Design Review and Post-Earthquake Assessment

Horowhenua District Council Building

126-148 Oxford St, Levin

Michael Feyen

Reference: 2788-8773

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Structural Concepts

This document is prepared for Michael Feyen by Structural Concepts Limited.

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Extent of Revision

Revision	Extent of Revision

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Technical Summary

Building Information	
Building Name/ Description	Horowhenua District Council building
Street Address	126-148 Oxford St, Levin
Territorial Authority	Horowhenua District Council
No. of Storeys	3
Area of Typical Floor (approx.)	2289m²
Year of Design (approx.)	2006
NZ Standard Designed to	NZS 4203:1992.
Structural System including Foundations	Across the building (perpendicular to Oxford St) lateral loads are resisted by a combination of reinforced concrete shear walls and cantilever concrete columns and frames. Along the building (parallel with Oxford St) lateral loads are resisted by Reinforced Concrete Shear walls and cantilever concrete columns
Key features of ground profile and identified geohazards	The site is generally flat. No geotechnical report is currently available. Site is likely underlain by river shingles, (GNS Science Data indicates Late Quaternary alluvium and colluvium)
Previous strengthening	None
Heritage Issues/ Status	None
Other	Building Contains HDC Civil Defence Headquarters
Assessment Information	
Consulting Practice	Structural Concepts Ltd
CPEng Responsible	Arthur Budvietas 165555, Garry Newton 65305
Date/Version of Drgs Reviewed	Varies May- October 2016
Geotechnical Report(s)	None Viewed
Date Building Inspected	November 2016
Previous Assessment Reports	Opus International consultants Ltd, June 2014 ISPS Consulting engineers Report Dated 2 March 2016
Other Relevant Information	Nil
Assessment Outcomes	
Describe the Governing Critical Structural Weakness and Likely Mode of Failure	Building constructed in three main areas, each with different issues A- Council Chambers and Civil Defence HQ – Lateral Support face loading of concrete precast wall panels and roof cantilever steel posts via roof bracing over council chamber

	B Entry Foyer – Lateral Support of (face loading) of concrete wall panels via roof bracing to other elements C Roof Bracing over offices – insufficient capacity and minor axis loading of rafter elements D Floor Diaphragm over offices – Insufficient strut/tie reinforcing in slab with penetrations rupture of diaphragm then overloading loading of cantilever column elements
Comment on Parts identified and assessed	• A – Roof bracing over main offices 50% IL2 , ~30%IL4 B- Entry Foyer – Support of face loaded wall panels – • C Roof Bracing over offices – ~60%IL2, ~34%IL4 • D Floor Diaphragm/cantilever columns over offices ~60% IL2, ~34%Il4
Recommendations	• Substantial upgrade works required. • Relocate Civil Defence HQ to new custom built facility.

Contents

Appendices

1. Preamble

1.1 We were requested by Michael Feyen to investigate and report on possible design shortcomings for the existing Horowhenua District Council building. We were also requested to undertake a rapid building assessment of the building following the November 2016 Kaikoura seismic event series, and undertake a Detailed Seismic Assessment of the building. Comment is required as to its structural adequacy with regard to current seismic standards (NBS). In particular, we have been asked to assess the building strength in terms of the Building Act and current %NBS. We have undertaken this at two different building importance levels (IL2 and IL4) The draft part C of the Seismic Assessment of Existing Buildings by NZSEE/SFSOC/MBIE has been used as a basis for this assessment along with the relevant design and loadings standards and the NZ Building Code.

1.2 This report is not intended to give specific strengthening design but will define strengthening options to be developed by further work.

1.3 The performance is assessed in terms of the New Building Standard (%NBS), where %NBS is the estimated earthquake resistance of the existing building relative to the current (2017) building code requirements for a new building at the same site with the same functional requirements.

1.4 The current loading standard (NZS1170.5) requires new buildings to be designed for two levels of performance or "Limit States"

- Ultimate limit state (ULS): Damage may be extensive but will permit safe exiting of the building. Occupancy may be restricted until repairs are made or the building may need to be demolished.
- Serviceability limit state (SLS): the degree of damage to the structure is minor and does not affect the use of the building and is readily repairable and does not prevent occupancy of the building.

Any seismic event above the SLS earthquake may cause damage that might require the building to be closed for at least a limited time for repairs, or even demolition if stresses or movements warrant it. This can occur even if the building is rated at 100% NBS.

Typically, in an assessment process we are evaluating the maximum load which will not cause collapse and comparing it with the ULS state. It is not normal practice to assess the SLS state unless specifically requested.

2. Building Description

The building comprises of 4 distinct areas in a building that has up to 3 storeys.

Area 1 is the ground floor/basement. When viewed from street level this floor is underground but across the width of the building the retained level reduces to nothing allowing vehicle at the rear and pedestrian access at the rear and sides of the building. The structure of this area

consists of a concrete slab on grade with concrete columns on isolated pad footings. The concrete columns support concrete beams which in turn support "double-T" precast floor elements covered by an in-situ concrete topping.

Lateral support at this level is provided by precast concrete wall panels cantilevering from concrete foundation beams. Some of these wall elements also provide retaining to the front and sides of the building.

The basement area is used for storage and as carparking.

Area 2 of the building contains the Council Chambers and Civil Defence headquarters and provides office space, meeting rooms, a kitchen and toilet facilities for these activities. This area is single storey above the basement, although the Council Chamber roof is elevated to appear two storeys high from Oxford Street.

The roof structure consists of steel purlins supporting lightweight roofing on steel rafters/beams.

Over the council chamber this steel roof is supported on cantilever steel posts attached to lateral steel trusses fixed to concrete wall panels around the chamber.

The remainder of this area is supported by cantilever concrete columns which are fixed by reinforcing starters in 48mm Diameter drossbachs to the ground floor columns.

Area 3 of the building is the main entry foyer for the building. It is a single storied structure and shares concrete panel walls with areas 2 and 4 of the building. The steel roof structure consists of steel purlins supporting a light weight roof and feature ceiling and spans to beams parallel to Oxford Street which are connected to the side walls via cantilever stubs protruding from the adjacent concrete panel walls. Lateral support to this area is through in-plane and out of plane loading of the shear walls.

Area 4 of the building houses the office space for council and has up to 2 levels above the ground floor. The rear portion is approximately 20m deep and consists of steel purlins on precambered steel beams, which are supported on precast cantilever concrete columns.

The front 10m of the office space is two storied and consists of a lightweight steel roof on steel purlins supported on steel rafters connected to cantilever concrete columns. The floor is a rib floor system on precast post tensioned beams supported on concrete columns with starters into columns from the floor below. The lateral system consists of a combination of diagonal roof bracing to cantilever columns for the upper level, a combination of shear walls and frame action via the concrete floor diaphragm and shear walls to the shear walls to the levels below.

3. Investigations

3.1 An earthquake Rapid Building Assessment Level 2 was performed as part of this project in November 2016. This process was undertaken using the Ministry of Business Industry and Employment guidelines dated May 2014. The complete RBA L2 form is included in Appendix A. The objective of the rapid building assessment is to quickly establish the usability of buildings and associated infrastructure where functions may be compromised by a hazard event. Hazard events include earthquake, flood, landslide, rock-fall, volcanic eruption, storm surge, tsunami, explosion, or other event with life safety, residential or business consequences.

3.2 Existing structural drawings and calculations were available for the building. These are dated during the period May to October 2006. In addition, visual walkthrough inspections were also undertaken by SCL staff in November and December 2016. No destructive, intrusive or scanning investigations were undertaken as part of this project.

3.3 Reports by Opus international Consultants Ltd and ISPS Consulting Engineers regarding the building were provided as part of the material made available for this project.

4. Original Design Compliance

4.1 Scope

The scope of this section is to review the original design for its compliance at the time of documenting and construction of the new structure for the HDC Municipal Buildings and Council Chambers. The review is limited to a review of the plans and drawings with a non-destructive visual inspection.

The main seismic components that affect the overall seismic capacity of the building have been reviewed. A review of both the calculations and detailing compliance has been carried out.

4.2 Compliance Documents

The relevant design compliance documents at the time of design, 2006, were as follows:

- New Zealand Standards -
- Loads – NZS4203 1992
- Materials - NZS3101 1995 (Concrete)

  NZ S3404 1997 (Structural Steel)
- Building Act – Building Code Clause B1 Structure (up to and including amendment 6)

4.3 Analysis

The original analysis was completed using a 2D analysis. For this type of building that would have been an acceptable methodology at the time however the building has many complex load paths and a 3D analysis would probably have been more appropriate. A 2D analysis would have been thought acceptable, especially so considering the utilisation of shear walls as the lateral load resisting elements.

For the seismic loading the following parameters were used from NZS4203:

- Zone Factor 1.2
- Risk Factor 1.3 (Importance Level 1 from NZS4203)
- Ductility 3 for frames and upper sheer walls
- Ductility 1.25 for basement shear walls and foundations
- Structural Performance Factor Sp 0.67
- Hazard Coefficient

These are acceptable parameters providing that the detailing matching the ductility level chosen is carried out.

The analysis of the different lateral resisting elements is consistent with the loads obtained from the above.

Not covered in the original analysis and calculations however are the parts coefficients for the seismic lateral systems that distribute loads to the main seismic components such as floor diaphragms, roof bracing and the horizontal truss to the main chambers.

4.4 Design Calculations

The review of the calculations found that the majority of the structural elements resisting lateral loads had been covered with the exception of:

- Mezzanine diaphragm
- Lateral load system to the chambers roof
- Roof bracing system including rod bracing, struts and connections
- Waler beams to foyer walls

The original design assumed ductilities of 3 for both the reinforced concrete columns and reinforced concrete shear walls above the 1st floor. A ductility of 1.25 was used for shear walls and foundations to the basement area.

The roof bracing complies if a ductility of 3 can be assumed. However, there is no identification of ductility being provided hence a maximum ductility of 1.25 should be used.

The outer columns do not comply to a ductility of 3 due to drossbach in the hinge zone as well as stirrup spacing. Upper level columns do not comply with a ductility of 3 due to stirrup spacing. Both of these elements should be designed for ductilities of 1.25.

The mezzanine diaphragm does not comply and cannot span between walls on grids E and H as intended.

Other calculations we would expect to be included but are not included are the majority of design for the structural steel elements, their fixings and the steel purlins. Calculations were found on the foyer and entry area.

4.5 Detailing Limitations on Design

4.5.1 - Columns

The detailing incorporated on the drawings limit the component ductilities. The upper columns will be restricted to ductilites of 1.25 as the spacing of stirrups is greater than d/3, = 120mm, at best, which is a requirement for a ductility of 3 as assumed by the designer. The spacing used is b/2 = 200mm. Furthermore no laps can occur in the hinge zone for a ductility of 3 hence the short columns on gridline 1 plus grid C adjacent grid 3 can only assume a ductility of 1.25 at best.

Furthermore the drossbach connection limits the strength as there is less reinforcing at this location. (See Appendix A, Diagram 1, 2, 3 & 4)

4.5.2 Shear Walls

Upper level shear wall in plane ductilities are also limited to 1.25, due to a ductility of 3 being limited to having only 50% of bars being lapped in the hinge zone area. This is detailed as 100%, hence maximum ductility should be 1.25. (See Appendix A, Diagram 5)

4.5.3 Roof Bracing to Chambers

The roof bracing to the chamber area does not engage the central portion of the roof in the north south direction, meaning the load must be resisted by cantilever posts fixed off the inside chord of the horizontal truss and then transfer stresses to a cleat fixed to the concrete panel, or it must span 10m which is generally not normally accepted as good practice. The first option is very flexible and unlikely to provide any significant effect until there is

significant damage.

At present it is more likely the loads get transferred via the roof cladding which would not have been the original design intent. (See Appendix A, Diagram 6, 7, & 8)

4.5.4 Roof Bracing Adjacent Foyer Walls

The roof bracing elements adjacent to the foyer PC panels have detailing issues with offset bolts at cleats and offset struts plus the use of PFC's as a compression strut element between.

The roof bracing elements adjacent to the foyer precast concrete panels have several detailing issues. Firstly the cleats to the PFC supporting the panels on grid 1 has offset bolts which will not be engaged under tension loads until failure of the bolts closest to the PFC member. This will limit the design capacity. Secondly the struts between grids B & C do not line up with the bracing strut between grid A & B. This will cause unwanted minor axis bending in the main rafter UB limiting the bracing systems strength. Thirdly the struts between grid B & C and grid 1 are PFC members which also limit the capacity of the bracing system. (See appendix A, Diagram 9 & 10)

4.5.5 Beam Bar Termination

Bar termination at mezzanine floor level of beams to columns does not comply with NZS3101. To engage the joint and provide continuity the bars should extend to the far face of the column and terminate by bending the bar up if it is the bottom bar and down if it is the top bar. The arrangement used will limit the capacity of the reinforcing to be engaged at the joint and therefore capacity at the system to act as a frame. (See appendix A, Diagram 11 & 12)

4.5.6 Mezzanine Diaphragm

The mezzanine floor diaphragm has large openings which will limit the ability for it to act as a diaphragm between grid E and N. Also the concrete beam on grid 3 has limited reinforcing and lacks the capacity to act as a chord member for the diaphragm. There does not appear to have been any attempt to deal with the potential high stresses that will occur around the openings. (See appendix A, Diagram 13 & 14)

4.5.7 Grid 1 UB/ Concrete Column Joint

The current detail on grid 1 between will not support continuity for two reasons. The first being the fact the bolts are very close, 75mm, to the top of the column and likely to bust out under significant load. The second is that the reinforcing terminates as a straight bar with no bend hence the development of the bars cannot be achieved and full capacity not available. (See Appendix A, Diagram 15)

4.5.8 Grid D & E Spandrel Panels & Waler

There is no indication in the calculations that any consideration has been made regarding out of plane support of the large spandrel panels at the centre of the wall line. There are significant forces to be resolved in this area that are complex due to the lack of a simple load path being available. Furthermore the waler does not have the strength or stiffness to satisfactorily deal with the loads from this panel.

The insitu stitch in this area will hinge and not provide continuity as the bars do not lap but link which will cause a hinge effect as opposed to continuity.

It is unlikely this area complied with the compliance documents at the time. (See Appendix A, Diagram 16 & 17)

4.5.9 Bracing to High Level Grid E to Grid L

The bracing at the high level between grids E and L have design issues due to the bracing being terminated away from the vertical brace element on the rafter. This will cause secondary stresses on the beams in their weak direction and becomes the governing strength of the system which has strengths less than that required by the compliance documents at the time. (See Appendix A, Diagram 18)

4.5.10 Column Grid A-3 Stirrups

This column has stirrups spaced closer than other columns however they are still further than d/3 apart plus they are hairpins and not closed. For these stirrups to be compliant they would need to be welded where the hairpins lap otherwise they will not provide any confinement as the column concrete cover degrades. There is no note requiring this to occur on the drawings or specification hence this would need to be investigated. Furthermore the detailing between the steel truss chords and concrete column has eccentricities that cause secondary effects that can be difficult to quantify plus there is a lack of detail of how the column interacts with basement level and continuity that ensures the column can achieve full capacity.

4.6 Original Assessment Conclusion

In conclusion the following items of the original design did not comply with the compliance documents at the time either because the detailing is incorrect or the design assumptions are incorrect.

Item	Potential Non-Compliance
Columns	Stirrup spacing too large meaning a ductility of 3 assumed by the designer cannot be used – overstressed
Grid 1 Columns	Drossbach connection in hinge zone meaning a ductility of 3 assumed by the designer cannot be used – overstressed.
P.C. Walls grid E & N In-plane	Wall connection to basement walls has more than 50% of bars lapping hence a ductility of 3 assumed by the designer cannot be used – overstressed.
Roof Bracing (Including rods, struts and joints) X	No design calculations found. Assessment shows they did not comply at the time, especially between grid A-d and E-F on lower area.
Bracing Structure to Chambers Roof X	No design for lateral loads. Assessment shows this did not comply at the time. Very flexible and undefined load paths.
Mezzanine Floor Diaphragm X	No design for the mezzanine floor diaphragm. This would be expected considering so many openings. Our review shows this could not distribute loads as expected in the original design.
Reinforced Concrete Frame Joints X	Bars are bent in the wrong direction when terminating at the columns, plus bars should extend to the far side of the column reinforcing.
UB Column Joint X	Bolts too close to edge and reinforcing terminating straight both limit the ability of this joint to work effectively.

Waler to Grid D & E	✗	Waler is not capable of resisting the loads applied by the p.c panels.
Precast Concrete Spandrel Grid D & E	✗	Panel has not been designed or detailed to resist loads effectively.
High Level Roof Bracing Grid E to L	✗	Bracing terminates away from vertical brace system.
Grid A-3 Column	✗	Stirrups are hairpins with no indication they are to be welded together.

5. Observations

The following observations were made on site. For the purposes of this report we will treat the front (West) elevation as the elevation that faces Oxford Street. In general structural elements and joints were not visible during the SCL walkthrough of the building, but in general the layouts and elements that could be seen appeared to be in accordance with the building permit documentation obtained.

During the walkthrough several areas were noted to have sustained cracks or other damage as noted below. Some of these have been noted in past reports commissioned by the Horowhenua District Council and are included here for completeness.

5.1 Cracks to slab on grade in lower level carpark

Numerous floor cracks have been noted in this slab particularly the northern end of the building. These cracks may be caused by shrinkage or ground movement and could be repaired through some form of cutting and repair with a flexible sealant.

5.2 Cracks in Retaining Walls

Numerous cracks in the retaining walls on the western side of the building, these may again be due to shrinkage and could be repaired with an injected epoxy repair system.

5.3 Cracks in 'Double-T' precast floor elements

In general these appear to be small and in locations that indicate expected/normal flexural behaviour of the member – These should be monitored.

5.4 Cracks in primary beams in subfloor area

In general these have been reported on previously and need to be monitored. These cracks appear small and are likely to be flexural cracks corresponding to normal behaviour of the beams.

5.5 Cracks in ends of wall panels on eastern side of building

Movement in cold joints have been noted in the shear wall elements at the interface between upper panels, floor and lower panels. These need to be monitored to ensure movement does not propagate or become worse. It is likely these cracks are due to a combination of minor movement due to lateral loads, shrinkage of concrete away from the cold joint and the presence of the cold joint.

6. Description of Secondary Building Components

6.1 Roof Construction

Roofing consists of light weight long-run profiled sheet roof is supported on cold formed steel purlins, in turn supported on steel rafter members.

6.2 Internal Wall Construction Ground and 1st floor level

Internal walls appear to be generally of timber framed construction with Gibboard or Villaboard wall linings. Some of these walls are fire rated using Gib Fyreline.

6.3 External Wall Construction

The external walls are a combination of precast panels forming the lateral supports of the building, or aluminium glazing systems with timber framed walls elements clad with Hardiflex externally and Gibboard internally.

7. Structural System

7.1 Lateral System

In the longitudinal direction, parallel to Oxford Street, the lateral loads are resisted by precast concrete shear walls either in face loading or in in plane loading. These are generally singly reinforced, although some wall components are doubly reinforced. Joints between wall panels are via starter bars in 48mm diameter drossbach and as such the wall system needs to be considered as a non-ductile/ limited ductile system as all starters are lapped in the vicinity of the potential plastic hinge zone. Some parts of the building use cantilever columns to transfer the loads to the floor diaphragm below or to the foundations. Roof loads are transferred to wall elements via diagonal rod bracing and steel strut members. In general these then transfer to the steel rafter member which is connected to the concrete column element via a bolted joint (shear transfer only)

In the lateral direction, perpendicular to Oxford Street, the lateral forces are resisted by a combinations of wall, frame and cantilever column elements as noted in the building description above.

7.2 Gravity System

The gravity load system can be described as a traditional beam and column system transferring loads from roof or floor to beams to columns and then directly to the foundations. The exception to this is over the council chamber where the roof is supported by rafters on steel posts which transfer loads to the inner unsupported edge of horizontal steel trusses which transfer the load in torsion to the concrete wall panels and then to the foundations.

7.3 Foundation System

The foundations are a mixture of substantial strip foundations under wall elements and isolated concrete pad foundations under column elements. We assume an ultimate bearing capacity of 300kPa applies to this site.

8. Geotechnical Considerations

We found no geotechnical report in the HDC files provided to us for this investigation. The Design producer statement for the GNS Geological map data readily accessible for the site indicates that the site is underlain by late quaternary alluvium and colluvium consisting of unconsolidated to poorly consolidated mud, sand, gravel and peat. An examination of a cut face to the rear of the building shows gravels extending from the Oxford street level to at least the floor level of the building.

Based on local experience we have assumed that the site is Soil Class D (NZS1170.5) Deep or Soft Soils site, no liquefaction or lateral spread is likely, and that there will be little to no loss of foundation support during a seismic event. This is based on our experience only and confirmation via a geotechnical investigation is recommended prior to any strengthening design being undertaken.

9. Seismic Loading and Assumed Material Strengths

The criteria below taken from NZS1170.5:2004 (Structural design Actions Part 5: Earthquake loads New Zealand) were taken as a basis for this review

Parameter	Value	Comments
Site Subsoil Class	D	As noted in earlier section
Z	0.40	Seismic Hazard factor for Levin
Ru(ULS)	1.8 or 1.0	For IL4 and IL2 respectively
N(T,D)	1	Distance from significant (named fault)>20km

Displacement Ductility µ (Columns)	2	Cantilever concrete columns –some ductility was noted as possible when specific elements reviewed using Response 2000 to confirm section properties. Higher ductilities may be possible but were limited to 2 for the purposes of this analysis.
Displacement Ductility µ (Walls)	1.25	Wall elements due to single layer unconfined reinforcement at hinge zone needs to be considered as 1.25
Displacement Ductility µ (Roof Bracing and Floor Diaphragms – Parts))	1	As required by the Loadings and Material codes for the relevant materials.

Building Loads and Element strengths for the various components are based on the following:

- Concrete elements 24.0kN/m^3 with a compressive strength of 35MPa (30 MPA Nominal)
- Wall Framing 0.5kN/m^2
- Roofing and ceiling including Purlins 0.5kN/m^2
- Steel Structures 300Mpa Yield stress Assumed
- Reinforcing Steel Grade Y – 540Mpa (500MPa Nominal)
- Reinforcing Steel Grade D – 325MPa (300MPa Nominal) -
- Live Loads on the roof have been taken as 0kPa
- Live loads on the suspended floors has been taken as 3.0kPa.

10. Assessment

The result of the DSA indicates the building seismic rating to be 50%NBS assessed in accordance with the EPB methodology. This seismic rating assumes an Importance Level 2 (IL2), which would be applicable for an office building, in accordance with the Joint Australian / New Zealand and Structural Design Actions Part 0, AS/NZS1120.0: 2002.

As the building currently houses the Civil Defence Headquarters for the Horowhenua District Council, the appropriate rating based on an Importance Level 4 (IL4) building in NZS1120.0: 2002, Part 0 is under 20%. An IL4 building is one in which the consequences of failure are high or which have post disaster functions such as a Civil Defence Headquarters.
Therefore this building if it continues to house the Civil Defence Headquarters is a Grade E (IL4) with an approximate risk to occupants 25 times greater relative to a new building. This is based on NZSEE guidelines in 2000. As an IL2 building (Civil Defence relocated elsewhere) the building is Grade C, with an approximate risk 5-10 times greater than a new building.

A building with a seismic rating less than 34%NBS is considered to be an Earthquake-Prone Building (EPB) in terms of the Building Act and a building rating less than 67%NBS as an Earthquake Risk Building (ERB) by the New Zealand Society of Earthquake Engineering. Therefore on this basis it is our opinion that the Horowhenua District Council Building is therefore categorised as an Earthquake Risk Building for normal use (Civil Defence assumed relocated).

Our assessment identified the following structural weakness in the building.

10.01 Roof Bracing Civil Defence offices (Grids A-D and 1-3):

The Tensile Capacity of rod bracing and flexural stiffness of rafters forming the rod bracing above the Civil Defence Offices. These components were assessed to have a score of ~60% of IL2 and <30% of IL4 (Grids A-D). Loads to these elements include the mass of the wall on Grid D. Similar issues apply to the rod bracing over the other offices on Lines 1-3 Grid E-F from the face loaded wall on Grid E)

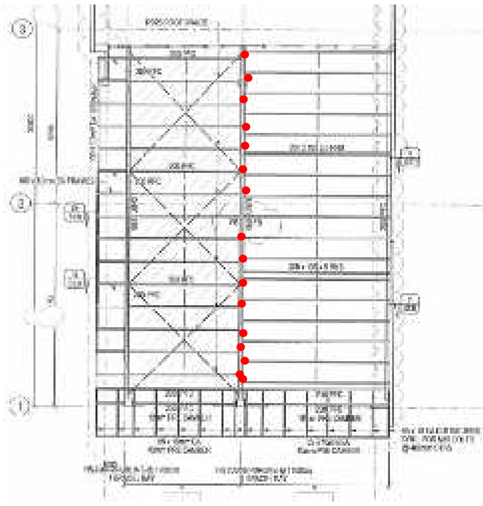


Figure 1 Part Plan of roof bracing over Civil Defence headquarters offices

10.02 Lateral Support of Roof over Council Chamber (Grids A-D and 3-4)

Flexural capacity of cantilever posts and face loaded shear wall element above horizontal brace element in flexure estimated in combination at 60% IL2 or 34% IL4.

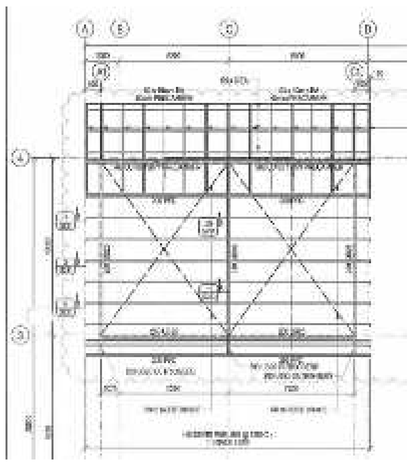


Figure 2 Part Plan of roof bracing over Council Chamber

10.03 Roof Bracing over office Lunchroom (Grids E-N and 3-4)

The Tensile Capacity of the rod Bracing and point loads to the rafter causing minor axis flexure to rafters over the office space causing large lateral movement and potential buckling

of the rafter to these areas.

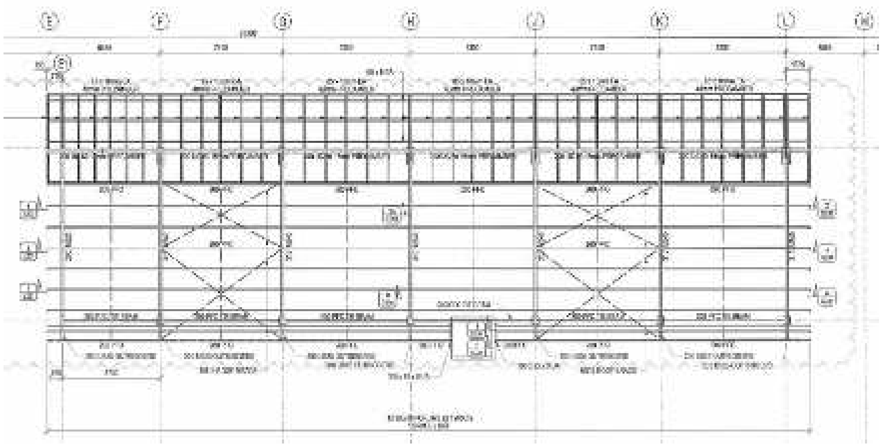


Figure 3 Partial Roof Plan Over offices lunchroom

10.04 Floor Diaphragm to offices level 1 (Grids E-N and 3-4)

The building behaviours in this area is very complex, with columns on grid 4 only partially supported by columns below and partially supported on the floor slab system over the basement and loads to these columns being applied and supported in such a way as to create large loads at slab levels. If as per the original design intent the floor system is considered to be supported at lines E and N by shear walls and on lines 3 and 4 by shear walls parallel with Oxford street, it is our opinion that the floor diaphragm will perform poorly, with stress concentrations at corners of opening and in the tie members exceeding the capacity of the reinforcing steel present. When checked as a part under section 8 of NZS1170.5 with the above support assumption this diaphragm has a rating of approximately 35% at IL2 and under 20% at IL4.

If the concrete frames on lines F-L are used as a partial support in the lateral direction, which is not an unreasonable assumption as there is a nominal moment joint between the column and the precast post tensioned beam at grid 3 the floor diaphragm is no longer the controlling element, but the moment connection at the base of the column now dominates. In this case we have assessed the floor as approximately 50% NBS at IL2 and under 30% at IL4.

The diaphragm for the level 2 offices and lunchroom if lateral support only provided by end walls for horizontal span in flexure have been assessed as ~34% at IL2 or 28% at IL4

If frame action of intermediate frames (Grids E-N) is considered, then this area able to carry lateral loads as fixed base columns in flexure the above system then has an assessed rating of 50% at IL2 and <30% at IL4.

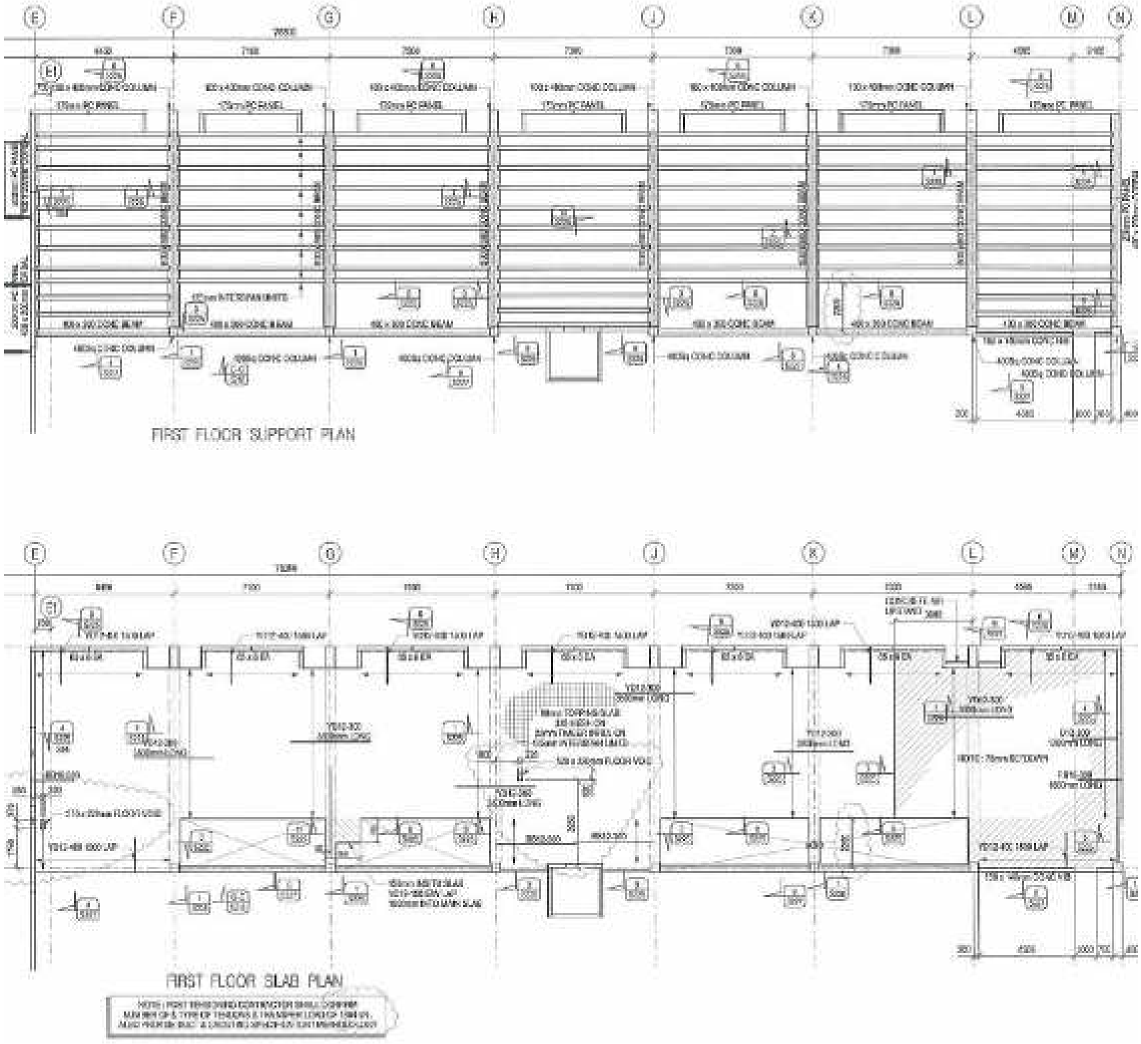


Figure 4 Floor Slab for mezzanine offices.

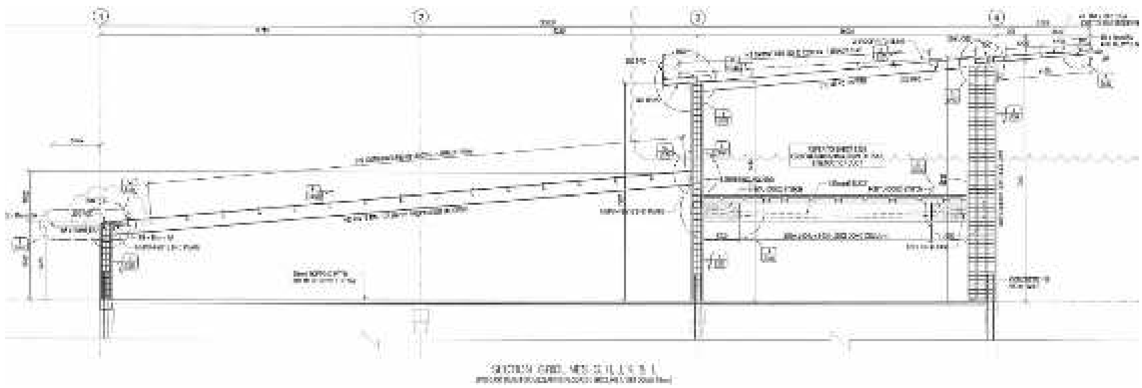


Figure 5 Frame at Line G-L

10.05 Flexural Capacity of Shear Walls above street level

These have been assessed as ~60% of IL2 this or ~33% of IL4 and is based on the connection of the wall to its foundation through starters in the drossbach. AS this potential hinge zone is effectively singly reinforced with no confinement, it is our opinion that the ductility of these walls is limited to 1.25.

11. Assumptions

The following assumptions have been made:

- Concealed structural elements match those shown on the consent documentation.
- Material strengths match those assumed and given in earlier sections.
- Ground conditions under the building match are equivalent to 300kPa ultimate.

12. Conclusions

12.1 The building is currently in sound condition.

12.2 The building has several main areas of concern, particularly for use as the Civil Defence headquarters. If this function was located elsewhere then the building could be considered as 50% NBS. Otherwise the building is less than 30% NBS (IL4).

13. Recommendations

It is our opinion, that the number of elements described as being potential structural vulnerabilities should be addressed. Some of the solutions are below:

- Relocate the Civil Defence Headquarters to a new location/ independent building.
- Confirm Geotechnical conditions before undertaking any strengthening design.
- Provide additional bracing elements to roof spaces or upgrade same to improve transfer capabilities of roof bracing.
- Provide diagonal brace elements to the posts supporting the roof over the Council Chamber to improve transfer of lateral loads to other elements.
- As there are considerable operational requirements and functional requirements for the 3 level area of the building a design concept has not been developed at this stage.

14. Elements Not Inspected

The following is a list of elements not specifically inspected:

- Foundations
- Soil
- Purlins
- Wall Framing
- Concrete reinforcement

15. Applicability

15.1 Recommendations and opinions in this report are based on existing drawings, plus the non-destructive visual inspection.

15.2 Although there is nothing to suggest otherwise, the nature and continuity of the structure hidden from sight (e.g. reinforcing steel, bolt depths, etc.) is inferred, but it must be appreciated that actual conditions could vary.

15.3 Findings presented in this report are for the sole use of the client. The findings may not contain sufficient information for use by other parties, and as such should not be relied upon unless discussed with Structural Concepts Ltd.

15.4 We have exercised our services in a professional manner using a degree of care and skill normally, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Appendix A

Rapid Building Assessment

EARTHQUAKE RAPID ASSESSMENT FORM

1. Assessor Name*: Garry Newton

Assessor ID*: 65345 CPEng Authority*:

Structural Concepts Ltd

2. Assessment Date*: 23 / 11 / 16 (Day / Month / Year) Assessment Time*: __ : __ (Hour / Minute) *(to nearest half hour)* A ◯ AM B ◯ PM

3. Building Name: Horowhenua DC Offices

Unit / Number*: ___ / ___

Street*: 126-148 Oxford Street

City/Town*: Levin

GPS (Degree with 5 decimals after comma) South -__ , _____ East ___ , _____

Other ID or access: ______ Photo taken A ◯ No B ◯ Yes Photo ID: ____

4. Contact Name: Nick Kickling

Type: A ◯ Owner B ◯ Tenant C ☑ Other: Project Manager

Phone (with area code): [illegible]

5. Existing Placard*: ☑ None ◯ W ◯ Y1 ◯ Y2 ◯ R1 ◯ R2 Date*: __ / __ / __ (Day / Month / Year) Team ID*: ____

BUILDING DESCRIPTION

6.

Dimensions	Constr. Age	Building Type	Structure Type	Cladding Type
Storeys above ground incl. ground floor: 2	A ◯ <1935	A ◯ Complex residential	A ◯ Timber frame	A ◯ Brick veneer
Storeys below ground: 0	B ◯ 1935-1976	B ◯ School	B ◯ Steel frame	B ☑ Concrete panels
Footprint (m²): ____	C ◯ 1977-1994	C ☑ Commercial/Office	C ☑ Concrete frame	C ◯ Steel
	D ◯ 1995-2000	D ◯ Industrial	D ☑ Concrete shear wall	D ☑ Glass
	E ☑ >2000	E ◯ Critical facility	E ◯ Tilt-up concrete	E ☑ Lightweight
	F ◯ Unknown	F ☑ Public assembly	F ◯ Reinforced masonry	F ◯ Other:
		G ◯ Other:	G ◯ Unreinforced masonry	
			H ◯ Other:	

7.

Potential Cause*	A Yes	B No
1 Objects falling from adjacent buildings. Adjacent building ID or address:	◯	☑
2 Land instability above	◯	☑
3 Land instability below	◯	☑
4 Other	◯	◯

If required add sketch or separate page showing extent and nature of the external risk factors.

(8)

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Overall Hazard*	N/A	A	B	C	D
1 Collapse or partial collapse	○	○	○	○	○
2 Building or storey leaning	○	○	○	○	○
3 Other:	○	○	○	○	○
Structural Hazards*	N/A	A	B	C	D
4 Foundations	○	○	○	○	○
5 Roofs, floors	○	○	○	○	○
6 Gravity systems (columns, beams, etc)	○	○	○	○	○
7 Lateral systems (walls, frames, braces)	○	○	○	○	○
8 Diaphragms, horizontal bracing	○	○	○	○	○
9 Precast connections	○	○	○	○	○
10 Other:	○	○	○	○	○

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Non-structural Hazards*	N/A	A	B	C	D
11 Parapets, ornamentation, chimneys	○	○	○	○	○
12 Cladding, glazing	○	○	○	○	○
13 Ceilings, light fixtures	○	○	○	○	○
14 Interior walls, partitions	○	○	○	○	○
15 Access/egress (elevators, stairs, exits)	○	○	○	○	○
16 Significant fire safety concerns	○	○	○	○	○
17 Utilities (e.g. gas, electricity, waste water, plumbing)	○	○	○	○	○
18 Other:	○	○	○	○	○

Comments:

(9) Estimated Damage   A ○ None   B ☑ 0-10%   C ○ 11-30%   D ○ 31-60%   E ○ 61-100%

(10)

Recommended further Assessment*
- A ☑ None
- B ○ Level 2 Rapid Assessment (tick below if particular expertise is required)
  - B1 ○ Structural Engineer
  - B2 ○ Geotechnical Engineer
  - B3 ○ Other:
- C ○ Further evaluation to be arranged by building owner

Safety Cordon*
- A ☑ None required
- B ○ Cordon required

Describe extent (add diagram on separate sheet if required)

Barricades*
- A ☑ None required
- B ○ Barricades already in place
- C ○ Barricades required

Describe extent (add diagram on separate sheet if required)

Urgency of suggested action*
- A ○ Standard
- B ○ Immediate action required

(11)

Observed Damage	Level 2 Rapid Assessment Outcome*
Light or no damage	W ☑ CAN BE USED (From assessment no known dangers)
Moderate damage	Y1 ○ RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY
	Y2 ○ RESTRICTED ACCESS – SHORT TERM ENTRY ONLY with or without supervision. Access to be supervised A ○ Yes B ○ No
Heavy Damage	R1 ○ ENTRY PROHIBITED (At risk from external factors)
	R2 ○ ENTRY PROHIBITED (Severe damage to building)

(12) **Survey Extent***

Exterior	A ☑ Partial
	B ○ Complete
	C ○ Not assessed
Interior	D ☑ Partial
	E ○ Complete

Assessor Signature*

(13)

Minor non structural damage to found in basement

Minor cracks to [illegible] beam/columns the cause is [illegible] not affecting strength.

No action required

If required add a sketch on a separate sheet of paper showing building damage, access restrictions or confusing areas. Identify the building on the sketch and staple the sheet to the assessment form.

Sketch included on separate page? ○ Yes ☑ No

Appendix B

Original Design Diagrams

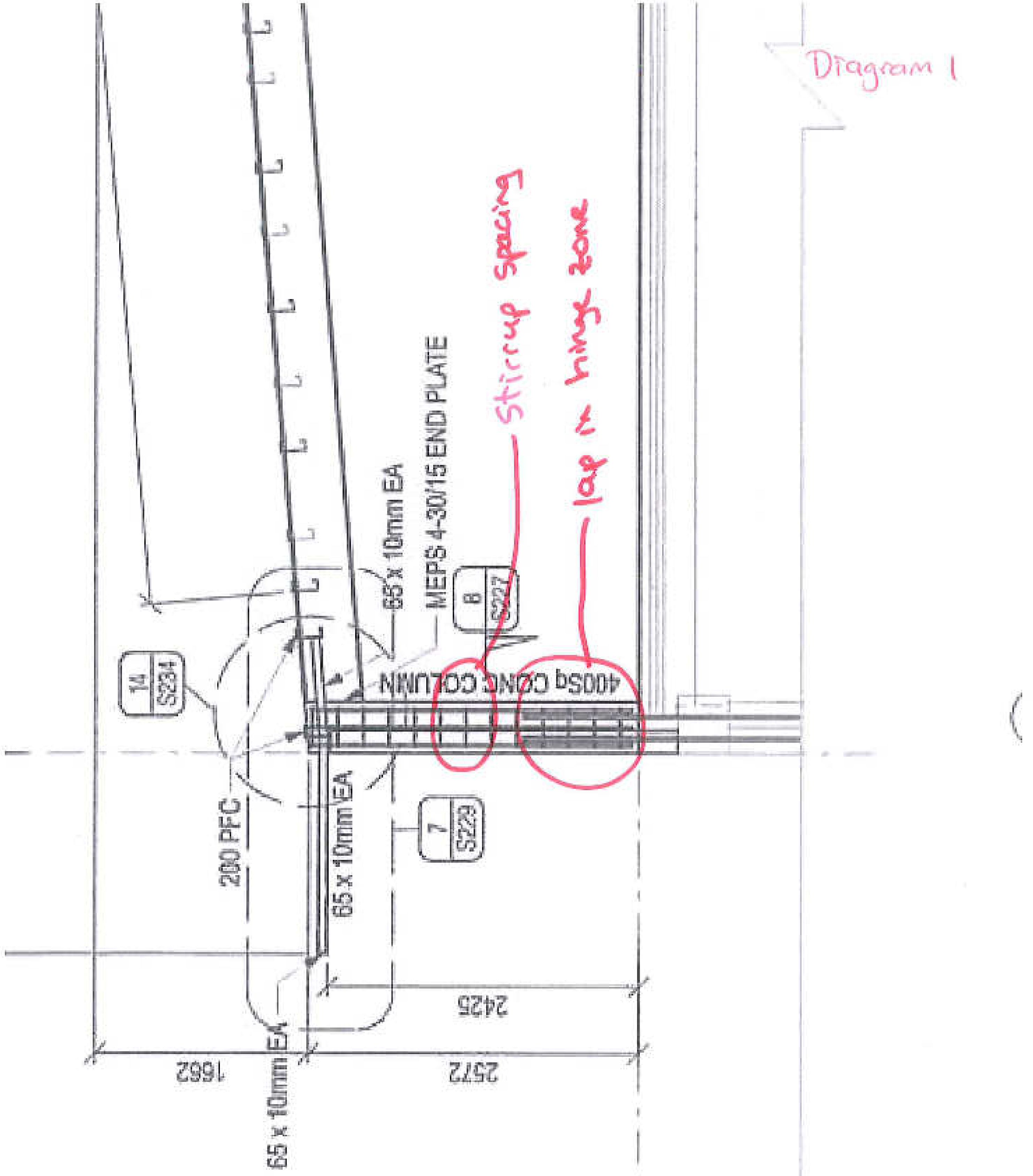
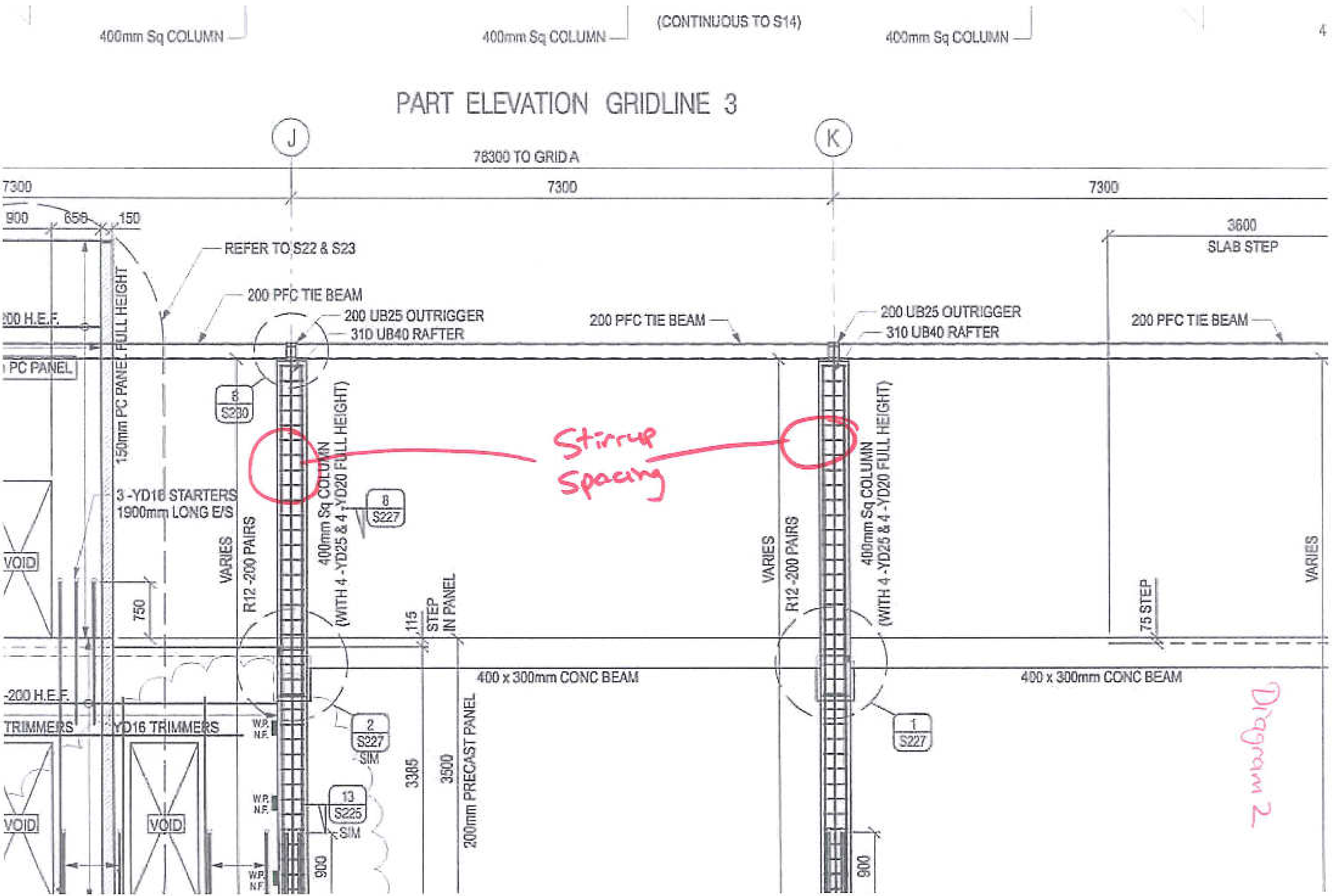


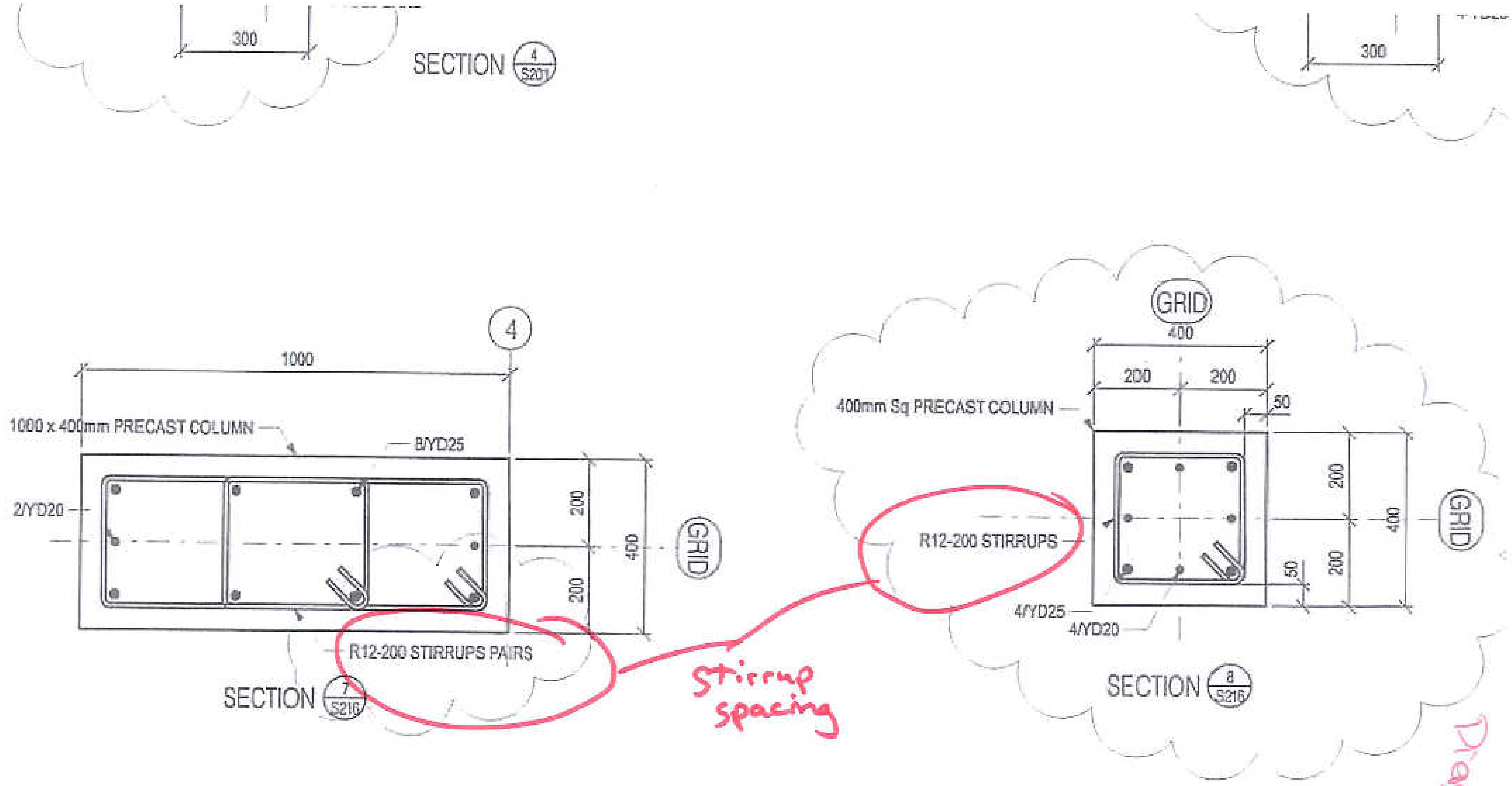
Diagram 1
65 x 10mm EA
MEPS 4-30/15 END PLATE
Stirrup spacing
lap in hinge zone
8
S227
400Sq CONC COLUMN
14
S234
200 PFC
65 x 10mm EA
7
S229
2425
1662
2572
65 x 10mm EA

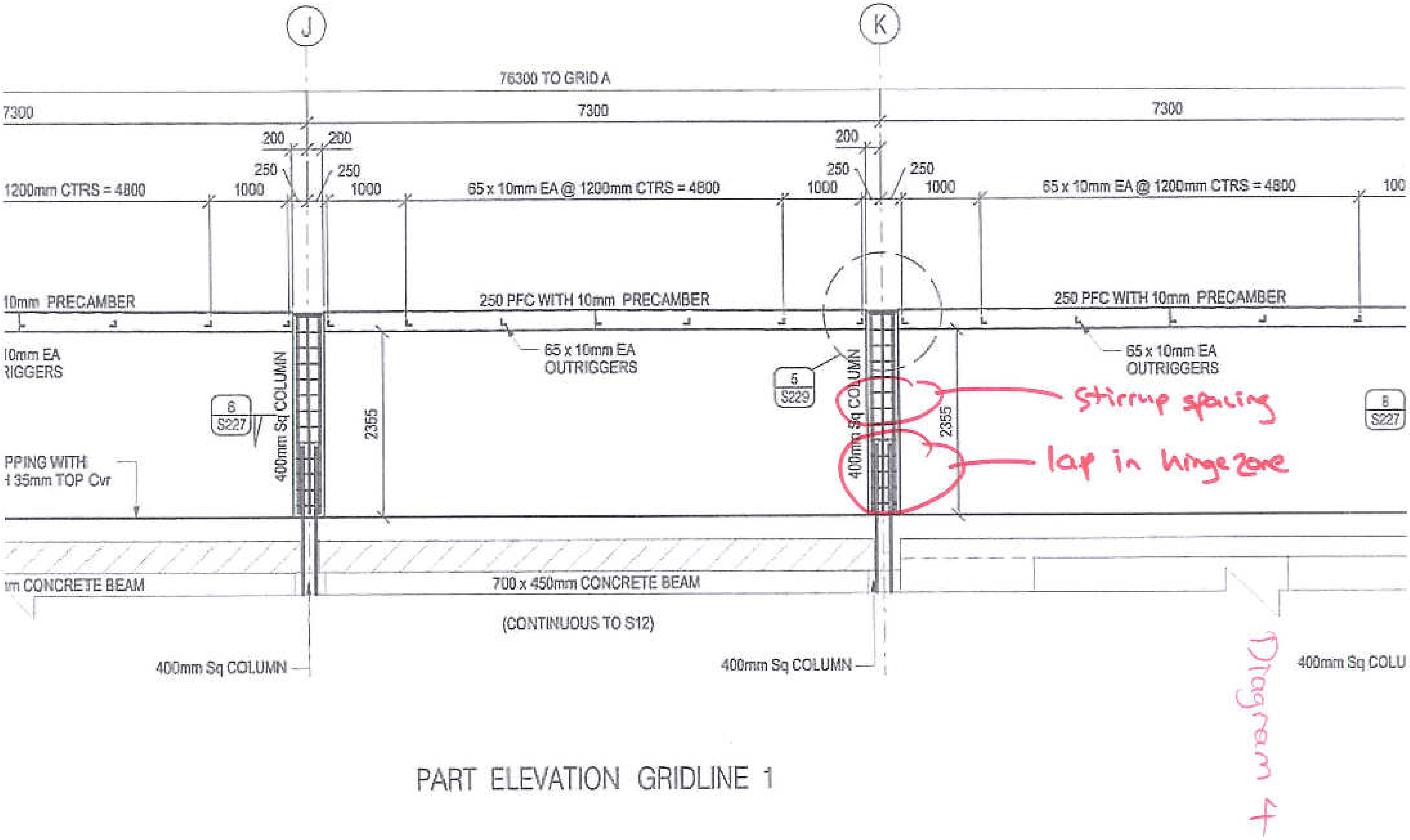
Diagram 1



400mm Sq COLUMN
400mm Sq COLUMN
(CONTINUOUS TO S14)
400mm Sq COLUMN
PART ELEVATION GRIDLINE 3
J
K
76300 TO GRID A
7300
7300
7300
900
650
150
3600
SLAB STEP
REFER TO S22 & S23
200 PFC TIE BEAM
200 UB25 OUTRIGGER
310 UB40 RAFTER
200 PFC TIE BEAM
200 UB25 OUTRIGGER
310 UB40 RAFTER
200 PFC TIE BEAM
200 H.E.F.
PC PANEL
150mm PC PANEL FULL HEIGHT
8
S230
Stirrup Spacing
3-YD16 STARTERS
1900mm LONG E/S
400mm Sq COLUMN
(WITH 4-YD25 & 4-YD20 FULL HEIGHT)
8
S227
VARIES
R12-200 PAIRS
VARIES
R12-200 PAIRS
400mm Sq COLUMN
(WITH 4-YD25 & 4-YD20 FULL HEIGHT)
VARIES
75 STEP
750
115
STEP
IN PANEL
400 x 300mm CONC BEAM
400 x 300mm CONC BEAM
-200 H.E.F.
TRIMMERS
YD16 TRIMMERS
VOID
VOID
VOID
W.P.
N.F.
2
S227
SIM
1
S227
3385
3500
200mm PRECAST PANEL
13
S225
SIM
900
900
Diagram 2

Diagram 3


300
SECTION 4/S201
300
1000
4
1000 x 400mm PRECAST COLUMN
B/YD25
2/YD20
200
200
400
GRID
R12-200 STIRRUPS PAIRS
SECTION 7/S216
Stirrup spacing
GRID
400
200
200
50
400mm Sq PRECAST COLUMN
R12-200 STIRRUPS
4/YD25
4/YD20
SECTION 8/S216



PART ELEVATION GRIDLINE 1

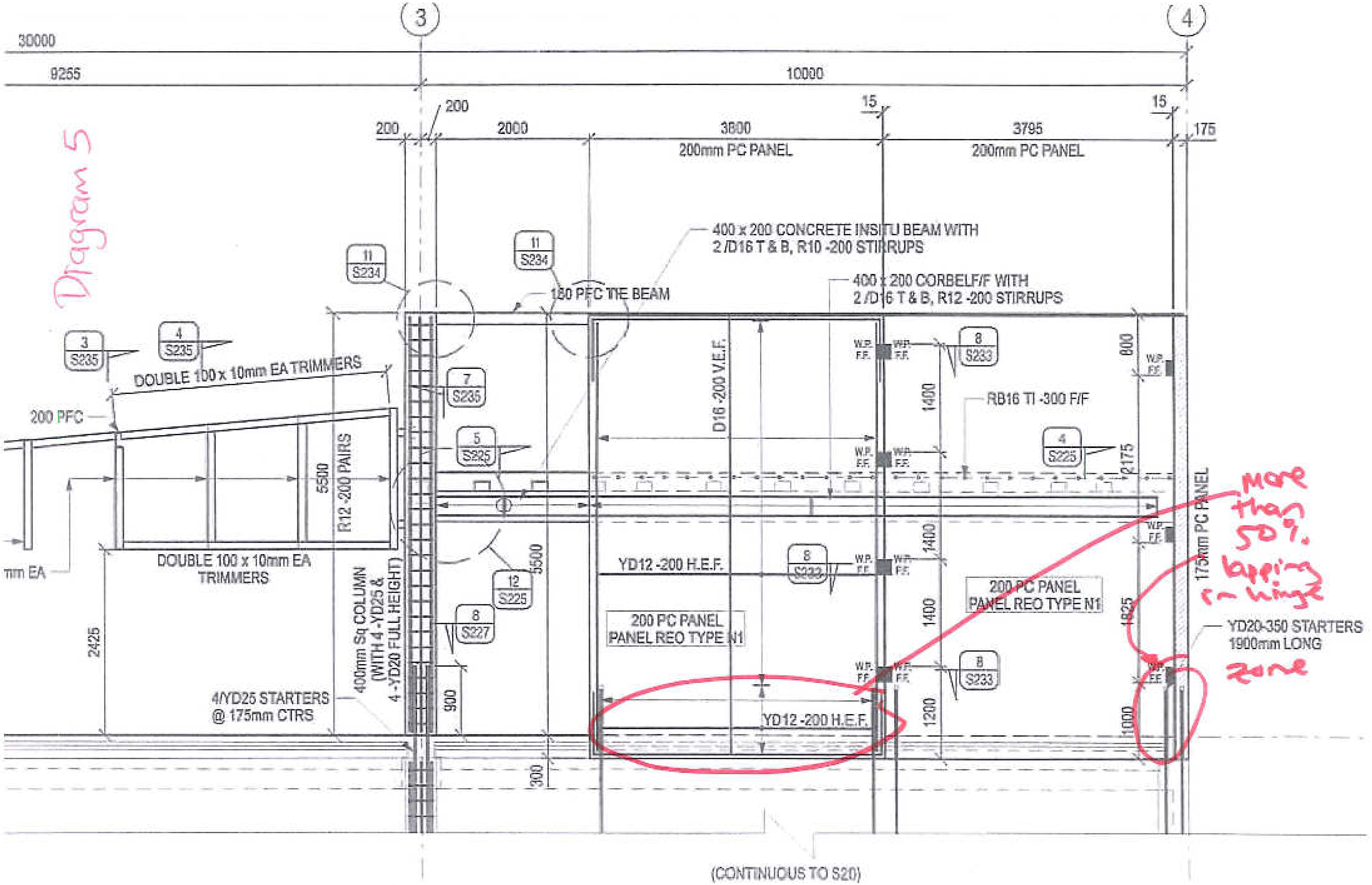


Diagram 5
30000
9255
10000
3
4
200
200
2000
3800
200mm PC PANEL
15
3795
200mm PC PANEL
15
175
400 x 200 CONCRETE INSITU BEAM WITH
2 /D16 T & B, R10 -200 STIRRUPS
400 x 200 CORBELF/F WITH
2 /D16 T & B, R12 -200 STIRRUPS
180 PFC TIE BEAM
11
S234
11
S234
3
S235
4
S235
DOUBLE 100 x 10mm EA TRIMMERS
200 PFC
7
S235
5
S225
5500
R12 -200 PAIRS
D16 -200 V.E.F.
W.P.
F.F.
8
S233
800
RB16 TI -300 F/F
1400
4
S225
2175
175mm PC PANEL
mm EA
DOUBLE 100 x 10mm EA
TRIMMERS
400mm Sq COLUMN
(WITH 4 -YD25 &
4 -YD20 FULL HEIGHT)
5500
12
S225
YD12 -200 H.E.F.
8
S233
200 PC PANEL
PANEL REO TYPE N1
1825
YD20-350 STARTERS
1900mm LONG
8
S227
2425
200 PC PANEL
PANEL REO TYPE N1
4/YD25 STARTERS
@ 175mm CTRS
900
YD12 -200 H.E.F.
1200
1000
300
(CONTINUOUS TO S20)
more than 50% lapping in hinge zone

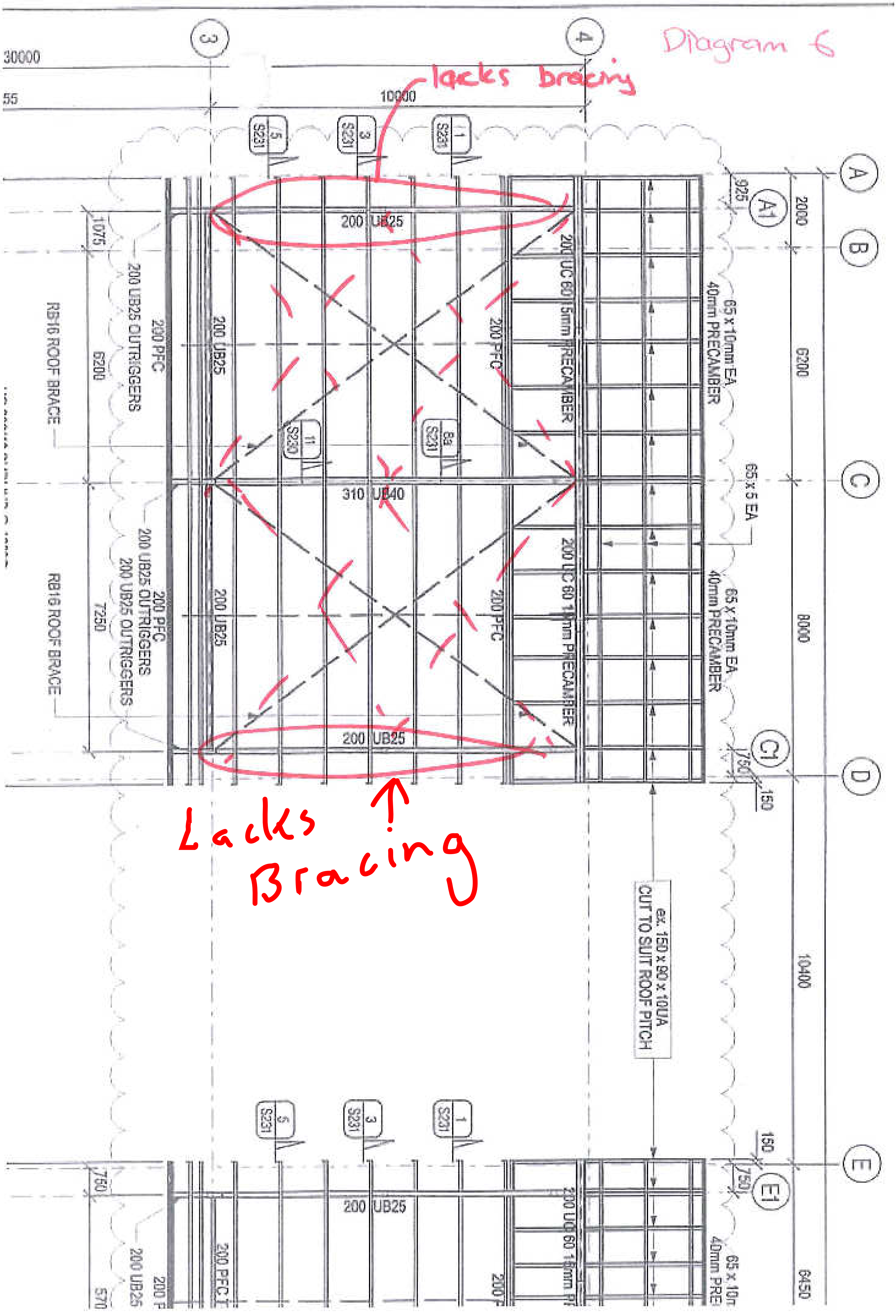


Diagram 6
lacks bracing
Lacks Bracing
30000
55
10000
3
4
A
B
C
D
E
A1
C1
E1
2000
6200
8000
10400
6450
925
1075
750
570
150
7250
1
S231
3
S231
5
S231
8a
S231
11
S230
200 UB25
310 UB40
200 UC 60 5mm PRECAMBER
200 UC 60 10mm PRECAMBER
200 PFC
200 UB25 OUTRIGGERS
RB16 ROOF BRACE
65 x 10mm EA
40mm PRECAMBER
65 x 5 EA
ex. 150 x 90 x 10UA
CUT TO SUIT ROOF PITCH

Diagram 7

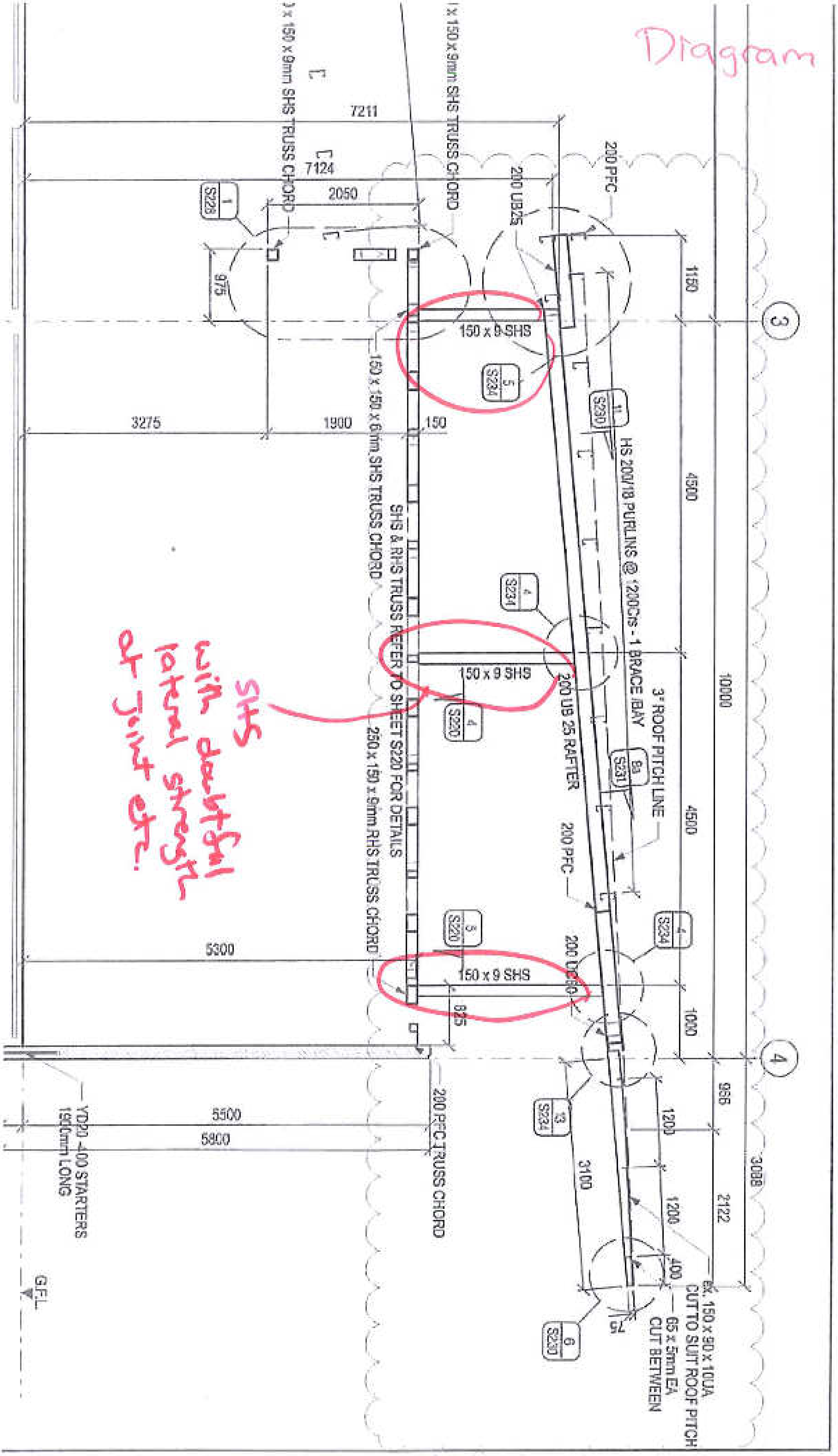
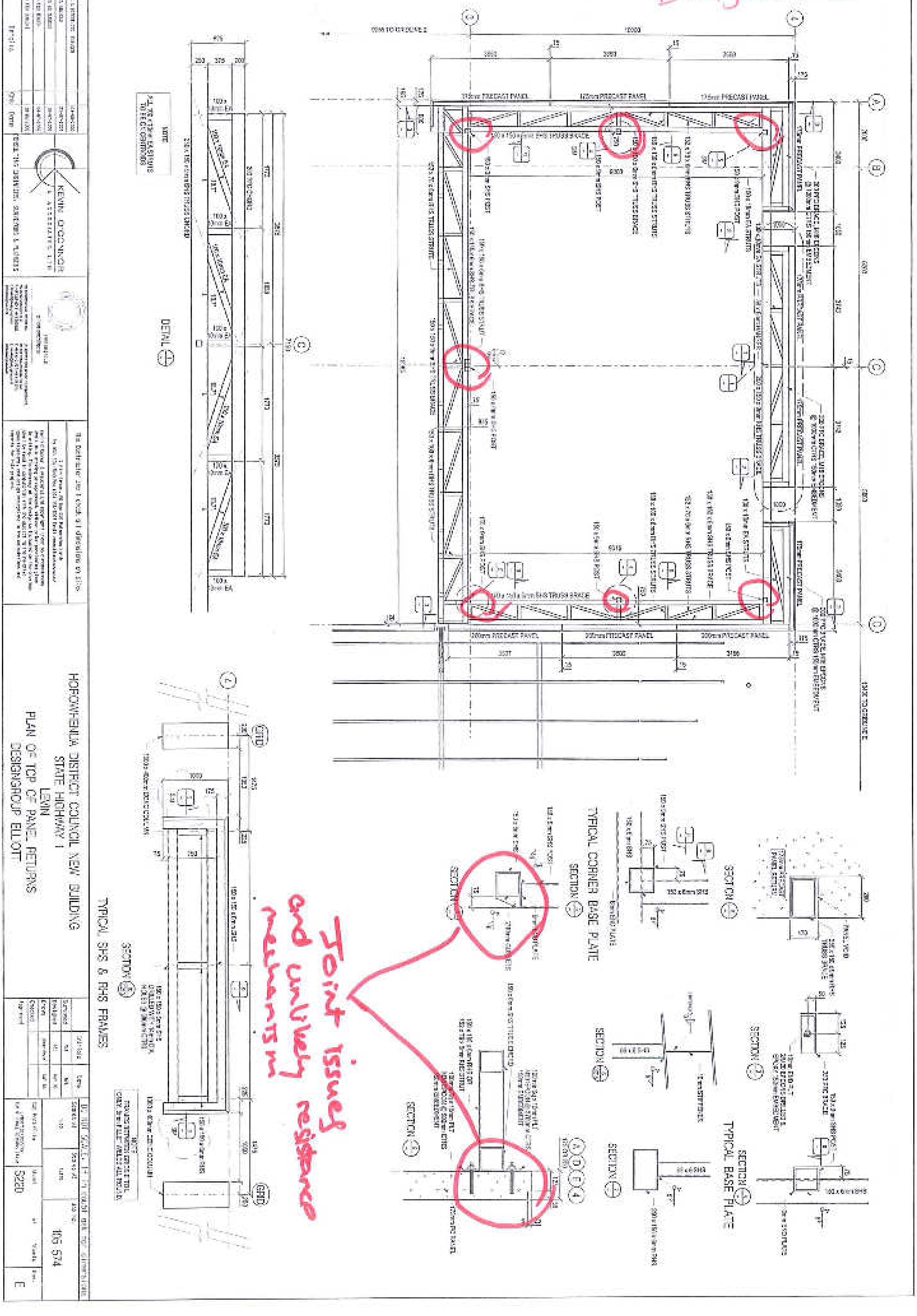
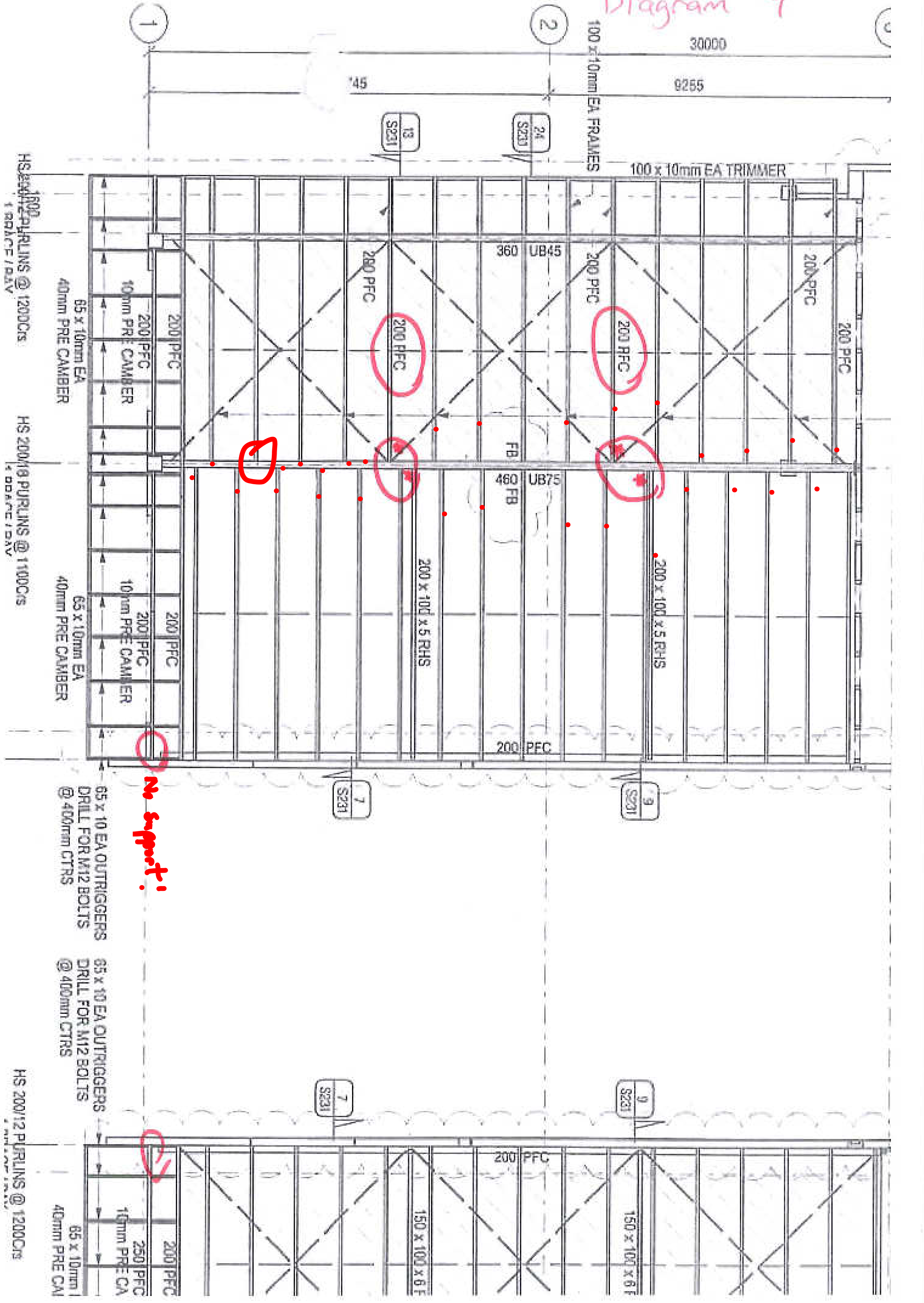

150 x 9mm SHS TRUSS CHORD
150 x 9mm SHS TRUSS CHORD
7211
7124
2050
975
200 PFC
200 UB25
1150
150 x 9 SHS
150 x 150 x 6mm SHS TRUSS CHORD
3275
1900
150
4500
10000
HS 200/18 PURLINS @ 1200Crs - 1 BRACE /BAY
SHS & RHS TRUSS REFER TO SHEET S220 FOR DETAILS
150 x 9 SHS
200 UB 25 RAFTER
3° ROOF PITCH LINE
250 x 150 x 9mm RHS TRUSS CHORD
200 PFC
4500
5300
150 x 9 SHS
825
1000
200 UB25
5500
5800
YD20 -400 STARTERS 1900mm LONG
200 PFC TRUSS CHORD
G.F.L.
1200
3100
1200
400
986
3088
2122
EA. 150 x 90 x 10UA CUT TO SUIT ROOF PITCH
65 x 5mm EA. CUT BETWEEN
1 S226
5 S234
11 S230
4 S234
4 S220
8a S231
5 S220
4 S234
13 S234
6 S230
3
4
SHS with doubtful lateral strength at joint etc.

Diagram 8



175mm PRECAST PANEL
200mm PRECAST PANEL
DETAIL
SECTION
TYPICAL CORNER BASE PLATE
TYPICAL BASE PLATE
TYPICAL SHS & RHS FRAMES
Joint issues and unlikely mechanism resistance
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
PLAN OF TOP OF PANEL RETURNS
DESIGNGROUP ELLIOT
KEVIN O'CONNOR & ASSOCIATES LTD

Diagram 9



1
2
30000
9255
100 x 10mm EA FRAMES
100 x 10mm EA TRIMMER
360 UB45
280 PFC
200 PFC
460 UB75
FB
200 x 100 x 5 RHS
65 x 10mm EA
40mm PRE CAMBER
10mm PRE CAMBER
HS 200/12 PURLINS @ 1200Crs
HS 200/18 PURLINS @ 1100Crs
65 x 10 EA OUTRIGGERS
DRILL FOR M12 BOLTS
@ 400mm CTRS
S231
150 x 100 x 6
250 PFC
No support!

Diagram 10

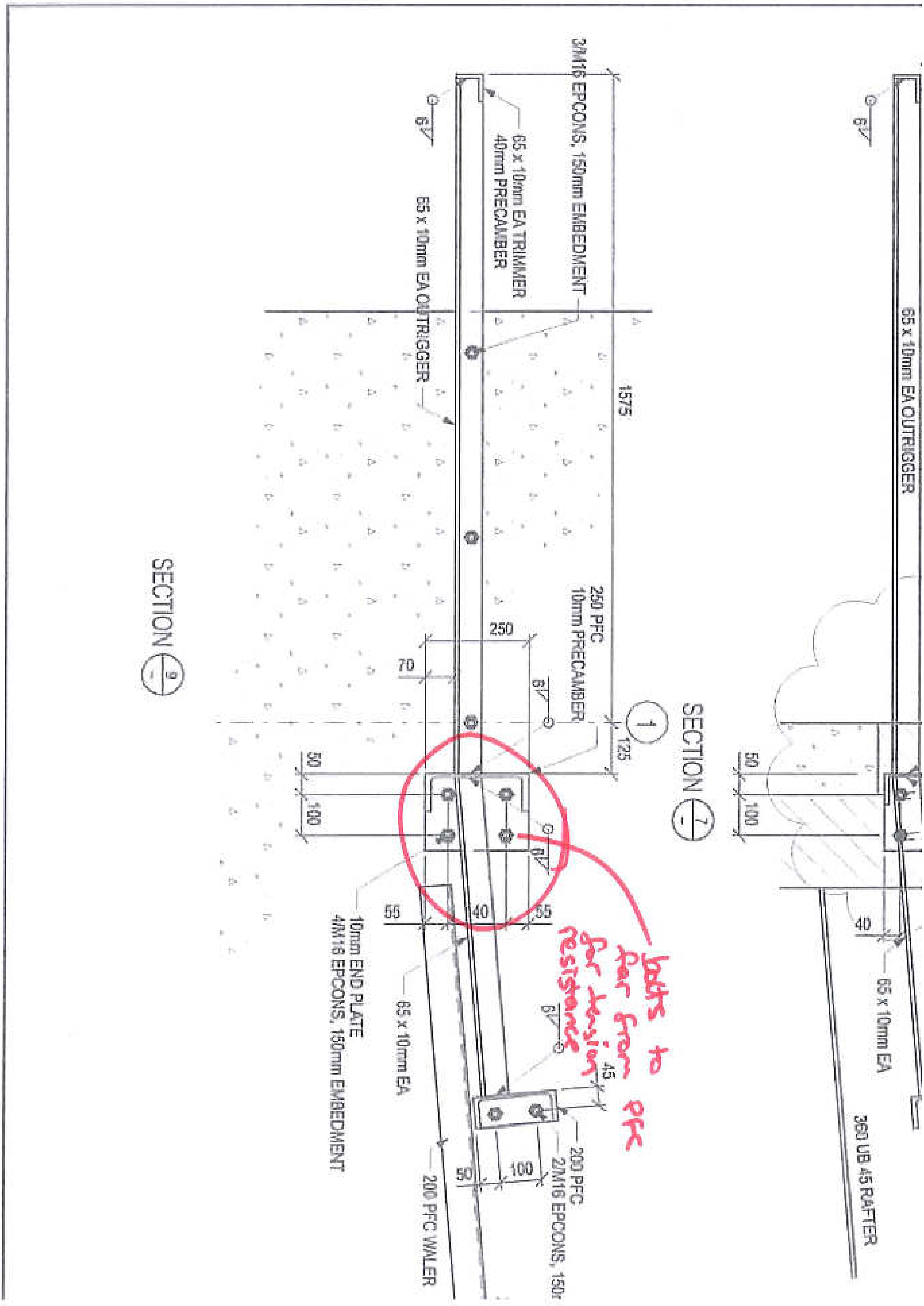
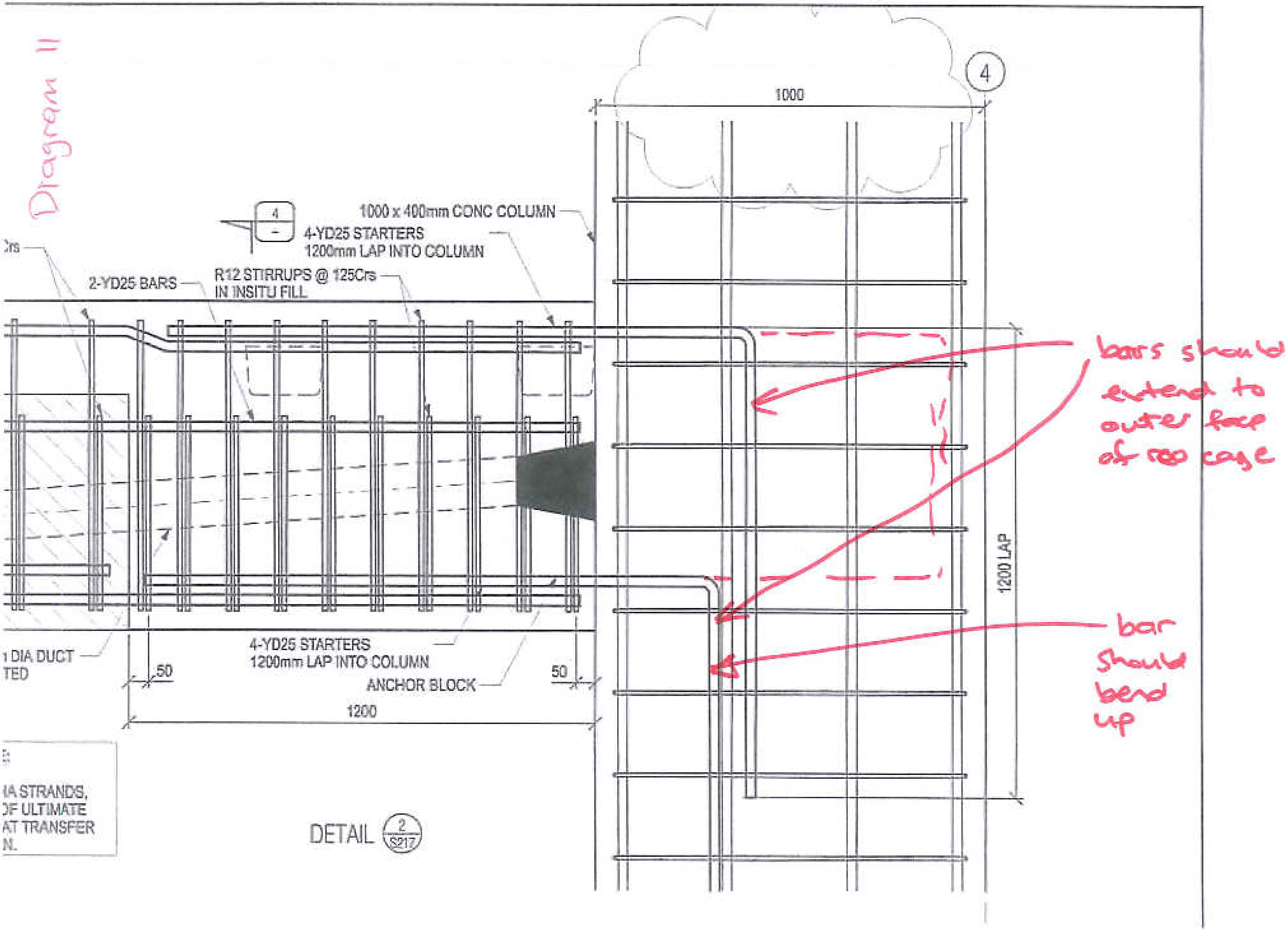

3M16 EPCONS, 150mm EMBEDMENT
65 x 10mm EA TRIMMER
40mm PRECAMBER
65 x 10mm EA OUTRIGGER
1575
250 PFC
10mm PRECAMBER
250
70
125
50
100
55
40
55
SECTION 1
SECTION 9
SECTION 7
10mm END PLATE
4M16 EPCONS, 150mm EMBEDMENT
65 x 10mm EA
45
200 PFC
2M16 EPCONS, 150
50
100
200 PFC WALER
360 UB 45 RAFTER
65 x 10mm EA OUTRIGGER
65 x 10mm EA
bolts to far from PFC for tension resistance

Diagram 11



1000 x 400mm CONC COLUMN
4-YD25 STARTERS
1200mm LAP INTO COLUMN
2-YD25 BARS
R12 STIRRUPS @ 125Crs
IN INSITU FILL
DIA DUCT
TED
4-YD25 STARTERS
1200mm LAP INTO COLUMN
ANCHOR BLOCK
50
50
1200
1000
1200 LAP
4
IA STRANDS,
OF ULTIMATE
AT TRANSFER
N.
DETAIL
bars should extend to outer face of reo cage
bar should bend up

Diagram 12

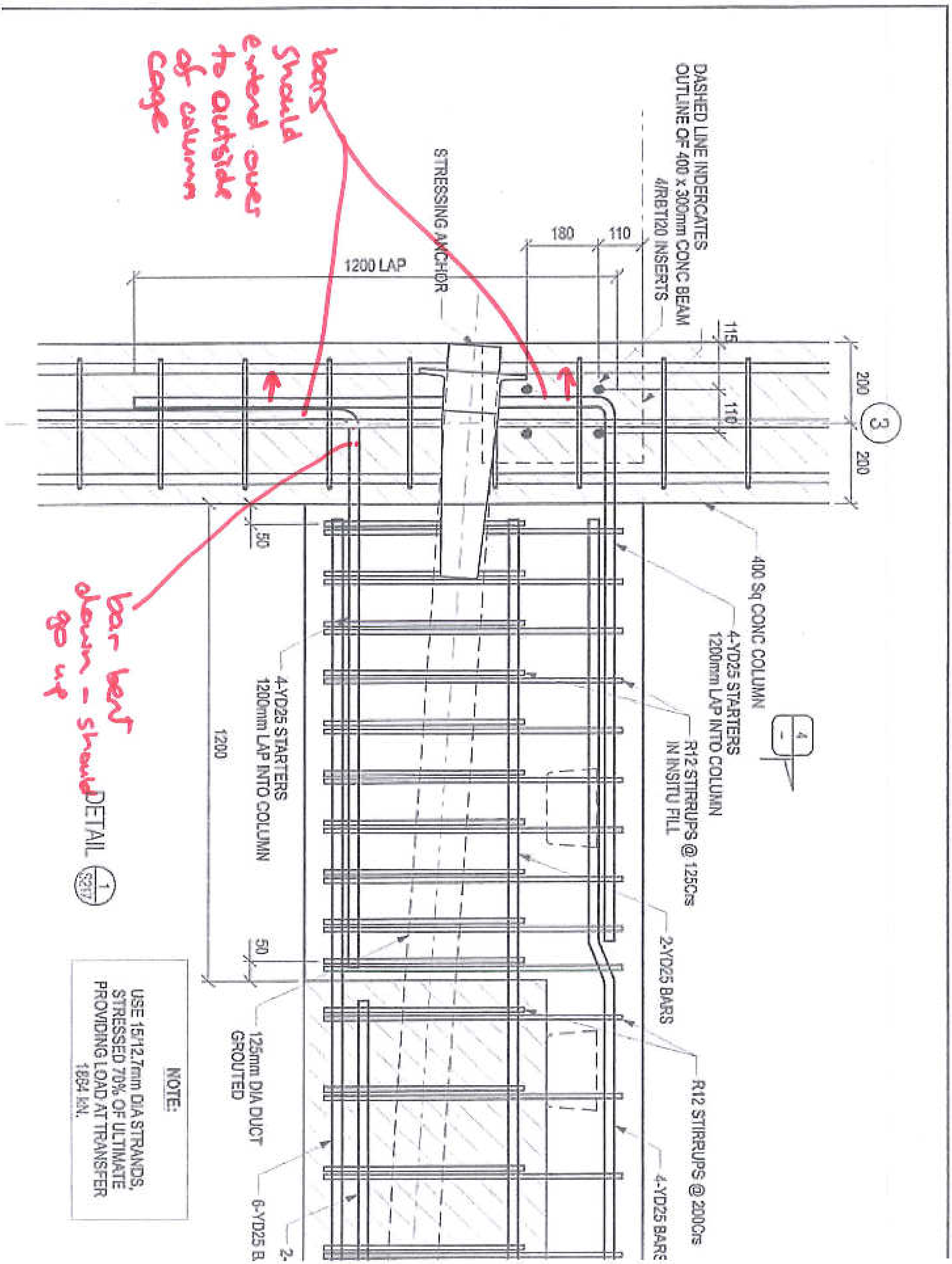
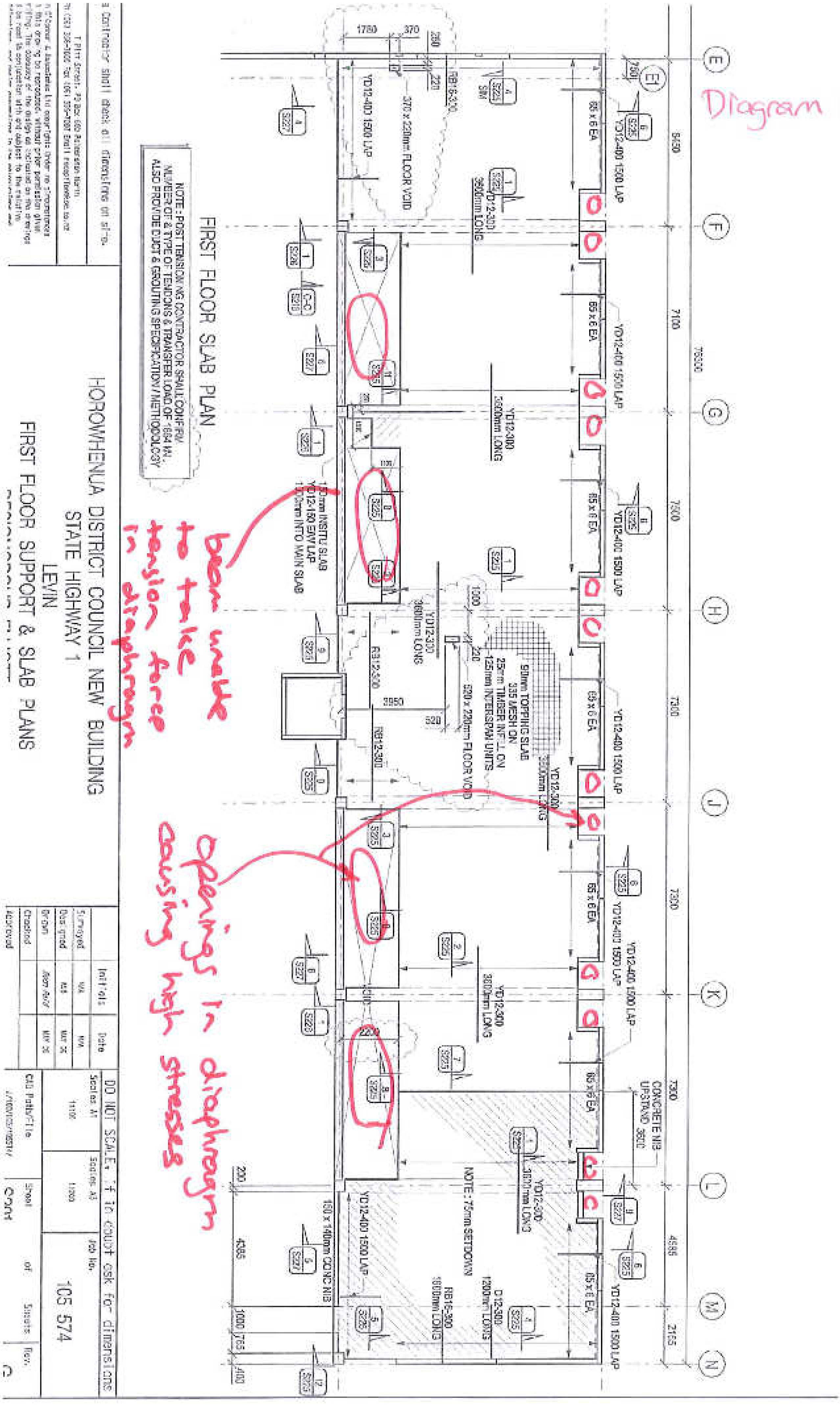

DASHED LINE INDERCATES
OUTLINE OF 400 x 300mm CONC BEAM
4/RBT120 INSERTS
STRESSING ANCHOR
180
110
1200 LAP
115
200
110
200
3
400 Sq CONC COLUMN
4-YD25 STARTERS
1200mm LAP INTO COLUMN
R12 STIRRUPS @ 125Crs
IN INSITU FILL
2-YD25 BARS
R12 STIRRUPS @ 200Crs
4-YD25 BARS
4
4-YD25 STARTERS
1200mm LAP INTO COLUMN
1200
50
50
125mm DIA DUCT
GROUTED
6-YD25 B
2-
DETAIL 1 S217
NOTE:
USE 15/12.7mm DIA STRANDS,
STRESSED 70% OF ULTIMATE
PROVIDING LOAD AT TRANSFER
1854 kN.
bars should extend over to outside of column cage
bar bent down - should go up

Diagram 13



FIRST FLOOR SLAB PLAN
NOTE: POST TENSIONING CONTRACTOR SHALL CONFIRM NUMBER OF & TYPE OF TENDONS & TRANSFER LOAD OF 1664 kN. ALSO PROVIDE DUCT & GROUTING SPECIFICATION / METHODOLOGY
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
FIRST FLOOR SUPPORT & SLAB PLANS
DO NOT SCALE. If in doubt ask for dimensions
105 574
beam unable to take tension force in diaphragm
openings in diaphragm causing high stresses
370 x 220mm FLOOR VOID
520 x 220mm FLOOR VOID
90mm TOPPING SLAB
335 MESH ON
25mm TIMBER INFILL ON
125mm INTERSPAN UNITS
NOTE: 75mm SETDOWN
CONCRETE NIB UPSTAND 360C
150 x 140mm CONC NIB
YD12-400 1500 LAP
65 x 6 EA

Diagram 14

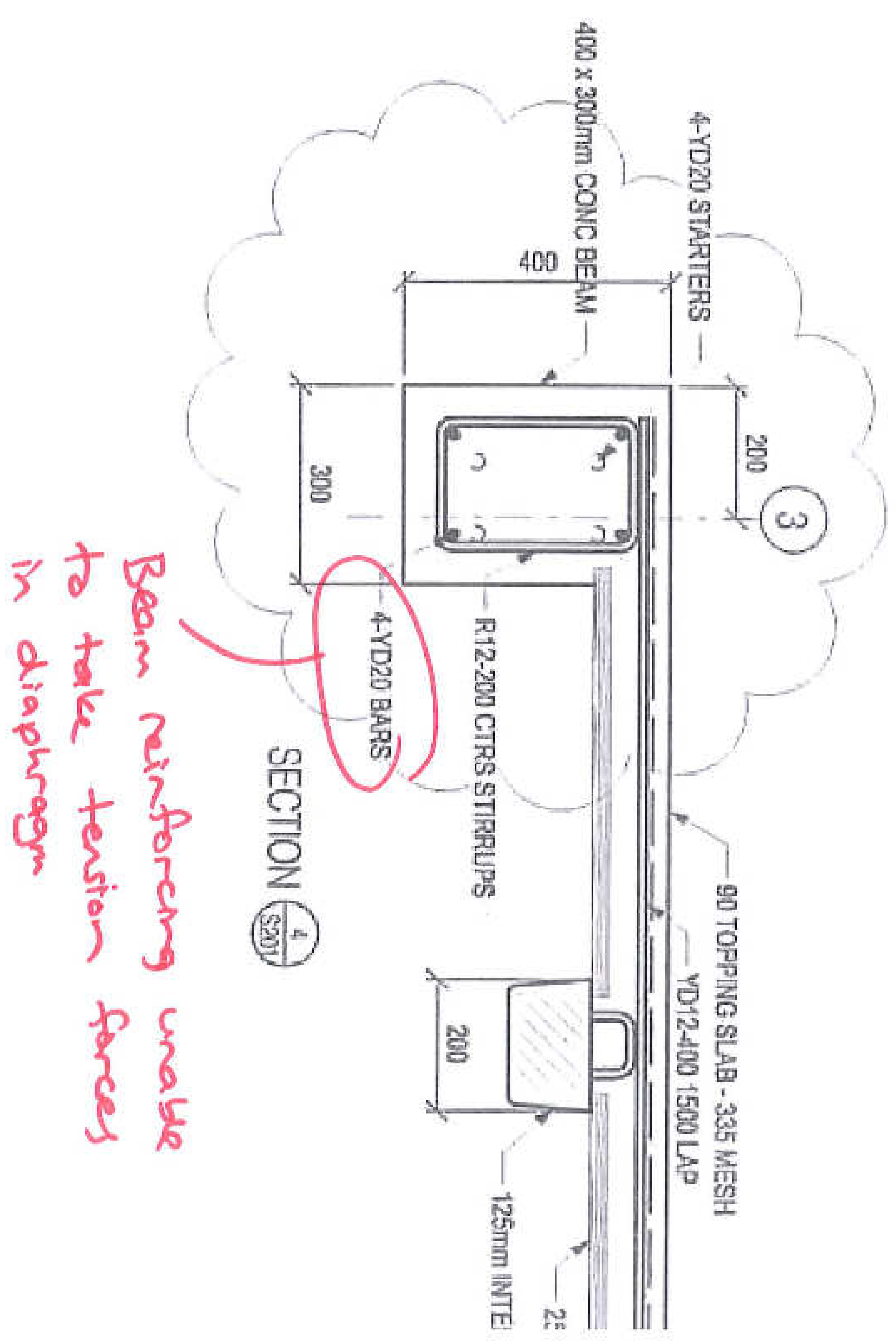
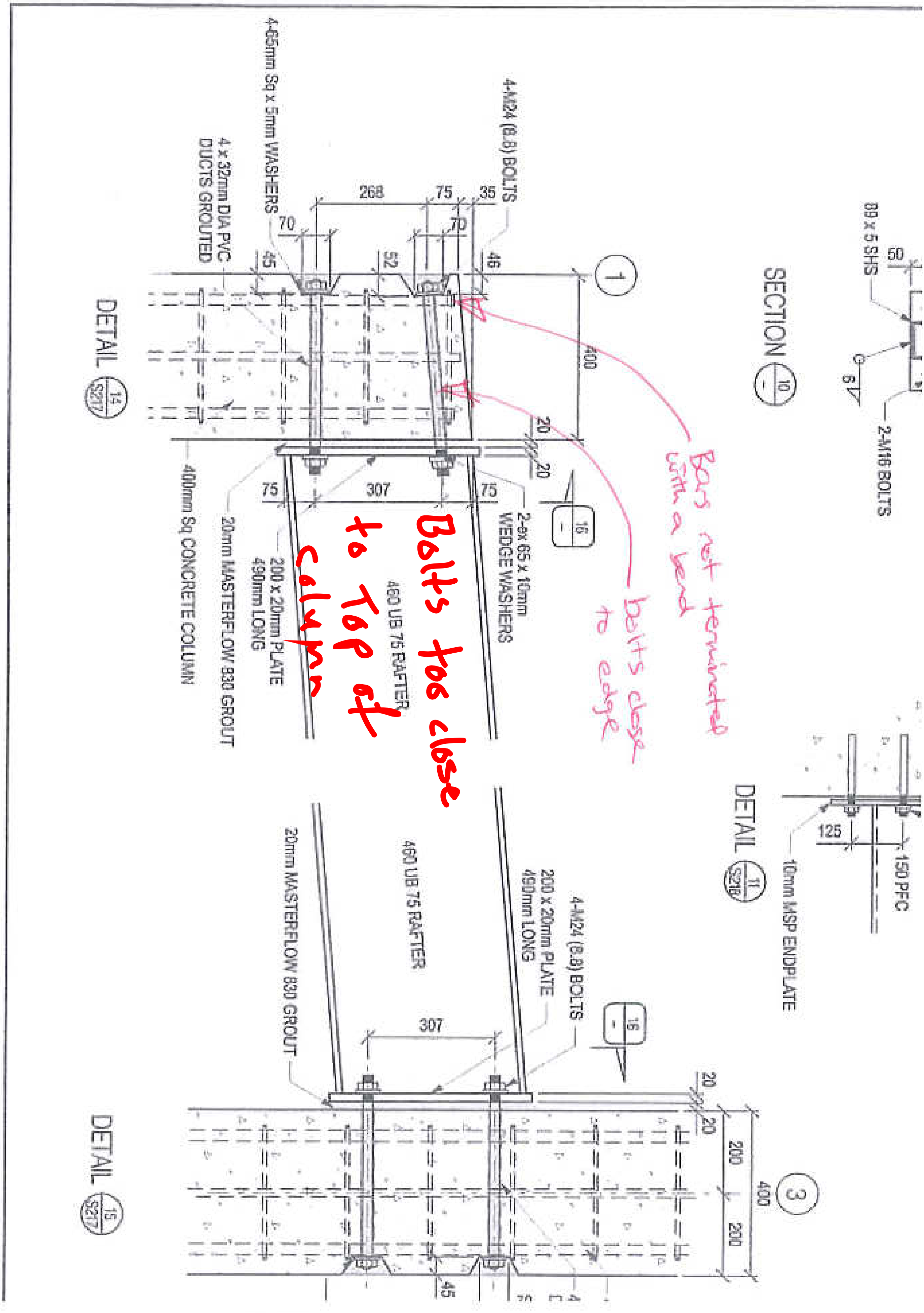
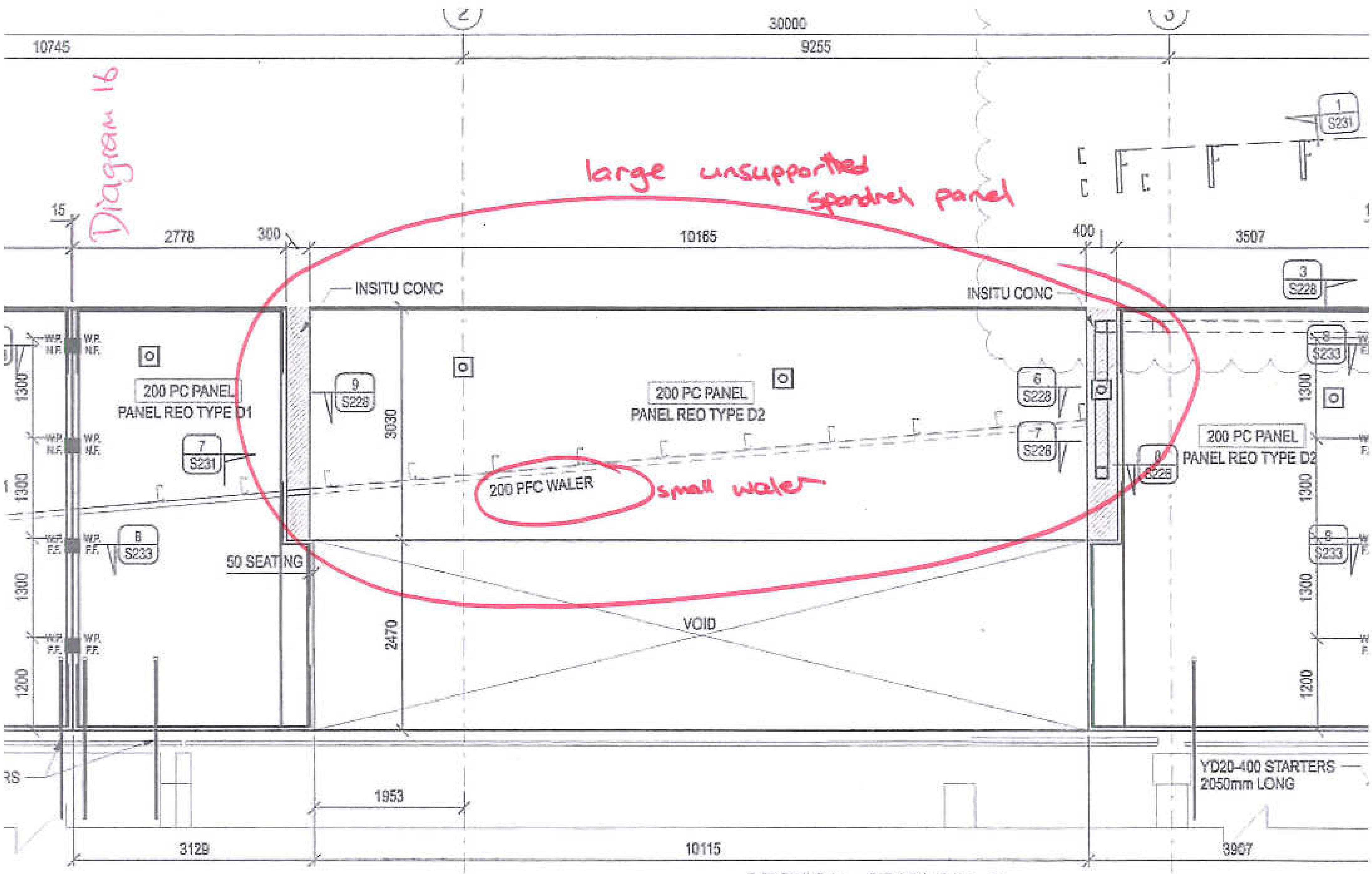

4-YD20 STARTERS
400 x 300mm CONC BEAM
400
200
300
3
4-YD20 BARS
R12-200 CTRS STIRRUPS
SECTION
4
S201
90 TOPPING SLAB - 335 MESH
YD12-400 1500 LAP
200
125mm INTE
Beam reinforcing unable to take tension forces in diaphragm

Diagram 15



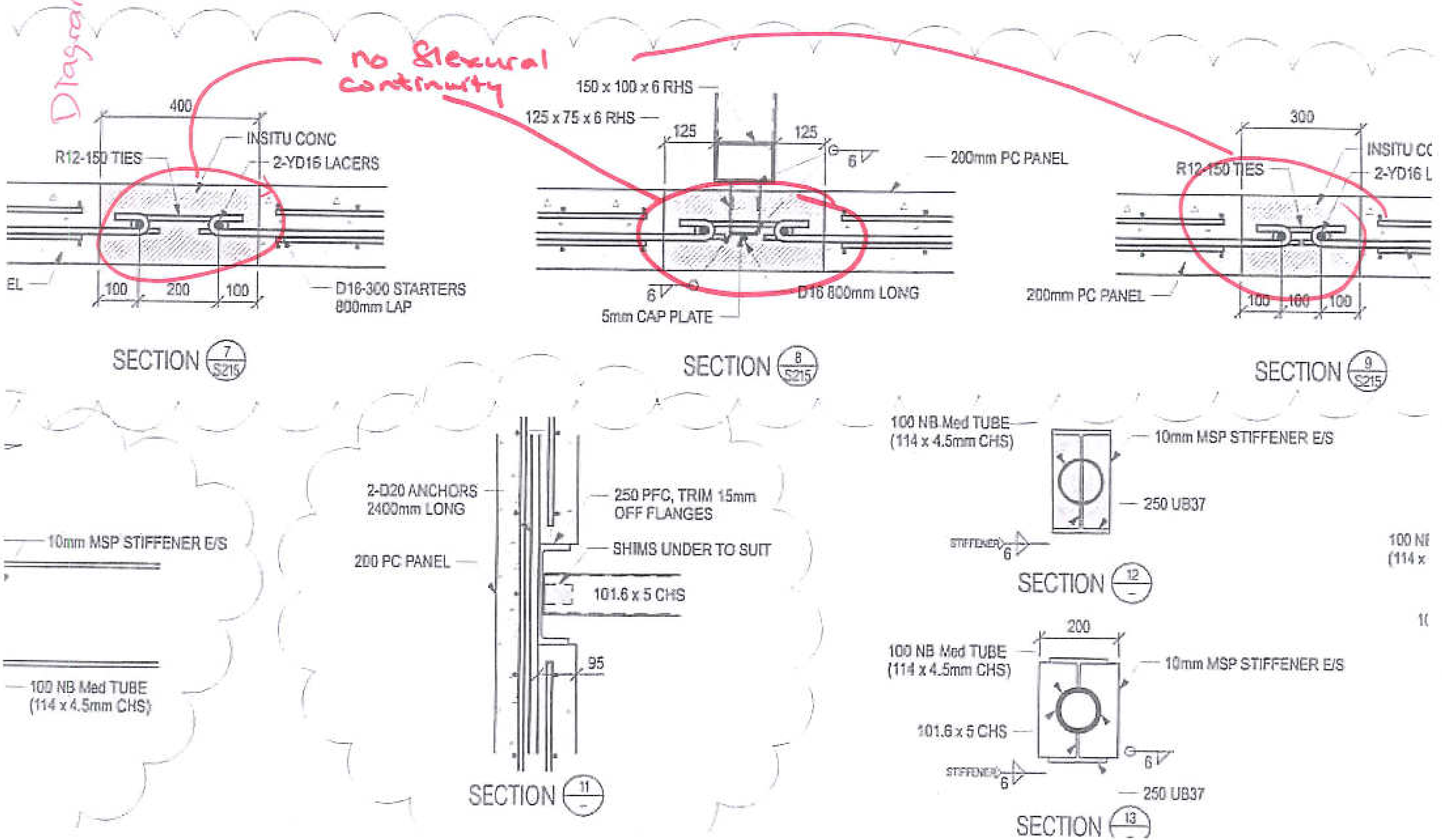
SECTION 10
89 x 5 SHS
50
6
2-M16 BOLTS
DETAIL 11 S216
125
150 PFC
10mm MSP ENDPLATE
DETAIL 14 S217
4-M24 (8.8) BOLTS
4-65mm Sq x 5mm WASHERS
4 x 32mm DIA PVC DUCTS GROUTED
268
75
35
70
70
45
52
46
400
20
20
1
75
307
75
16
2-ex 65 x 10mm WEDGE WASHERS
460 UB 75 RAFTER
200 x 20mm PLATE 490mm LONG
20mm MASTERFLOW 830 GROUT
400mm Sq CONCRETE COLUMN
Bars not terminated with a bend
bolts close to edge
Bolts too close to Top of column
DETAIL 15 S217
460 UB 75 RAFTER
200 x 20mm PLATE 490mm LONG
4-M24 (8.8) BOLTS
20mm MASTERFLOW 830 GROUT
307
16
20
20
200
400
200
3
45



SECTION GRIDLINE D

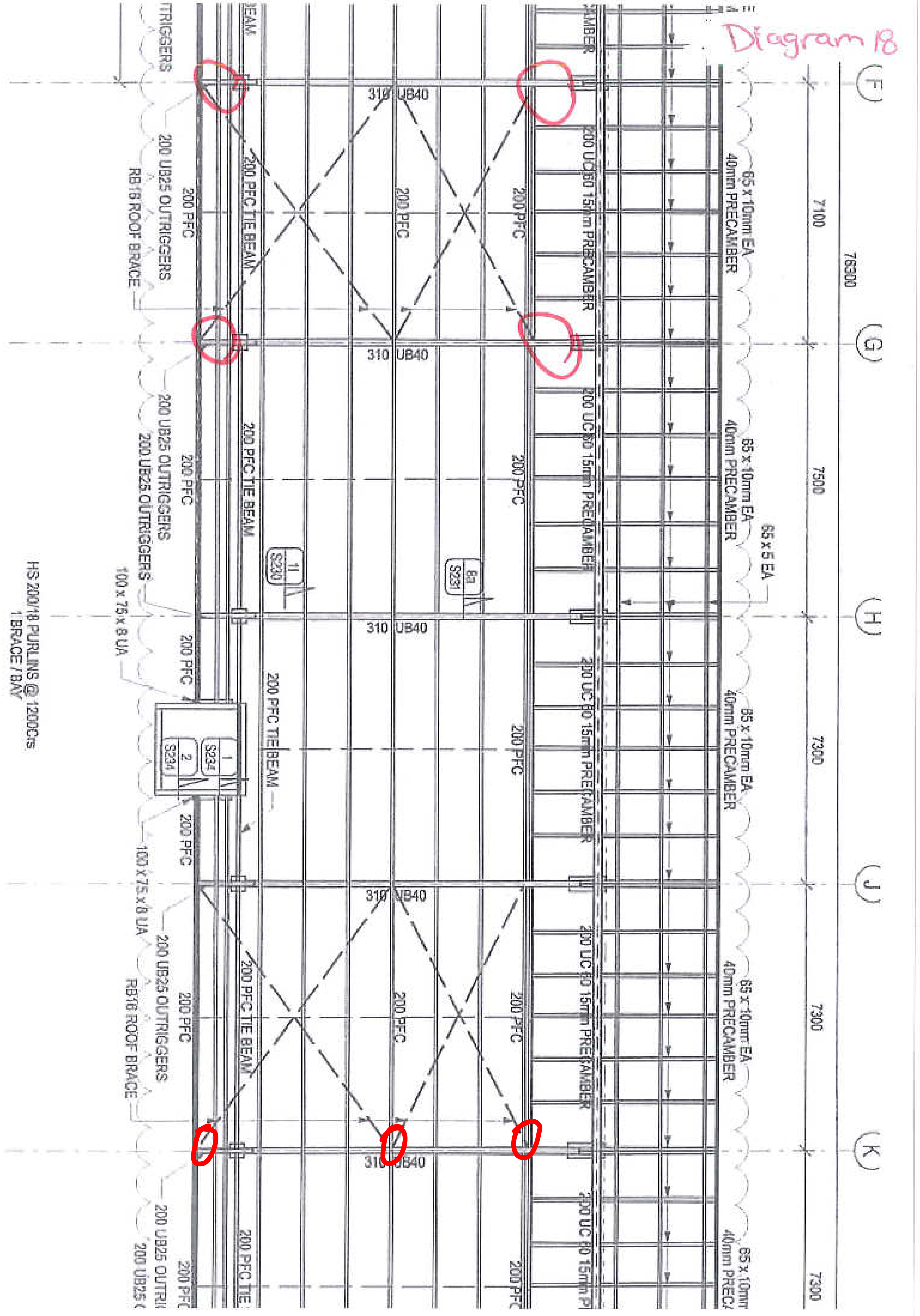
NOTE : YD16 TRIMMERS TO ALL PANELS & OPENINGS

Diagram 17



no flexural continuity
400
R12-150 TIES
INSITU CONC
2-YD16 LACERS
EL
100
200
100
D16-300 STARTERS
800mm LAP
SECTION 7 S215
150 x 100 x 6 RHS
125 x 75 x 6 RHS
125
125
6
200mm PC PANEL
D16 800mm LONG
5mm CAP PLATE
SECTION 8 S215
300
R12-150 TIES
200mm PC PANEL
SECTION 9 S215
10mm MSP STIFFENER E/S
100 NB Med TUBE
(114 x 4.5mm CHS)
2-D20 ANCHORS
2400mm LONG
200 PC PANEL
250 PFC, TRIM 15mm
OFF FLANGES
SHIMS UNDER TO SUIT
101.6 x 5 CHS
95
SECTION 11
100 NB Med TUBE
(114 x 4.5mm CHS)
10mm MSP STIFFENER E/S
250 UB37
STIFFENER
SECTION 12
200
100 NB Med TUBE
(114 x 4.5mm CHS)
10mm MSP STIFFENER E/S
101.6 x 5 CHS
STIFFENER
250 UB37
SECTION 13

Diagram 18



310 UB40
200 PFC
200 PFC TIE BEAM
200 UB25 OUTRIGGERS
RB16 ROOF BRACE
200 UC60 15mm PRECAMBER
65 x 10mm EA
40mm PRECAMBER
65 x 5 EA
7100
7500
7300
76300
F
G
H
J
K
100 x 75 x 6 UA
HS 200/18 PURLINS @ 1200Crs
1 BRACE / BAY
S230
S231
S234

Diagram 19

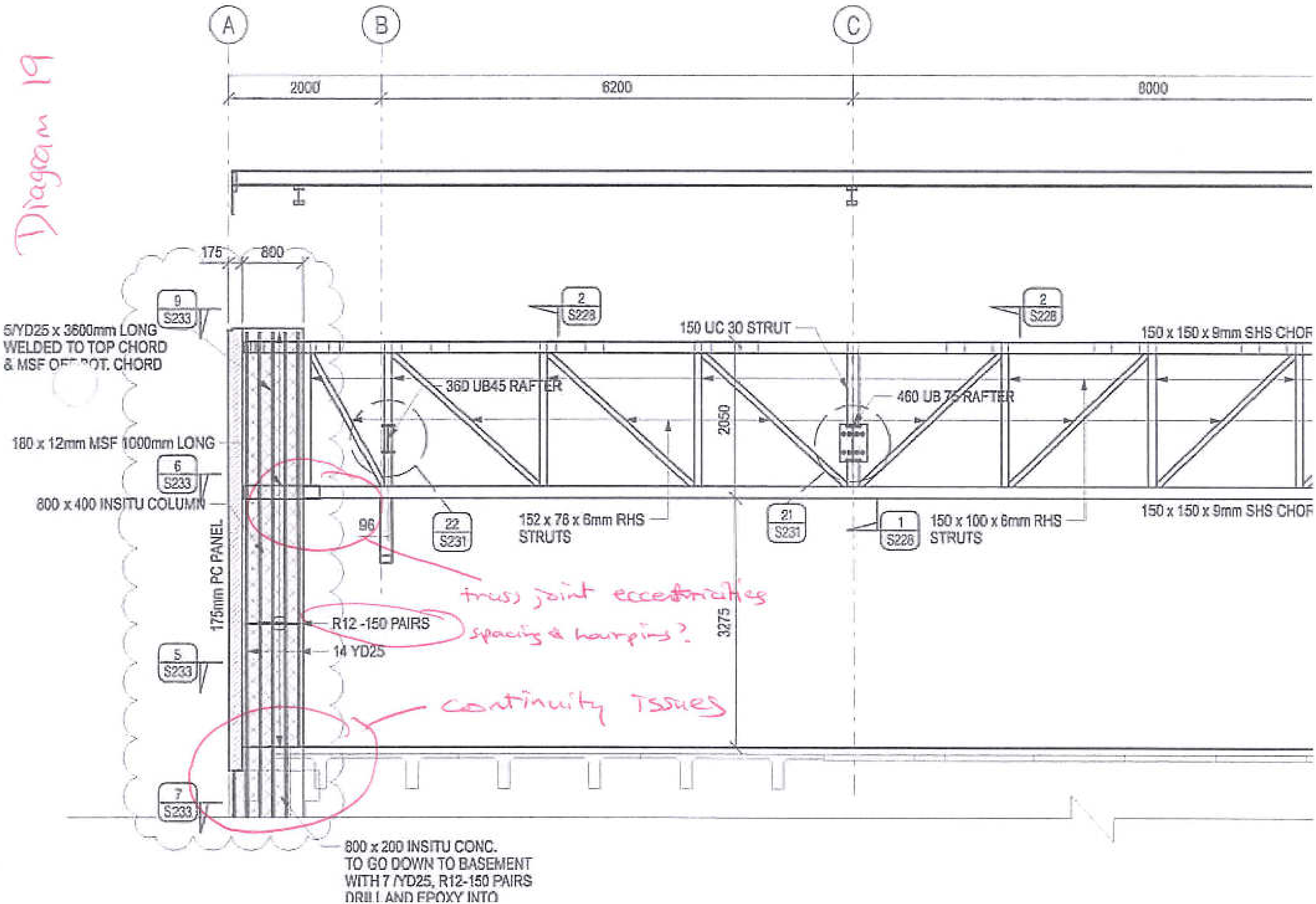

A
B
C
2000
6200
8000
175
800
9
S233
5/YD25 x 3600mm LONG
WELDED TO TOP CHORD
2
S228
150 UC 30 STRUT
150 x 150 x 9mm SHS CHOR
360 UB45 RAFTER
460 UB 75 RAFTER
180 x 12mm MSF 1000mm LONG
2050
6
S233
800 x 400 INSITU COLUMN
96
22
S231
152 x 76 x 6mm RHS
STRUTS
21
S231
1
S228
150 x 100 x 6mm RHS
STRUTS
175mm PC PANEL
R12 -150 PAIRS
14 YD25
3275
5
S233
7
S233
800 x 200 INSITU CONC.
TO GO DOWN TO BASEMENT
WITH 7 /YD25, R12-150 PAIRS
truss joint eccentricities
spacing & hairpins?
continuity Issues

Diagram 20

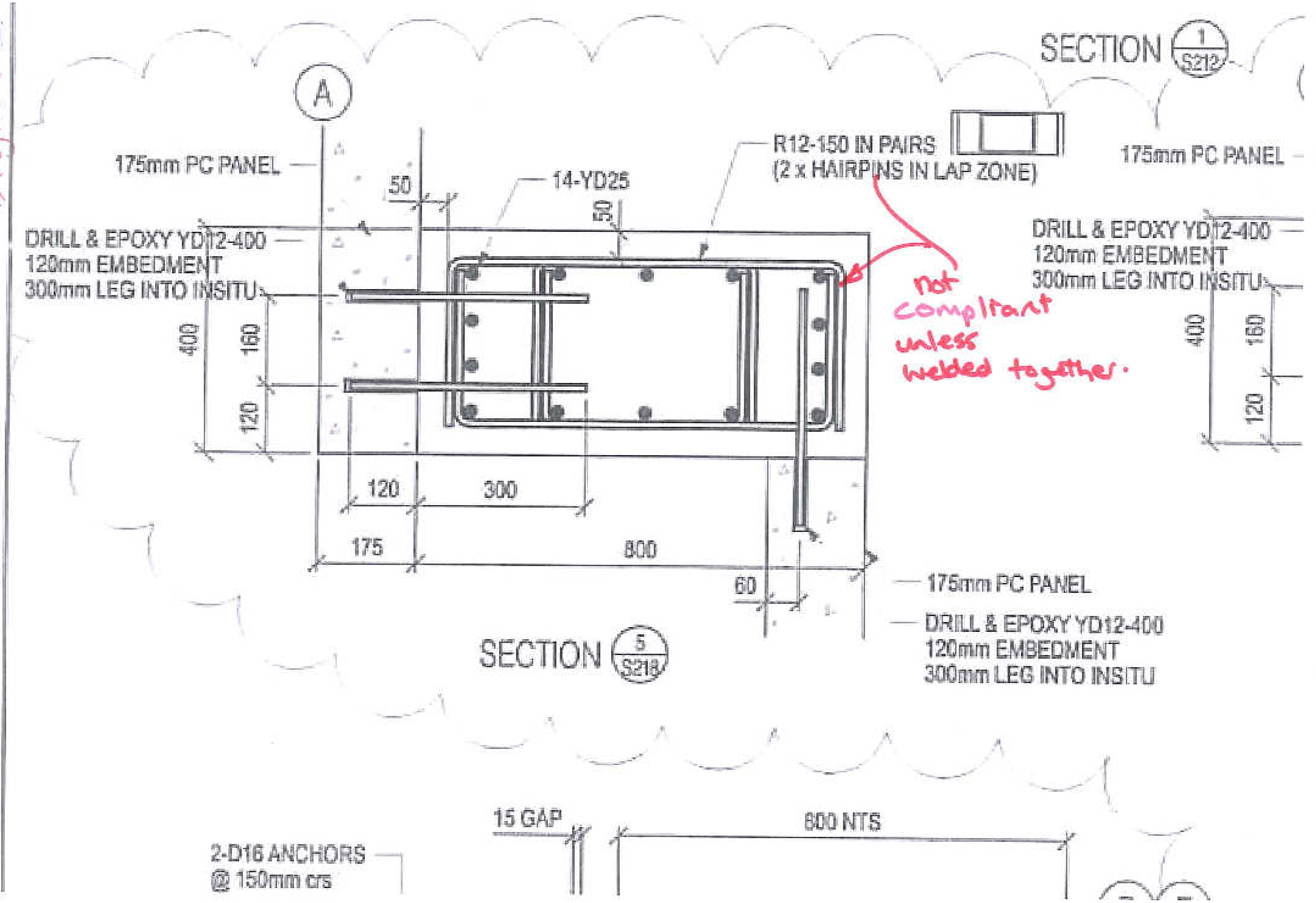
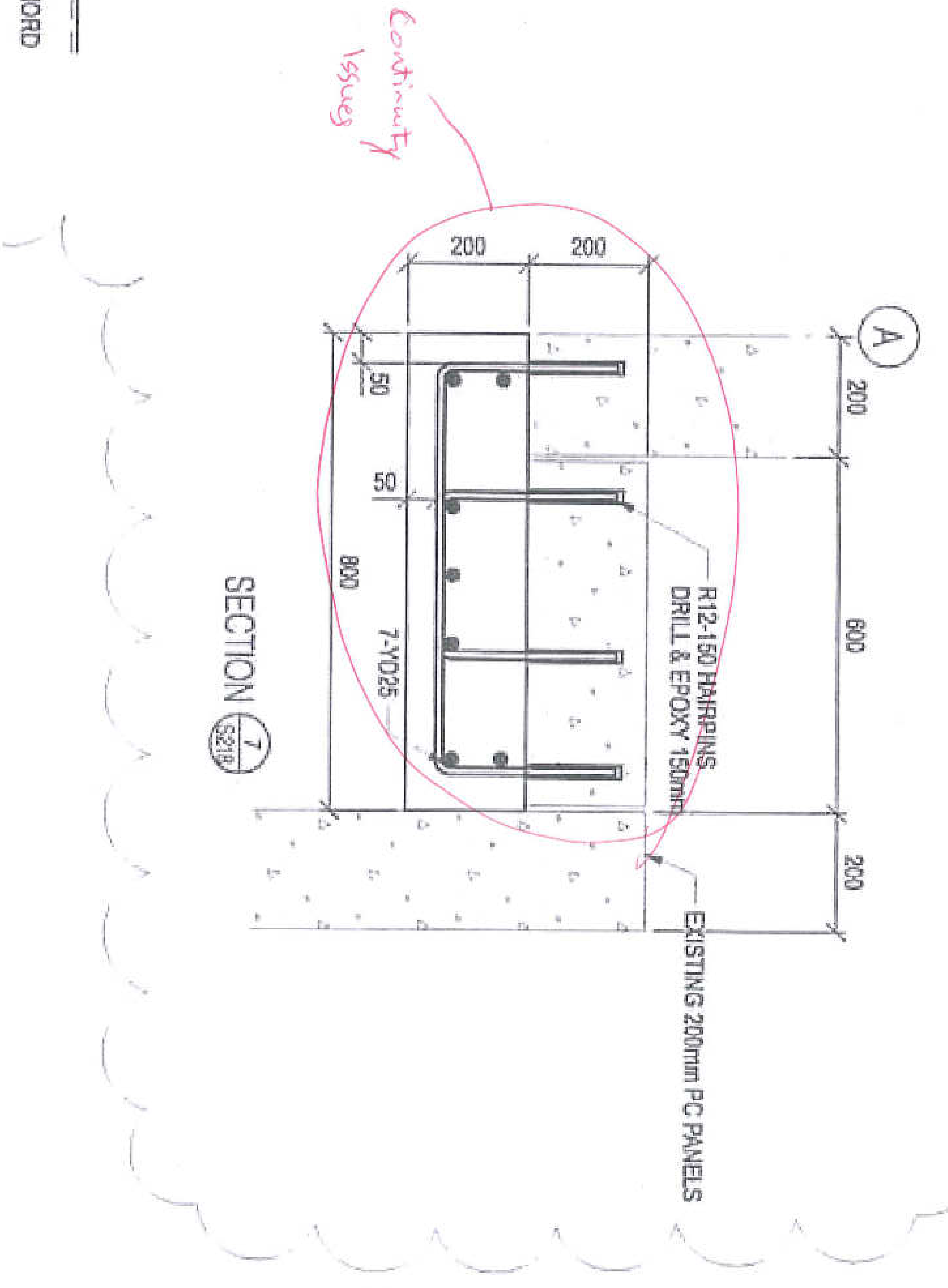
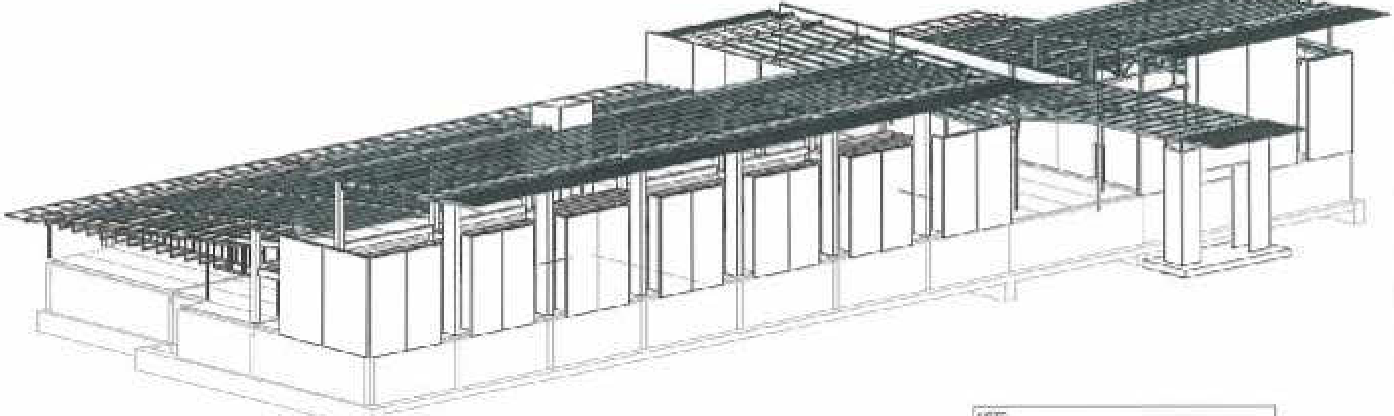

SECTION 1 S212
A
175mm PC PANEL
14-YD25
50
50
R12-150 IN PAIRS
(2 x HAIRPINS IN LAP ZONE)
175mm PC PANEL
DRILL & EPOXY YD12-400
120mm EMBEDMENT
300mm LEG INTO INSITU
DRILL & EPOXY YD12-400
120mm EMBEDMENT
300mm LEG INTO INSITU
400
160
120
not compliant unless welded together.
120
300
175
800
60
175mm PC PANEL
DRILL & EPOXY YD12-400
120mm EMBEDMENT
300mm LEG INTO INSITU
SECTION 5 S218
15 GAP
800 NTS
2-D16 ANCHORS
@ 150mm crs

Diagram 21


SHS TRUSS CHORD
Continuity issues
200
200
A
200
600
200
50
50
800
7-YD25
R12-150 HAIRPINS DRILL & EPOXY 150mm
EXISTING 200mm PC PANELS
SECTION
7
S21B

Appendix C

Partial Plan Set



NOTE
THIS DRAWING IS FOR SCHEMATIC PURPOSES ONLY
AND SHOULD NOT BE USED FOR CONSTRUCTION

Designed by: ABB Drawn by: Stuart Abel

HOROWHENUA DISTRICT COUNCIL
NEW COUNCIL BUILDING
STATE HIGHWAY 1, LEVIN

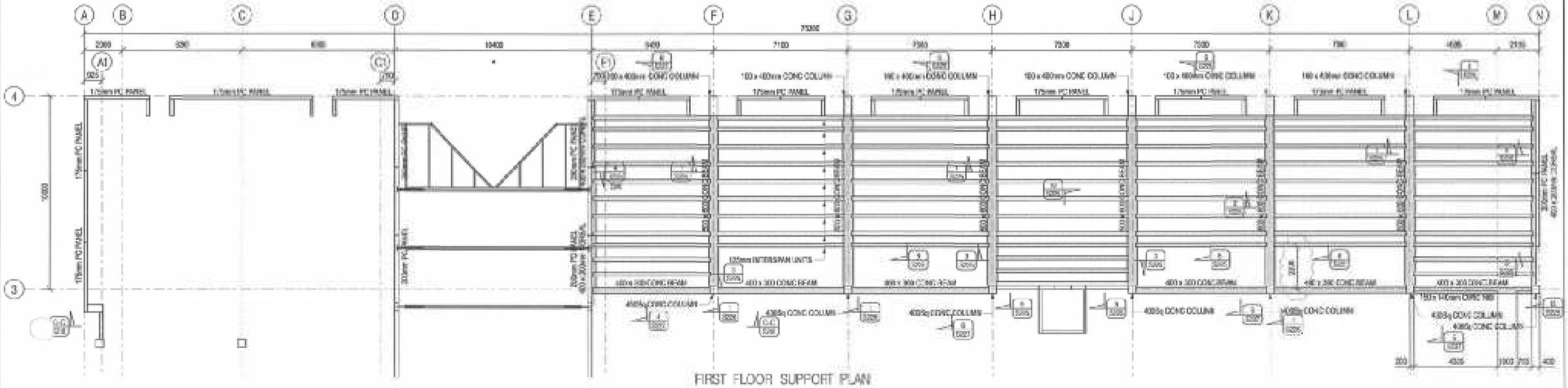
DESIGNGROUP ELLIOTT

KEVIN O'CONNOR
& ASSOCIATES LTD
CONSULTING ENGINEERS, SURVEYORS & PLANNERS
7 Pitt Street, PO Box 869 Palmerston North
Ph (06) 356-7000 Fax (06) 356-7307 Email reception@koa.co.nz

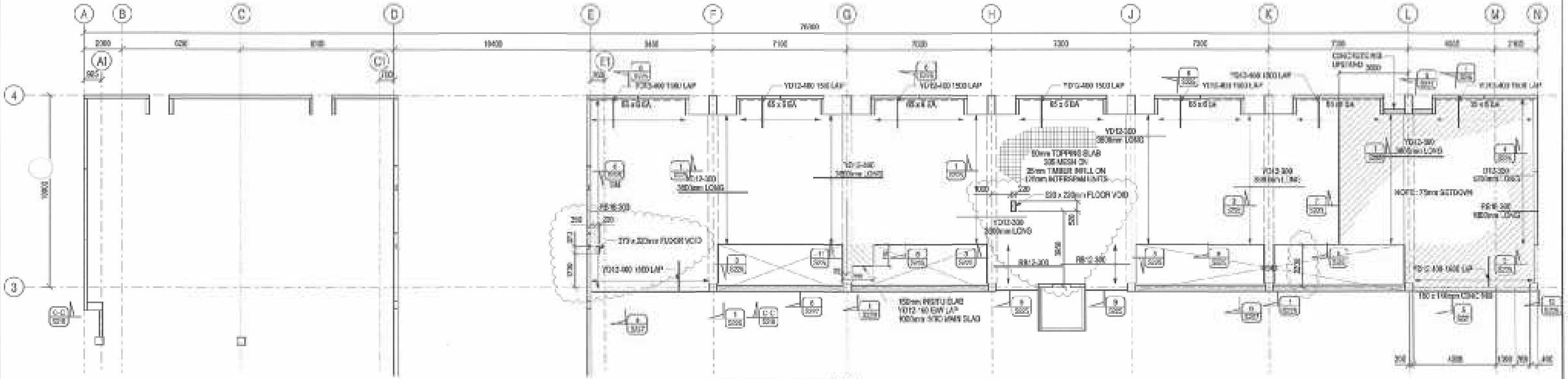
105 574

DRAWING REGISTER

No	Sheet Name	Rev	Date
S0	COVER SHEET	E	11-07-2006
	STAGE ONE		
S1	BASEMENT FOUNDATION PLAN	F	04-08-2006
S2	BASEMENT SLAB PLAN	E	05-08-2006
S3	BASEMENT DETAILS 1	D	05-06-2006
S4	BASEMENT DETAILS 2	D	05-06-2006
S5	BASEMENT DETAILS 3	D	25-06-2006
S6	BASEMENT DETAILS 4	D	04-08-2006
S7	BASEMENT DETAILS 5	C	11-05-2006
S10	GROUND FLOOR SUPPORT PLAN	G	04-05-2006
S10A	GROUND FLOOR SUPPORT PLAN	C	04-05-2006
S11	GROUND FLOOR SLAB PLAN	G	05-05-2006
S12	ELEVATION GRIDLINE 1	F	04-05-2006
S13	SECTION GRIDLINE 2	G	02-04-2006
S14	SECTION GRIDLINE 3	D	05-04-2006
S15	ELEVATION GRIDLINE 4	D	02-04-2006
S16	ELEVATION GRIDLINE A & B	D	05-04-2006
S17	SECTION GRIDLINE C & D	E	02-04-2006
S18	SECTION GRIDLINE E, F, G & K	F	18-07-2006
S19	SECTION GRIDLINE H, J & L	D	05-04-2006
S20	ELEVATION GRIDLINE M & N	D	03-04-2006
S21	SECTION ON CONCRETE BEAM G, L, U & PRECAST PANELS	E	05-04-2006
S22	LIFT SHAFT SECTIONS & DETAILS	C	04-05-2006
S23	LIFT SHAFT SECTIONS & DETAILS	D	07-05-2006
S24	PRECAST PANEL ELEVATIONS	C	15-05-2006
S24A	NIBS / STAIR AROUND LIFT SHAFT	A	15-05-2006
S25	DETAILS 1	E	01-08-2006
S26	DETAILS 2	G	01-08-2006
S27	DETAILS 3	F	18-07-2006
S28	DETAILS 4	E	01-08-2006
	STAGE TWO		
S200	TOWER FOUNDATION PLAN	E	29-08-2006
S201	FIRST FLOOR SUPPORT & SLAB PLAN	G	17-08-2006
S202	LOWER ROOF PLAN	F	04-08-2006
S203	HIGH ROOF PLAN	G	30-08-2006
S204	CANOPY ROOF PLANS	E	11-08-2006
S205	CANOPY SECTIONS	J	11-08-2006
S206	ELEVATION GRID 1	F	04-08-2006
S207	ELEVATION GRID 3	D	30-08-2006
S208	ELEVATION GRID 4	F	04-08-2006
S209	ELEVATION GRID # & 3	D	30-08-2006
S210	SECTION C & D	H	30-08-2006
S211	SECTION E & F	G	30-08-2006
S212	SECTION G, H, J, K, L & M	G	30-08-2006
S213	ELEVATION GRID N + SECTION O-O	D	30-08-2006
S214	ELEVATION R, S & Q	F	30-08-2006
S215	PLAN OF TOP OF PANEL RETURNS	E	04-08-2006
S225	CONC DETAILS 1	F	30-08-2006
S226	CONC DETAILS 2	F	17-08-2006
S227	CONC DETAILS 3	D	04-08-2006
S228	CONC DETAILS 4	D	04-08-2006
S229	STEEL DETAILS 1	C	21-07-2006
S230	STEEL DETAILS 2	E	30-08-2006
S231	STEEL DETAILS 3	C	21-07-2006
S232	TOWER DETAILS	D	20-07-2006
S233	CONC DETAILS 5	E	30-08-2006
S234	STEEL DETAILS 4	B	30-08-2006
S235	STEEL DETAILS 5	B	11-08-2006
S236	PRECAST PANEL DETAILS	A	18-08-2006
	105574.02 - SITEWORKS		
SW1	EXISTING SITE LEVELS	B	03-08-2006
SW2	SITE SERVICES	B	03-10-2006
SW2A	TANK/PUMP PLANS & CROSS SECTION	A	03-10-2006
SW3	DETAILS	B	02-10-2006
SW4	PROPOSED DRAINAGE PLAN	A	10-08-2006
SW5	SECTION THROUGH LANE	A	10-08-2006
SW6	SETOUT PLAN	A	02-10-2006
SW7	FINISHED LEVELS 1	A	02-10-2006
SW8	FINISHED LEVELS 2	A	02-10-2006
SW9	FINISHED LEVELS 3	C	03-10-2006
SW10	BRIDGING DETAILS	A	02-10-2006



FIRST FLOOR SUPPORT PLAN



FIRST FLOOR SLAB PLAN

NOTE: POST TENSIONING CONTRACTOR SHALL CONFIRM NUMBER OF & TYPE OF TENDONS & TRANSFER, GROUT TIME ETC. ALSO PROVIDE DUCT & GROUTING SPECIFICATION/METHODOLOGY

Rev	Details	Chk	Date
8	FLOOR VOIDS & DIMENSIONS ADDED		17-08-2010
7	PC PANELS CHANGED & ...		26-08-2010
6	PC PANELS ON GRID ...		21-07-2010
5	PC PANELS DELETED & CHANGED		15-07-2010
C	ISSUED FOR TENDER		04-07-2010
B	REFERENCES ADDED & CHANGES AS CLOUDED		25-06-2010
A	ISSUED FOR COMMENT		23-06-2010

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designgroup

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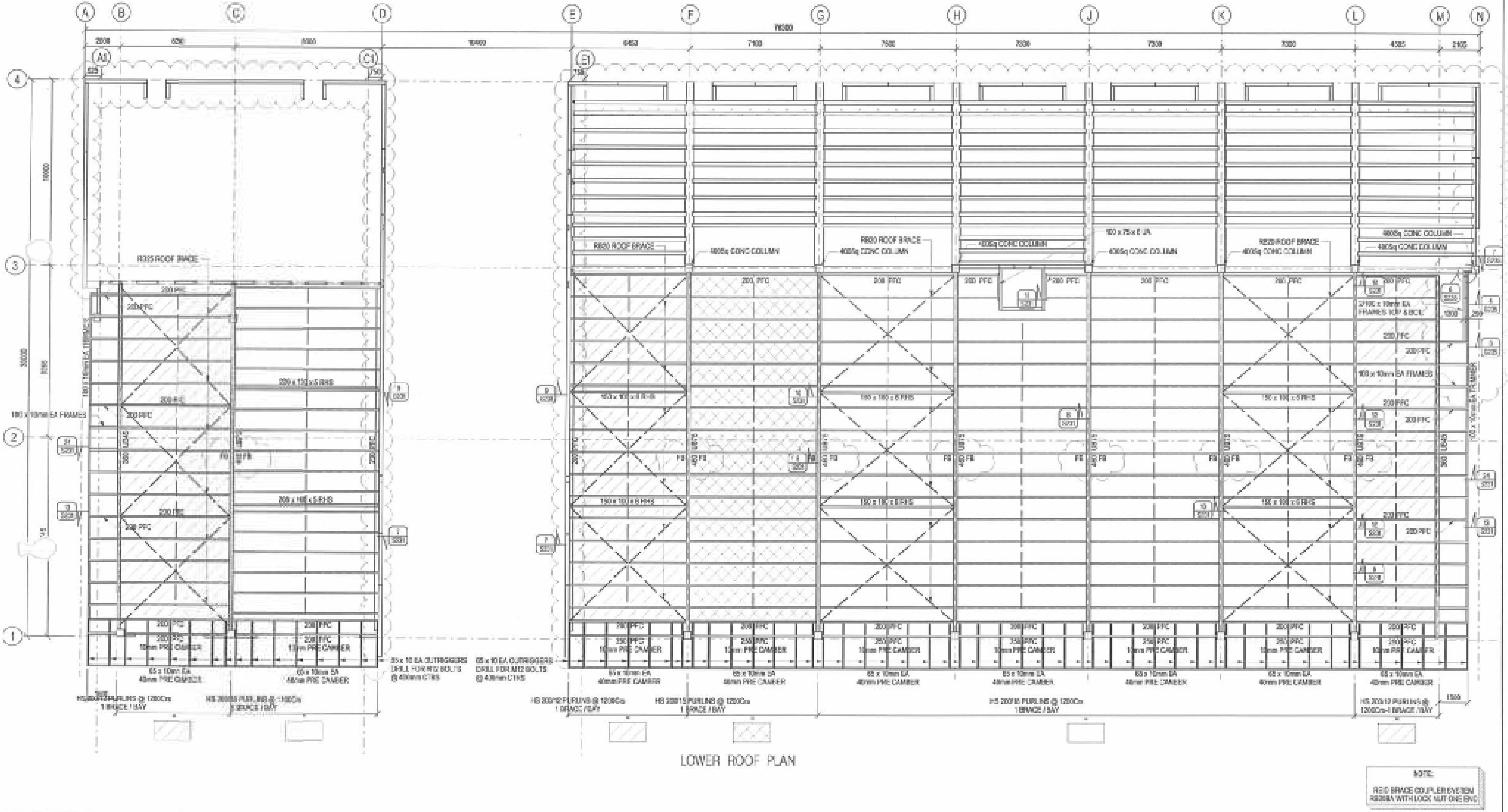
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
FIRST FLOOR SUPPORT & SLAB PLANS
DESIGNGROUP ELLIOTT

DO NOT SCALE. IF IN DOUBT ASK FOR DIMENSIONS

Job No. 105 574

Sheet S201

Rev. G



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HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
LOWER ROOF PLAN
DESIGNGROUP ELLIOTT

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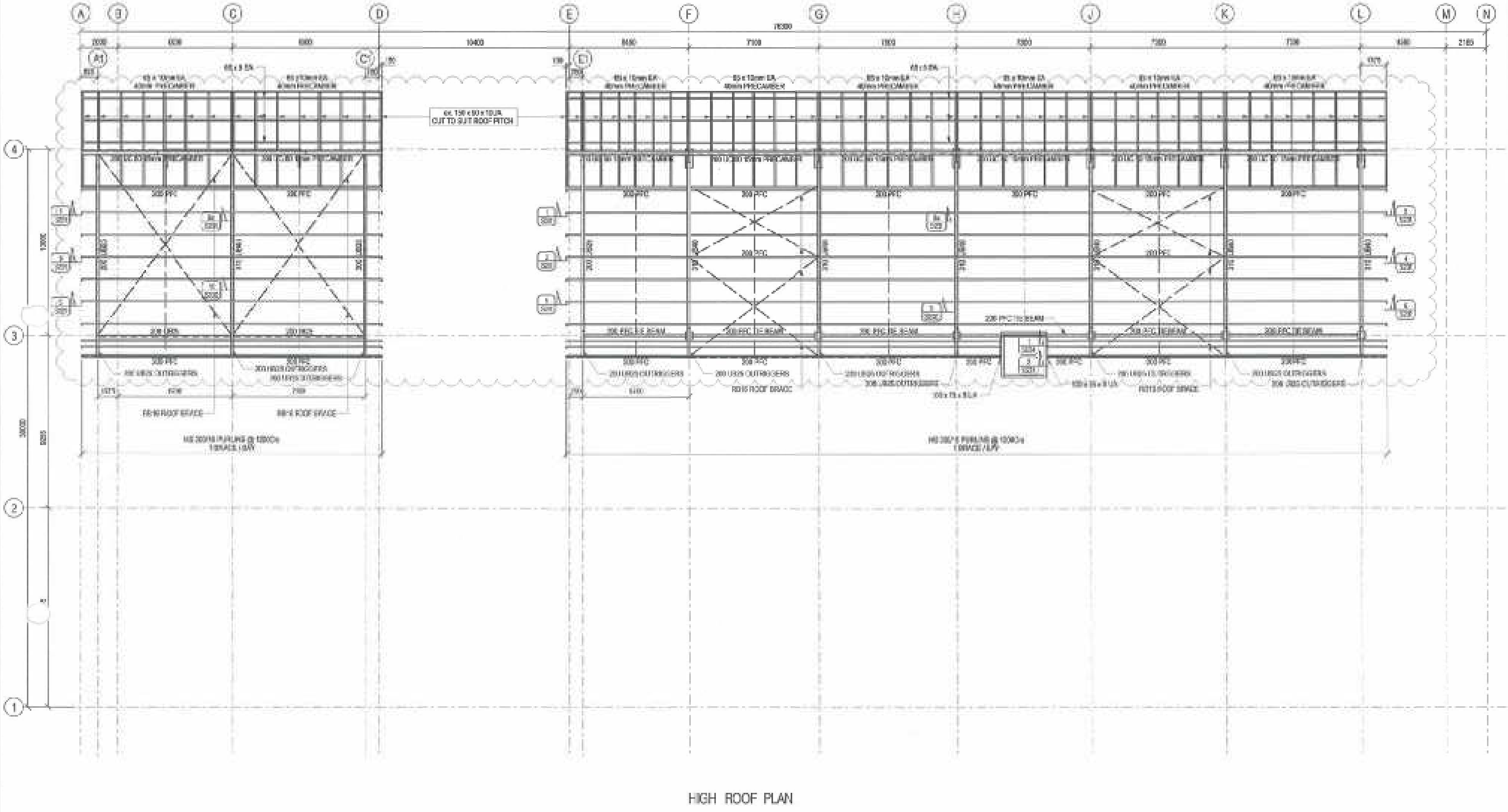
Job No. 105 574

Sheet S202

Rev. F



NOTE:
RB12 BRACE COUPLER SYSTEM
RB16BA WITH LOCK NUT ONE END

The Contractor shall check all dimensions on site.

HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
HIGH ROOF PLAN
DESIGNGROUP ELLIOTT

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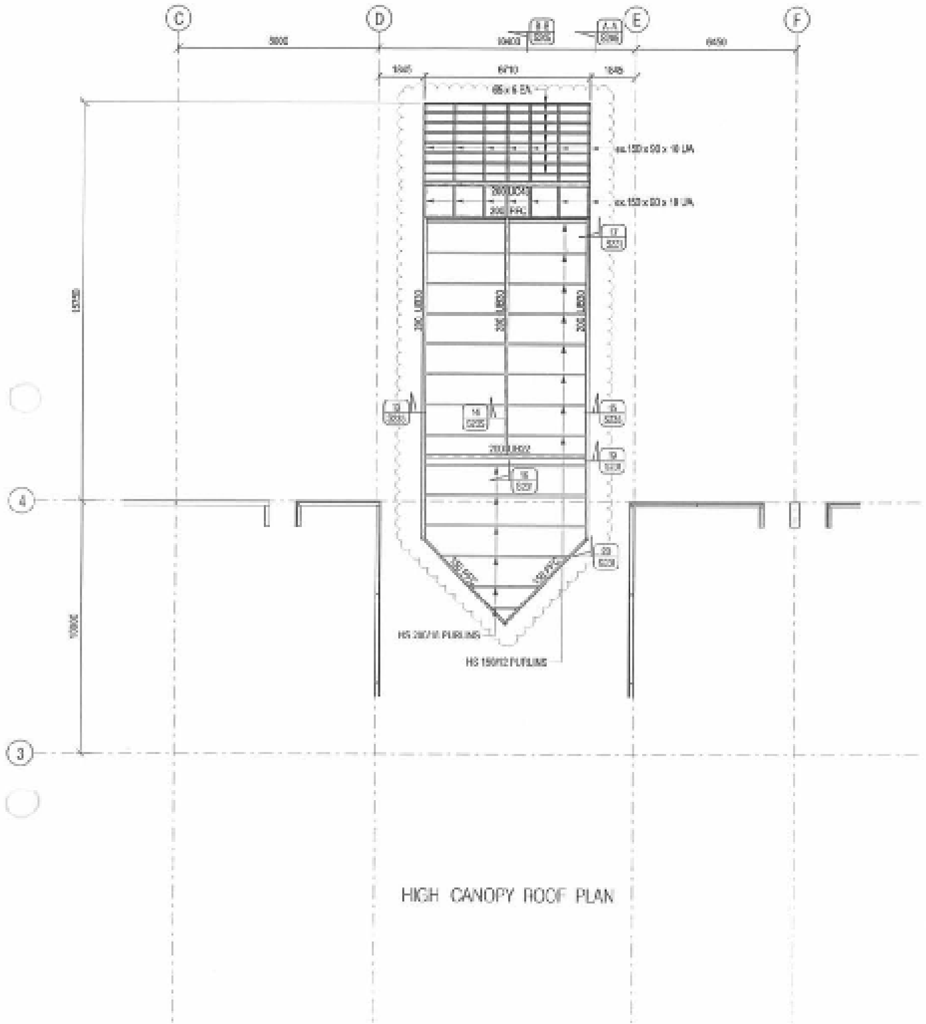
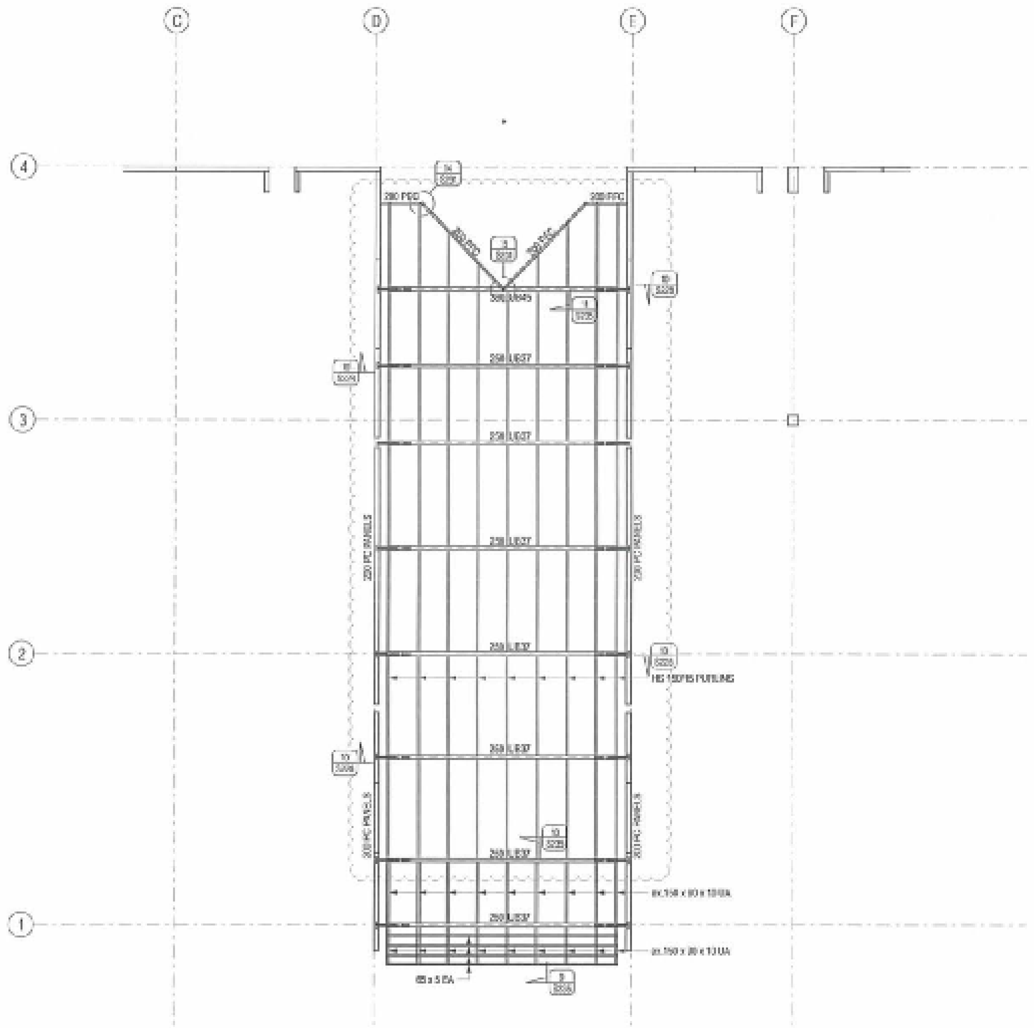
Job No. 105 574

Sheet S203

Rev. G



HIGH CANOPY ROOF PLAN



LOW CANOPY ROOF PLAN

Rev	Details	Chk	Date
[illegible]	ROOF PITCH CHANGED FROM [illegible]		[illegible]
[illegible]	REFERENCES ADDED		[illegible]
[illegible]	[illegible] CHANGES		[illegible]
[illegible]	REFERENCES ADDED		[illegible]
[illegible]	CHANGES AS CHECKED		[illegible]
[illegible]	ISSUED FOR TENDER		[illegible]
[illegible]	ISSUED FOR CONSENT		[illegible]

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designgroup elliott architects

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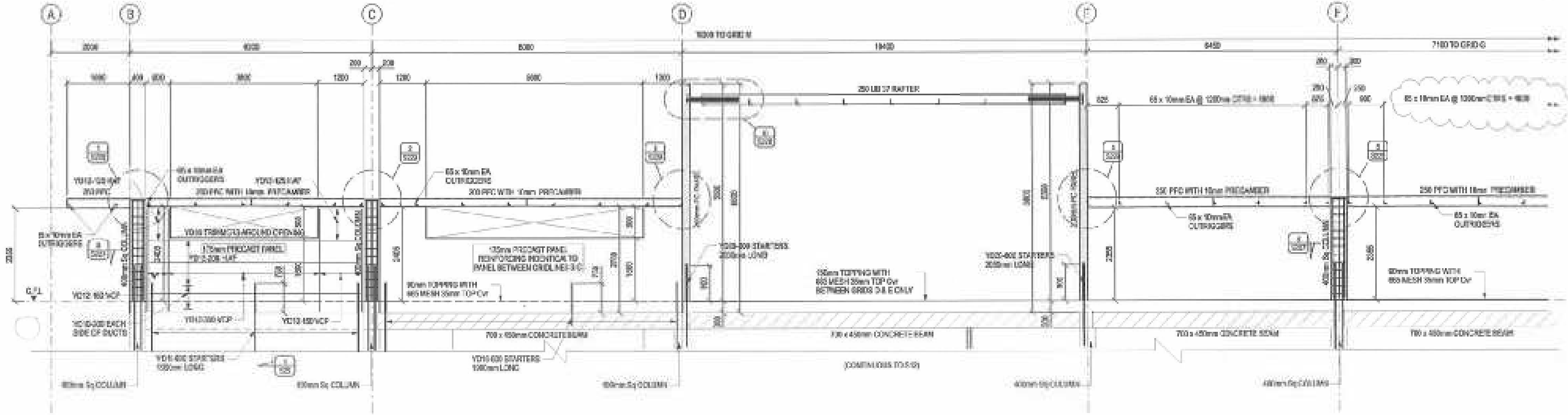
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
CANOPY ROOF PLANS
DESIGNGROUP ELLIOTT

	Initials	Date
Surveyed		
Designed		
Drawn		
Checked		
Approved		

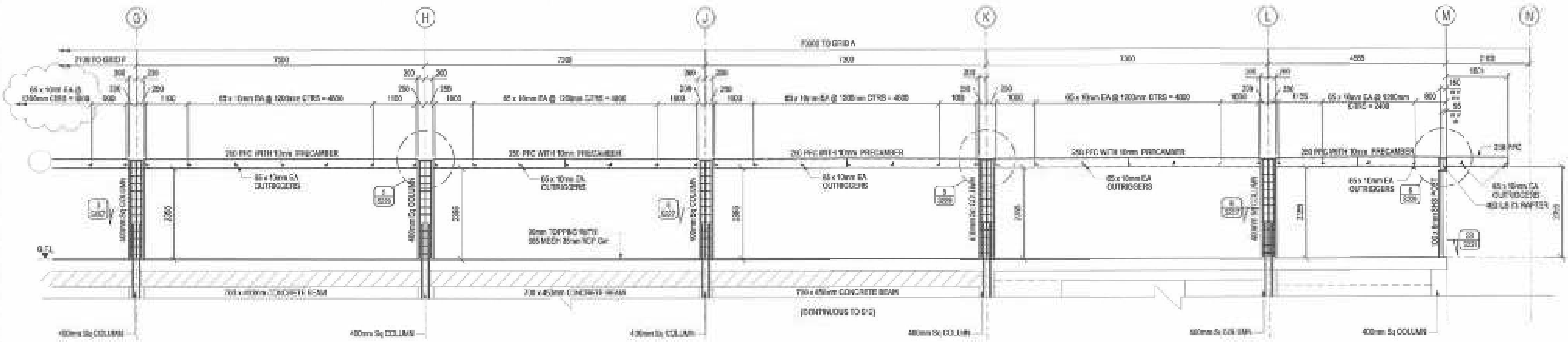
DO NOT SCALE. If in doubt ask for dimensions

Scales A1	Scales A3	Job no.
1:200	1:200	105 574

CAD Path/File	Sheet	of	Sheets	Rev.
	S204			G



PART ELEVATION GRIDLINE 1



PART ELEVATION GRIDLINE 1

NOTE: POST TENSIONING CONTRACTOR SHALL CONFIRM NUMBER OF & TYPE OF TENDONS & TRANSFER LOAD OF 100 kN. ALSO PROVIDE DUCT & GROUTING SPECIFICATION / METHODOLOGY

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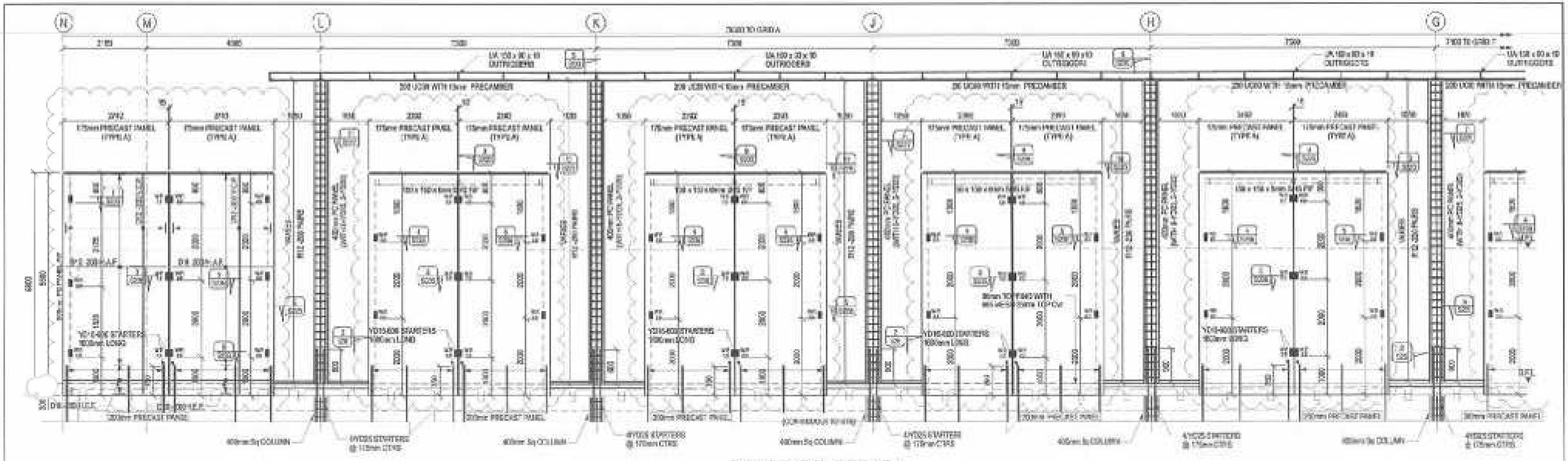
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
ELEVATION GRIDLINE 1 (ABOVE GROUND FLOOR)
DESIGNGROUP ELLIOTT

DO NOT SCALE. If in doubt ask for dimensions

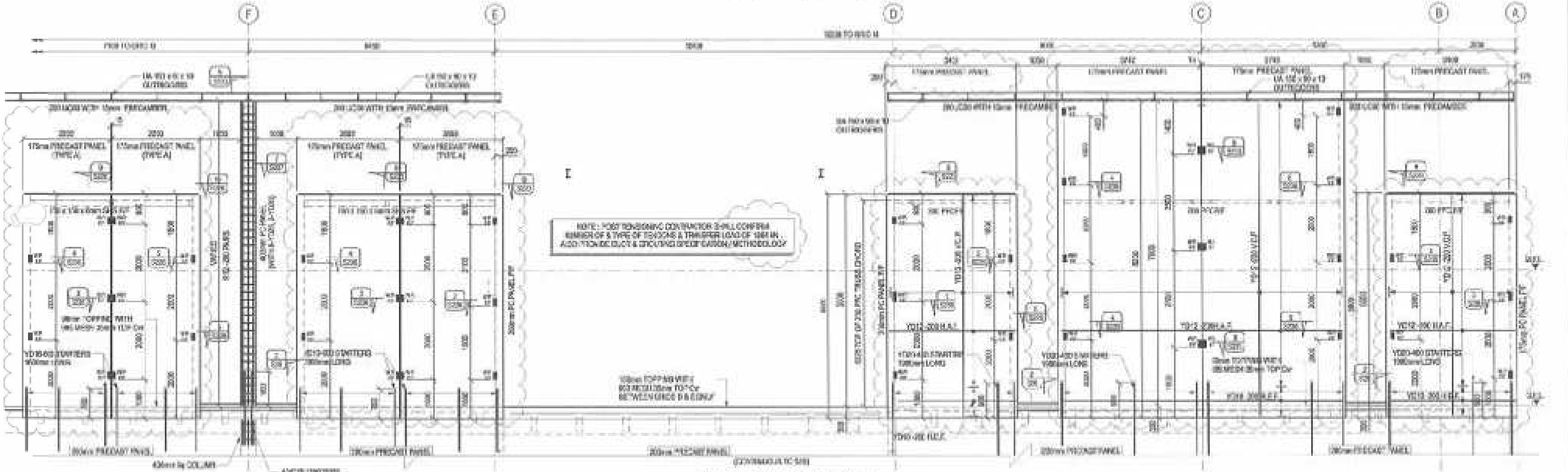
Job No. 105 574

Sheet S211

Rev. F



PART ELEVATION GRIDLINE 4



PART ELEVATION GRIDLINE 4

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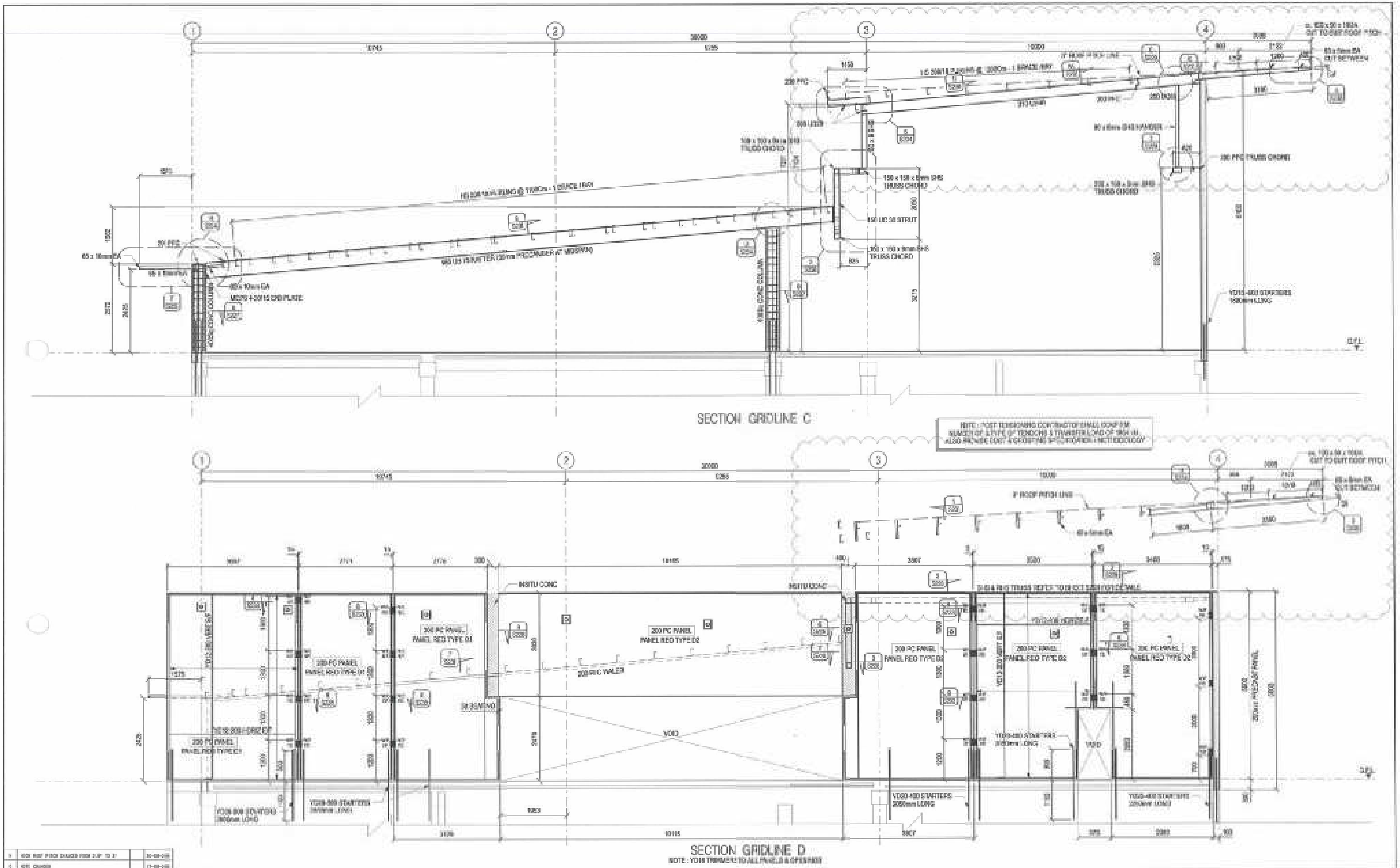
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
ELEVATION GRIDLINE 4 (ABOVE GROUND FLOOR)
DESIGNGROUP ELLIOTT

Job No. 105 574

Sheet S213

Rev F



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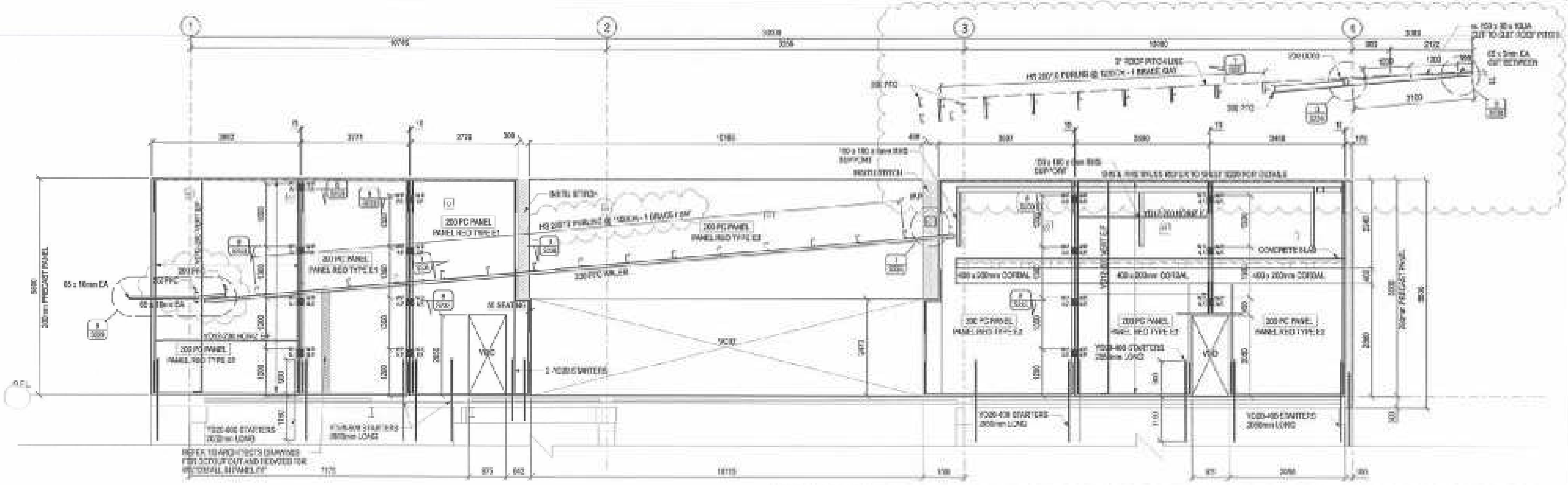
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
SECTION GRIDLINES C & D (ABOVE GROUND FLOOR)
DESIGNGROUP ELLIOTT

DO NOT SCALE. If in doubt ask for dimensions.

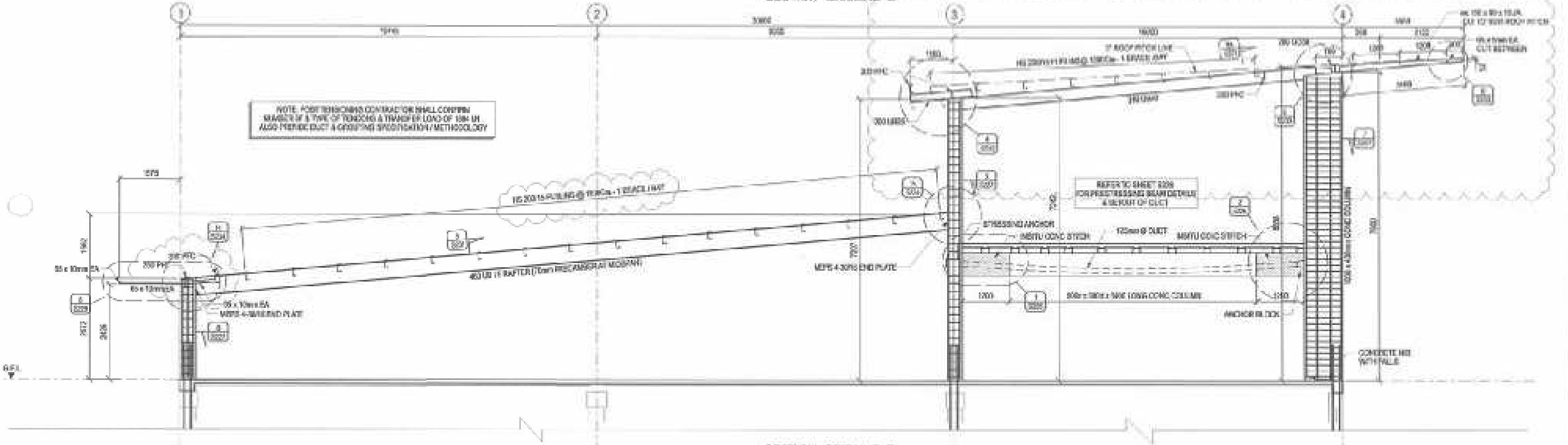
Job No. 105 574

Sheet S215

Rev. H



SECTION GRIDLINE E



SECTION GRIDLINE F

Rev	Details	Chk	Date
G	[illegible]		[illegible]
F	[illegible]		[illegible]
E	[illegible]		[illegible]
D	[illegible]		[illegible]
C	[illegible]		[illegible]
B	[illegible]		[illegible]
A	[illegible]		[illegible]

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The Contractor shall check all dimensions on site.

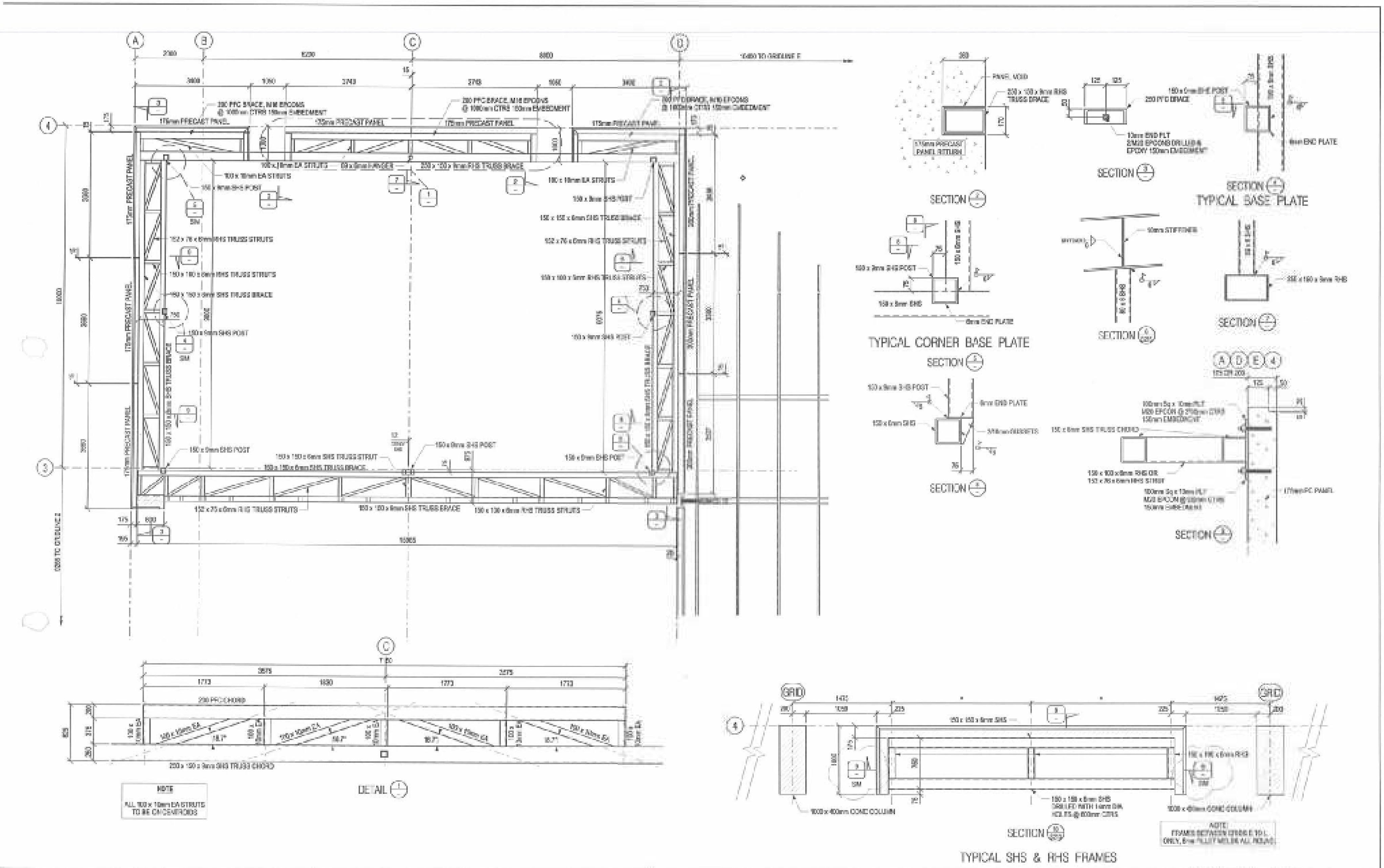
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
SECTION GRIDLINES E & F (ABOVE GROUND FLOOR)
DESIGNGROUP ELLIOTT

DO NOT SCALE.

Job No: 105 574

Sheet: S216

Rev: G



The Contractor shall check all dimensions on site.

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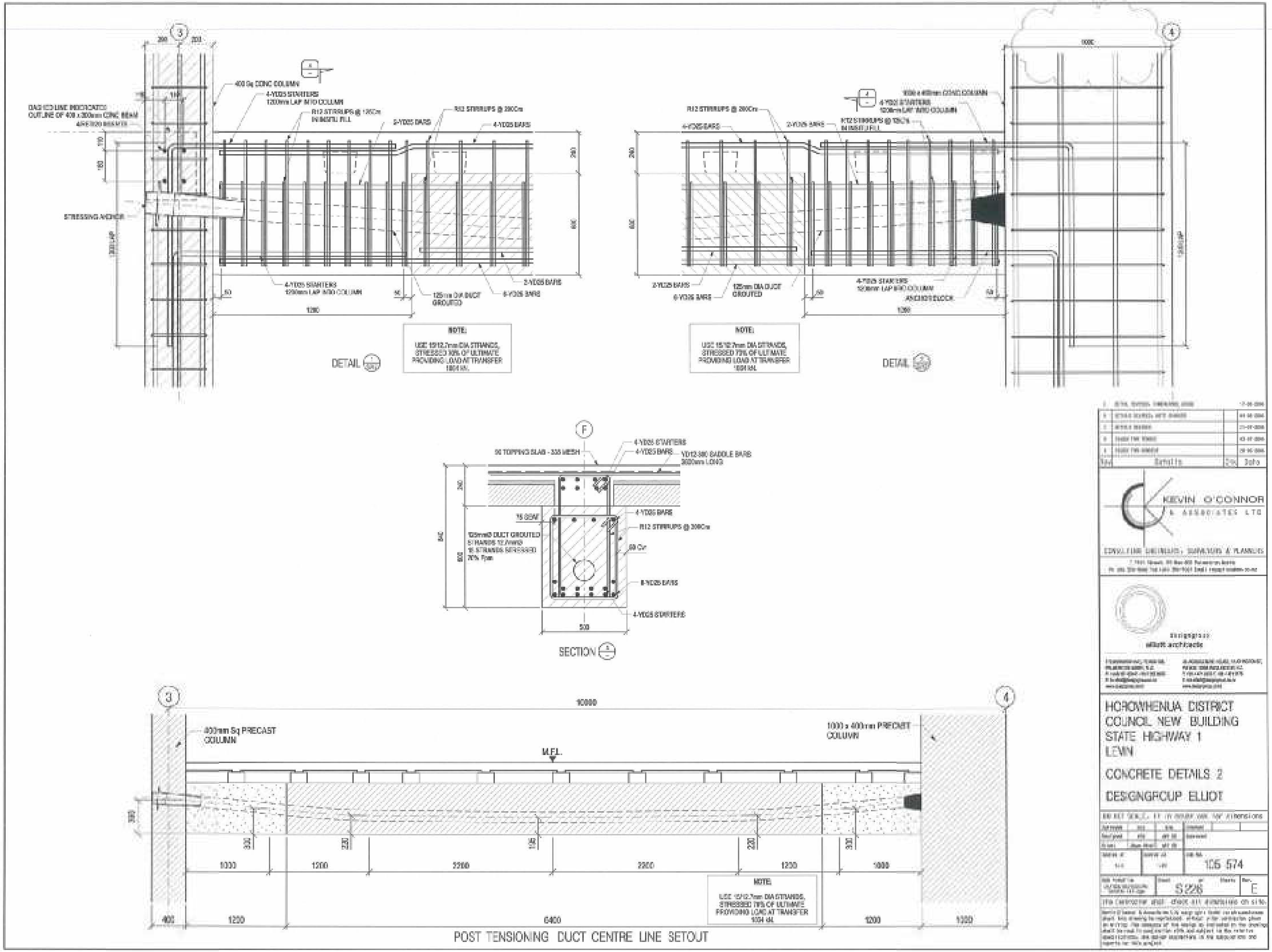
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
PLAN OF TOP OF PANEL RETURNS
DESIGNGROUP ELLIOTT

Job No. 105 574

Sheet S220

Rev. E


400 Sq CONC COLUMN
4-YD25 STARTERS 1200mm LAP INTO COLUMN
R12 STIRRUPS @ 120Crs IN INSITU FILL
2-YD25 BARS
R12 STIRRUPS @ 200Crs
4-YD25 BARS
DASHED LINE INDICATES OUTLINE OF 400 x 300mm CONC BEAM
STRESSING ANCHOR
125mm DIA DUCT GROUTED
6-YD25 BARS
NOTE:
USE 15/12.7mm DIA STRANDS, STRESSED 70% OF ULTIMATE PROVIDING LOAD AT TRANSFER 1004 kN.
DETAIL
1000 x 400mm CONC COLUMN
ANCHOR BLOCK
90 TOPPING SLAB - 335 MESH
4-YD25 STARTERS
YD12-300 SADDLE BARS 3000mm LONG
15 SEAT
125mmØ DUCT GROUTED
R12 STIRRUPS @ 200Crs
8-YD25 BARS
SECTION
400mm Sq PRECAST COLUMN
1000 x 400mm PRECAST COLUMN
M.F.L.
10000
POST TENSIONING DUCT CENTRE LINE SETOUT
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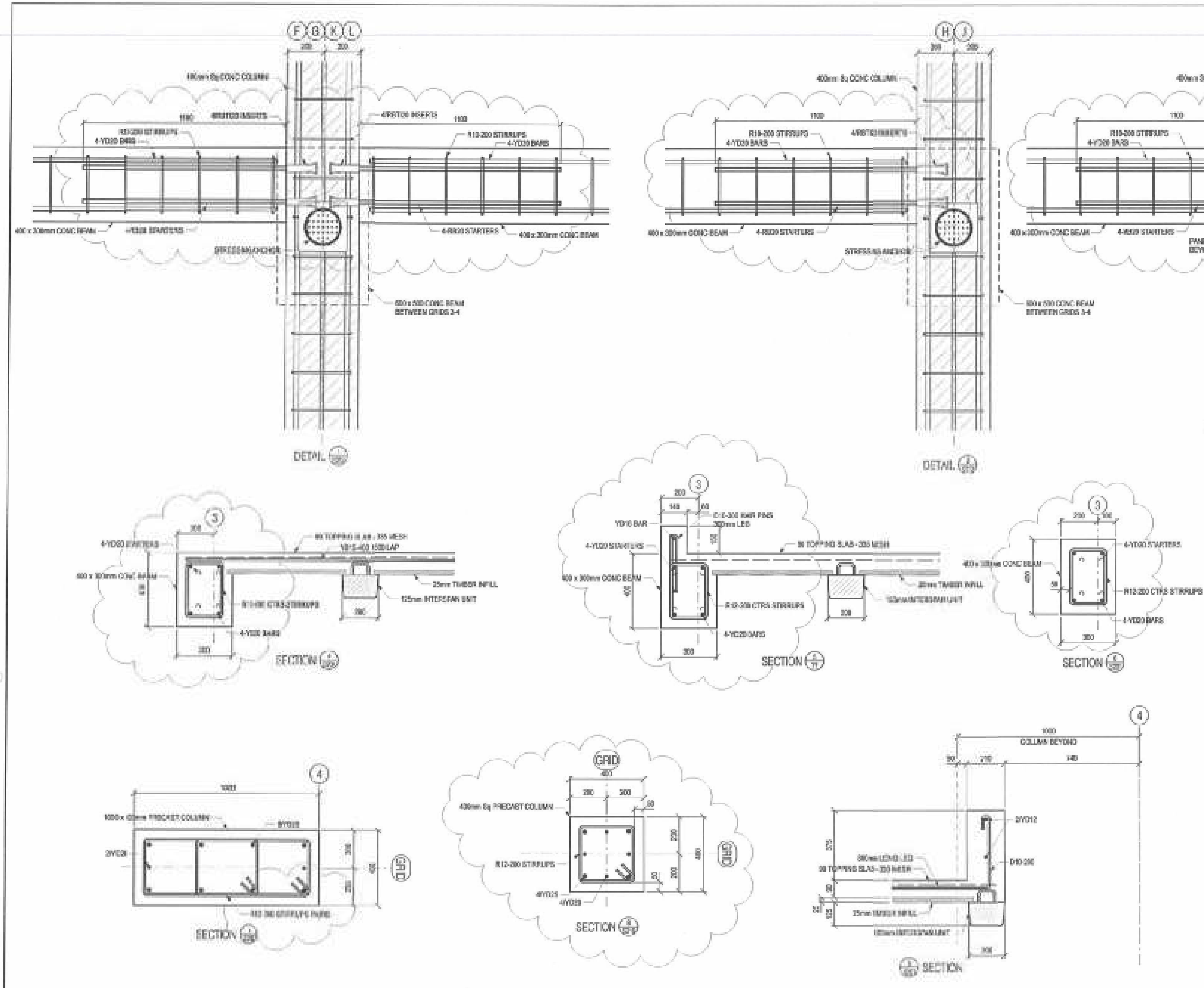
designgroup elliott architects
HOROWHENUA DISTRICT COUNCIL NEW BUILDING STATE HIGHWAY 1 LEVIN
CONCRETE DETAILS 2
DESIGNGROUP ELLIOT
105 574
S226
E



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HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN

CONCRETE DETAILS 3

DESIGNGROUP ELLIOT

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Job No. 105 574

Sheet S 227

Rev D

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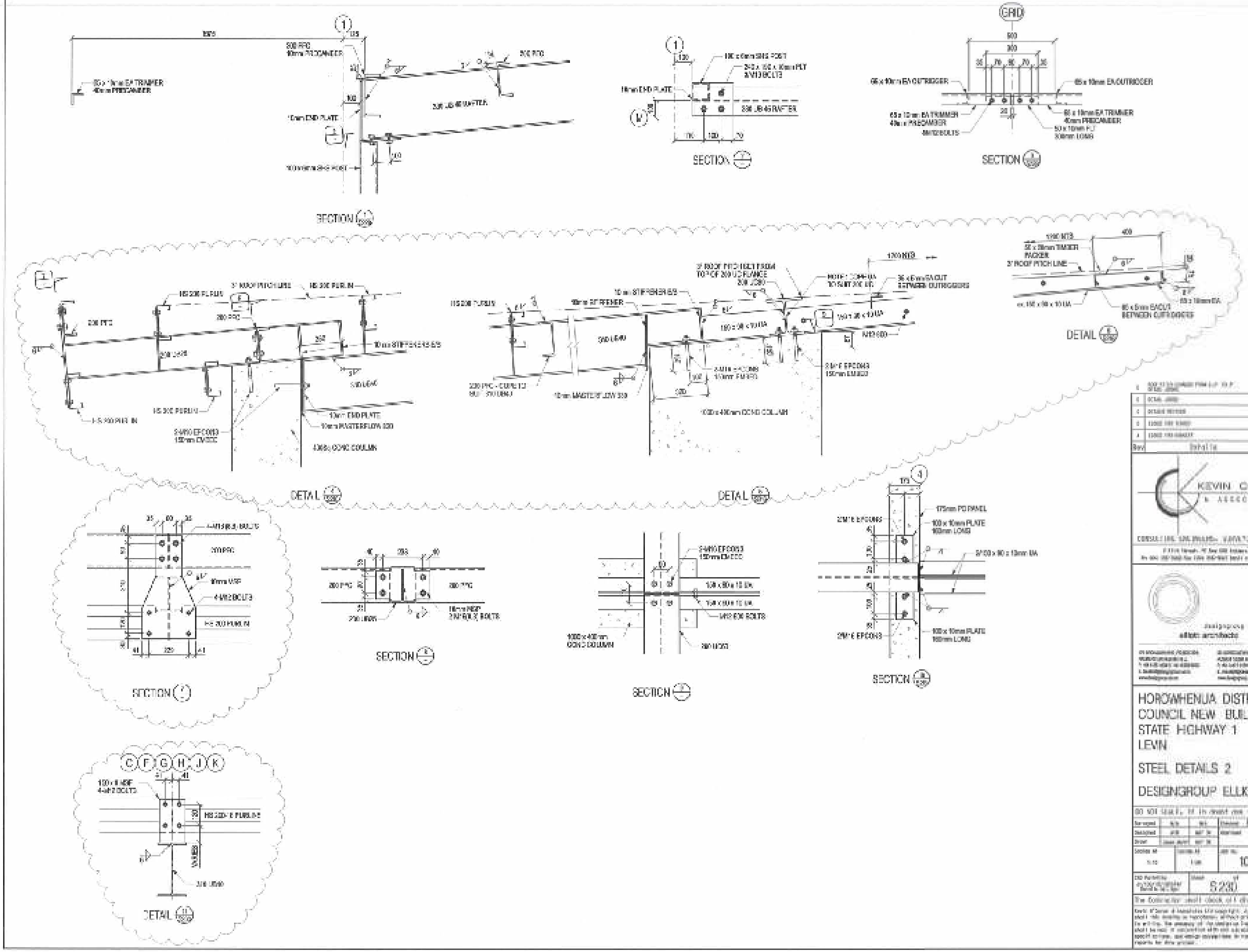

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HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN

STEEL DETAILS 2

DESIGNGROUP ELLIOT

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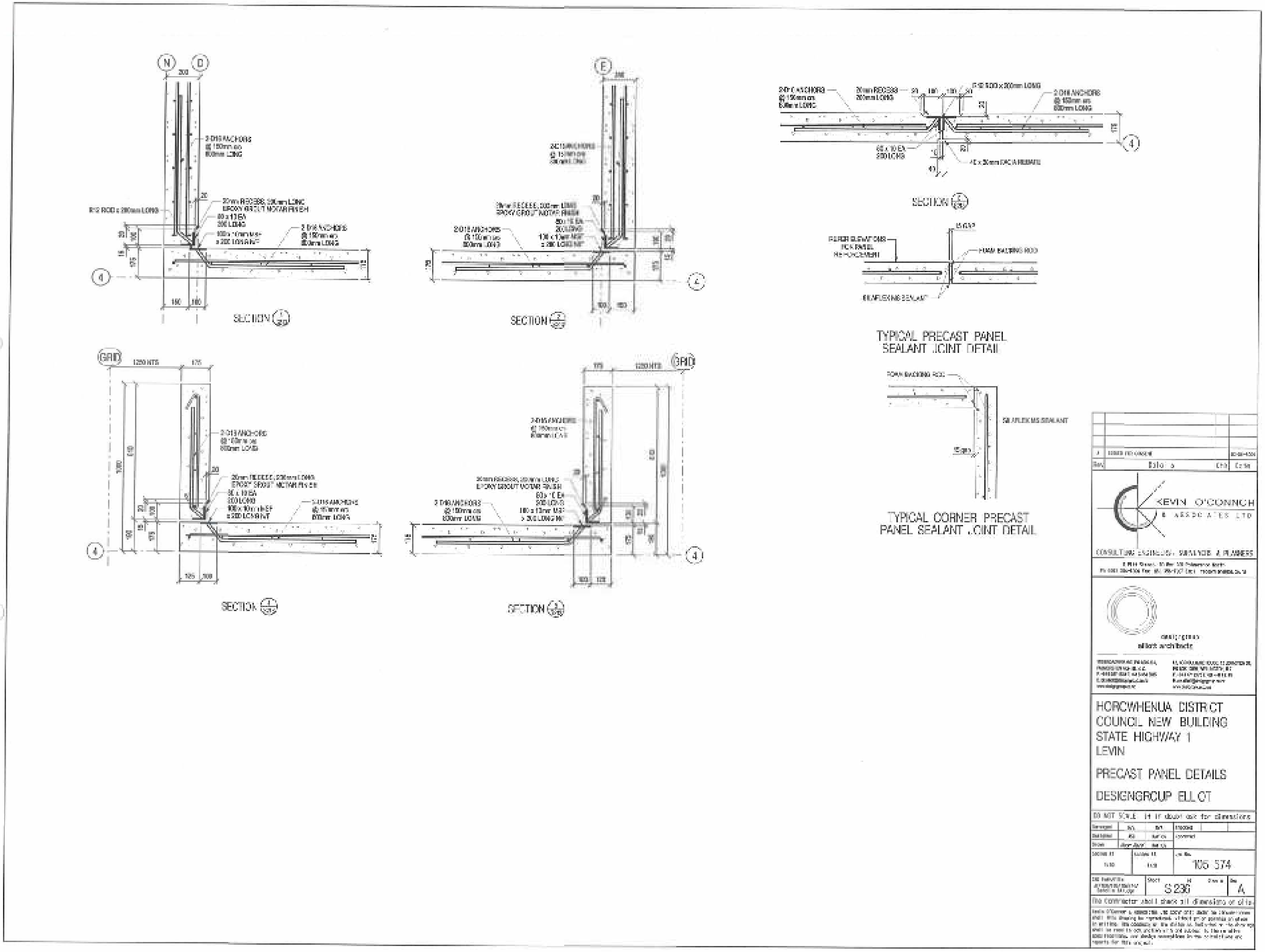
S230

C



SECTION
SECTION
SECTION
SECTION
SECTION
TYPICAL PRECAST PANEL SEALANT JOINT DETAIL
TYPICAL CORNER PRECAST PANEL SEALANT JOINT DETAIL
FOAM BACKING ROD
KEVIN O'CONNOR & ASSOCIATES LTD
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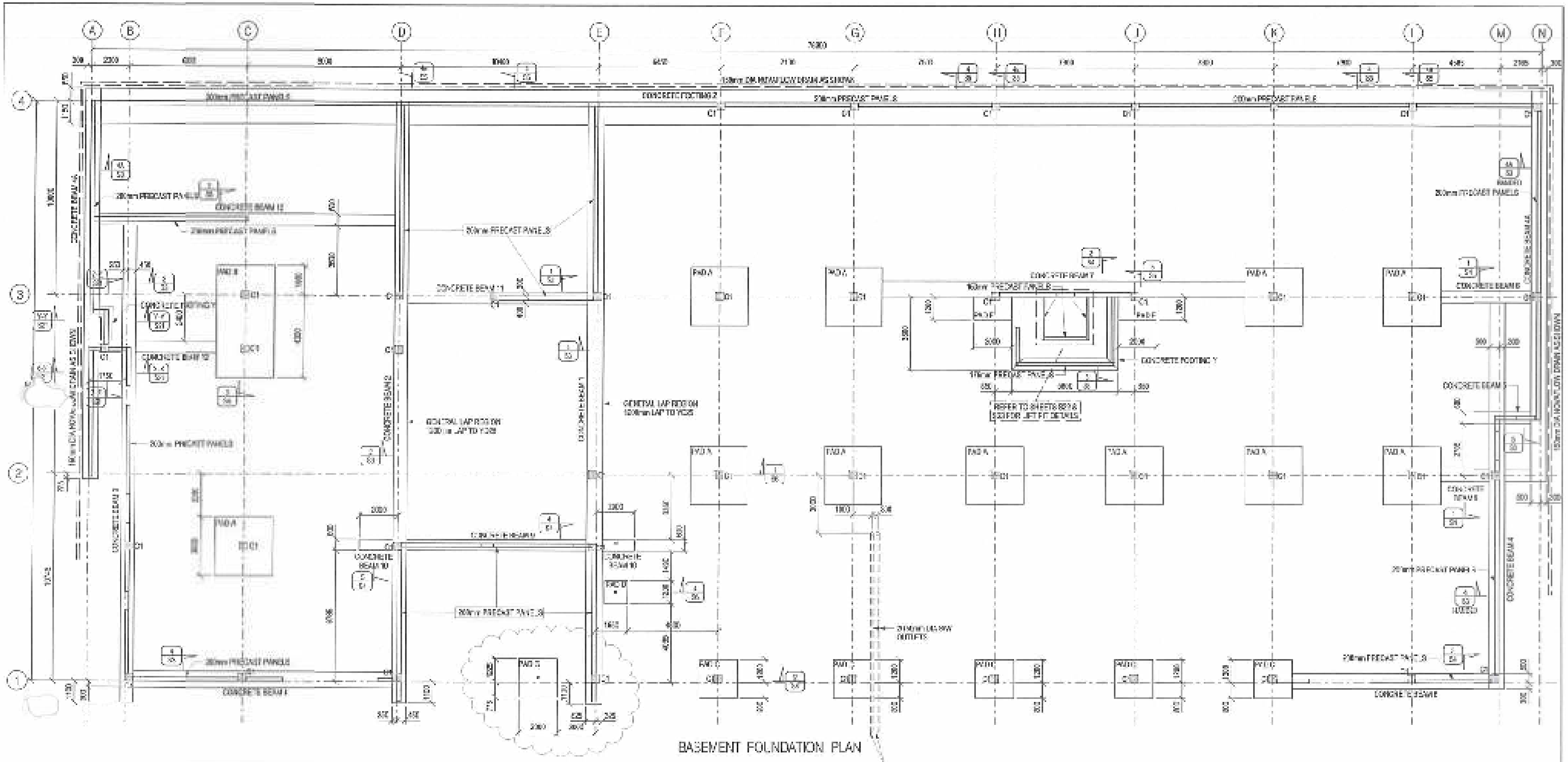
designgroup elliott architects
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
PRECAST PANEL DETAILS
DESIGNGROUP ELLIOT
105 574
S236
A



BASEMENT FOUNDATION PLAN

NEW 150mm DIA SW PIPE @ 1:200 MIN THROUGH FOUNDATION BEAMS CONNECT TO SW TOWN SERVICES AS PART OF STAGE 2.

LEGEND

CONCRETE BEAM 1:	850 x 1500mm DEEP 18 YD25 T & B, 3 ROWS (10+10+8) R12-300 STIRRUPS PAIRS	PAD A:	2800mm Sq x 400mm DEEP YC16-300 EW 50mm TOP CVR YC20-300 EW 75mm BOT. CVR
CONCRETE BEAM 2:	700 x 1200mm DEEP 14 YD25 T & B, 2 ROWS (8+6) R12-300 STIRRUPS PAIRS	PAD B:	5500 x 2000 x 400mm DEEP YC16-300 EW 50mm TOP CVR YC20-300 EW 75mm BOT. CVR
CONCRETE BEAM 3:	700 x 1200mm DEEP 14 YD25 T & B, 2 ROWS (8+6) R12-300 STIRRUPS	PAD C:	2000mm Sq x 400mm DEEP YC16-300 EW 50mm TOP CVR YC16-300 EW 75mm BOT. CVR
CONCRETE BEAM 4:	300 x 1200mm DEEP 15 YD25 T & B, 2 ROWS (10+5) R12-250 STIRRUPS PAIRS	PAD D:	1200mm Sq x 400mm DEEP 6YD16 EW 50mm TOP CVR & 75mm BOT. CVR
CONCRETE BEAM 5:	300 x 1200mm DEEP 6 YD25 T & B R12-300 STIRRUPS	PAD F:	2000 x 1200 x 400mm DEEP YC16-300 EW 50mm TOP CVR YC20-300 EW 75mm BOT. CVR
CONCRETE BEAM 6:	600 x 1000mm DEEP 11 YD25 T & B, 2 ROWS (6+5) R12-300 STIRRUPS PAIRS		
CONCRETE BEAM 7:	600 x 1200mm DEEP 11 YD25 T & B, 2 ROWS (6+5) R12-300 STIRRUPS PAIRS		
CONCRETE BEAM 8:	600 x 1000mm DEEP 11 YD25 T & B, 2 ROWS (6+5) R12-300 STIRRUPS PAIRS		
CONCRETE BEAM 9:	300 x 600mm DEEP 6 YD25 T & B R12-300 STIRRUPS		
CONCRETE BEAM 10:	600 x 800mm DEEP 8 YD25 T & B R12-150 STIRRUPS PAIRS		
CONCRETE BEAM 11:	600 x 600mm DEEP 18 YD25 T & B, 3 ROWS (6+6) R12-300 STIRRUPS PAIRS		
CONCRETE BEAM 12:	600 x 1000mm DEEP 11 YD25 T & B, 2 ROWS (6+5) R12-300 STIRRUPS PAIRS		
CONCRETE FOOTING Y:	1600 x 400mm DEEP 4YC25 T & B, 75mm BOT CVR 50mm TOP CVR, R10-300 STIRRUPS		
CONCRETE FOOTING Z:	1100 x 400mm DEEP 5YC25 T & B, 75mm BOT CVR 50mm TOP CVR, R10-150 STIRRUPS		
C1:	400mm Sq CONCRETE COLUMN 4YD25 + 4Y 20, R10-200 STIRRUPS		

NOTE:

STAGE 1 INCLUDES ALL FOUNDATION, BASEMENT AND GROUND FLOOR WORK INCLUDING STARTERS TO GROUND FLOOR PRECAST WALLS AND COLUMNS. GROUND FLOOR PRECAST WALLS AND COLUMNS ARE PART OF STAGE 2 WORKS.

Rev	Details	Chk	Date
F	FOUNDATION PLAN LOCKED		
E	ISSUED FOR CONSTRUCTION		
D	ISSUED COLUMN ADDED		
C	NOTE CHANGED, STORMWATER ADDED		
B	ISSUED FOR TENDER – CHANGES AS SHOWN		
A	ISSUED FOR CONSENT		

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DESIGNGROUP ELLIOTT

The Contractor shall check all dimensions on site.

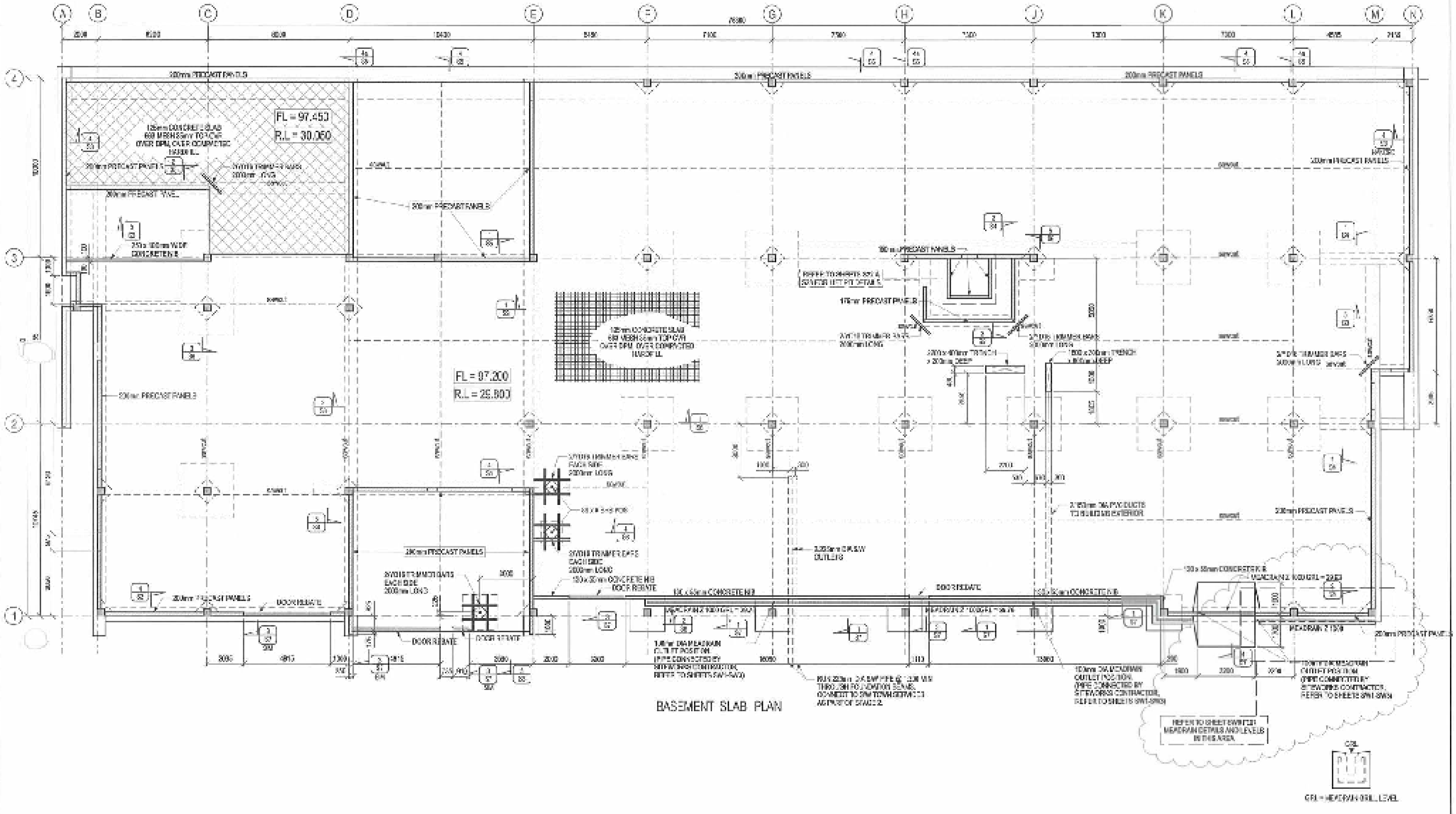
HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
BASEMENT FOUNDATION PLAN
DESIGNGROUP ELLIOTT

DO NOT SCALE. If in doubt ask for dimensions.

Job no.: 105 574

Sheet: S1

Rev.: F



NOTE:

STAGE 1 INCLUDES ALL FOUNDATION, BASEMENT AND GROUND FLOOR WORK INCLUDING STARTERS TO GROUND FLOOR PRECAST WALLS AND COLUMNS. GROUND FLOOR PRECAST WALLS AND COLUMNS ARE PART OF STAGE 2 WORKS

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HOROWHENUA DISTRICT COUNCIL NEW BUILDING

STATE HIGHWAY 1

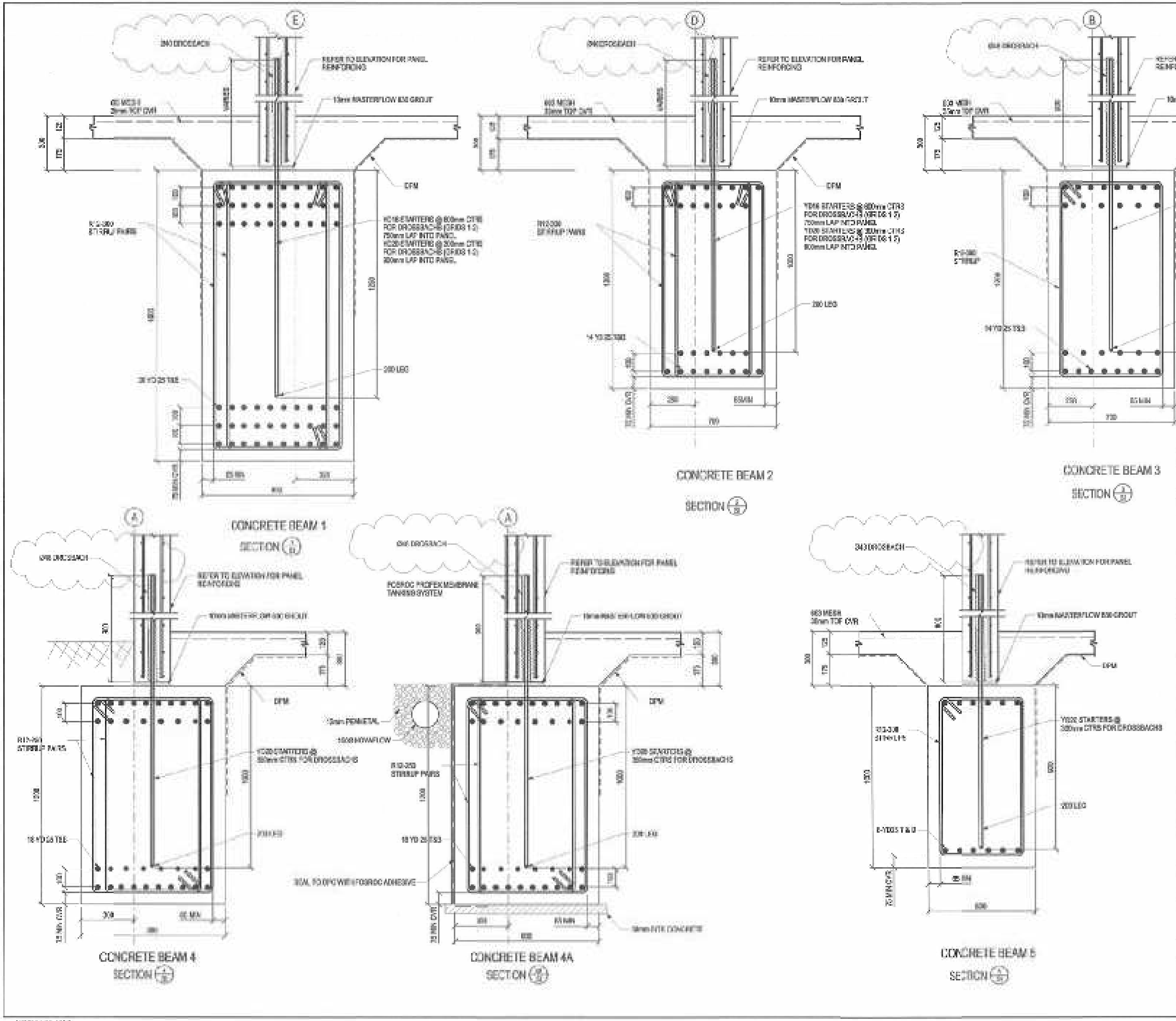
LEVIN

BASEMENT SLAB PLAN

DESIGNGROUP ELLIOTT

DO NOT SCALE. If in doubt ask for dimensions

Job No.	Sheet	Rev.
105 574	S2	K



C		
B	ISSUED FOR PRICING - CHANGES AS CLOUDED	
A	ISSUED FOR CONSENT	
Rev	Details	Chk. Date

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designgroup elliot architects

HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
BASEMENT DETAILS 1

DESIGNGROUP ELLIOT

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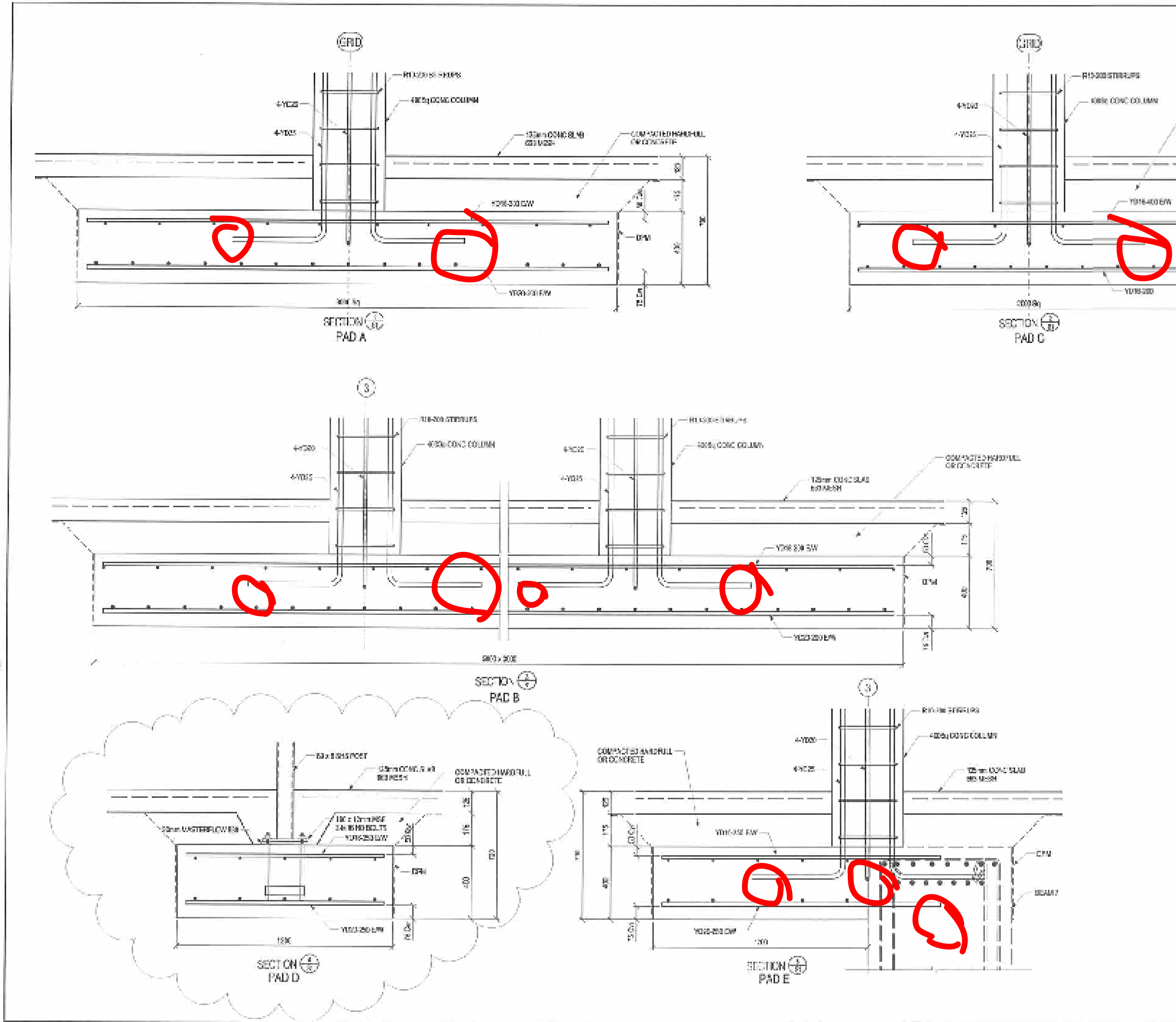
Job No. 105 574

Sheet S3 Rev. C

The Contractor shall check all dimensions on site.

[FOR PD USE ONLY]



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designgroup elliott architects

HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN
BASEMENT DETAILS 4

DESIGNGROUP ELLIOT

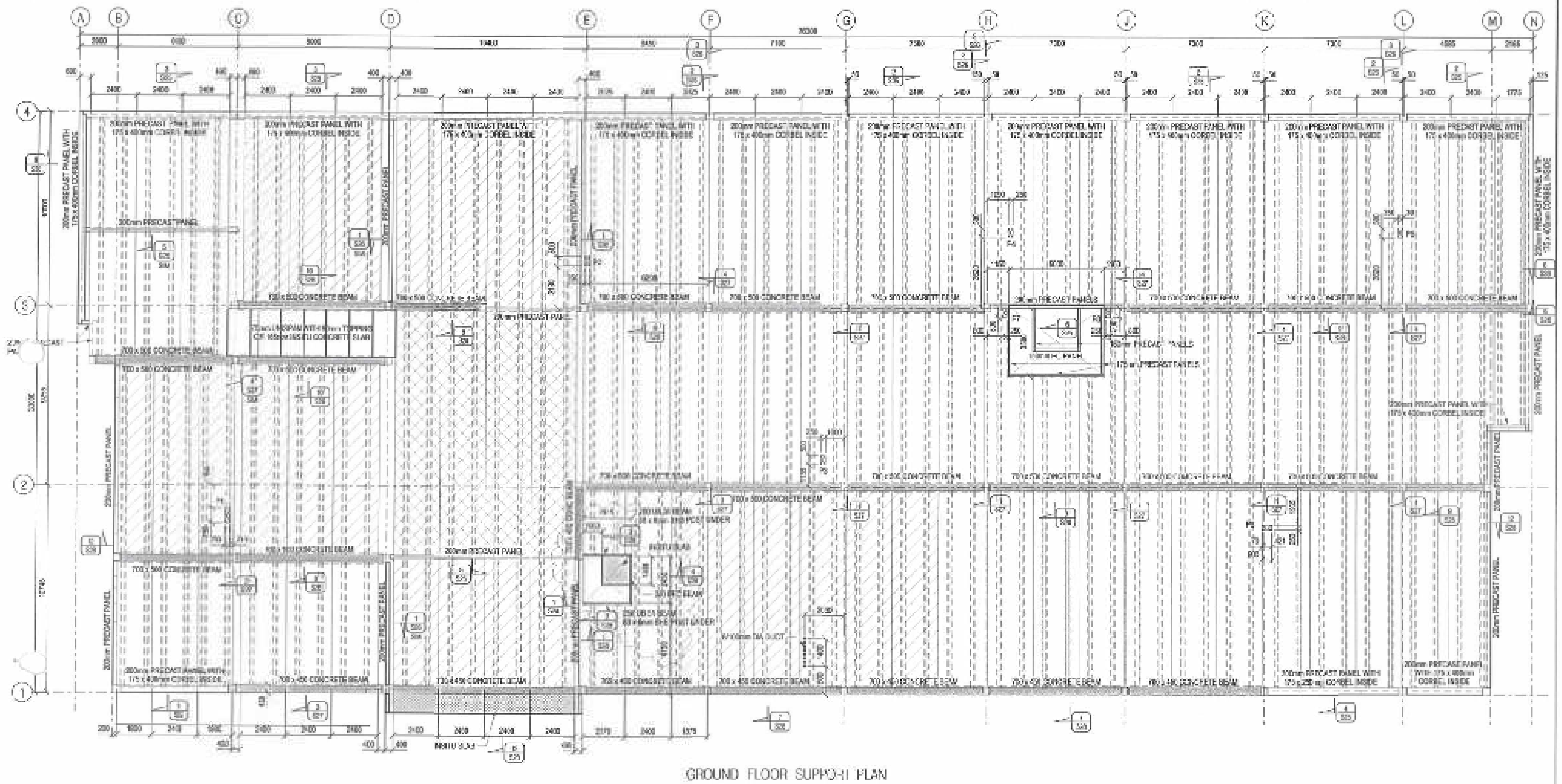
DO NOT SCALE. If in doubt ask for dimensions

Job No. 105 574

Sheet 56

Rev D

The Contractor shall check all dimensions on site.



LEGEND:

VOID

200 DOUBLE 'T' UNITS (NO HATCH)

400 DOUBLE 'T' UNITS

300 DOUBLE 'T' UNITS

NOTE:

STAGE 'F' INCLUDES ALL FOUNDATION, BASEMENT AND GROUND FLOOR WORK INCLUDING STARTERS TO GROUND FLOOR PRECAST WALLS AND COLUMNS. GROUND FLOOR PRECAST WALLS AND COLUMNS ARE PART OF STAGE 'D' WORKS.

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HOROWHENUA DISTRICT COUNCIL NEW BUILDING

STATE HIGHWAY 1

LEVIN

GROUND FLOOR SUPPORT PLAN

DESIGNGROUP ELLIOTT

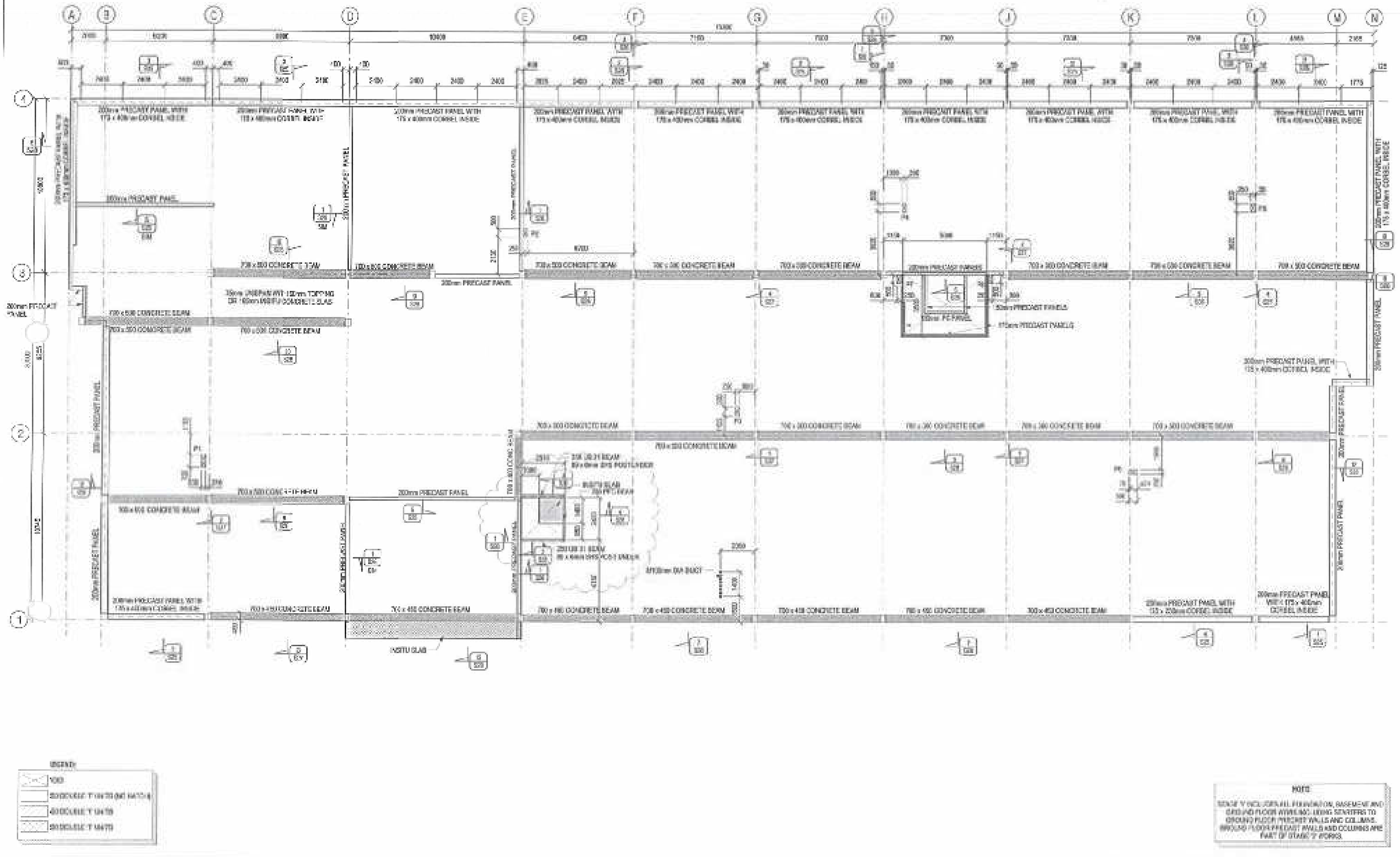
DO NOT SCALE. If in doubt ask for dimensions

Job No. 105 574

Sheet S10

Rev. G

Details	Chk	Date



NOTE

STAGE 'I' INCLUDES ALL FOUNDATION, BASEMENT AND GROUND FLOOR WORKS INCLUDING STARTERS TO GROUND FLOOR PRECAST WALLS AND COLUMNS. GROUND FLOOR PRECAST PANELS AND COLUMNS ARE PART OF STAGE 2 WORKS.

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DESIGNGROUP ELLIOTT

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HOROWHENUA DISTRICT COUNCIL NEW BUILDING

STATE HIGHWAY 1

LEVIN

GROUND FLOOR SUPPORT PLAN

DESIGNGROUP ELLIOTT

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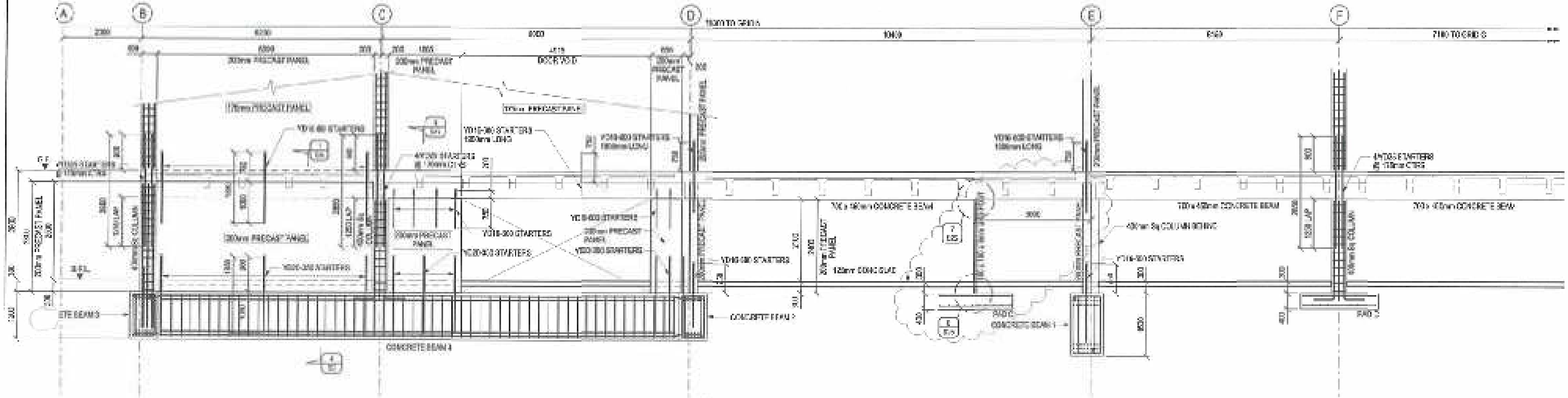
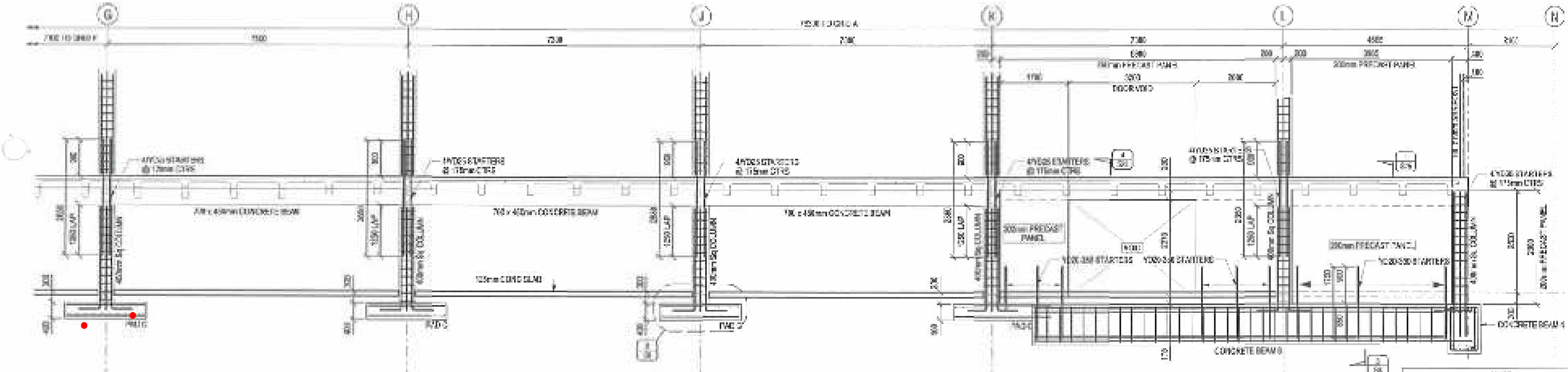
Job No. 105 574

Sheet S10A

Rev. C



PART ELEVATION GRIDLINE 1



PART ELEVATION GRIDLINE 1

200mm PRECAST PANEL REINFORCING FOR GRIDLINE 1

TYPICAL 400mm Sq COLUMN REINFORCING

4YD25 & 4YD20 VERT

R10-200 STIRRUPS

NOTE

STAGE 1 INCLUDES ALL FOUNDATION, BASEMENT AND GROUND FLOOR WORK INCLUDING STARTERS TO GROUND FLOOR PRECAST WALLS AND COLUMNS. GROUND FLOOR PRECAST WALLS AND COLUMNS ARE PART OF STAGE 2 WORKS.

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HOROWHENUA DISTRICT COUNCIL NEW BUILDING

STATE HIGHWAY 1

LEVIN

ELEVATION GRIDLINE 1

DESIGNGROUP ELLIOTT

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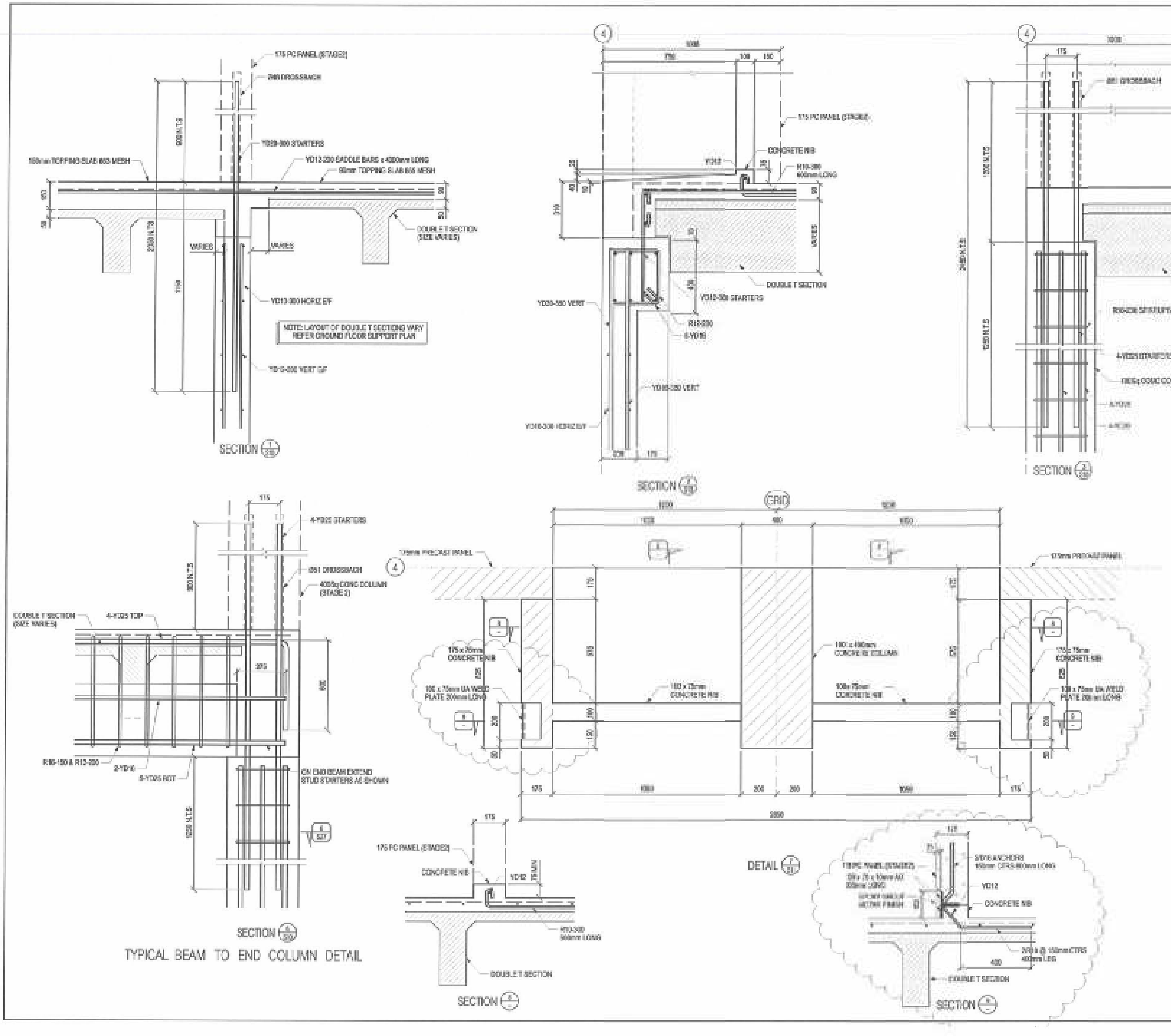
	Initials	Date
Surveyed		
Designed		
Drawn		
Checked		
Approved		

Job No. 105 574

Sheet S12



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HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN

DETAILS 2

DESIGNGROUP ELLIOT

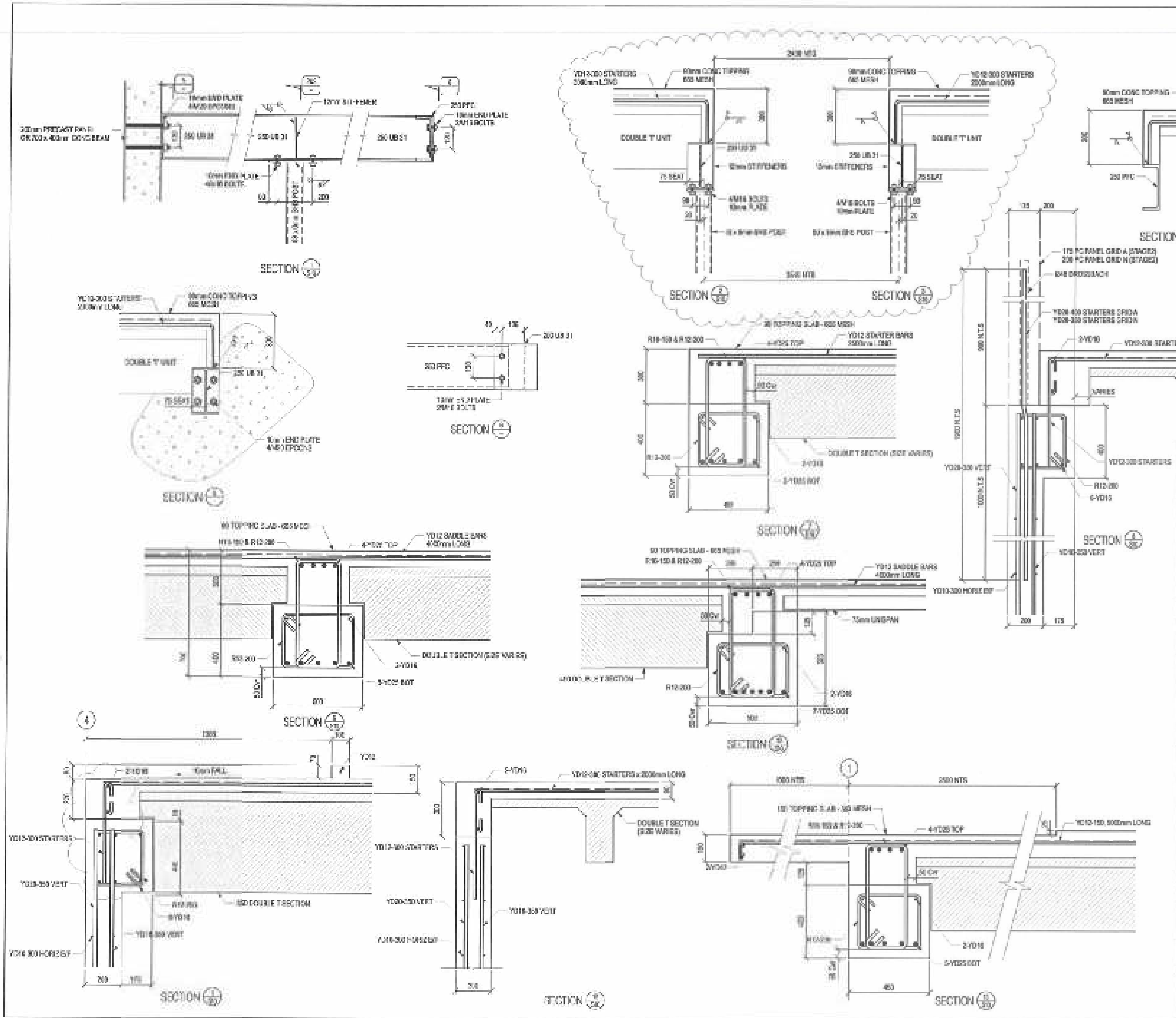
DO NOT SCALE, if in doubt ask for dimensions

106 574

S26

G

The Contractor shall check all dimensions on site.



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HOROWHENUA DISTRICT COUNCIL NEW BUILDING
STATE HIGHWAY 1
LEVIN

DETAILS 4

DESIGNGROUP ELLIOT

DO NOT SCALE. If in doubt ask for dimensions

Job No. 106 574

Sheet S26

Rev. D

The Contractor shall check all dimensions on site.

Appendix D

Photographs

Figure 1Street View of Horowhenua District Council Building

Figure 2Street View of Entry and Council Chamber

Figure 3View of south side of building

Figure 4Cold Joint movement Cracks on Grid 1

Figure 5 Beam joint movement at intersection Grid B and Grid 2

Figure 6Movment in Joint between panel and Column at intersection of Grid A and Grid 3


Figure 7 Floor Wall intersection in basement typical movement defect.