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Hornby Courts Block A

BU 1580-001 EQ2

Detailed Engineering Evaluation

Quantitative Report

Version FINAL

2 Goulding Avenue, Hornby

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Hornby Courts Block A
BU 1580-001 EQ2

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Quantitative Report
Version FINAL

2 Goulding Avenue, Hornby

Christchurch City Council

Prepared By
Mirjana Hrnjak

Reviewed By
Stephen Lee

Date
31th October 2012

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Hornby Courts Block A

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Detailed Engineering Evaluation

Quantitative Report - SUMMARY

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Background

This is a summary of the Quantitative report for the building structure, and is based in general on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 18th January 2012 and available drawings itemised in 5.2.

Building Description

Hornby Courts Block A is located at 2 Goulding Avenue, in the western Christchurch within the suburb of Hornby. The building is a 2-storey RC structure, consisting of a communal block and multi-unit residential block. The building was constructed on 2001.

Key Damage Observed

Key damage observed includes:-

- Minor cracks at staircase located between the communal block and residential block
- Minor cracks at window corners at lower floors in the communal block of the building
- Cracks at suspended slab connected to the steel columns in the communal block of the building.

Building Capacity Assessment

Based on the results of the quantitative assessment the building scored 70% NBS. Therefore the building is not Earthquake Risk.

Recommendation

No further work is recommended by GHD and the building can remain occupied.

1. Background

GHD has been engaged by Christchurch City Council (CCC) to undertake a detailed engineering evaluation of Hornby Courts Block A.

This report is a Quantitative Assessment of the building structure, and is based in general on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

2. Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

2.1 Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status and amount of damage
- The age and structural type of the building
- Consideration of any critical structural weaknesses
- The extent of any earthquake damage

2.2 Building Act

Several sections of the Building Act are relevant when considering structural requirements:

Section 112 – Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67% NBS however where practical achieving 100% NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67% NBS.

2.2.1 Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- There is a risk that other property could collapse or otherwise cause injury or death; or
- A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

2.3 Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

We anticipate that any building with a capacity of less than 33% NBS (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67% NBS of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply 'as near as is reasonably practicable' with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

2.4 Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

- Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
- Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

3. Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

The likely capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a buildings capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	Unacceptable	Unacceptable

Figure 1. NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE

Table 1 compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

Figure 2. %NBS compared to relative risk of failure

4. Building Description

4.1 General

Hornby Courts Block A is located at 2 Goulding Avenue, in the western Christchurch within the suburb of Hornby. The building is located south of Main South Line and north of Hornby Library.

The subject site is predominantly flat and surrounded by residential and commercial properties and bordered to the north by Goulding Avenue.

Hornby Courts Block A is a 2-storey building consisting of a communal block and multi-unit residential block. The building was constructed on 2001. The building houses eight residential units at the residential block and 1 residential unit at the communal block; hence the building is an importance level 2 building. A concrete staircase is located between the communal block and residential block to the northeast, and a steel staircase to the southwest end. The car park lot is directly adjacent to the building.

The multi-unit residential block consists of precast RC walls as unit partitions. Lightweight timber framing forms both the internal unit and some external walls on the long sides. Internal wall linings consist of timber frames lined with plasterboard. The roof cladding is composed of metal roofing. The roof structure consists of the timber rafters with timber purlins supporting the roof.

Brick cladding is used to the exterior walls located at the northeast and southeast of the building.

The dimensions of the building are approximately 42m long, 15m wide and 7m in height. The overall footprint of the building is approximately 630m^2.

Sketch of key details are shown in Figure 4.1.

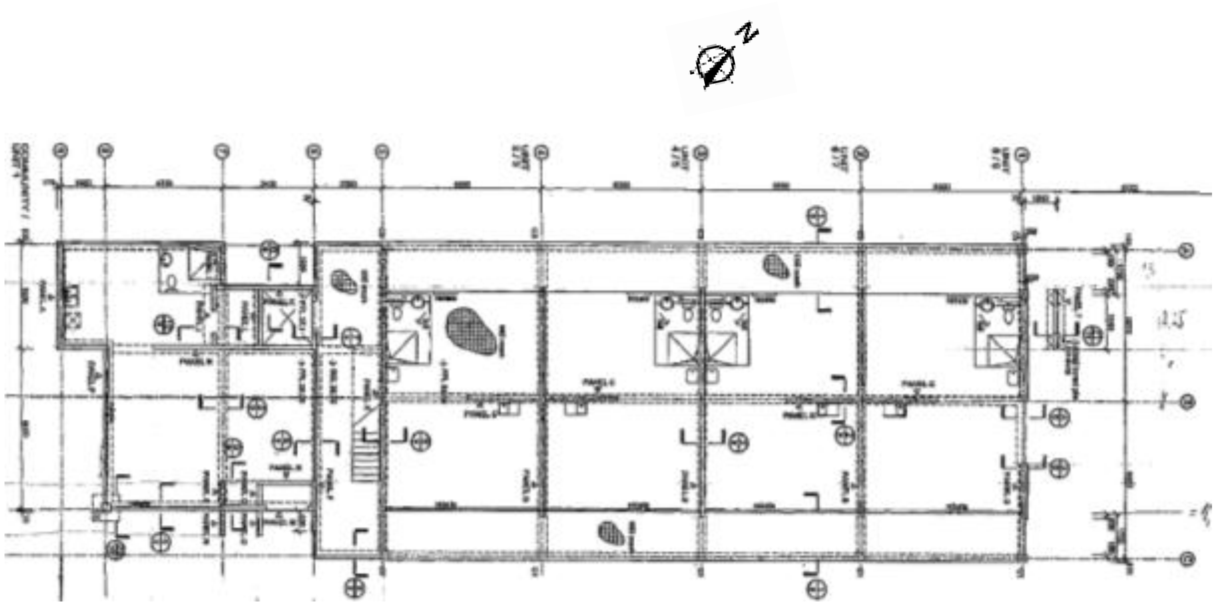


Figure 4.1 Plan sketch showing key structural elements

4.2 Gravity Load Resisting System

The gravity load from the roof cladding is distributed to the roof structure consists of the timber rafters with timber purlins. The load is further transferred from the timber roof structure to the precast RC panels and then passed into the 500 x 300 mm concrete foundation beams.

Internal load from at the first floor level is taken by the RC slabs which are supported by RC walls.

The reinforced concrete beams and posts on the longitudinal sides also carry gravity loads from the balcony slabs and timber roof structure.

4.3 Lateral Load Resisting System

In the both transverse and longitudinal direction, the lateral loads are resisted by precast RC panels. The RC panels work together thanks to rigid first floor slab and the roof structure which act as a diaphragm.

5. Assessment

5.1 Site Inspection

An inspection of the building was undertaken on the 5th of March 2012. Both the interior and exterior of the building were inspected. The building was observed to have a green placard in place. The main structural components of the building were all able to be viewed however details of the roof structure could not be observed. It should be noted that no inspection of the foundations of the structures was able to be undertaken.

The inspection consisted of observing the building to determine the structural systems and likely behaviours of the building during earthquake. The site was assessed for damage, including observing the ground condition, checking for damage areas where damage would be expected for the structure type observed and noting general damage observed throughout the building in both structural and non-structural elements.

5.2 Available Drawings

The full building architectural design done by “Housing Project of HORNBY” was available to GHD. Both Block A and Block B details are in the same design. The following drawings are relevant to Block A:

Table 1. Existing drawings

Item #	Title	Sheet No.	Date
1	Foundation Plan	S 01	July 2000
2	First Floor Structure	S 03	July 2000
3	Precast Wall Panels	S 04	July 2000
4	Precast Wall Panels	S 04 A	July 2000
5	Precast Wall Panels	S 05	July 2000
6	Precast Wall Panels	S 05 A	July 2000
7	Foundation Details	S 09	July 2000
8	Precast Panel Details	S 11	July 2000
9	First Floor Concrete Flooring Details	S 12	July 2000
10	In situ Concrete Details	S 13	July 2000
11	Ground Floor Plan	WD 02	July 2000
12	First Floor Plan	WD 03	July 2000
11	Roof Framing Plan	WD 04	July 2000
12	Roof Plan	WD 05	July 2000
13-16	Elevations	WD 06- WD 09	July 2000
17-20	Cross Sections	WD 10	July 2000
21-24	Details	WD 14- WD 16	July 2000

All drawings are attached as Appendix B.

5.3 Analysis and Modelling Methodology

Mathematical Modelling

An analytical three-dimensional (shell) model of the Hornby Court- Block A building was created using the finite element software pocket, ROBOT, version 2012.

The main structural elements of the building are RC walls. The ROBOT subprogram form - "SHELL" design was used.

To avoid modeling the panels with openings, some panels were split and connected with beams and columns; one example is shown below.

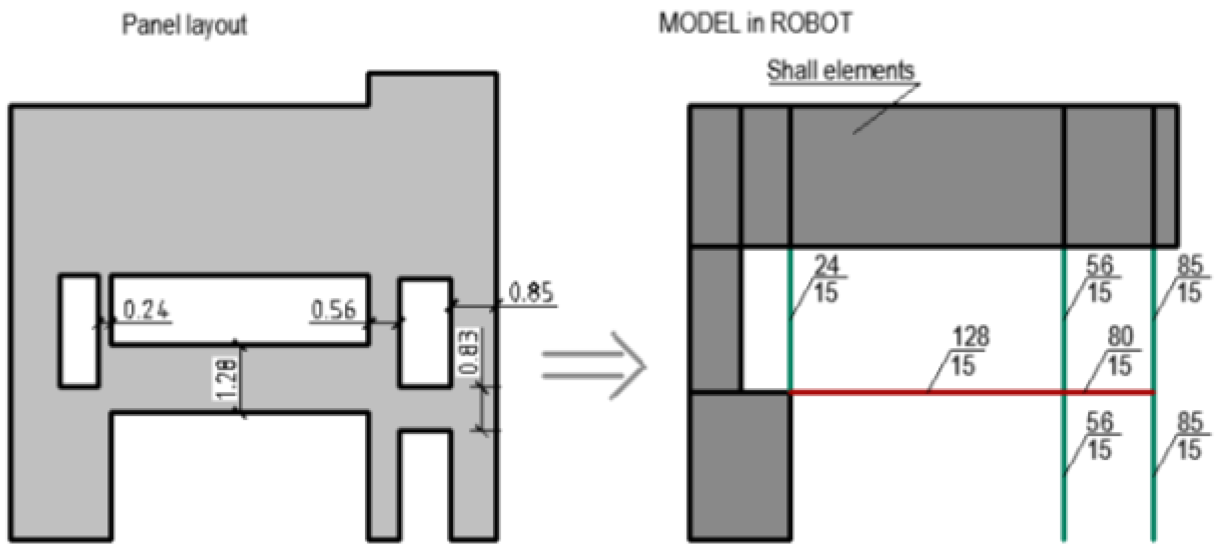


Figure 3. Modeling of the panel- model without openings

RC slabs, both uni span and cast in situ, are modeled as shell elements.

Unreinforced masonry walls not bounded by the reinforced concrete frames were not modeled as these are non structural elements that are expected to failed. The weight of the masonry wall is considered by modeling a line load equivalent to the density of the wall.

The timber roof structure is modeled as a semi-flexible diaphragm with equivalent characteristics (weight and modulus of elasticity) to the real roof structure.

Overview of the materials is listed in the table (Table 2):

Table 2. Material Properties:

Elements	Robot name material	Material properties	
All RC panels, beams, columns	CONCR	Unit weight	γ = 23.61 kN/m^3
		Young Modulus	E = 31,500.00 MPa
		Poisson Ratio	μ = 0.167
Roof diaphragm	CONCR 3	Unit weight	γ = 5.72 kN/m^3
		Young Modulus	E = 315,000.00 MPa
		Poisson Ratio	μ = 0.167

The 3D model of the building is shown below:

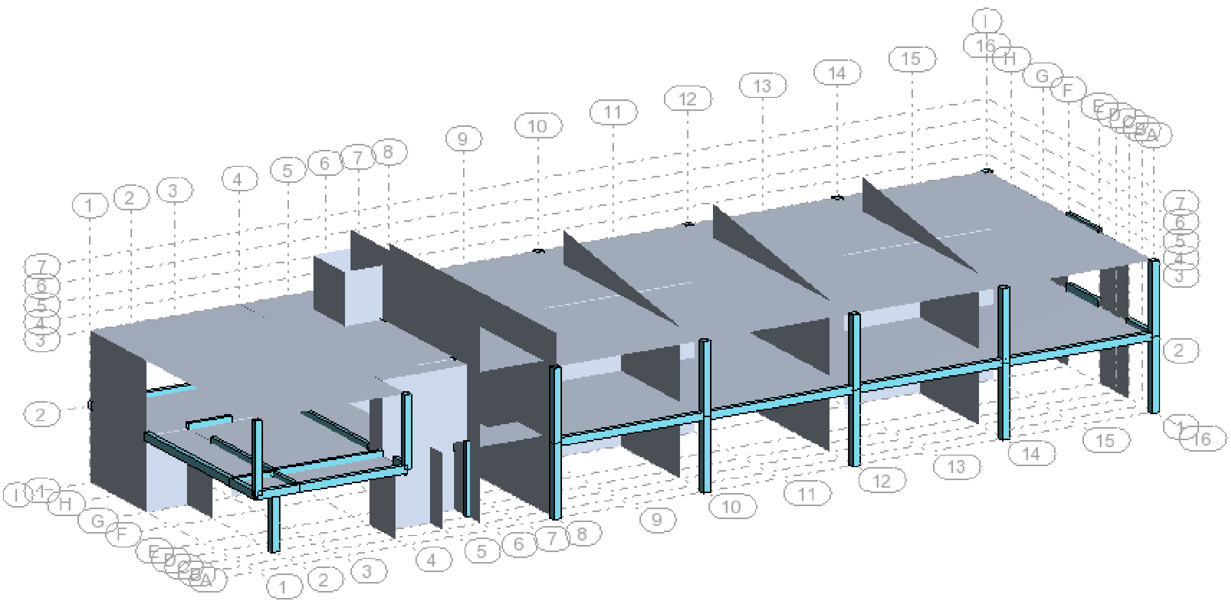


Figure 4. 3D model of the building

The staircases are not included in the 3D model as a structural element; they have been modelled separately in a 2D frame ROBOT design.

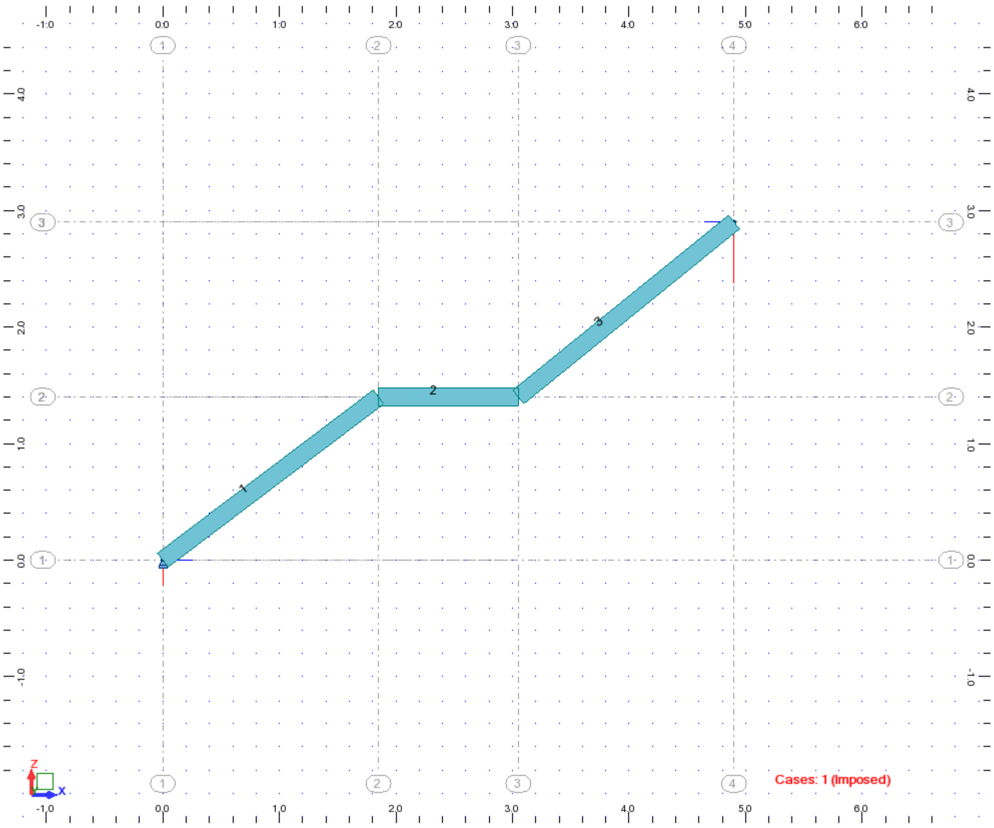


Figure 5. 2D model of the staircases

The obtained reactions from the self-weight and imposed load were then applied in a 3D building model.

Loading Conditions

- **Design Load Types:**
  - Dead Loads

1. DL1: Self-weight of structural elements of the building,
2. Additional dead: weight of the elements which are not modeled,

  - Live Loads

1. Imposed action

0.25 kPa – at the roof level

1.5 kPa – for the residence units

2.0 kPa - Staircase & Landing

  - Seismic load -Seismic Analysis Procedure: Modal Response Spectral Analysis

Critical load combinations – those that impose the greatest stress on the structure – are selected for design and listed below:

1. **1.0G+0.3Q**
2. **1.2G+1.5Q**
3. **1.0G+0.4Q±Ex**

   3a. 1.0G+0.4Q+Ex

   3b. 1.0G+0.4Q-Ex

4. **1.0G+0.4Q±Ey**

   4a. 1.0G+0.4Q+Ey

   4b. 1.0G+0.4Q-Ey

Determination of %NBS

Member forces resulting from the modal response spectral analysis were used to determine the seismic demand on each structural member. These were compared with the member capacities. The single factor to assess the acceptability of each member is the ratio of the seismic demand of the structural member over the member capacity (DCR). The DCRs are then expressed as a % NBS to determine the risk level of the building.

Based on the %NBS of each structural member and the overall building's behavior, the deficiencies in the structure were identified.

Seismic Design

The building structure was checked to the seismic design standards in accordance with the AS/NZ 1170.5, NZBC Clause B1 Structure and New Zealand Society of Earthquake Engineering Guidelines for Assessment and Improvement of the Structural Performance of Buildings in Earthquakes.

6. Damage Assessment

6.1 Surrounding Buildings

The closest building to the Court- Block A is the Hornby Court Block B. The damages observed on this building are minor and include the follows:

- Minor cracking to plasterboard wall linings throughout.
- Cracking to stairs in the 2 storey section of the building.
- Cracking to the first floor slab.

6.2 Residual Displacements and General Observations

- Minor cracking was noted throughout the building.
- No damage was noted to the roof structure.
- No damage was noted to the floor slabs except at the communal block where cosmetic cracks were observed at suspended floor slab bearing the loads coming from the steel post (see Photos 14 & 15).

Minor cracking was noted at the concrete staircase located between the communal block and multi-unit residential block. These cracks can be seen in Photos 12 & 13 in Appendix A.

6.3 Ground Damage

No ground damage was observed during our inspection of the site.

7. Structural Analysis

7.1 Seismic Parameters

Earthquake loads shall be calculated using New Zealand Code.

◗ Site Classification	D
◗ Seismic Zone factor (Z)	
(Table 3.3, NZS 1170.5:2004 and NZBC Clause B1 Structure)	0.30 (Christchurch)
◗ Annual Probability of Exceedance	
(Table 3.3, NZS 1170.0:2002)	1/500 (ULS) Importance Level 2
◗ Annual Probability of Exceedance	
(Table 3.3, NZS 1170.0:2002)	1/25 (SLS)
◗ Return Period Factor (Ru)	
(Table 3.5, NZS 1170.5:2004)	1.0 (ULS)
◗ Return Period Factor (Rs)	
(Table 3.5, NZS 1170.5:2004 and NZBC Clause B1 Structure)	0.33 (SLS)
◗ Ductility Factor (μ)	1.5
◗ Ductility Scaling Factor (k_{μ})	1.29
◗ Performance Factor (Sp), based on NZS 3.1.0.1	0.85
◗ Gravitational Constant (g)	9.81 m/s^2

An increased Z factor of 0.3 for Christchurch has been used in line with recommendations from the Department of Building and Housing recommendations resulting in a reduced % NBS score.

7.2 Modal Response Spectral Analysis

Modal Response Spectral Analyses (EMA) in the transverse and longitudinal directions of the building were carried out. The fundamental building period calculated from ROBOT was very low; T= 0.06 seconds. The base shears calculated from EMA are V_L=1126.76 kN (longitudinal) and V_T=938.97 kN (transverse).

An equivalent static analysis was also carried out as a consistency check of the EMA output. A 2460.75 kN (V_e) base shear was calculated from the equivalent static method. The EMA base shears are scaled to 80% of the equivalent static method base shear by applying scaling factors of 1.75 in the longitudinal direction and 2.10 in the transverse direction. The building was analyzed as having a ductility of μ= 1.5 and the design actions were applied separately in each perpendicular direction. This calculation is shown below.

The elastic site hazard spectrum for horizontal loading:

$$C(T_1)=C_h \cdot Z \cdot R \cdot N(T,D)$$

C_h=3.0 – Value from 3.1 table for the period calculated from ROBOT (T=0.06s)

Z=0.3 – Hazard factor determined from the table 3.3 (NZS 1170.5:2004)

R=1.0 – Return period factor determined from the table 3.5 (NZS 1170.5:2004)

N (T,D) = 1.0 – Near fault factor- clause 3.1.6. (NZS 1170.5:2004)

$C(T_1)= 3.0 \cdot 0.3 \cdot 1.0 \cdot 1.0 = 0.9$

The horizontal design action coefficient:

$$C_d(T_1)=\frac{C(T_1)\cdot S_p}{k_\mu}=\frac{0.90\cdot 0.85}{1.29}=0.593$$

Horizontal seismic shear for static equivalent forces method:

$V_e=C_d(T_1)\cdot W_t=0.593\cdot 4149.67=2460.75$ kN

Where:

W_t- Summary of all vertical forces (Fz) for the combination 1.0G+ 0.3Q taken from ROBOT.

As per NZS 1170.5:2004, Clause 5.2.2.2- Ultimate limit state design- Structures that are not classified as irregular.

80% (2460.75)=1968.60 kN.

Scaling of actions and displacements, calculated base shear (sum of horizontal forces for Ex and Ey) in Robot is greater than corresponding to the equivalent static analysis, scaling factor are taken as:

$$k_x=\frac{\mathbf{0.8}\cdot V_e}{V}=\frac{1968.60}{1126.76}=1.75$$

$$k_y=\frac{0.8\cdot V_e}{V}=\frac{1968.60}{938.97}=2.10$$

8. Geotechnical Consideration

8.1 Site Description

The subject site is located in western Christchurch within the suburb of Hornby. The site is predominantly flat and surrounded by residential and commercial properties and boarded to the north by Goulding Avenue. The site is approximately 2km from the Heathcote River and at approximately 28m above mean sea level.

8.2 Public Information on Ground Conditions

8.2.1 Published Geology

The geological map of the area[1] indicates that the site is underlain by Holocene alluvial soils of the Yaldhurst Member, sub-group of the Springston Formation, comprising alluvial sand and silt overbank deposits.

8.2.2 Environmental Canterbury Logs

Information from Environment Canterbury (ECan) indicates that seven boreholes are located within a 100m radius of the site. The lithology for two of these boreholes, the site geology described in these logs show the area is predominantly underlain by gravelly sands with silt and sand bands.

It should be noted that the purpose of the boreholes the well logs are associated with, were sunk for groundwater extraction and not for geotechnical purposes. Therefore, the amount of material recovered and available for interpretation and recording will have been variable at best and may not be representative. The logs have been written by the well driller and not a geotechnical professional or to a standard. In addition strength data is not recorded.

8.2.3 EQC Geotechnical Investigation

The Earthquake Commission has undertaken geotechnical testing in some areas of Christchurch. For the Hornby area, no investigations were carried out, as of 23rd of January 2012.

8.2.4 Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has published areas showing the Green Zone Technical Category in relation to the risk of future liquefaction and how these areas are expected to perform in future earthquakes. The Hornby Library site is in the “not applicable” technical category, as it is in a rural area or beyond the extent of land damage mapping. Following these guidelines, normal consenting procedures apply.

[1] Brown, L. J. and Weeber J.H. 1992: Geology of the Christchurch Urban Area. Institute of Geological and Nuclear Sciences 1:25,000 Geological Map 1. Lower Hutt. Institute of Geological and Nuclear Sciences Limited.

8.2.5 Post February Aerial Photography

Aerial photography taken following the 22 February 2011 earthquake shows no signs of liquefaction outside the building footprint or adjacent to the site.

Figure 6. Post February 2011 Earthquake Aerial Photography2

8.2.6 Summary of Ground Conditions

From the ECan borehole information, the ground conditions on Goulding Avenue comprise multiple strata of gravelly sands with silt and sand bands.

8.3 Seismicity

8.3.1 Nearby Faults

There are many faults in the Christchurch region, however only those considered most likely to have an adverse effect on the site are detailed in Table 3.

[2] Aerial Photography Supplied by Koordinates sourced from http://koordinates.com/layer/3185-christchurch-post-earthquake-aerial-photos-24-feb-2011/

Table 3. Summary of Known Active Faults[3,4]

Known Active Fault	Distance from Site (km)	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	120	8.3	~300 years
Greendale (2010) Fault	13	7.1	~15,000 years
Hope Fault	100	7.2~7.5	120~200 years
Kelly Fault	100	7.2	~150 years
Porters Pass Fault	54	7.0	~1100 years

Recent earthquakes since 22 February 2011 have identified the presence of a new active fault system / zone underneath Christchurch City and the Port Hills. Research and published information on this system is in development and not generally available. Average recurrence intervals are yet to be estimated.

8.3.2 Ground Shaking Hazard

This seismic activity has produced earthquakes of Magnitude-6.3 with peak ground accelerations (PGA) up to twice the acceleration due to gravity (2g) in some parts of the city. This has resulted in widespread liquefaction throughout Christchurch.

New Zealand Standard NZS 1170.5:2004 quantifies the Seismic Hazard factor for Christchurch as 0.30, being in a moderate to high earthquake zone. This value has been provisionally upgraded recently (from 0.22) to reflect the seismicity hazard observed in the earthquakes since 4 September 2010.

In addition, the ground conditions are anticipated to be Holocene alluvial soils comprising alluvial gravel, sand, and silt, with bedrock expected to be in excess of 500m deep. Combining this with a 475-year PGA (peak ground acceleration) of ~0.4 (Stirling et al, 2002), the ground shaking is expected to be moderate to high.

8.3.3 Slope Failure and/or Rockfall Potential

The site is located within Hornby, a flat suburb in western Christchurch. Global slope instability risk is considered negligible. However, any localised retaining structures and/or embankments should be further investigated to determine the site-specific slope instability potential.

8.3.4 Liquefaction Potential

The site is considered at minor risk from liquefaction during further earthquakes as evidenced by:

- No previous liquefaction at the site post February ($_{MW}$ 6.3, 2.0g) and the June ($_{MW}$ 5.6-6.3, 1.5g) events.
- Ground conditions encountered highlighting sand layers considered to be moderately liquefiable.

[3] Stirling, M.W. McVerry, G.H., and Berryman, K.R. (2002). A New Seismic Hazard Model for New Zealand, Bulletin of the Seismological Society of America, Vol. 92 No. 5, pp. 1878-1903, June 2002.

[4] GNS Active Faults Database

8.3.5 Recommendations

If a more detailed assessment is required, intrusive investigation comprising one piezocone CPT test to 20m bgl should be undertaken. This will allow a numerical liquefaction analysis to be carried out.

8.3.6 Conclusions & Summary

This assessment is based on a review of the geology and existing ground investigation information, and observations from the Christchurch earthquakes since 4 September 2010.

The site appears to be situated on stratified alluvial deposits, comprising gravelly sands with silt and sand bands. Associated with this the site also has a minor to moderate liquefaction potential, in particular where sands and/or silts are present. Liquefaction in this area could cause settlement of ground and damage to property

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that an intrusive investigation comprising of one piezocone CPT be conducted.

A soil class of **D** (in accordance with NZS 1170.5:2004) should be adopted for the site.

9. Results of Analysis

Using 3D model of the building, two RC panel show capacity less than 67% NBS. They are shown below:

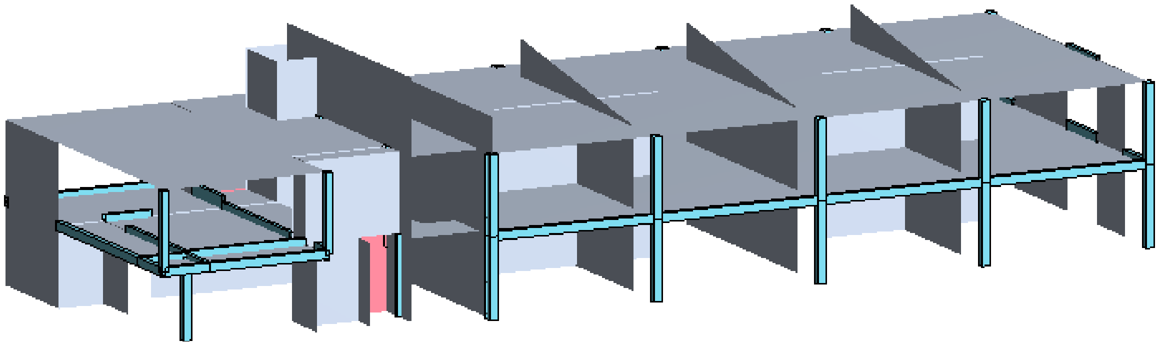


Figure 7. Frontal view of the building- highlighted elements with capacity less than 67%NBS.

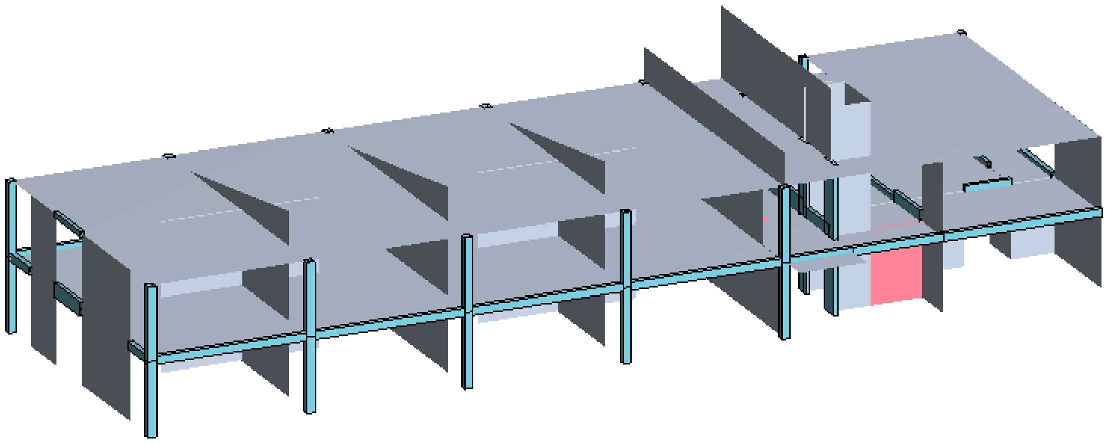


Figure 8. View of the building from the opposite side- highlighted elements with capacity less than 67%NBS.

The calculations were re-run, excluding these two elements from the model.

The results of this analysis showed that these two elements were not critical seismic elements. A premature failure of the overall building, or partial building would not be expected if the capacities of these elements were exceeded.

The achieved percentages of the NBS for the characteristic structural elements are listed in the Table 4.:

Table 4. % NBS for the building elements

Element	% NBS
Columns	>100
Beams	81
Slabs	70
Walls	71

9.1 Discussion of Results

The results obtained from the analysis are consistent with those expected for a building of this age and construction type founded on Class D soils.

The Hornby Court Block A was designed in 2000 and is likely to be designed to the loading standard current at the time, NZS 4203:1992. The design loads used are likely to have been less than those required by the current loading standard. In addition, the detailing requirements for ductile seismic behaviour present in the current codes are unlikely to have been considered in the design of this building. Therefore it would be expected that the building would not achieve 100% NBS.

10. Conclusions

10.1 Building Capacity Assessment

The building overall has been assessed as having a seismic capacity of 70% NBS and is therefore classified as not being 'Earthquake Risk'.

10.2 Occupancy

Because the building achieved more than 67% NBS it is not classified as Earthquake Risk Building. As per Christchurch City Council's policy regarding occupancy of potentially Earthquake Risk buildings, the Hornby Courts-Block A can remain occupied.

11. Recommendations

The building overall has been assessed as having a seismic capacity more than 67% NBS and is therefore classified as not being 'Earthquake Risk'. As per Christchurch City Council's policy regarding occupancy of potentially Earthquake Risk buildings, the Hornby Courts-Block A can remain occupied.

12. Limitations

12.1 General

This report has been prepared subject to the following limitations:

- Available drawings itemised in 5.2 was used in the assessment.
- The roof structure and foundations of the building were unable to be inspected.
- Foundations were not checked.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.

It is noted that this report has been prepared at the request of Christchurch City Council and is intended to be used for their purposes only. GHD accepts no responsibility for any other party or person who relies on the information contained in this report.

12.2 Geotechnical Limitations

The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical professional before being used for any other purpose. GHD Limited (GHD) accepts no responsibility for other use of the data by third parties.

Where drill hole or test pit logs, cone tests, laboratory tests, geophysical tests and similar work have been performed and recorded by others under a separate commission, the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

The advice tendered in this report is based on information obtained from the desk study investigation location test points and sample points. It is not warranted in respect to the conditions that may be encountered across the site other than at these locations. It is emphasised that the actual characteristics of the subsurface materials may vary significantly between adjacent test points, sample intervals and at locations other than where observations, explorations and investigations have been made. Subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind when assessing the data.

It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. GHD does not accept responsibility for the consequences of significant variances in the conditions and the requirements for execution of the work.

The subsurface and surface earthworks, excavations and foundations should be examined by a suitably qualified and experienced Engineer who shall judge whether the revealed conditions accord with both the assumptions in this report and/or the design of the works. If they do not accord, the Engineer shall modify advice in this report and/or design of the works to accord with the circumstances that are revealed.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances which arise from the issue of the report which have been modified in any way as outlined above.

Appendix A

Photographs

Photo 1. Hornby Courts Block A (Rear, southwest of the building).

Photo 2. Hornby Courts Block B (Front, southwest of the building).

Photo 3. Photo 1 Hornby Courts Block A (Rear, northeast of the building).

Photo 4. Hornby Courts Block A (sideways, northeast of the building).

Photo 5. Hornby Courts Block A Communal Block (Front, northeast of the building).

Photo 6. RC column supporting the roof (front view of building).

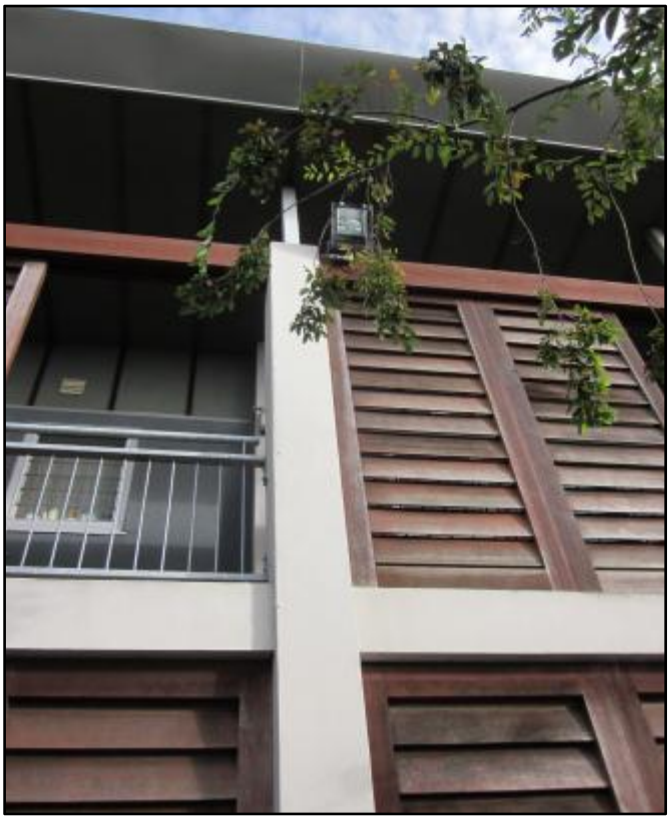


Photo 7. RC columns connected to steel columns supporting the roof (rear view of building).

Photo 8. Photo 2 Lower floor of residential block (front view of building).

Photo 9. View of the roof cladding comprising of metal roofing.

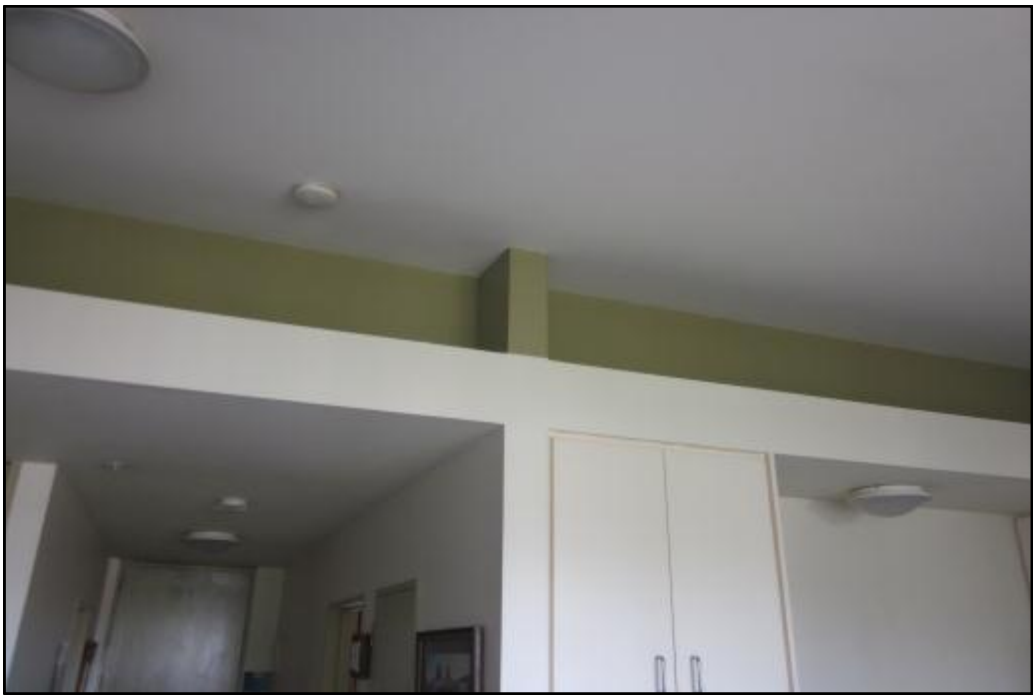


Photo 10. Interior of building.

Photo 11. Door entrance toward staircase (communal block to the left and residential block to the right).

Photo 12. Minor cracks at concrete staircase.

Photo 13. Minor cracks at concrete staircase.

Photo 14. Cracking at slab bearing the loads from the steel column (front view).

*Photo 15.	Cracking at slab bearing the loads from the steel column (side view).*

*Photo 16.	Reinforced cantilevered slab at front; brick wall cladding at rear (photo taken at side view of communal block).*

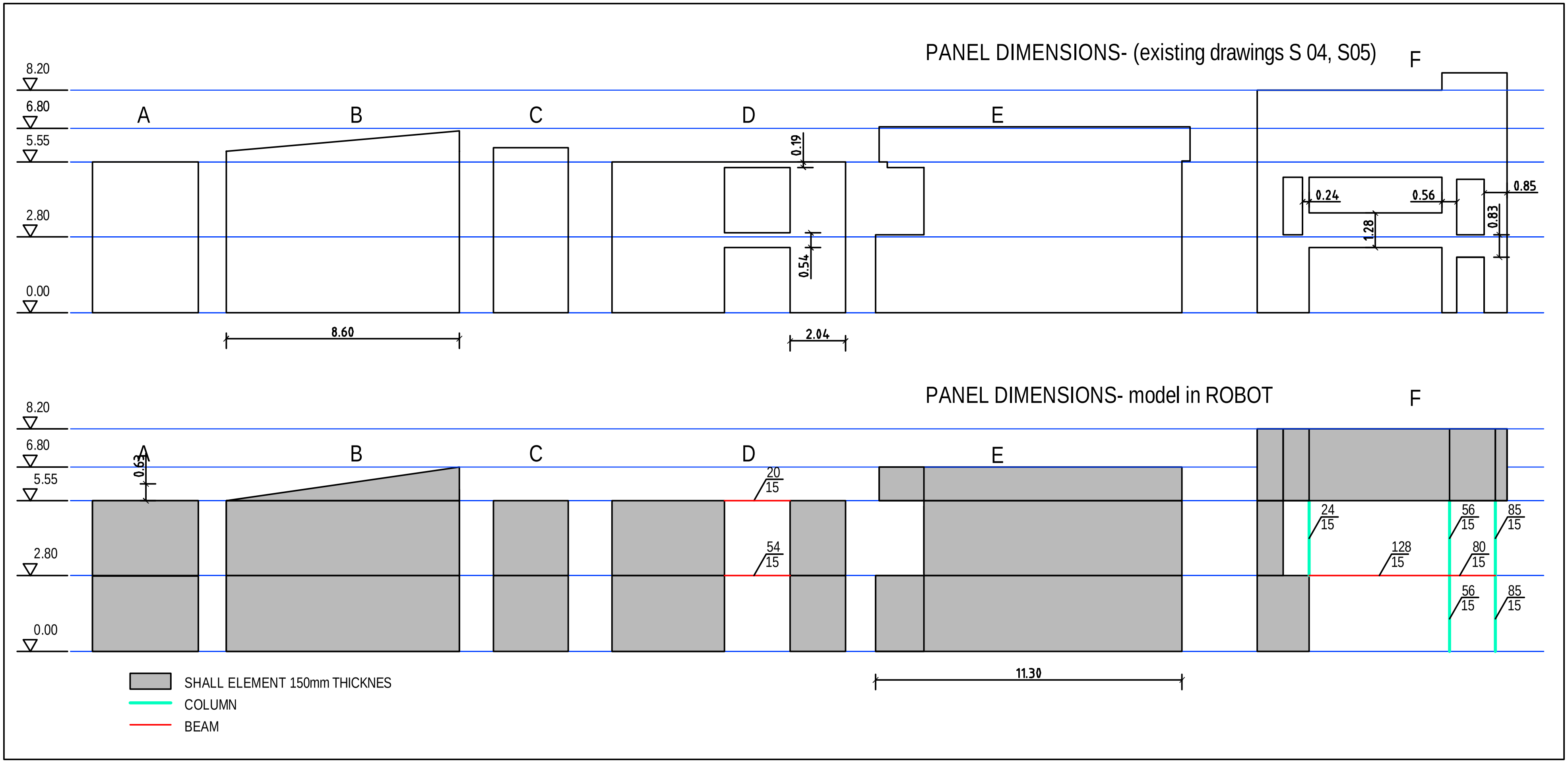
Photo 17. Reinforced cantilevered slab, front view of Communal Block.

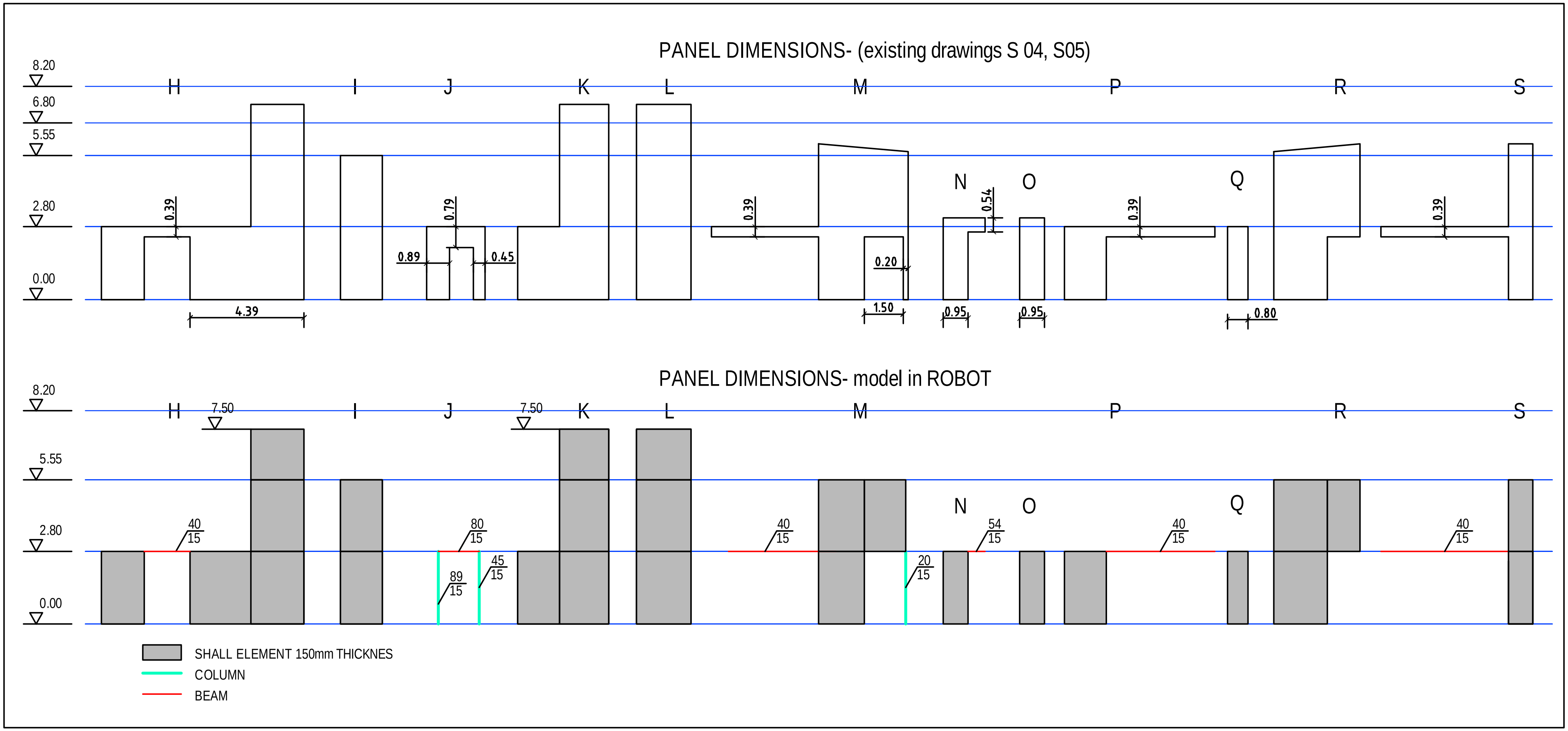
Photo 18. Cracking found at external beam.

Appendix B

Existing Drawings

GEOMETRY OF MODEL




PANEL DIMENSIONS- (existing drawings S 04, S05)
PANEL DIMENSIONS- model in ROBOT
SHALL ELEMENT 150mm THICKNES
COLUMN
BEAM

Notes:

TENDER

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0	Tender documentation	CS	1/1/00

CHRISTCHURCH CONSENT DOCUMENT 18 JUL 2000

All building ... shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

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PEOPLE PLACE WORK
COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell,
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Ph 64 09 377 9936, Fax 64 09 377 9938

GENERAL NOTES:

1 Concrete

a) All concrete work to comply with the provisions of NZS 3109:1997 & related documents.
b) Concrete strength F'C (28 days) to be:

Foundations	20MPa
Ground/1st floor slabs	25MPa
Cast in place	
Precast Walls	35MPa
Unislab toppings	25MPa

c) All construction joints shall be type B unless shown otherwise

2 Reinforcement

a) All reinforcement shall be in accordance with NZS3109:1997 & related documents.
b) R denotes plain round bar grade 300
D denotes deformed bar grade 300
HD denotes deformed bar grade 430
c) All bends in reinforcement to comply with NZS 3109:1997
d) Cover to reinforcement to be 50mm unless shown otherwise
e) Laps in reinforcement to be 40D minimum
f) Lap 665 mesh crosswires by 200mm

HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

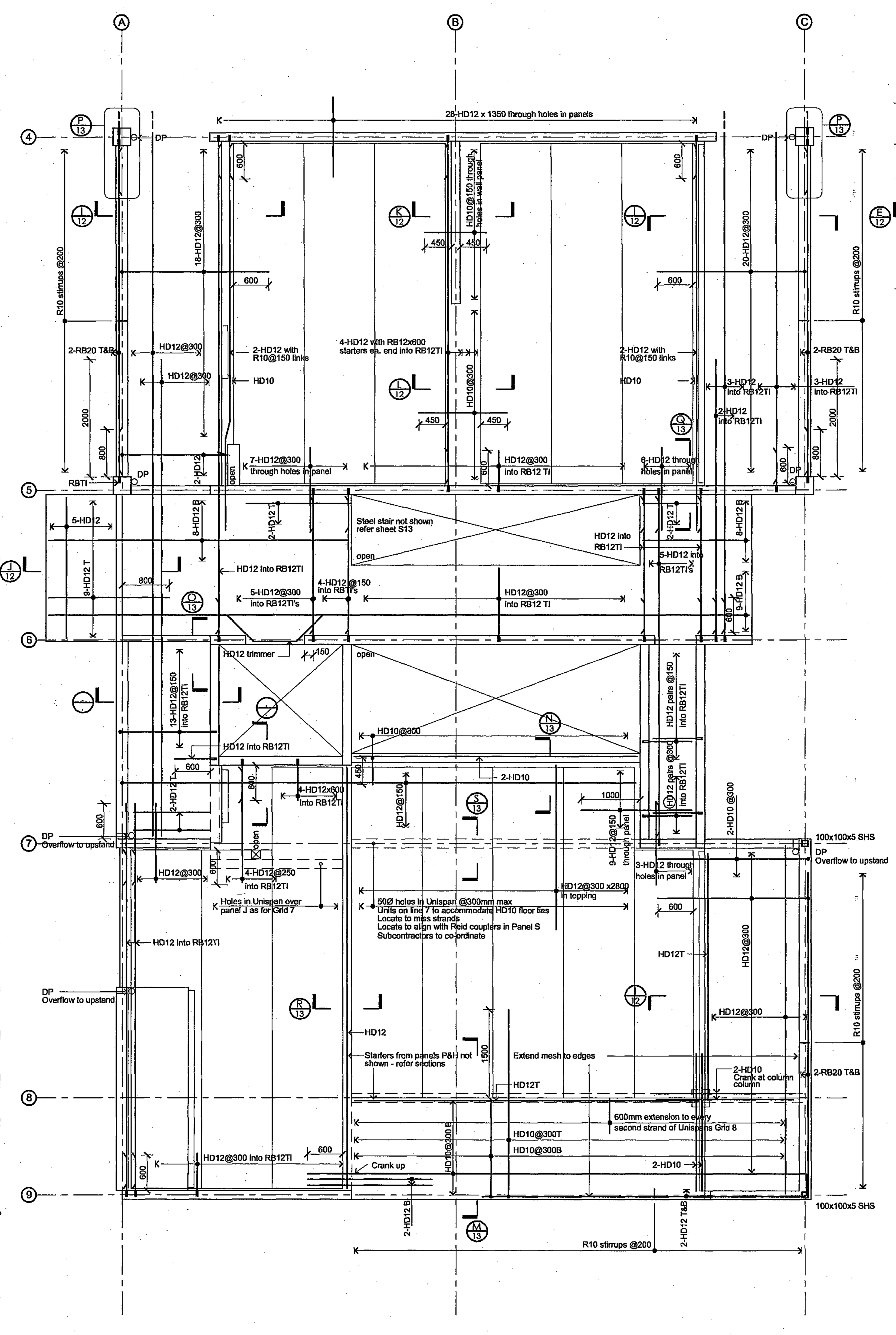
designed	D.C., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017401	30/3/00
approved		/ /

FOUNDATION PLAN

scale	1:100
contract	99/2000-321
sheet	S01

rev. 0

Notes:



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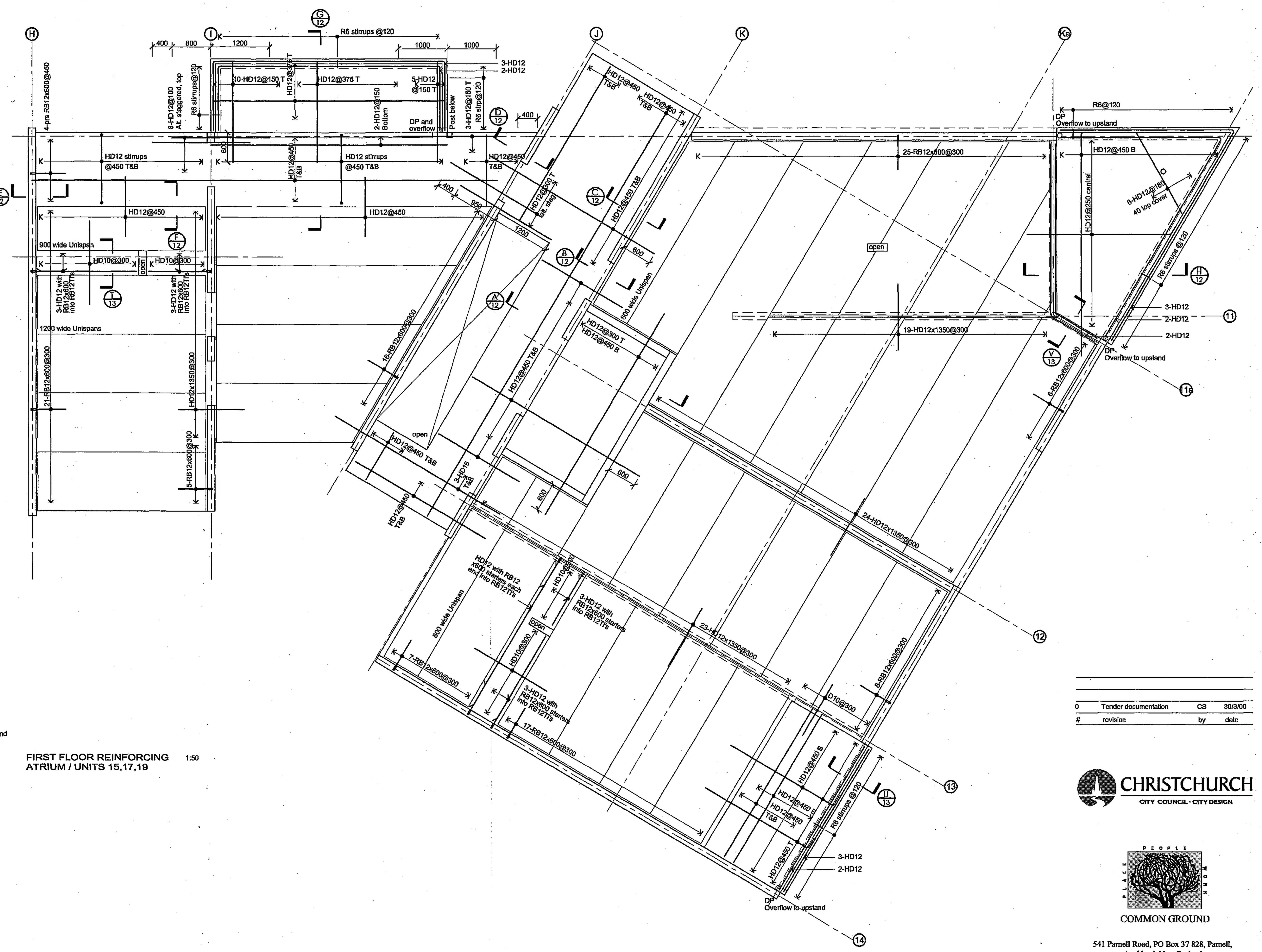
ATRIUM / UNITS 1,3



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ATRIUM / UNITS 15,17,19

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#	revision	by	date

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drawn	C.S.	MARCH 2000
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dwg check		
indexed	sd017403	30/3/00
approved		/ /

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FIRST FLOOR
CAST INSITU CONCRETE

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contract	99/2000-321	
sheet	S03	0

CITY DESIGN

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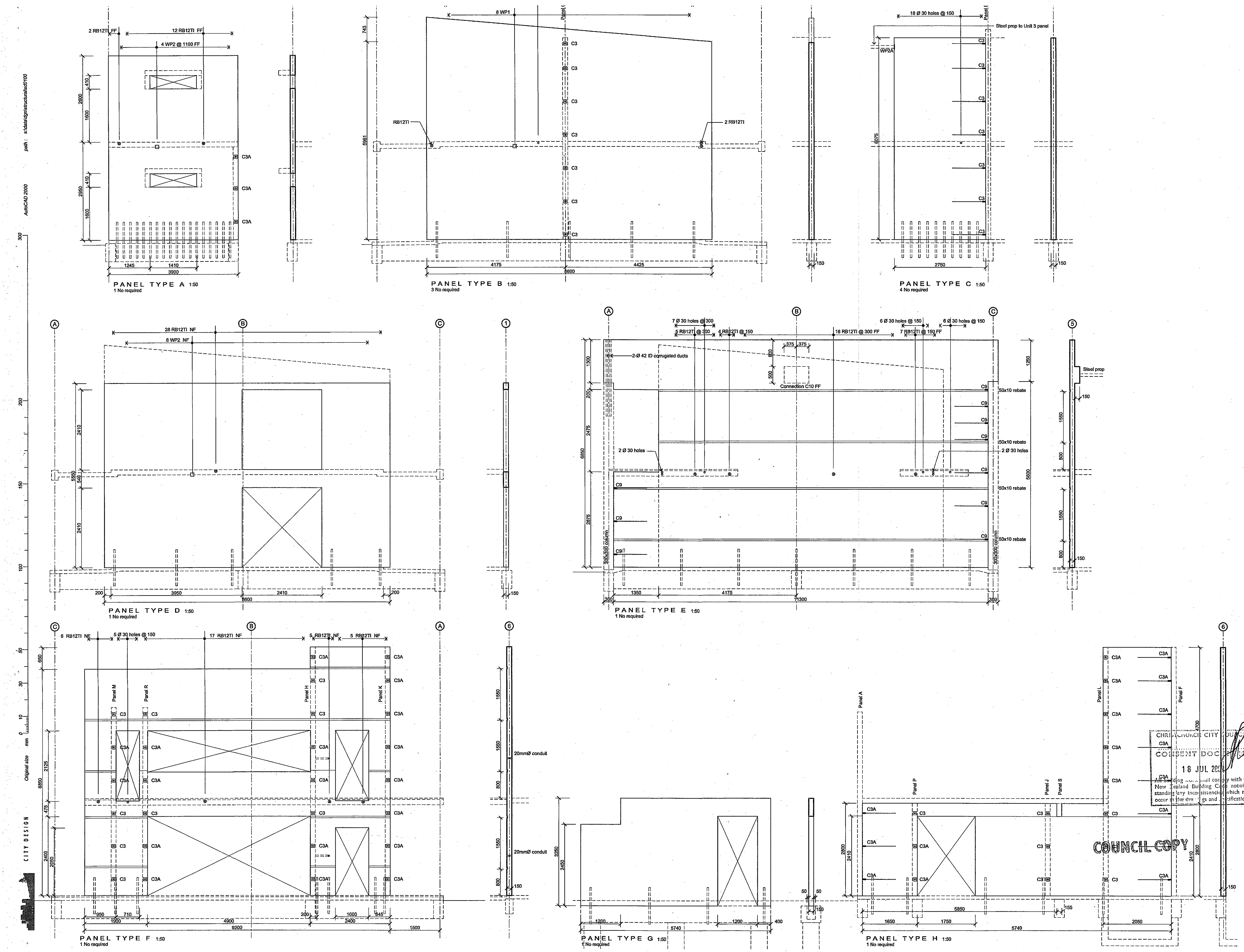
AutoCAD 2000
Original size



Notes:

PRECAST WALL NOTES:

-Refer also to General Notes sheet S01
-Panels are viewed from the side indicated on Sheet S01.

1) All panels are 150mm thick except as noted.
Refer to panel elevations for all recesses etc.

2) Provide HD16 trimmers to full perimeter of all panels (use 2-HD12 for edges with cast in ducts or TCM inserts. Place one bar either side of duct/TCM)

Provide HD16 trimmers to each side of all openings. Extend these trimmers 600mm beyond edge of opening (provide bends as below at edge of panel if typical beyond opening is not possible. Note trimmers may be continuous over more than one opening.)

Provide 40mm cover to all trimmers.

Provide bends to ends of all horizontal and vertical reinforcement as follows.
HD16 250
HD12 150

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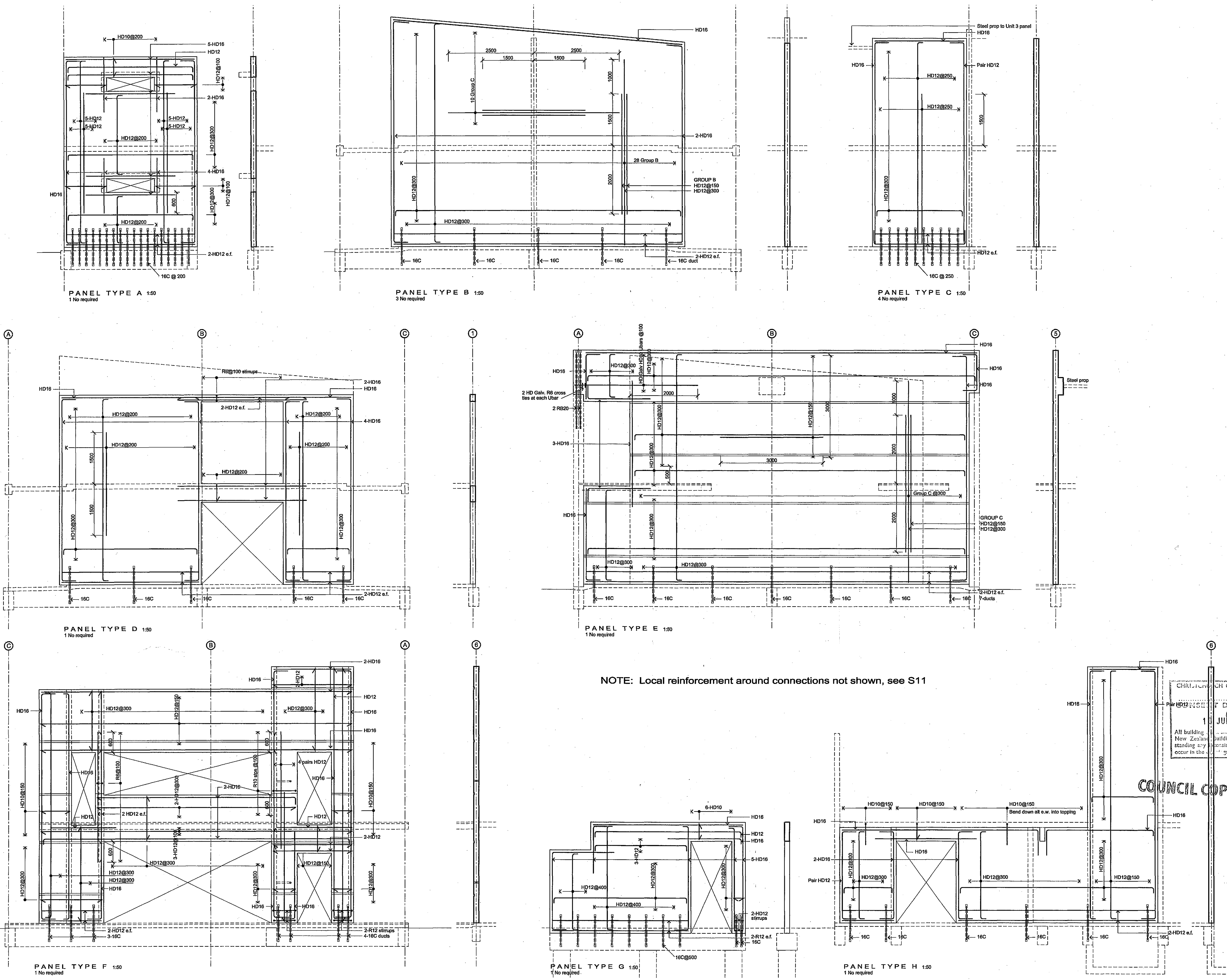
dwg check		
indexed	sd017404.dwg	
approved		/ /

PRECAST WALL PANELS

scale	1:50
contract	99/2000-321
sheet	S04

rev. 0



Notes:

PRECAST WALL NOTES:

-Refer also to General Notes sheet S01
-Panels are viewed from the side indicated on Sheet S01.

1) All panels are 150mm thick except as noted.
Refer to panel elevations for all recesses etc.

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Provide 40mm cover to all trimmers.

Provide bends to ends of all horizontal and vertical reinforcement as follows.
HD16 250
HD12 150

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dwg check		
indexed	sd017404A.dgn	
approved		/ /

PRECAST WALL PANELS

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contract	99/2000-321
sheet	S04A

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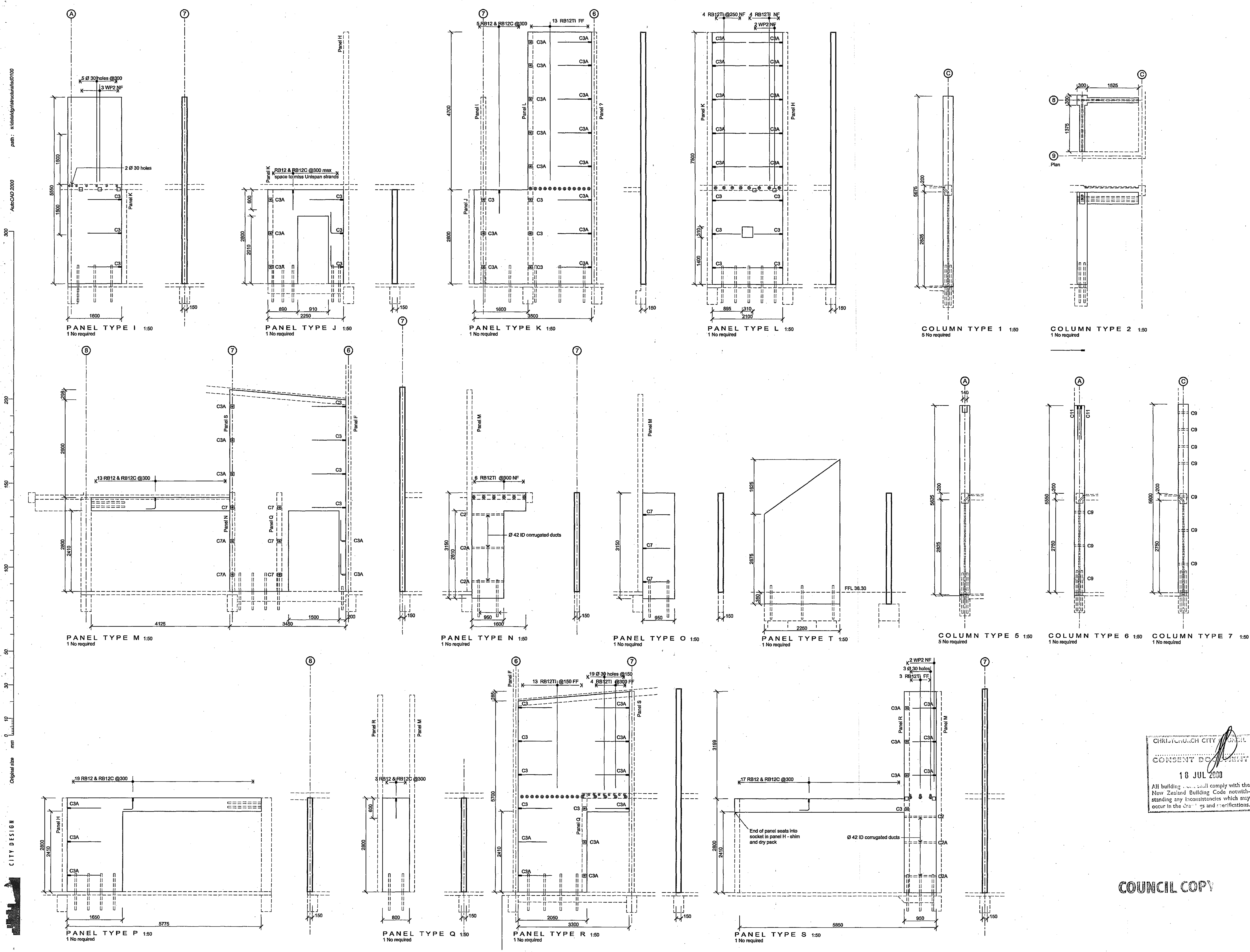

Notes:

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dwg check		
indexed	sd017405.dwg	
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PRECAST WALL PANELS

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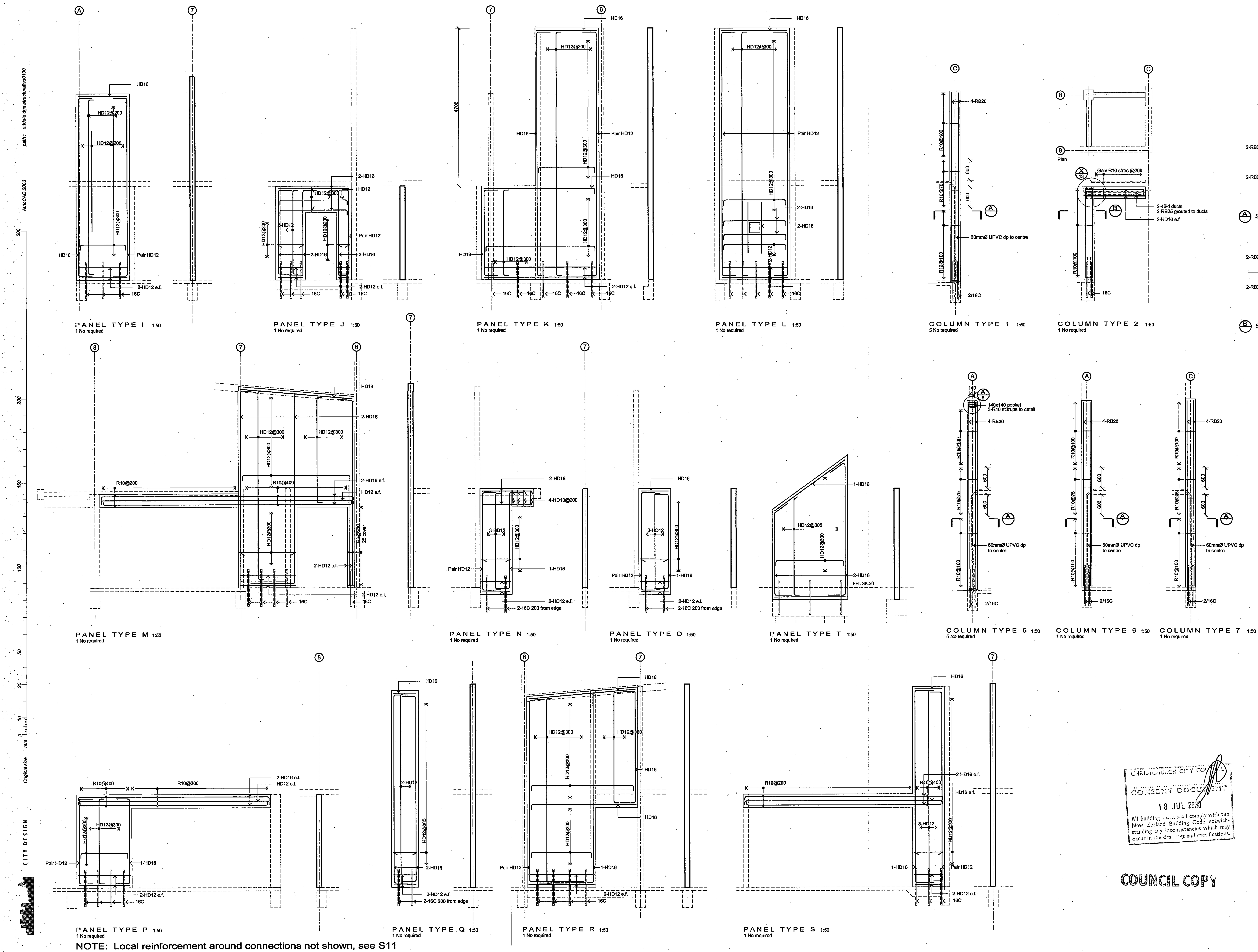
contract	99/2000-321
sheet	S05

rev. 0



NOTE: Local reinforcement around connections not shown, see S11

Notes:

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0	Tender documentation	CS	20/3/00

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dwg check		
indexed	SD017405A.dwg	30/3/00
approved		/ /

PRECAST WALL PANELS

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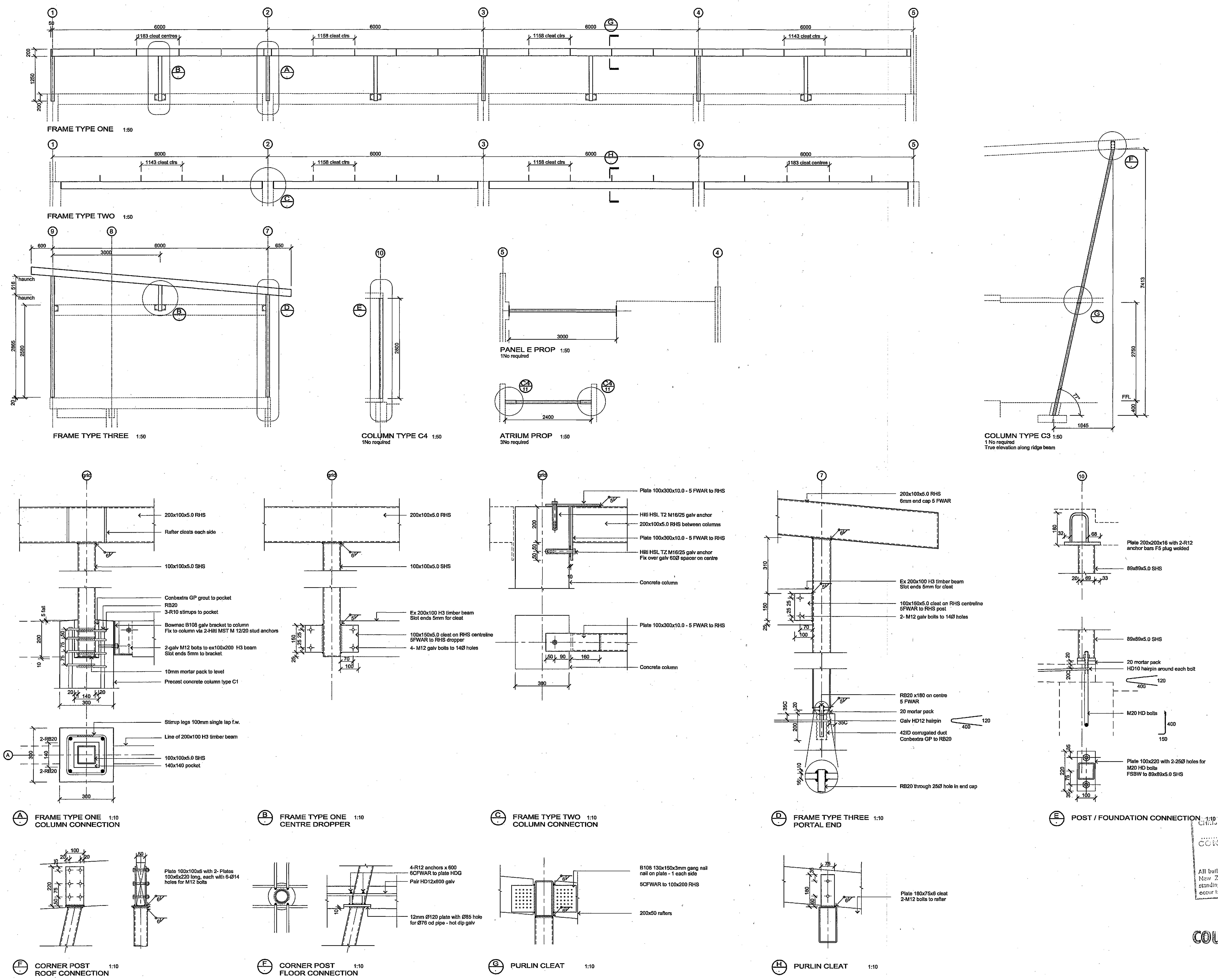

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HORNBY
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dwg check		
indexed	sd017408	30/3/00
approved		/ /

STRUCTURAL STEELWORK

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contract	99/2000-321
sheet	S08

rev. 0

CITY DESIGN

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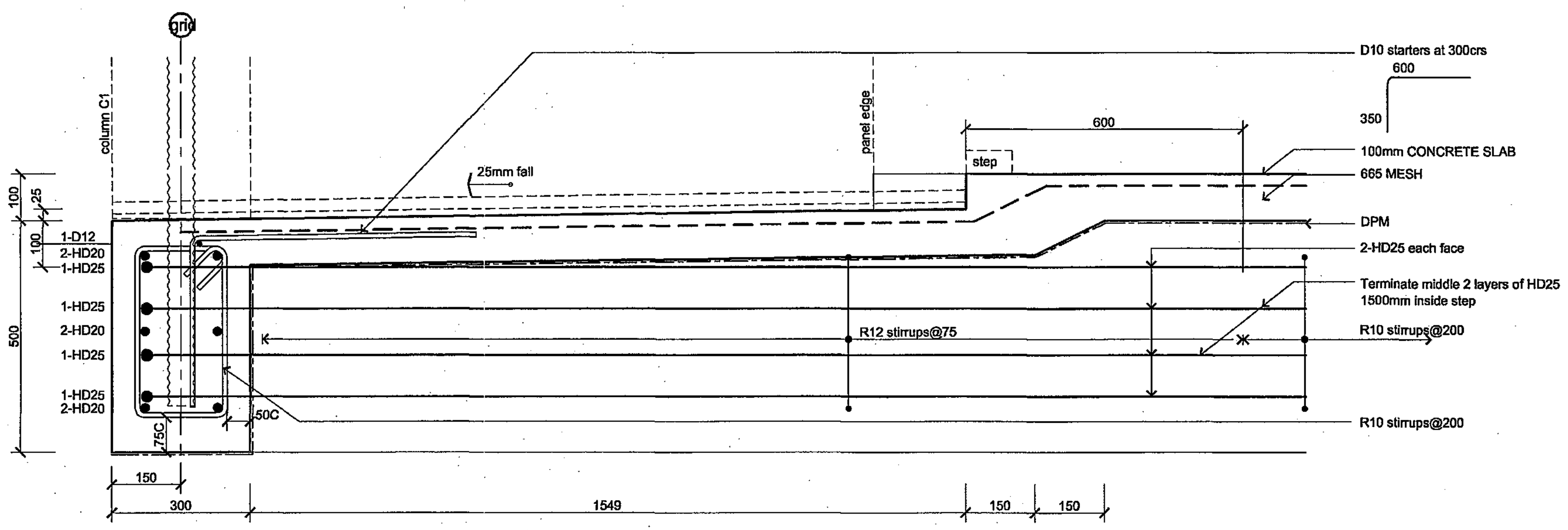
AutoCAD 2000

Original size mm

CITY DESIGN



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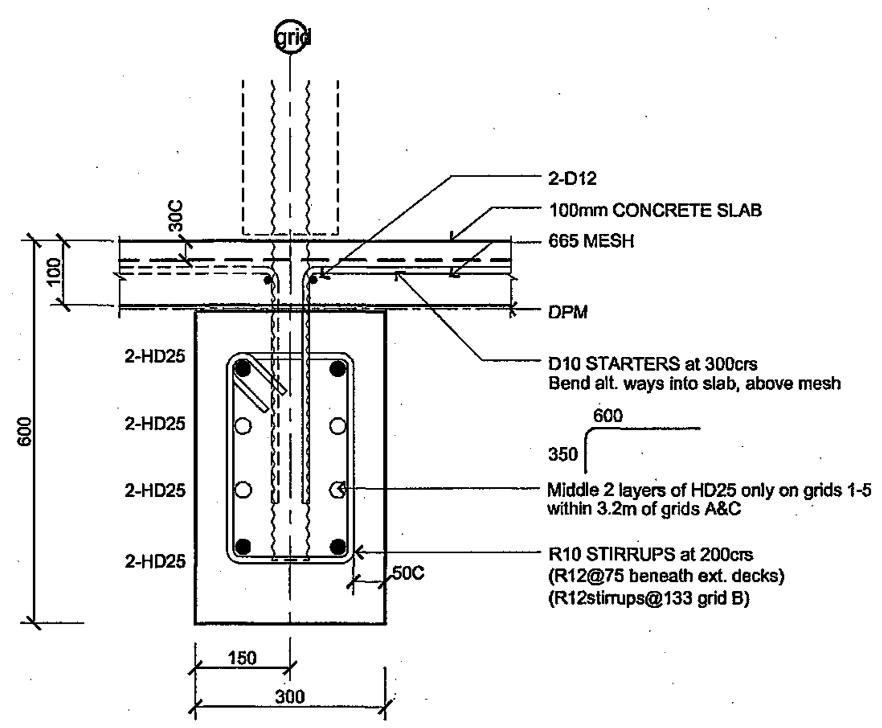

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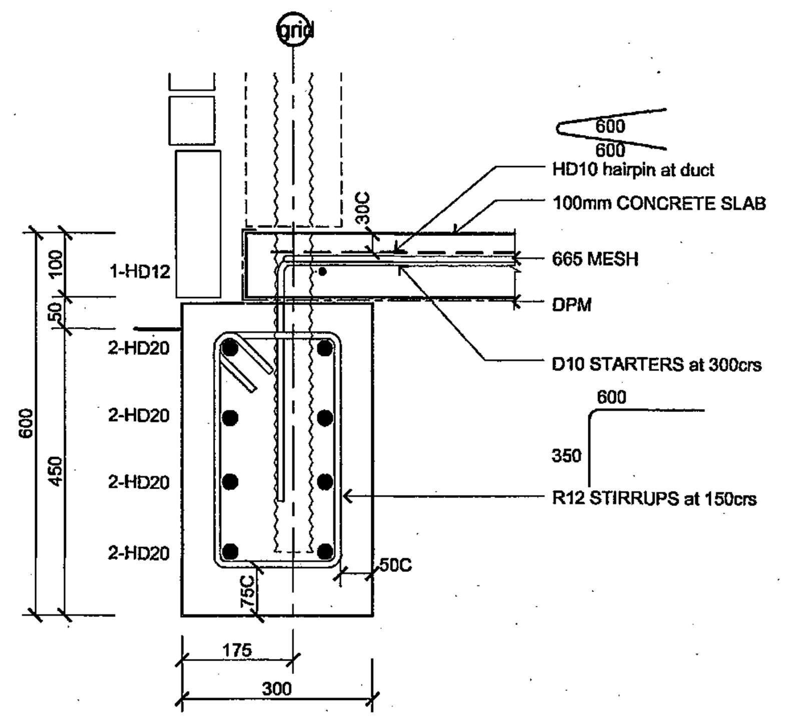

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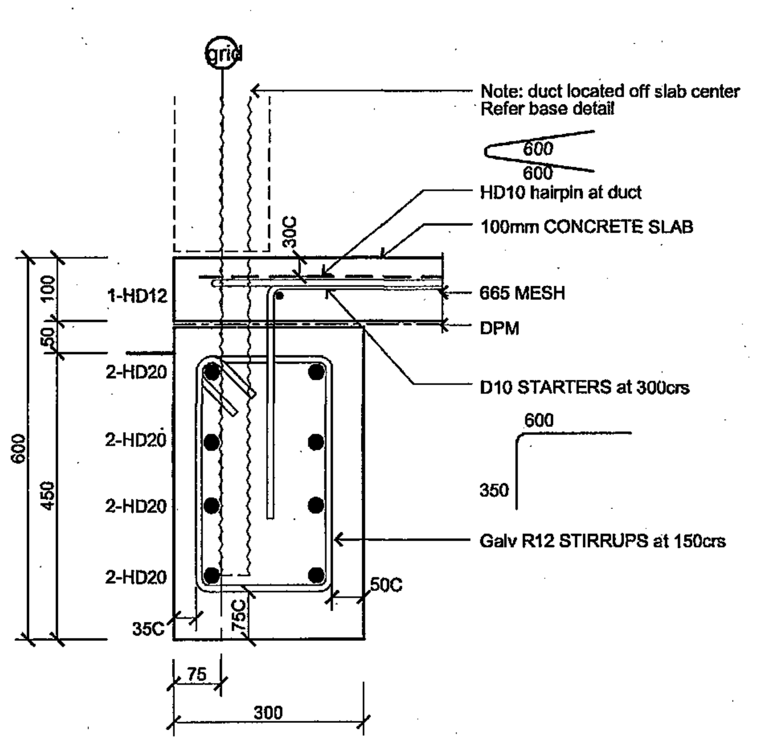

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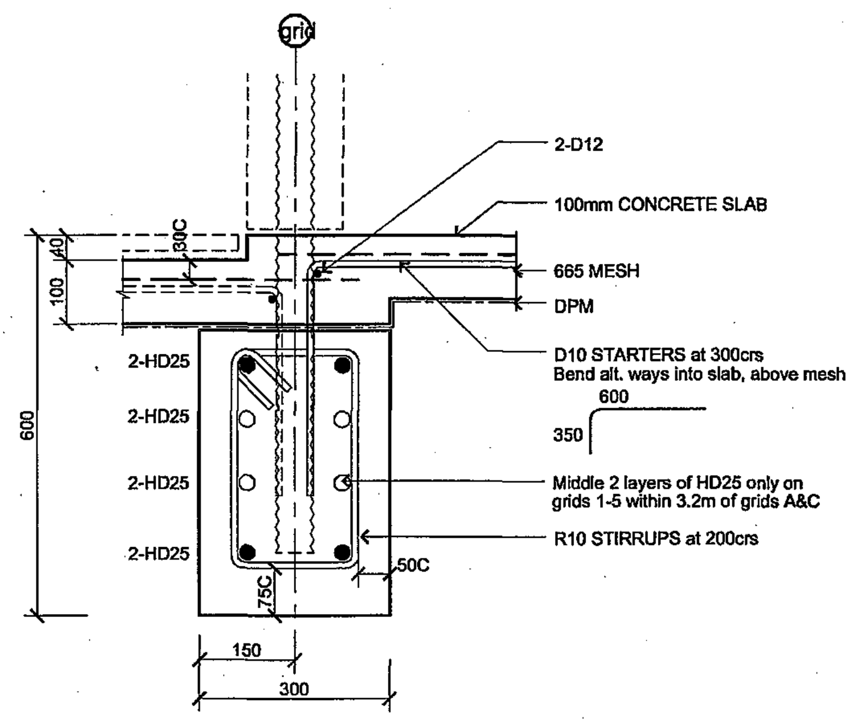

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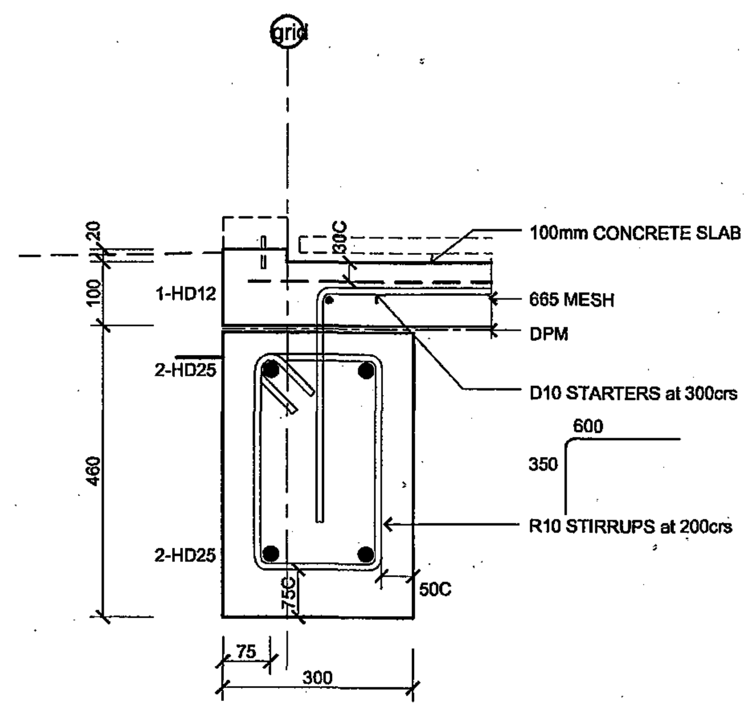

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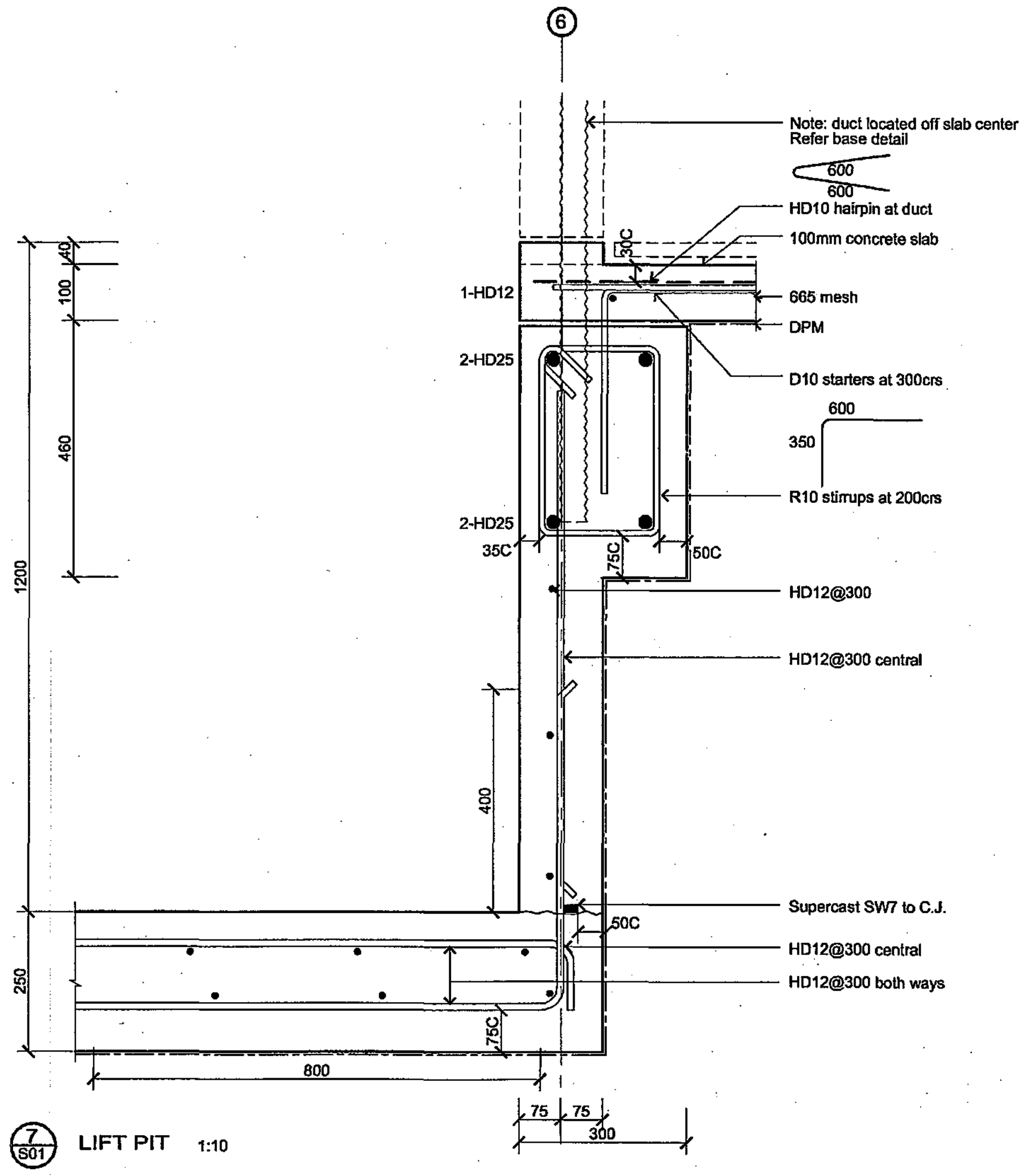
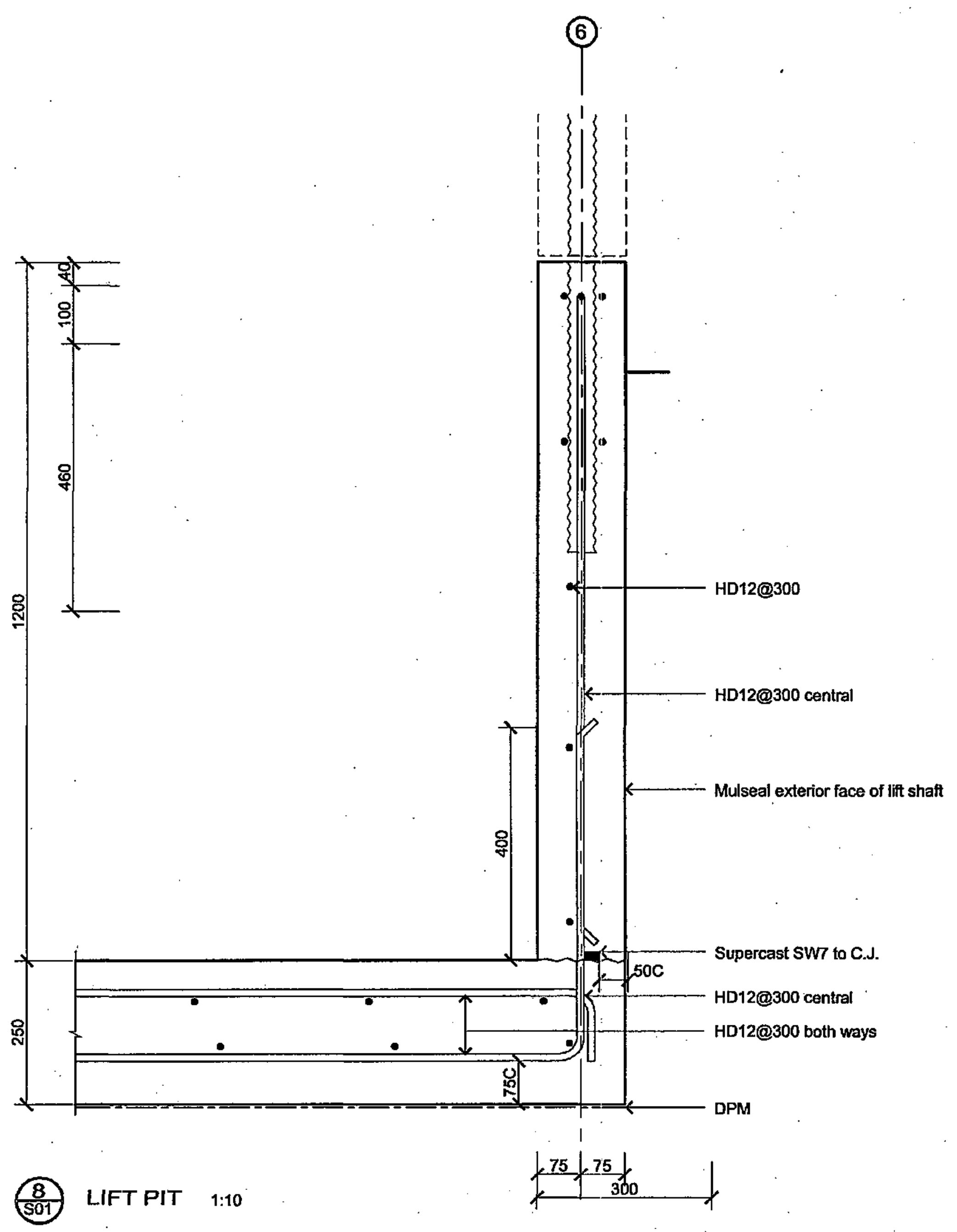


LIFT PIT 1:10



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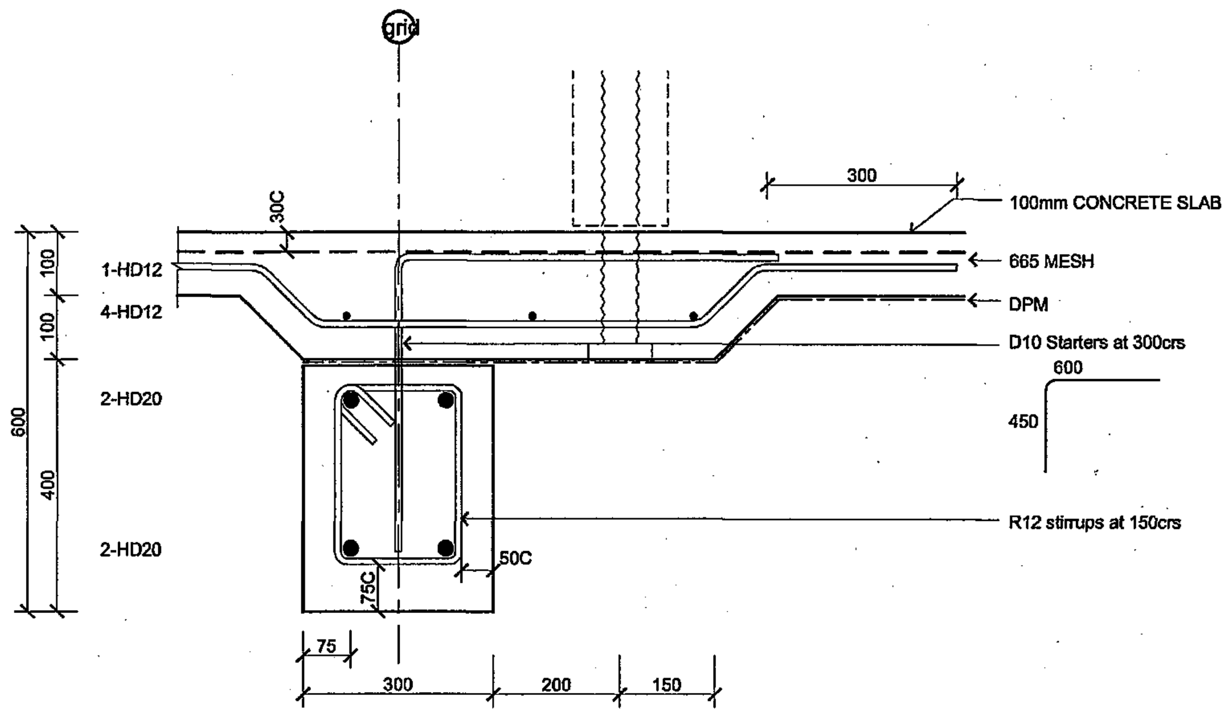

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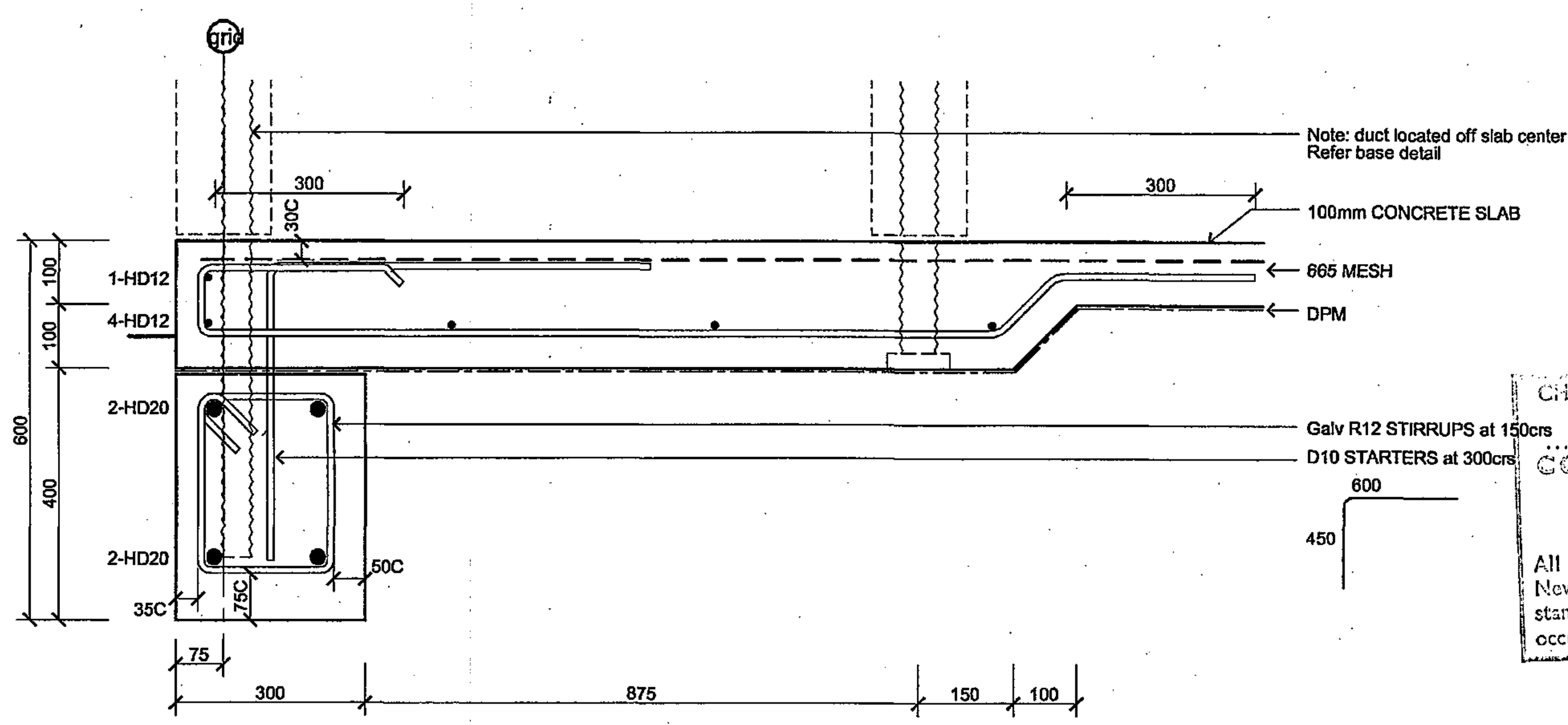

PERIMETER 1:10

Notes:

Refer architectural drawings for location of polystyrene insulation.
Typically to inside vertical face of all external foundation walls and beneath slab at perimeter within 500mm of exterior foundation wall.

TENDER

0	Tender documentation	CS	1/1/00
#	revision	by	date

CHRISTCHURCH
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PEOPLE PLACE WORK
COMMON GROUND

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Ph 64 09 377 9936, Fax 64 09 377 9938

HOUSING PROJECT OF
HORNBY
For:Christchurch City Council

designed	S.D.S., D.C., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg. check		
indexed	sd017409	30/3/00
approved		/ /

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
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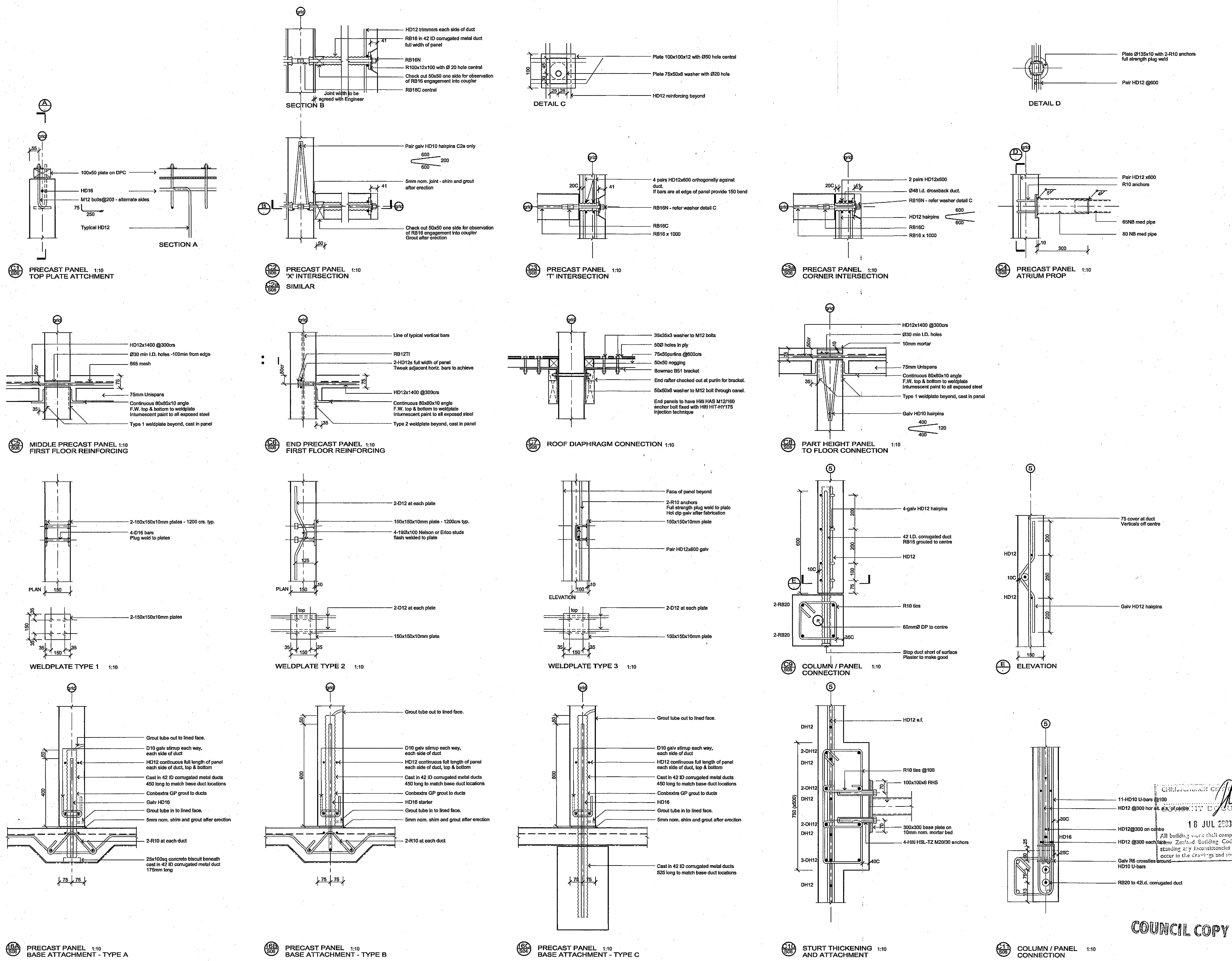
FOUNDATION DETAILS

scale	1:10
contract	99/2000-321
sheet	S09

rev. 0

Notes:



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0	Tender documentation	CS	1/1/00

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COMMON GROUND

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HOUSING PROJECT OF
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For: Christchurch City Council

18 JUL 2000
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designed	S.D.S., D.C., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
checked	sd017411	30/3/00
approved		/ /

PRECAST PANEL DETAILS

scale	1:10
contract	99/2000-321
sheet	S11

rev. 0

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CITY DESIGN

Notes:

SURFACE ENTRY SUMPS shall comply with NZBC E1/AS1/3.6.2 Type One (Fig 8). An acceptable alternative is a CCC type SD 224 house drain sump, provided it is fitted with a trapped or submerged outlet to comply with NZBC E1/AS1/ 3.6.1(c).

KEY

All plumbing & drainage is to comply with AS3500.2 and the New Zealand Building Code

①	Gridline 1
W/d	washing machine
	SS. sink insert
	vanity unit
	shower recessed to floor
	WC
	Sewer pipe
	Water supply
	Stormwater pipe
ORG	Overflow relief gully
FWG	Floor waste gully
AP	Access point
dp	Downpipe position

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0	Tender documentation	CS	30/3/00

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PEOPLE PLACE WORK
COMMON GROUND

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HOUSING PROJECT OF
HORNBY
For: Christchurch City Council

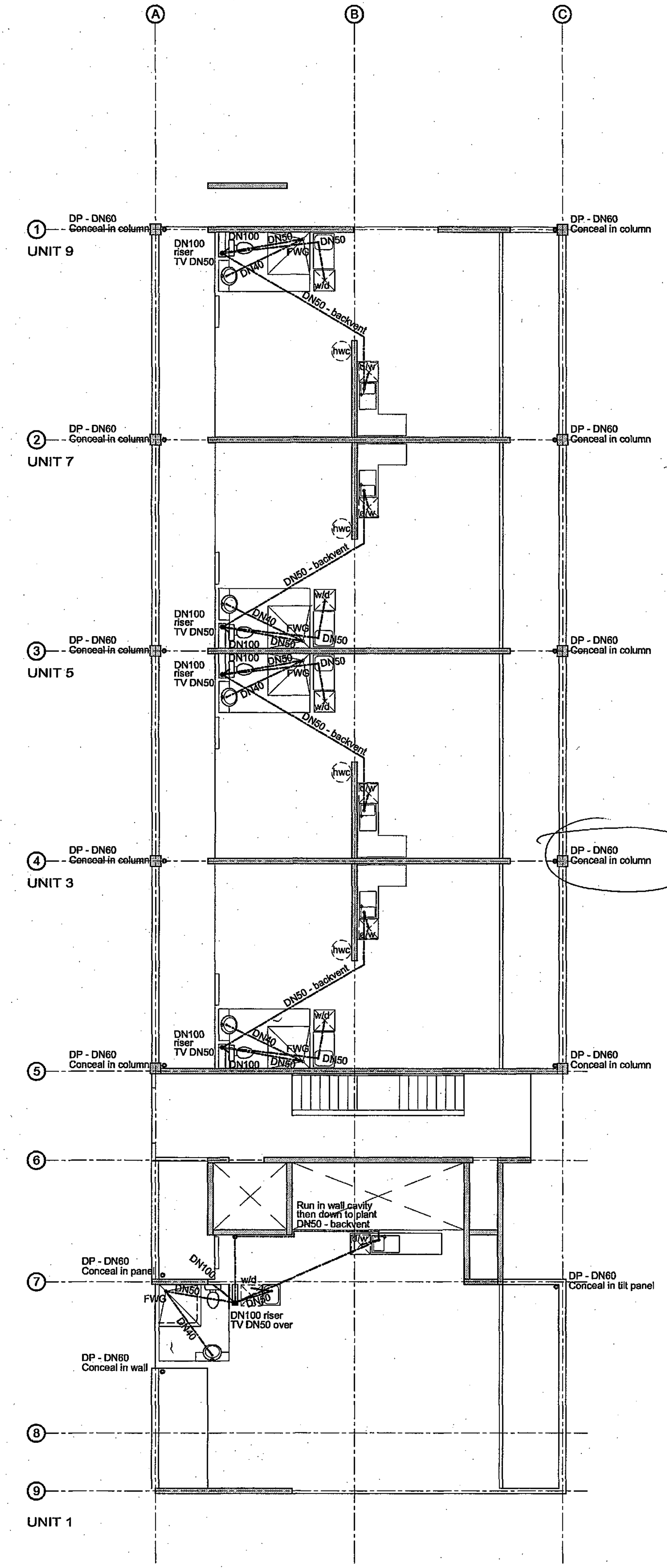
designed	C.S. G.W.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017602	30/3/00
approved		/ /

GROUND FLOOR
PLUMBING & DRAINAGE

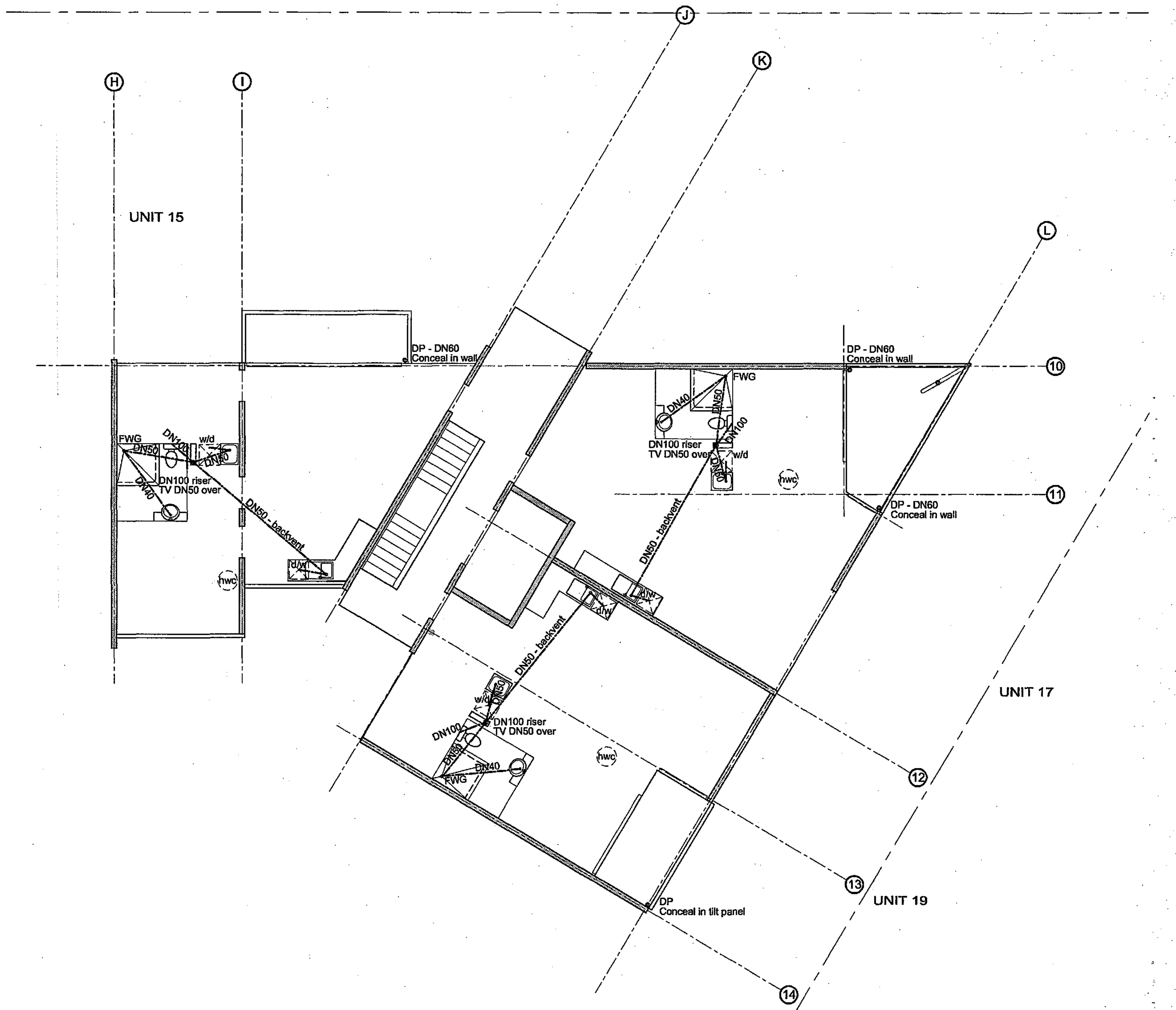
scale	1:100
contract	99/2000-321
sheet	M02

rev. 0

Notes:



GROUND FLOOR
PLUMBING & DRAINAGE 1:100



AMENDED
C.C.C.

All these dps
must be 63dia min
to comply with NZBC E1/AS1 4.2.1

TENDER

#	revision	by	date
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COMMON GROUND

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H O R N B Y
For: Christchurch City Council

designed	C.S. G.W.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017603	30/3/00
approved		/ /

FIRST FLOOR
PLUMBING & DRAINAGE

scale	1:100	rev.
contract	99/2000-321	
sheet	M03	0

KEY

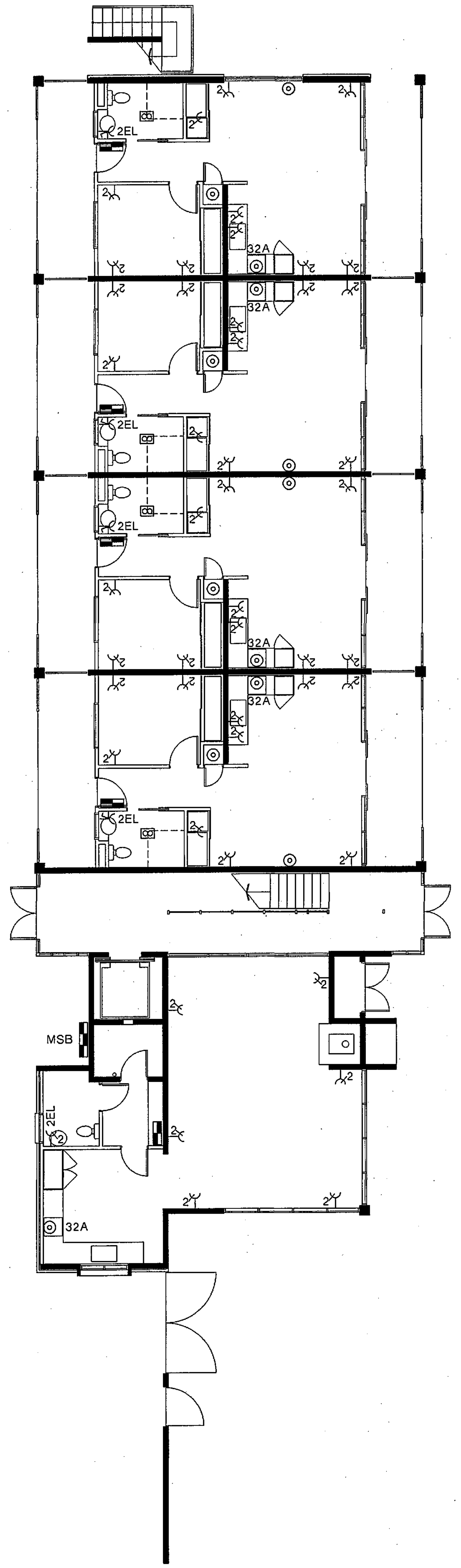
All plumbing & drainage is to comply with AS3500.2 and the New Zealand Building Code

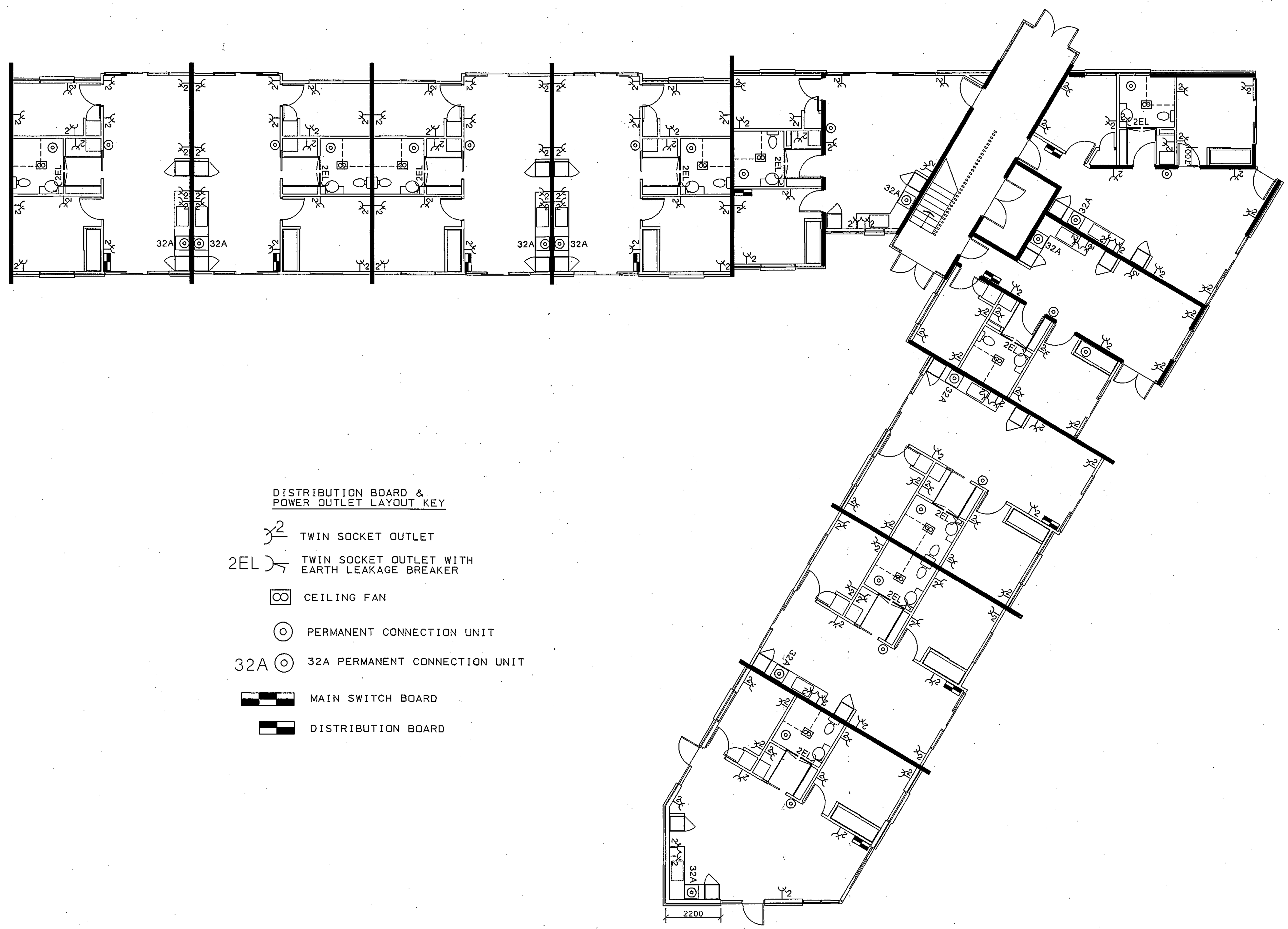
- Gridline 1
- washing machine
- SS. sink insert
- vanity unit
- shower recessed to floor
- WC
- Sewer pipe
- Water supply
- Stormwater pipe
- ORG Overflow relief gully
- FWG Floor waste gully
- AP Access point
- dp Downpipe position

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

path: s:\plot\dgn\structural\sd0100 AutoCAD 2000 Original size

CITY DESIGN





DISTRIBUTION BOARD & POWER OUTLET LAYOUT KEY

- TWIN SOCKET OUTLET
- 2EL — TWIN SOCKET OUTLET WITH EARTH LEAKAGE BREAKER
- CEILING FAN
- PERMANENT CONNECTION UNIT
- 32A — 32A PERMANENT CONNECTION UNIT
- MAIN SWITCH BOARD
- DISTRIBUTION BOARD

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CONSENT DOCUMENT
18 JUL 2000
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ORIGINAL SHEET SIZE A1

CITY DESIGN

	NAME	DATE
DESIGNED		
DRAWN		
DRW. CHK'D		
DES. CHK'D		

APPROVED
DATE
D.E. Elect./Mech.

CLIENT: CHRISTCHURCH CITY COUNCIL · CITY STREETS

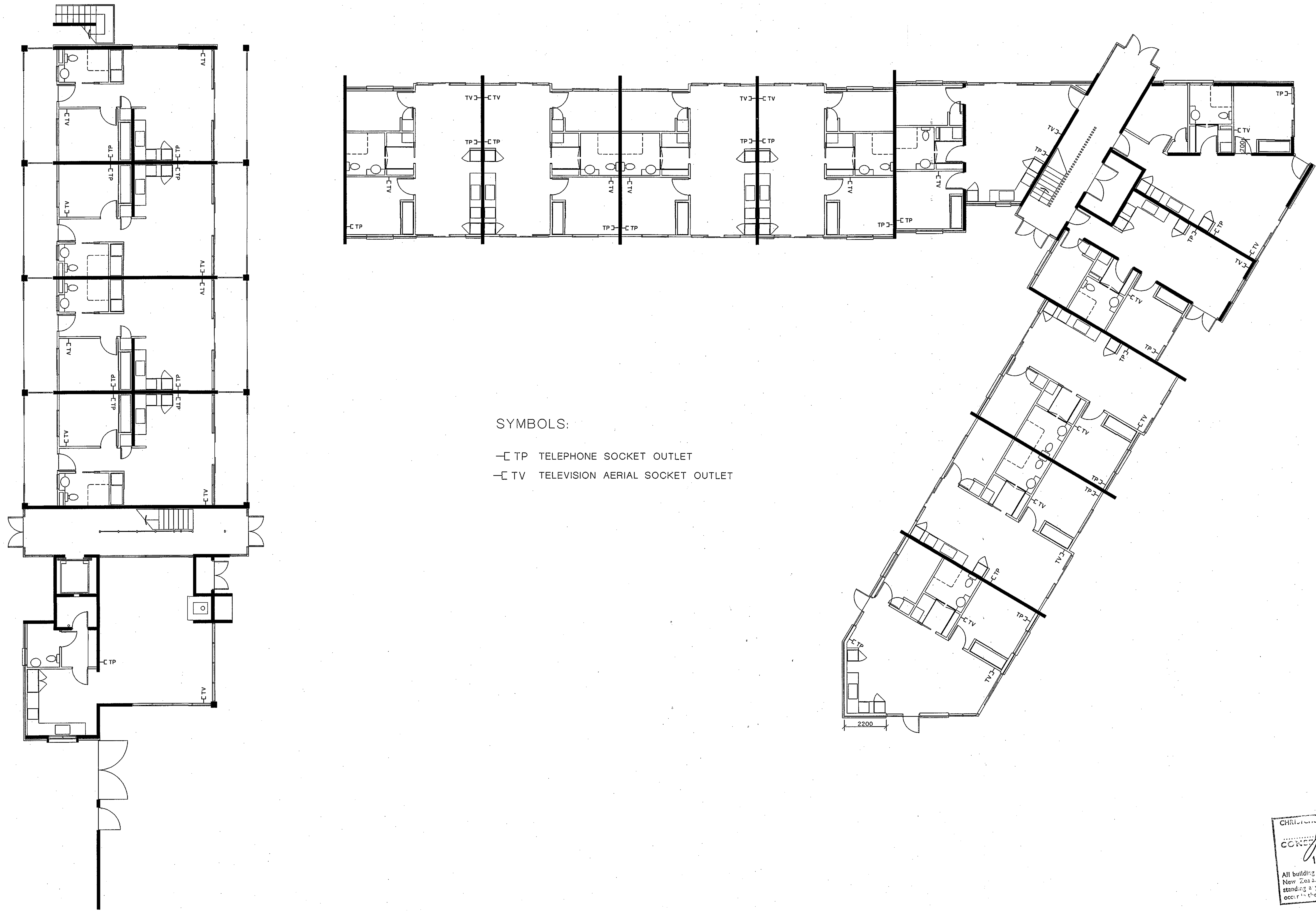
PROJECT TITLE: HORNBY HOUSING PROJECT

DRAWING TITLE: POWER LAYOUT GROUND FLOOR

REV	DESCRIPTION	DESIGNED	DRAWN	DRW. CHK	DES. CHK	APP'D	DATE

CAD FILE NAME
CONTRACT NUMBER
ORIGINAL SHEET SIZE: A1
SCALES: 1:1000
DRAWING NUMBER: E.0225
SHEET: 2 OF 6

...\Electrical\ed0200\ed022501.dgn May. 02, 2000 11:20:07 City Design, CCC.



SYMBOLS:

—[TP TELEPHONE SOCKET OUTLET

—[TV TELEVISION AERIAL SOCKET OUTLET

CITY DESIGN		NAME	DATE	APPROVED	CLIENT	PROJECT TITLE	DRAWING TITLE
	DESIGNED			DATE	CHRISTCHURCH CITY COUNCIL · CITY STREETS	HORNBY HOUSING PROJECT	PHONE/TV LAYOUT GROUND FLOOR
	DRAWN						
	DRW. CHK'D						
	DES. CHK'D						
	© COPYRIGHT CHRISTCHURCH CITY COUNCIL			D.E. Elect./Mech.			

REV	DESCRIPTION	DESIGNED	DRAWN	DRW. CHK	DES. CHK	APP'D	DATE

CAD FILE NAME	ORIGINAL SHEET SIZE	SCALES
CONTRACT NUMBER	A1	1:1000
DRAWING NUMBER		SHEET
E.0225		3 OF 6

...\Electrical\ed0200\ed022501.dgn May. 02, 2000 11:20:50 City Design, CCC.

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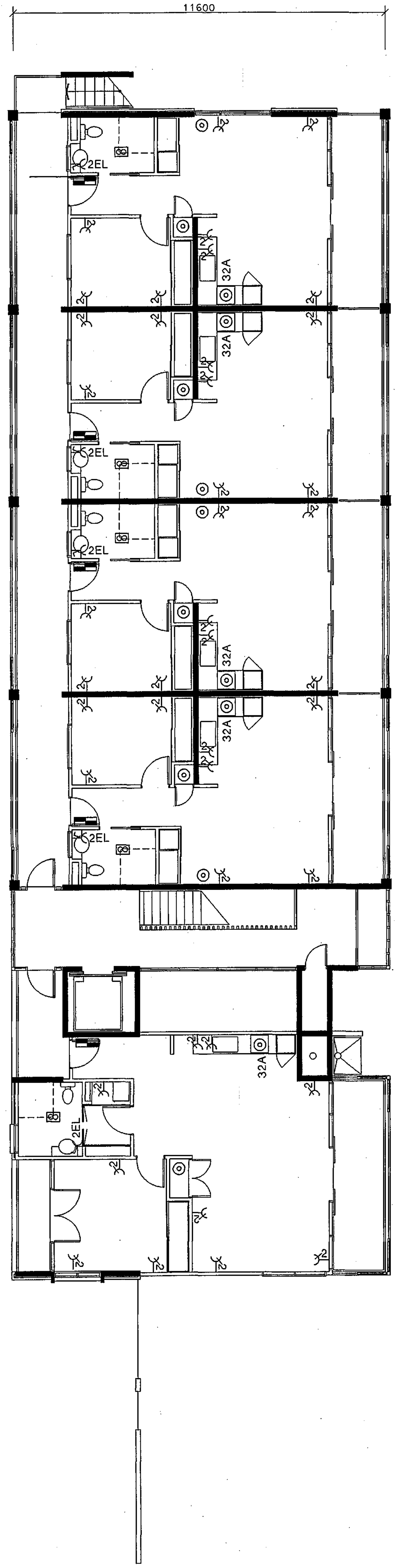
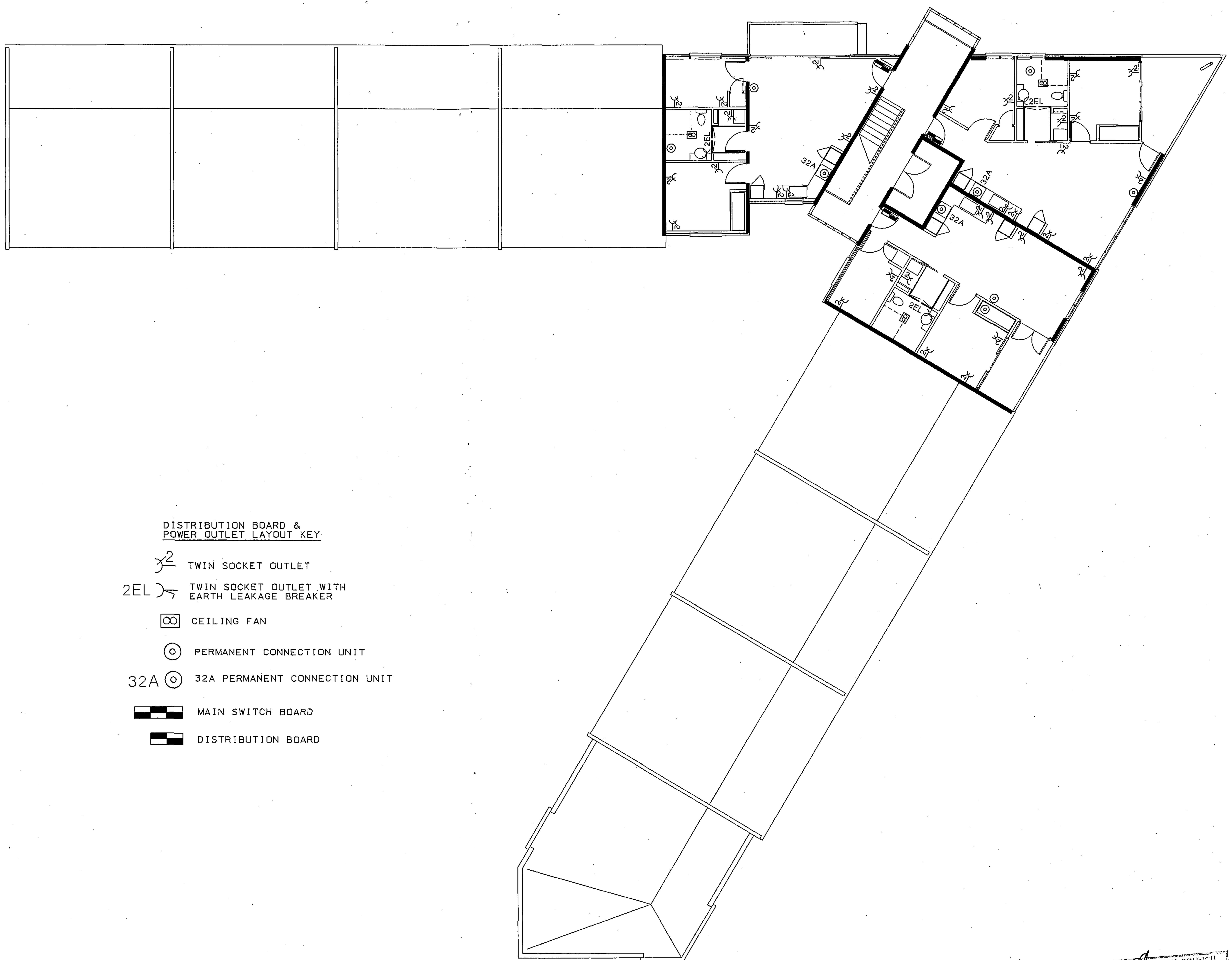
ORIGINAL SHEET SIZE A1





DISTRIBUTION BOARD & POWER OUTLET LAYOUT KEY

- 2 — TWIN SOCKET OUTLET
- 2EL — TWIN SOCKET OUTLET WITH EARTH LEAKAGE BREAKER
- CEILING FAN
- PERMANENT CONNECTION UNIT
- 32A — 32A PERMANENT CONNECTION UNIT
- MAIN SWITCH BOARD
- DISTRIBUTION BOARD

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the City plans and specifications.

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ORIGINAL SHEET SIZE A1

CITY DESIGN		NAME	DATE
	DESIGNED		
	DRAWN		
	DRW. CHK'D		
	DES. CHK'D		

APPROVED

DATE

D.E. Elect./Mech.

CLIENT: CHRISTCHURCH CITY COUNCIL · CITY STREETS

PROJECT TITLE: HORNBY HOUSING PROJECT

DRAWING TITLE: POWER LAYOUT FIRST FLOOR

REV	DESCRIPTION	DESIGNED	DRAWN	DRW. CHK	DES. CHK	APP'D	DATE

CAD FILE NAME

CONTRACT NUMBER

ORIGINAL SHEET SIZE: A1

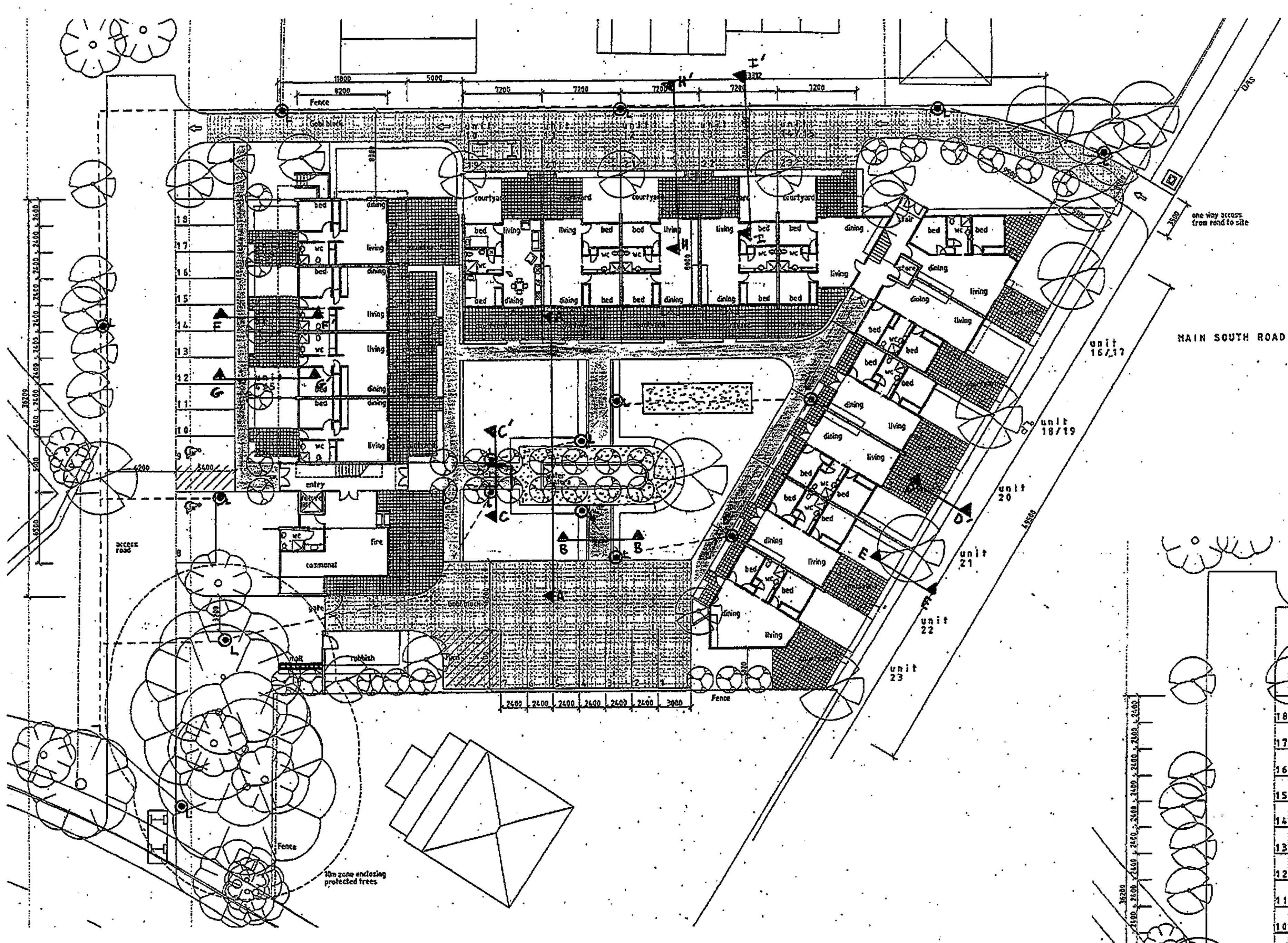
SCALES: 1:100

DRAWING NUMBER: E.0225

SHEET: 5 OF 6

...\Electrical\ed0200\ed022501.dgn May. 02, 2000 11:23:00 City Design, CCC.

1 : 400



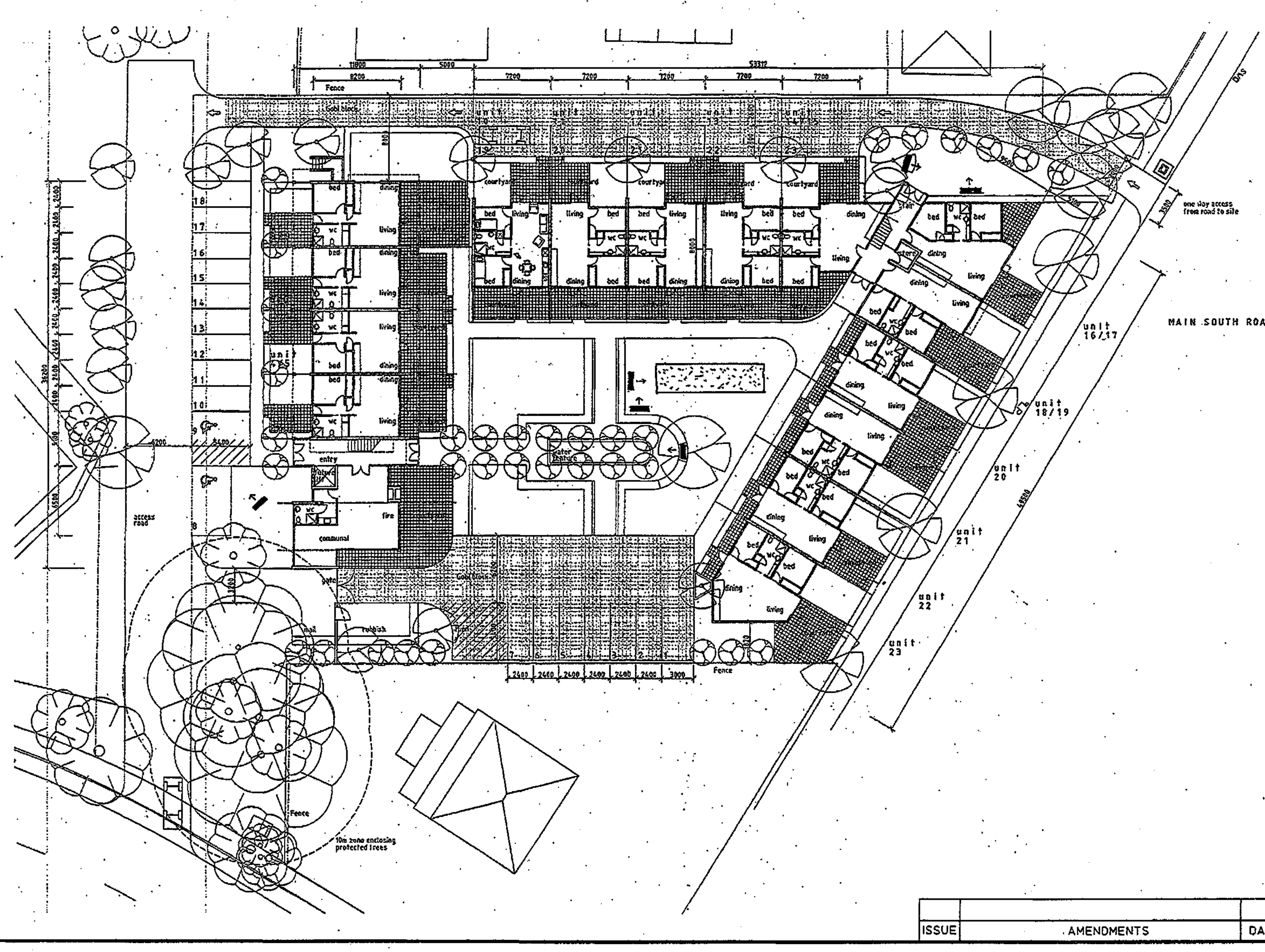
◉L = 16× Lighting Bollards with 70Kw hps Lamps Mounted @ 1m Above ground

= 23× Government Patent Mailboxes on Standard Mounts

= Asphaltic Concrete Paths

= Chip Paths and Surfaces

1 : 400



ISSUE	AMENDMENTS	DATE

CITY DESIGN

CHRISTCHURCH
THE GARDEN CITY
The city that shines

	INITIALS	DATE		
DESIGNED	A Shadbolt	31/3/2000	DATUM	
DRAWN	A Shadbolt	31/3/2000	BENCH MK.	
TRACED			SURVEY FB	
DRW. CHK.	DCP	31/3.	SURVEY LB	
DES. CHK.			CONSTN. EB	
INDEXED			CONSTN. LB	

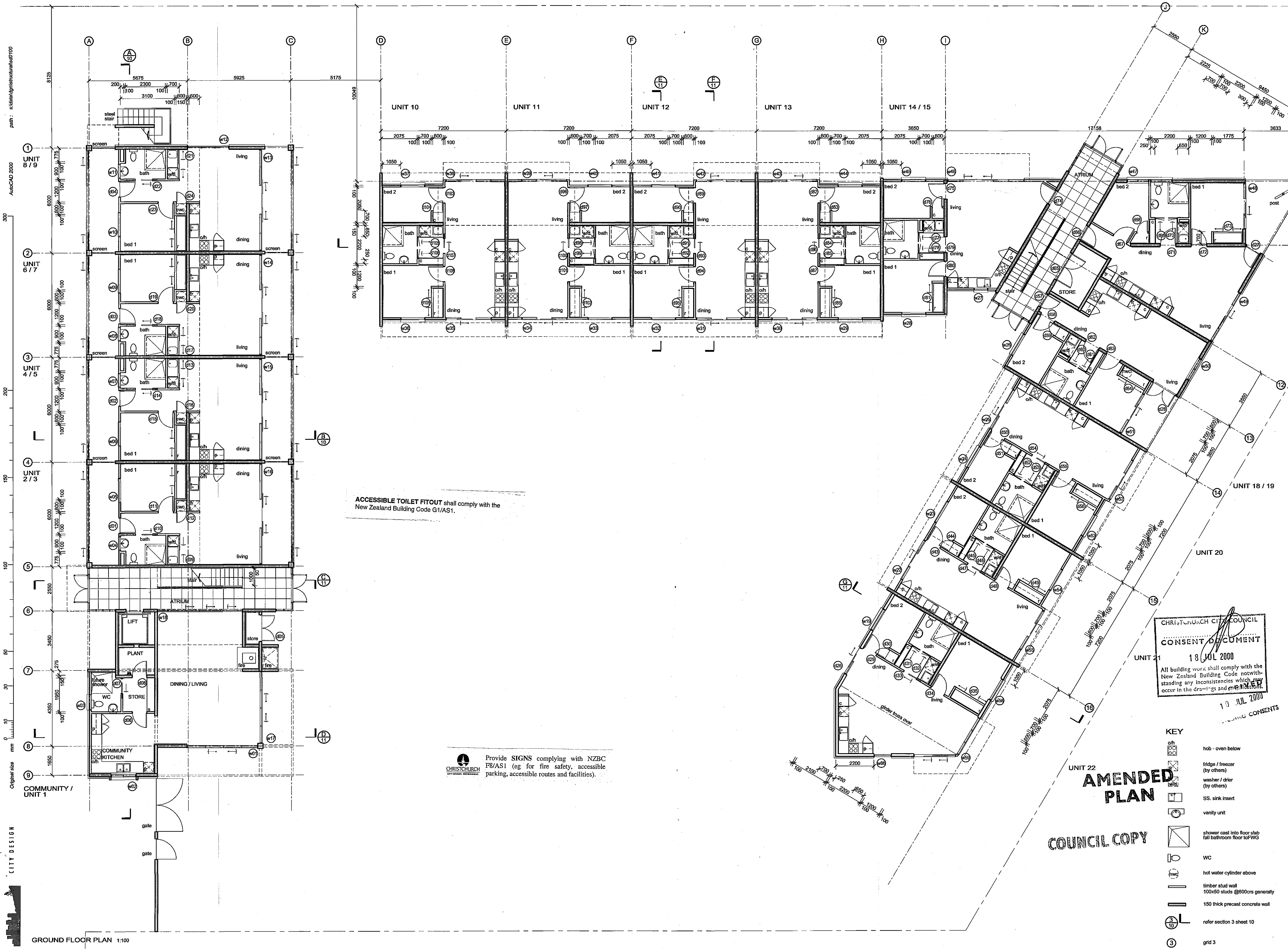
APPROVED
31/3 2000
DATE
CITY DESIGN MANAGER

DRAWING TITLE

**Hornby Housing Project;
Lighting, Park Benches & Mail Boxes**

SCALES	C.N.
1 : 400	L4425
	SHEET 2 OF 10

Notes:



KEY

- hob - oven below
- fridge / freezer (by others)
- washer / drier (by others)
- SS. sink insert
- vanity unit
- shower cast into floor slab fall bathroom floor toFWG
- WC
- hot water cylinder above
- timber stud wall 100x50 studs @600crs generally
- 150 thick precast concrete wall
- refer section 3 sheet 10
- grid 3

NOTES

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2. All dimensions in metric.
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6. Any discrepancy shall be immediately referred to the architect.

CONSTRUCTION

#	revision	by	date
1	Construction Issue	CS	10/7/00
0	Tender documentation	CS	30/3/00

CHRISTCHURCH
CITY COUNCIL · CITY DESIGN

PEOPLE PLACE WORK
COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell, Auckland, New Zealand
Ph 64 09 377 9936, Fax 64 09 377 9938

HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

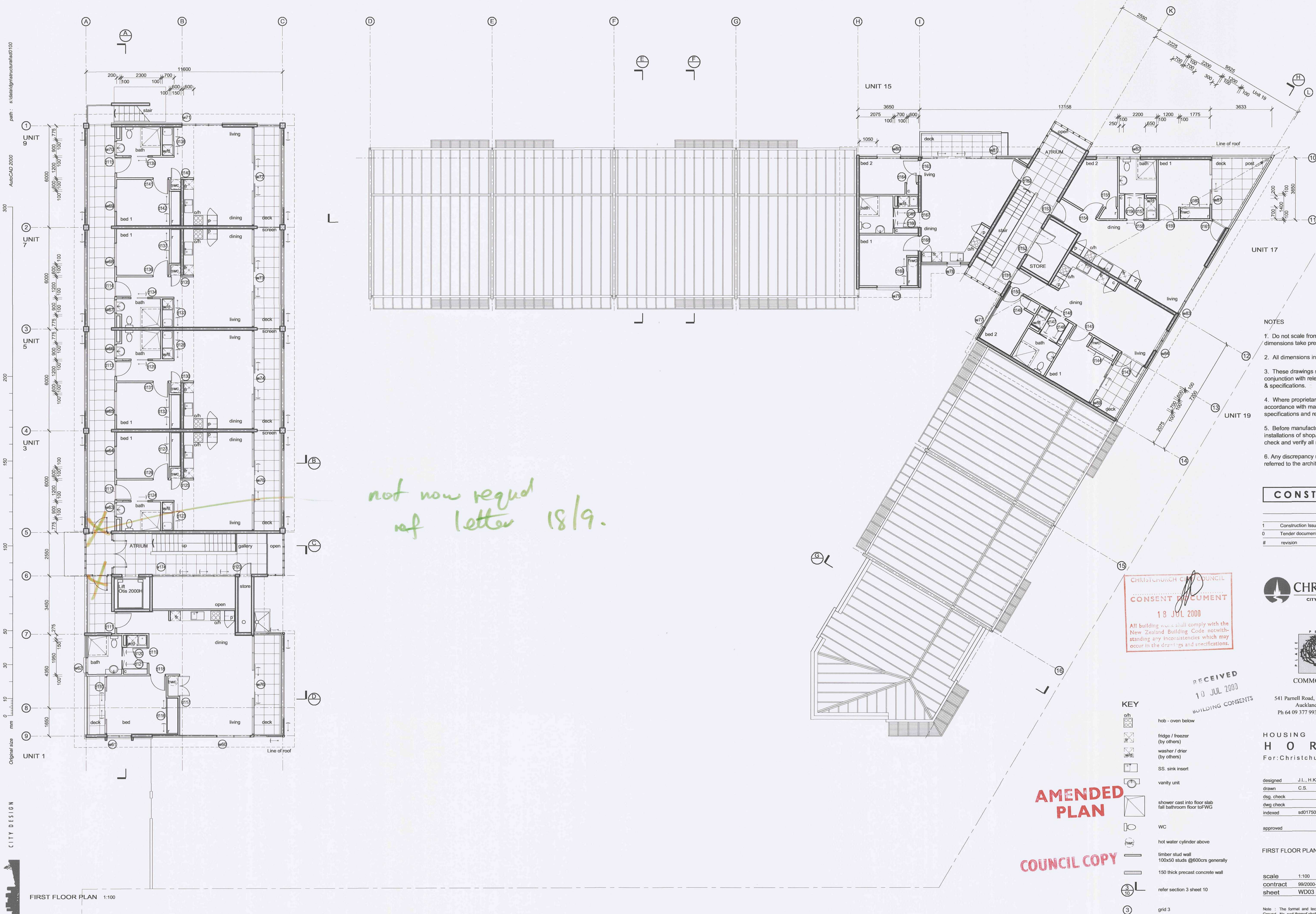
designed	J.L., H.K.B., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017502	30/3/00
approved		/ /

GROUND FLOOR PLAN

scale	1:100
contract	99/2000-321
sheet	WD02

rev. 0

Notes:



FIRST FLOOR PLAN 1:100

CITY DESIGN

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CONSTRUCTION

#	revision	by	date
1	Construction Issue	CS	10/7/00
0	Tender documentation	CS	30/3/00

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CONSENT DOCUMENT
18 JUL 2000
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

RECEIVED
10 JUL 2000
BUILDING CONSENTS

AMENDED PLAN

COUNCIL COPY

KEY

o/h	hob - oven below
fr	fridge / freezer (by others)
w/d	washer / drier (by others)
	SS. sink insert
	vanity unit
	shower cast into floor slab fall bathroom floor toFWG
	WC
hwc	hot water cylinder above
	timber stud wall 100x50 studs @600crs generally
	150 thick precast concrete wall
3/10	refer section 3 sheet 10
3	grid 3

CHRISTCHURCH
CITY COUNCIL · CITY DESIGN

PEOPLE PLACE WORK
COMMON GROUND

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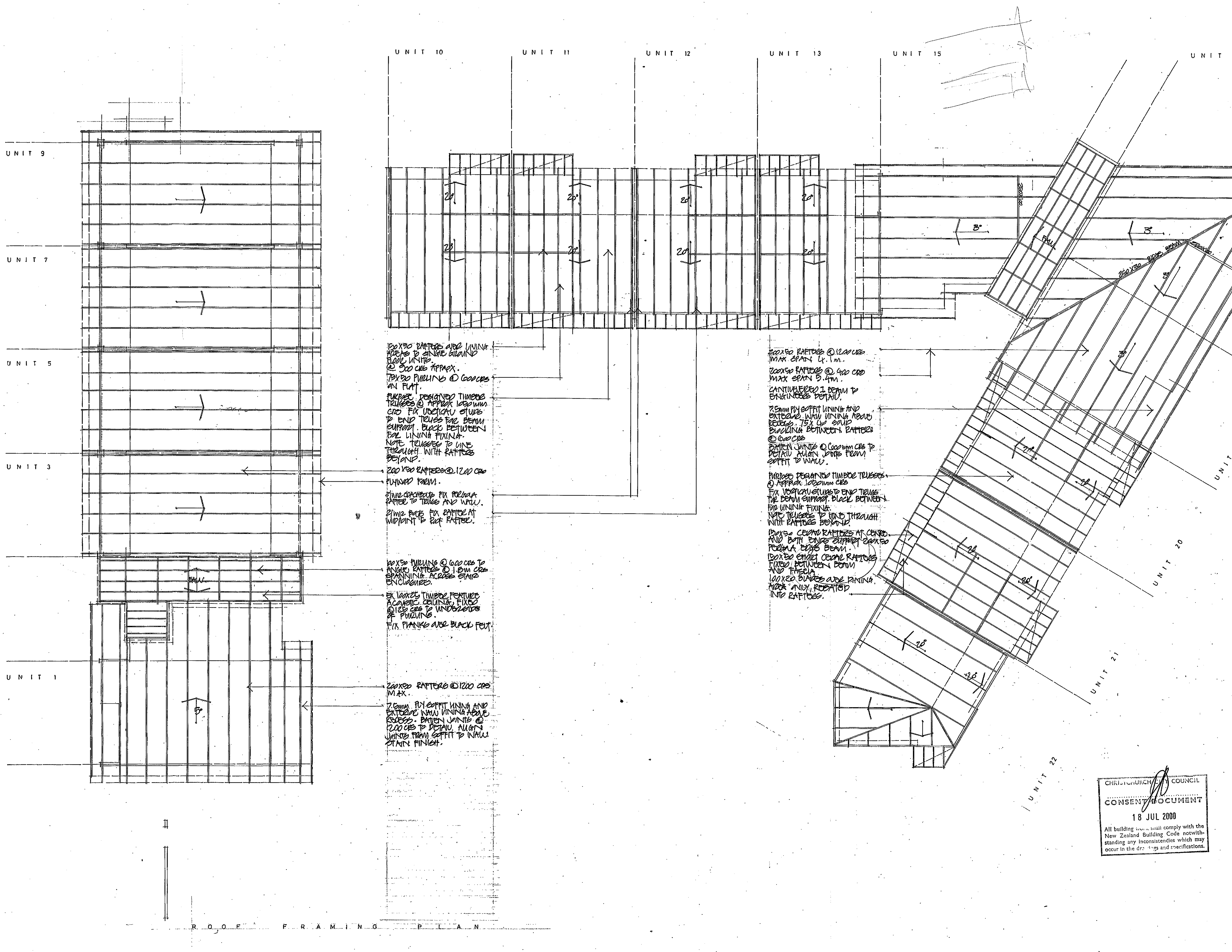
HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

designed	J.L., H.K.B., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017503	30/3/00
approved		/ /

FIRST FLOOR PLAN

scale	1:100	rev.
contract	99/2000-321	
sheet	WD03	0



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#	revision	by	date

CITY DESIGN

CHRISTCHURCH
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The city that shines

PEOPLE

COMMON GROUND

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18 JUL 2000
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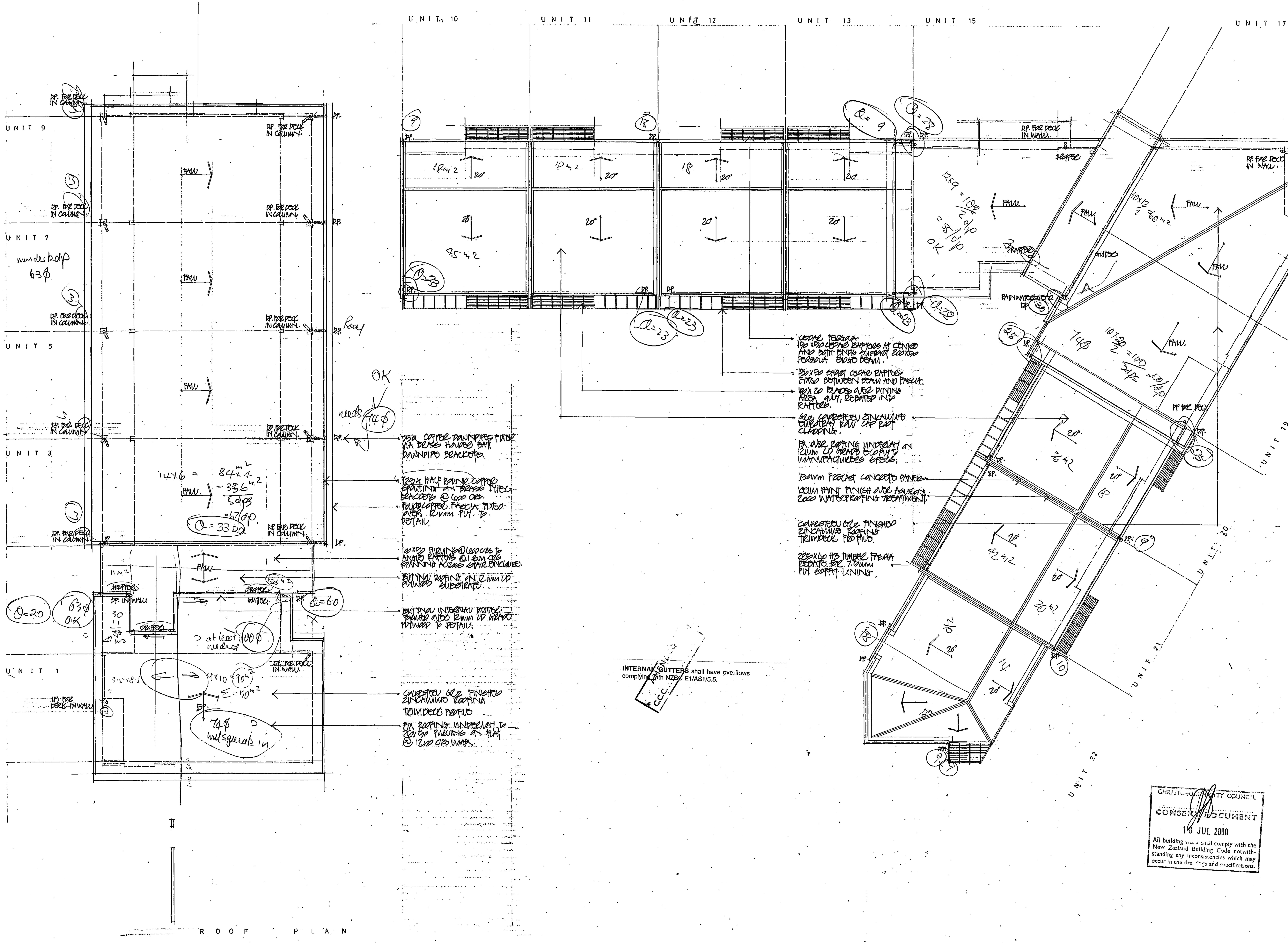
HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

ROOF FRAMING PLAN.

scale	1 : 100.		rev.
contract			△
sheet	WD 04		
designed	H.K.B. C.S.	03 : 2000.	
drawn	H.K.B.	03 2000	
dsg. check			
dwg check			
indexed			
approved		/ /	



NOTES

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CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
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#	revision	by	date

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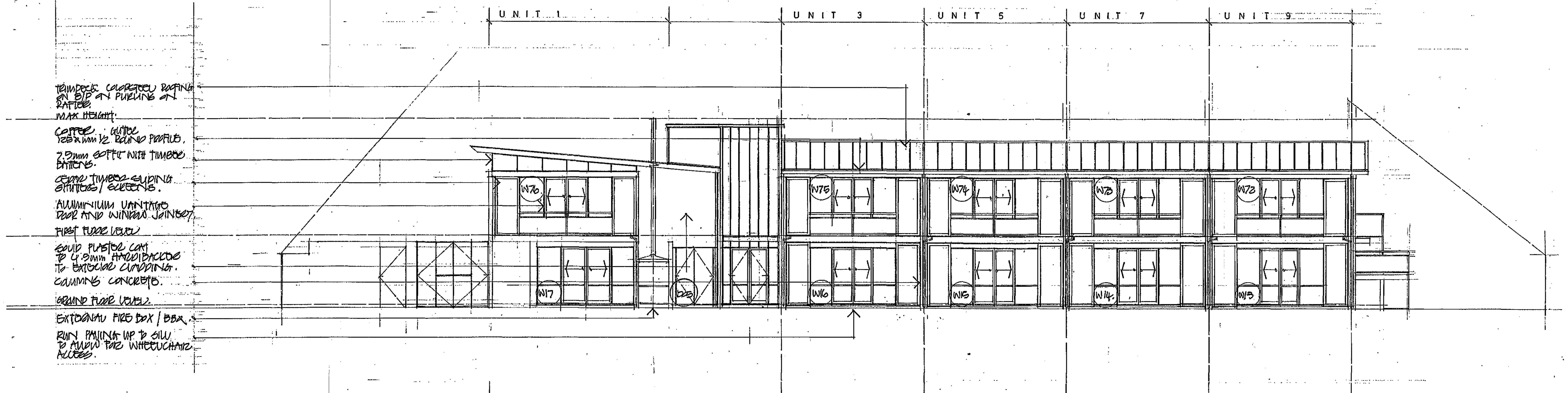
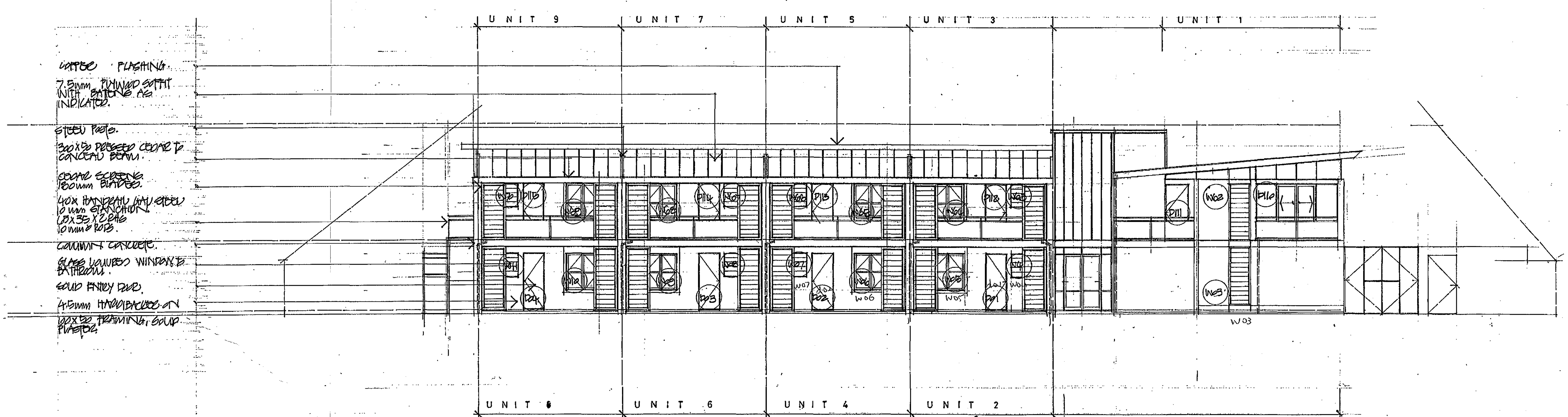
HOUSING PROJECT OF
HORNBY
For:Christchurch City Council

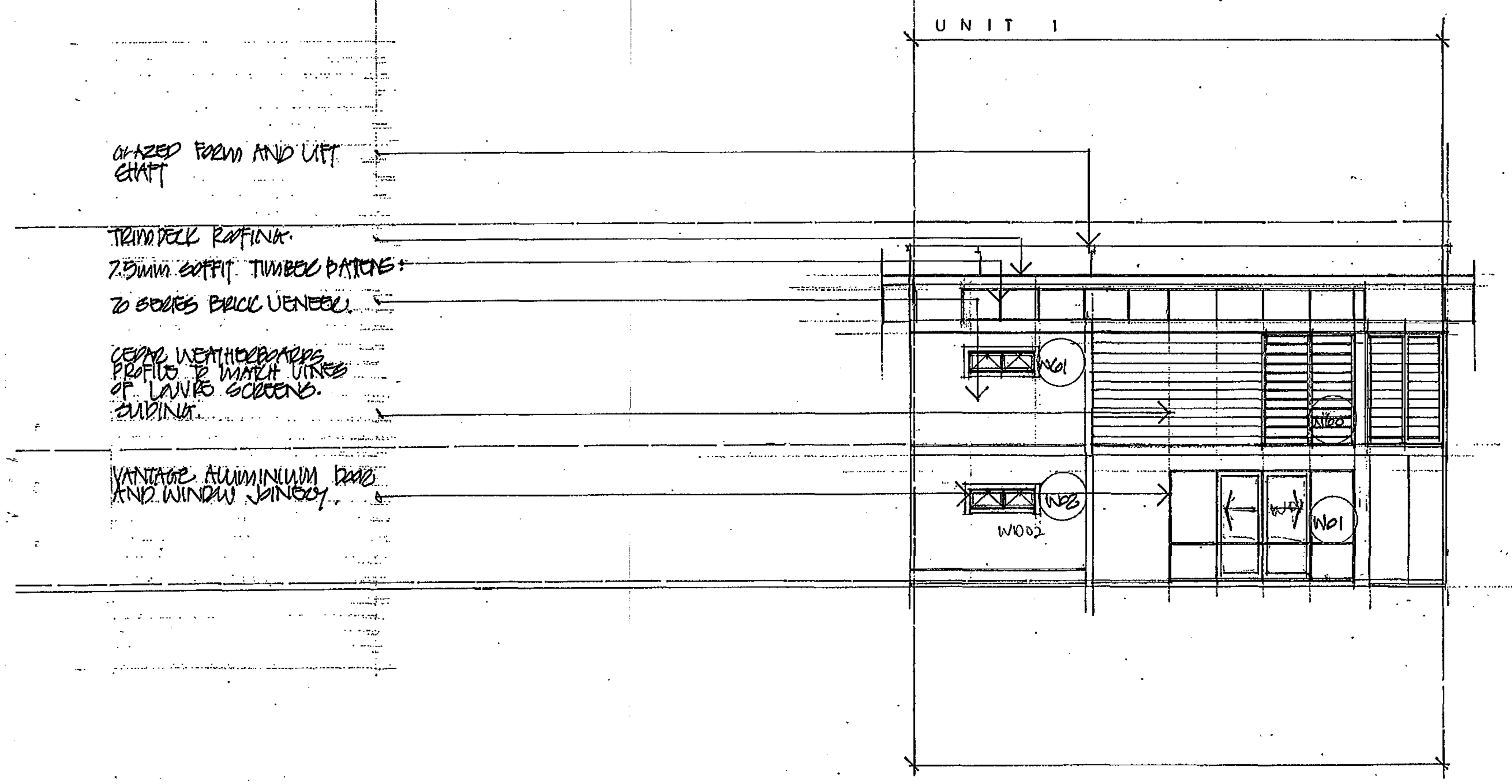
ROOF PLAN

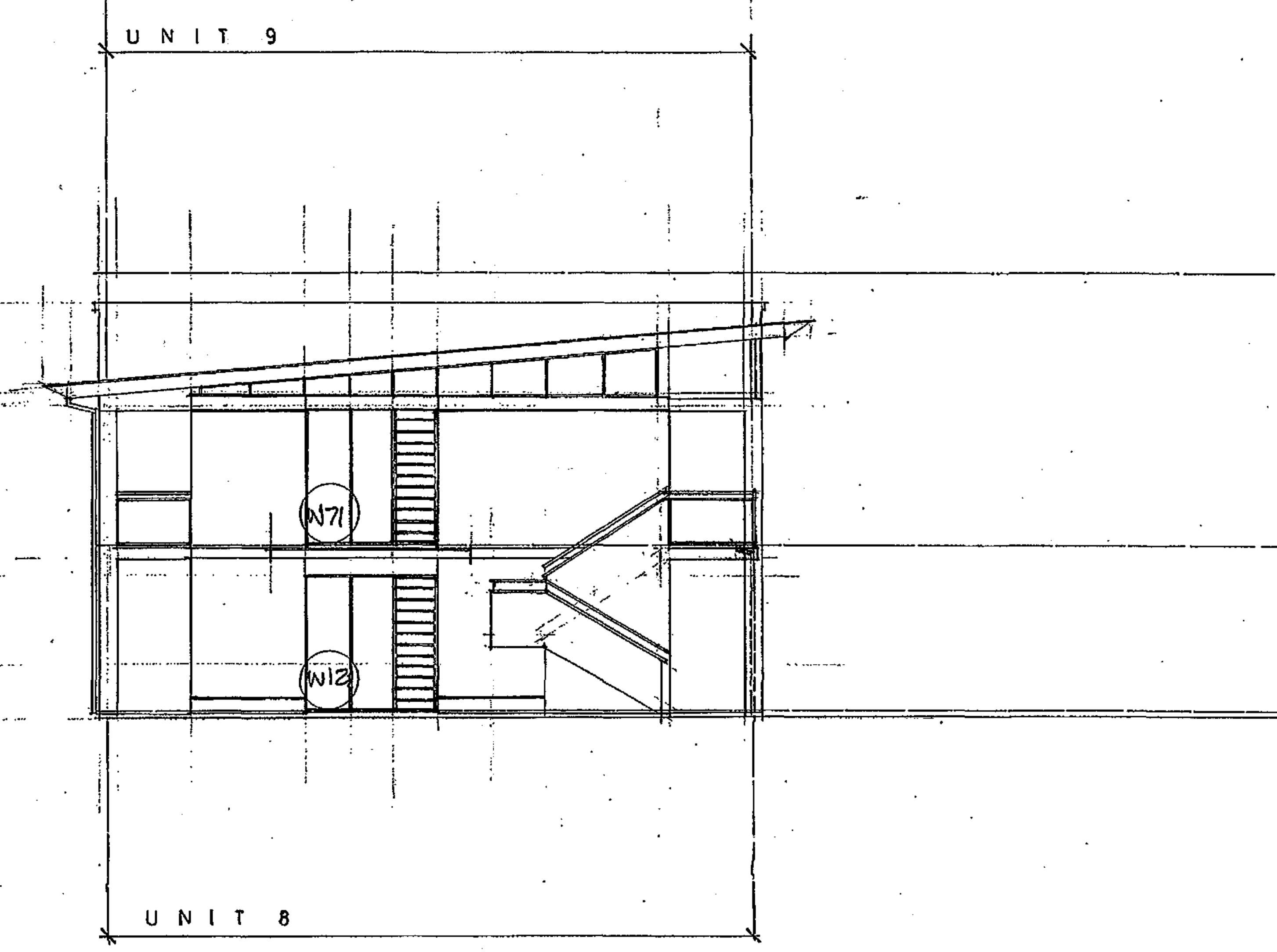
scale 1 : 100
contract
sheet WD 05
rev. △

designed	H.K.B. C.S.	03 2000
drawn	H.K.B.	03 2000
dsg. check		
dwg check		
indexed		
approved		/ /









NOTES

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#	revision	by	date

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
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HOUSING PROJECT OF
HORNBY
For: Christchurch City Council

ELEVATIONS.

scale	1 : 100.	rev.
contract		
sheet	WD 06	△
designed	H.K.B. C.S.	03 2000
drawn	H.K.B.	03 2000
dsg check		
dwg check		
indexed		
approved		/ /

NOTES

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#	revision	by	date

CITY DESIGN

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COMMON GROUND

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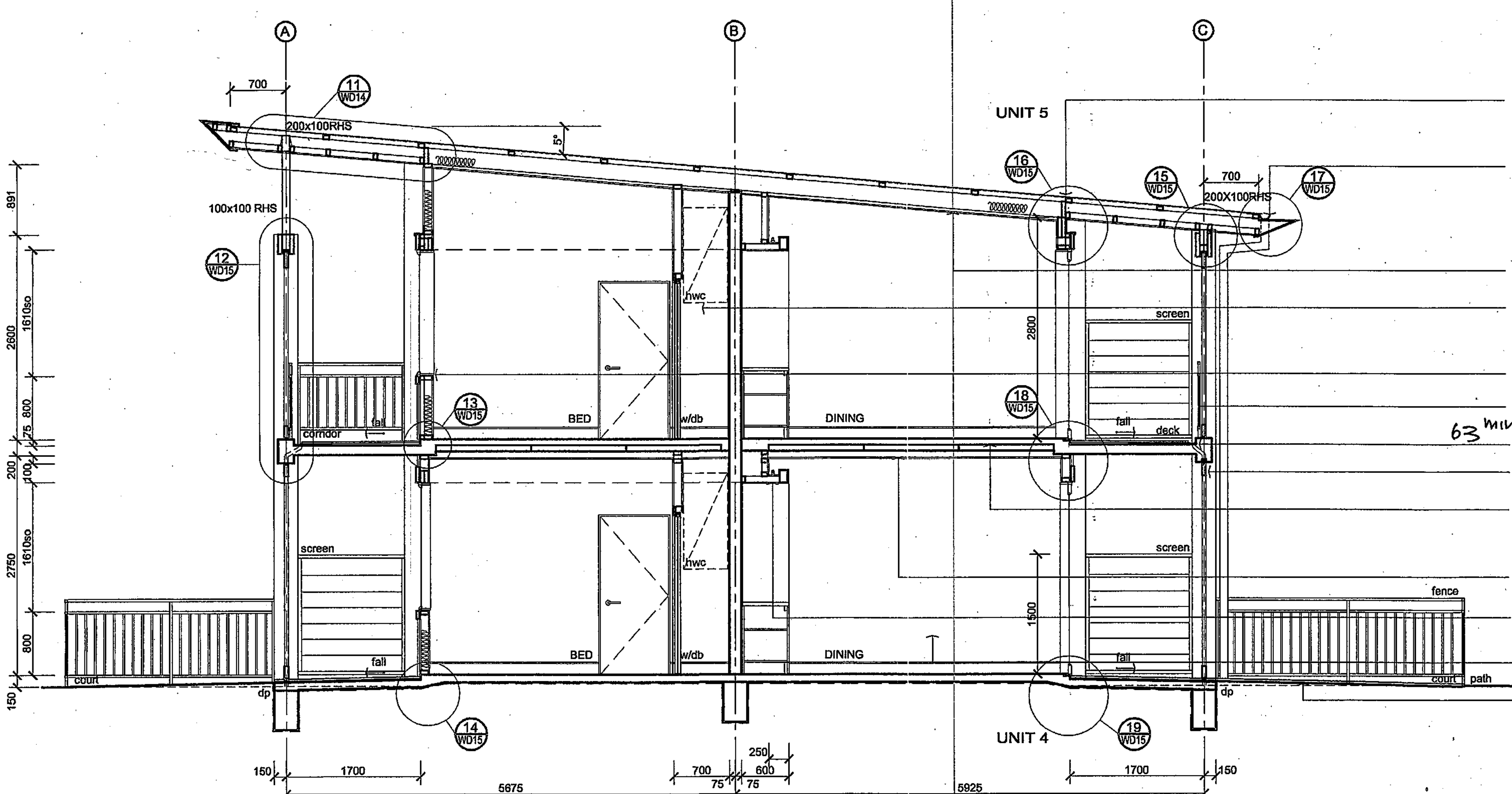
H O R N B Y
For: Christchurch City Council

E L E V A T I O N S

scale	1 : 100.	rev.
contract		
sheet	WD 09	△
designed	H.K.B. C.S.	03 2000
drawn	H.K.B.	03 2000
dsg. check		
dwg check		
indexed		
approved		/ /

Notes:

SECTION A-A 1:50



Colorsteel G2z finished zincalume roofing - trimdeck profile. Fix over roofing underlay to 100x50 purlins on flat @1200crs max.

200x50 rafters @1200crs max.

125Ø half round copper spouting on brass type 2 brackets @600crs. Folded copper fascia fixed over 12mm ply to detail.

7.5mm ply soffit lining and exterior wall lining above recess. 75x40 solid blocking between rafters @600crs. Batten joints @600mm crs to detail. Align joints from soffit to wall.

9.5mm gib Ultraline ceiling on Gib Rondo metal ceiling battens @600crs.

Internal/external stud walls 100x50 @600crs - above 3.0m 100x50 @480crs. Exterior studs treated to H1. Insulate cavity to spec. Pack exterior stud wall 50mm below 2.6m to form step.

3 layer, 20mm solid plaster on galv steel lathe on Building Paper over 4.5mm Hardibacker. Polystyrene head to detail.

Galv steel balustrade - paint finish.

63 min

Tiled deck on grout bed - fall to perimeter drain.
60mm UPVC downpipes concealed in precast concrete columns.

by NZBC E1/AS1 4.2.1

Cedar sliding window shades - fix on track gear to details. Cedar intertenancy screens to detail.

75mm concrete topping on 75mm Unispans. Perimeter deck cast insitu over 100mm wide continuous timber shuttering to soffit. F6 finish to downstand beam. Aquron 2000 waterproofing treatment to all exterior concrete.

9.5mm Gib ultraline fixed to USG Donn suspension system @600crs.

200x100 Lintel over bench - fix to conc walls via joist hangers. Frame out lighting pelmet in 75x50 @600crs.

Interior wall linings generally 9.5mm gib to studs, and 9.5mm gib adhesive fixed to concrete walls.

600x600 precast concrete paving slabs to courtyard.

SECTION B-B 1:50

TENDER

0	Tender documentation	CS	30/3/00
#	revision	by	date

CHRISTCHURCH CITY COUNCIL · CITY DESIGN

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
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PEOPLE PLACE WORK

COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell, Auckland, New Zealand
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HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

NOTES

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designed	J.L., H.K.B., C.S.	MARCH 2000
drawn	C.S.	MARCH 2000
dsg. check		
dwg check		
indexed	sd017510	30/3/00
approved		/ /

CROSS SECTIONS

scale	1:50
contract	99/2000-321
sheet	WD10

rev. 0

NOTES

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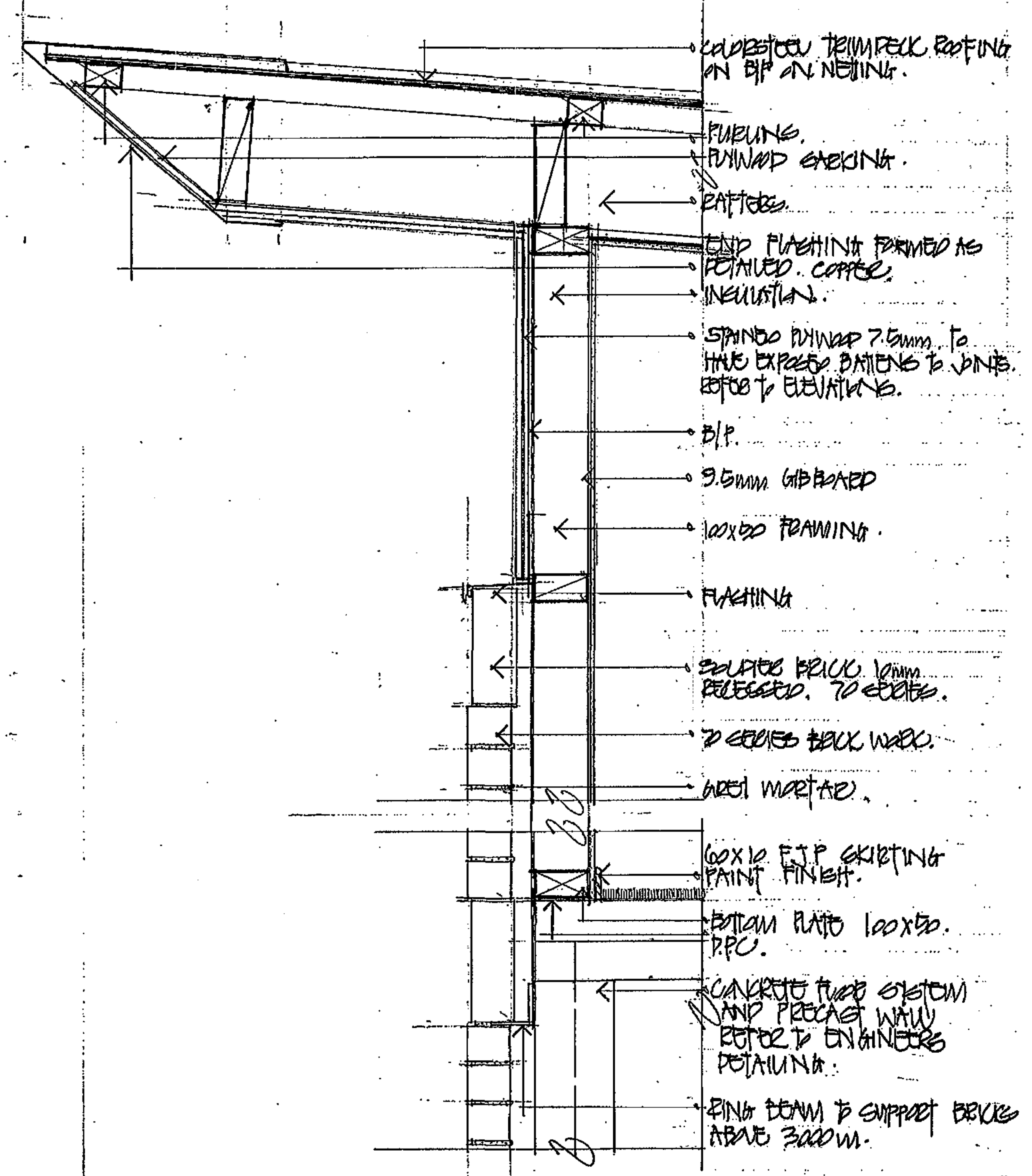

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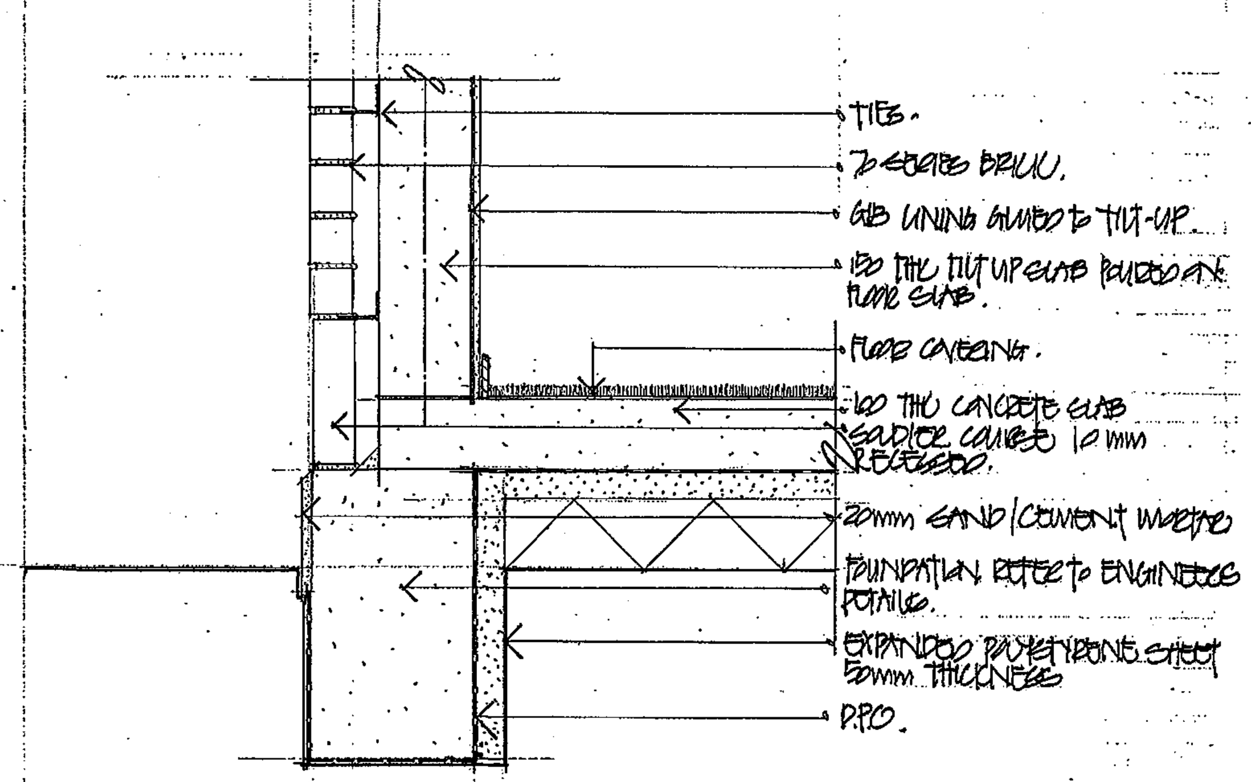

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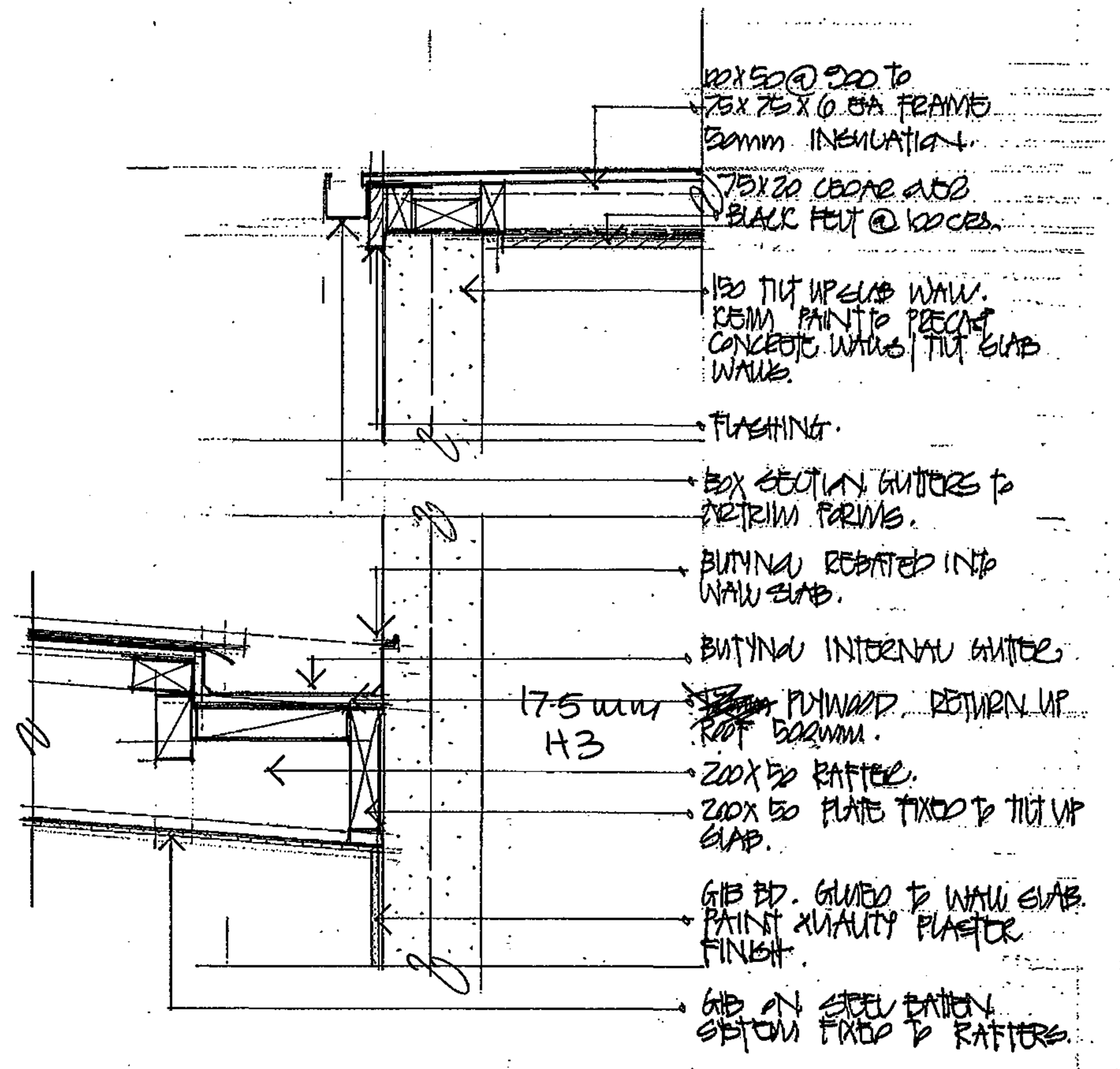
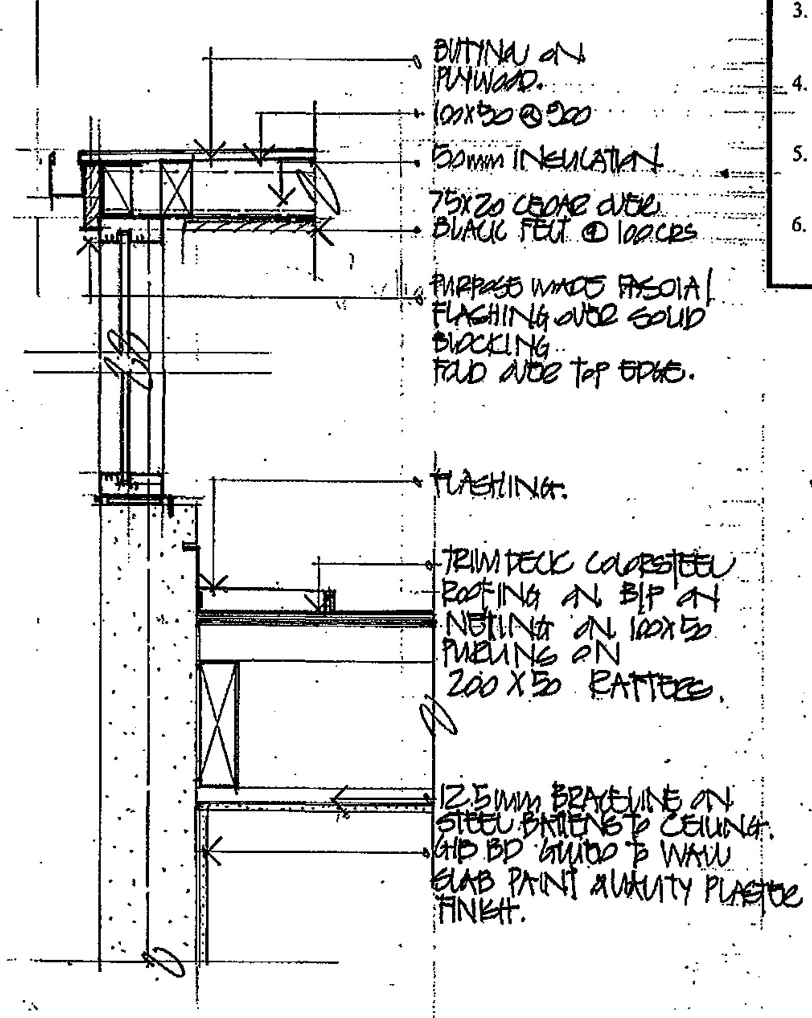
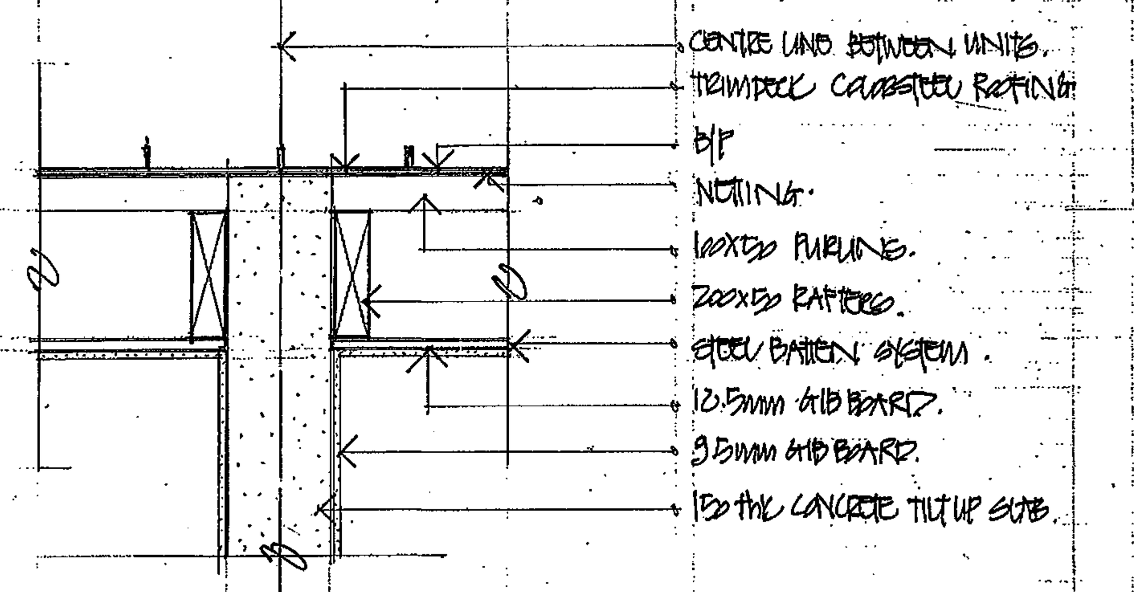


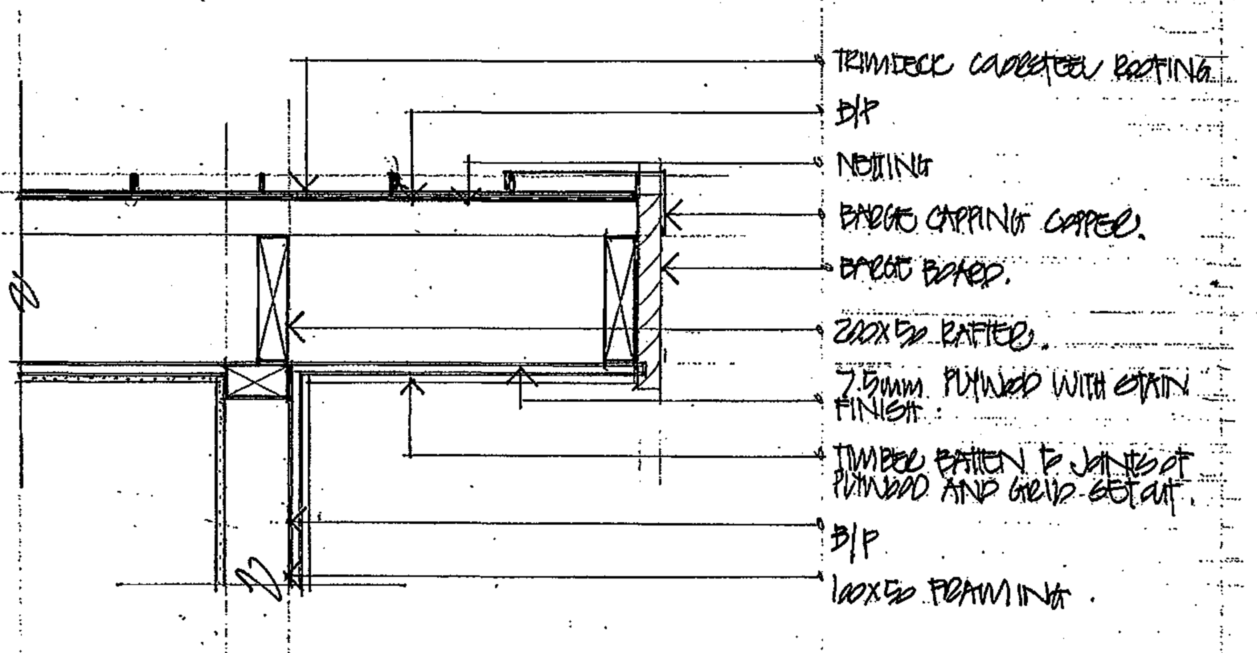
4,5 / WD 10 — R O O F E A V E . I N T E R N A L G U T T E R .



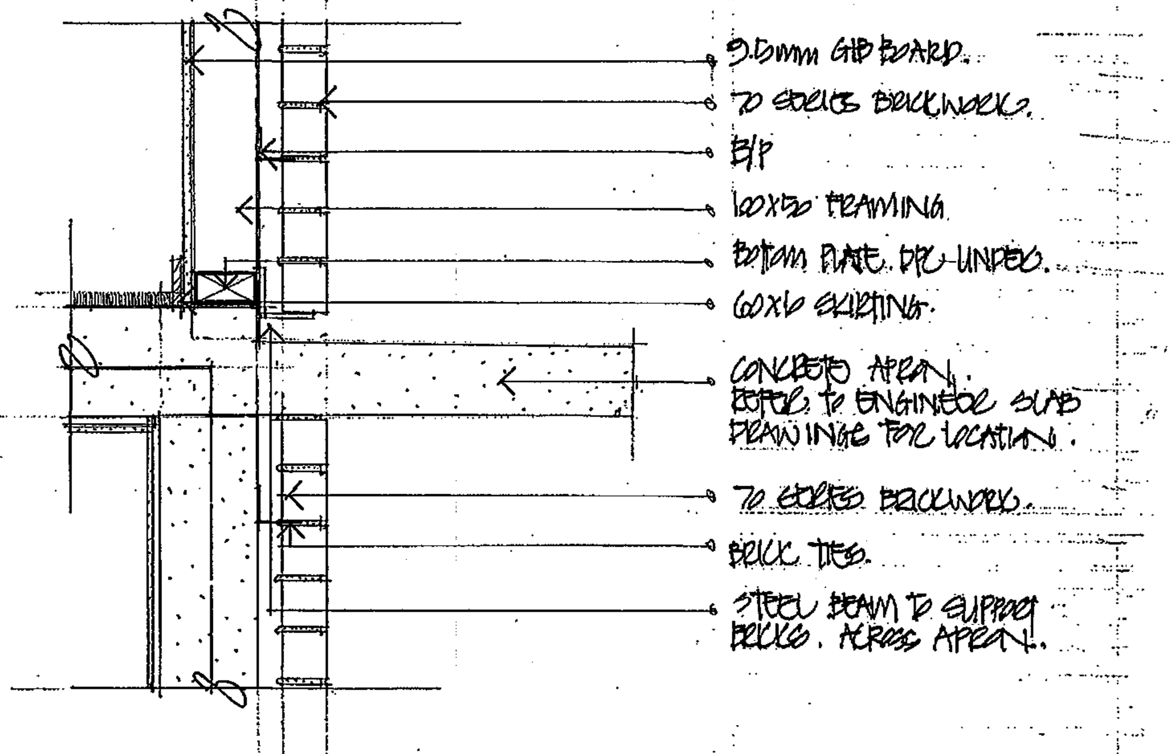
6,7 / WD 10 — R O O F E A V E .



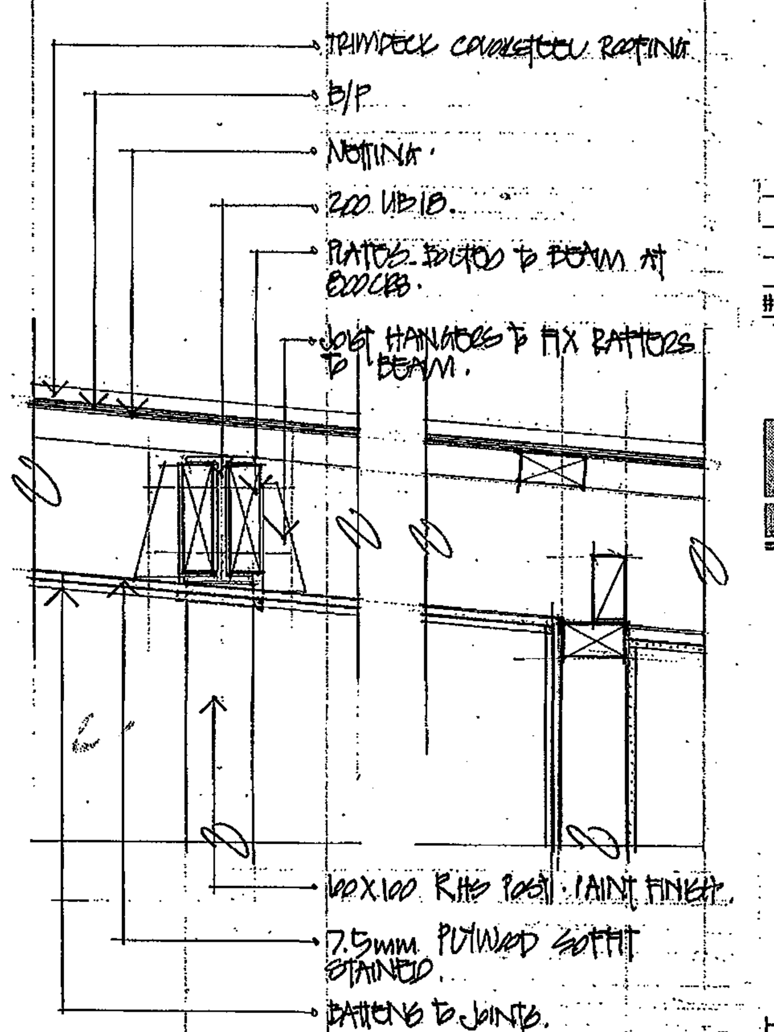
08 / WD 10 — R O O F T I L T S L A B W A L L J U N C T I O N



09 / WD 10 — B A R G E D E T A I L



10 / WD 10 — B R I C K W O R K / A P R O N



11 / WD 10 — C O R R I D O R R O O F

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

#	revision	by	date

CITY DESIGN
CHRISTCHURCH THE GARDEN CITY — The city that shines

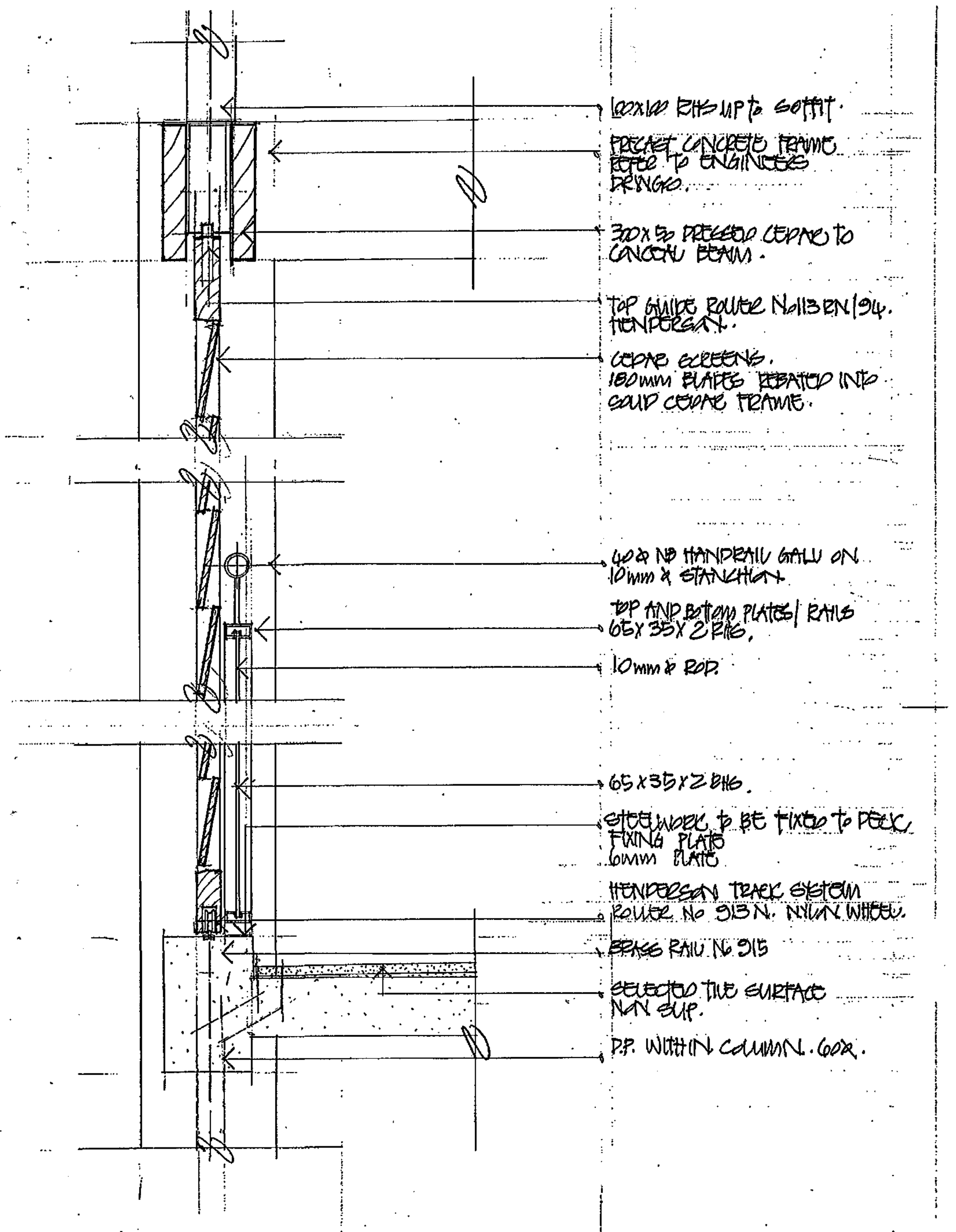
PEOPLE PLACE
COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell, Auckland, New Zealand
Ph 64 09 377 9936, Fax 64 09 377 9938

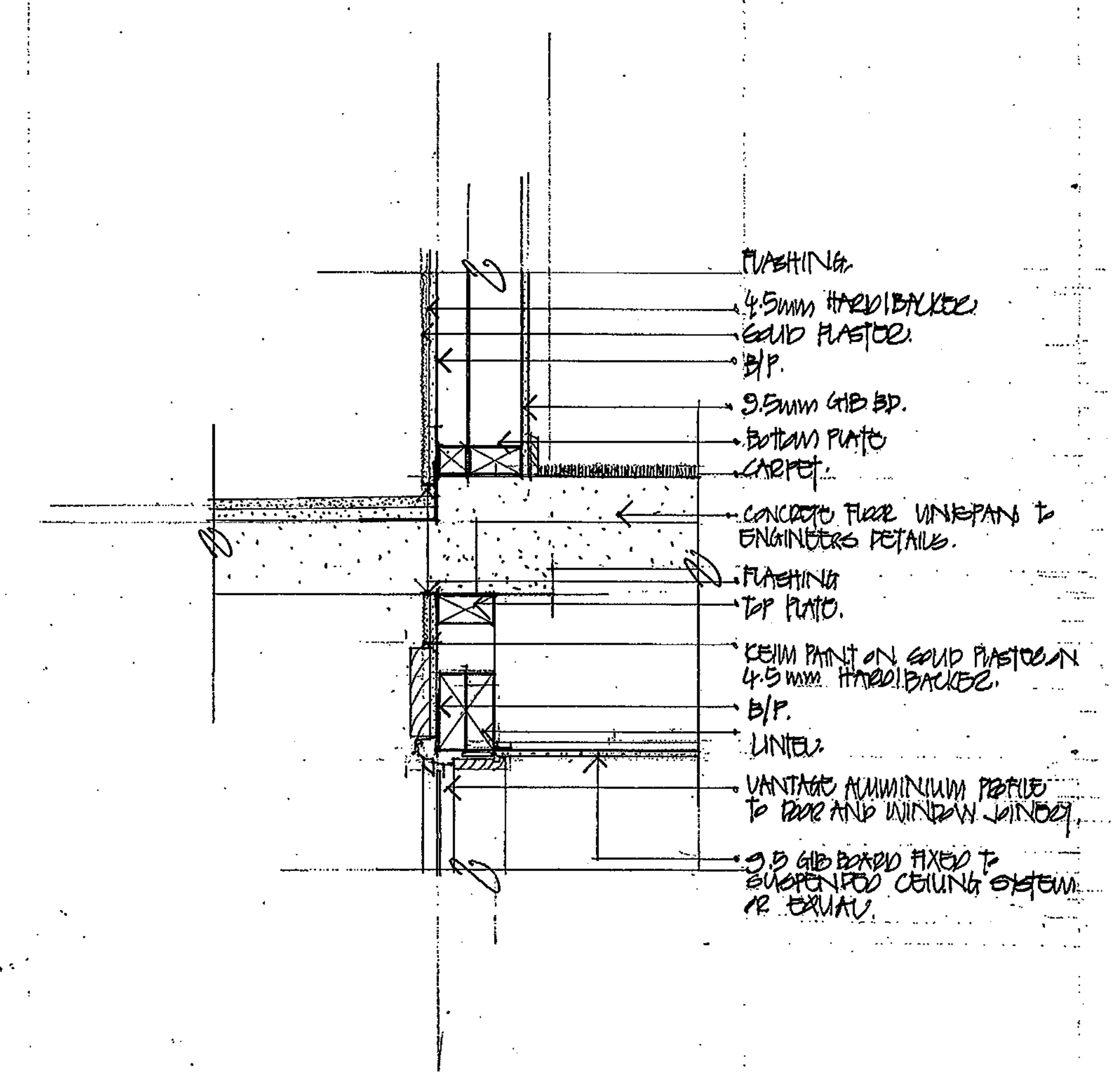
HOUSING PROJECT OF
H O R N B Y
For:Christchurch City Council

D E T A I L S

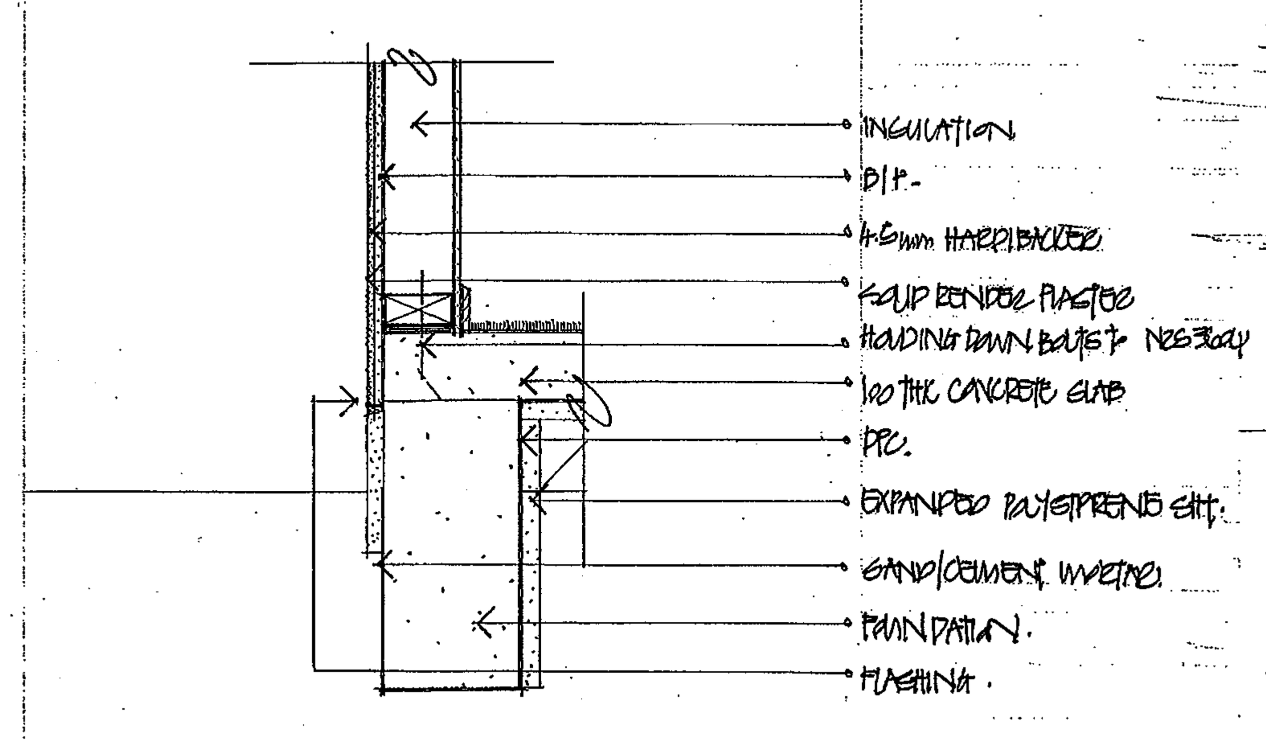
scale	1 : 10.
contract	
sheet	WD 14
rev.	△
designed	H.K.B. C.S. 03 2000
drawn	H.K.B. 03 2000
dsg. check	
dwg check	
indexed	
approved	/ /



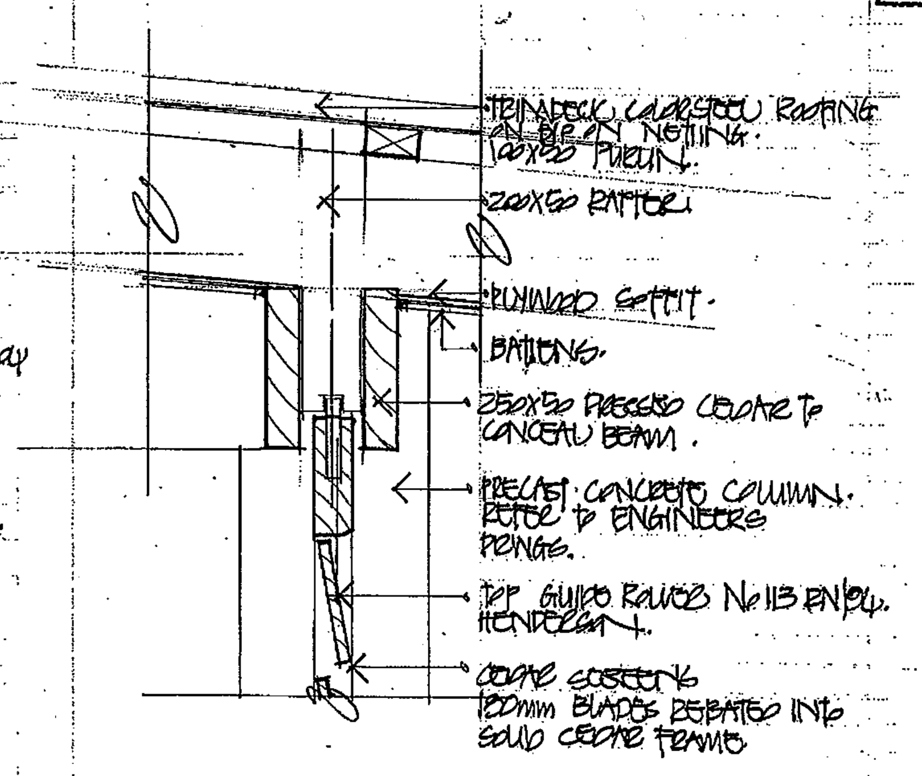
12 / WD10 — SCREEN / BALUSTRADE.



13 / WD10 — FLOOR / CORRIDOR JUNCTION



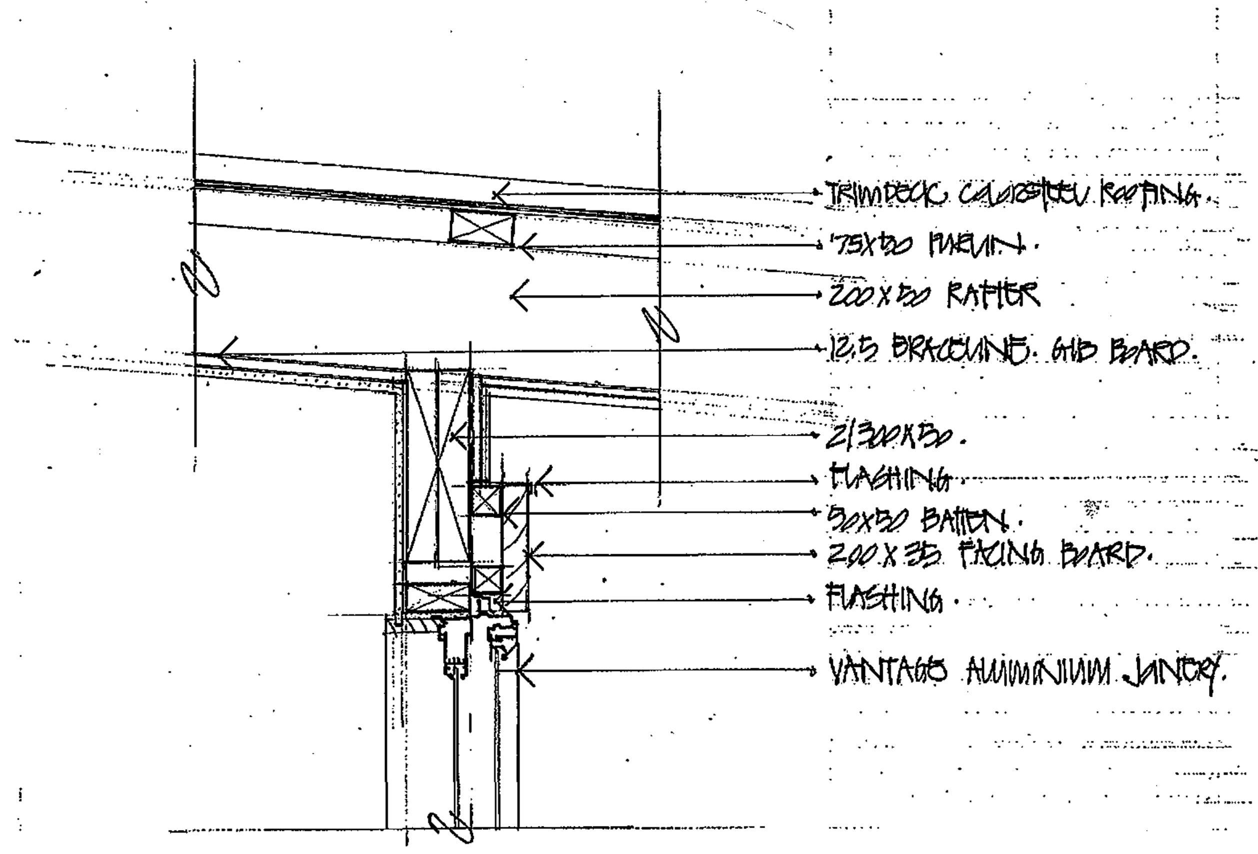
14 / WD10 — WALL / FOUNDATION JUNCTION.



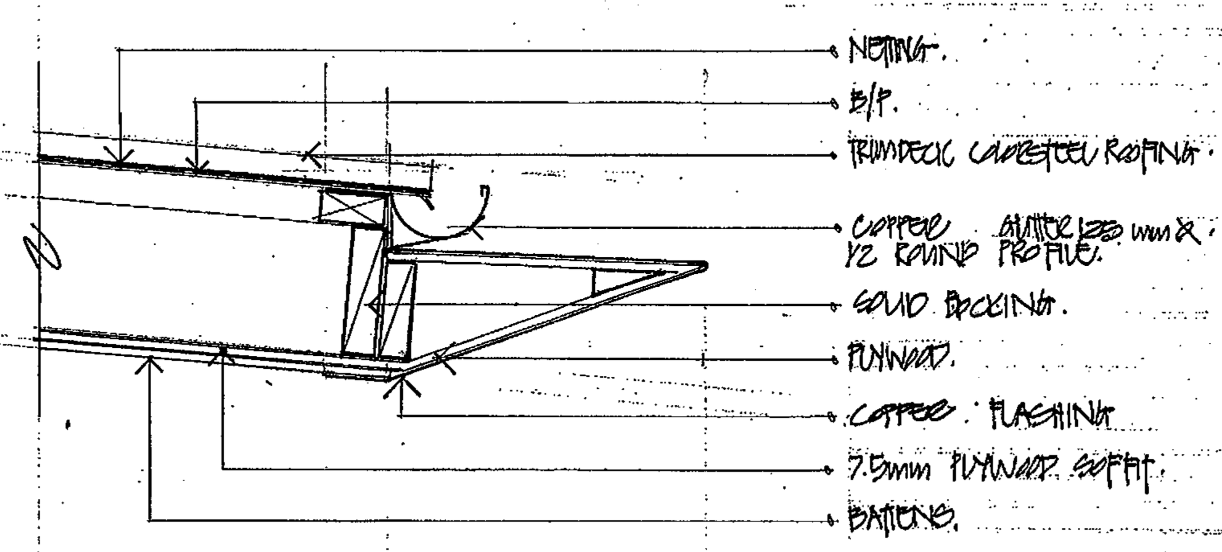
15 / WD10 — SCREEN / ROOF

NOTES

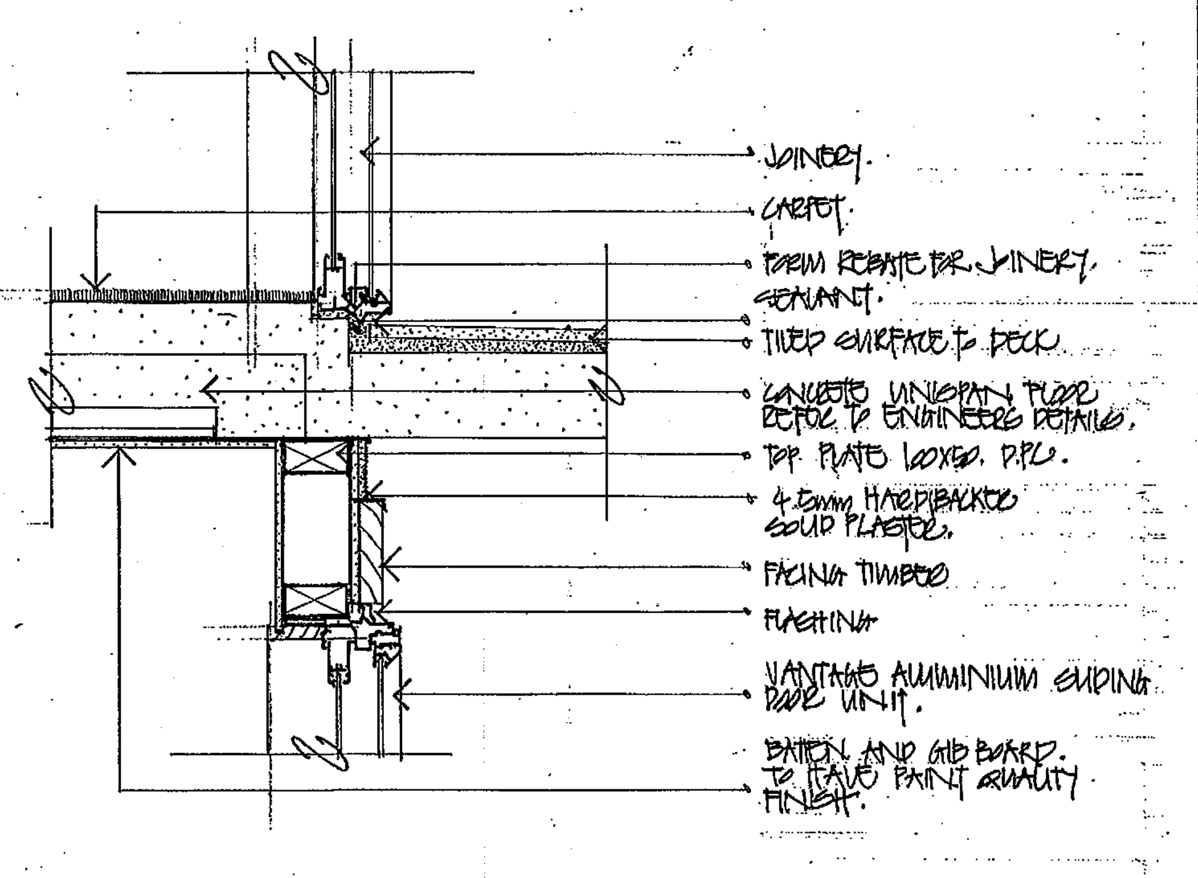
1. Do not scale from drawings, written dimensions take precedence.
2. All dimensions in metric.
3. These drawings shall be read in conjunction with relevant consultants drawing & specifications.
4. Where proprietary items are used, install in accordance with manufacturers current specifications & recommendations.
5. Before manufacture and/or erection or installation of shop/factory or pre-built items check & verify all relevant dimensions.
6. Any discrepancy shall be immediately referred to the architect.



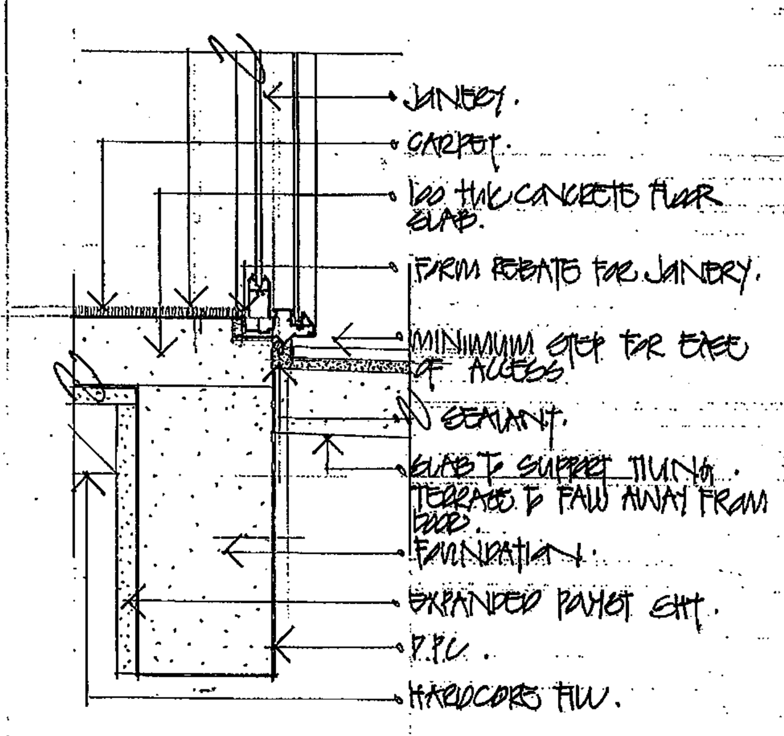
16 / WD10 — LINTEL / ROOF JUNCTION



17 / WD10 — EAVE / GUTTER DETAIL.



18 / WD10 — FLOOR / CORRIDOR JUNCTION.



19 / WD10 — SILL / FOUNDATION.

#	revision	by	date

CITY DESIGN
CHRISTCHURCH
THE GARDEN CITY
The city that shines

PEOPLE · PLACE
COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell, Auckland, New Zealand
Ph 64 09 377 9936, Fax 64 09 377 9938

HOUSING PROJECT OF
HORNBY
For: Christchurch City Council

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
18 JUL 2000
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

DETAILS

scale	1 : 10.		rev.
contract			
sheet	WD. 15.		△
designed	H.K.B. C.S	03 2000	
drawn	H.K.B.	03 2000	
dsg. check			
dwg check			
indexed			
approved		/ /	

NOTES

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3. These drawings shall be read in conjunction with relevant consultants drawing & specifications.
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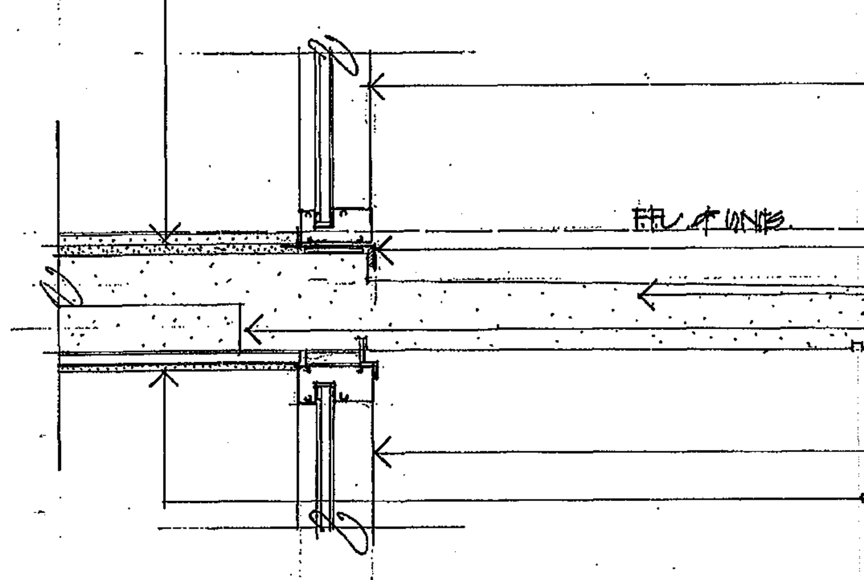
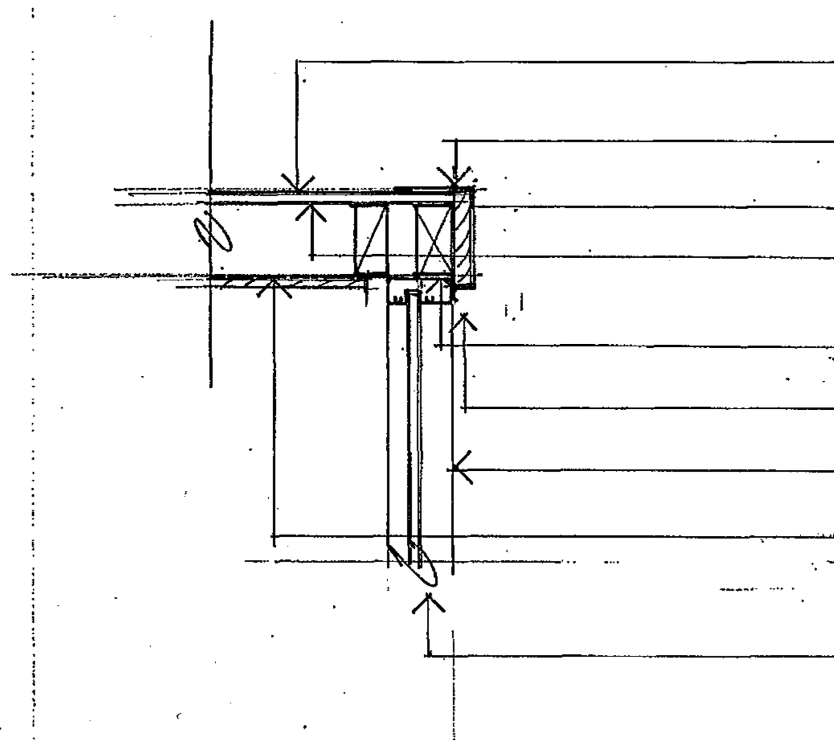
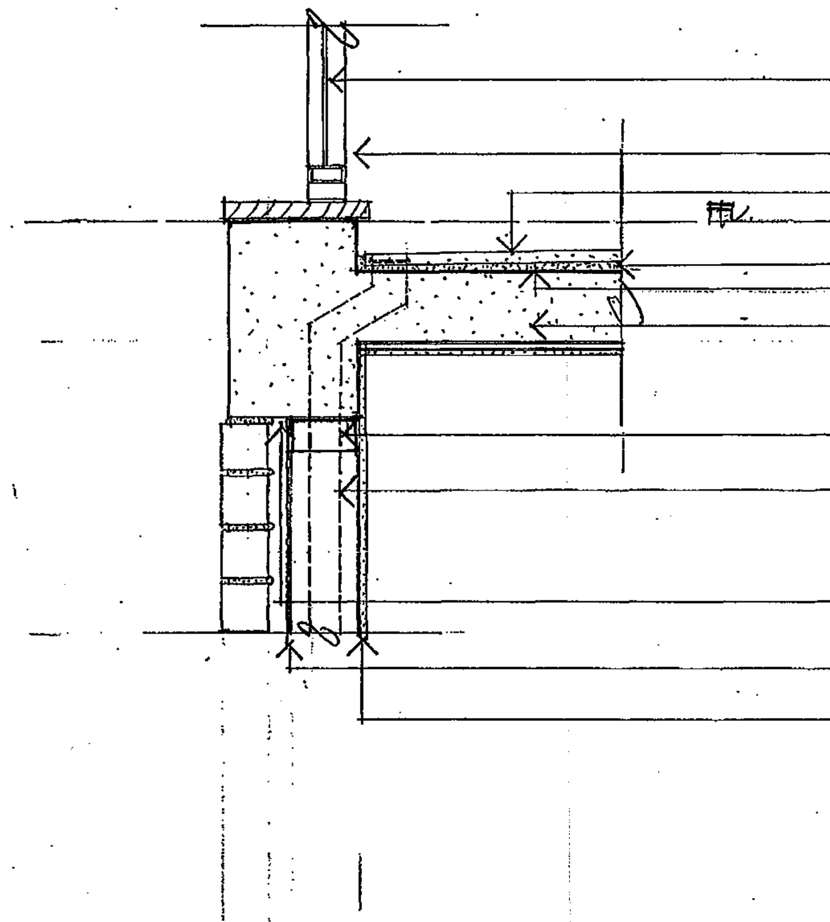


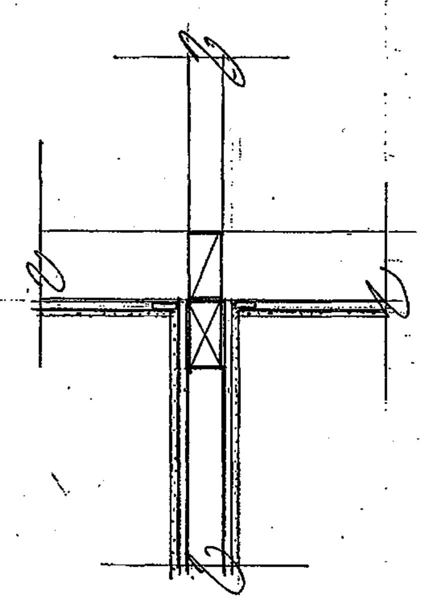
20 WD 11 ENTRY CANOPY JOINERY JUNCTION



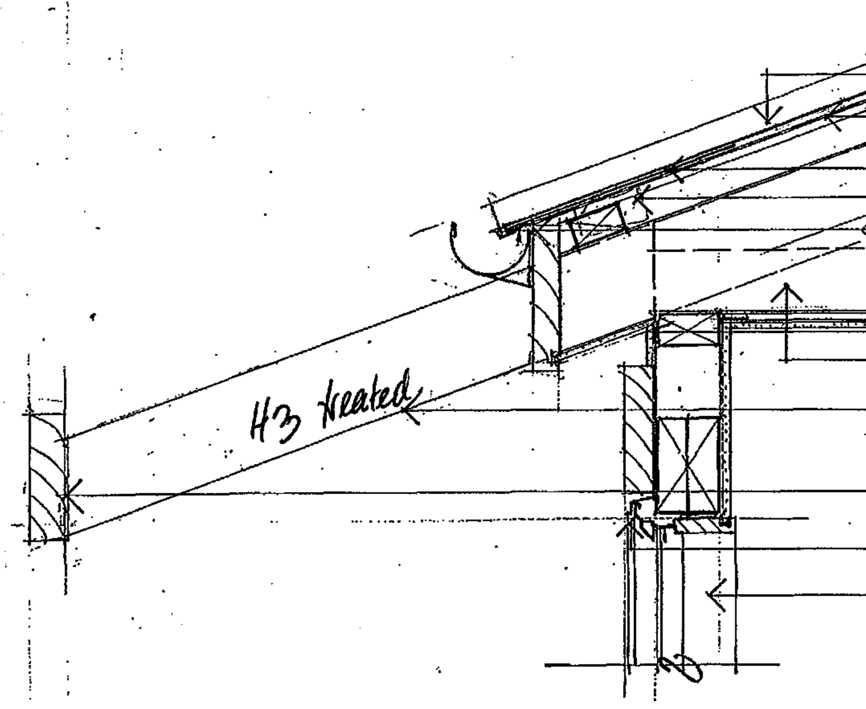
21 WD 11 EAVE DETAIL



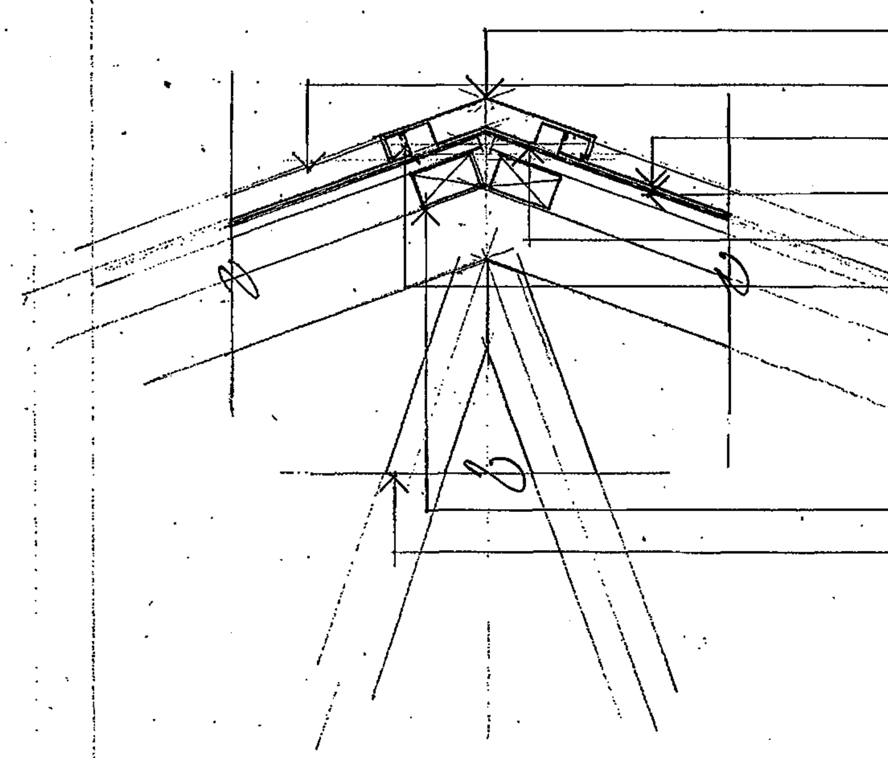
22 WD 11 DECK VENEER JUNCTION



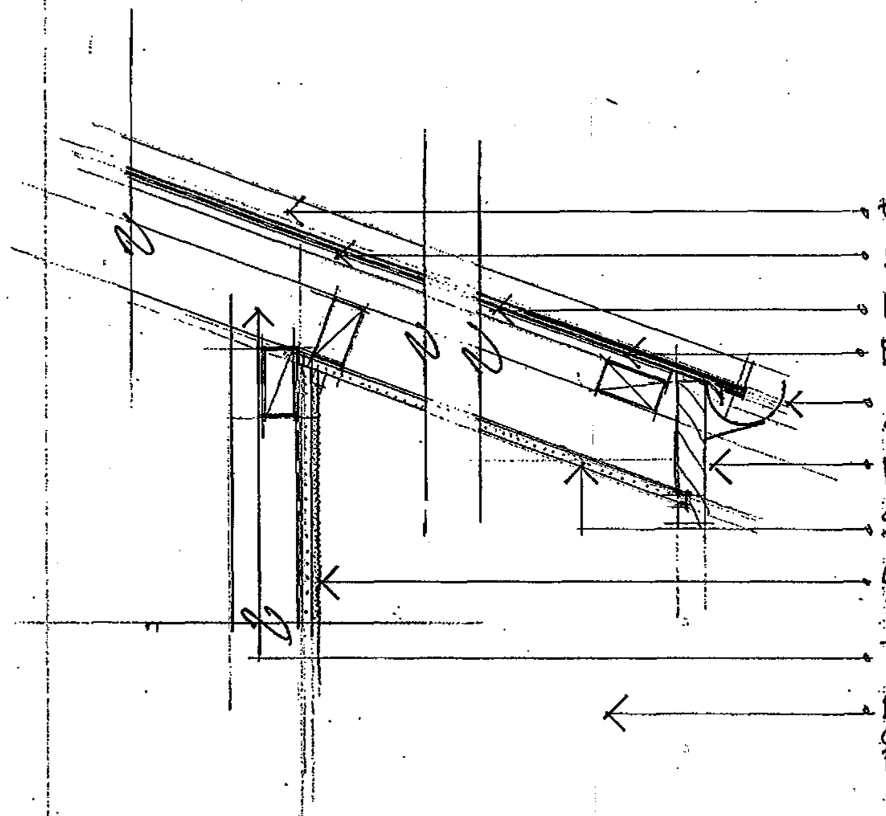
23 WD 11 WALL CEILING JUNCTION.



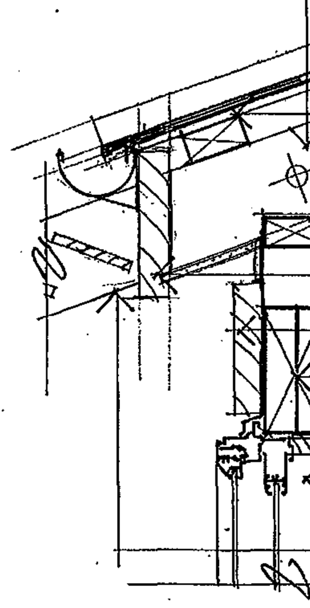
24 WD 11 PERGOLA EAVE



25 WD 11 RIDGE DETAIL



26 WD 11 EAVE DETAIL



27 WD 11 EAVE DETAIL

#	revision	by	date

CITY DESIGN

CHRISTCHURCH THE GARDEN CITY
The city that shines

PEOPLE
COMMON GROUND

541 Parnell Road, PO Box 37 828, Parnell, Auckland, New Zealand
Ph 64 09 377 9936, Fax 64 09 377 9938

HOUSING PROJECT OF
HORNBY
For: Christchurch City Council

DETAILS

scale	1 : 10	
contract		
sheet	WD-16	rev. △
designed	H.K.B. - C.S.	03 2000
drawn	H.K.B.	03 2000
dsg. check		
dwg check		
indexed		
approved		/ /

GHD

Level 11, Guardian Trust House
15 Willeston street, Wellington 6011
T: 64 4 472 0799 F: 64 4 472 0833 E: wgtnmail@ghd.com

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
FINAL	Mirjana Hrnjak	Stephen Lee		Nick Waddingtom		31/10/12