

Goulburn Hospital

Schematic Design Report – Civil & Structural

Revision: 5

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BONACCI

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1. EXECUTIVE SUMMARY

Structural Works

The structure proposed for the new Acute services building is to be concrete framed. The column grid is generally in accordance with the Health Infrastructure (HI) guidelines, spaced at 8.4 metres in each direction.

The floor slabs are proposed to be post-tensioned banded slabs with the bands orientated to suit the reticulation of major ductwork where possible. The floors have been designed to accommodate all the design requirements in the HI guidelines with respect to vibration performance, future flexibility with respect to set downs and creation of additional risers. No vertical expansion has been allowed for in the design, however shell spaces and zones for future lateral expansion have been identified.

The columns are supported via piles embedded into rock or by pad footings bearing directly onto rock. The lower ground slab is to be supported on piers extending to rock level with void formers around the perimeter edge beams to minimise movement arising from shrinkage/swelling of the reactive clays.

Lateral loads are to be resisted by in situ concrete shear walls. The structure is considered to be Importance Level 4 for the determination of design return periods.

Significant excavation is required for the new building. It is proposed that the use of retaining walls adjacent buildings is to be avoided where possible.

A steel framed two level structure is proposed to create a link between the new Acute services building and the existing Theatre and Emergency Department buildings. These link corridors are located on ground and first floor levels. To avoid the difficulties with constructing foundations between existing buildings, this structure has been designed to span significant distances over areas where access would be difficult. Other single storey corridor structures are to be constructed to the north and west of the existing Emergency Department.

Significant refurbishment of the existing Emergency Department and the existing Physiotherapy Unit requires structural walls to be removed and new supporting structure to be installed. Some new foundations may also be required. The requirements to enhance the seismic capacity of the Emergency Department building needs to be further developed.

The existing Theatre block is to be retained and the adjoining buildings are to be demolished beyond the existing movement/expansion joint. To avoid the need to upgrade the structure, significant alterations have been avoided. For this reason, any new structures abutting the building have been designed to be self-supporting.

Civil Works

The existing site occupies an area of approximately 40,000 m² and generally falls from the west (Albert Street) to the east (Faithfull Street). There is an existing major drainage line in the centre of the site, which discharges into the Council system located in Faithfull Street. It is intended that this connection be maintained. The footprint of the proposed new building extends over the existing service road, which connects to the eastern site boundary. The existing major drainage line is located within this road and will need to be diverted to the south. There may be a drainage connection from the Chisolm Ross Centre to the kerb inlet pit on Clifford Street. There may also be a drainage connection from the Community Health Centre to the drainage pit at the corner of Faithfull Street and Goldsmith Street. Further survey is being undertaken to confirm drainage connections.

Goulburn Mulwaree Council's Stormwater Drainage Design Handbook nominates the provision of on-site detention on sites that are to be redeveloped. A prescriptive approach is nominated in Councils design guidelines – for the hospital site this would require an on-site detention volume of approximately 480m³ (this is based on a site area of 40,000 m² draining to the OSD, impervious area of 70%). It does not appear feasible to provide this amount of storage as part of this redevelopment – an alternative could be provision of sufficient on-site

detention to ensure that peak flows from the site as a result of the redevelopment are not increased from the current site peak flows.

Runoff from carparks and roads is to be treated to achieve water quality targets through the use of bio-retention, which will need to be incorporated into the landscaping.

New on grade carparks are to be constructed to the north and east of the new acute services building. Retaining walls will be required to account for the level changes between the existing street and the proposed (and existing) hospital floor levels. Carparking is also to be constructed on the western side of the site after demolition of the existing buildings. The roadway from the southern boundary connecting to Clifford St will become the main access for deliveries. Upgrading of this roadway may be required along with development of a turning bay and manoeuvring area at the loading dock.

According to the Wollondilly and Mulwaree Rivers Flood Study (WMA September 2016), the site is not affected by flooding in any event (including the PMF).

2. EXISTING CONDITIONS

2.1. Location

The proposed development is located on the existing Goulburn Hospital campus. Currently, there are existing buildings (Asset management, Workshop, Community Mental Health, Nurses Quarters), one demountable and a carpark on the proposed site for the new Acute services building. All of these buildings will require demolition and/or relocation. There is also a number of in ground services, which will require relocation as the new building footprint extends over the existing east-west running access road from Faithfull St.

Other proposed works include demolition and relocation of the Paediatric, CT, Maternity, Medical records and Education buildings, among others.

2.2. Topography



Figure 2.2 – Aerial view of the Goulburn Hospital campus.

The site slopes from the north-west corner to a sag point mid-way along the eastern boundary. There is an internal overland flow path, which traverses the site occupied by the helipad, down the access road to the sag point on Faithfull Street.

2.3. Geotechnical

The existing records indicate that the site is underlain by the Rhyanna Formation, which consist of sandstone, siltstone and mudstone. A geotechnical investigation has been undertaken by JK Geotechnics, with the findings presented in report No. 30116V1 Goulburn (Refer Appendix E). As noted in the report, the site has been classified as 'Class P' (Problem) in accordance with AS2870 due to the presence of fill of variable compaction and depth.

Highly reactive residual clays were also encountered and the potential swelling/heaving due to moisture changes will require 100mm thick void formers below the edge beams for a width of 2-3m around the full perimeter of the building. An external apron or paving slab should extend at least 2m around the building and shed water away from the footings.

The geotechnical report recommends the new structure is founded on deep pad footings or bored piers into the bedrock.

2.4. Existing Structures

The existing building structures on the Goulburn Hospital site vary throughout. Generally, the structures are brick clad with timber-framed roofs supporting either tiles or roof sheeting. Refer to Appendix C for the site inspection report and due diligence summary.

2.5. Stormwater and Watercourses

The main stormwater discharge is currently to the Council system located at the sag point on the Eastern boundary (Faithfull Street). Should the Council system not be capable of conveying the flows in the pipe network, it is expected that overland flow through the properties to the east of the hospital site will occur in major events.

Water NSW (which incorporates the former Sydney Catchment Authority) has confirmed that it wishes to review the development of the stormwater concept. Strategies have been incorporated into the design to address the quality of stormwater discharge. These strategies include:

- Use of bio-retention systems where landscaping allows; and
- Directing runoff from hard surfaces to landscaping/bio-retention where possible.

Preliminary advice indicates that a change in impervious area of greater than 2500m² was required for water NSW to review the project.

Goulburn Mulwaree Council have stormwater guidelines, which nominate that on-site detention is to be provided for all developments that drain to Council's stormwater infrastructure. The aim is to ensure that new developments and redevelopments do not increase peak stormwater flows in any downstream area during major storms up to and including the 100 year ARI (1% Annual Exceedance Probability) storm events.

Council has a prescriptive table that details the storage requirements based upon the amount of site that is impervious and percentage of the site that drains to the on-site detention system. For a 90% impervious site that all drains to the on-site detention system, the rate is 152m³/ha.

An alternative approach would be to undertake hydrological and hydraulic modelling to determine the required volume of detention to ensure that the hospital redevelopment did not result in an increase in peak stormwater flows. This approach was discussed with Council – and would be the preferred method of achieving compliance with the Council aims of limiting post-development flows to pre-development flows.

The site is not affected by flooding – refer Figure 2.5, extract from Wollondilly and Mulwaree Rivers Flood Study (WMA September 2016).

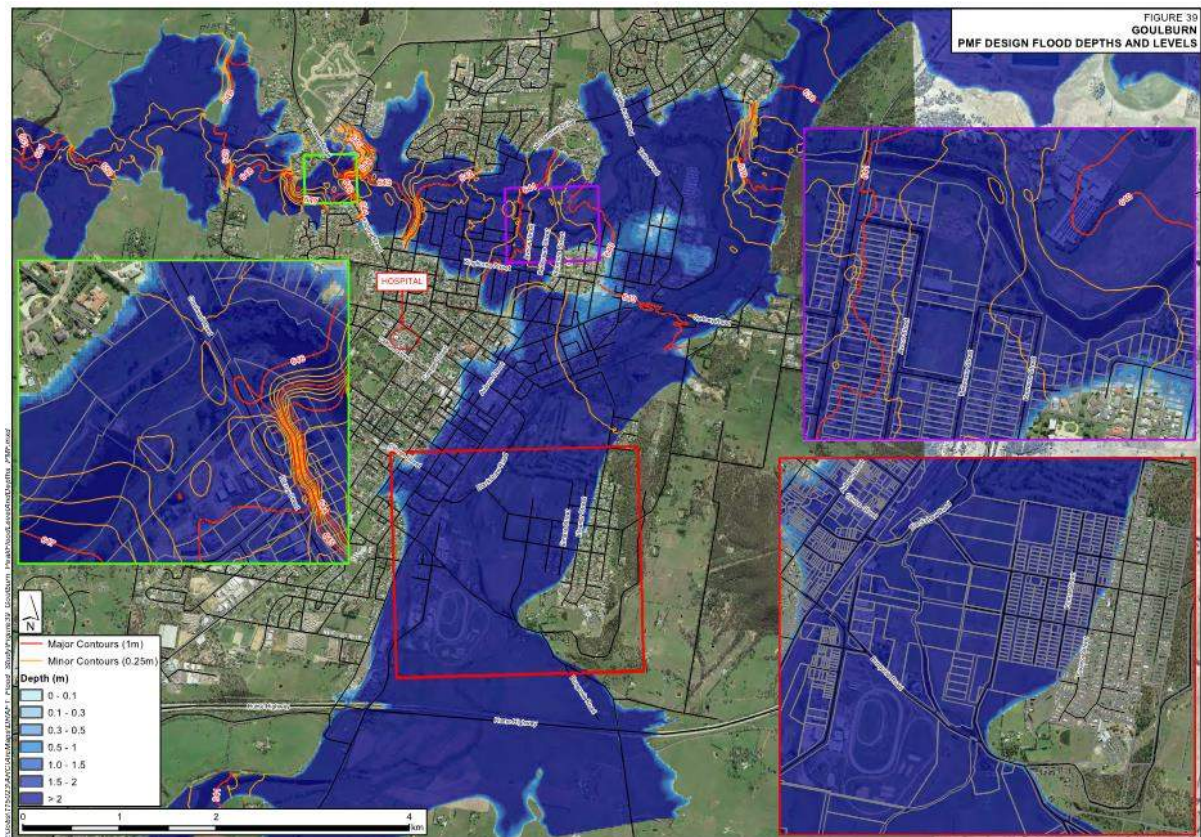


Figure 2.5 – PMF Flood Map: Extract from Wollondilly and Mulwaree Rivers Flood Study (WMA September 2016).

2.6. Existing Documentation

The following relevant existing documentation exists:

- Geotechnical report for Sub Acute building;
- Incomplete structural and architectural drawings for Main Hospital Buildings; and
- Survey drawings.

It should be noted that all existing drawings present at the Goulburn Hospital site have been scanned and are expected to be available for DD phase.

3. PROPOSED DEVELOPMENT

3.1. General Description

The proposed development comprises the construction of a new Acute services building to the east of the Theatre and ICU/Emergency Department buildings. Link corridor connections are to be made at ground and first floors of the new building to connect with the existing Theatre, Emergency Department/ICU and Pathology buildings.

3.2. Civil Works

3.2.1. Earthworks

The proposed development will require cut and fill for the new carparks and building. Retaining walls will be required to account for the level change between the existing road and the proposed carparks (which need to meet the existing and proposed hospital floor levels). The new building is located to the east of the existing building. The proposed lower ground floor level is RL 652.41m AHD, while the northern area that the new building is to be situated has an existing level of approximately RL 654.50. Thus the maximum amount of cut for the building will be approximately 2m (not including deeper excavation for structure). The new carpark to the north of the new building will be set at approximately the same level as the building ground floor (slightly lower to allow adequate drainage). The existing level at the carpark location is approximately RL 654.3, which corresponds to a maximum amount of cut of approximately 2m (diminishing to approximately 800mm at the eastern end of the carpark).

3.2.2. Stormwater

The proposed building location on/over the existing access road will require the existing overland flow path to be adjusted and the stormwater diverted. The levels of the building and adjacent areas will need to be set to ensure that the overland flow path is maintained while providing protection from stormwater flow to the building entrances.

Proposed civil works to the Goldsmith Street frontage include new carparks and a new entrance. The level differences from the street to the proposed building will require retaining walls to be incorporated in the landscape. This will provide opportunities to implement bio-retention to treat runoff from the carpark areas.

There will be an increase in impervious area as a result of the redevelopment. On-site detention will be required to limit flows from the site (to ensure there is no adverse impact on downstream properties as a result of the development). Goulburn Mulwaree Council stormwater guidelines specify prescriptive amounts of detention based on site area, pervious area percentages and percentage of site draining to the detention system. This method of sizing the detention system would result in a volume that is not readily achievable (economically or spatially). An alternative discussed with Goulburn Mulwaree Council is to provide sufficient detention to limit post development peak flows from the site to the current site peak flows. This will ensure that there is no adverse impact on downstream properties as a result of the hospital redevelopment. Detailed sizing of the detention volume will be undertaken during design development, with initial estimates indicating that a volume of approximately 95m³ will be required.

Stormwater quality has been addressed through the provision of bio-retention to treat runoff from new carpark areas. The proposed building is located over existing impervious areas, including existing roadways. The site stormwater quality will be improved as a result of the proposed measures, as new carpark/road areas will be treated through the use of bio-retention (previously roads were untreated) and existing roads will be replaced with building roof areas (which will reduce pollutant generation).

3.3. Structural Works

3.3.1. Foundations

The findings presented in the geotechnical report (refer Section 2.3 and Appendix E) indicate the site is underlain by the Rhyanna Formation, which consists of sandstone, siltstone and mudstone. From the advice provided in the geotechnical report, the structure is to be supported by piers, which are socketed into the bedrock or high-level pads bearing on weathered sandstone/siltstone. Retaining walls and elements not supporting elements of the building may be supported on high level foundations bearing on the natural clay.

Parameters for the preliminary design of the piers are in accordance with the project specific geotechnical report undertaken by JK Geotechnics (30116V1 Goulburn). Design parameters for the piles include:

Allowable Bearing Pressure - 1000 kPa

Allowable Skin Friction - 100 kPa

Alternative pad footing sizes noted on the structural drawings are to be founded in bedrock and have been designed for an allowable bearing pressure of 1000 kPa (as noted above). It is expected however that the quality of the sandstone improves with depth. Rock coring is to occur as part of the proposed investigation for the project. The piling schedule for this project is shown below in Table 3.3.1.

PILING SCHEDULE						
MARK	DIAMETER (mm)	WORKING LOAD (kN)	ULTIMATE COMPRESSION (kN)	ULTIMATE TENSION (kN)	SOCKET LENGTH (mm)	ALT. PAD SIZE
P1	1200	2750	7250	4250	14500	N/A
P2	1000	2000	2750	-	5000	1400x1400x450d
P3	1000	1200	1500	-	2500	N/A
P4	1000	3500	4750	1250	11500	1800x1800x500d
P5	1000	2000	3750	1250	8000	N/A
P6	600	225	300	-	-	N/A

Table 3.3.1 – Piling schedule nominating design loads, socket length and alternative pad footing size.

As noted in Section 2.3, highly reactive clays are present on the site and requires void formers to be placed under the edge beams and slab around the perimeter of the building. Refer Figure 3.3.1 below.

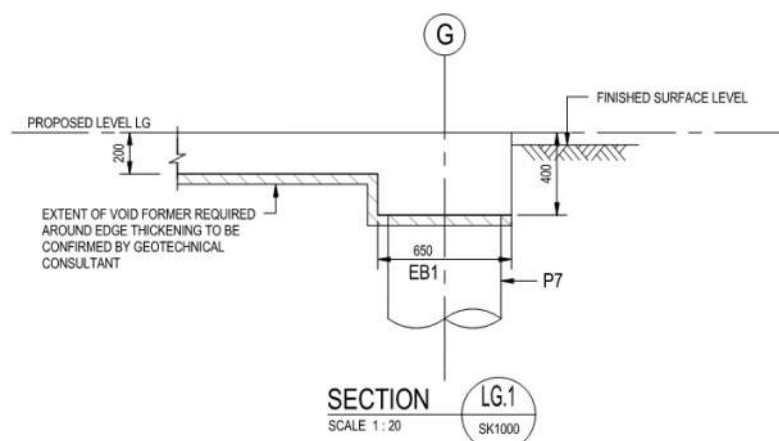


Figure 3.3.1 – Typical slab and edge beam arrangement showing location of void formers.

3.3.2. Lower Ground Floor

It is proposed that the slab for the lower ground floor is lower than the existing ground surface. As such, the ground surface will batter around the building to tie into existing ground levels. Where the required batter

cannot be achieved, bored piers will be utilised for soil retention. These will be required along the Northern boundary on Goldsmith St where the proposed carpark level is lower than the adjacent road.

The slab on ground has been design as suspended due to the presence of highly reactive clays. The slab is supported by bored piers that are embedded into the bedrock, which help to reduce settlement of the slab on ground. The slab has also been jointed carefully with dowelled control joints to minimise differential settlement.

3.3.3. Superstructure

The superstructure is to be a braced frame with columns placed on a 8.4m x 8.4m grid in accordance with the HI Design Guidelines. Lateral resistance is to be provided by in situ shear walls and the central lift shaft. The stair cores have not been utilised in the lateral assessment of the building as they are positioned off grid and will not engage enough slab weight to result in effective foundation design. The riser locations will also lead to significant penetrations through these walls during developed design. Generally, column sizes are 400x400 for perimeter columns and 450x450 for internal columns, along with two different blade columns sizes - 250x1000 and 200x800. The column schedule is shown below:

RC COLUMN SCHEDULE			
MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

Table 3.3.3 – RC Column schedule.

3.3.4. Floor Systems

A number of floor systems have been considered and are shown in the table below:

Option	Primary Beams	Secondary Beams	Slab	Use
1 - Post tensioned	400 D x 2200 W running East-West	N/A	260 end span/ 210 internal	General areas. Design response factor 2.0
2 - Post tensioned	450 D x 2200 W running East-West	N/A	260 end span/ 260 internal	Imaging areas and surgical areas. Design response factor 1.0

Table 3.3.4 – Floor system summary

3.3.5. Roof Structure

The roof structure is to be a combination of post-tensioned banded slabs and steel-framed metal deck roof. The post-tensioned banded slabs will be used to support the plant located on Level 3. Concrete columns and walls will therefore continue to the underside of Level 3 in the plant zones. For all other steel framed roof zones, concrete load bearing elements will terminate at Level 2 with steel columns over.

The suspended roof slabs will need to be waterproofed through the use of a waterproof membrane and strict crack control/stressing requirements for the post-tensioning.

3.3.6. Spandrel Panels

The building is to be sprinklered, therefore spandrel panels which comply with Clause C2.6 of the NCC will not be required in the façade.

3.3.7. Future Expansion

Future expansion was considered for the new Acute services building at Goulburn Hospital from a structural and costing viewpoint. The future expansion report is shown in Appendix D. From this study, it was decided that no vertical expansion was to be allowed for.

3.3.8. Future Flexibility

The floor slabs are to be provided with a 40mm sacrificial cover zone as per the HI Design Guidelines. Structural details are shown below in Figure 3.3.8a-c. The reinforcement and post tensioning tendons are set down sufficiently so that they maintain the minimum cover when the 40mm sacrificial topping has been removed. This is in accordance with HI Design Guidelines.

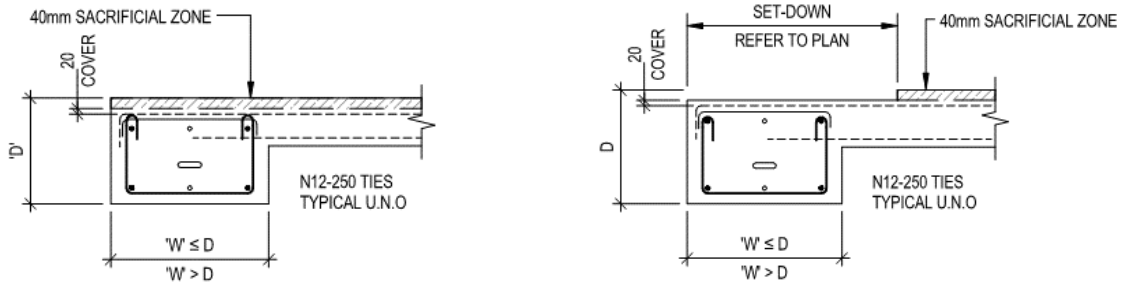


Figure 3.3.8a – Typical edge beam detail with sacrificial topping. Figure 3.3.8b – Typical edge beam detail at set-down.

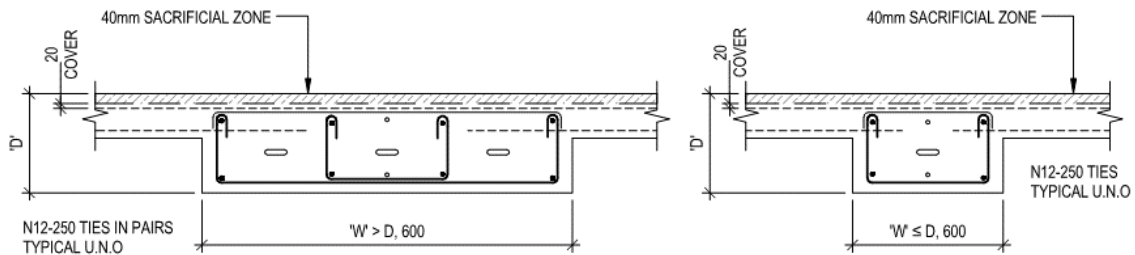


Figure 3.3.8c – Typical internal beam detail with sacrificial topping.

Allowance for additional service risers at each internal column is to be made in the design in accordance with HI Design Guidelines. This will require the reinforcement at the column lines to be displaced so that penetrations can be cut in the future and not require any associated strengthening works to the slab. Refer Figure 3.3.8d and Figure 3.3.8e.

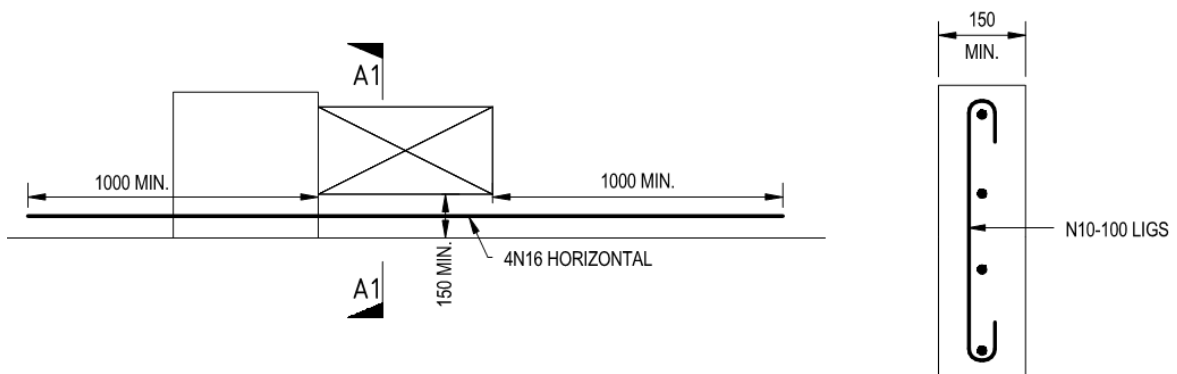


Figure 3.3.8d – Allowance for future service riser zone adjacent to column.

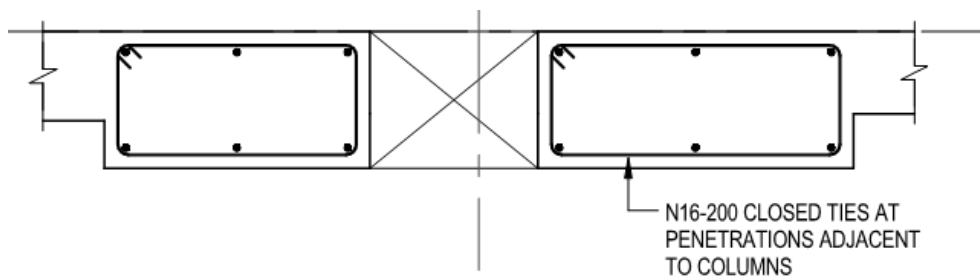


Figure 3.3.8e - Allowance for future service riser zone adjacent to column – Alternative detail.

Shell spaces have been incorporated into the floor plates for future flexibility. On lower ground level, an option to remove the slab on ground in the shell zones along with the MRI area was proposed. For this option, the edge beams (providing support to the façade system) and piles (to support the future ground slab) were still to be constructed. This option prevented future trenching and chasing works through the ground slabs for installation of services. It also reduced the risk of construction delay for the MRI supporting slab as the set downs and services can be laid to suit the equipment location at a later date. The infill slab structure can then be dowelled into the previously constructed edge beams.

During the schematic design stage, it was agreed to construct the ground slabs monolithically. As such, any new services to be installed in these zones would require trenching works to be undertaken.

On the upper levels, the shell space will be poured as part of the in situ concrete floor but will have a metal deck roof constructed over the top. This can be removed as part of the future expansion to increase the floor space. Façade works will need to accompany this expansion, and the suspended slabs above will provide adequate support.

3.3.9. Service Coordination

Penetrations through band beams have also been considered (refer Figure 3.3.9a) at riser locations to maximise the riser sizes and not significantly compromise on the capacity of the band beams. The structural scheme also terminates perpendicular band beams in a particular way (refer Figure 3.3.9b) so as to provide adequate space for ducting (servicing each wing) within the ceiling space.

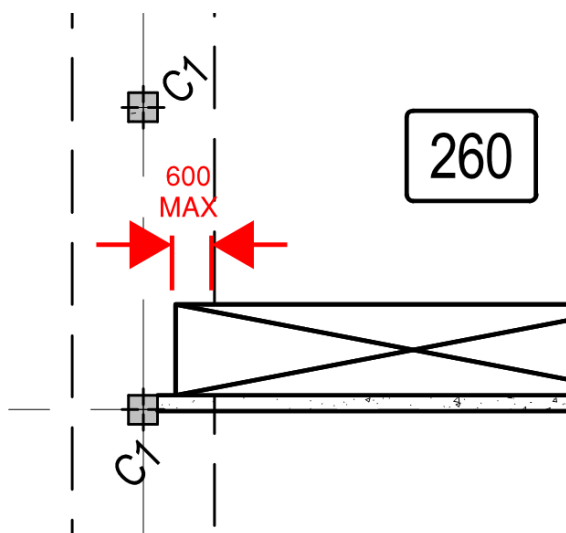


Figure 3.3.9a – Service penetration zones at risers.

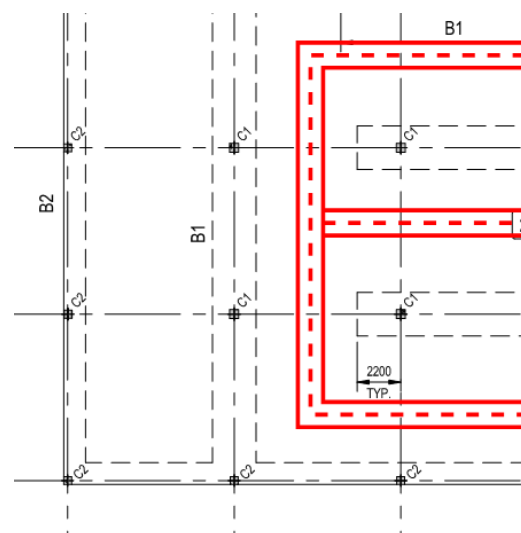


Figure 3.3.9b – Ducting allowance within ceiling space achieved via terminating bands.

3.3.10. Alterations Required to Existing Buildings

The existing campus map is shown in Figure 3.3.10 below.

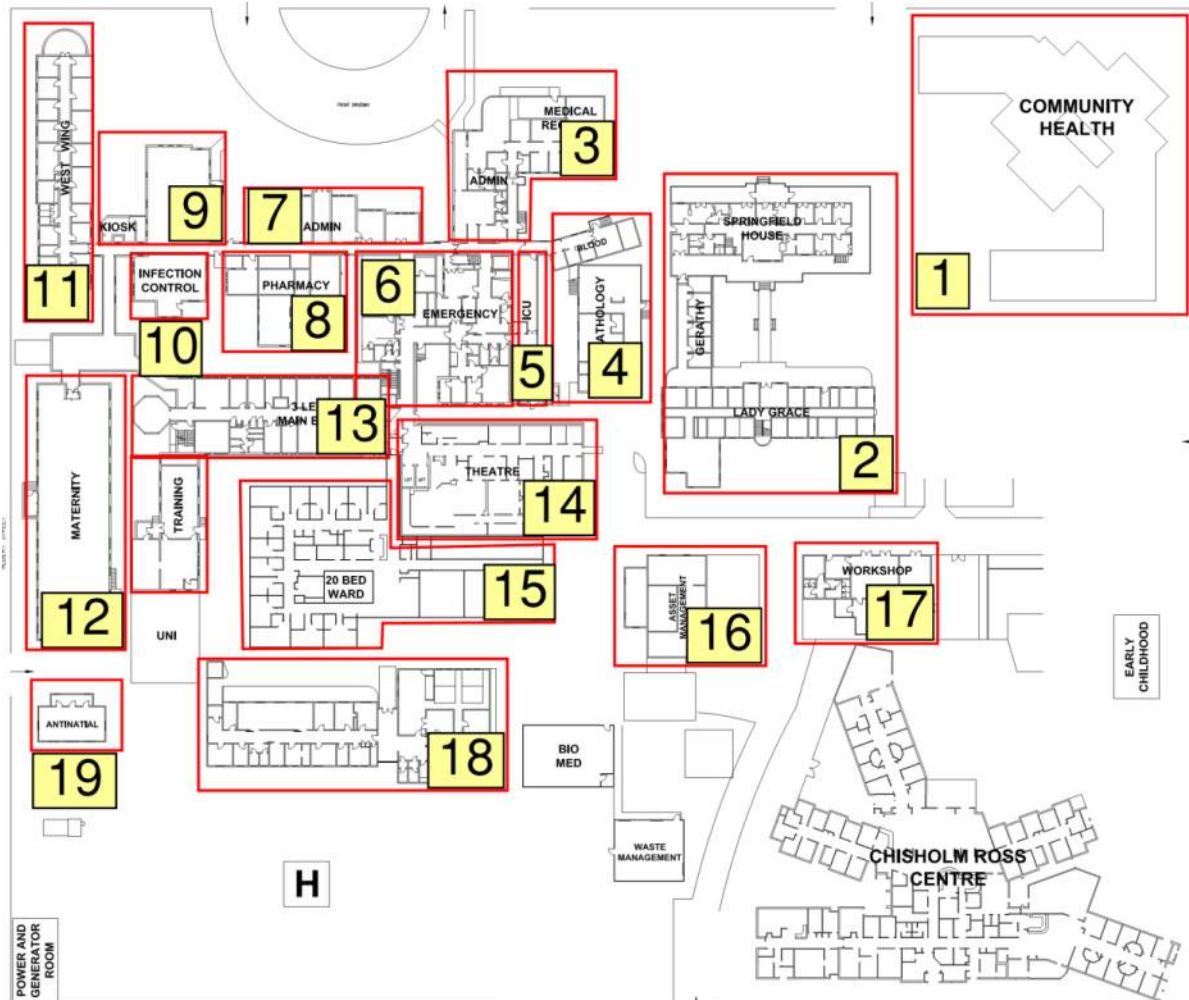


Figure 3.3.10 – Existing campus map.

A summary of the alterations to the existing buildings and required structural works are noted below:

1. Community Health Centre

New single storey infill structure is to be built that connects two existing wings. It is understood that the alterations to the existing building are considered minor such that no significant upgrades to the existing structure are required.

Where new openings are proposed in the existing facade, lintels will be required to support the brickwork above. The internal studwork leaf (assumed load bearing) will also require alterations in the form of additional jamb studs either side of the opening and a lintel to support the roof structure above.

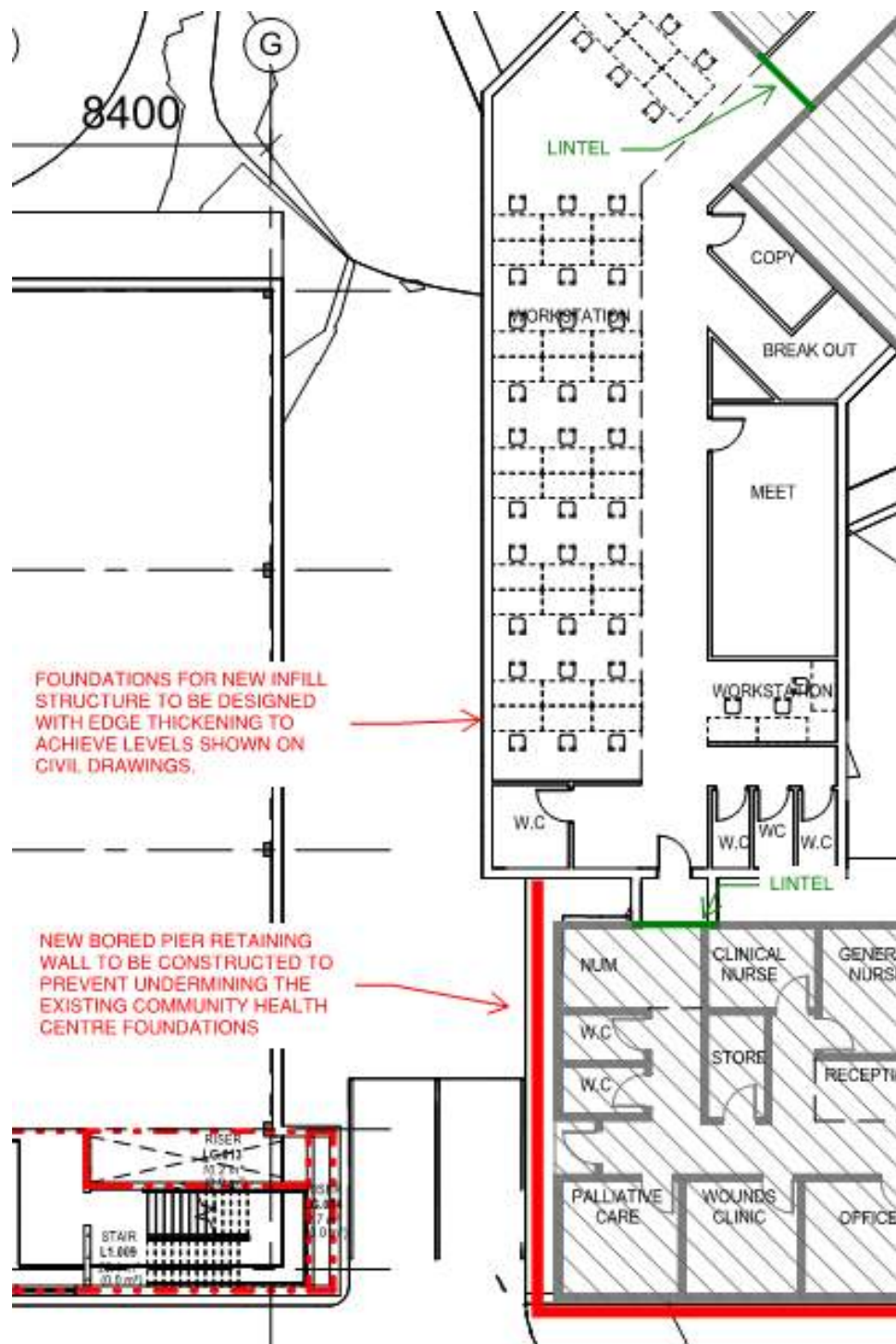


Figure 3.3.10.1 – Community Health Centre structural works.

5. ICU/Emergency

Internal walls are to be removed, which will require additional steelwork posts and transfer beams to support the floor and roof structure above. From the existing drawings located on site, it appears as though retrofitted steel beams were installed to facilitate loadbearing wall removal at an earlier date. These steel beams, load bearing masonry walls and columns are shown in Figure 3.3.10.5a.

The extent of renovation works for the Emergency Department and the whether they trigger a requirement for seismic strengthening works will need to be further investigated in the detailed design stage.

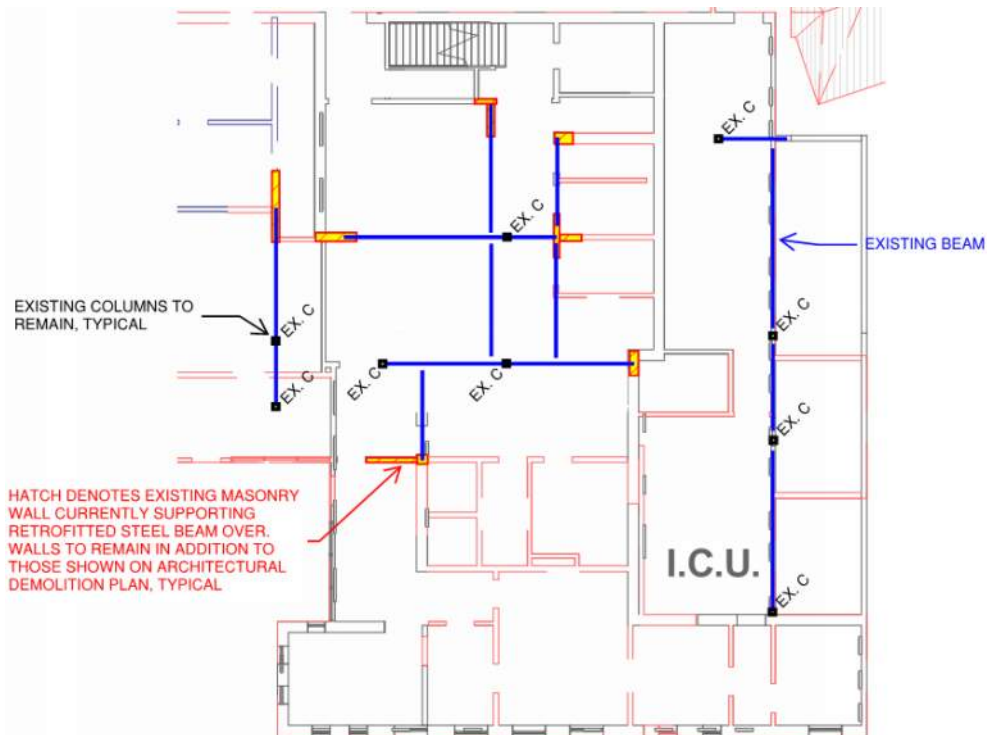


Figure 3.3.10.5a – ED/ICU existing structural beam and column layout overlaid on demolition plan.

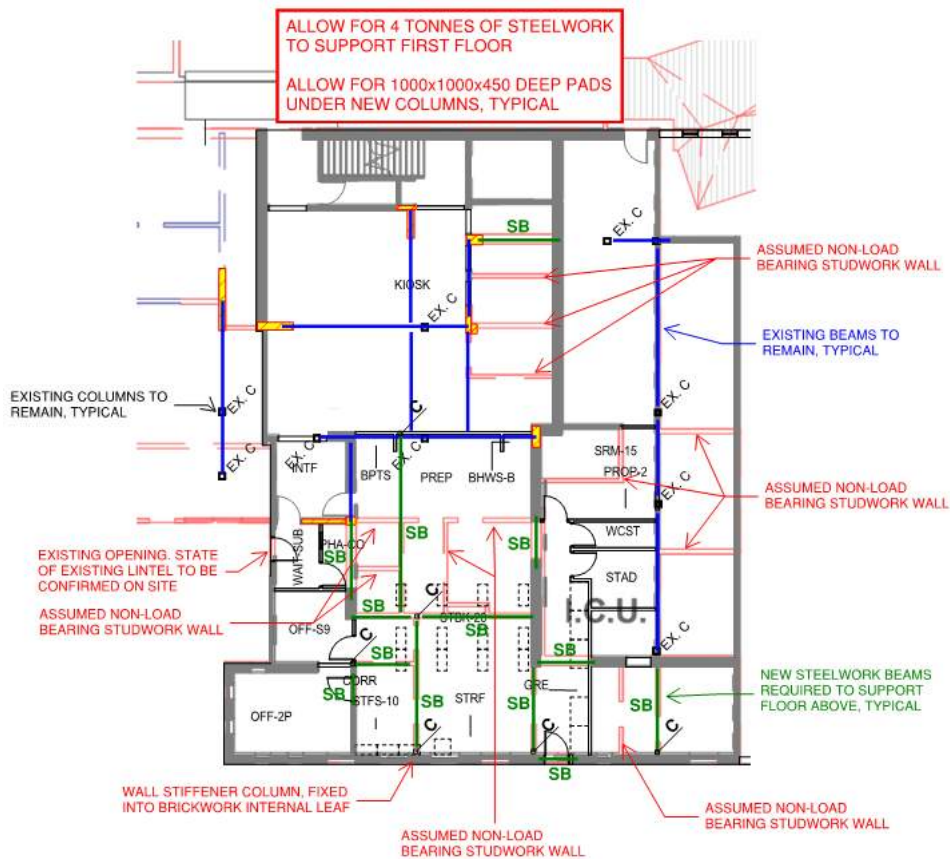


Figure 3.3.10.5b – ED/ICU proposed floor plan overlaid on demolition plan, showing locations of steel beams and columns required as a result of load bearing wall removal.

6-11. Link Corridor

Buildings either side of the existing East-West running corridor are to be demolished and the link corridor maintained. Existing link corridor will need to be braced for lateral stability now that it is exposed to external wind pressures.

8. Pharmacy

Existing roof structure is to be demolished and raised. Floor structure to be strengthened or demolished and rebuilt to accommodate relocated medical records. These works may be avoided if the existing ground floor in the Pharmacy is not altered and Medical records is relocated elsewhere.

13. Tower Block

The existing tower block is to be demolished to the west of the existing building expansion joint. No strengthening works will be required to the existing building as either side of the expansion joint is self-supported. Stair core in tower block is to be demolished and rebuilt as an open steel stair to prevent significant strengthening works required to ensure the stair is compliant with current codes and standards.

14. Theatre

It is understood that the alterations to the existing building are considered minor such that no upgrades to the structure are required.

18. Physiotherapy

New openings are to be made through the existing masonry wall façade. These will require new wall stiffeners either side of the openings and lintel beams to laterally support the top of the window and provide vertical support to the purlins running north-south. The existing connection of the purlins to the external brickwork wall will be removed and retrofitted to fix into the new windowhead/lintel members.

As a result of punching new holes through the existing façade, the load path for resisting wind pressures has been altered. This will require the existing roof bracing system to be strengthened in the form of additional lightweight steel strap bracing. This will require the existing ceiling to be removed to allow the bracing to sit on the underside of the existing purlins. Due to the size of the building, these purlins can likely be used as the chords and compression/tension struts in the roof bracing system.

Internal walls that currently support the roof steelwork are to be removed, resulting in additional transfer beams. The new line of columns to facilitate this wall removal are to be located directly over the existing masonry wall under. The connection of the slab to the wall under may also need to be investigated to ensure there is sufficient hold down capacity for external wind pressures.

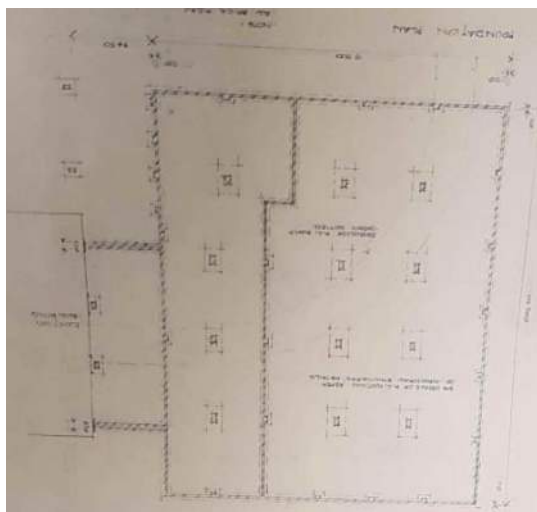


Figure 3.3.10.18a – Existing structural drawings showing footings and basement walls.

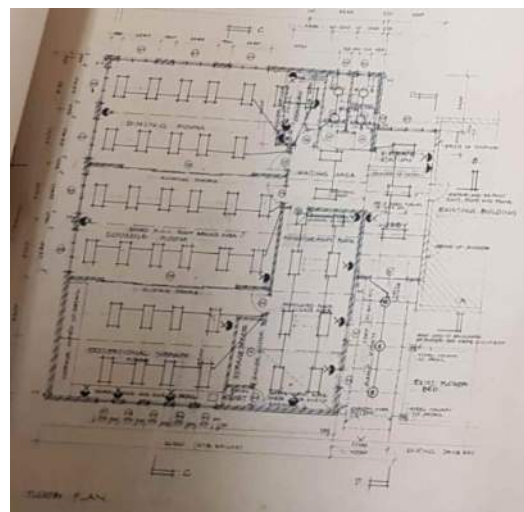


Figure 3.3.10.18b – Existing architectural drawing showing rafter and masonry wall locations.

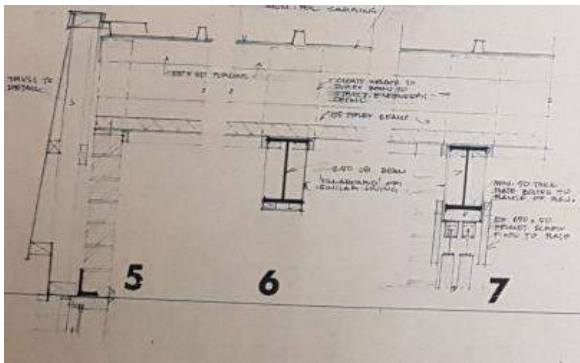


Figure 3.3.10.18c – Existing architectural drawing showing detail of roof structure.

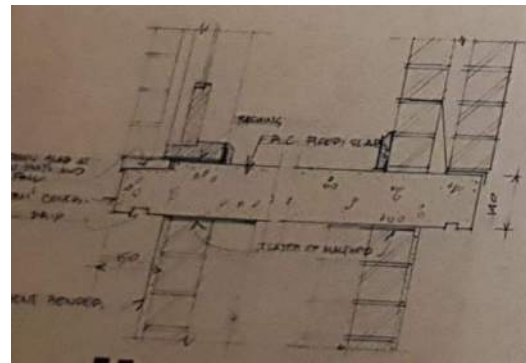


Figure 3.3.10.18d – Existing architectural drawing showing detail of suspended ground slab structure and masonry wall interface.

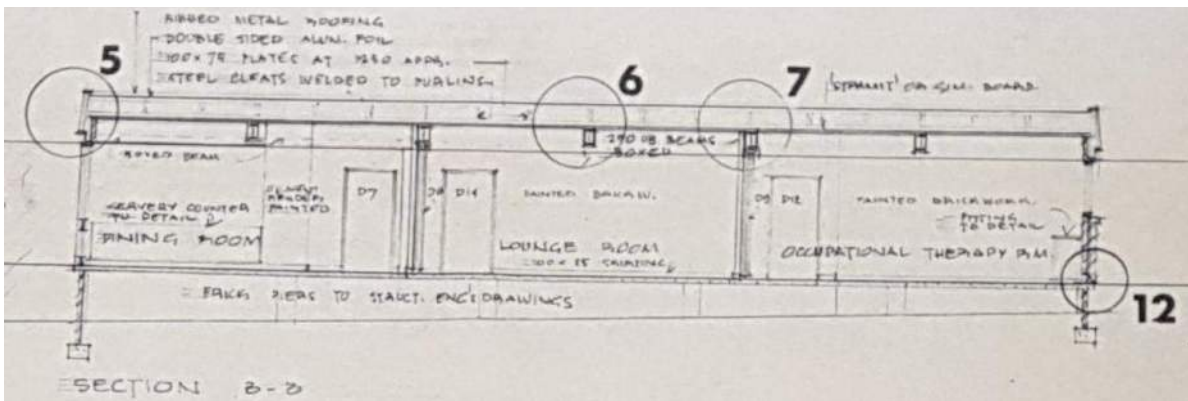


Figure 3.3.10.18e – Existing architectural drawing showing section through building.

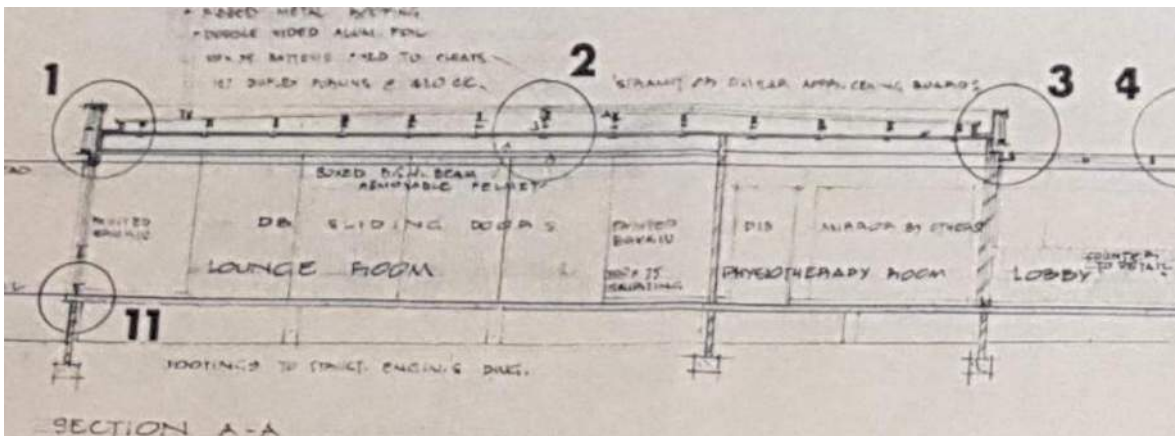


Figure 3.3.10.18f – Existing architectural drawing showing section through building.

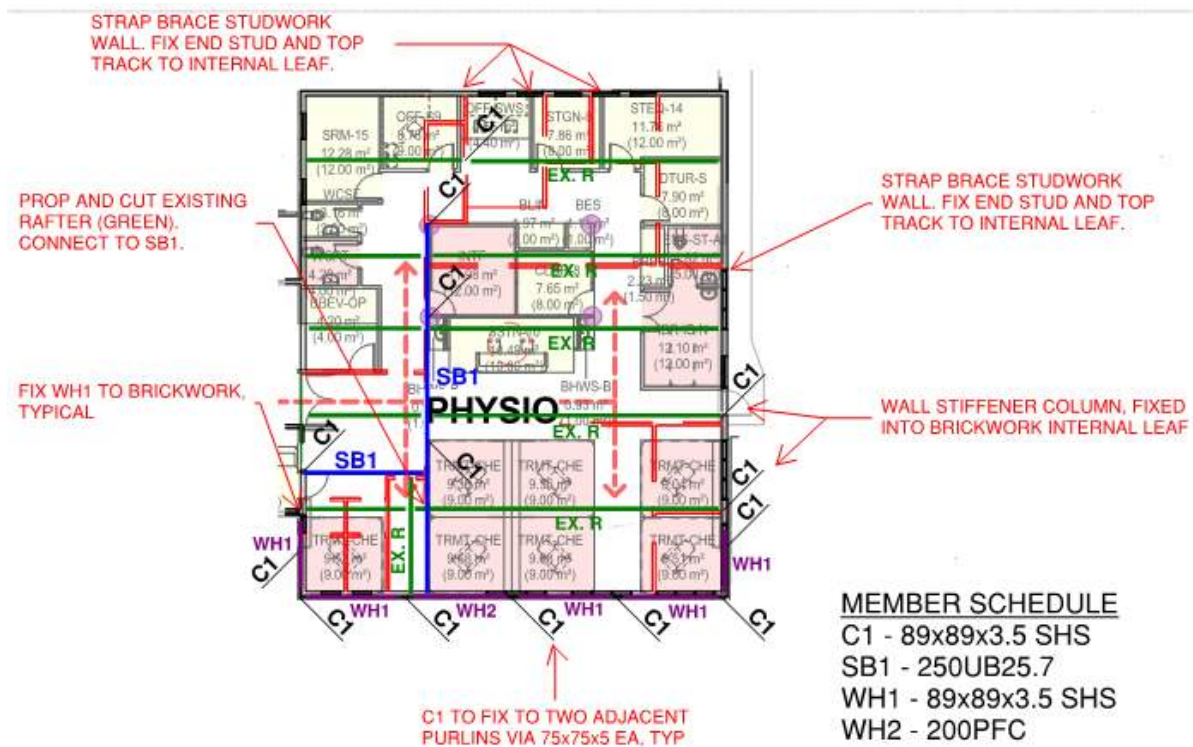


Figure 3.3.10.18g – Proposed structural layout showing location of existing rafters and extent of existing masonry walls to be demolished.

3.3.11. New Link Corridor

A proposed link corridor connects the new Acute services hospital building with the existing Theatre and ED/ICU buildings. Due to the close proximity of these two existing buildings and the presence of an existing retaining wall, a truss has been proposed to bridge between these two buildings and keep the new link structure isolated from the existing buildings (from a vertical and lateral loading viewpoint). The truss scheme eliminates columns, and hence foundations, for the corridor space at LG level between these two buildings, where pile installation could prove difficult.

The self supporting link structure will prevent having to upgrade the existing buildings for seismic loading as no significant structural alterations will be made to the existing buildings. The only structural works relevant to this corridor will involve creating localised openings in the existing external walls for access onto the new link structure.

The new link structure will resist lateral loads via a trussed floor system that spans between wall braces on the western side and a portalised frame on the eastern side. The 460UB frame will be propped at Ground level and portalised between Ground level and L2 (roof) - i.e. a diagonal wall brace will extend from Ground floor to LG where the foundations are located. This will allow the link corridor to remain open above Ground floor as no wall braces will be required running north-south within the corridor space.

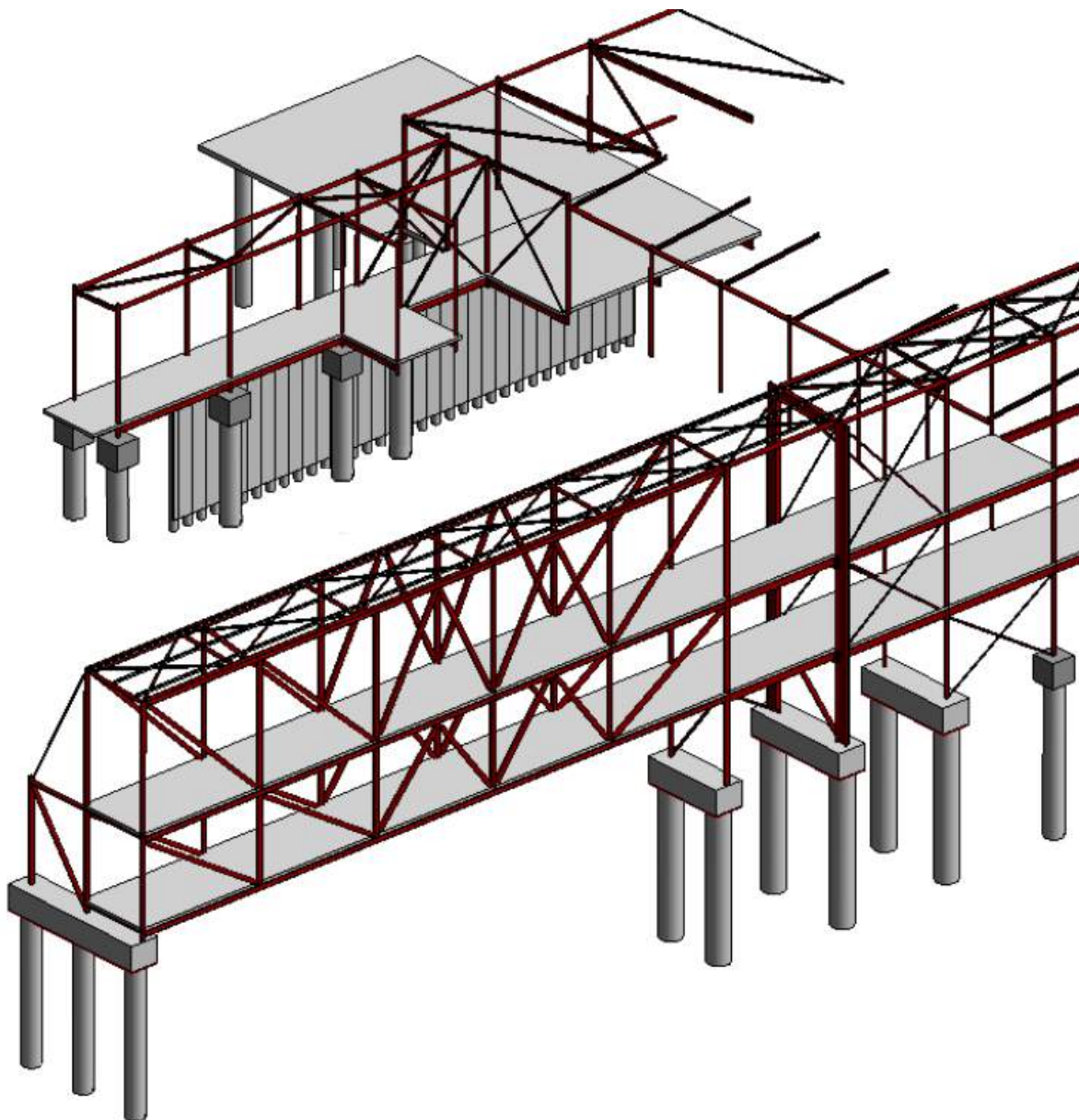


Figure 3.3.11 – Link corridor steel framed structure

3.4. Risks & Methods to Mitigate Risks

Potential risks and issues that may arise during redevelopment works are outlined within the Site Inspection and Due Diligence Report attached in Appendix C. These risks include:

- Presence of uncontrolled fill in locations where new buildings and foundations are to be constructed;
- Presence of Asbestos in buildings where demolition and renovation is to occur;
- Incomplete set of existing architectural and structural drawings. These will be required to determine existing structural member sizes, otherwise extensive on site investigation will be required; and
- Only existing survey completed has not been verified for accuracy.

One way to reduce these risks is for the existing drawings to be formally scanned and uploaded to Aconex for all consultants to access.

3.5. Enabling Works

The Enabling Works - Phase A structural scope includes the demolition of the Child & Family, Workshop and Asset Management buildings along with the construction of an addition to the new Community Mental Health building. The existing demountable structure south of Lady Grose house will also require relocation.

The new addition to the Community Mental Health building will be self-supporting and require new openings to be made in the façade of the existing buildings. These structural works are referred to in Section 3.3.9. Risks and methods to mitigate any risks during demolition works are referred to in Section 3.4.

Civil enabling works will include diversion of existing stormwater infrastructure around the site of the proposed building footprint. Carpark works to the Faithfull Street side of the site may also be undertaken – this may provide temporary parking or site work area during construction. The temporary carpark/works area could be resurfaced at the end of the construction phase to provide the final carpark.

3.6. Value Engineering

As noted in the architectural schematic design report, the value engineering options are listed below:

1. Medical Records and Patient Flow to be located on LGF in shell east of ED.
2. TECS to be located on LGF in shell east of Imaging.
3. The western visitor lift car and shaft to be omitted - minor adjustment of vertical risers.
4. The new link (running east west from Acute Building to New Ambulatory Entry) and sandwiched between between the existing ED and Theatre buildings to be omitted and replaced with a shorter link between the new Acute Building and the Eastern face of the existing Theatre building on Levels 1 and GF.
5. Pharmacy Scope - VE option requires replanning to limit structural scope.
6. SARU refurbishment - VE option requires showing curtains to divide rooms instead of Gyprock partitions as shown in SDR.
7. Education Building to be retained, car park to be redesigned

Some of these value engineering options have an associated civil and structural impact, as listed below:

1. No strengthening works will be required to the existing Pharmacy building floor structure if Medical Records is relocated to LGF shell.
3. As the lift is being utilized as vertical support for the floor system, an additional 450x450 column will be required (full height of the building). The lift pit extent can stay as documented and provide support to the new column. The two stair cores (previously not used for lateral support) will now need to be engaged as lateral load resisting elements, leading to a possible increase in pile size underneath these elements.
4. Elimination of the steel-framed link corridor truss with metal deck concrete slabs will reduce steelwork tonnage and the extent of piling between the existing buildings. Refer Appendix A for preliminary structural scheme and indicative rates for this option.
5. Replanning of Pharmacy to accommodate existing walls will reduce the steelwork tonnage (beams and columns) and reduce the extent of foundation works to be carried out below new columns.
7. Retention of the Education building on the Albert St side of site will require the western parking arrangement to be amended. This will result in modification of the documented civil works in this zone.

Additionally, the value engineering options outlined below have been investigated to assist with preliminary pricing:

- Piling and foundation design by D&C contractor. This would potentially allow the socket lengths of the piles to be reduced based on a new geotechnical strength reduction factor $\phi_g = 0.67$ (increased from $\phi_g = 0.5$ provided by JK Geotechnics) in accordance with AS2159. Provided the piling contractor is well experienced and carries out their own ground investigation and significant testing, the risk factor of the site will reduce. This results in an increase in the ϕ_g factor and the following reduction in socket lengths may be achievable:

PILING SCHEDULE						
MARK	DIAMETER (mm)	WORKING LOAD (kN)	ULTIMATE COMPRESSION (kN)	ULTIMATE TENSION (kN)	SOCKET LENGTH (mm)	ALT. PAD SIZE
P1	1200	2750	7250	4250	14500 14500	N/A
P2	1000	2000	2750	-	3000 5000	1400x1400x450d
P3	1000	1200	1500	-	1200 2500	N/A
P4	1000	3500	4750	1250	8000 11500	1800x1800x500d
P5	1000	2000	3750	1250	8000 8000	N/A
P6	600	225	300	-	-	N/A

NO CHANGE IN SOCKET LENGTH
2000mm REDUCTION IN SOCKET LENGTH
1300mm REDUCTION IN SOCKET LENGTH
3500mm REDUCTION IN SOCKET LENGTH
NO CHANGE IN SOCKET LENGTH

Figure 3.6 – Pile socket length reduction.

- Review by geotechnical engineer for potential to revise need for bored piles supporting LG slab;
- Permanent metal-deck formwork systems for suspended slabs;
- Investigate whether single construction type is more economical for the roof structure. i.e. Continue post-tensioned banded slabs over entire roof area rather than transitioning from in situ concrete to steel-framing above Level 2 in some zones;
- Investigate potential relocation of some mechanical plant from roof to lower ground floor and reduce the overall area of suspended concrete to the roof level. This would result in a larger area of lightweight metal deck roof and would reduce lateral loads on the building from earthquake;
- Replace ground floor concrete terrace with lightweight metal deck roof. Refer Figure 3.6.1 and Figure 3.6.2 below for metal deck roof member sizes.

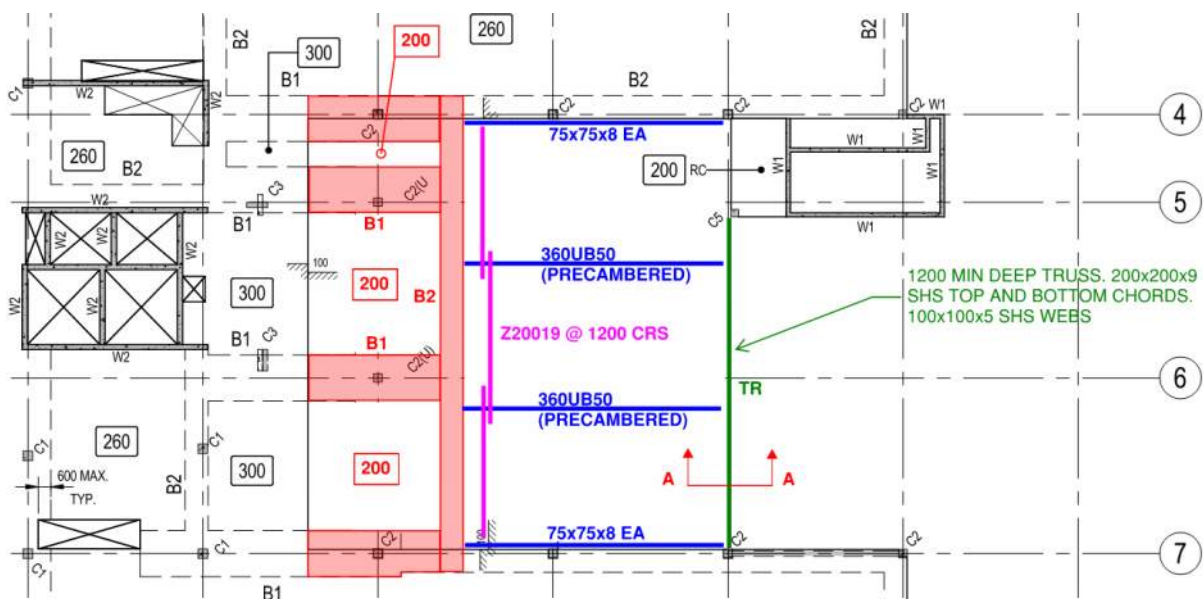


Figure 3.6.1 – Metal deck roof terrace option

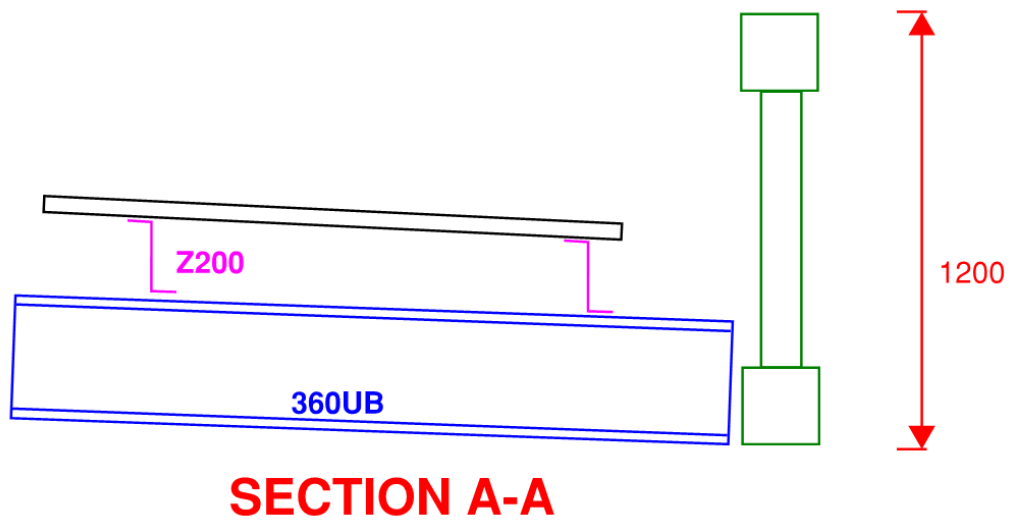


Figure 3.6.2 – Section through terrace showing upstand truss

4. PERFORMANCE PARAMETERS

4.1. Importance Factor

As the building is to accommodate medical emergency and surgical facilities, it has Importance Level 4 and will be designed to fulfil a post disaster function.

4.2. Design Loads

Table 4.2a: Floor & Roof Loads

Floor Type	Uniform Imposed Load (kPa)	Imposed Point Load (kN)	Superimposed Dead Load (kPa)	40mm Sacrificial Topping (kPa)
Stairs, ramps	4.0	4.5	0.0	0.0
Corridors, circulation areas and foyer spaces	5.0	4.5	1.3	1.0
Wards typically	2.0	1.8	1.8	1.0
Clinical areas	3.0	4.5	1.8	1.0
Plant rooms	7.5	4.5	2.4	0.0
Roof typically	0.25	1.4	0.75	0.0
Shell space future expansion	4.0	4.5	3.0	0.0

Table 4.2b: Wind Load Parameters

Item	Value
Location	Region A3
Importance Level	4
V_u	48m/s
V_s	37m/s
M_s	1.0
M_t	1.0
M_d	1.0
Terrain Category	3

Table 4.2c: Earthquake Load Parameters

Item	Value
Importance Level	4
Probability Factor, K_p	1.8
Hazard Factor, Z	0.10
Sub-Soil Class	C_e
Earthquake Design Category	II*
Structural Ductility Factor, μ	3**
Structural Performance Factor, S_p	0.67

*Structure height < 25m

**This assumes that ductile shear walls are to be utilised.

4.3. Floor Vibration

Footfall response will be calculated using the Concrete Centre Design Guide. The response will also be checked against the recommendations made within and Murray, Allen and Ungar in the AISC, 2003.

The footfall frequencies and corresponding response factors defined within the NSW Health Design Guidance Note No. 1 (refer Table 4.3) will be checked for compliance with the Concrete Centre Design Guide. From the latest architectural layout, Imaging is located on Lower Ground (LG), which requires the LG and GF slabs to achieve the required design response factor in Table 4.3.

Once clinical planning has been completed, thicknesses of beams and slabs can be rationalised to meet the required vibration criteria. The current response factors are shown in Figure 4 below.

Table 4.3: Footfall Response Factor Design Parameters – Concrete Centre Method

Facility/Equipment/Use	Design Response Factor	Footfall Frequency (Hz)
Generally procedure rooms, laboratories and general surgery	2	2.2
Corridors, circulation spaces, offices and other non-vibration sensitive areas	4	2.2
Imaging Suite and operating theatres	1	1.8
Plant areas	N/A	N/A
Roof areas	N/A	N/A



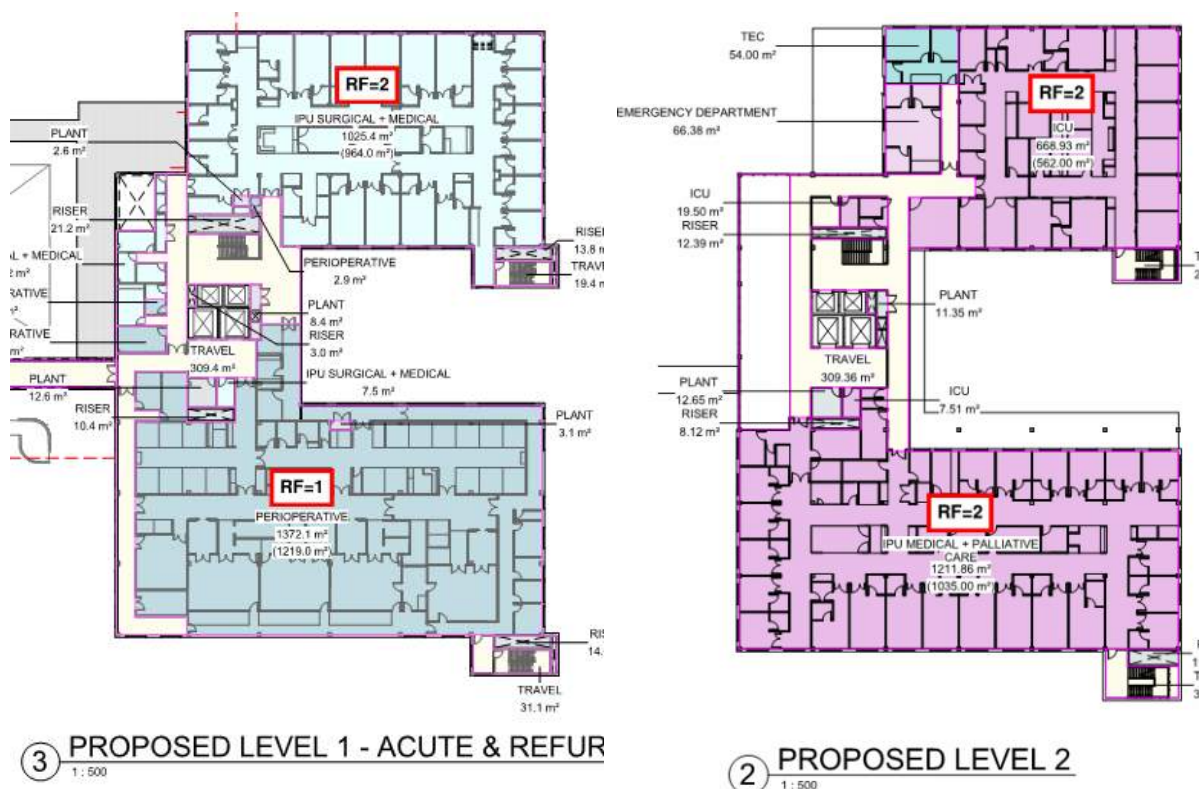


Figure 4.3a – Required response factors for each floor zone.

A banded slab floor system was considered for the schematic design stage vibration analysis. With this option, 450mm deep bands and 260mm thick slabs (generally) are required to achieve a Response Factor (RF) = 1. These zones are located south of the lift core on Lower Ground and Level 1 (refer Figure 4.3a) for Medical Imaging and Perioperative zones, respectively. As stipulated in the HI Design Guidelines, this response factor is required for the slab directly above and below, and therefore all slabs (excluding Level 3) south of the lift core require RF = 1. The remainder of the slab can be designed to achieve RF = 2.

4.3.1. Robot Analysis

Autodesk Robot 2016 was used for the vibration analysis. The parameters for both analyses carried out include:

- Dynamic Young's Modulus of Concrete = 38GPa
- Person mass = 75kg;
- Footfall frequency = 2.2 Hz;
- Footfall repetitions = 25 steps;
- Damping = 3.5%;
- Superimposed dead load = 1.5kPa; and
- Vertical support to slab is assumed to be provided by the perimeter curtain wall and riser shaft walls.

A summary of the two geometries analysed is presented below:

- Model 1 (Figure 4.3.1a and Figure 4.3.1c)
 - 2200mm W x 450mm D internal beams;
 - 1100mm W x 450mm D edge beams; and
 - 260mm thick slabs throughout.

- Model 2 (Figure 4.3.1b and Figure 4.3.1d)
 - 2200mm W x 450mm D internal beams;
 - 1100mm W x 450mm D edge beams;
 - 260mm thick slabs generally; and
 - 300mm thick slab for Grid A-B.

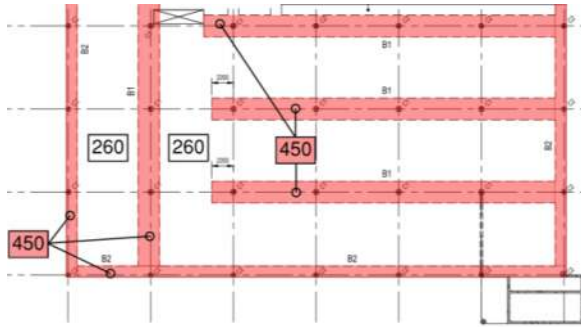


Figure 4.3.1a – Model 1 slab and beam thicknesses south of the lift core.

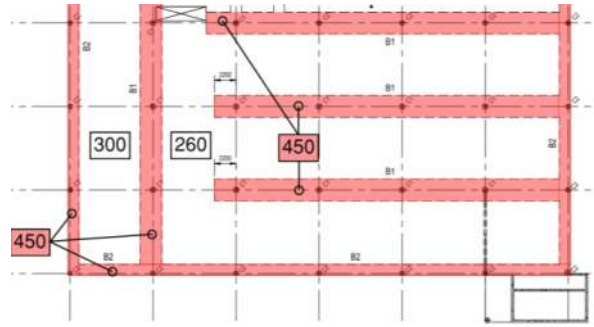


Figure 4.3.1b – Model 2 slab and beam thicknesses south of the lift core.

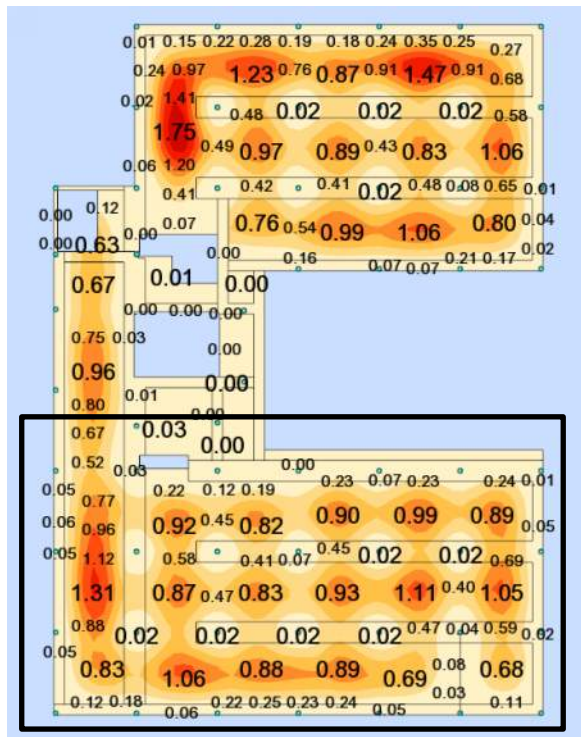


Figure 4.3.1c – Response factors for Model 1.

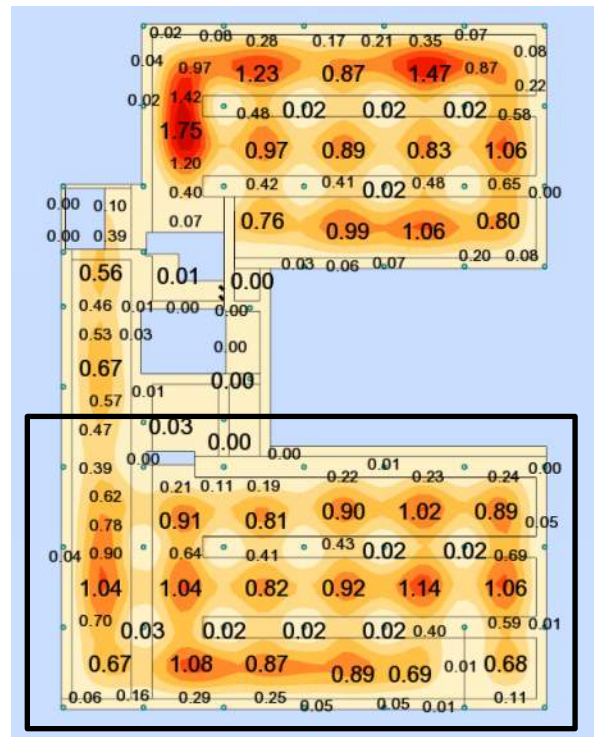


Figure 4.3.1d – Response factors for Model 2.

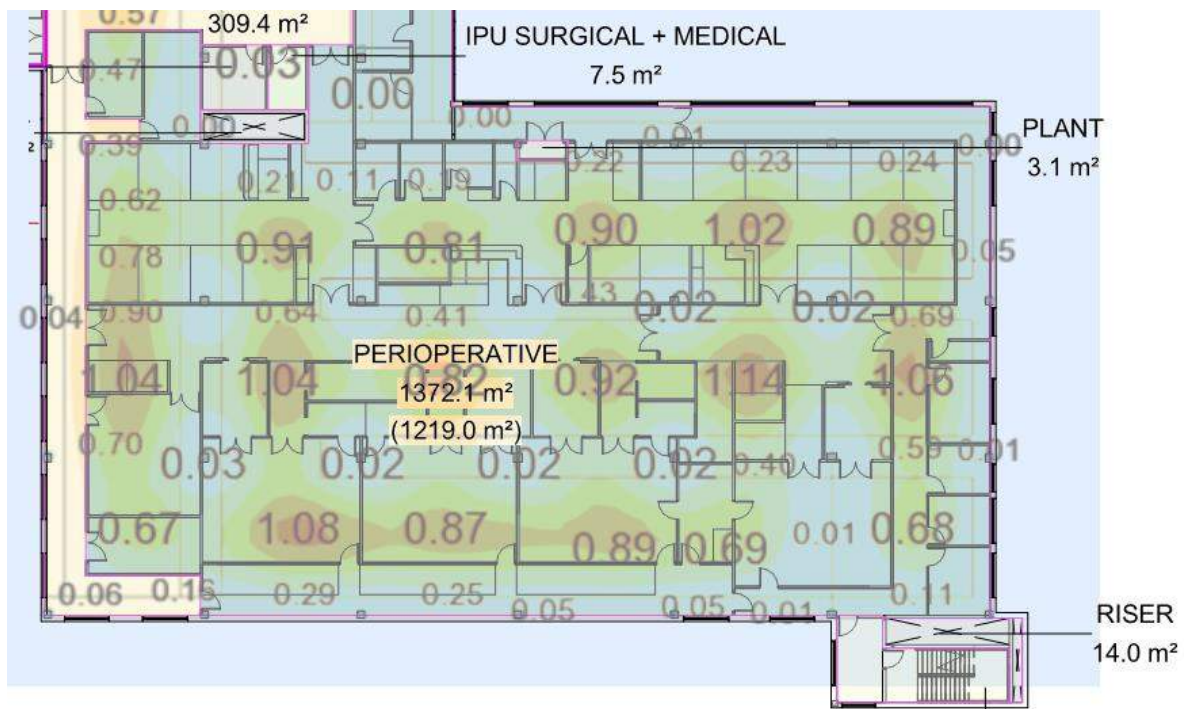


Figure 4.3.1e – Response factors for Level 1 slab (Model 2) overlaid on Perioperative floor zone.

Despite exceeding the required RF = 1 in some locations, a 260mm slab has been documented (Refer Appendix A) for consistency. During the DD stage, it will be possible to rationalise slab and band thicknesses in these localised sensitive areas. It will also be possible to re-run the vibration analyses with frequencies that match the room layout rather than a blanket 2.2Hz maximum at all locations on the floor plate. I.e. A maximum frequency of 1.8Hz would be more common in wards, whereas a 2.2Hz maximum is more likely for corridors.

4.4. Fire Rating

Building Element	FRL (Type 9a)
External Walls (Load Bearing)	120/60/30
External Columns	120/-/-
Load Bearing Fire Walls	120/120/120
Shafts (Non-load Bearing)	-/-/-
Other Load Bearing Walls, Beams, Trusses, Columns	120/-/-
Floors	120/120/120
Steel Framed and Metal Sheeted Roofs Not Providing Fire Separating Function	No FRL*
Steel Columns Supporting Steel Framed and Metal Sheeted Roofs Not Providing Fire Separating Function	120/-/- (TBC)

*This concession is gained as the building is to be fully sprinklered

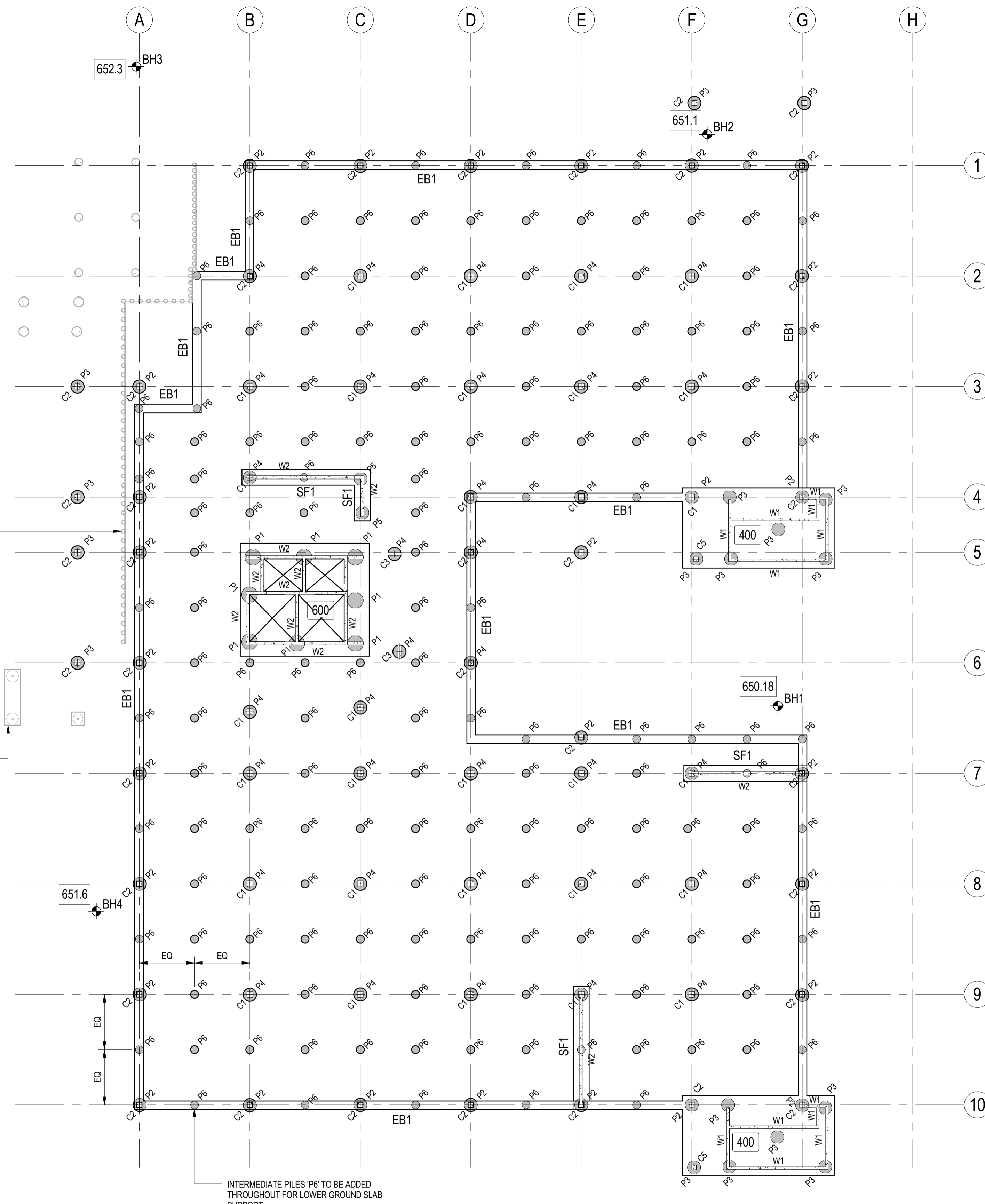
4.5. Health Infrastructure Design Guidelines

A list of the Health Infrastructure Design Guidelines is shown in Table 4.5 below. The guidelines that are relevant to the civil and structural disciplines of this project have been assigned a 'Y'. All other HI Design guidelines that are not relevant to the civil and structural disciplines have been noted as 'N/A',

Table 4.5: Health Infrastructure Design Guidelines

DGN No	Rev	Name	Consultant
1	A	Structural Design Criteria Guidelines	Y
5	A	Engineering Services	N/A
6	C	General Design Principles	Y
7	B	In Building Coverage	N/A
8	A	Reduction of Interference in Neurophysiology Departments	N/A
9	A	AusHFG Clarification	N/A
10	A	Use of Curtains in Clinical Environments	N/A
12	A	Certification of HI Projects	N/A
13	A	Project Team Guidance Relating to Coordination with ERG	N/A
15	C	Asbestos Management	N/A
16	A	Legionella Risk Delayed Staged Occupation	N/A
17	A	Construction Works under ISEPP	Y
18	C	Training_and_Aboriginal_Participation_28062016	N/A
19	B	Helipads	N/A
20	A	Design Deliverables for Tender	N/A
21	B	Medical Gas System	N/A
22	A	Planning and Delivery Workshop Plan	N/A
23	A	Black Start Test Guidance Process	N/A
24	A	Building Importance Levels for NSW Health Projects	Y
25	A	Commissioning Validation Period & Support Process	N/A
26	A	MockUps Prototypes Sample Rooms and Spares	N/A
27	A	Switchable Glass in ICU	N/A
28	A	AUS HFG Isolation Room	N/A
29	A	Overhead Protective Structures	N/A
30	A	Site Investigations	Y
31	A	Water Testing and Compliance	N/A
32	A	External Wall Construction and Facade Compliance	N/A
33	A	Acoustic ESG	N/A

APPENDIX A. STRUCTURAL DRAWINGS



FOR LINK CORRIDOR STRUCTURE REFER TO DRAWINGS SK2000 TO SK2800

BORED PIER RETAINING WALL TO BE DESIGNED AND CERTIFIED BY PILING CONTRACTOR. TYPICAL

FOR LINK CORRIDOR STRUCTURE REFER TO DRAWINGS SK2000 TO SK2800

INTERMEDIATE PILES 'P6' TO BE ADDED THROUGHOUT FOR LOWER GROUND SLAB SUPPORT

PROPOSED FOOTING PLAN
SCALE: 1 : 200

LEGEND

- DENOTES BORE HOLE NUMBER AND APPROXIMATE LOCATION AS PER GEOTECHNICAL REPORT
- DENOTES APPROXIMATE LEVEL OF ROCK AS PER BORE HOLE LOGS. TO BE CONFIRMED ON SITE

RC COLUMN SCHEDULE			
MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

PILING SCHEDULE						
MARK	DIAMETER (mm)	WORKING LOAD (kN)	ULTIMATE COMPRESSION (kN)	ULTIMATE TENSION (kN)	SOCKET LENGTH (mm)	ALT. PAD SIZE
P1	1200	2750	7250	4250	14500	N/A
P2	1000	2000	2750	-	5000	1400x1400x450d
P3	1000	1200	1500	-	2500	N/A
P4	1000	3500	4750	1250	11500	1800x1800x500d
P5	1000	2000	3750	1250	8000	N/A
P6	600	225	300	-	-	N/A

NOTE: ALTERNATE PAD SIZES AND P6 BORED PIERS BASED ON 1000 kPa ALLOWABLE BEARING PRESSURE

STRIP FOOTING SCHEDULE			
MARK	DEPTH	WIDTH	REMARKS
EB1	400	650	
SF1	400	1200	

Rev	Description	Date	By	App
P5	RE ISSUED FOR SCHEMATIC DESIGN	21.09.17	TJW	
P4	ISSUED FOR SCHEMATIC DESIGN	21.07.17	TJW	
P3	ISSUED FOR INFORMATION	05.07.17	AV	
P2	ISSUED FOR INFORMATION	07.06.17	TJW	
P1	ISSUED FOR INFORMATION	09.05.17	TJW	



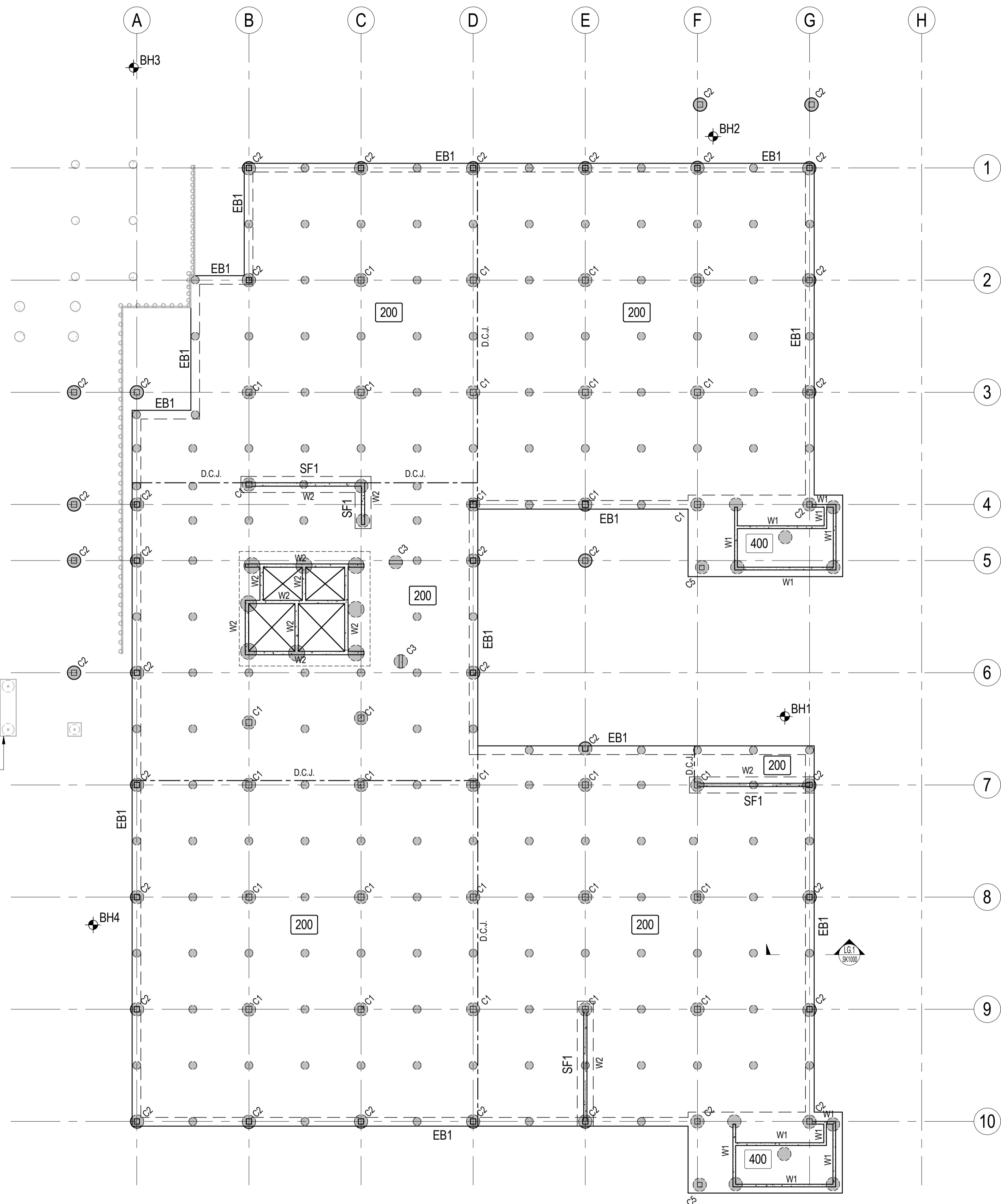
GOULBURN HOSPITAL AND HOSPITAL SERVICES REDEVELOPMENT



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FOOTING PLAN

SCHEMATIC DESIGN			
Designed	AC	Project Director Approved	Date
Drawn	TJW		North
Scale	As indicated	Project Ref.	Drawing No.
Date		202172601S	SK0900
Sheet	A1		Rev P5



FOR LINK CORRIDOR STRUCTURE
REFER TO DRAWINGS SK2000 TO SK2800

FOR LINK CORRIDOR STRUCTURE
REFER TO DRAWINGS SK2000 TO SK2800

PROPOSED LEVEL LG

SCALE: 1:200

STRUCTURAL SIZES

(UNLESS OTHERWISE NOTED)

SLAB	GENERALLY 200mm REINFORCED CONCRETE SLAB
STAIRS	TYPICALLY 200 THICK RC
RC COLUMNS	REFER TO COLUMN SCHEDULE
CORE WALLS	TYPICALLY 250 THICK RC

CONCRETE GRADE

ALL FLOOR ELEMENTS	S40 (DENSEWEIGHT)
COLUMNS	N50 (LG - GF) N40 (GF-ROOF)
WALLS	N40 (LG - GF)

NOTE

PROVIDE VOID FORMERS AROUND EDGE THICKENINGS IN ACCORDANCE WITH GEOTECHNICAL REPORT

LEGEND

(UNLESS OTHERWISE NOTED)

- 250 DENOTES THICKNESS OF SLAB
- DENOTES CONSTRUCTION JOINT
- DENOTES DOWELLED CONTROL JOINT
- DENOTES SLAB STEP
REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT AND DIMENSIONS
- DENOTES CONCRETE ELEMENT OVER
- DENOTES LOAD-BEARING ELEMENT UNDER

RC COLUMN SCHEDULE			
MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

STRUCTURAL WALL SCHEDULE		
MARK	WIDTH	REMARKS
W1	200	RC WALL
W2	250	RC WALL

EDGE BEAM SCHEDULE		
MARK	DEPTH	WIDTH
EB1	400	650

Rev	Description	Date	By	App
P5	RE ISSUED FOR SCHEMATIC DESIGN	21.09.17	TJW	
P4	ISSUED FOR SCHEMATIC DESIGN	21.07.17	TJW	
P3	ISSUED FOR INFORMATION	05.07.17	AV	
P2	ISSUED FOR INFORMATION	07.06.17	TJW	
P1	ISSUED FOR INFORMATION	09.05.17	TJW	

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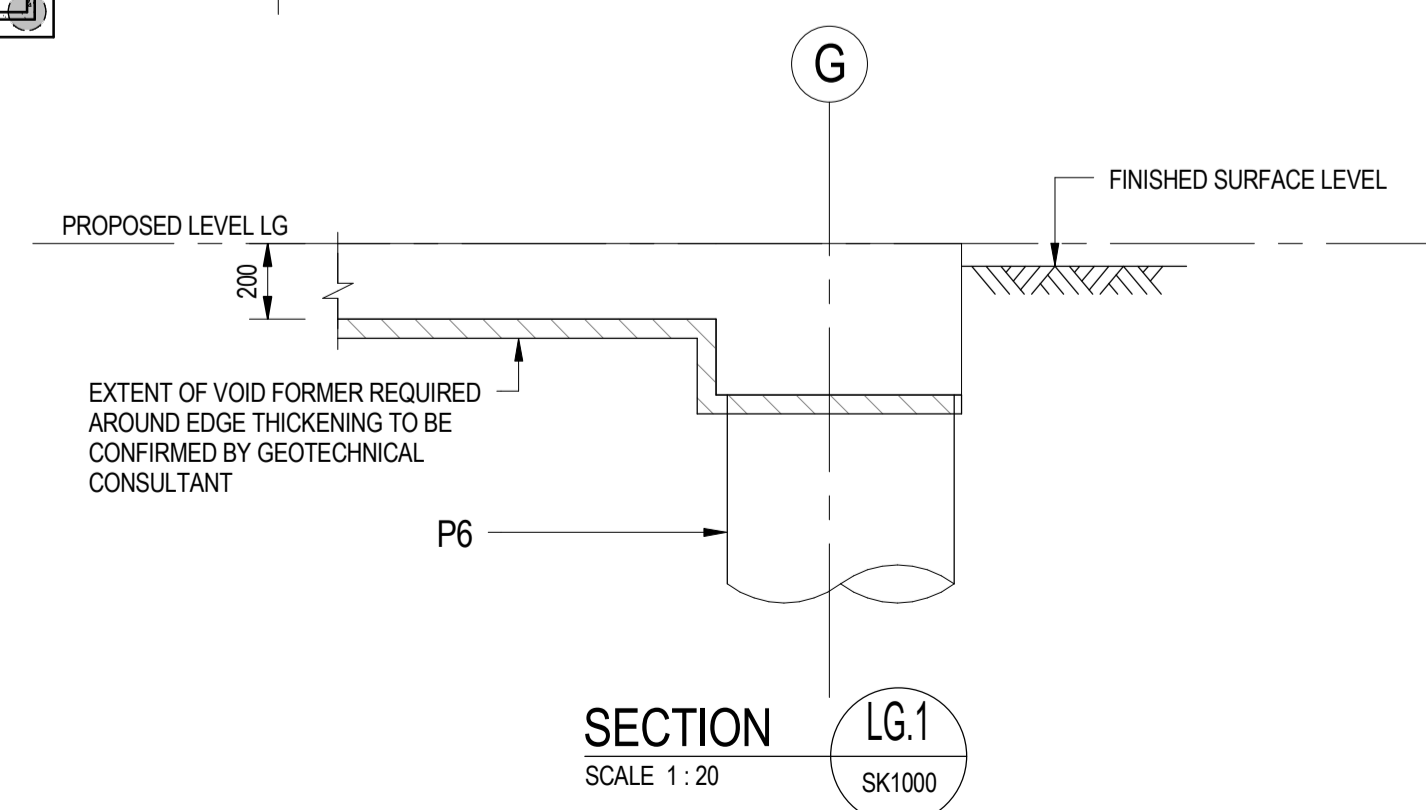


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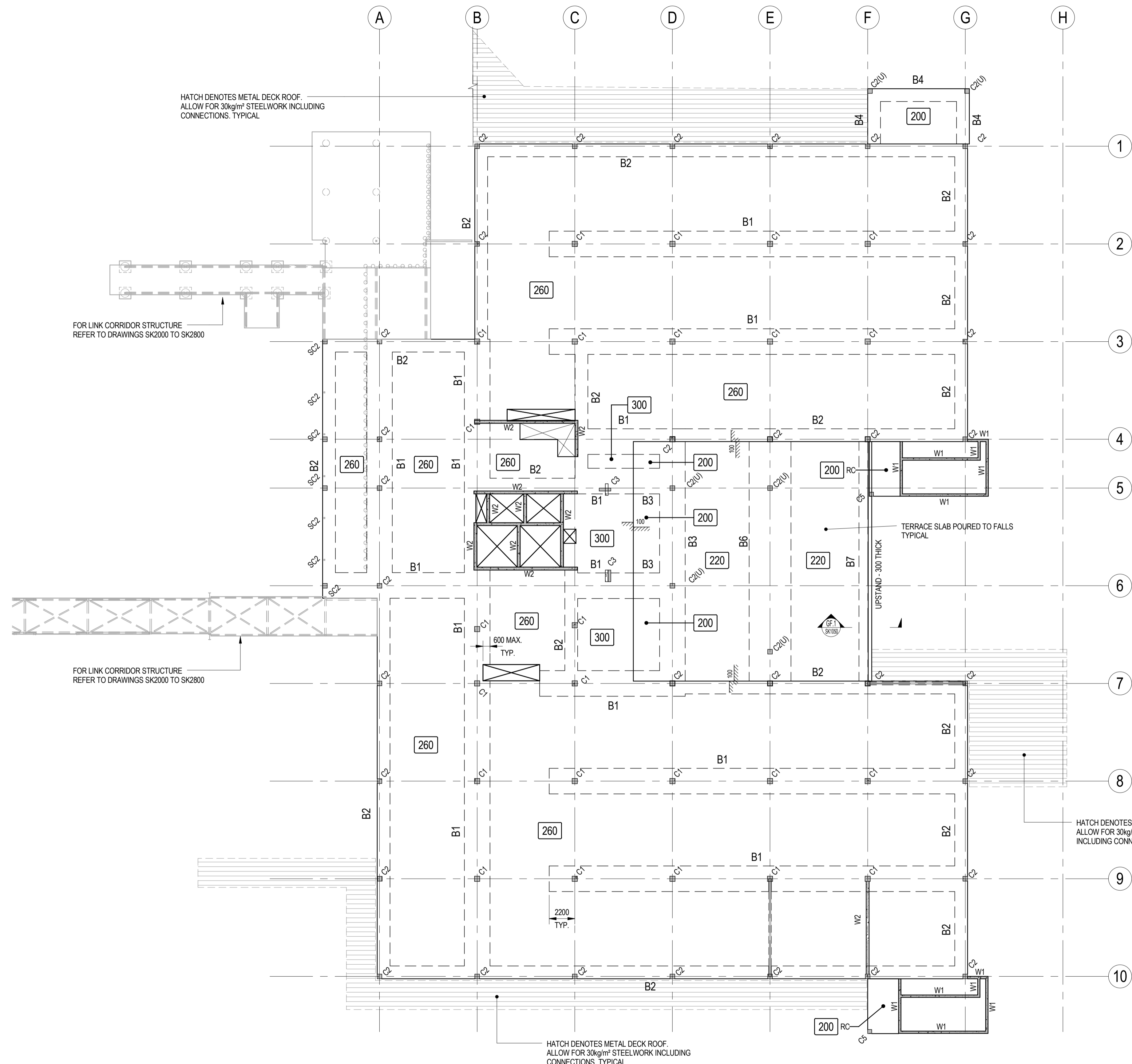
STRUCTURAL PLAN - LOWER GROUND



SCHEMATIC DESIGN			
Designed	AC	Project Director Approved	Date
Drawn	TJW		North
Scale	As indicated	Project Ref.	Drawing No. Rev
Date		202172601S	SK1000 P5
Sheet	A1		

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STRUCTURAL SIZES (UNLESS OTHERWISE NOTED)

SLAB	GENERALLY 260mm THICK POST TENSIONED SLAB
STAIRS	TYPICALLY 200mm THICK RC
RC COLUMNS	REFER TO COLUMN SCHEDULE
CORE WALLS	TYPICALLY 250mm THICK RC

CONCRETE GRADE

ALL FLOOR ELEMENTS	S40 (DENSEWEIGHT)
COLUMNS	N50 (LG - GF) N40 (GF-ROOF)
WALLS	N40 (LG - GF)

LEGEND (UNLESS OTHERWISE NOTED)

- 250 DENOTES THICKNESS OF SLAB
- DENOTES CONSTRUCTION JOINT
- DENOTES DOWELLED CONTROL JOINT
- DENOTES SLAB STEP
REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT AND DIMENSIONS
- DENOTES CONCRETE ELEMENT OVER
- DENOTES LOAD-BEARING ELEMENT UNDER

RC COLUMN SCHEDULE

MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

STRUCTURAL WALL SCHEDULE

MARK	WIDTH	REMARKS
W1	200	RC WALL
W2	250	RC WALL

BAND BEAM SCHEDULE

MARK	DEPTH	WIDTH
B1	450	2200
B2	450	1100
B3	350	2200
B4	350	1100
B5	450	400
B6	400	3600
B7	400	1100

Rev	Description	Date	By	App
P5	RE ISSUED FOR SCHEMATIC DESIGN	21.09.17	TJW	
P4	ISSUED FOR SCHEMATIC DESIGN	21.07.17	TJW	
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P2	ISSUED FOR INFORMATION	07.06.17	TJW	
P1	ISSUED FOR INFORMATION	09.05.17	TJW	

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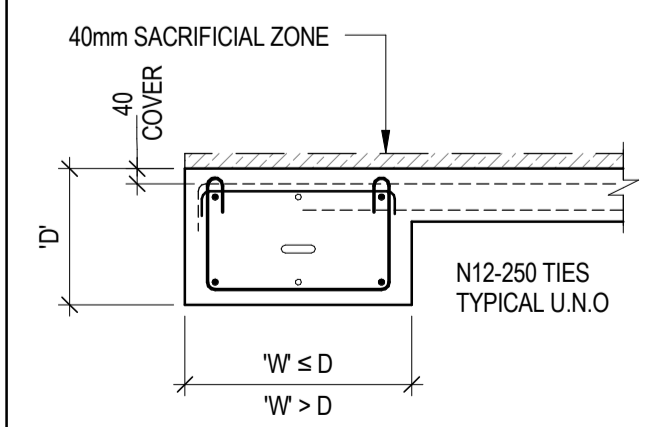
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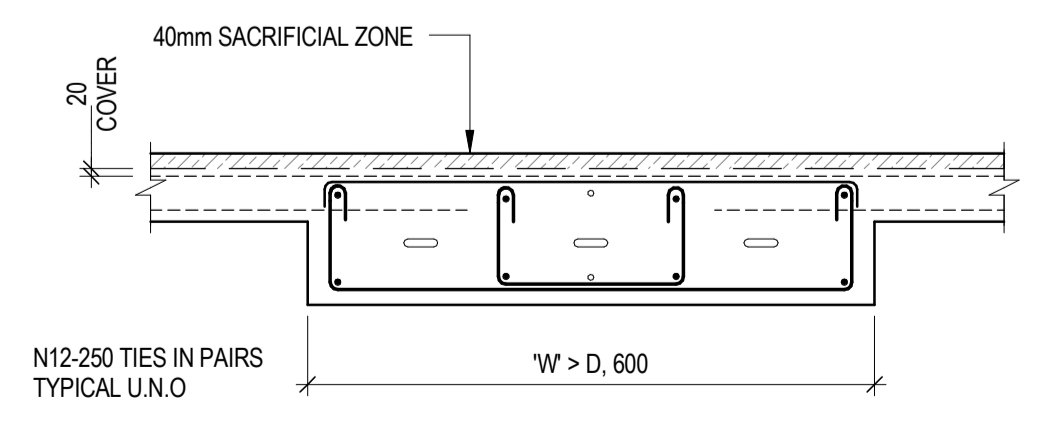
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STRUCTURAL PLAN - GROUND LEVEL

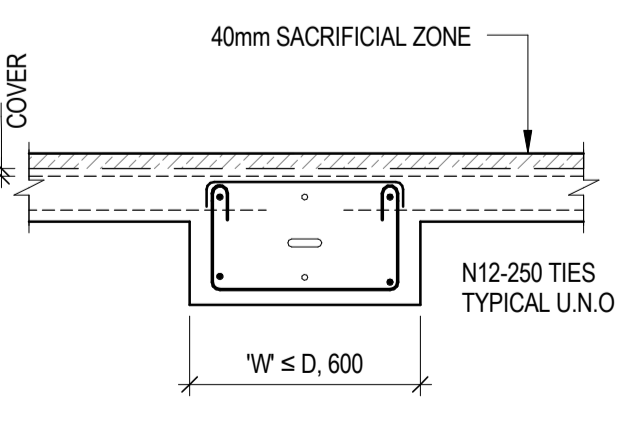
PROPOSED LEVEL G
SCALE: 1:200



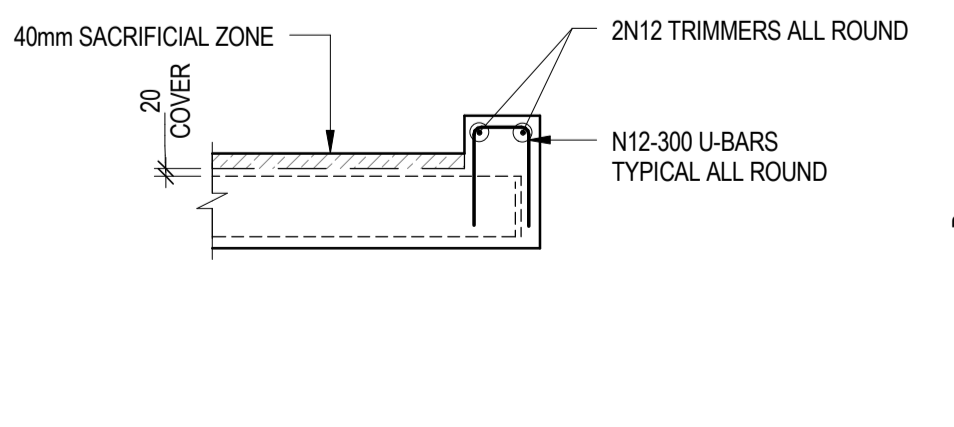
TYPICAL EDGE BEAM DETAIL



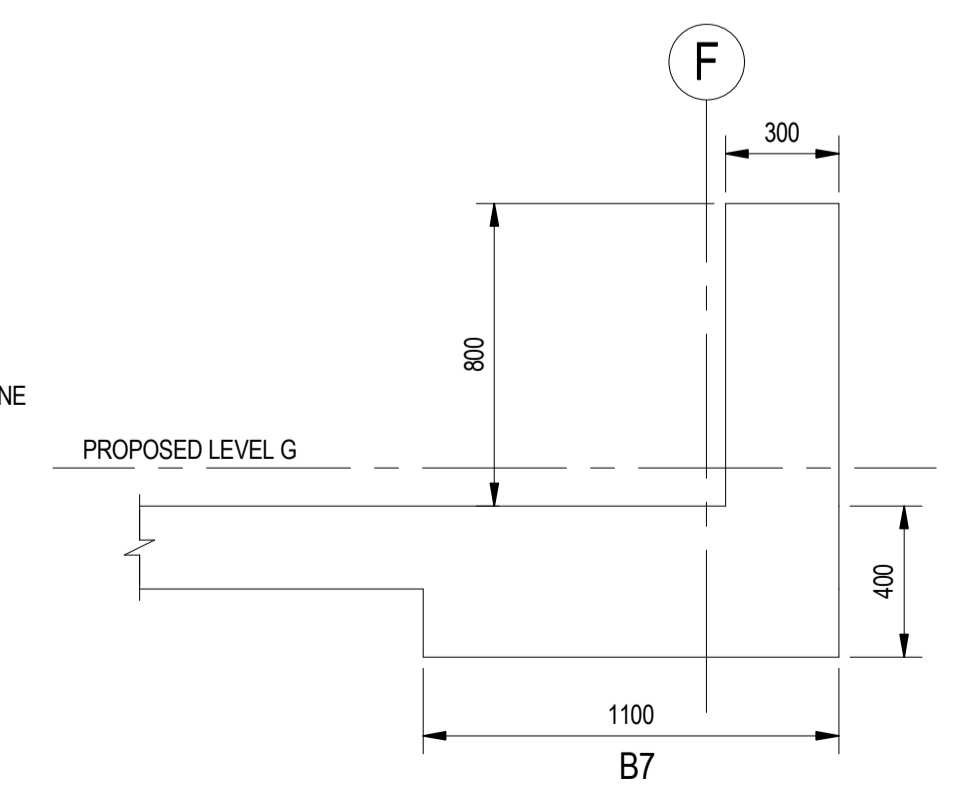
TYPICAL INTERNAL BEAM DETAIL



TYPICAL HOB DETAIL AT PENETRATION



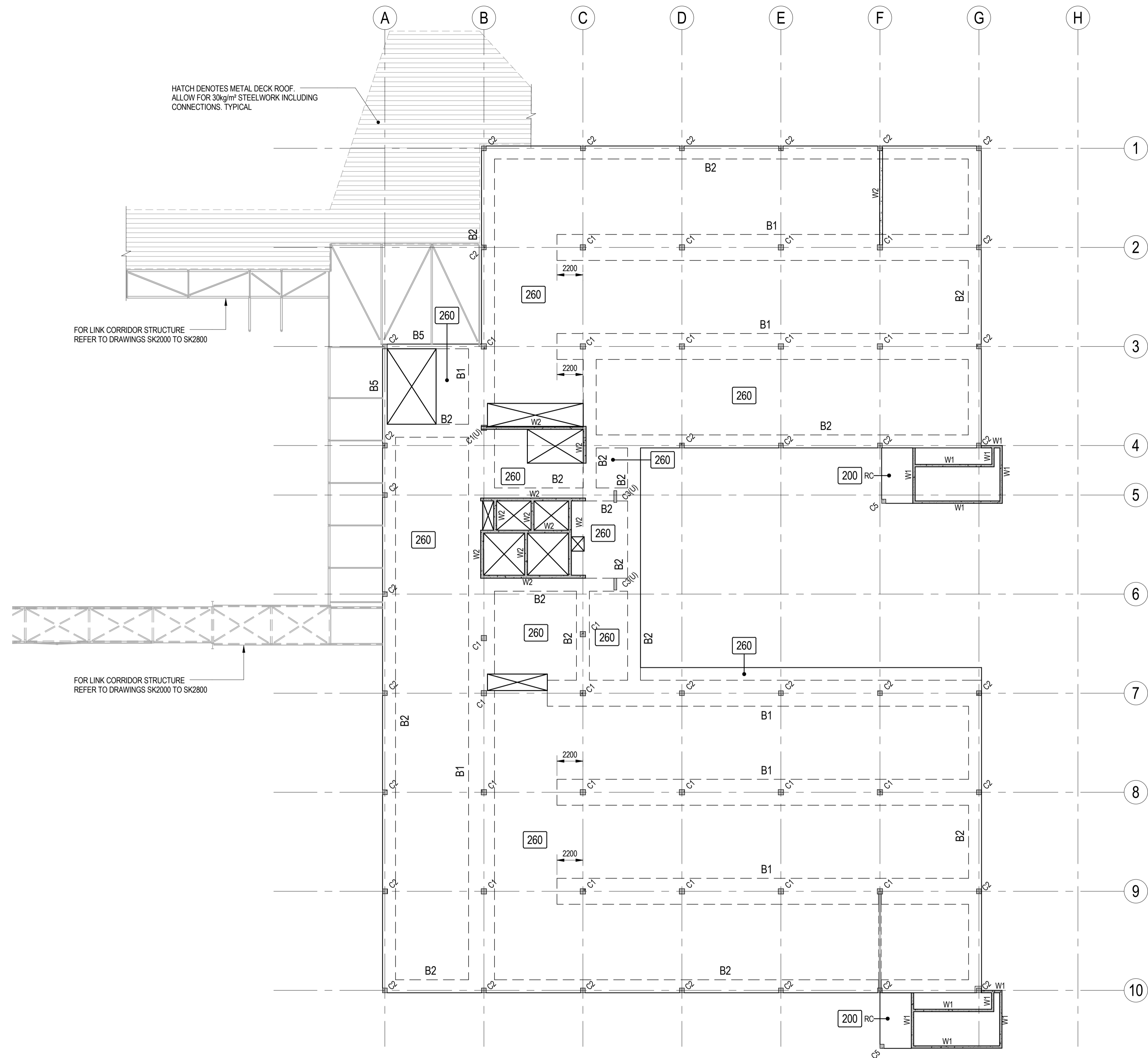
TYPICAL EDGE BEAM AT SET-DOWN DETAIL



SECTION GF.1
SCALE 1:20

SCHEMATIC DESIGN

Designed	AC	Project Director Approved	Date	North
Drawn	TJW			
Scale	As indicated	Project Ref.	Drawing No.	Rev
Date		202172601S	SK1050	P5
Sheet	A1			



HATCH DENOTES METAL DECK ROOF.
ALLOW FOR 30kg/m² STEELWORK INCLUDING CONNECTIONS. TYPICAL

FOR LINK CORRIDOR STRUCTURE
REFER TO DRAWINGS SK2000 TO SK2800

FOR LINK CORRIDOR STRUCTURE
REFER TO DRAWINGS SK2000 TO SK2800

PROPOSED LEVEL 1
SCALE: 1:200

STRUCTURAL SIZES (UNLESS OTHERWISE NOTED)

- SLAB GENERALLY 260mm THICK POST TENSIONED SLAB
- STAIRS TYPICALLY 200mm THICK RC
- RC COLUMNS REFER TO COLUMN SCHEDULE
- CORE WALLS TYPICALLY 250mm THICK RC

CONCRETE GRADE

- ALL FLOOR ELEMENTS S40 (DENSEWEIGHT)
- COLUMNS N50 (LG - GF)
N40 (GF-ROOF)
- WALLS N40 (LG - GF)

LEGEND (UNLESS OTHERWISE NOTED)

- 260 DENOTES THICKNESS OF SLAB
- DENOTES CONSTRUCTION JOINT
- DENOTES DOWELLED CONTROL JOINT
- DENOTES SLAB STEP
REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT AND DIMENSIONS
- DENOTES CONCRETE ELEMENT OVER
- DENOTES LOAD-BEARING ELEMENT UNDER

RC COLUMN SCHEDULE			
MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

STRUCTURAL WALL SCHEDULE		
MARK	WIDTH	REMARKS
W1	200	RC WALL
W2	250	RC WALL

BAND BEAM SCHEDULE		
MARK	DEPTH	WIDTH
B1	450	2200
B2	450	1100
B3	350	2200
B4	350	1100
B5	450	400
B6	400	3600
B7	400	1100

Rev	Description	Date	By	App
P5	RE ISSUED FOR SCHEMATIC DESIGN	21.09.17	TJW	
P4	ISSUED FOR SCHEMATIC DESIGN	21.07.17	TJW	
P3	ISSUED FOR INFORMATION	05.07.17	AV	
P2	ISSUED FOR INFORMATION	07.06.17	TJW	
P1	ISSUED FOR INFORMATION	09.05.17	TJW	

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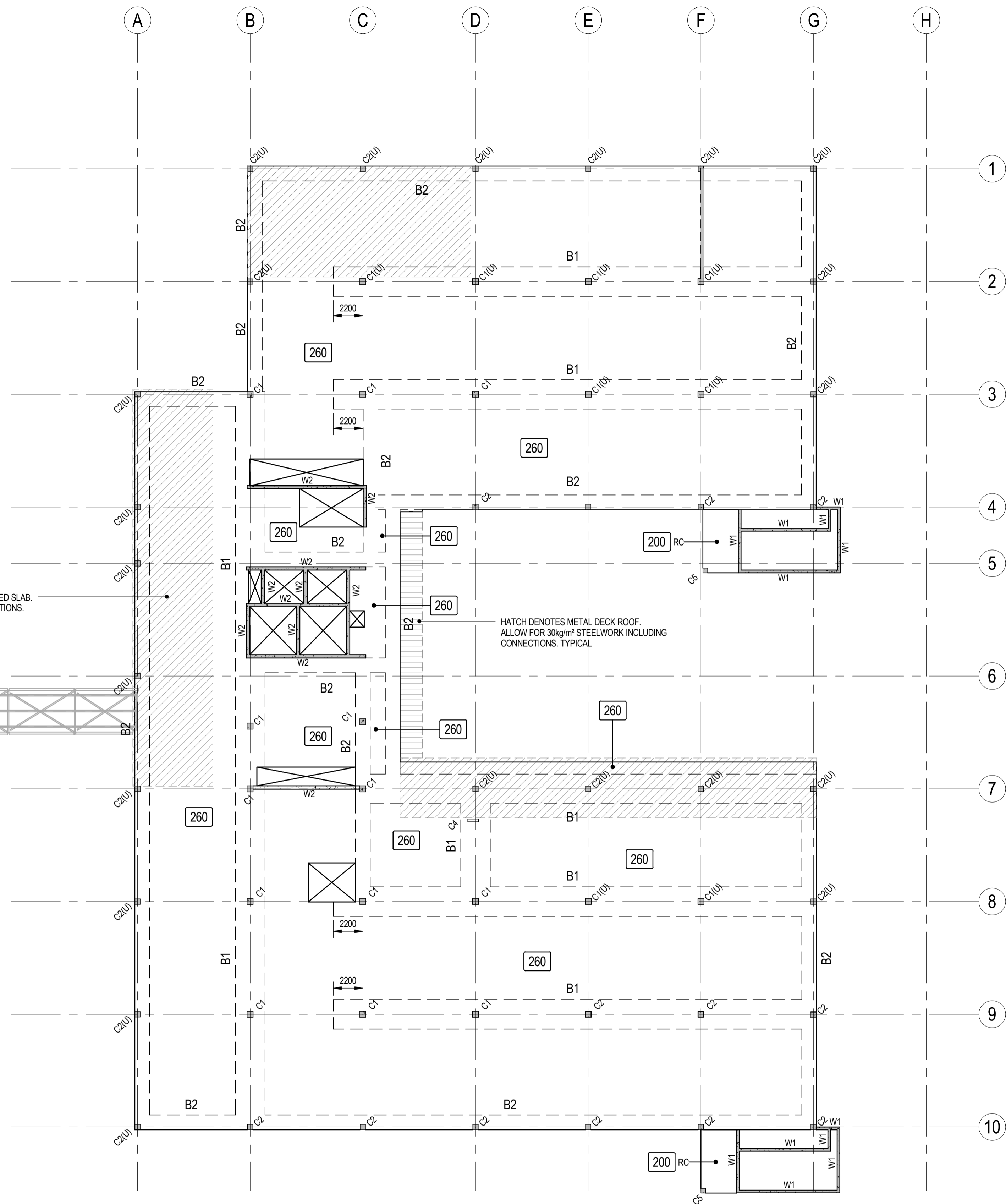
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STRUCTURAL PLAN - LEVEL 1

SCHEMATIC DESIGN				
Designed	AC	Project Director Approved	Date	North
Drawn	TJW			
Scale	As indicated	Project Ref.	Drawing No.	Rev
Date		202172601S	SK1100	P5
Sheet	A1			



HATCH DENOTES METAL DECK ROOF OVER SUSPENDED SLAB. ALLOW FOR 30kg/m² STEELWORK INCLUDING CONNECTIONS. TYPICAL

HATCH DENOTES METAL DECK ROOF. ALLOW FOR 30kg/m² STEELWORK INCLUDING CONNECTIONS. TYPICAL

FOR LINK CORRIDOR STRUCTURE REFER TO DRAWINGS SK2000 TO SK2800

PROPOSED LEVEL 2
SCALE: 1 : 200

STRUCTURAL SIZES (UNLESS OTHERWISE NOTED)

- SLAB GENERALLY 260mm THICK POST TENSIONED SLAB
- STAIRS TYPICALLY 200mm THICK RC
- RC COLUMNS REFER TO COLUMN SCHEDULE
- CORE WALLS TYPICALLY 250mm THICK RC

CONCRETE GRADE

- ALL FLOOR ELEMENTS S40 (DENSEWEIGHT)
- COLUMNS N50 (LG - GF)
N40 (GF-ROOF)
- WALLS N40 (LG - GF)

LEGEND (UNLESS OTHERWISE NOTED)

- 250 DENOTES THICKNESS OF SLAB
- DENOTES CONSTRUCTION JOINT
- DENOTES DOWELLED CONTROL JOINT
- DENOTES SLAB STEP REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT AND DIMENSIONS
- DENOTES CONCRETE ELEMENT OVER
- DENOTES LOAD-BEARING ELEMENT UNDER

RC COLUMN SCHEDULE			
MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

STRUCTURAL WALL SCHEDULE		
MARK	WIDTH	REMARKS
W1	200	RC WALL
W2	250	RC WALL

BAND BEAM SCHEDULE		
MARK	DEPTH	WIDTH
B1	450	2200
B2	450	1100
B3	350	2200
B4	350	1100
B5	450	400
B6	400	3600
B7	400	1100

Rev	Description	Date	By	App
P5	RE ISSUED FOR SCHEMATIC DESIGN	21.09.17	TJW	
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P3	ISSUED FOR INFORMATION	05.07.17	AV	
P2	ISSUED FOR INFORMATION	07.06.17	TJW	
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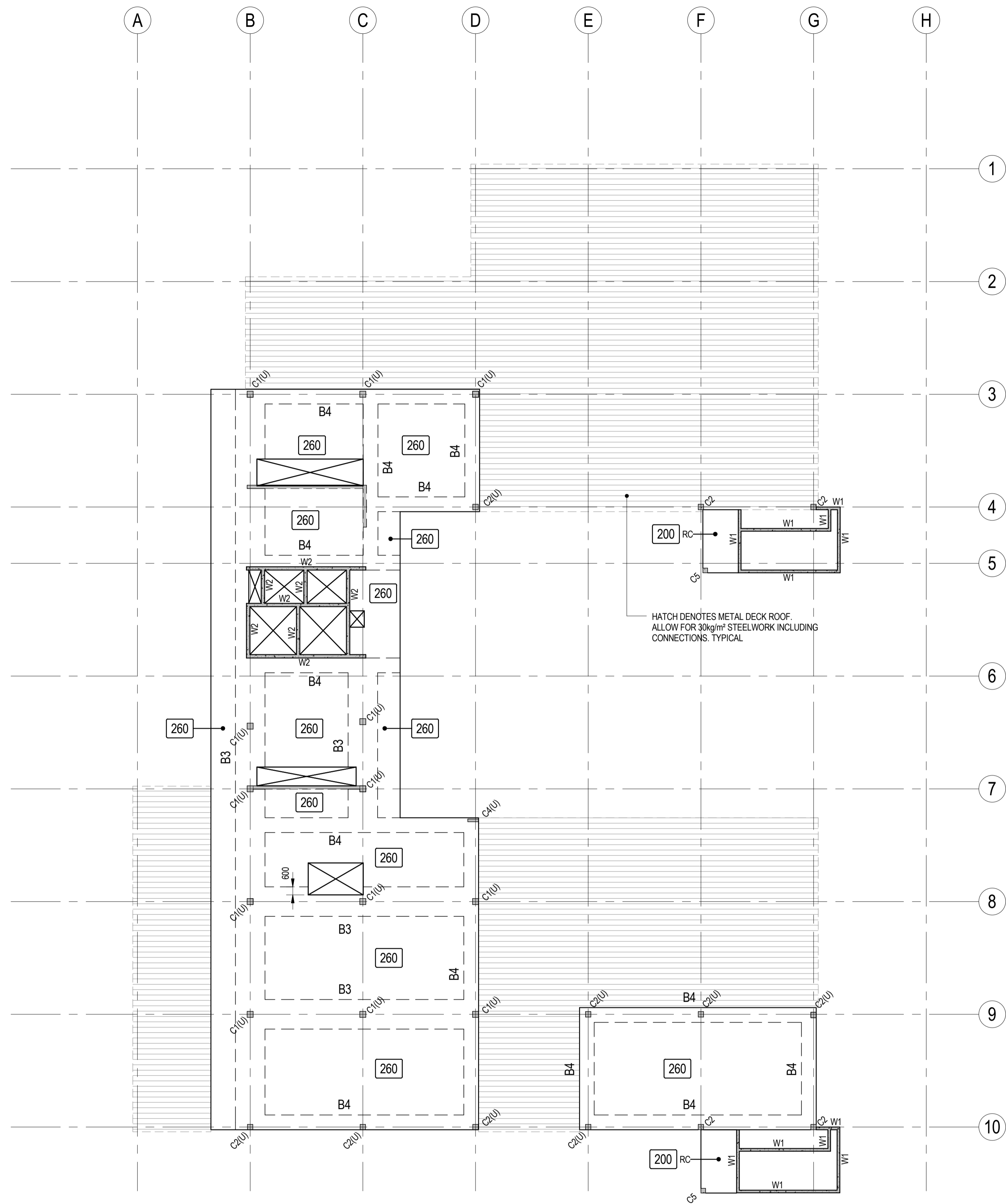
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STRUCTURAL PLAN - LEVEL 2

SCHEMATIC DESIGN				
Designed	AC	Project Director Approved	Date	North
Drawn	TJW			
Scale	As indicated	Project Ref.	Drawing No.	Rev
Date		202172601S	SK1200	P5
Sheet	A1			



PROPOSED ROOF LEVEL
SCALE: 1:200

STRUCTURAL SIZES (UNLESS OTHERWISE NOTED)

SLAB: GENERALLY 260mm THICK POST TENSIONED SLAB
 STAIRS: TYPICALLY 200 THICK RC
 RC COLUMNS: REFER TO COLUMN SCHEDULE
 CORE WALLS: TYPICALLY 250 THICK RC

CONCRETE GRADE

ALL FLOOR ELEMENTS: S40 (DENSEWEIGHT)
 COLUMNS: N50 (LG - GF), N40 (GF-ROOF)
 WALLS: N40 (LG - GF)

LEGEND (UNLESS OTHERWISE NOTED)

- 260 DENOTES THICKNESS OF SLAB
- DENOTES CONSTRUCTION JOINT
- DENOTES DOWELLED CONTROL JOINT
- DENOTES SLAB STEP
REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT AND DIMENSIONS
- DENOTES CONCRETE ELEMENT OVER
- DENOTES LOAD-BEARING ELEMENT UNDER

RC COLUMN SCHEDULE

MARK	LENGTH	WIDTH	REINFORCEMENT
C1	450	450	8N28 N12-300 TIES
C2	400	400	8N20 R10-300 TIES
C3	1000	250	
C4	800	200	
C5	350	350	

STRUCTURAL WALL SCHEDULE

MARK	WIDTH	REMARKS
W1	200	RC WALL
W2	250	RC WALL

BAND BEAM SCHEDULE

MARK	DEPTH	WIDTH
B1	450	2200
B2	450	1100
B3	350	2200
B4	350	1100
B5	450	400
B6	400	3600
B7	400	1100

Rev	Description	Date	By	App
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P1	ISSUED FOR INFORMATION	09.05.17	TJW	



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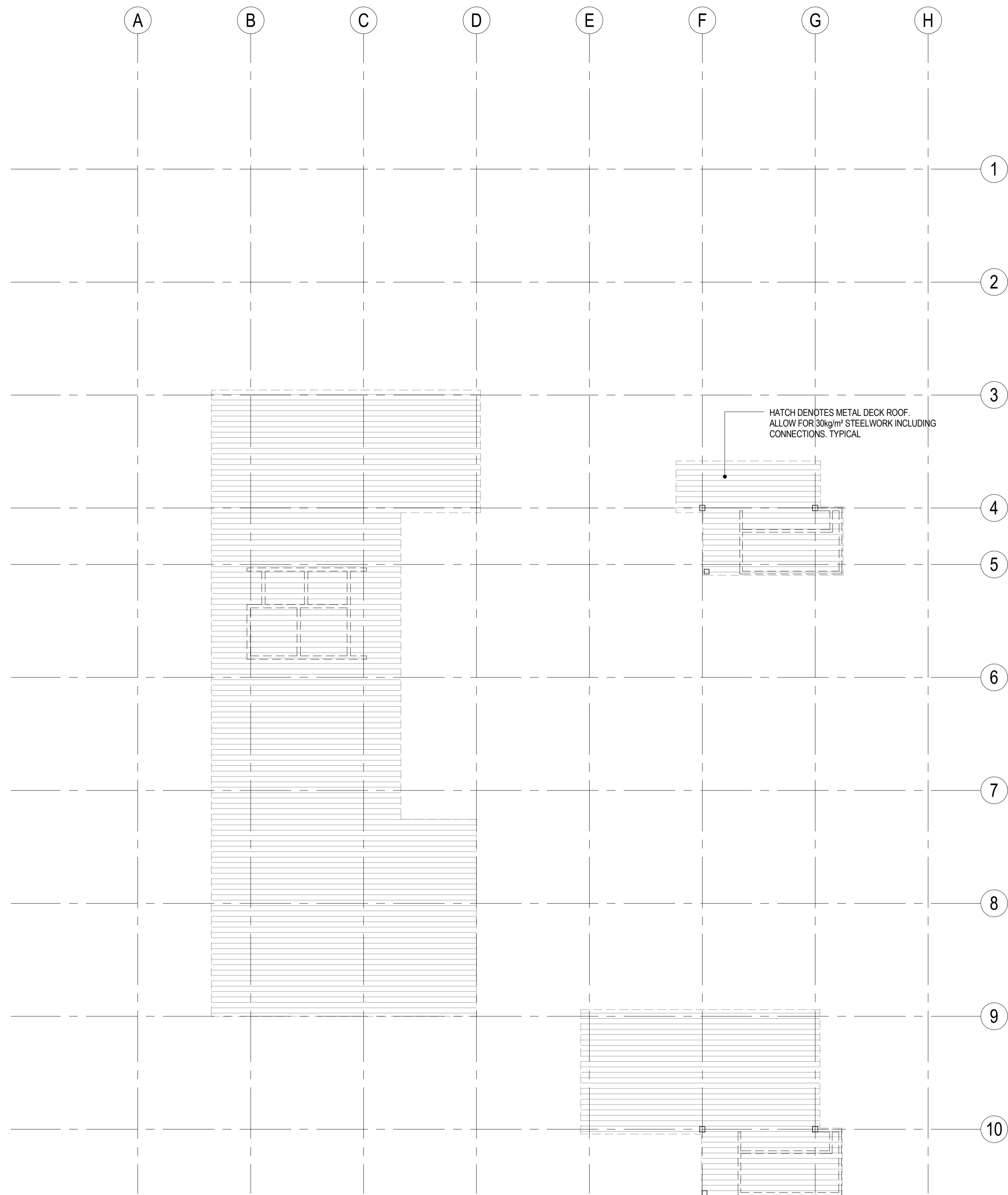
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STRUCTURAL PLAN - ROOF LEVEL

SCHEMATIC DESIGN

Designed	AC	Project Director Approved	Date	North
Drawn	TJW			
Scale	As indicated	Project Ref.	Drawing No.	Rev
Date		202172601S	SK1300	P5
Sheet	A1			

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STRUCTURAL PLAN - UPPER ROOF
SCALE: 1:200

Rev	Description	Date	By	App
P2	RE-ISSUED FOR SCHEMATIC DESIGN	21.08.17	TJW	
P1	ISSUED FOR SCHEMATIC DESIGN	21.07.17	TJW	

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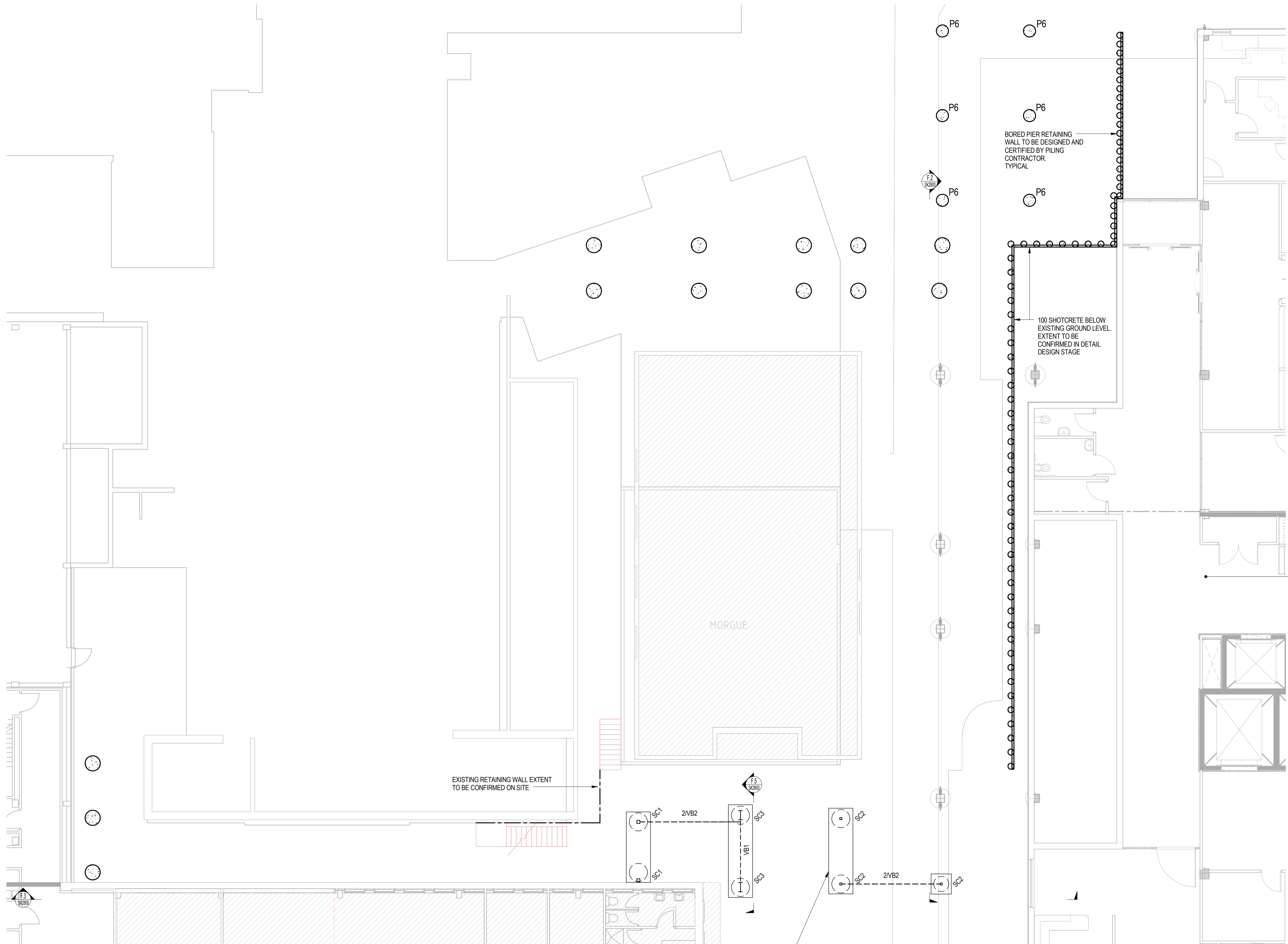
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STRUCTURAL PLAN - UPPER ROOF

SCHEMATIC DESIGN				
Designed	AC	Project Director Approved	Date	North
Drawn	TJW			
Scale	1:200	Project Ref.	Drawing No.	Rev
Date		202172601S	SK1400	P2
Sheet	A1			

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REFER TO DRAWING SK0900-SK1400 FOR STRUCTURE TO ADJACENT PROPOSED BUILDING

Rev	Description	Date	By	App
P2	RE-ISSUED FOR SCHEMATIC DESIGN	21.08.17	TJW	
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LINK CORRIDOR FRAMING PLAN - LOWER GROUND

STEEL FRAMING SCHEDULE		
MARK	SIZE	REMARKS
BR1	90 x 90 x 8 EA	
BR2	139 x 3.5 CHS	
BR4	150 x 150 x 5 SHS	
P1	Z15019	AT 1200 MAX. CTS. 2 ROWS BRIDGING
R1	150 PFC	
R2	250 UB 26	
RA1	75 x 75 x 8 EA	
SB1	410 UB 54	
SB2	310 UB 32	
SB3	150 x 150 x 10 EA	
SB4	460 UB 82	
SB5	200 UC 60	
SC1	150 x 150 x 9 SHS	
SC2	100 x 100 x 6 SHS	
SC3	460 UB 82	

STEEL FRAMING SCHEDULE		
MARK	SIZE	REMARKS
VB1	168 x 4.8 CHS	
VB2	75 x 75 x 6 EA	
WH1	150 x 100 x 4 RHS ON FLAT	

ALL STEELWORK BELOW GROUND TO BE PAINTED WITH 2 COATS OF HIGH BUILD EPOXY

STEEL COLUMN SCHEDULE		
MARK	SIZE	REMARKS
SC1	150 x 150 x 9 SHS	
SC2	100 x 100 x 6 SHS	
SC3	460 UB 82	

STRIP FOOTING AND PILES FOR LINK CORRIDOR STRUCTURE SHOWN INDICATIVELY

SCHEMATIC DESIGN			
Designed	AC	Project Director Approved	Date
Drawn	TJW		North
Scale	1:100	Project Ref.	Drawing No. Rev
Date		202172601S	SK2000 P2
Sheet	A1		