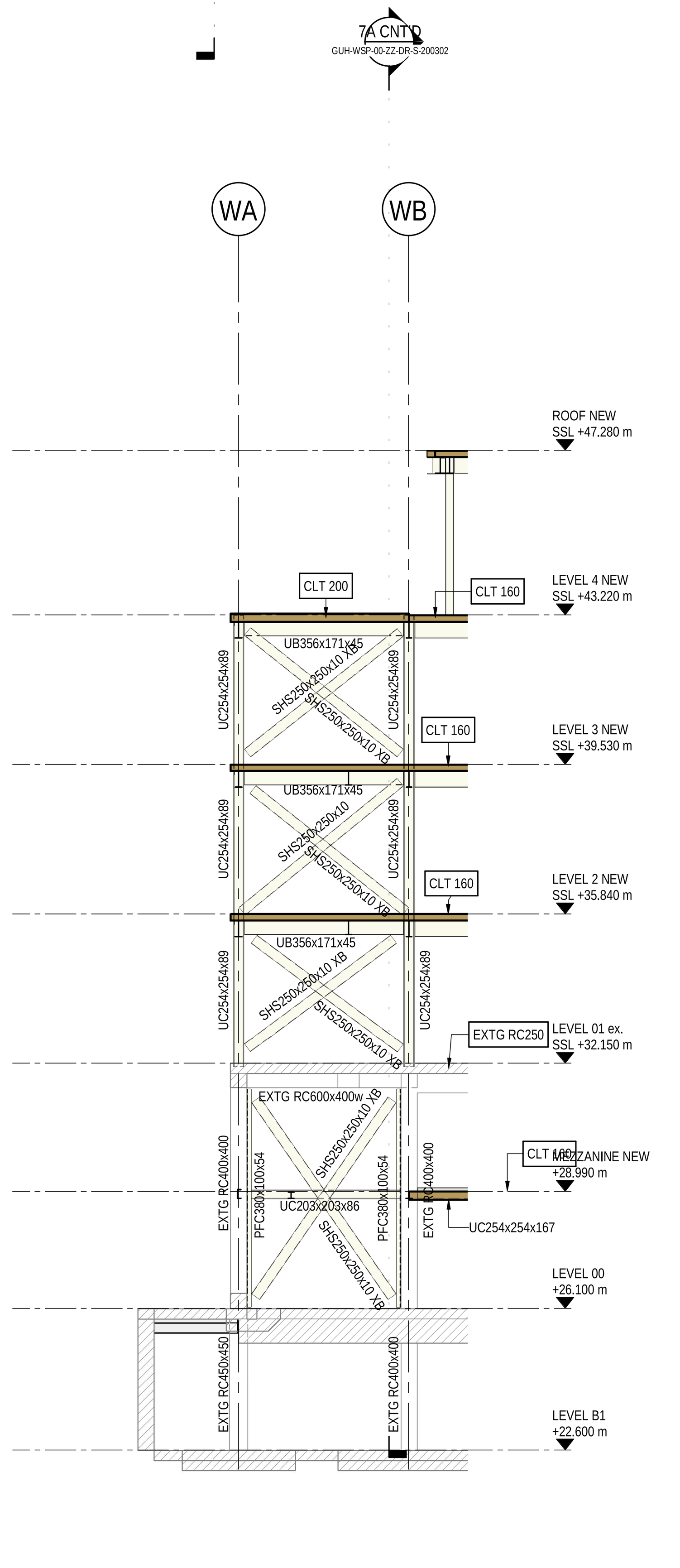

SECTION 9A
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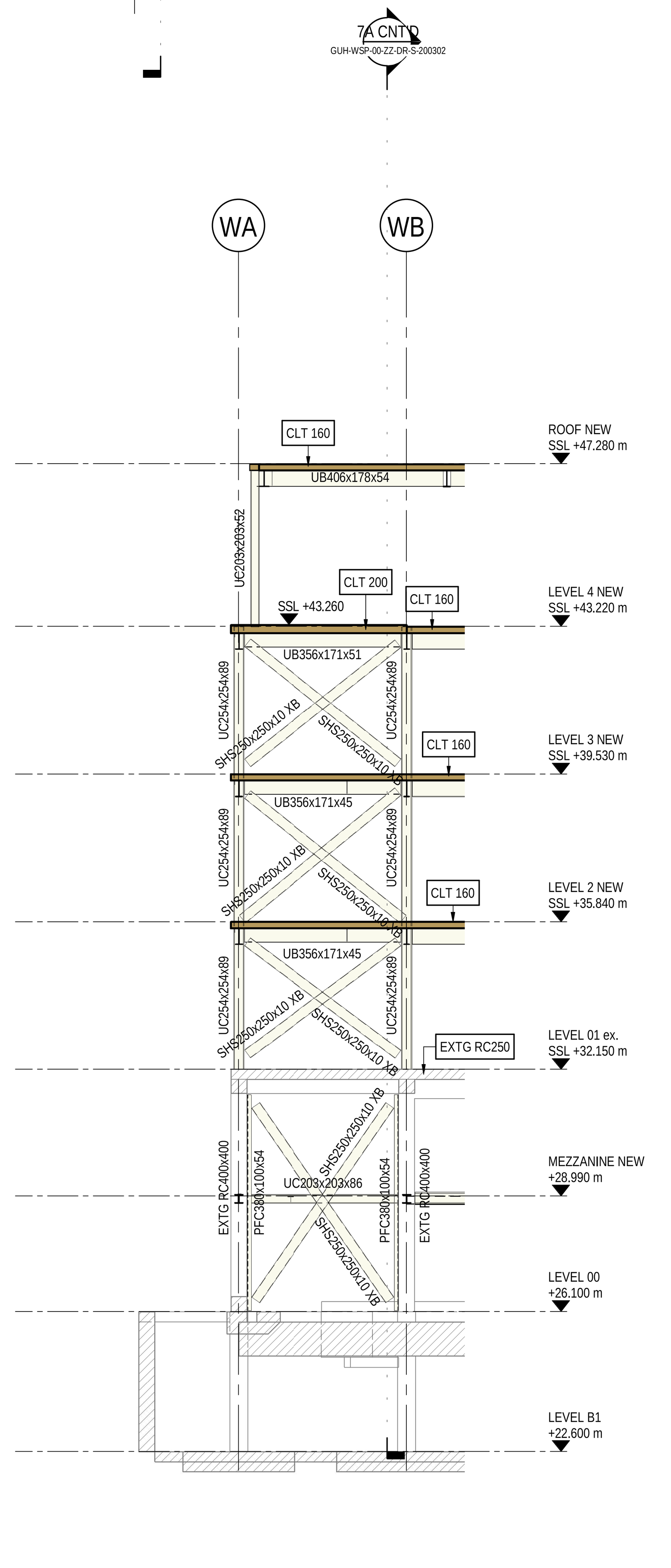

SECTION 10A
1 : 100 GUH-WSP-00-00-DR-S-130101

DO NOT SCALE

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P02	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P01	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

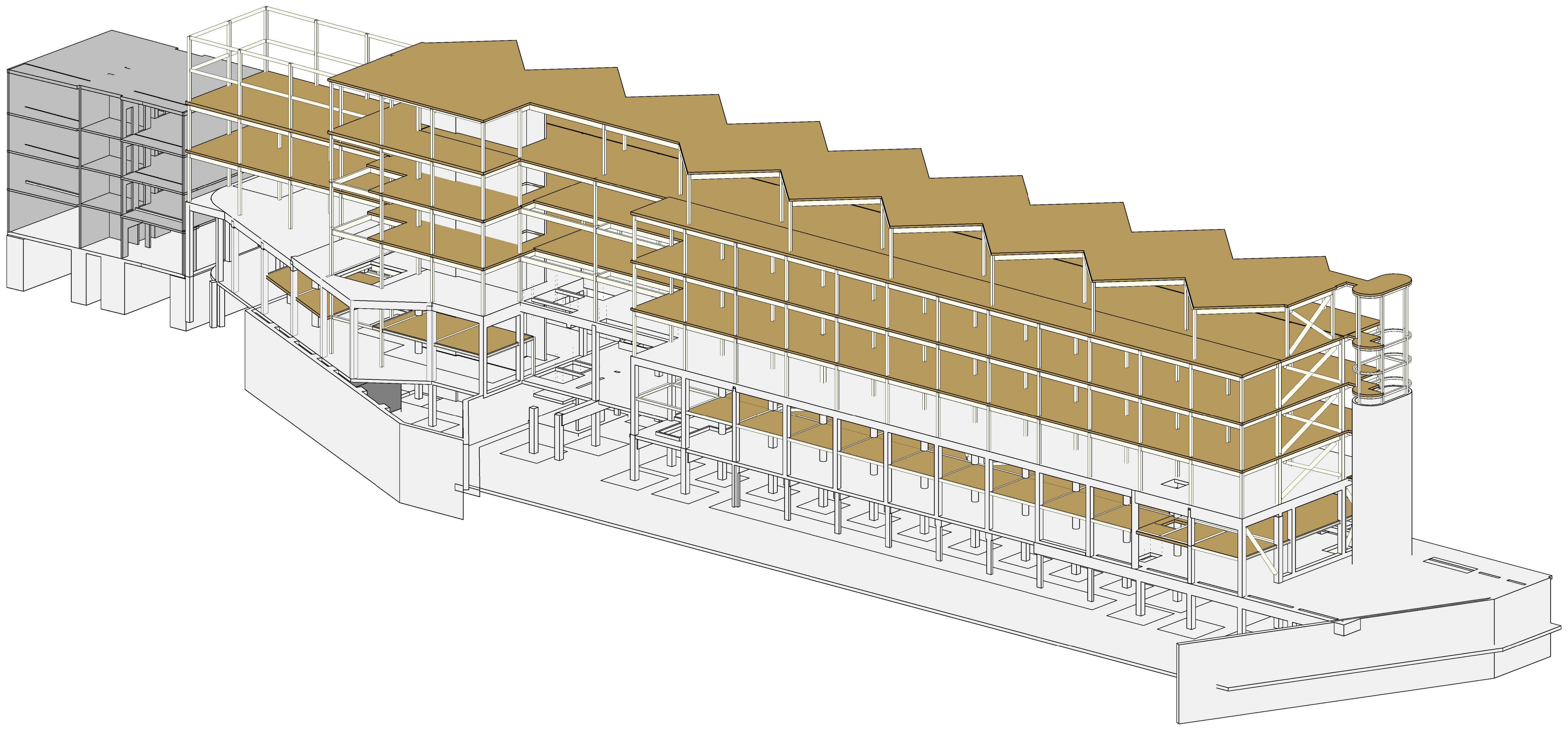
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

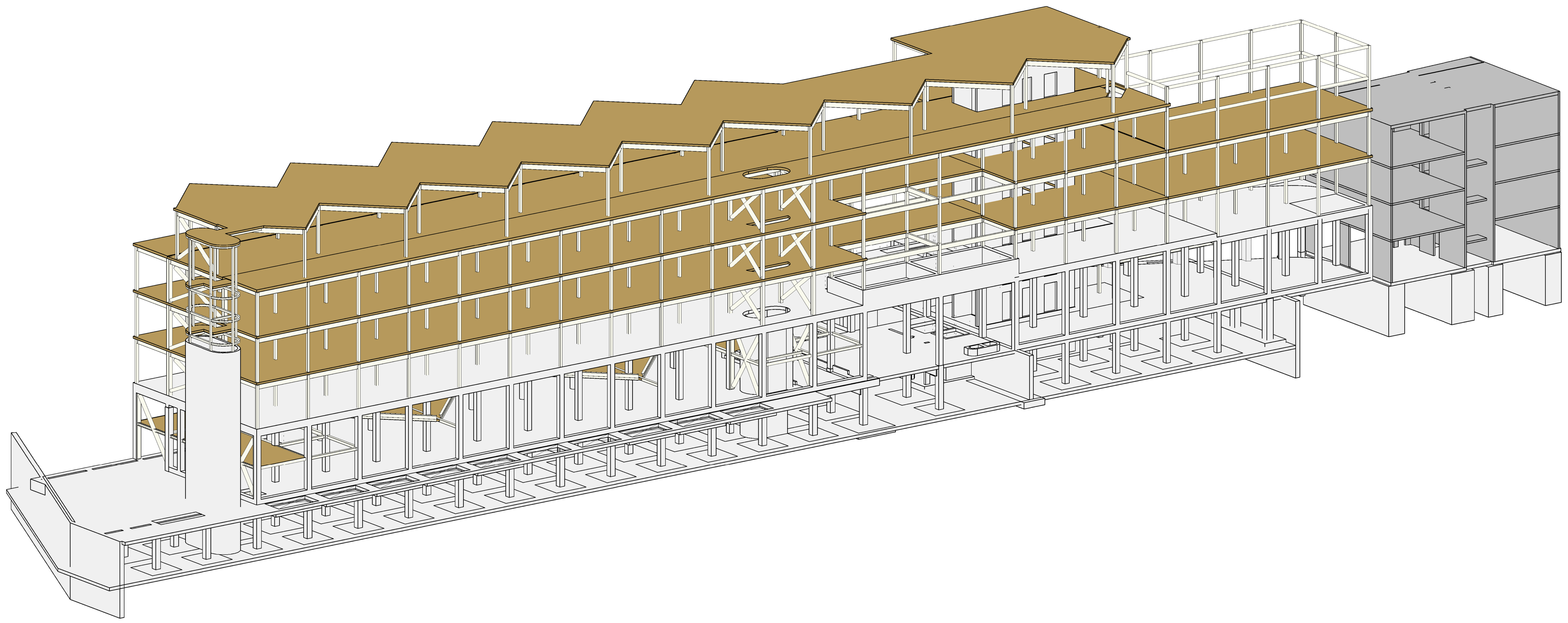
TITLE: PROPOSED SECTIONS SHEET 3 OF 3

SCALE @ A0: 1:100	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: SEPTEMBER 2018

DRAWING No: GUH-WSP-00-ZZ-DR-S-200303 REV: P02



PROPOSED 3D VIEW 1



PROPOSED 3D VIEW 2

DO NOT SCALE

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KEY TO HEALTH & SAFETY SYMBOLS

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P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

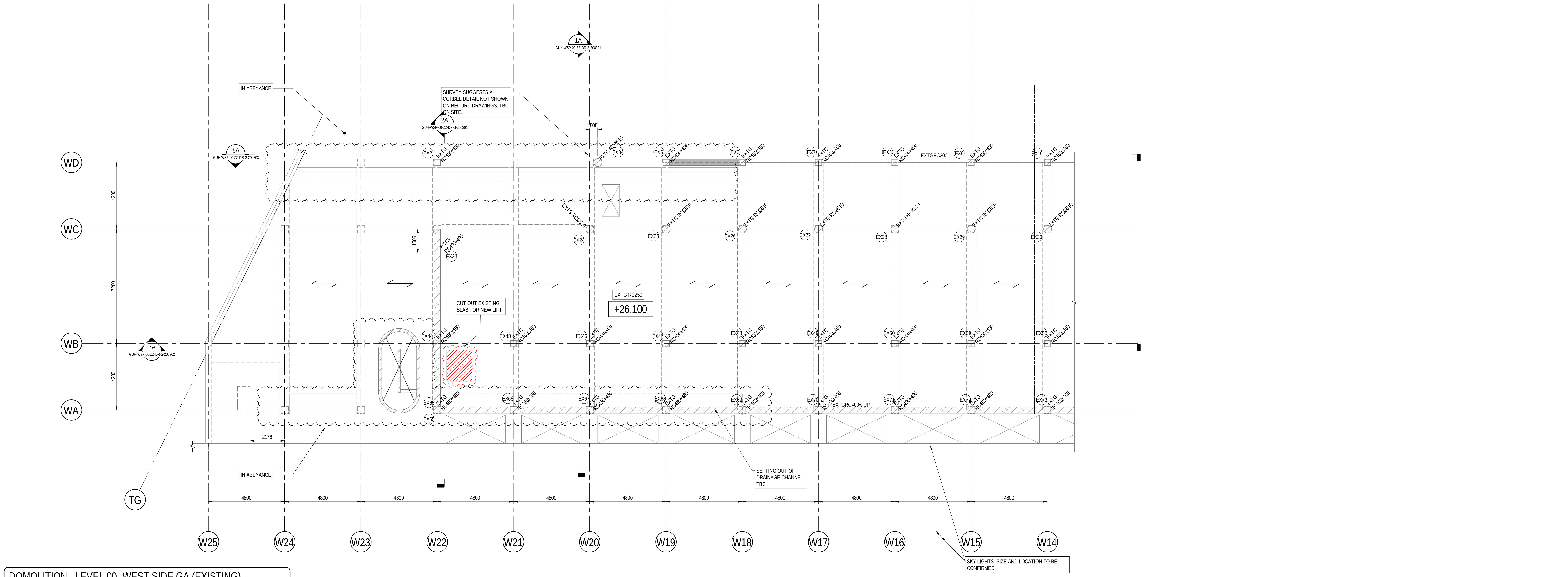
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: PROPOSED 3D VIEWS

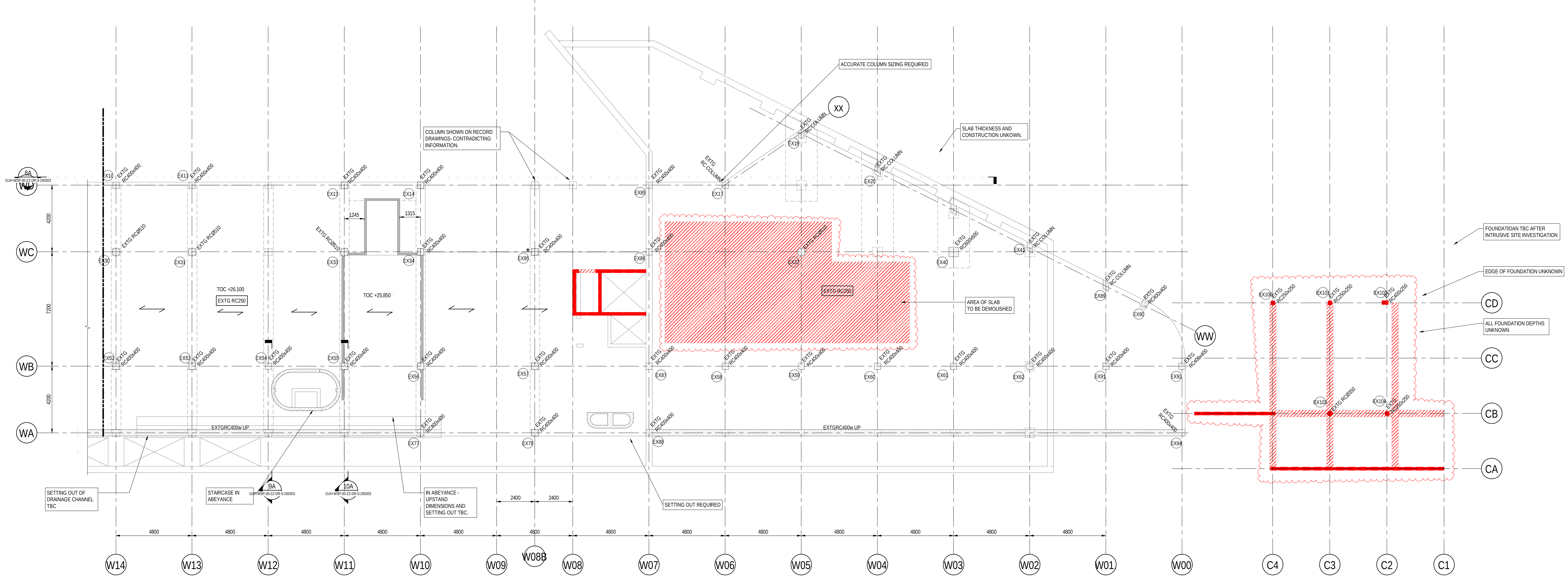
SCALE @ A0:	CHECKED:		APPROVED:
1:200	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-00-ZZ-DR-S-200901 REV: P03



DOMOLITION - LEVEL 00- WEST SIDE GA (EXISTING)

1 : 100



DOMOLITION - LEVEL 00- EAST SIDE GA (EXISTING)

1 : 100

DO NOT SCALE

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KEY TO HEALTH & SAFETY SYMBOLS

WARNING RISK
INDICATES A RESIDUAL RISK AS A WARNING.

COMPULSORY RISK
INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.

PROHIBITIVE RISK
INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.

INFORMATION RISK
INDICATES A RESIDUAL RISK FOR INFORMATION.

* DENOTES- COLUMN REINFORCEMENT DATA NOT AVAILABLE FROM RECORD INFORMATION.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

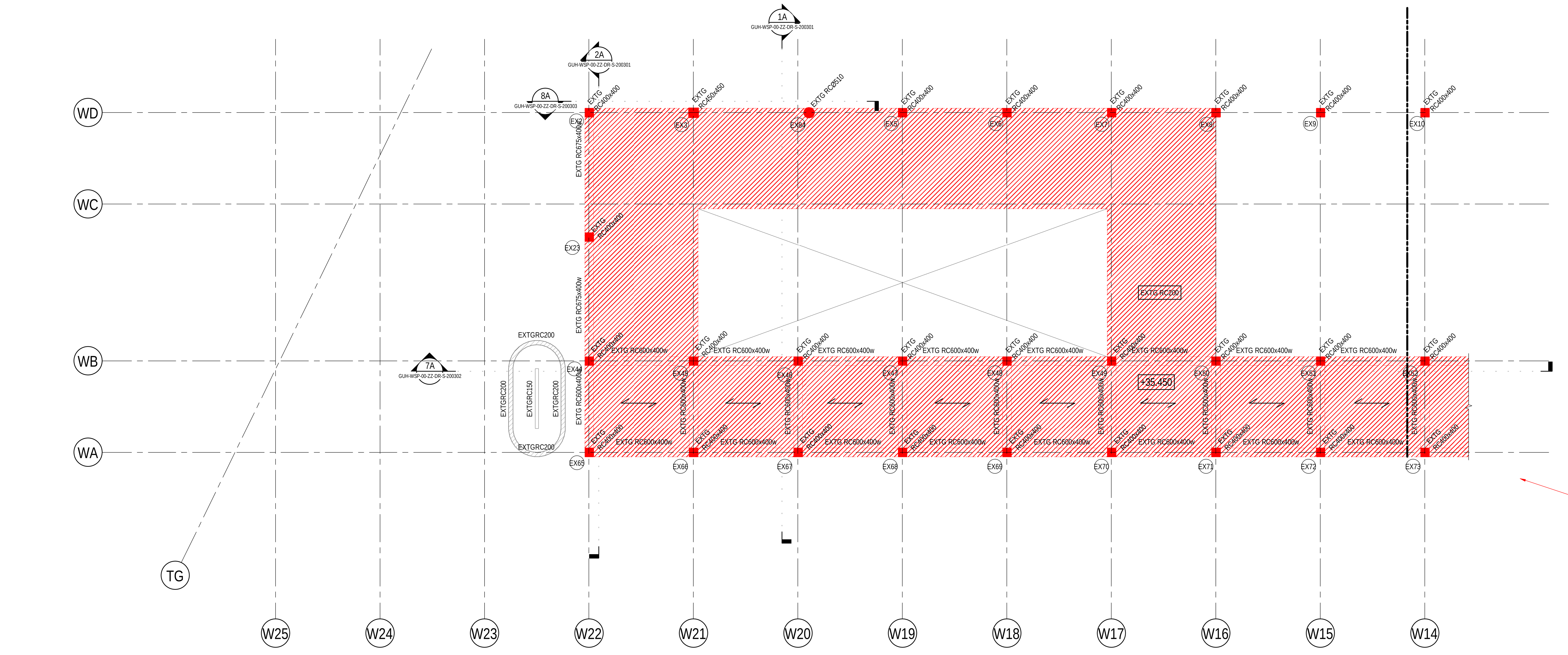
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: DEMOLITION EXISTING LEVEL 00

SCALE @ A0: 1:100	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: AT	DRAWN: TRC	DATE: FEBRUARY 2021

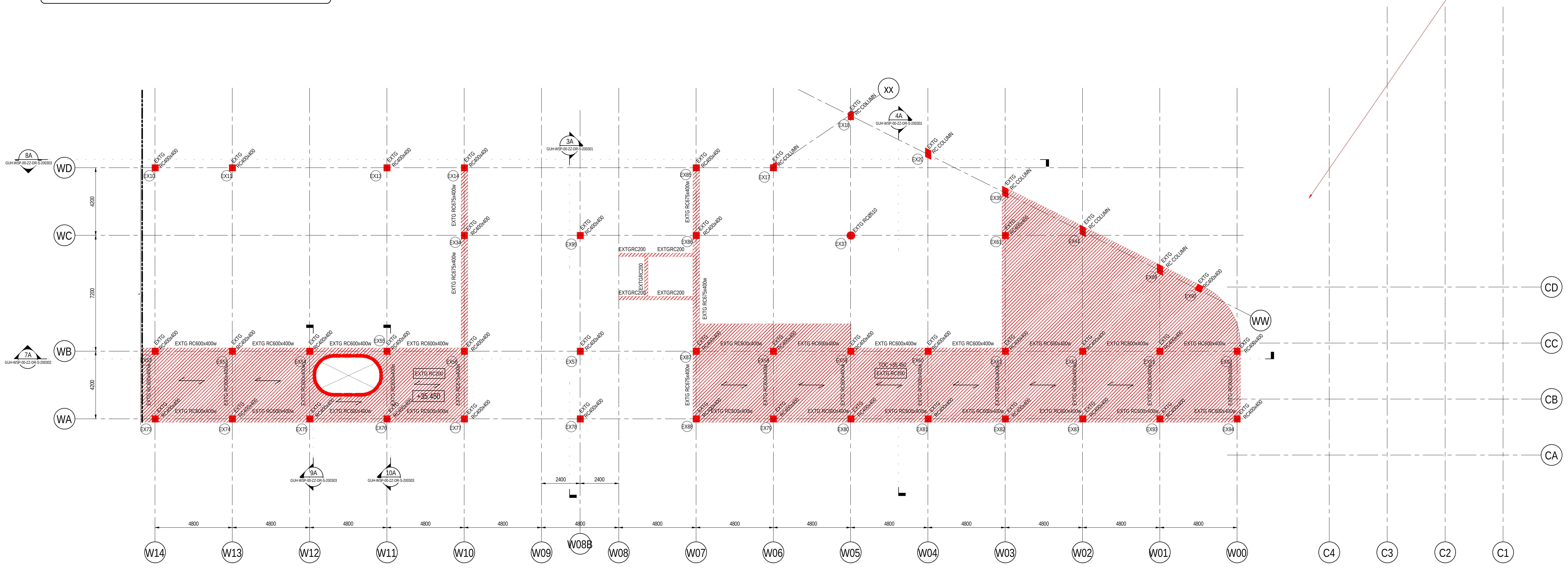
DRAWING No: GUH-WSP-DE-00-DR-S0130100 — REV: P01



DEMOLITION - MEZZANINE- WEST SIDE GA (EXISTING)

1 : 100

EXISTING STRUCTURE TO BE DEMOLISHED USING NON-PERCUSSIVE METHODS.



DEMOLITION - MEZZANINE- EAST SIDE GA (EXISTING)

1 : 100

DO NOT SCALE

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PROHIBITIVE ACTION RISK

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TEMPORARY STABILITY OF THE STRUCTURE: THE BUILDINGS HAVE BEEN DESIGNED BASED ON THE PERMANENT CONDITION ONLY; THE CONTRACTOR WILL HAVE TO MAKE AN ASSESSMENT OF THE TEMPORARY STABILITY OF THE BUILDINGS BASED ON THEIR SPECIALIST CONSTRUCTION KNOWLEDGE AND INTENDED CONSTRUCTION SEQUENCE.

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P01	04.10.2018	JO	ISSUED FOR STAGE 2	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

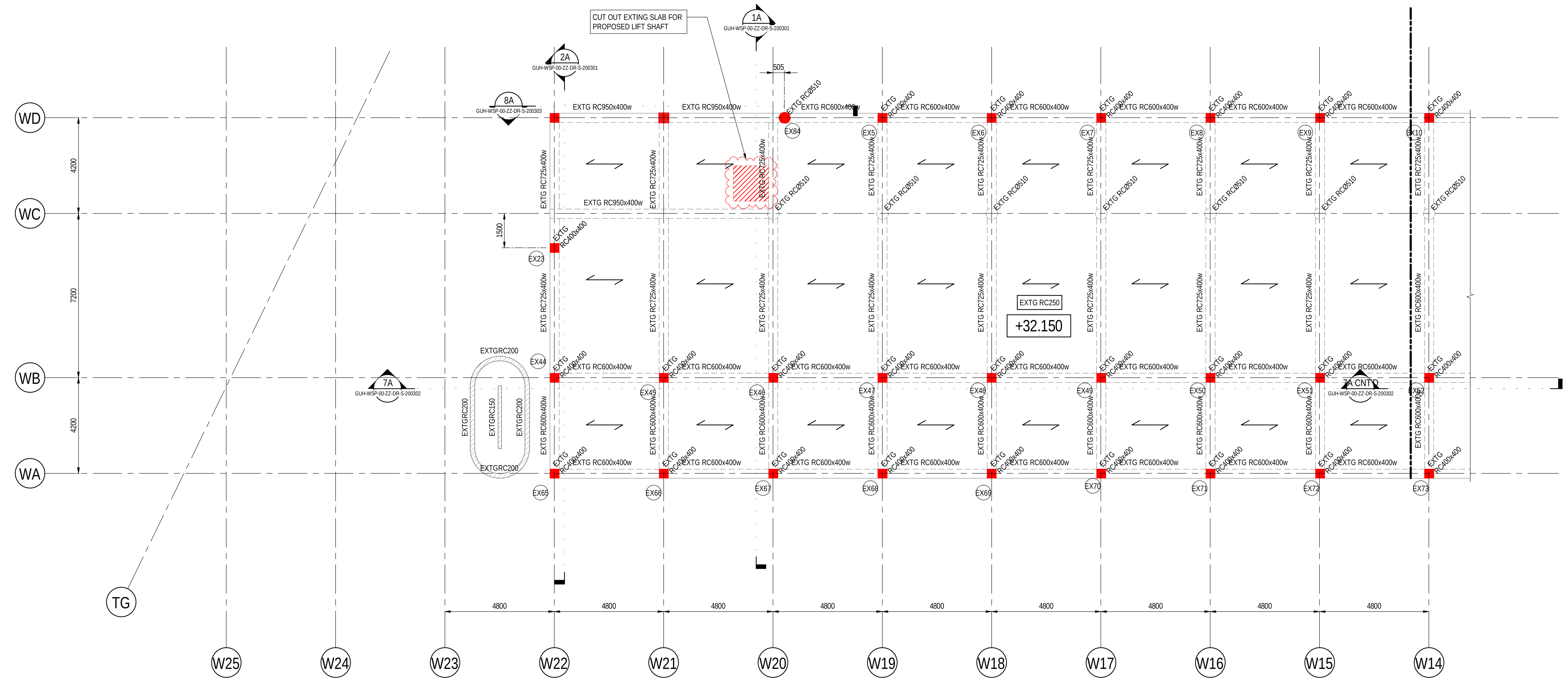
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: DEMOLITION EXISTING MEZZANINE

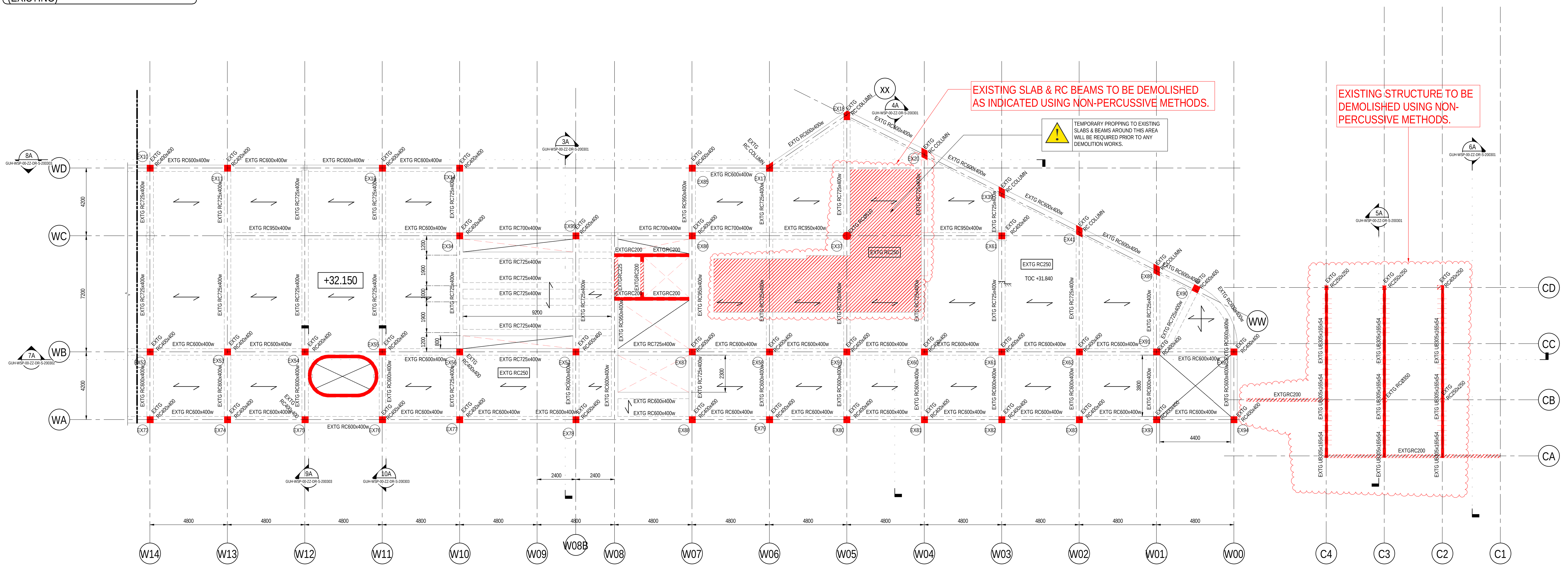
SCALE @ A0:	CHECKED:		APPROVED:
AS NOTED	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-DE-0M-DR-S-200101 REV: P02



PLEASE NOTE : ALL EXISTING RC COLUMNS ABOVE EXISTING LEVEL L01 TO BE DEMOLISHED

DEMOLITION- LEVEL 01- WEST SIDE GA (EXISTING)



PLEASE NOTE : ALL EXISTING RC COLUMNS ABOVE EXISTING LEVEL L01 TO BE DEMOLISHED

DEMOLITION- LEVEL 01- EAST SIDE GA (EXISTING)

DO NOT SCALE

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REV	DATE	BY	DESCRIPTION	CHK	APP
P02	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P01	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: DEMOLITION EXISTING LEVEL 01

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-DE-01-DR-S-200101 REV: P02

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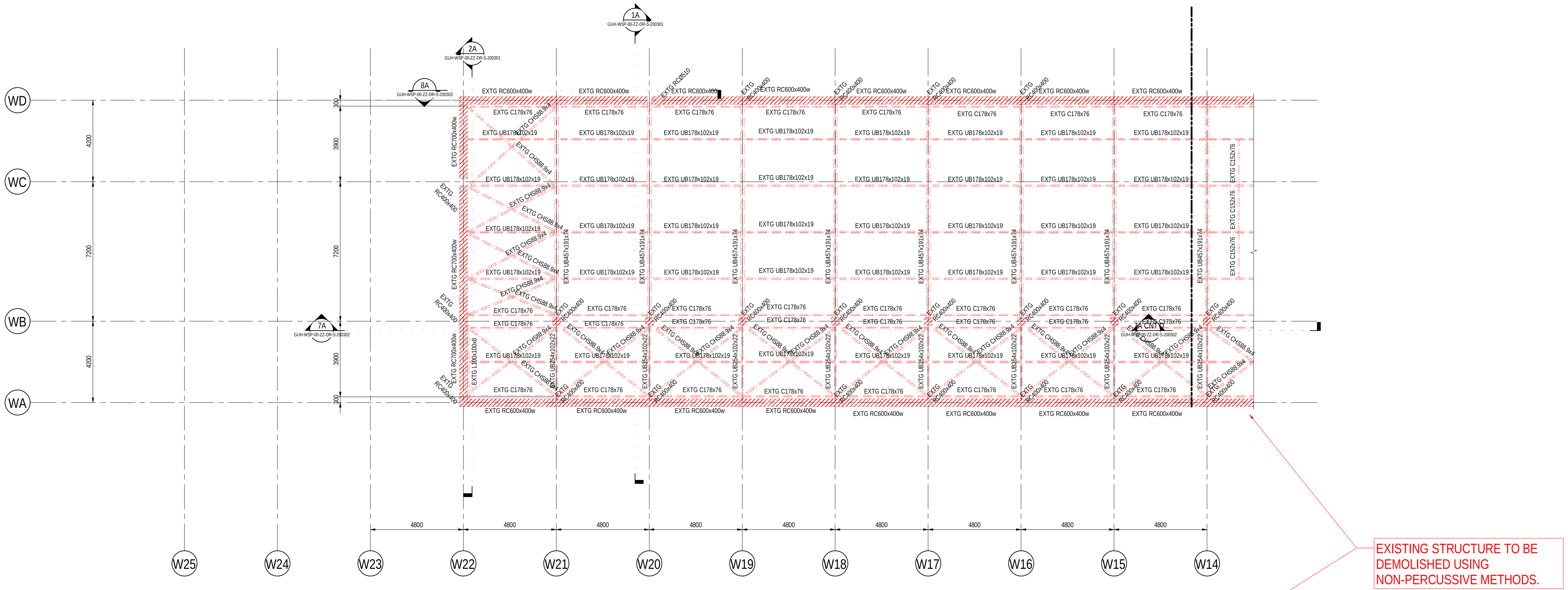
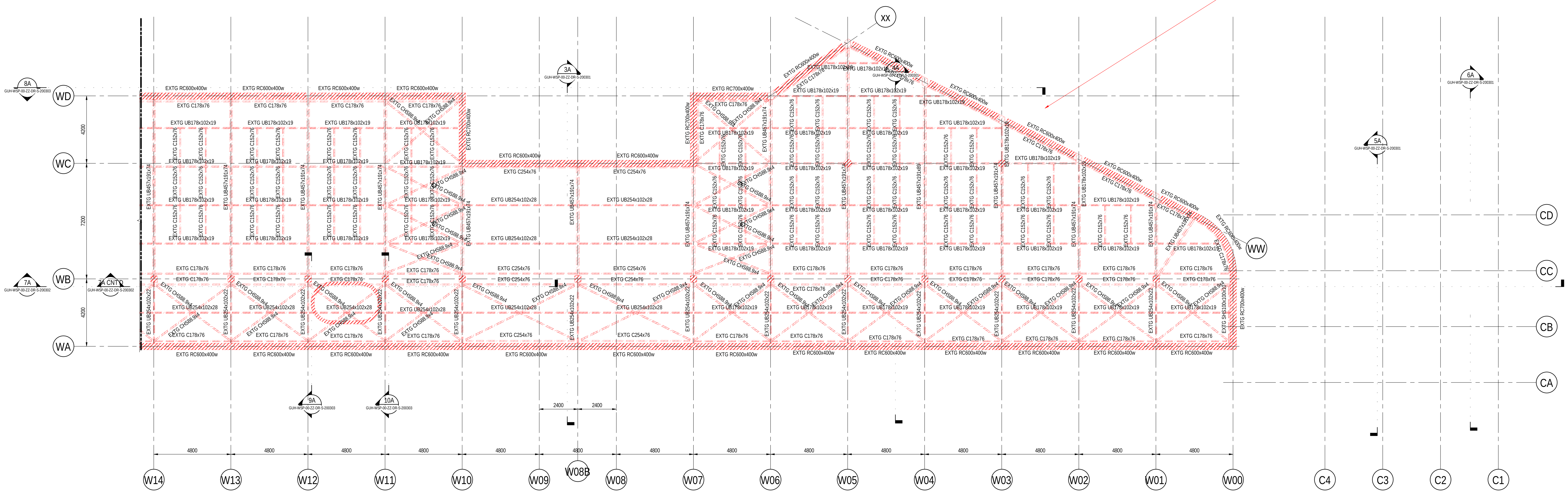


DEMOLITION- ROOF- WEST SIDE GA (EXISTING)

1 : 100



DEMOLOTION- ROOF- EAST SIDE GA (EXISTING)

1 : 100

KEY TO HEALTH & SAFETY SYMBOLS

- WARNING RISK
  INDICATES A RESIDUAL RISK AS A WARNING.
- COMPULSORY RISK
  INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.
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P02	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P01	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

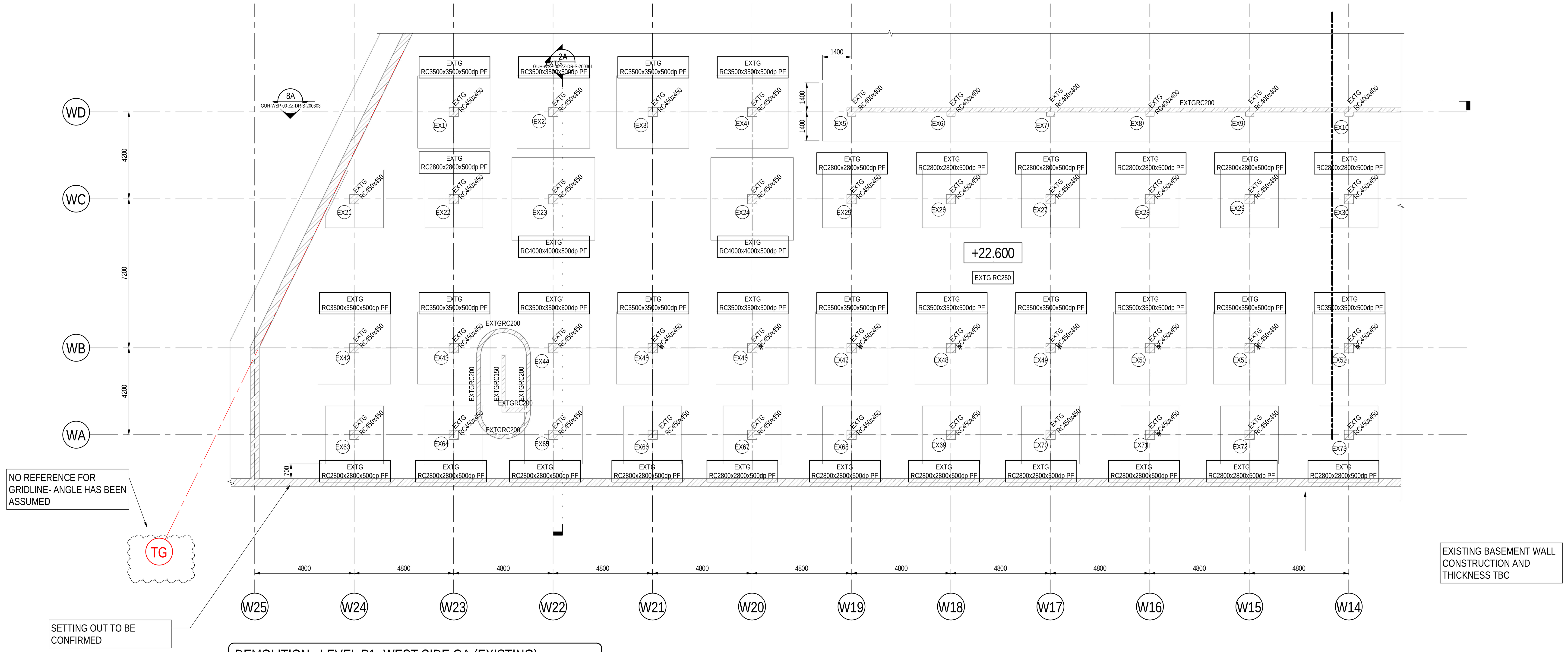
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: DEMOLITION EXISTING ROOF

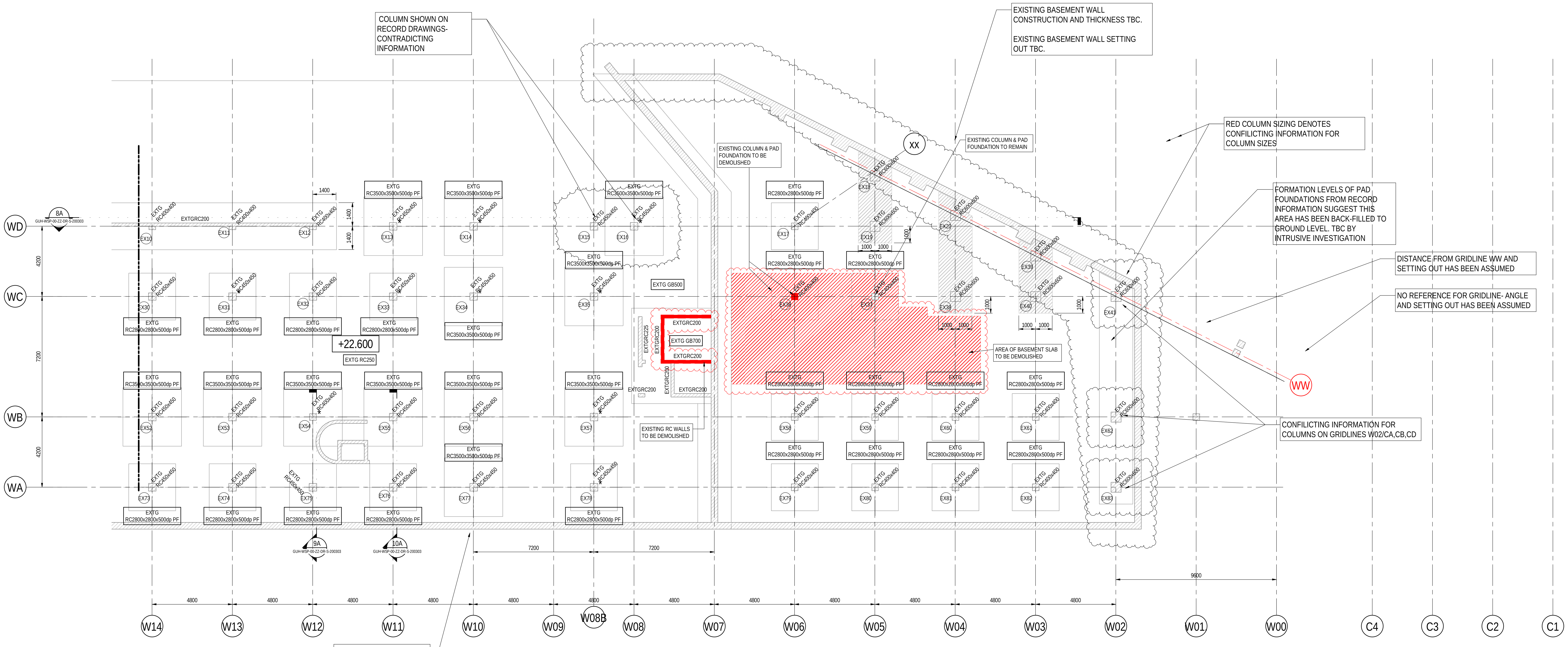
SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-DE-04-DR-S-200101 REV: P02



DEMOLITION - LEVEL B1- WEST SIDE GA (EXISTING)

1 : 100



DEMOLITION - LEVEL B1- EAST SIDE GA (EXISTING)

1 : 100

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KEY TO HEALTH & SAFETY SYMBOLS

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REV	DATE	BY	DESCRIPTION	CHK	APP
P01	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

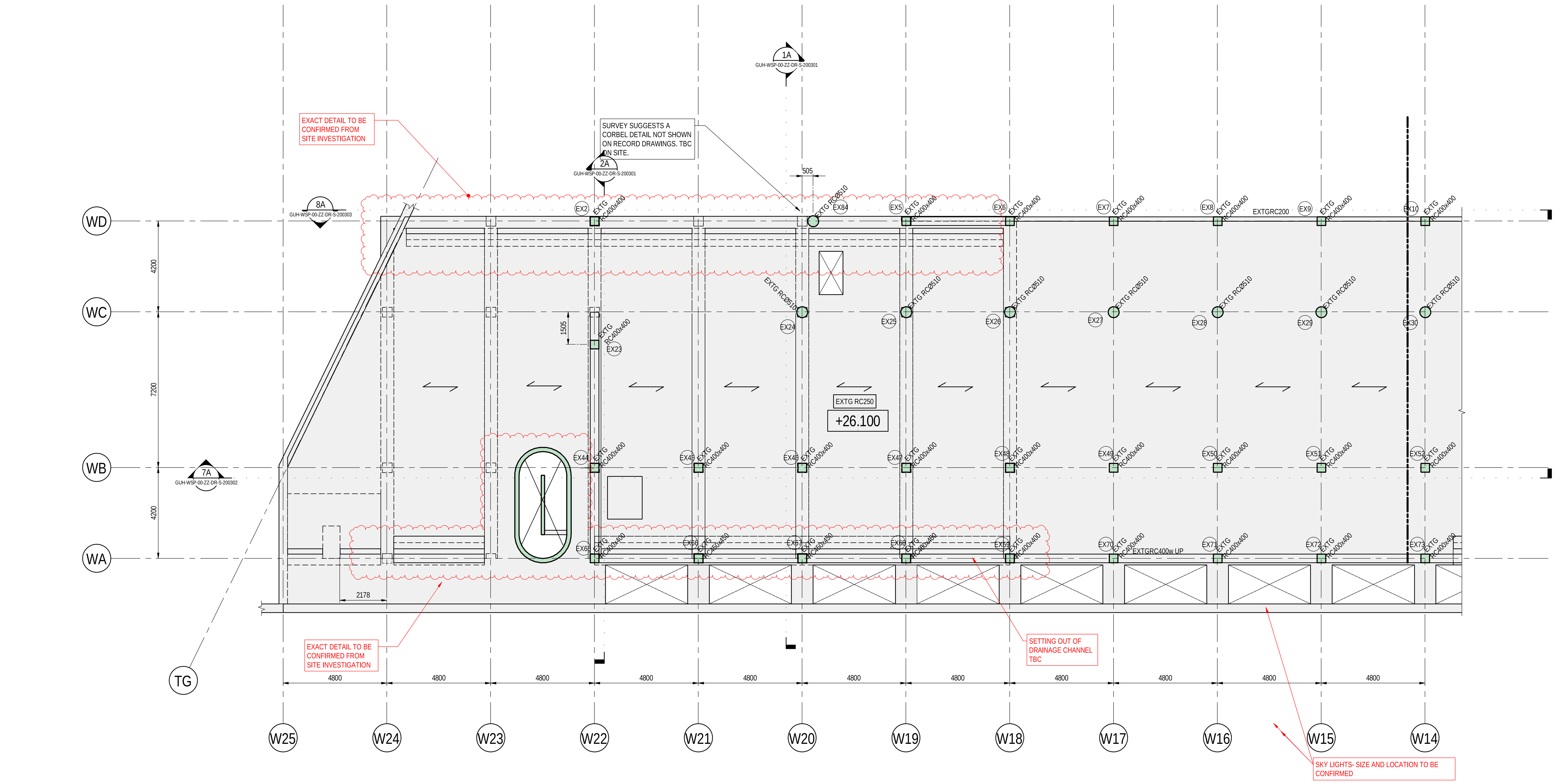
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

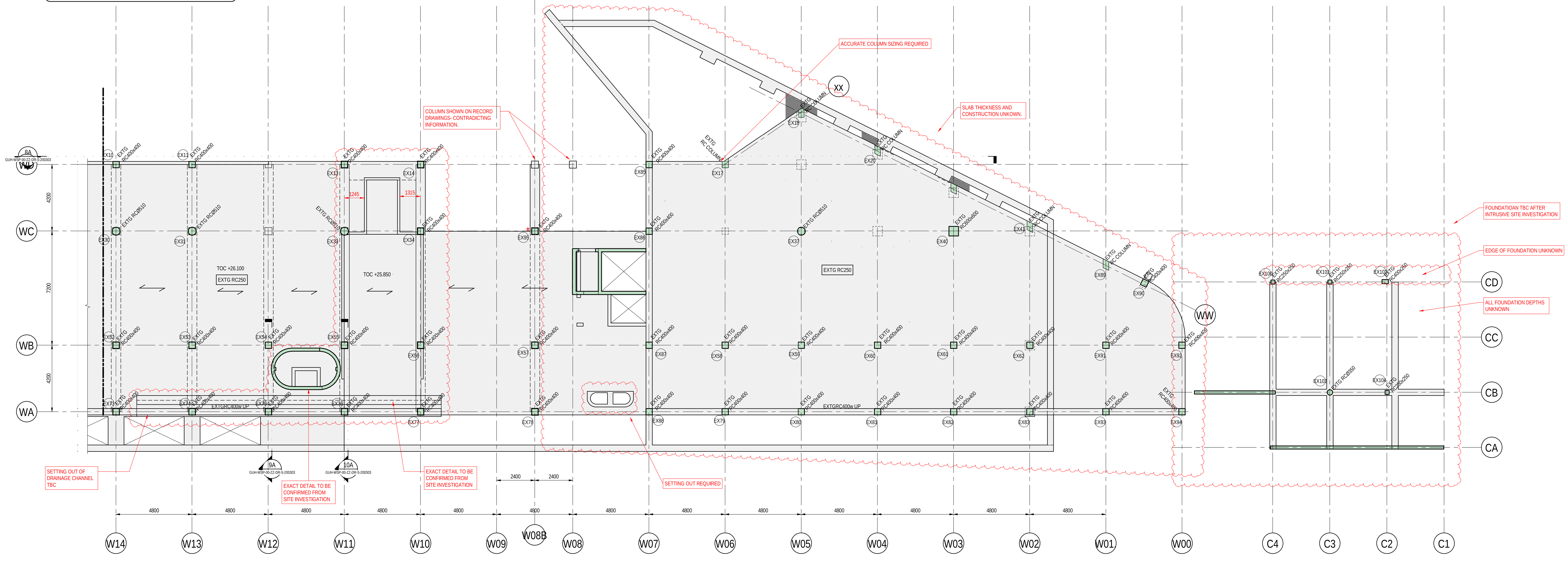
TITLE: DEMOLITION EXISTING FOUNDATION

SCALE @ A0: 1:100	CHECKED: AT		APPROVED: MC
PROJECT NUMBER: 70075698	DESIGNED: AT	DRAWN: TRC	DATE: FEBRUARY 2021

DRAWING No: GUH-WSP-DE-B1-DR-S0160100 REV: P01



LEVEL 00- WEST SIDE GA (EXISTING)
1 : 100



LEVEL 00- EAST SIDE GA (EXISTING)
1 : 100

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REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

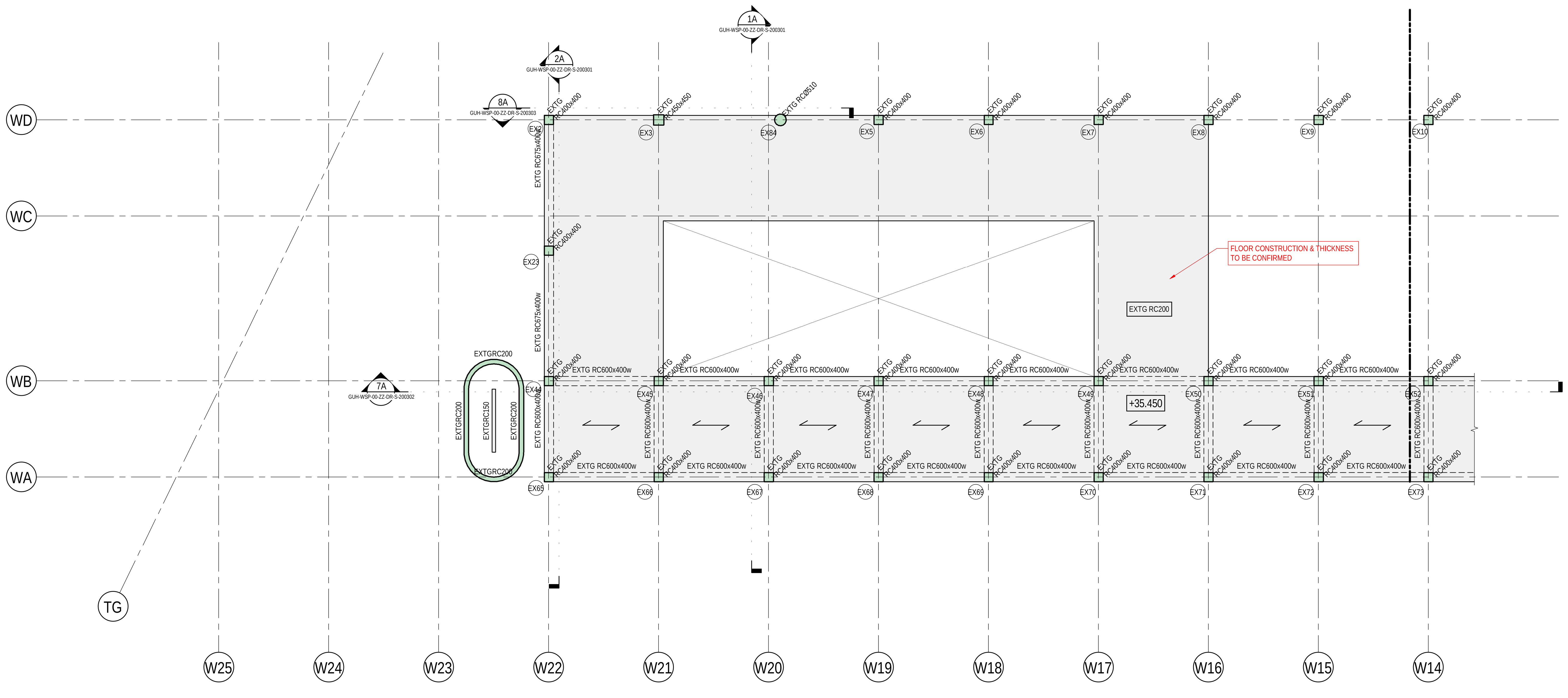
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

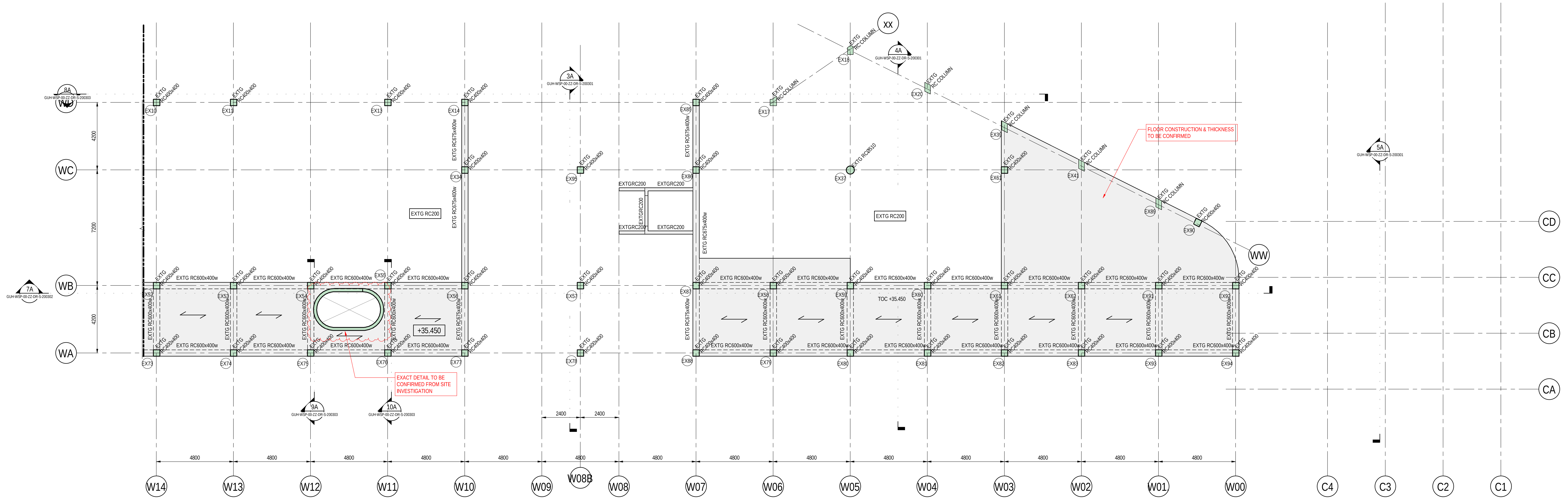
TITLE: EXISTING LEVEL 00 GENERAL ARRANGEMENT

SCALE @ A0: 1:100	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: SEPTEMBER 2018

DRAWING No: GUH-WSP-EX-00-DR-S-130101 — REV: P03



MEZZANINE- WEST SIDE GA (EXISTING)
1 : 100



MEZZANINE- EAST SIDE GA (EXISTING)
1 : 100

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REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

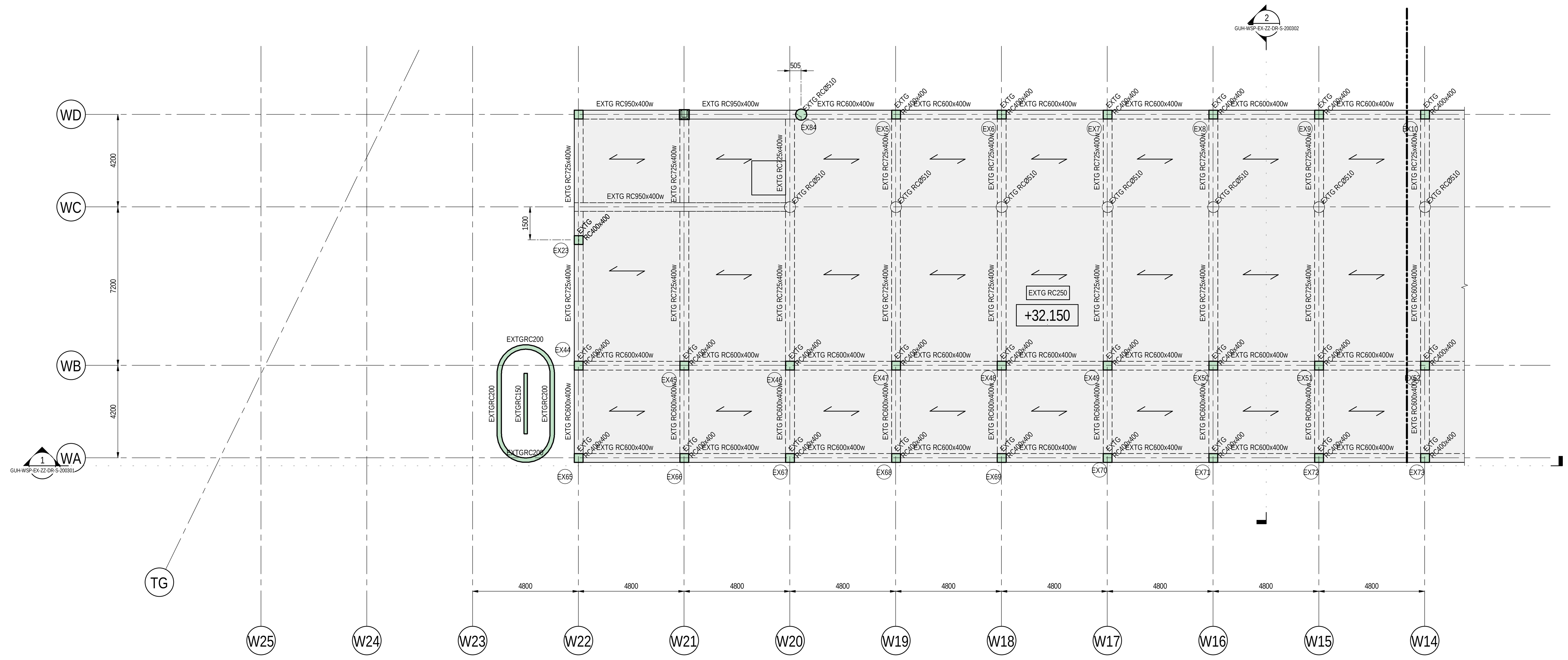
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

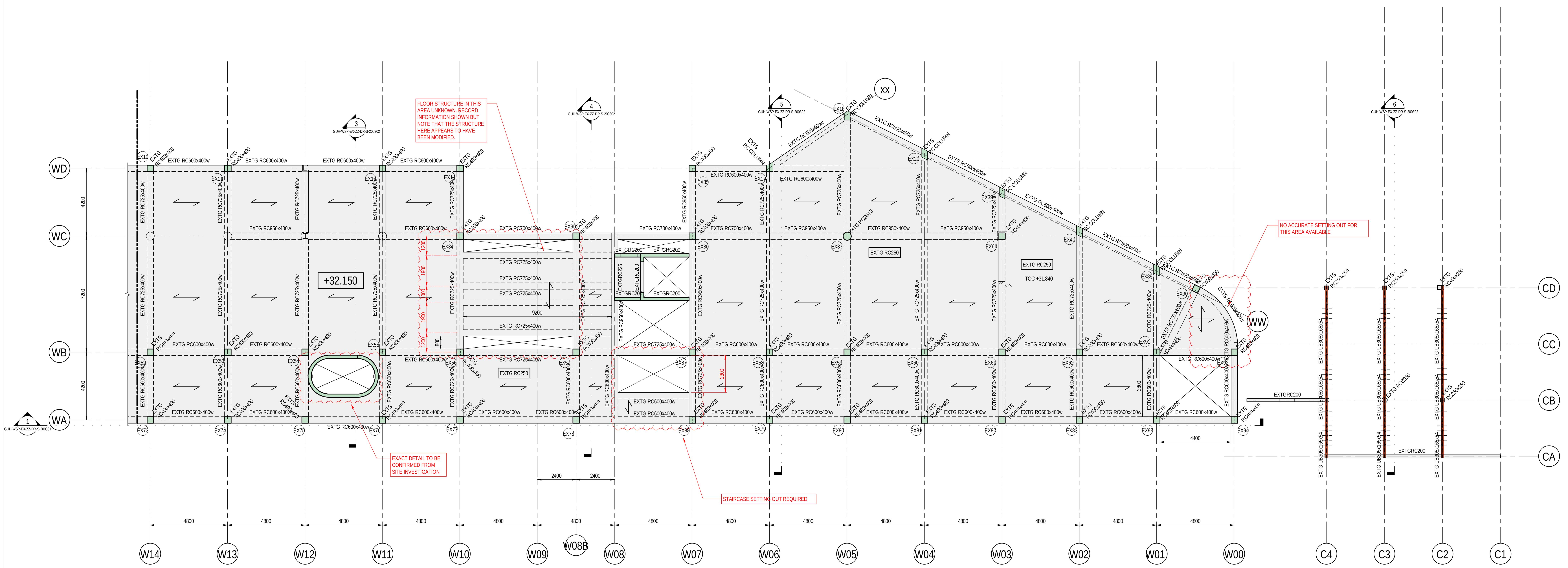
TITLE: EXISTING MEZZANINE GENERAL ARRANGEMENT

SCALE @ A0:	CHECKED:		APPROVED:
1:100	ASW		ASW
PROJECT NUMBER:	DESIGNED:	DRAWN:	DATE:
70075698	ASW	JO	SEPTEMBER 2018

DRAWING No: GUH-WSP-EX-0M-DR-S-200101 REV: P03



LEVEL 01- WEST SIDE GA (EXISTING)
1 : 100



LEVEL 01- EAST SIDE GA (EXISTING)
1 : 100

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REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT	ASW	ASW

DRAWING STATUS: STAGE 2

WSP House, 70 Chancery Lane, London WC2A 1AF
Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

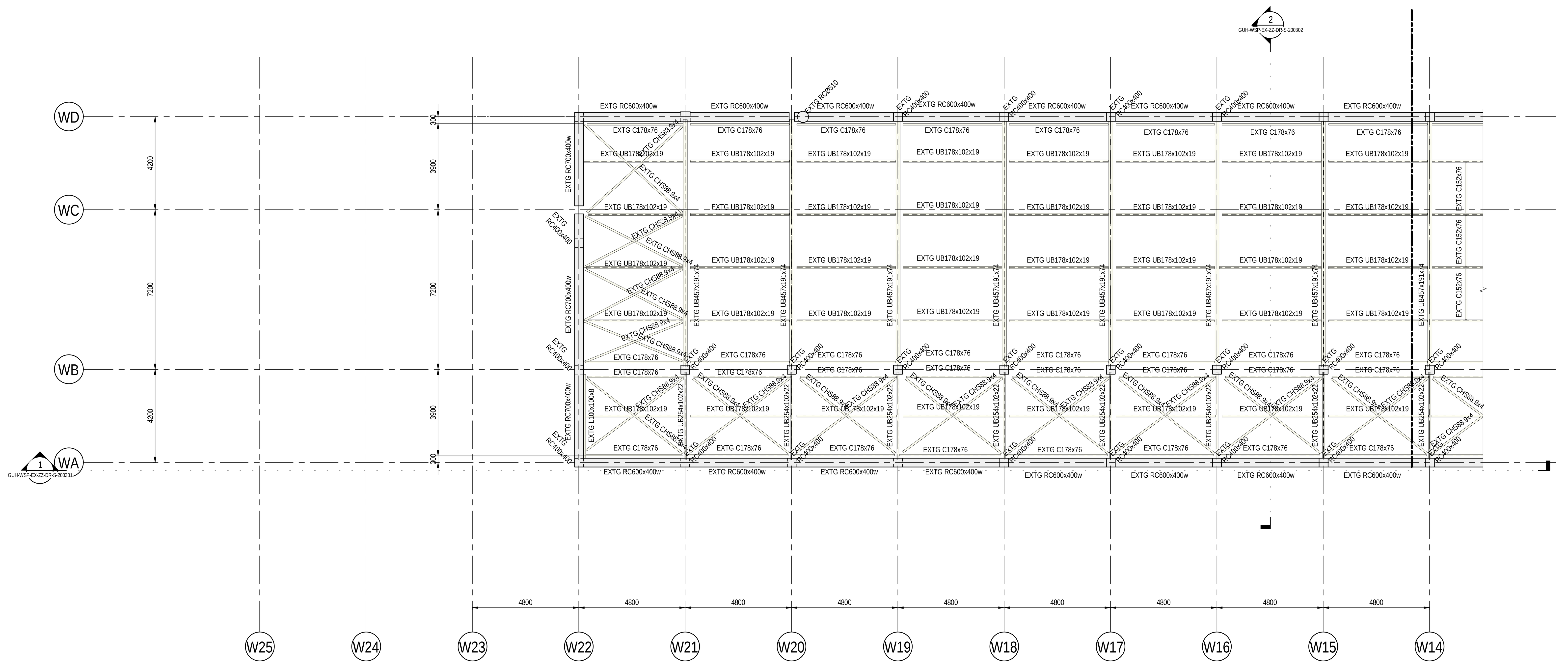
ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: EXISTING LEVEL 01 GENERAL ARRANGEMENT

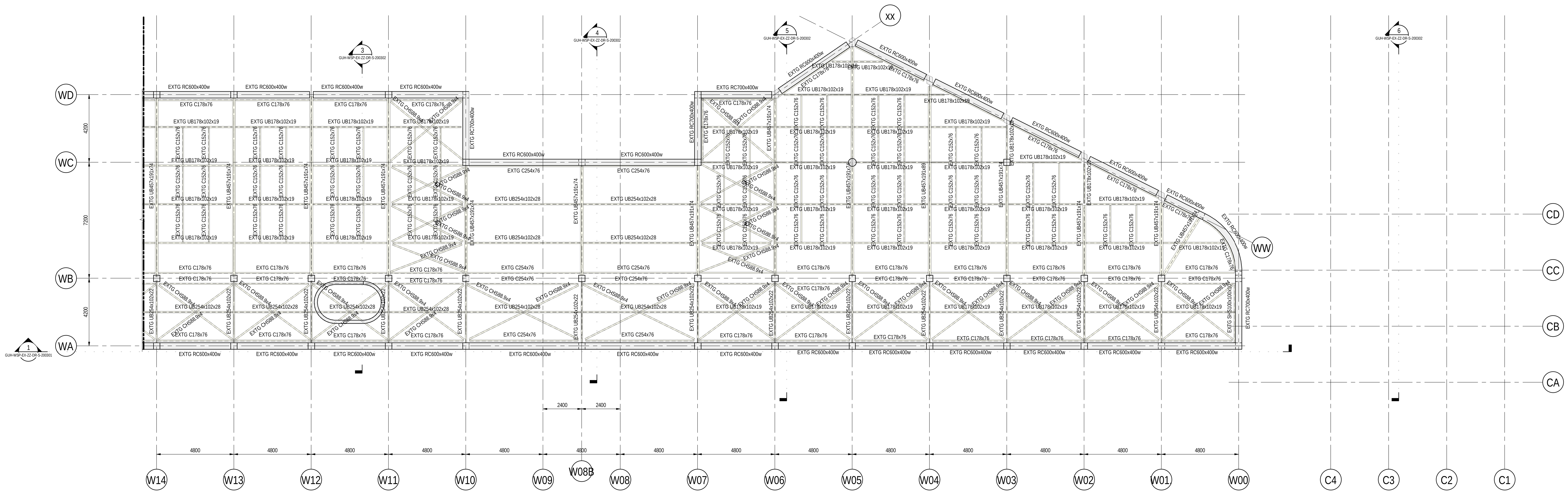
SCALE @ A0: 1:100	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: SEPTEMBER 2018

DRAWING No: GUH-WSP-EX-01-DR-S-200101 REV: P03



ROOF- WEST SIDE GA (EXISTING)

1 : 100



ROOF- EAST SIDE GA (EXISTING)

1 : 100

DO NOT SCALE

NOTES:

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2. DIMENSIONS ARE NOT TO BE SCALED FROM THIS DRAWING.
3. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOL LEGEND REFER TO DRAWING GUH-WSP-00-00-DR-S-020100.

THIS DRAWING HAS BEEN CREATED USING INCOMPLETE RECORD INFORMATION AND A SURVEY. IT IS INTENDED TO ASSIST THE CONTRACTOR AND IS NOT COMPREHENSIVE AND ITS ACCURACY CANNOT BE GUARANTEED.

BASED ON DIFFERENCES BETWEEN THE SURVEY AND RECORD INFORMATION, IT IS CLEAR THAT THE STRUCTURE CHANGED DURING THE CONSTRUCTION PHASE - EVEN FROM CONSTRUCTION ISSUE RECORD DRAWINGS.

BEFORE PROCEEDING WITH THE WORK THE CONTRACTOR IS TO VERIFY THE INFORMATION BY UNDERTAKING ADDITIONAL INVESTIGATIONS AS REQUIRED AND IS TO NOTIFY THE DESIGN TEAM OF ANY DIFFERENCES.

KEY TO HEALTH & SAFETY SYMBOLS

WARNING RISK
INDICATES A RESIDUAL RISK AS A WARNING.

COMPULSORY RISK
INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.

PROHIBITIVE RISK
INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.

INFORMATION RISK
INDICATES A RESIDUAL RISK FOR INFORMATION.

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.08.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

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http://www.wsp.com

CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: EXISTING ROOF GENERAL ARRANGEMENT

SCALE @ A0: 1:100	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: SEPTEMBER 2018

DRAWING No: GUH-WSP-EX-04-DR-S-200101 REV: P03

DO NOT SCALE

NOTES:

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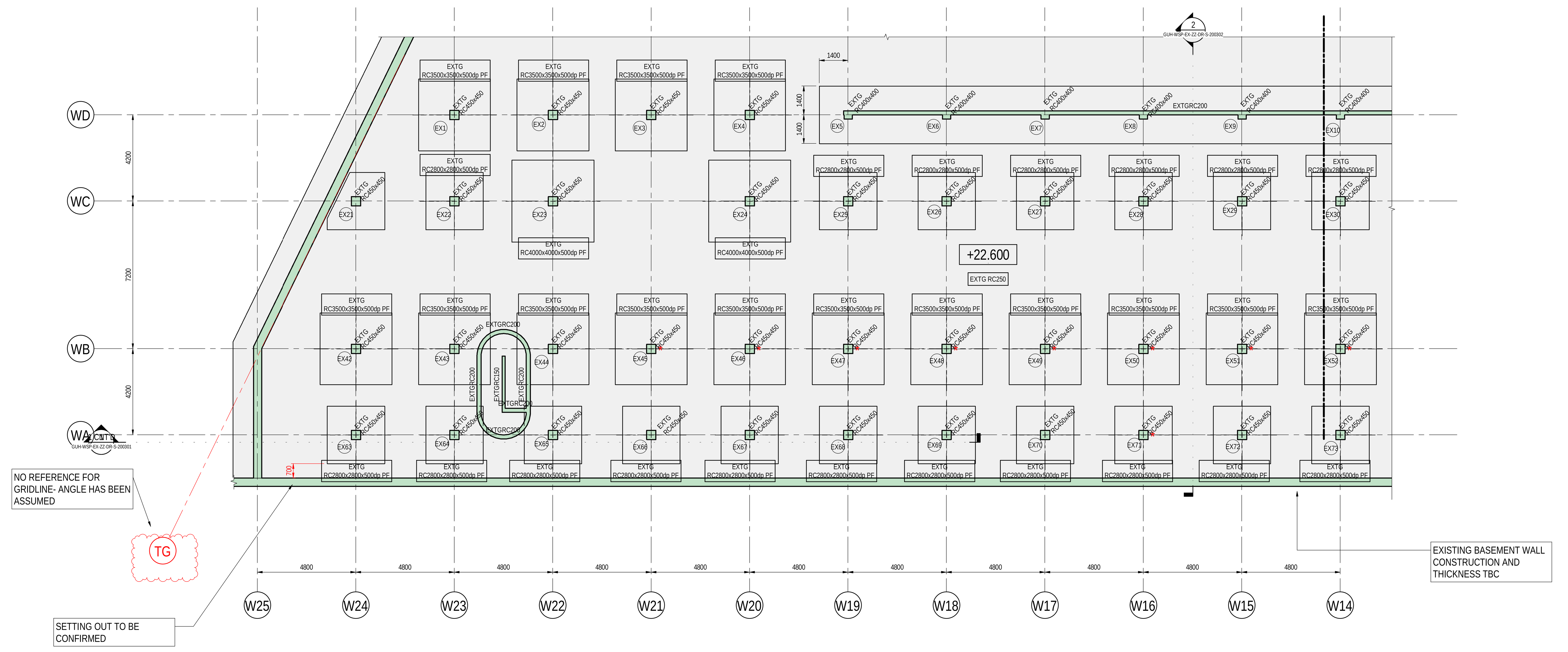


EXISTING PAD FOUNDATIONDS AS SHOWN ARE FOUNDED DIRECTLY ON ORIGINAL RC RAFT FOUNDATION MIN 750mm THICK (TO BE CONFIRMED BY STRUCTURAL INVESTIGATION) APPLIED FOUNDATION LOAD DISTRIBUTES THROUGH 750mmTHK RAFT AT 45 DEG ANGLE) TO MOBILISE WIDER EFFECTIVE BASE AREA.

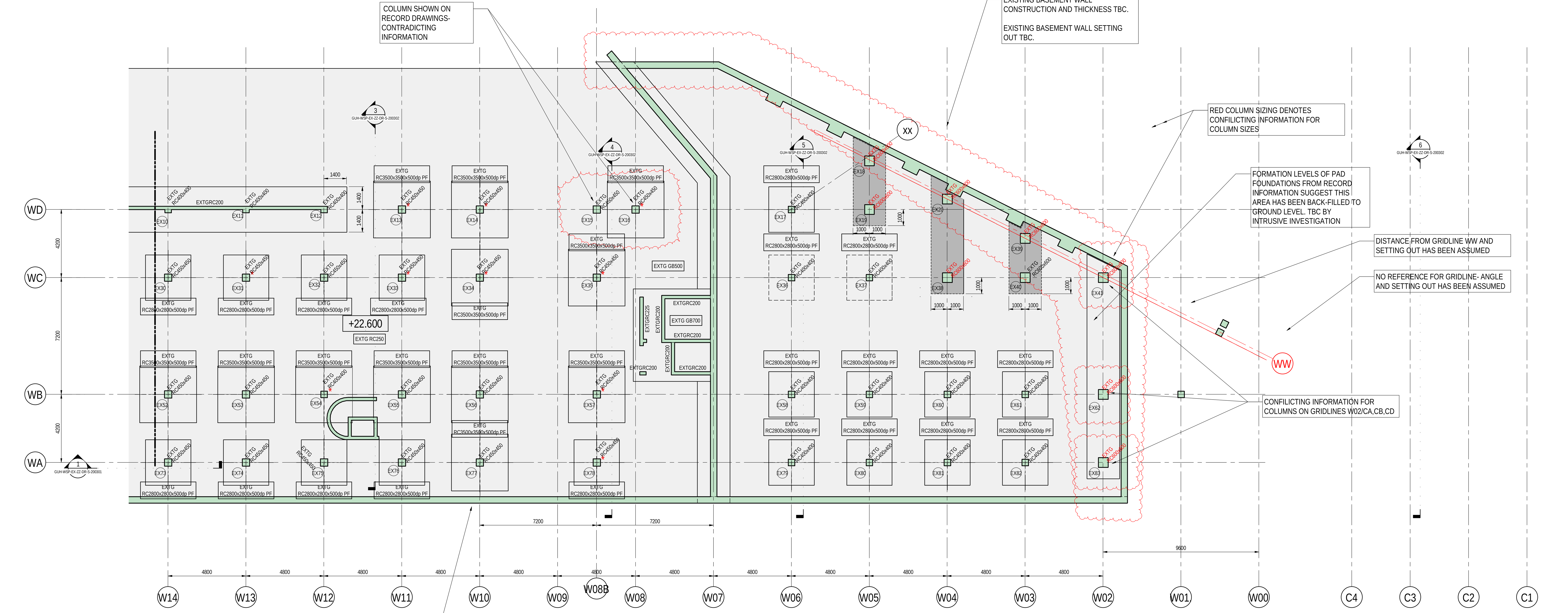
KEY TO HEALTH & SAFETY SYMBOLS

- WARNING RISK – INDICATES A RESIDUAL RISK AS A WARNING.
- COMPULSORY RISK – INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.
- PROHIBITIVE RISK – INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.
- INFORMATION RISK – INDICATES A RESIDUAL RISK FOR INFORMATION.

* DENOTES- COLUMN REINFORCEMENT DATA NOT AVAILABLE FROM RECORD INFORMATION.

LEVEL B1- WEST SIDE GA (EXISTING)

1 : 100



LEVEL B1- EAST SIDE GA (EXISTING)

1 : 100

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	05.02.2021	TRC	2020 SCHEME - STAGE 2 ISSUE (DRG No. ADJUSTED)	AT	MC
P02	04.10.2018	JO	STAGE 2 ISSUE	ASW	ASW
P01	05.09.2018	JO	STAGE 2 DRAFT ISSUE	ASW	ASW

DRAWING STATUS: STAGE 2

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Tel: +44 20 7314 5000 Fax: +44 20 7314 5111
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CLIENT: SELLAR DEVELOPMENTS

ARCHITECT: 6A ARCHITECTS

PROJECT: GRAND UNION HOUSE LONDON

TITLE: EXISTING FOUNDATION GENERAL ARRANGEMENT

SCALE @ A0: AS NOTED	CHECKED: ASW		APPROVED: ASW
PROJECT NUMBER: 70075698	DESIGNED: ASW	DRAWN: JO	DATE: AUGUST 2018

DRAWING No: GUH-WSP-EX-B1-DR-S-160101 | REV: P03