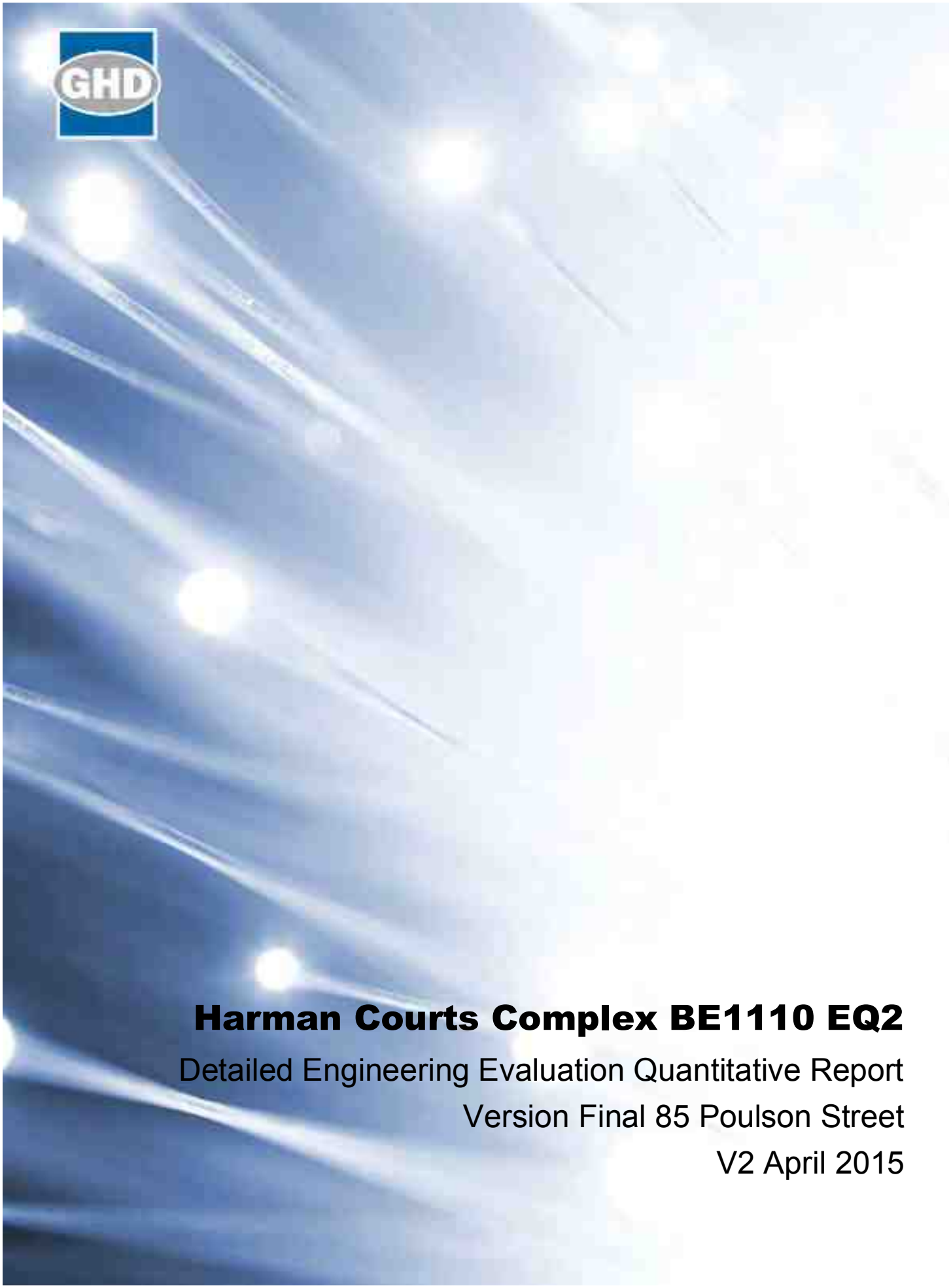


Harman Courts Complex BE1110 EQ2

Detailed Engineering Evaluation Quantitative Report

Version Final 85 Poulson Street

V2 April 2015

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Harman Courts Complex
BE1110 EQ2

Detailed Engineering Evaluation
Quantitative Report

85 Poulson Street

Christchurch City Council

Version FINAL

Prepared by
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Date
26th February 2013

Version FINAL V2

Prepared by
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Date
1st April 2015

Quantitative Report Summary

Harman Courts Complex

BE1110 EQ2

Detailed Engineering Evaluation

Quantitative Report - SUMMARY

Version FINAL V2

85 Poulson Street

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 and visual inspections on 01 November 2012 and available drawings as stated in Section 5.7 and Appendix A of this report.

Further to this, repairs and strengthening have been carried out to some of the blocks between July 2014 and November 2014, as detailed in the relevant appendices. This report has been updated to FINAL V2 to reflect revised building seismic capacity (%NBS) and repairs at the conclusion of construction edited sections feature a vertical line in the right hand margin.

Brief Description

The Harman Courts is located at 85 Poulson Street, Addington. It is composed of a series of residential and amenity buildings which form an elderly persons housing complex. The buildings are single, two and in one case three storey structures with concrete masonry, timber framed or precast concrete load bearing walls.

The residential buildings consist of Blocks A to I while the amenity buildings consist of a Residents' Lounge and a number of Garages (Blocks M, N, O, P and Q). Blocks A to G, and the Garages were constructed in 1978 and Blocks H, I and the Residents' Lounge were constructed as a later extension in 1991.

Key Damage Observed

Key damage for each building are summarised in the table below.

Table 1 Key Damage Observed

Building	Key Damage
Block A	• Hairline cracking was identified in the internal wall

Building	Key Damage
	linings of Units 2 & 3 and in the ceiling linings of Unit 3. • A pre-existing crack, located between unit 3 & 4, has been worsened by the recent seismic activity
Block B	• No damage was identified in the structure.
Block C	• Cracking in the reinforced concrete staircase located outside Unit 11B. • Hairline cracking to internal linings
Blocks D, E, F and G	• Cracking was noted around the reinforced concrete arches and the precast concrete slabs. • Minor cracking was noted in various locations around the structure.
Block H	• No damage was identified in the structure.
Block I	• No damage was identified in the structure.
Residents' Lounge	• No damage was identified in the structure.
Garages	
Blocks N, O and P	• No damage was identified in the structure.
Block M	• A full height vertical crack approximately 2 mm in width was noted in the east gable wall.
Block Q	• Minor cracking was noted in the concrete ground slab.

Building Capacity Assessments, Conclusions and Recommendations

Based on the site inspection, available drawings and the results of quantitative assessment, the following table shows the buildings overall capacities, classifications and recommendations for strengthening the buildings.

Table 2 Assessment Results, Conclusions and Recommendations

Building	Overall Building %NBS	Classification	Recommendation (%NBS)
Block A	67%	Not Earthquake Risk	N/A
Blocks B and C	72%	Not Earthquake Risk	N/A
Blocks D, E, F and G	76%	Not Earthquake Risk	N/A
Block H	50%	Earthquake Risk	67%

Building	Overall Building %NBS	Classification	Recommendation (%NBS)
Block I	67%	Not Earthquake Risk	N/A
Residents' Lounge	83%	Not Earthquake Risk	N/A
Blocks M, N, O, P and Q (Garages)	100%	Not Earthquake Risk	N/A

Note: Blocks B and C are identical

Blocks D, E, F and G are similar

Recommendations

GHD recommend that a seismic strengthening scheme is developed for Block H to achieve a minimum of 67% NBS

Strengthening was carried out to Block I to achieve 67% NBS in 2014.

No further assessment or strengthening is required to comply with CCC policy in respect of Blocks A, B, C, D, E, F, G, Residents' Lounge and Garages (Blocks M, N, O and Q).

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Appendices

Appendix A Specific Reports

Appendix B Geotechnical Investigation Reports and Analysis

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of Harman Courts, a residential housing complex for elderly persons.

This report is a Quantitative Assessment of the various building structures that form the housing complex. Quantitative Assessment involves a full seismic review of the existing structures, which are discussed in this report. The structural investigation has been carried out in accordance with the requirements of the relevant New Zealand Standards and the New Zealand Society for Earthquake Engineering (NZSEE) Guidelines for the 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes'.

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 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.

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 another property could collapse or otherwise cause injury or death; or
- The 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 building's capacity based on a comparison of loading codes from when the building was designed to those used 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 Required)	Unacceptable	Unacceptable

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

Table 3 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

Table 3 %NBS compared to relative risk of failure

4. Building Description

4.1 General

Harman Courts is located at 85 Poulson Street, Addington near Christchurch, New Zealand. It is composed of a series of residential and amenity buildings. The buildings are single, two and in one case three storey structures with concrete masonry, timber framed or precast concrete load bearing walls

The residential buildings comprise Blocks A to I while the amenity buildings consist of a Residents' Lounge and Garages (Blocks M, N, O, P and Q). Blocks A to G, and the Garages were constructed in 1978 while Blocks H, I and the Residents' Lounge were constructed as later additions in 1991.

The buildings are currently used as elderly persons housing. The overall footprint area of the various structures is approximately 13,410 m^2.

Principle building dimensions and storey heights are shown in the table below.

Table 4 Principle Building Dimensions and Storey Heights

Building	Height (m)	Building Dimensions (m)		Storey
		Length (L)	Width (W)	
Block A	5.0	46.5	7.3	1
Blocks B and C	12.0	30.0	10.0	3
Blocks D, E, F and G	8.0	10.8	9.4	2
Block H	4.8	24.0	10.0	1
Block I	7.3	25.7	10.0	2
Residents' Lounge	5.9	12.2	8.8	1
Garages				
Block M	2.7	16.2	5.6	1
Block N	2.7	13.0	5.6	1
Block O	2.7	9.8	5.6	1
Block P	2.7	22.6	5.6	1
Block Q	4.3	16.2	11.4	1

A general plan/aerial view of Harman Courts is shown in Figure 2 on the next page.

A specific and detailed assessment report for each building is provided in Appendix A.



Figure 2 Plan/Aerial View of Harman Courts

4.2 Load Resisting Systems

Table 5 Summary of Load Resisting Systems

Building	Gravity Load Resisting	Lateral Load Resisting
Block A	• Timber trusses • Timber framed walls • Reinforced block walls	• Timber framed walls • Reinforced block walls
Blocks B, C	• Timber trusses • Precast concrete slab • Timber framed walls • Reinforced block walls	• Timber framed walls • Reinforced block walls
Blocks D, E, F and G	• Timber trusses • Precast concrete slab • Timber framed walls • Reinforced block walls	• Timber framed walls • Reinforced block walls
Block H	• Timber trusses • Timber framed walls • Reinforced block walls	• Timber framed walls • Reinforced block walls
Block I	• Timber trusses • Timber framed walls • Precast concrete walls	• Timber framed walls • Precast concrete walls
Residents' Lounge	• Timber trusses • Timber framed walls	• Timber framed walls

Building	Gravity Load Resisting	Lateral Load Resisting
Blocks M, N, O, P and Q (Garages)	• Timber rafters • Reinforced block walls	• Reinforced block walls

5. Assessment Methodology

5.1 Quantitative Assessment

The quantitative assessment of the buildings comprised an investigation of the in-plane and out-of-plane strength of the masonry block walls and an assessment of the timber framed walls. The investigation was based on the analysis of the seismic loads that the structures are subjected to, distribution of these forces throughout the various structures and the analysis of the capacity of existing structural elements to resist the forces applied. The capacity of the existing structural elements was compared to the demand placed on the elements to give the %NBS of each of the structural elements.

5.2 Demand

5.2.1 Specific Design

The demand forces for each block wall and timber framed wall were assessed by applying seismic loading to finite element models of the buildings. NZS 1170.5:2004 makes allowance for accidental eccentricity and requires that the earthquake action be applied at an eccentricity of 10% of the building dimension which is perpendicular to the force applied. This results in a torsional action about the centre of resistance of the building, and induces forces in the lateral force resisting structural elements. Cl 5.3.1.2 of NZS 1170.5: 2004 states that for nominally ductile and brittle structures an action set of 100% of the earthquake actions in one direction and 30% in the orthogonal direction must be applied when calculating the demand for any structural member and has such been applied in the analysis.

5.2.2 Non-Specific Design

For appropriate timber framed buildings demand was determined using the non-specific design approach in accordance with NZS 3604:2011. (Refer to 5.4 below)

5.3 Reinforced Concrete Masonry Assessment

5.3.1 Seismic Weight Coefficient Masonry

The elastic site hazard spectrum for horizontal loading, C (T), for the building was derived from Equation 3.1(1);

$C(T) = C_h Z R N(T.D)$

Where

$C_h(T)$ = the spectral shape factor determined from CL 3.1.2

Z = the hazard factor from CL 3.1.4 and the subsequent amendments which increased the hazard factor to 0.30 for Christchurch

R = the return period factor from Table 3.5 for an annual probability of exceedance of 1/500 for an Importance Level 2 building

N (T,D) = the near-fault scaling factor from CL 3.1.6

The structural performance factor, S_p, was calculated in accordance with CL 4.4.2

S_p = 1.33-0.3μ

The structural ductility factor, μ, was taken as 1.25 for reinforced concrete block walls.

The seismic weight coefficient was then calculated in accordance with Cl 5.2.1.1 of NZS 1170.5: 2011. For the purposes of calculating the seismic weight coefficient a period, T_1 was computed using the ETABS model. The coefficient was then calculated using Equation 5.2(1);

$C_d(T_1) = (C(T_1) S_p)/k_\mu$

Where

$k_\mu = ((\mu-1) T_1)/0.7+1$

5.3.2 In-Plane and Out of Plane Capacity of Reinforced Masonry

The in-plane and out-of-plane capacity of the reinforced concrete masonry walls was determined using the NZS 4230 Design of Reinforced Concrete Masonry Structures (NZS 4230:2004).

5.4 Calculation of Timber Framed Walls Bracing Capacity and Demand

The seismic assessment of the lateral load resistance of the structure was carried out using manual calculations and spread sheets with reference to NZS 3604:2011 and NZS 3604: 1981 (New Zealand Standard for Timber-framed buildings).

The Total Bracing Demand, in Bracing Units (BU), was determined for each direction ('Along' and 'Across') for the seismic critical load condition in accordance with the Code. The Total Bracing Demand was then compared to the Total Bracing Capacity of the structure and the %NBS was calculated accordingly.

The minimum Bracing Demand and Capacity ratio was also computed for each bracing line element.

5.5 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

5.6 Investigation & Opening Up Work

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

5.7 Available Drawings

Available existing drawings for each building are provided with the specific reports in Appendix A.

5.8 Analysis and Modelling Methodology

Analysis and Mathematical Modelling

Non-Specific Design - Blocks D, E, F, G, and Residents' Lounge

The structures above are considered to be covered by the scope of non-specific design as per NZS 3604-2011 and NZS 4229. These Codes were used to calculate the capacity of the timber framing or block walls.

Specific Design - Blocks A, B, C, H, I, and Garages (Blocks M, N, O, P and Q)

Three-dimensional frame modelling of the structures above was performed to realistically simulate the effects of the applied loads on the structure under different conditions such as normal operation, earthquake and combinations thereof.

This modelling approach determines the adequacy of members or sections of the structure under various loading conditions.

Each section, member and node of the model was defined using the physical dimensions, material properties and connection details from the available drawings described in Section 5.3. Using Etabs Version 9.7.2 structural analysis software, computer models that incorporate the properties of the timber frames and reinforced masonry structures were prepared.

Loading Conditions

The loading conditions and load combinations used in the analysis of the structure were in accordance with the AS/NZS 1170 and NZS 3604.

Determination of %NBS

Upon determination of the critical loading conditions, each of the members that make up the Harman Courts buildings were checked to determine %NBS of the members indicated in the available drawings. Member demand and capacity ratios were computed and %NBS were calculated accordingly.

Seismic Design

Harman Courts structures were checked to the seismic design standards stated previously together with NZBC Clause B1 Structure and the New Zealand Society of Earthquake Engineering Guidelines for Assessment and Improvement of the Structural Performance of Buildings in Earthquakes (NZSEE).

6. Damage Assessment

6.1 Surrounding Buildings

The buildings of Harman Court suffered only minor damage, if any during the recent seismic activity. All damage identified in the structure was in the form of cracking, predominantly located at openings. In some cases the damage was pre-existing, though the cracking was reportedly aggravated by the recent Earthquake. Damage was identified in internal wall and ceiling linings, external concrete masonry panels and the concrete ground floor slabs of various structures. The most significant damage identified was located at the reinforced concrete arches which support precast concrete slabs in Blocks D, E, F & G. While the damage is more significant in these instances, the structural performance of these and all other damaged elements are not expected to be adversely affected. Due to the more significant nature of this damage, remedial works are recommended.

Additional support to the precast concrete slabs in Blocks D, E, F & G was designed by GHD and construction carried out in 2014. Refer to Appendix A3 for further information.

6.2 Residual Displacements and General Observations

A level survey of units was undertaken during the inspection of the site. The units were selected as a representative sample of the site, to confirm that residual displacements were within acceptable limits. The survey was carried out with a zip level, using the entrance to each unit as the datum point. Levels were taken at the corners of each room in the units where accessible.

Residual displacements varied slightly between units with the greatest recorded being in the order of 22 mm, as found in Unit 12A Block C. The values obtained from the level survey suggest that sections of the buildings' foundations have settled slightly. The minor extent of settlement suggests that liquefaction settlement was not the dominant cause for the settlement, with other factors also likely involved. These settlements are not likely to affect seismic performance of the buildings.

6.3 Ground Damage

During the geotechnical field investigation, a 'sink hole' was noted in the grounds to the immediate north of the site. It is believed this is associated with a stormwater drain and is not a sand boil. A broken water pipe was also noted on site which had caused some ground disturbance.

Liquefaction was not observed on site. Some minor cracking to concrete paths was noted.

7. Structural Analysis

7.1 Seismic Parameters

7.1.1 Specific Design (Blocks A, B, C, H, I and Garages (Blocks M, N, O, P and Q))

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) Importance Level 2 1/500 (ULS)

- 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)
  - (Reinforced block walls) 1.25
  - (Precast reinforced concrete walls) 1.50
  - (Timber framed walls) 3.00
- Performance Factor (Sp)
  - (Reinforced block walls) 0.90
  - (Precast reinforced concrete walls) 0.81
  - (Timber framed walls) 0.70
- 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.

7.1.2 Non-Specific (Blocks D, E, F, G and Residents' Lounge)

- Site Classification
  (NZS 1170.5:2004, Clause 3.1.3, Soft Soil) D
- Earthquake Zone
  (Figure 5.4 NZS 3604:2011) 2 (Christchurch)
- Importance Level 2 (Residential)
- Applied Floor Load
  (Residential Generally) 1.5
  (Residents' Lounge) 2.0

7.2 Structural Ductility Factor

The following table shows the structural ductility factor used for each building.

Table 6 Structural Ductility Factor

Building	Structural Ductility Factor (μ)	
	'Across' Direction	'Along' Direction
Block A	1.25 (Reinforced block walls)	1.25 (Reinforced block walls)
Blocks B and C	1.25 (Reinforced block walls)	1.25 (Reinforced block walls)
Blocks D, E, F and G	N/A	N/A
Blocks H	1.25 (Reinforced block walls)	3.0 (Timber framed walls)
Block I	1.50 (Precast reinforced concrete walls)	1.50 (Precast reinforced concrete walls)
Residents' Lounge	N/A	N/A
Blocks M, N, O, P and Q (Garages)	1.25 (Reinforced block walls)	1.25 (Reinforced block walls)

Structural ductility factors of 1.25 and 1.50 have been used and are based on the reinforced concrete block wall and precast reinforced concrete wall system respectively as indicated on the available drawings and photographs.

In one instance, a structural ductility factor of 3.0 has been assumed based on the timber framed wall system as indicated on the available drawings and photographs.

8. Geotechnical Consideration

The site is situated in the suburb of Addington, south of Christchurch City centre. It is relatively flat at approximately 8.5 m above mean sea level. It is approximately 1.2 km south of Avon River, and 9.8 km west of the coast (Pegasus Bay).

8.1 Published Information on Ground Conditions

8.1.1 Local Geology

The geological map[1] of the area indicates that the site is underlain by:

- Dominantly alluvial sand and silt overbank deposits, being alluvial soils of the Yaldhurst Member, sub-group of the Springston Formation, Holocene in age;
- The Riccarton gravels are located approximately 21 m bgl; and
- Groundwater is likely within 1 m of ground level.

8.1.2 Environment Canterbury Records

Information from Environment Canterbury (ECan) indicates that there are five boreholes located within 200 m of the site. The three boreholes with what is considered reliable or useful information are summarised in Table 7.

These indicate the area is underlain by clay, silt and sand layers to 3 m bgl, overlying further layers of sand and clay with some silt layers, overlying gravel at 21 m bgl. Varying amounts of wood and gravel are present.

Table 7 ECan Borehole Summary

Bore Name	Log Depth	Groundwater	From Site	Log Summary
M35/2194	24.29 m	2.3 m bgl	170 m N	0 – 0.3 m Fill 0.3 – 0.9 m SAND and CLAY 0.9 – 2.1 m SAND 2.1 – 2.4 m CLAY with wood 2.4 – 2.7 m Wood 2.7 – 3.9 m CLAY with wood 3.9 – 5.4 m SAND with wood 5.4 – 6.4 m Sandy CLAY 6.4 – 12.7 m CLAY 12.7 – 17.9 m SAND 17.9 – 20.4 m Sandy SILT with shells 20.4 – 21.0 m CLAY 21.0 – 24.3 m GRAVEL
M35/12082	3.66 m	Not indicated	185 m NW	0 – 0.3 m Fill 0.3 – 2.9 m Sandy SILT 2.9 – 3.7 m SAND
M35/16828	1.7 m SE	Not indicated	185 m SE	0 – 0.4 m SILT (topsoil)

[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.

Bore Name	Log Depth	Groundwater	From Site	Log Summary
				0.4 – 0.7 m Silty CLAY 0.7 – 0.9 m Clayey SILT 0.9 – 1.6 m SAND 1.6 – 1.7 m GRAVEL

It should be noted that the logs may have been written by the well driller and not a geotechnical professional or to a standard. In-situ strength or density data is not recorded.

8.1.3 EQC Geotechnical Investigations

The Earthquake Commission has undertaken geotechnical testing in the area of the site which is included in the Tonkin & Taylor Report for Addington[2]. Two investigation points were undertaken within 200 m of the site, as summarised below in Table 8

Table 8 EQC Geotechnical Investigation Summary Table

Bore Name	Orientation from Site	Depth (m bgl)	Log Summary[3]
CPT-CBD-116	178 m N	0 – 1.5 1.5 – 3 3 – 3.8 3.8 – 4.2 4.2 – 4.6 4.6 – 5	Pre-drilled Silty SAND, loose Silty CLAY, firm SAND, loose SILT, stiff SAND, very loose (WT at 2 m bgl)
CPT-HIS-0246	167 m NW	0 – 0.3 0.3 – 1.3 1.3 – 1.5 1.5 – 2.1 2.1 – 2.9	CLAYS, stiff SAND mix, very loose CLAYS, stiff SAND, very loose CLAY, firm (WT not indicated)

Observations of the CPT results indicate the soils are interbedded very loose sands and stiff clays. Both CPT's terminated at relatively shallow depths but the logs do not have high tip resistances at these depths. A conclusion with regards to soil type as to why these holes terminated at shallow depths cannot be drawn.

8.1.4 CERA Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has indicated the site is situated within the Green Zone, indicating that repair and rebuild may take place.

Land in the CERA green zone has been divided into three Technical Categories (TC). These categories describe how the land is expected to perform in future earthquakes.

The site has been categorised as "N/A – Urban Nonresidential". However, the site is surrounded by **TC2** properties. This means that minor to moderate land damage from liquefaction is possible in future significant earthquakes.

8.1.5 Post-Earthquake Land Observations

Aerial photography has been taken after each of the significant seismic events and is summarised below:

[2] Tonkin & Taylor Ltd., 2011: Christchurch Earthquake Recovery, *Geotechnical Factual Report, Addington.*

[3] [3] Log Summary for CPT's interpreted from Soil Behavior Type Robertson *et al*. 2010

- 4 September 2010: no signs of liquefaction
- 22 February 2011: minor signs of liquefaction at the site, as shown in Figure 1.
- 13 June 2011: shows no signs of liquefaction
- 23 December 2011 shows minor signs of liquefaction at the site.

Figure 3 Post February 2011 Earthquake Aerial Photography[4]



8.2 Historical Aerial Photography

No fill is indicated from the CCC Landfill Map5. Aerial Photos taken in 19466 and 19557 show residential property.

8.3 Seismicity

8.3.1 Nearby Faults

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

---

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

[5] Map of the "Christchurch Landfill Sites", Christchurch City Council, 29 September 1995

[6] Aerial Photography of, Burwood, Greater Christchurch, taken 30/05/1946, provided by Christchurch City Council

[7] Aerial Photography of Burwood, Greater Christchurch, 2nd Edition, taken 10/05/1955, provided by Christchurch City Council

Table 9 Summary of Known Active Faults[8,9]

Known Active Fault	Distance from Site	Direction from Site	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	130 km	NW	~8.3	~300 years
Greendale Fault (2010)	20 km	W	7.1	~15,000 years
Hope Fault	110 km	N	7.2~7.5	120~200 years
Kelly Fault	110 km	NW	7.2	150 years
Port Hills Fault (2011)	6 km	SE	6.3	Not estimated

The recent earthquakes since 4 September 2010 have identified the presence of a previously unmapped active fault system underneath the Canterbury Plains; these include the Greendale Fault and Port Hills Fault listed in Table 9. Research and published information on this system is in development and the average recurrence interval is yet to be established for the Port Hills Fault.

8.3.2 Ground Shaking

The 2010-2012 seismic activity in the Canterbury area has generated earthquakes with significant peak ground accelerations in some parts of Christchurch; these eathquakes have resulted in widespread liquefaction.

The Canterbury Geotechnical database[10] indicates the Harman Courts site experienced conditional PGA's of 0.21 g during the 4 September 2010 earthquake, 0.41 g on 22 February 2011, and 0.20 g on 13 June 2011.

New Zealand Standard NZS 1170.5:2004 determines the Seismic Hazard factor for Christchurch as 0.30, this relating to a moderate to high earthquake zone. This value has been provisionally upgraded from 0.22 to reflect the increased seismic hazard now prevalent in the region since 4 September 2010

8.3.3 Slope Failure and Rockfall Potential

Given the site's location and typically flat terrain in Addington, global or local slope instability is considered negligible. However, any localised retaining structures or embankments should be further investigated to determine the site-specific slope instability potential. There are no natural sources for rockfall to occur within the site.

8.4 Field Investigations

The geotechnical field investigation comprised a site walkover two cone penetrometer tests (CPT01 – CPT02) located around the building. The investigation layout is shown in Figure 4 and the GPS locations of the tests are tabulated in Table 10 below.

Table 10 Investigation Locations

Borehole Number	Depth (m bgl)	Northing (NZMG)	Easting (NZMG)
CPT01	12.8	5740405	2479214

[8] 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.

[9] GNS Active Faults Database

[10] Canterbury Geotechnical Database (2012): "Conditional PGA for Liquefaction Assessment", Map Layer CGD5110 - 27 Sept 2012, retrieved 31/10/2012 from https://canterburygeotechnicaldatabase.projectorbit.com/

CPT02	13.6	5740360	2479303

The two CPTs were undertaken by McMillan Specialist Drilling Services on 1 November, 2012.

Figure 4 Investigation Location Plan



8.4.1 Field Observations

During the field investigation, a “sink hole” was noted in the grounds to the immediate north of the site. It is believed this is associated with a stormwater drain and is not a sand boil. A broken water pipe was also noted on site which had caused some ground disturbance.

Liquefaction was not observed on site. Some minor cracking to concrete paths were photographed by the GHD structural engineers.

8.5 Ground Conditions Encountered

The ground conditions encountered are summarised in this section. Our investigations showed there is a shallow sandy gravel layer at typically 2 m depth, overlain by silty sand. This upper gravel layer is underlain by interbedded sand and silt. The CPT’ terminated at 13.5 m on assumed dense gravel or sand. A summary of the ground conditions encountered are shown in Table 11.

The CPTs collapsed at 2.9 m and 3.0 m respectively with water noted at 2.9 m in CPT01.

8.5.1 Cone Penetrometer Tests

A summary of the inferred lithology from the soil behaviour type encountered by the CPT investigations is summarised in Table 11 below.

Table 11 Summary of CPT-Inferred Lithology

Depth (m)	Soil Behaviour Type
0 – 2	Silty SAND, loose
2 – 3.7	Sandy GRAVEL, very dense
3.7 – 6.9	Interbedded sandy SILT, firm to stiff
6.9 – 9.4	Silty SAND and SAND, loose
9.4 – 13.1	Interbedded sandy SILT, firm to stiff

Detailed engineering bore logs can be found in Appendix B.

8.6 Liquefaction Assessment

Due to the anticipated presence of loose/soft alluvial soils a comprehensive liquefaction analysis has been undertaken.

8.6.1 Parameters used in Analysis

Assumptions made for the analysis process are as follows:

- Importance Level 2, 50-year design life, giving peak ground accelerations (PGA's) of:
  - 0.35 g for Ultimate Limit State (ULS), and
  - 0.13 g for Serviceability Limit State (SLS);
- Earthquake Magnitude 7.5; and
- Groundwater level at 2.9 m bgl.

Soil unit weights have been approximated using the tip resistance and sleeve friction from the CPT investigation data using formulae from Robertson & Cabal.

The liquefaction analysis process has been conducted using the methodology from Robertson & Wride, and from the NZGS Guidelines. Settlements were estimated using the methodology outlined in Zhang et al (2002).

8.6.2 Results of Liquefaction Analysis

The results of the liquefaction analysis, as outlined in Table 12 and Table 13 indicate that several layers are liquefiable. The sand layer between 6.2 m to 9.0 m depth is highly susceptible to liquefaction.

Table 12 Summary of Liquefaction Susceptibility

Test Location	Depth range of liquefiable layers at Ultimate Limit State (ULS) with Settlement per layer (mm) and % of layer thickness	Depth range and thickness of liquefiable layers at Serviceability Limit State (SLS) with Settlement per layer (mm) and% of layer thickness
CPT01	3.3 m to 3.9 m (14 mm, 2%) 4.2 m – 4.4 m (9 mm, 5%) 4.7 m – 5.2 m (20 mm, 4%) 6.2 m – 8.5 m (79 mm, 3%) 10.7 m – 10.9 m (3 mm, 2%)	3.4 m - 3.9 m (6 mm, 1%) 4.2 m – 4.4 m (8 mm, 4%) 4.9 m – 5.2 m (18 mm, 6%) 6.2 m – 8.5 m (71 mm, 3%) 10.7 m – 10.9 m (5 mm, 2%)

Test Location	Depth range of liquefiable layers at Ultimate Limit State (ULS) with Settlement per layer (mm) and % of layer thickness	Depth range and thickness of liquefiable layers at Serviceability Limit State (SLS) with Settlement per layer (mm) and% of layer thickness
	11.2 m – 11.4 m (3 mm, 2%) 12.6 m – 12.7 m (2 mm, 1%)	
CPT02	4.2 m – 4.9 m (16 mm, 2%) 5.2 m – 5.4 m (10 mm, 5%) 6.3 m – 6.5 m (5 mm, 3%) 6.8 m – 9.0 m (72 mm, 3%) 12.5 m – 13.5 m (33 mm, 3%)	5.1 m – 5.4 m (11 mm, 4%) 6.3 m – 6.5 m (3 mm, 2%) 6.8 m – 9.0 m (41 mm, 2%) 12.5 m – 13.4 m (23 mm, 3%)

Please refer to Appendix B for further details.

Table 13 Summary of Liquefaction Induced Vertical Settlement

	Liquifaction deformation limits		
	ULS	SLS	SLS Index
For TC2 land	100 mm	50 mm	_
For TC3 land	> 100 mm	>50 mm	_
Test location	Calculated liquefaction induced vertical settlement		
	ULS	SLS	SLS Index
CPT01	130 mm	108 mm	103 mm
CPT02	136 mm	108 mm	85 mm

8.7 Interpretation of Ground Conditions

The site is considered to be of low to moderate susceptibility to liquefaction based on the following:

- No obvious signs of liquefaction directly outside the footprints of the buildings on site.
- Moderate liquefaction was observed in the grounds to the north east corner of the site, as well as liquefaction in the adjacent park and along Harman Street to the north.
- The liquefaction analysis at ULS indicates high liquefaction susceptibility of the soils at ULS from 3.2 m to 4.9 m bgl, from 6.8 m to 9.0 m bgl, and from 12.5 m to 13.4 m bgl; however, the presence of the shallow 2 m thick dense gravel layer at ~ 2 m depth is likely to inhibit liquefaction at lower depths reaching the surface.

Floor level surveys, carried out by GHD Structural personnel, recorded a maximum differential settlement of 48 mm. This is consistent with the TC2 zoning for this site. However, the liquefaction induced vertical settlement analysis indicates >100 mm of settlement at ULS which would be more consistent with TC3 land behaviour. The analysis is recognised as over-predicting settlement and does not take into account the presence of the confining gravel layer. It also relies on liquefaction ejecta reaching the surface.

The PGA for the 22 February 2011 event (0.41 g) exceeds 170% of the magnitude-corrected SLS value, therefore the site can be considered "sufficiently tested at SLS". This means ground damage during a future moderate earthquake (SLS) is likely to be similar or less than that observed in the 22 February 2011 earthquake.[11]

8.7.1 Summary and Recommendations

The subject structures on the site have remained operational throughout the Canterbury earthquake sequence and have suffered minor settlement.

Based on the information presented above, we recommend the following for the subject site:

- A soil class of **D** (in accordance with NZS 1170.5:2004) should be adopted for this site;
- The site has a low to moderate susceptibility to liquefaction.

The site is classified as a TC2 property which indicates that moderate land damage may occur from future earthquakes, although filed evidence indicates minor damage will occur.

[11] Bradley and Hughes (2012): Conditional Peak Ground Accelerations in the Canterbury Earthquakes for Conventional Liquefaction Assessment – Technical Report for the Ministry of Business, Innovation and Employment

9. Results of Analysis

The following sections provide results of the structural analysis of the Harman Courts complex.

9.1 Results of Analysis

The following table itemises the results of the analysis for each building.

Table 14 Results of Analysis

Building	Direction		Elements	%NBS	Overall %NBS
Block A	*Across*		Timber frame walls Reinforced block walls	>100%	67%
	Along		Timber frame walls Block walls	>100%	
	Out of Plane		Reinforced block walls	67%	
			Diaphragm load transfer connection	>100%	
Blocks B and C	*Across*	2nd floor	Reinforced block walls	>100%	72%
		1st floor	Reinforced block walls	>100%	
		Ground floor	Reinforced block walls	>100%	
	Along	2nd floor	Reinforced block walls	>100%	
		1st floor	Reinforced block walls	>100%	
		Ground floor	Reinforced block walls	89%	
	Out of Plane		Reinforced block walls	72%	
			Diaphragm load transfer connection	>100%	
Blocks D, E, F and G	*Across*	1st floor	Timber framed walls	82%	76%
		Ground floor	Reinforced block walls	>100%	
	Along	1st Floor	Timber framed walls	76%	
		Ground floor	Reinforced block walls	>100%	
			Diaphragm load transfer connection	>100%	

Building	Direction		Elements	%NBS	Overall %NBS
Block H	*Across*		Reinforced block walls Timber framed walls	>100%	50%
	Along		Timber framed walls	50%	
	Out of Plane		Reinforced block walls	>100%	
			Diaphragm load transfer connection	>100%	
Block I	*Across*	1st floor	Timber framed walls Precast concrete walls	>100%	67%
		Ground floor	Timber framed walls Precast concrete walls	>100%	
	Along	1st floor	Timber framed walls Precast concrete walls	67%[12]	
		Ground floor	Timber framed walls Precast concrete walls	>100%	
	Out of Plane		Reinforced block walls	68%	
		Ground Floor	Reinforced Concrete Columns	>100%	
			Diaphragm load transfer connection	>100%	
Residents' Lounge	*Across*		Timber framed walls	>100%	83%
	Along		Timber framed walls	83%	
			Diaphragm load transfer connection	>100%	
Blocks M, N, O, P and Q (Garages)	*Across*		Reinforced block walls	>100%	>100%
	Along		Reinforced block walls	>100%	
	Out of Plane		Reinforced block walls	>100%	

Specific results for each building are attached in Appendix A.

[12] Refer to Appendix A5

9.2 Discussion of Results

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

Blocks H, I and Residents' Lounge

The buildings were constructed in 1991 and were likely to be designed to the loading standard current at the time, namely NZS 4203:1984. The design loads used in this standard were less than those required by the current loading standard. In addition, the detailing requirements for ductile seismic behaviour that are present in the current standards were not used in the design of this building. As a result, it would be expected that the building would not achieve 100% NBS. The increase in the hazard factor for Christchurch to 0.3 further reduces the %NBS score

Blocks A, B, C, D, E, F, G and M, N, O, P and Q (Garages)

The buildings were constructed in 1978 forming the original scheme and were likely to be designed to the loading standard current at the time, namely NZS 4203:1976. The design loads used in this standard were less than those required by the current loading standard. In addition, the detailing requirements for ductile seismic behaviour that are present in the current standards were not used in the design of this building. As a result, it would be expected that the building would not achieve 100% NBS except for the Blocks M, N, O, P and Q (Garages). The increase in the hazard factor for Christchurch to 0.3 also further reduces the %NBS score.

10. Conclusions and Recommendations

The table shows the individual overall %NBS, classifications and recommendations for the buildings that comprise the Harman Courts complex.

Table 15 Table of overall %NBS, Classifications and Recommendations

Building	Overall %NBS	Classification	Recommendation (Strengthened to at least %NBS)
Block A	67%	Not Earthquake Risk	N/A
Blocks B and C	72%	Not Earthquake Risk	N/A
Blocks D, E, F and G	76%	Not Earthquake Risk	N/A
Block H	50%	Earthquake Risk	67%
Block I	67%	Earthquake Prone	67%[13]
Residents' Lounge	83%	Not Earthquake Risk	N/A
Blocks M, N, O, P and Q (Garages)	100%	Not Earthquake Risk	N/A

Note: Blocks B and C are identical

Blocks D, E, F and G are similar

Strengthening was carried out to Block I in 2014 to increase the %NBS to 67% NBS. Strengthening has also been carried out to the stairwells of blocks B-G to provide additional support for the stairs in the case of another seismic event.

Recommendations

GHD recommend that a seismic strengthening scheme is developed for Block H to achieve a minimum of 67% NBS.

No further assessment or strengthening is required to comply with CCC policy in respect of Blocks A, B, C, D, E, F, G, I, Residents' Lounge and Garages (Blocks M, N, O and Q).

[13] Refer to Appendix A5.

11. Limitations

11.1 General

This report has been prepared subject to the following limitations:

- Available drawings in each specific report were used in the assessment.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- Foundations were not checked.
- The PS3 provided by Citycare for works undertaken to Block I has been accepted in good faith and not independently verified. GHD did not carry out the construction monitoring of these works.

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.

11.2 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 engineer 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 in Section 8.

Appendix A Specific Reports

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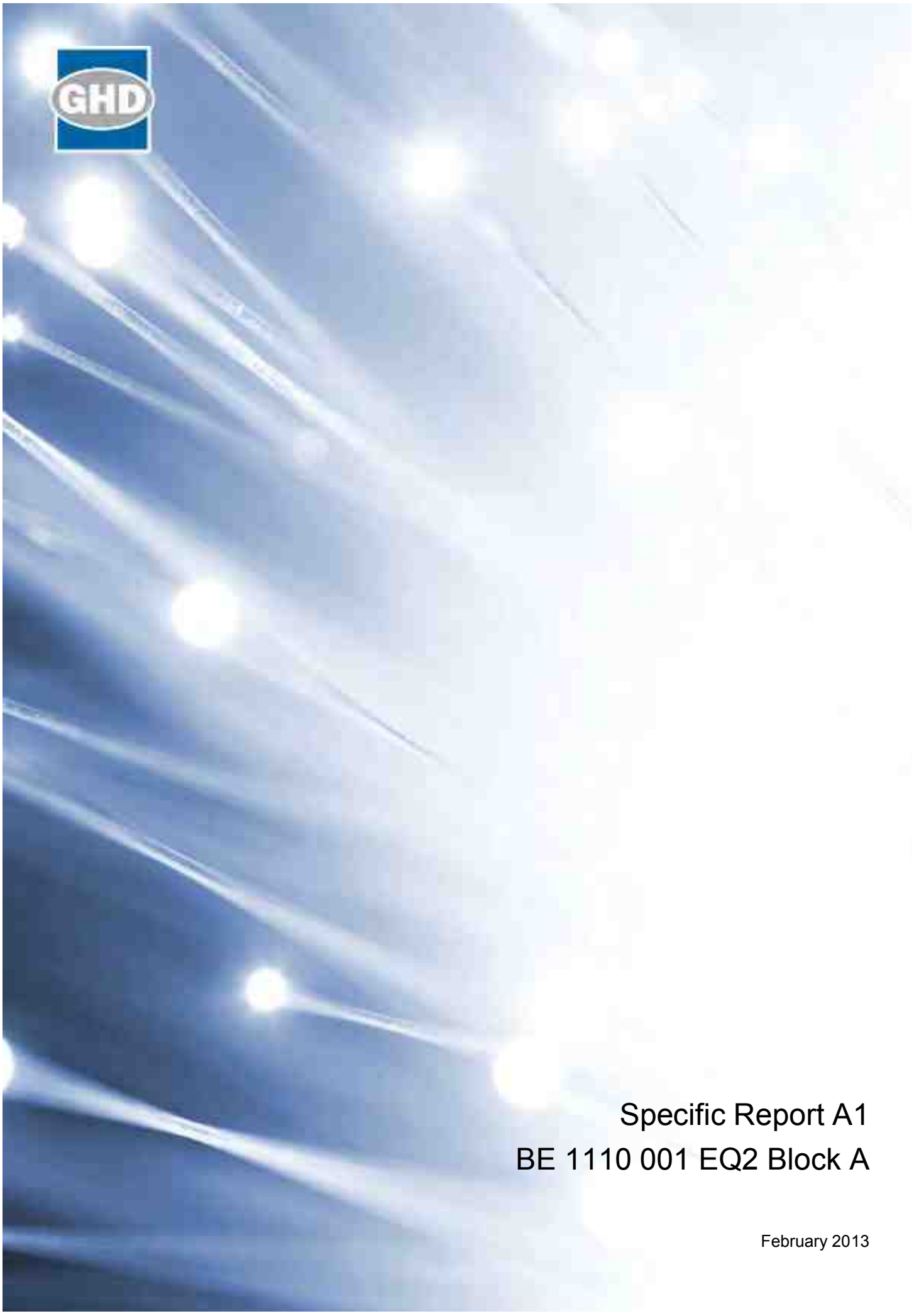
A3 Blocks D, E, F and G

A4 Block H

A5 Block I

A6 Residents' Lounge

A7 Blocks M, N, O, P and Q (Garages)



Specific Report A1
BE 1110 001 EQ2 Block A

February 2013

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Photograph 6 Timber Trusses

Appendices

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Appendix A1/C	CERA Spreadsheet

1. Building Description

1.1 General

Block A is a residential block located at the south side of the Harman Courts complex (See Figure 1). The block comprises six units which are arranged diagonally on plan with each unit having one or two part walls common with the adjacent property. Block A was constructed in 1976 and is 46.5 m in length overall. The individual units are 7.30 m square overall with a height to roof ridge of 5.0 m.

The common walls which separate the units are 200 mm thick masonry walls which also act as firewalls.

A summary of the building's key structural features are:

- Roofs are identical for all units and are primarily composed of corrugated galvanised metal sheeting on timber purlins and timber trusses. The bottom chord ceiling is at three meters above floor level. The top chords of the truss extend down to the wall top plate at 2.4 m above floor level
- The external walls are part 190 mm thick reinforced concrete masonry and part timber framed with block veneer.
- The floors are concrete slab 100 mm thick on grade. The external walls are supported by perimeter concrete strip foundations.

Figure 2 shows the floor plan layout for a single unit. Complete drawn information mentioned above is provided in Appendix A1/B.



Figure 1 Plan/Aerial View of Harman Courts

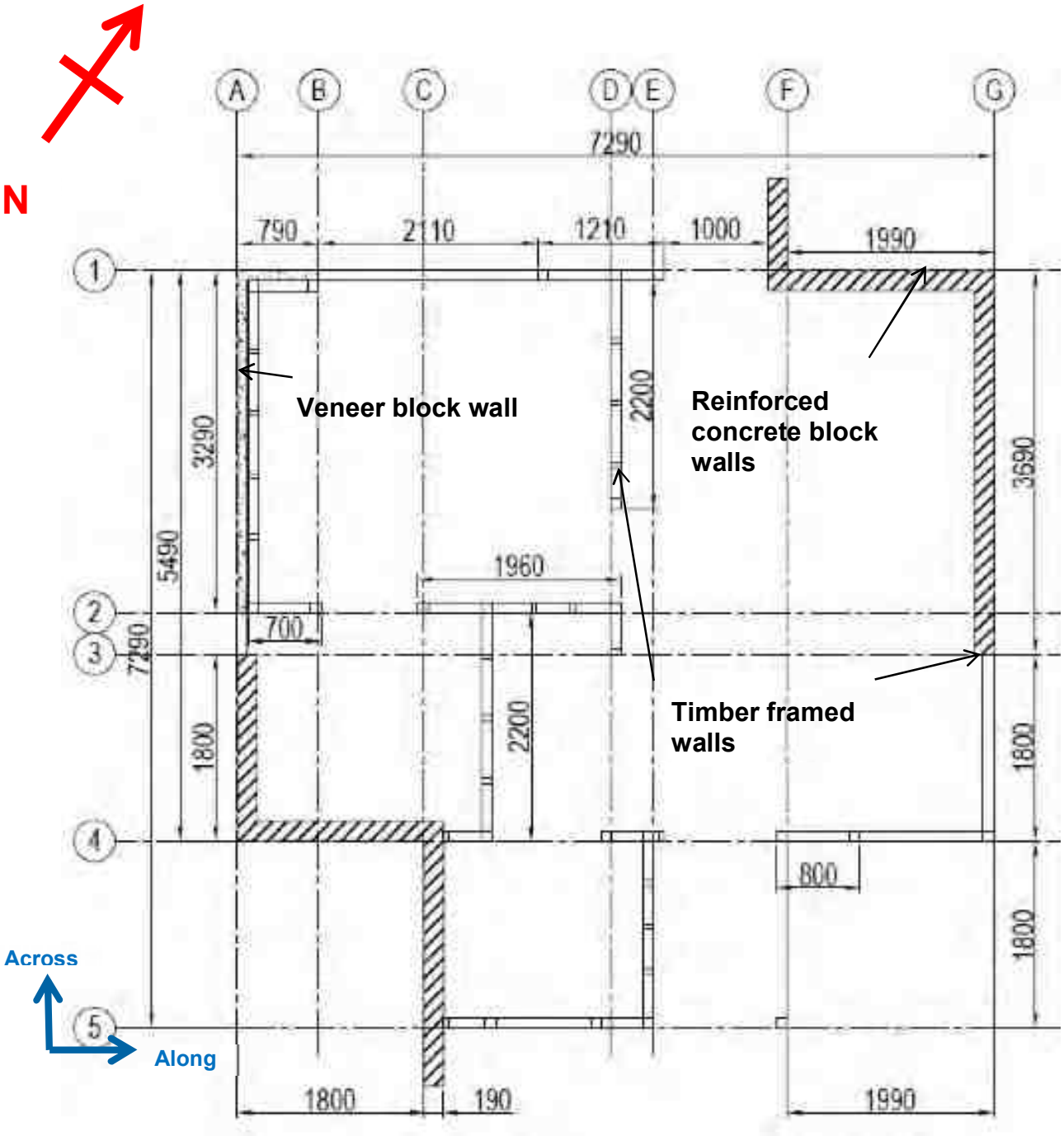


Figure 2 Block A Typical Plan Sketch Showing Key Structural Elements

1.2 Gravity Load Resisting System

Gravity loads imposed on the galvanised metal roofing are transferred to the timber purlins then to the timber trusses. The truss rafters are supported on the 200 mm thick masonry walls on one side and the timber framed walls on the other side. The gravity load is then transferred to the walls and then to the concrete strip foundations.

1.3 Lateral Load Resisting System

The reinforced masonry and timber framed walls are the primary components resisting the lateral loads in the ‘Across’ and ‘Along’ directions. The roof trusses and the plaster board ceiling provide the ceiling diaphragm action.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Site Plan and Elevation	Sheet 1 of 5	April 1976
2	Typical Plan	Sheet 2 of 5	April 1976
3	Cross Section and Elevation	Sheet 3 of 5	April 1976
4	Longitudinal Section and Details	Sheet 4 of 5	April 1976
5	Architectural Connection Details	Sheet 5 of 5	April 1976
6	Typical Roof Framing and Bracing	S1	May 1976

Available drawings are attached in Appendix A1/B.

2.4 Analysis and Modelling

A seismic assessment was carried out based on a specific design in accordance with NZS 1170.5:2004 and NZS 4230:2004 and Branz Bracing Data. The building was modelled using a ductility factor of 1.25 (reinforced concrete masonry walls) in both directions.

3. Damage Assessment

3.1 General

Only minor earthquake damage was noted to Block A. Hairline cracking was identified in the internal wall linings of Units 2 & 3 and in the ceiling linings of Unit 3. A pre-existing crack, located between unit 3 & 4, has been worsened by the recent seismic activity. Damage identified will not affect structural performance.

4. Results of Analysis

The following are the results of the structural analysis of Block A building.

4.1 Reinforced Concrete Masonry and Timber Framed Walls

Across

The combined reinforced concrete masonry and timber framed walls in the 'Across' direction achieved 100% NBS overall. However, the timber bracing line panel at Grid D and E was found to be rated at 81% NBS in the analysis. In view of the overall NBS rating, the particular result for bracing panel line D and E is not considered to be significant.

Along

The combined reinforced concrete masonry and timber framed walls in the 'Along' direction achieve 100% NBS overall.

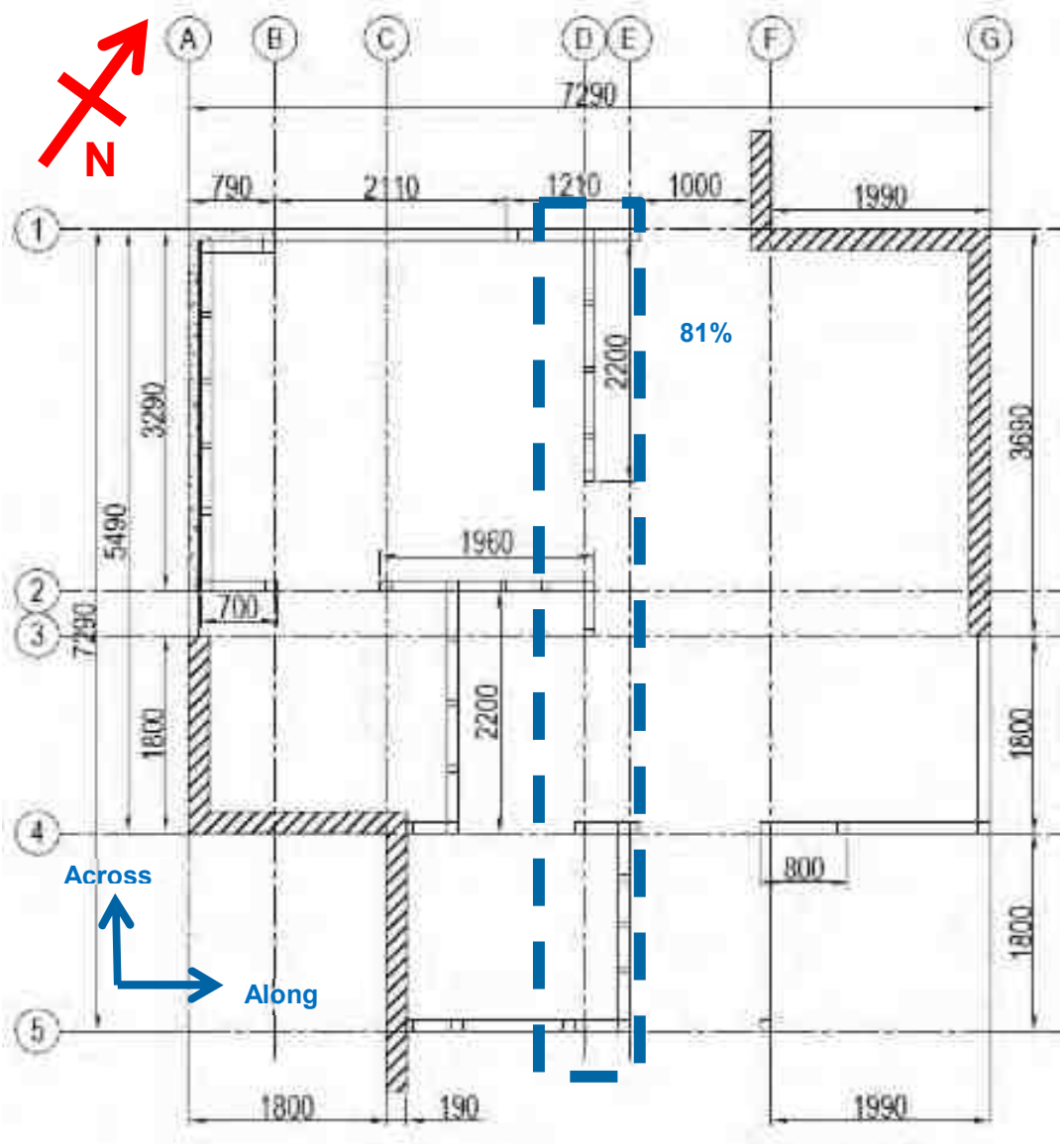


Figure 3 Typical framing plan showing reinforced concrete masonry and timber framed walls

4.2 Reinforced Concrete Masonry Walls

4.2.1 Out of Plane

Reinforced concrete masonry walls rated more than 67% but less than 100% NBS are highlighted in blue below.

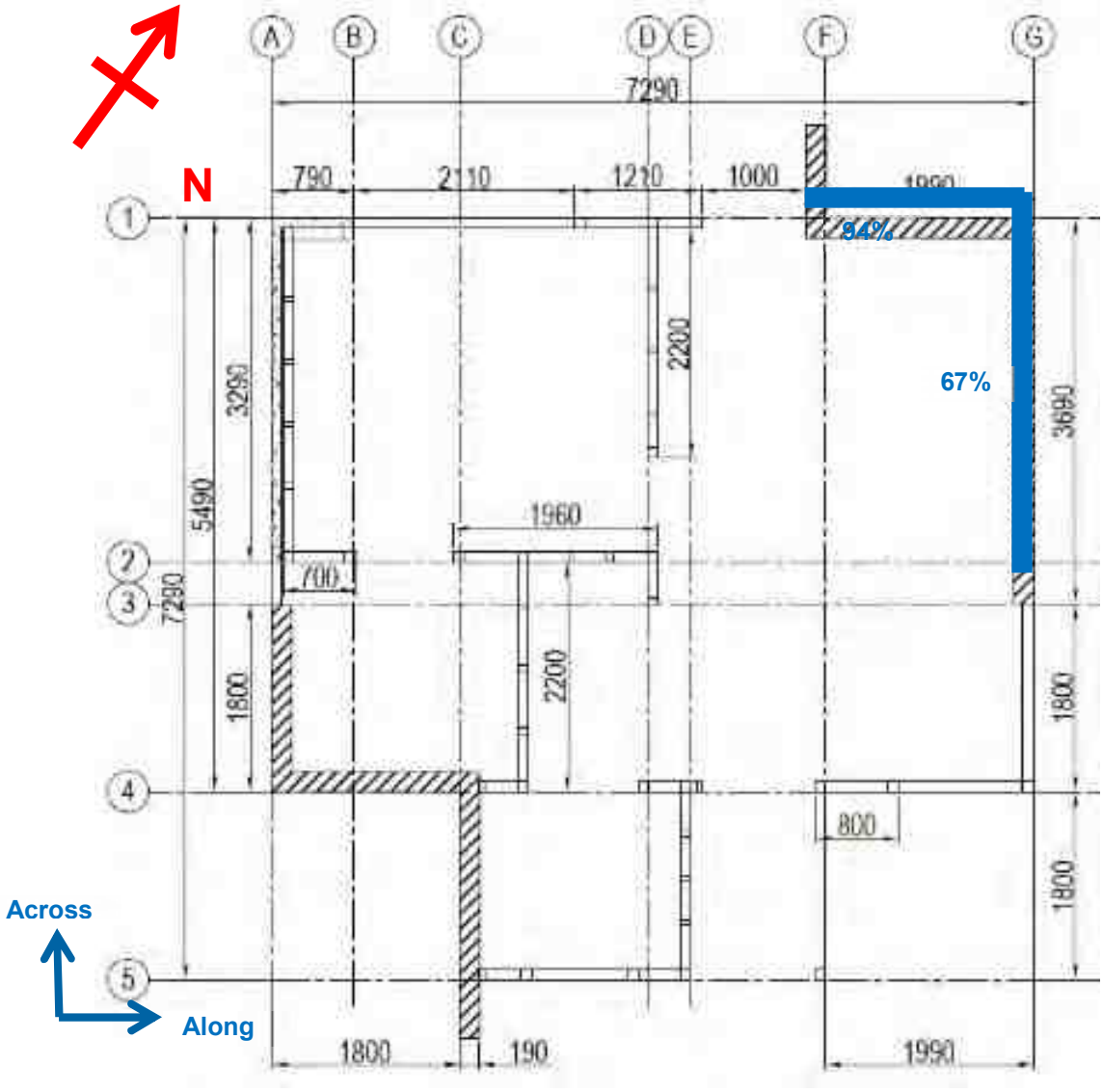


Figure 4 Typical Framing Showing reinforced masonry walls rated less than 100% NBS but more than 67% NBS

4.3 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.

5. Conclusion and Recommendations

The building overall has been assessed as having a seismic capacity of 67% NBS and is therefore classified as not an ‘Earthquake Risk’.

No further assessment or strengthening is required to comply with CCC policy.

Appendices

Appendix A1/A Photographs



Photograph 1 Block A Units at North-East Facing Elevation



Photograph 2 Block A at North East Facing Elevation



Photograph 3 Block A at East Elevation



Photograph 4 Block A Units at North-West Facing Elevation



Photograph 5 South Elevation



Photograph 6 Timber Trusses

Appendix A1/B Available Drawings

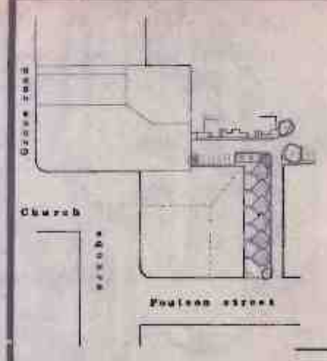
BCP 434

ELDERLY PERSONS' HOUSING
POULSON STREET
FOR
CHRISTCHURCH CITY COUNCIL

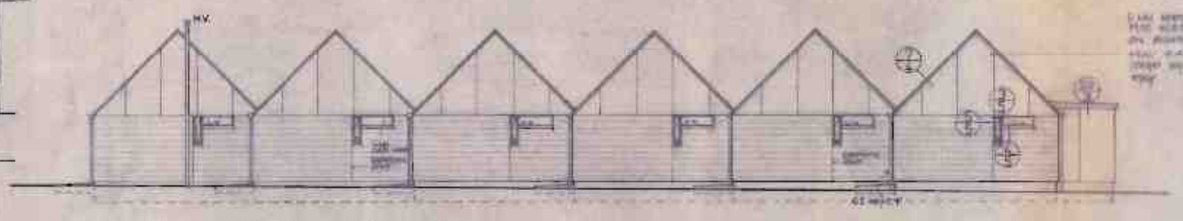
ELECTRICITY SUPPLY
METER BOX TO BE INSTALLED ON
OUTSIDE WALL NEAR THE MAIN
ENTRANCE OR COMMON
NOT BEHIND A FENCE OR GATE UNLESS
CABLE LENGTH WILL

GRIFFITHS MOFFAT & PARTNERS ARCHITECTS & ENGINEERS

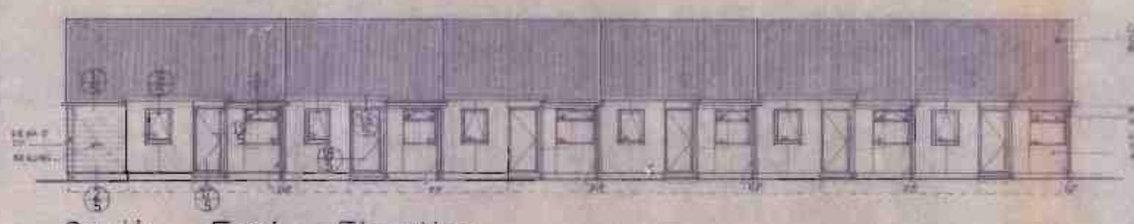
Approved
24 NOV 1977
City Engr



Location plan



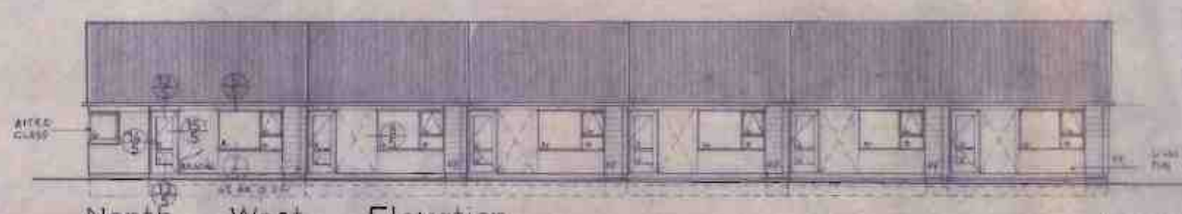
South West Elevation



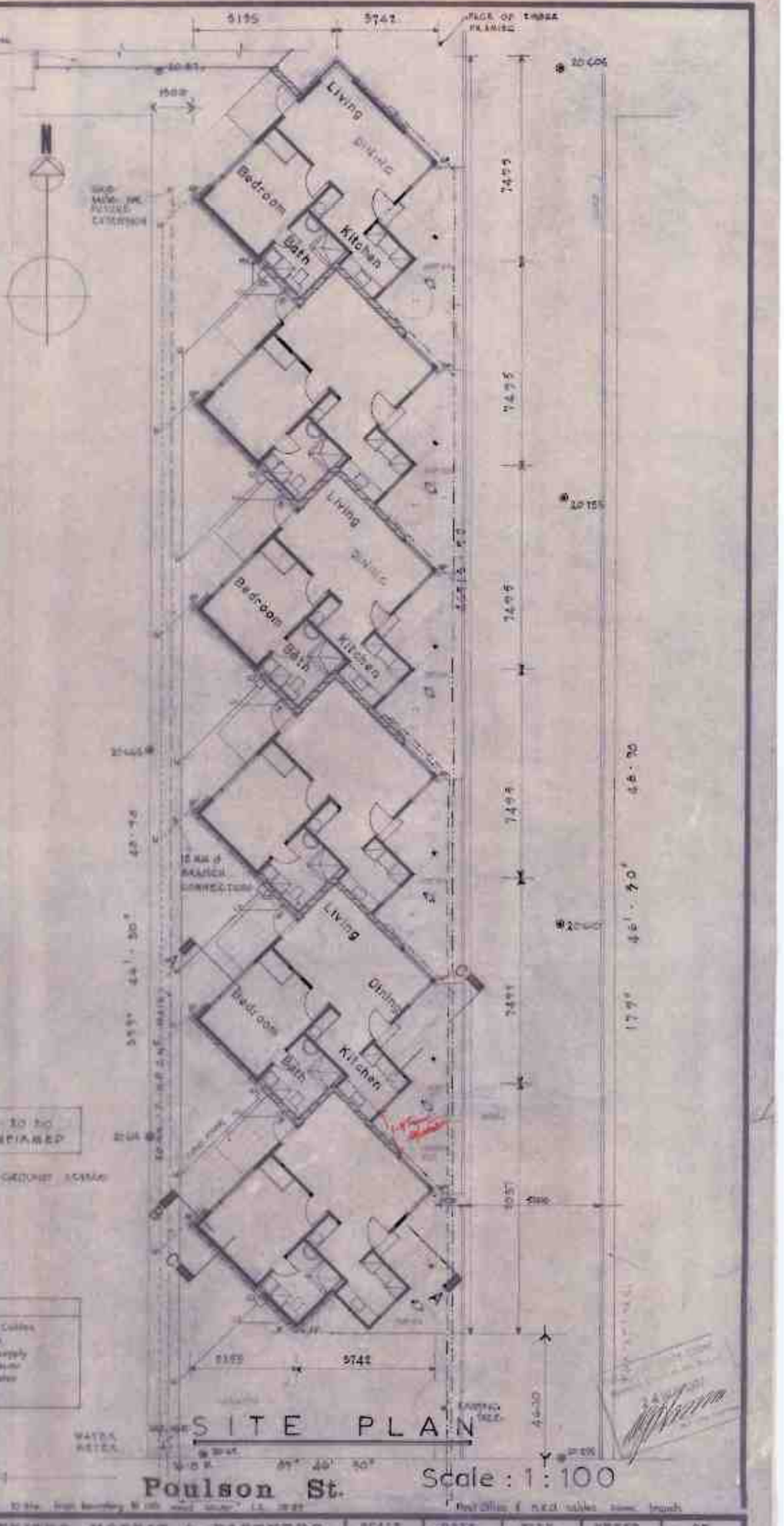
South East Elevation



North East Elevation



North West Elevation



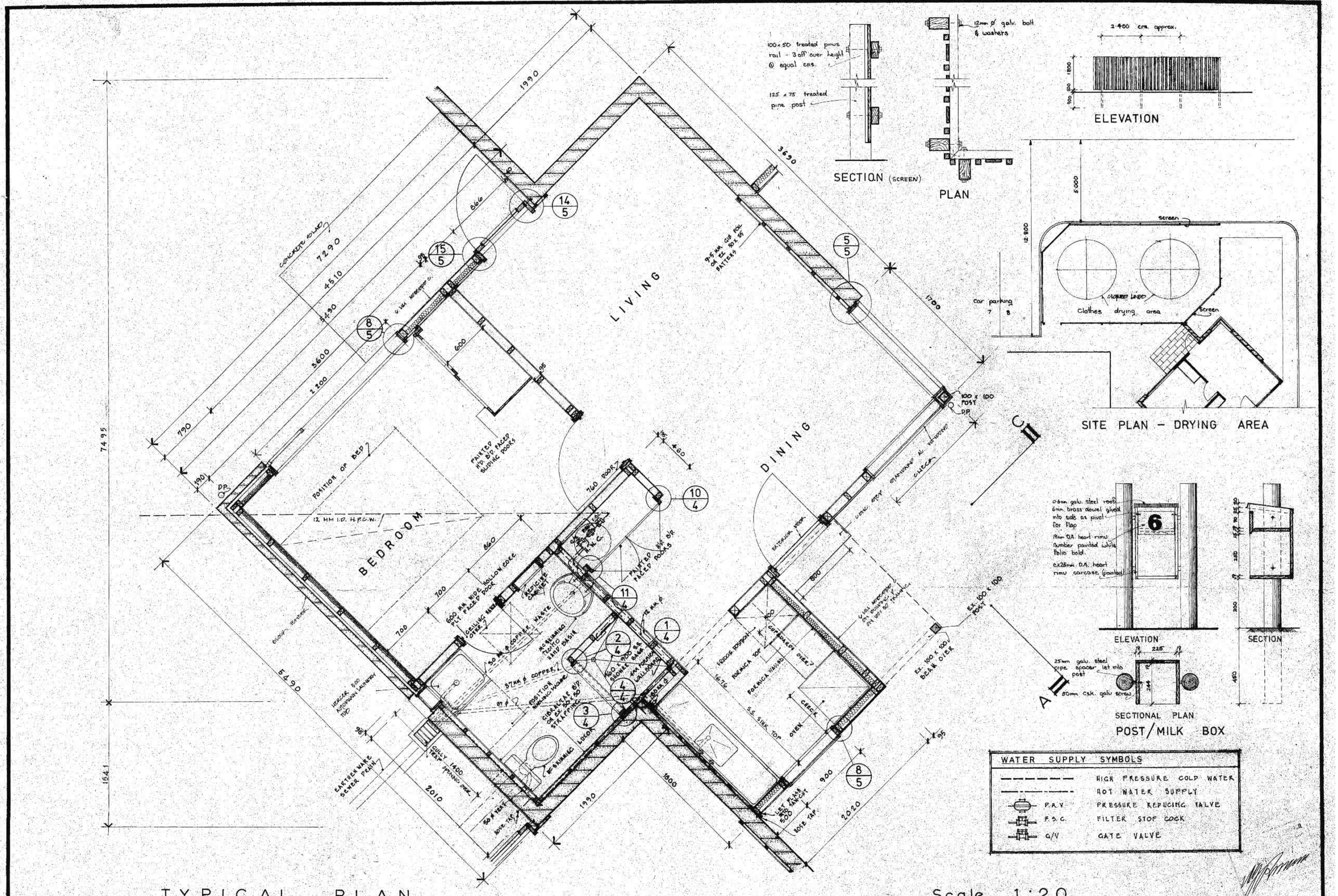
SITE PLAN

Scale : 1:100

ELEVATIONS - ELDERLY PEOPLES HOUSING

ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL.

GRIFFITHS MOFFAT & PARTNERS	SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	1:100	APRIL 1976	792/2	1	5



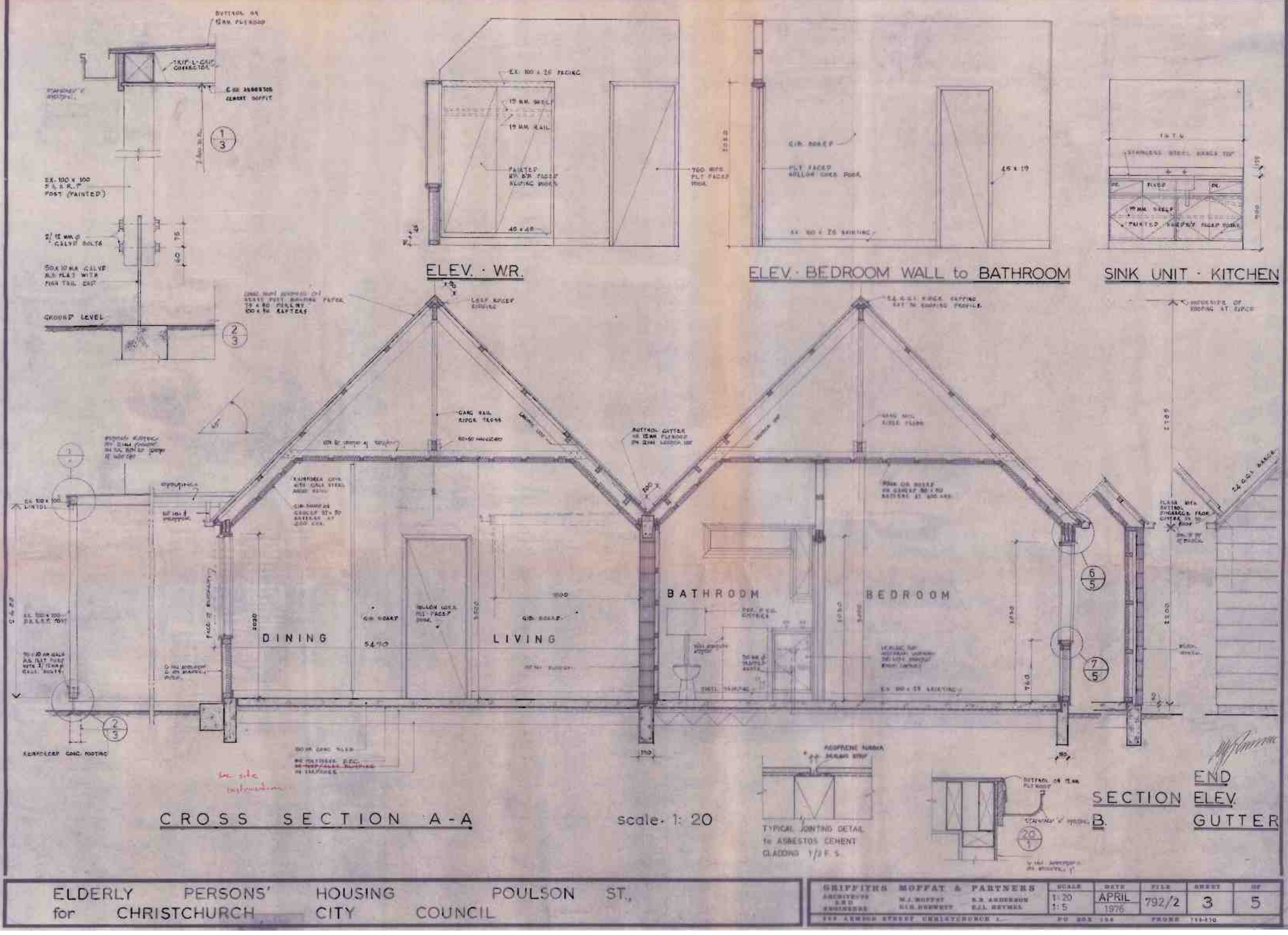
TYPICAL PLAN

Scale 1:20

ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL.

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT	K.B. ANDERSON	1:20	APRIL 1976	792/2	2	5
	G.H. DREWETT	E.J.L. HEYMEL					

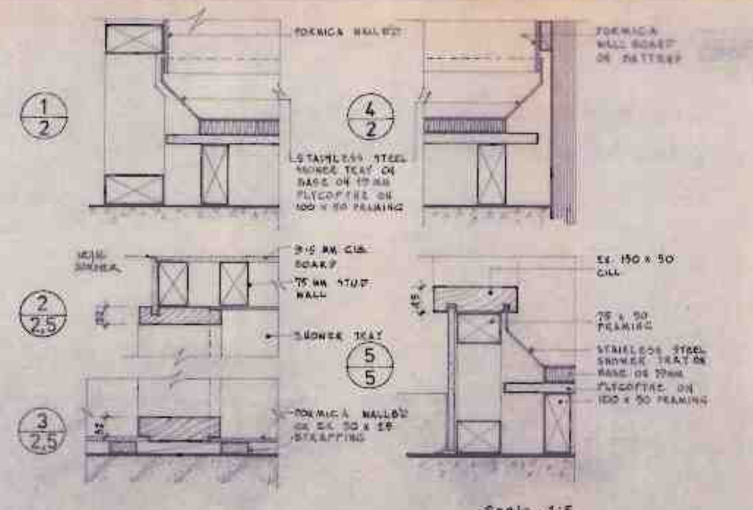
292 ARMAGH STREET CHRISTCHURCH 1. P.O. BOX 188 PHONE 794-830



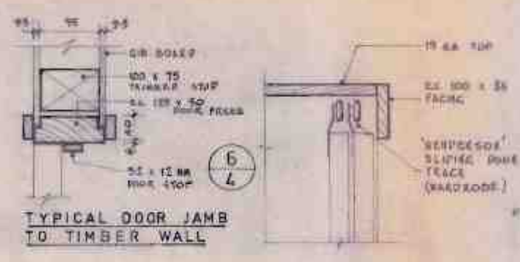
ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL

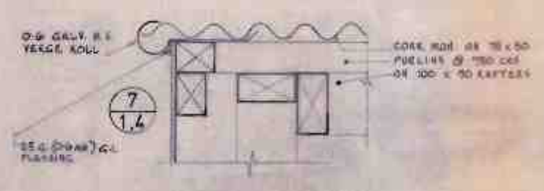
GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS
AND
ENGINEERS
M.J. MOFFAT B.E. ANDERSON
D.H. DERWENT E.J.I. HEYMES
197 ARMAGH STREET CHRISTCHURCH 1. PO BOX 154 PHONE 794-910

SCALE	DATE	FILE	SHEET	OF
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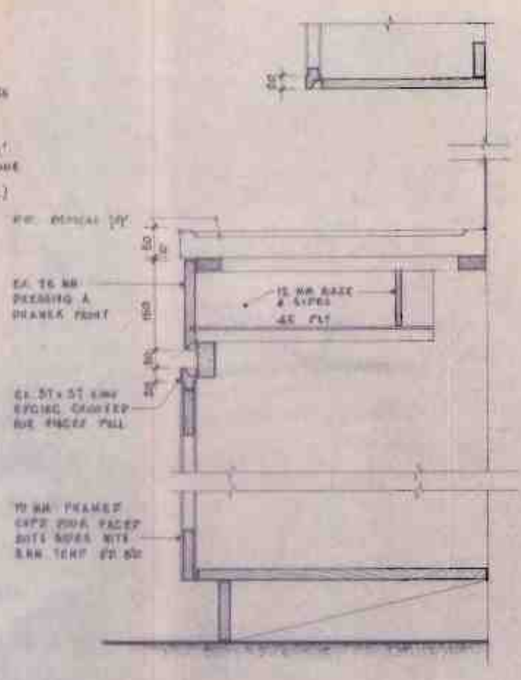


Scale - 1:5

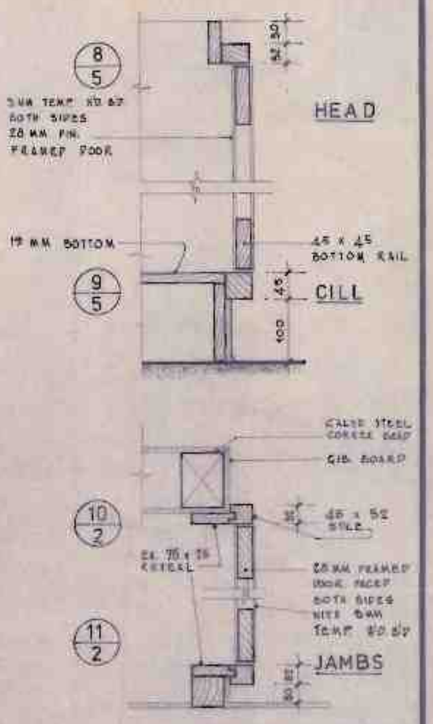




Scale - 1:5

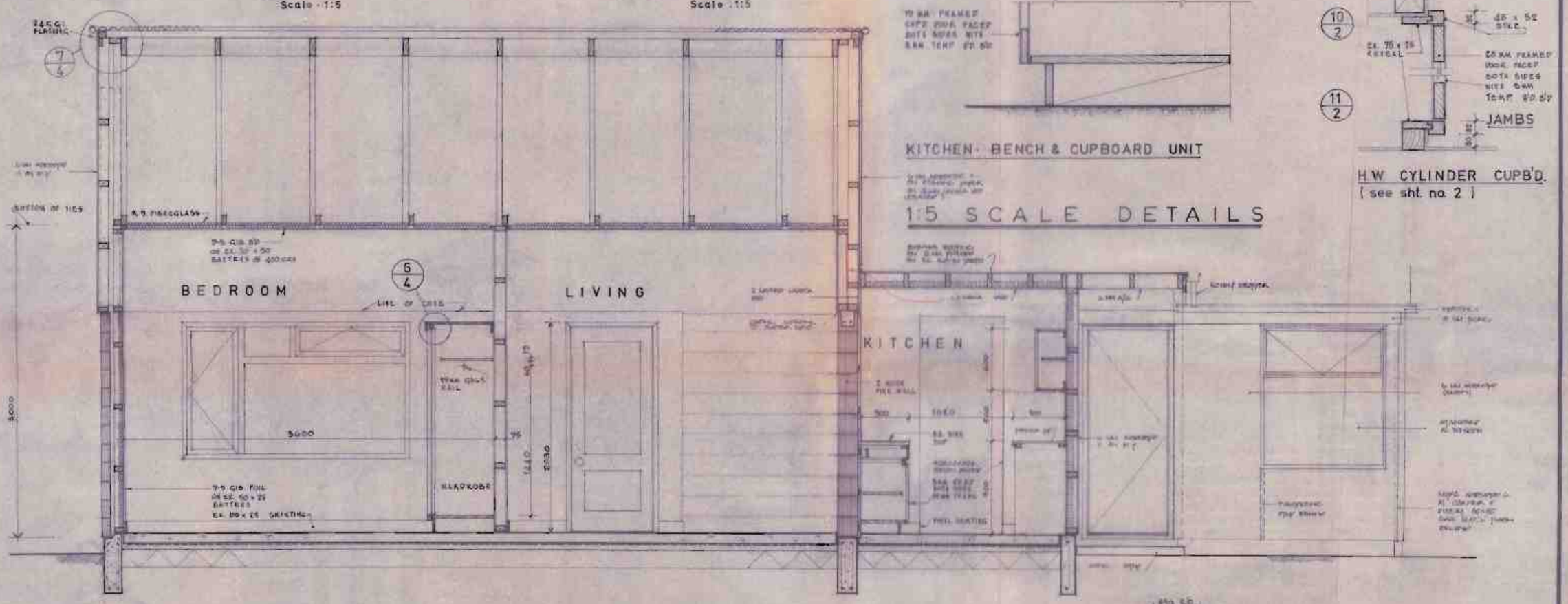


KITCHEN BENCH & CUPBOARD UNIT

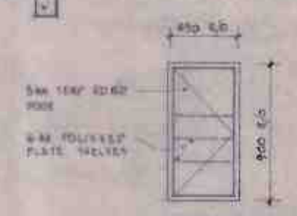


H.W CYLINDER CUPB'D. [see sht. no. 2]

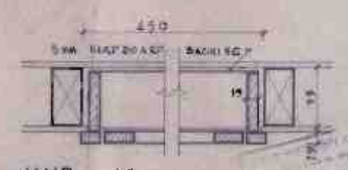
1:5 SCALE DETAILS



LONGITUDINAL SECTION C-C scale· 1:20



ELEVATION 1:20

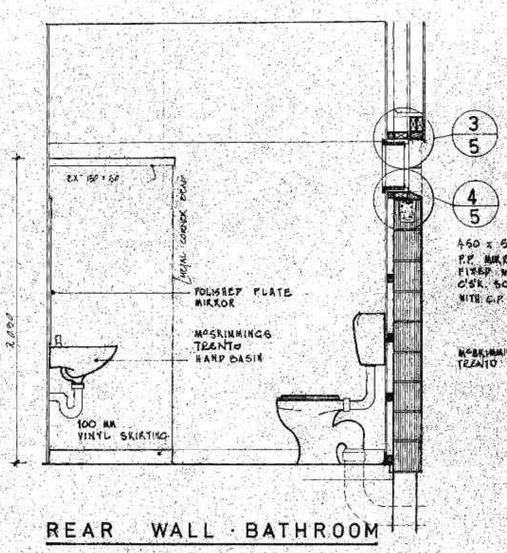


MEDICINE CABINET DETAILS

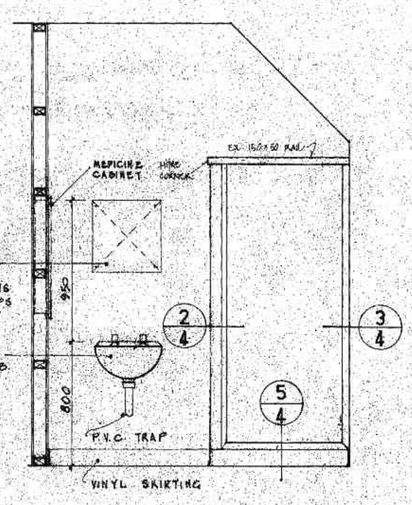
ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL.

GRIFFITHS MOFFAT & PARTNERS	SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS — M.J. MOFFAT, G.G.B. GRIFFITHS, R.R. ANDERSON, R.J.L. REVNELL	1:20 1:5	APRIL 1976	792/2	4	5

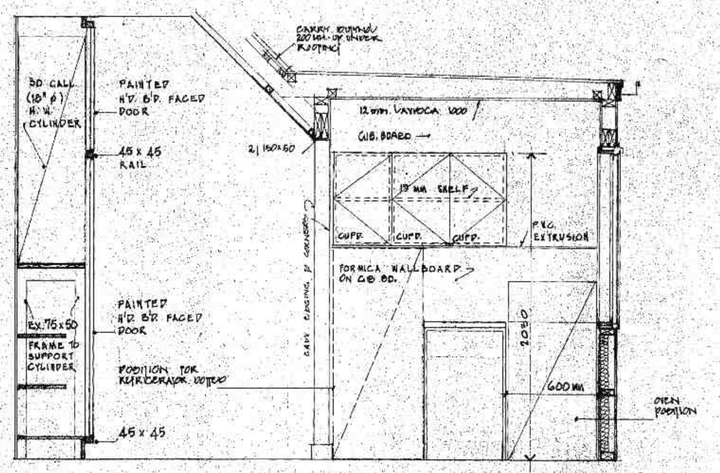
944 COLOMBO STREET CHRISTCHURCH 1 — P.O. BOX 934 — PHONE 794-930



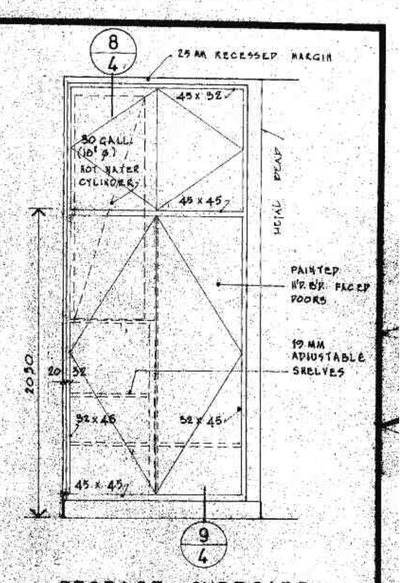
REAR WALL · BATHROOM



INTERNAL WALL : BATHROOM

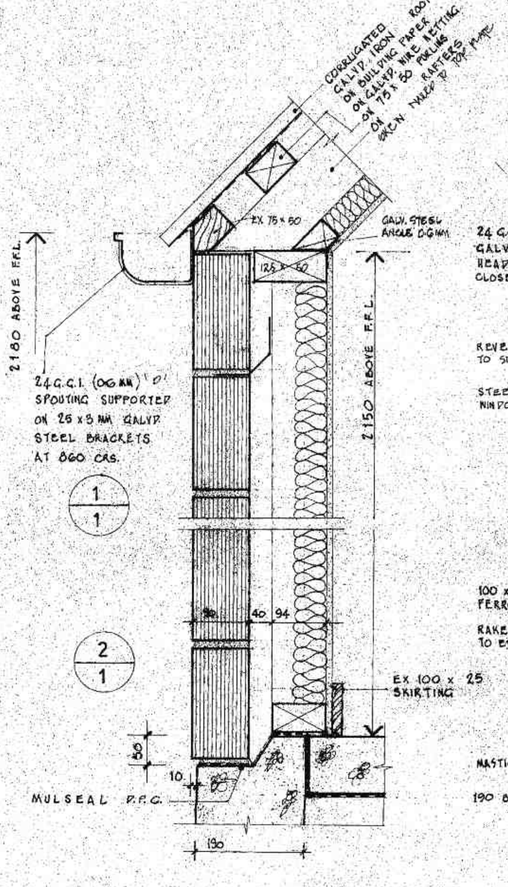


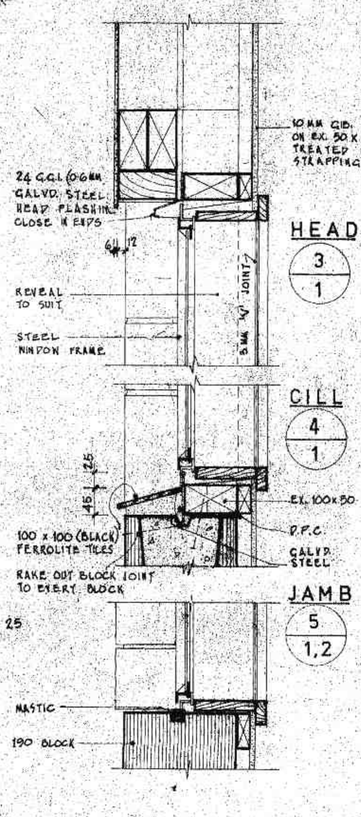
LONGITUDINAL SECTION THRO KITCHEN

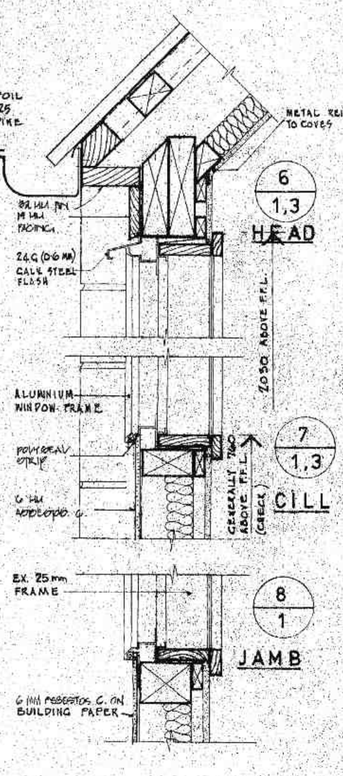


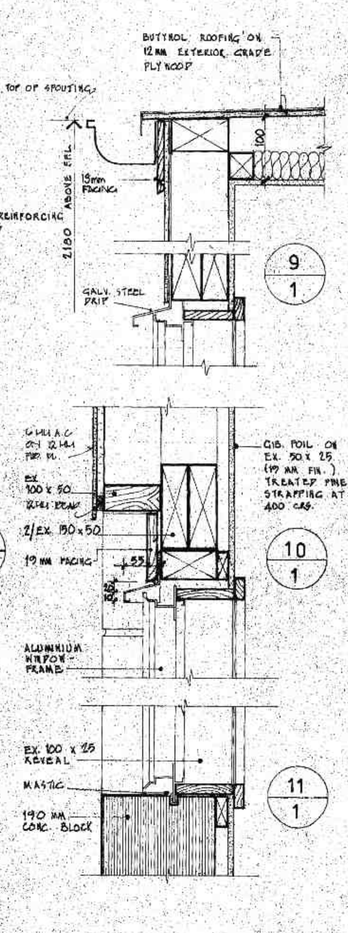
STORAGE CUPBOARD

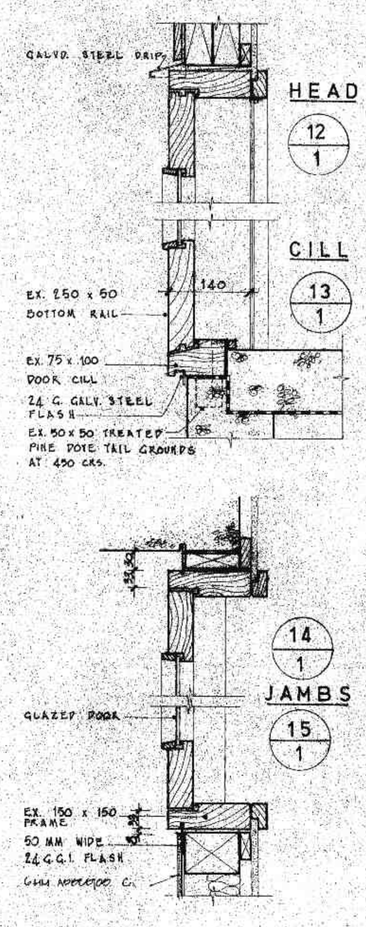
ELEVATIONS

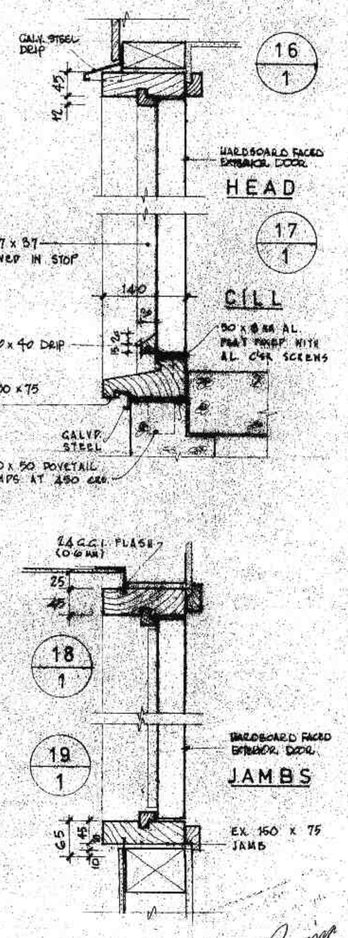












1:5 SCALE DETAILS

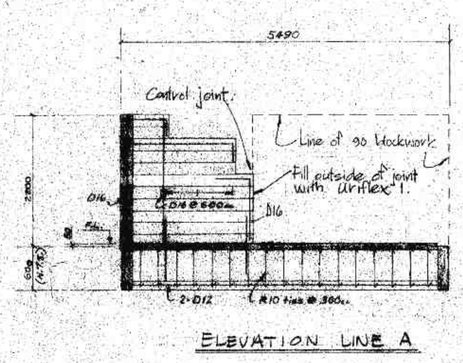
ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT	K.R. ANDERSON	1:20 1:5	APRIL 1976	792/2	5	5
	G.M. DREWETT	B.J.L. BEYMER					

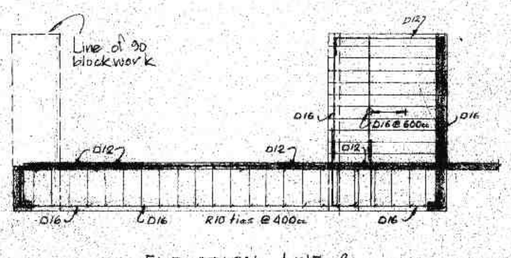
302 ARMAGH STREET CHRISTCHURCH 1. PO BOX 150 PHONE 795-830

NOTES :

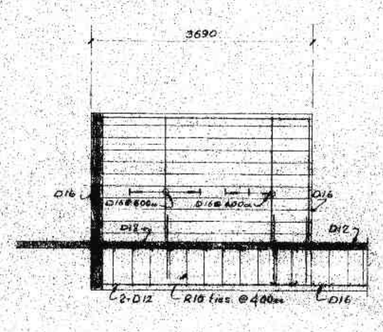
1) All blockwork fully filled, or where reinforced.
2) See Arch. dwgs for dimensions.



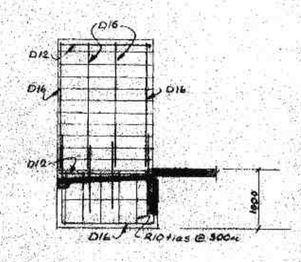
ELEVATION LINE A



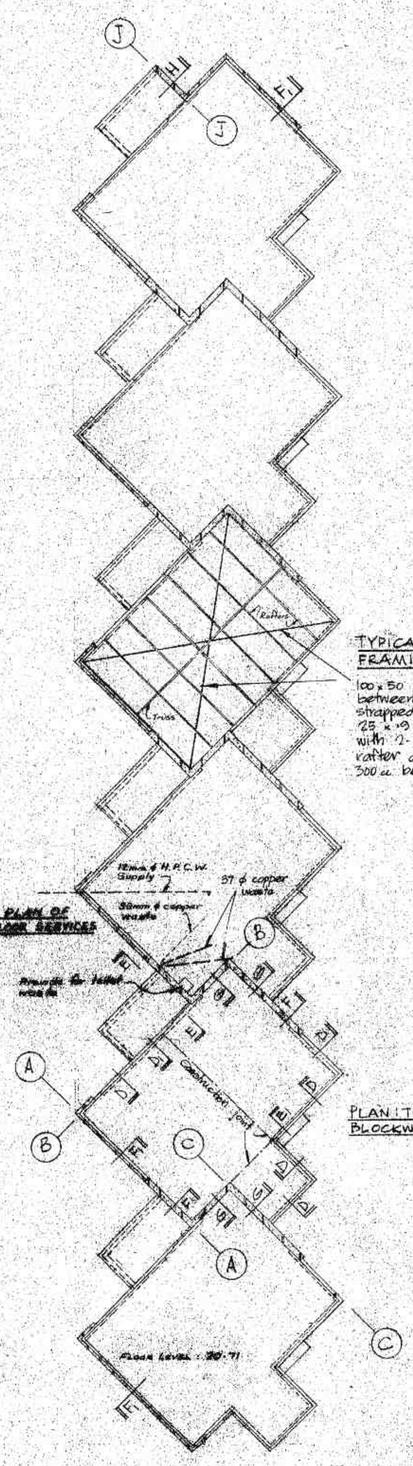
ELEVATION LINE B



ELEVATION LINE C



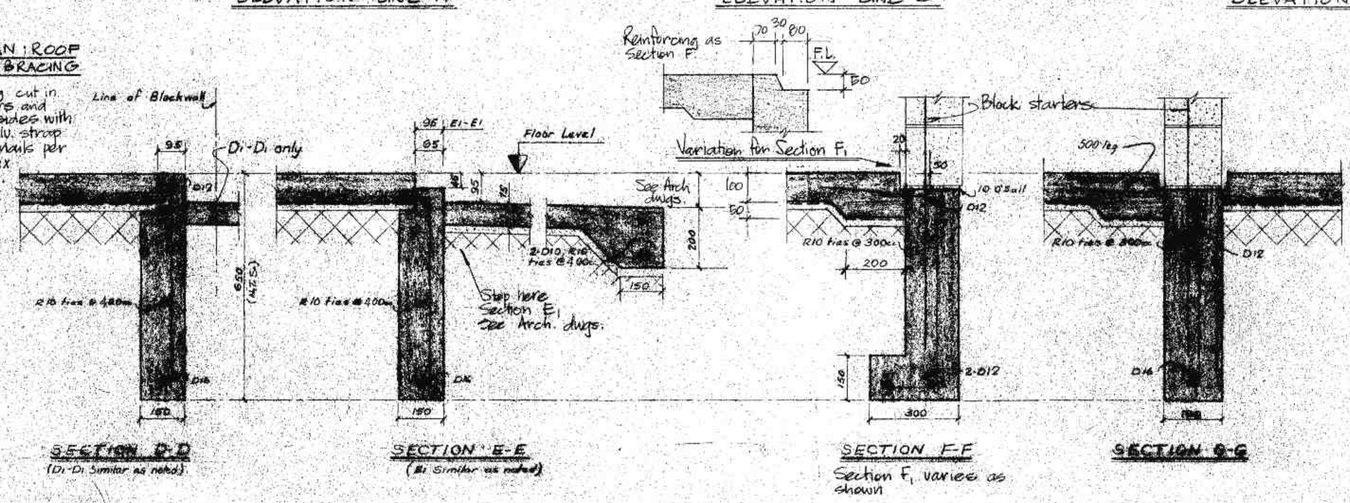
ELEVATION LINE J



TYPICAL PLAN OF UNDERFLOOR SERVICES

TYPICAL PLAN : ROOF FRAMING & BRACING

100 x 50 bracing cut in between rafters and strapped both sides with 25 x 0.9 mm galv. strap with 2-65 mm nails per rafter and max 300 cc between.



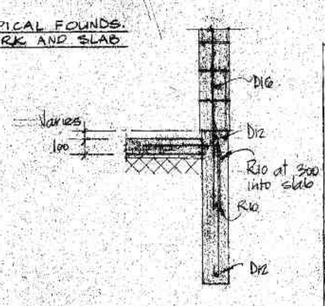
SECTION D-D
(D1-D1 Similar as noted)

SECTION E-E
(E1 Similar as noted)

SECTION F-F
Section F1 varies as shown

SECTION G-G

PLAN : TYPICAL FOUNDS. BLOCKWORK AND SLAB



SECTION H.

Gang Nail Truss Design Data

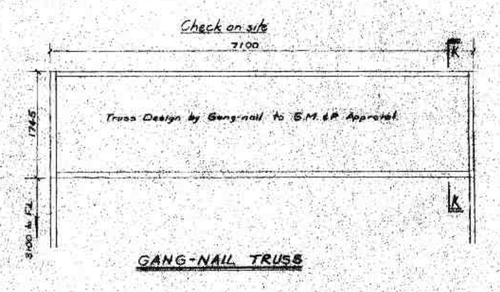
D.L. ROOF 0.6 mm steel tray roof on bldg paper on 75 x 50 purlins at 750 on 100 x 50 rafters at 900 cc.

D.L. CEILING 10 gib board on 50 x 50 battens at 400 on 100 x 50 joists at 900.

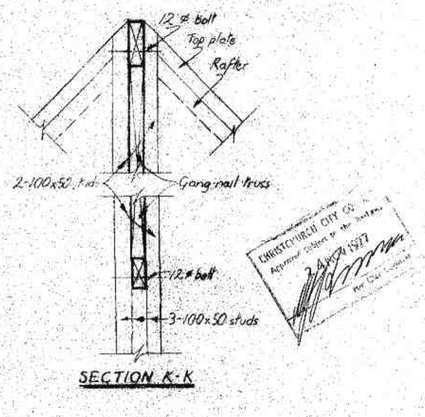
S.L. Minimum design load 300 N/m² on sloping roofs.

WIND Min dynamic pressure
$q = 480\ N/m^2$
$C_{pe} = -0.8$
$C_{pi} = \pm 0.3$.

Note : Roof pitch = 45°



GANG-NAIL TRUSS



SECTION K-K

PLAN

Datum: N.E. Corner of M.H. Frame, Intersection of Poulson St. and Church Sq. R.L. 30.985

ELDERLY PERSONS' HOUSING POULSON ST.,
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	FILE	DATE	SHEET	OF
ARCHITECTS AND ENGINEERS:	R. D. GRIFFITHS, J. A. MARTIN, G. I. H. DREWETT, M. J. MOFFAT, K. R. ANDERSON		1:10, 1:20, 1:100	732/2	May 1976, C.A.Stace	S.1	1
222 ARMAGH ST. CHRISTCHURCH 1. P.O. BOX 186 PHONE							

85 POULSON ST

6 ELDERLEY PERSONS HOUSES POULSON ST.

SPR

2152

SPR. 77- 2152

Appendix A1/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Block A				Reviewer:	Stephen Lee	
		Unit	No:	Street	CPEng No:	1006840	
Building Address:			85	Poulson	Company:	GHD	
Legal Description:					Company project number:	513090277	
					Company phone number:	6433780900	
		Degrees	Min	Sec			
GPS south:					Date of submission:		
GPS east:					Inspection Date:		
					Revision:	Final	
Building Unique Identifier (CCC):	BE 1110 001 EQ2				Is there a full report with this summary?	yes	

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	
Storeys below ground	0			
Foundation type:	strip footings		if Foundation type is other, describe:	Strip ground beams
Building height (m):	5.00		height from ground to level of uppermost seismic mass (for IEP only) (m):	3.6
Floor footprint area (approx):	41			
Age of Building (years):	34		Date of design:	1965-1976
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	multi-unit residential		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	2.8, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	none	overall depth x width (mm x mm)	
Columns:	timber	typical dimensions (mm x mm)	100x100
Walls:	fully filled concrete masonry	#N/A	

Lateral load resisting structure

Lateral system along:	fully filled CMU			
Ductility assumed, μ:	1.25	**Note: Define along and across in detailed report!**	note total length of wall at ground (m):	
Period along:	0.22	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.22	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:			
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	full	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:	green		
Along Damage ratio:	0%	Describe how damage ratio arrived at:	
Along Describe (summary):			
Across Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
Across Describe (summary):			
Diaphragms Damage?:	no	Describe:	
CSWs: Damage?:	no	Describe:	
Pounding: Damage?:	no	Describe:	
Non-structural: Damage?:	no	Describe:	

Recommendations

Level of repair/strengthening required:			Describe:	
Building Consent required:			Describe:	
Interim occupancy recommendations:			Describe:	
Along Assessed %NBS before e'quakes:	94%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
Along Assessed %NBS after e'quakes:	94%			
Across Assessed %NBS before e'quakes:	67%	##### %NBS from IEP below		
Across Assessed %NBS after e'quakes:	67%			

Specific Report A2
BE 1110 005-006 EQ2 Blocks B and C

April 2015

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Photograph 4 South-West View of Block B

Photograph 5 Front view of typical unit for Block C

Photograph 6 Southwest View of Block C

Appendices

Appendix A2/A Photographs

Appendix A2/B Available Drawings

Appendix A2/C CERA Spreadsheet

Appendix A2/D Stairwell Additional Support

1. Building Description

1.1 General

The following information describes Blocks B and C buildings of Harman Courts.

- Blocks B and C are situated towards the southern boundary of the site, just south of garage blocks M and N respectively. See Figure 1 for location of the blocks.
- Blocks B and C are two identical 3 storey structures comprising reinforced concrete masonry walls supporting timber roof trusses and precast concrete floor units at first and 2nd floor levels.
- Each of Blocks B and C consists of four structural units; each unit in turn is sub-divided vertically into 3 flats. There are two common staircases per block providing access to the flats. The staircases are in-situ reinforced concrete.
- The roof has a pitch of 50 degrees and consists of lightweight corrugated metal sheeting on 100 x 50 purlins over timber trusses.
- The ground floor is 100 mm thick cast-in-situ concrete slab on grade. The 1st and 2nd floors are 75 mm thick Unispan precast concrete units with 90 mm thick in-situ topping.
- Foundations of the building comprise reinforced concrete piles and ground beams.
- The dimensions of each building are approximately 10.0 m wide, 30.0 m long and 12.0 m in height to roof ridge.

Figure 2 shows the floor plan layout of the whole structure. Complete information mentioned above is provided in Appendix A2/B.



Figure 1 Plan/Aerial View of Harman Courts

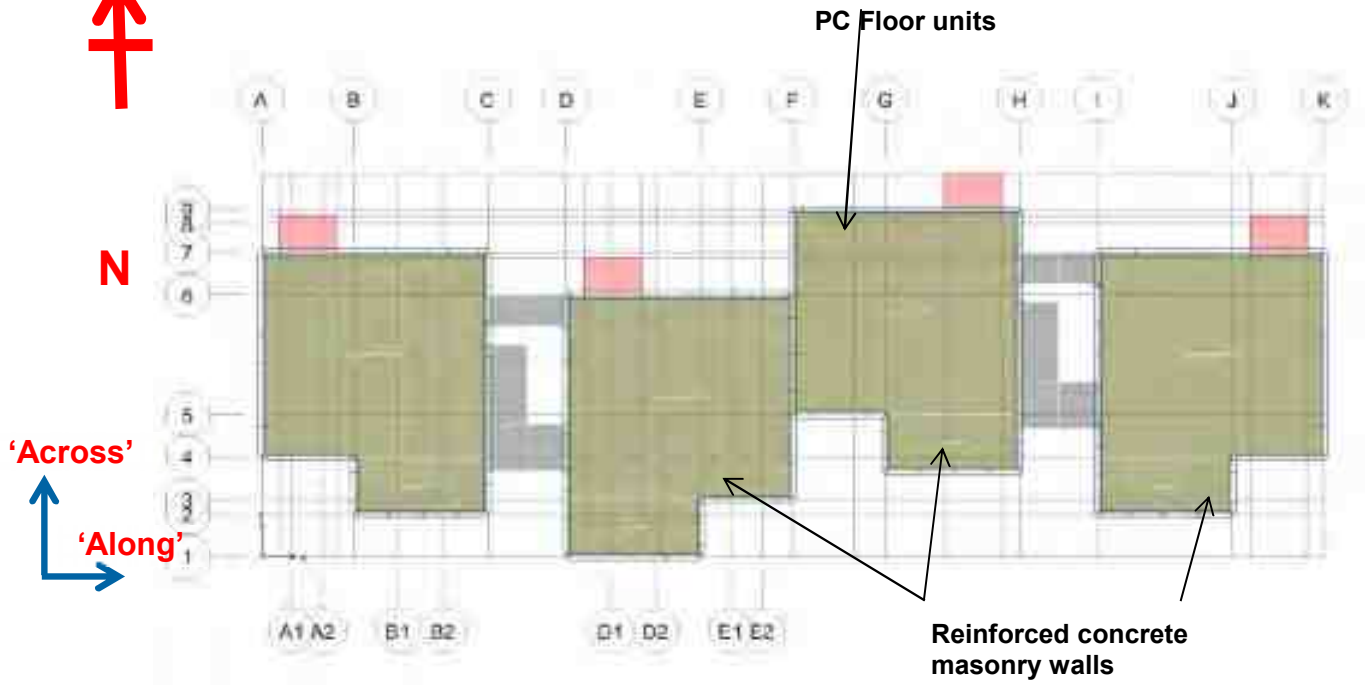


Figure 2 Sketch Plan Block B Showing Key Structural Elements. Block C is Identical

1.2 Gravity Load Resisting System

The roof gravity loads are supported by the timber roof trusses which transmit the load to the three storey reinforced concrete masonry walls. The precast Unispan floor slabs transfer the 1st and 2nd floor gravity loads into the reinforced concrete masonry walls which transmit the loads to the foundations.

1.3 Lateral Load Resisting System

The reinforced concrete masonry walls resist the lateral loads in both the 'Across' and 'Along' directions. The diaphragm action of the roofing system transmits the roof lateral load to the upper reinforced concrete masonry walls while the 1st and 2nd Unispan floor units with topping act as stiff diaphragms and transmit the floor lateral loads to the reinforced concrete masonry walls and then down to the foundations.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Typical Foundation Plan and Details	Sheet 1 of 6	October 1976
2	Foundation Beam Elevations	Sheet 2 of 6	October 1976
3	Elevation of Block Walls	Sheet 3 of 6	October 1976
4	Block Wall Details – 1st and 2nd Floor Plan	Sheet 4 of 6	October 1975
5	Details of Concrete Staircase	Sheet 5 of 6	October 1975
6	Details of Timber Roof Trusses	Sheet 6 of 6	November 1975
7	Site Plan	Sheet 1 of 18	September 1976
8	Elevations	Sheet 2 of 18	January 1976
9	Ground Floor Plan	Sheet 3 of 18	January 1976
10	1st Floor and 2nd Floor Plan	Sheet 4 of 18	January 1976

Item	Title	Sheet No.	Drawing Date
11	Cross Section	Sheet 5 of 18	January 1976
12	Stairwell Details	Sheet 6 of 18	January 1976
13	Window Details	Sheet 7 of 18	January 1976
14	Door Details	Sheet 8 of 18	January 1976
15	Joinery Details	Sheet 9 of 18	January 1976
16	Balcony Details	Sheet 10 of 18	January 1976

Available drawings are attached in Appendix A2/B.

2.4 Analysis and Modelling

A seismic assessment was carried out based on a specific design in accordance with NZS 1170.5:2004 and NZS 4230:2004. The building was modelled using a ductility factor of 1.25 (reinforced masonry walls) in both directions.

3. Damage Assessment

3.1 General

3.1.1 Block B

No damage was identified in the Block B.

3.1.2 Block C

Cracking in the reinforced concrete staircase located outside Unit 11B of Block C was reported as pre-existing, however this may have been exacerbated by the recent seismic activity. Hairline cracking to internal linings was also noted; however some was identified as previous to the recent seismic activity. Damage identified will not affect structural performance.

4. Results of Analysis

The following are the results of the structural analysis of Blocks B and C buildings.

4.1 Reinforced Concrete Masonry Walls

4.1.1 In Plane

Across

Above 2nd Floor

The reinforced concrete masonry walls were found to be rated more than 100% NBS.

Above 1st Floor

The reinforced concrete masonry walls were found to be rated more than 100% NBS.

Above Ground Floor

The reinforced concrete masonry walls were found to be rated more than 100% NBS.

Along

Above 2nd Floor

The reinforced concrete masonry walls were found to be rated more than 100% NBS.

Above 1st Floor

The reinforced concrete masonry walls were found to be rated more than 100% NBS.

Above Ground Floor

The reinforced concrete masonry walls were found to be rated at 89% NBS.

4.1.2 Out of Plane

The reinforced concrete masonry walls were found to be rated at 72% NBS.

4.2 Roof Timber Truss Framing

The roof timber truss framing were found to be rated more than 100% NBS.

4.3 Roof diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.

4.4 RC Foundation Beams

The reinforced concrete foundation beams were found to be rated above 100% NBS.

5. Stairwell Support

Additional support for the stairwells was designed by GHD and completed in November 2014. Refer to Appendix A2/D for further details.

6. Conclusion and Recommendation

The building overall has been assessed as having a seismic capacity of 72% NBS and is therefore classified as not an 'Earthquake Risk'.

No further assessment or strengthening is required to comply with CCC policy.

Appendices

Appendix A2/A Photographs



Photograph 1 Front view of typical unit for Block B



Photograph 2 Rear view of Block B



Photograph 3 South-East View of Block B



Photograph 4 South-West View of Block B



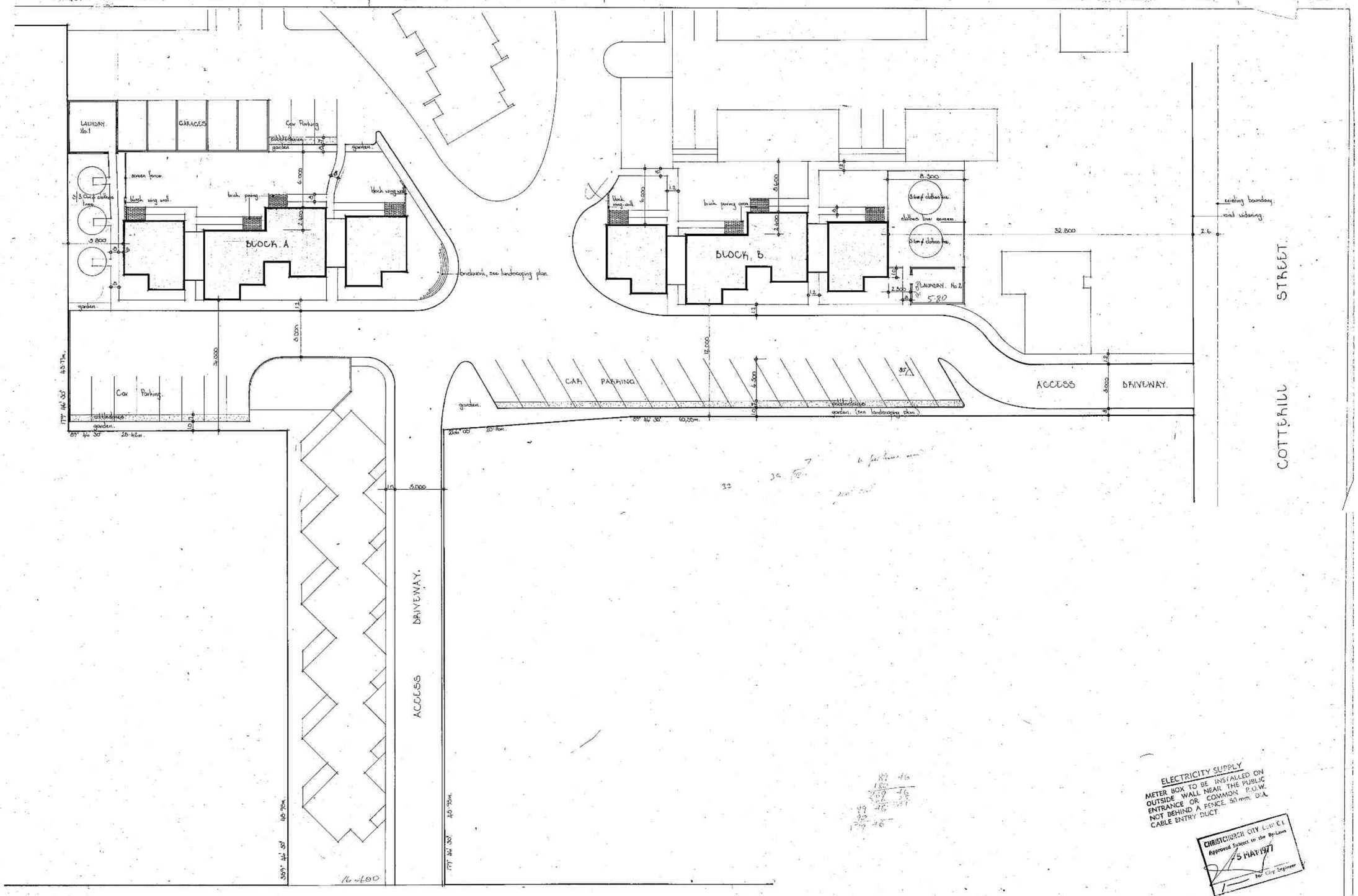
Photograph 5 Front view of typical unit for Block C



Photograph 6 Southwest View of Block C

Appendix A2/B Available Drawings

SPR 77-565



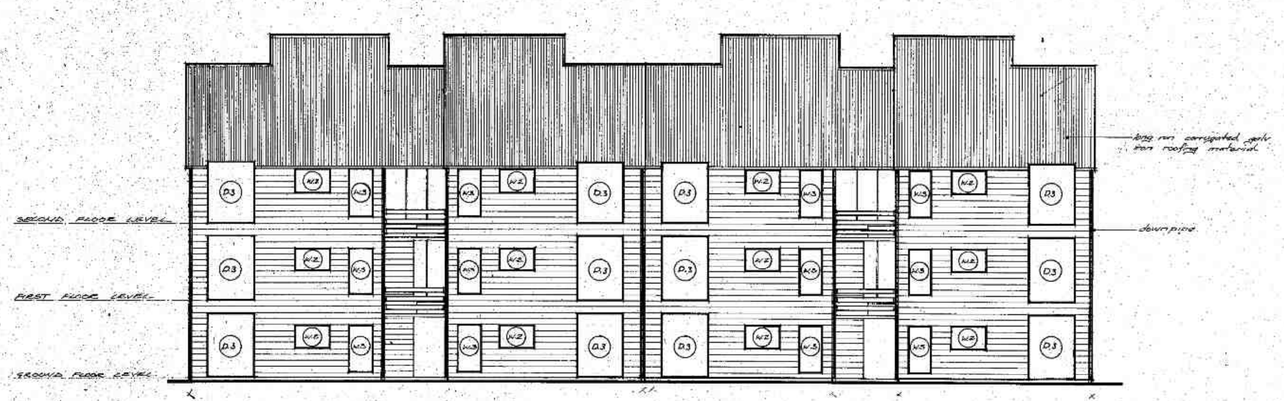
ELECTRICITY SUPPLY
METER BOX TO BE INSTALLED ON OUTSIDE WALL NEAR THE PUBLIC ENTRANCE OR COMMON P.O.W. NOT BEHIND A FENCE. 30 mm. DIA. CABLE ENTRY DUCT.

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
5 MAY 1977
City Engineer

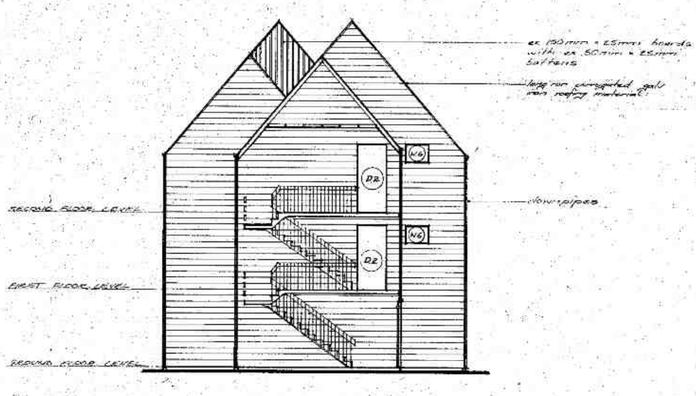
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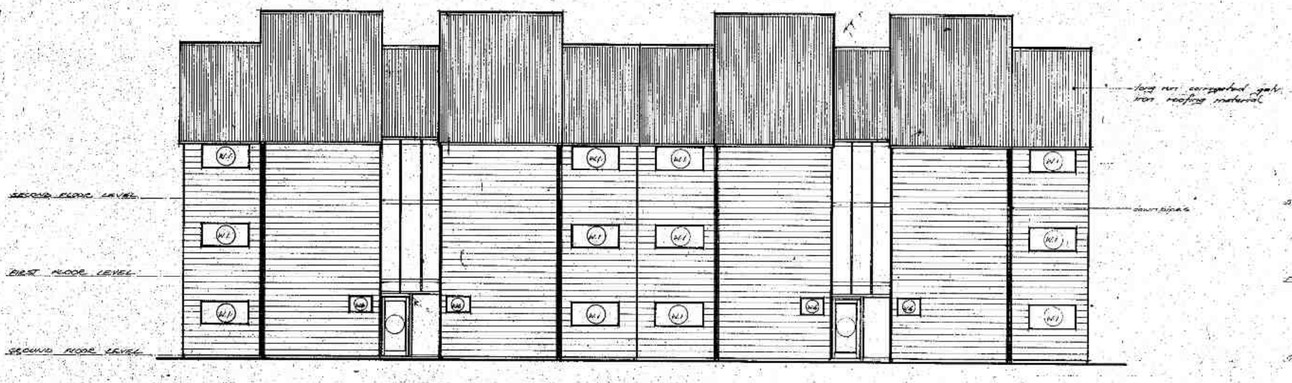
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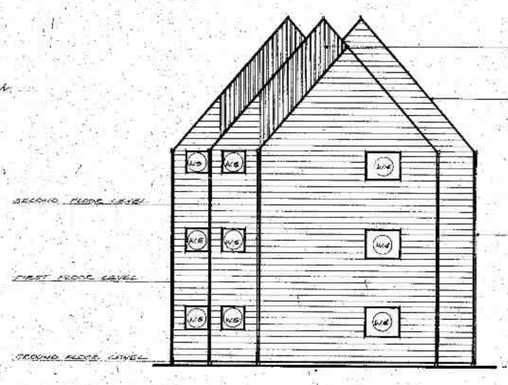
FRONT ELEVATION
SCALE 1:100



TYPICAL SECTION THROUGH STAIR LOBBY
SCALE 1:100



REAR ELEVATION
SCALE 1:100



END ELEVATION : SCALE - 1:100

CITY COUNCIL
Approved as Shown on Plans
31 MAR 1977
for City Engineer

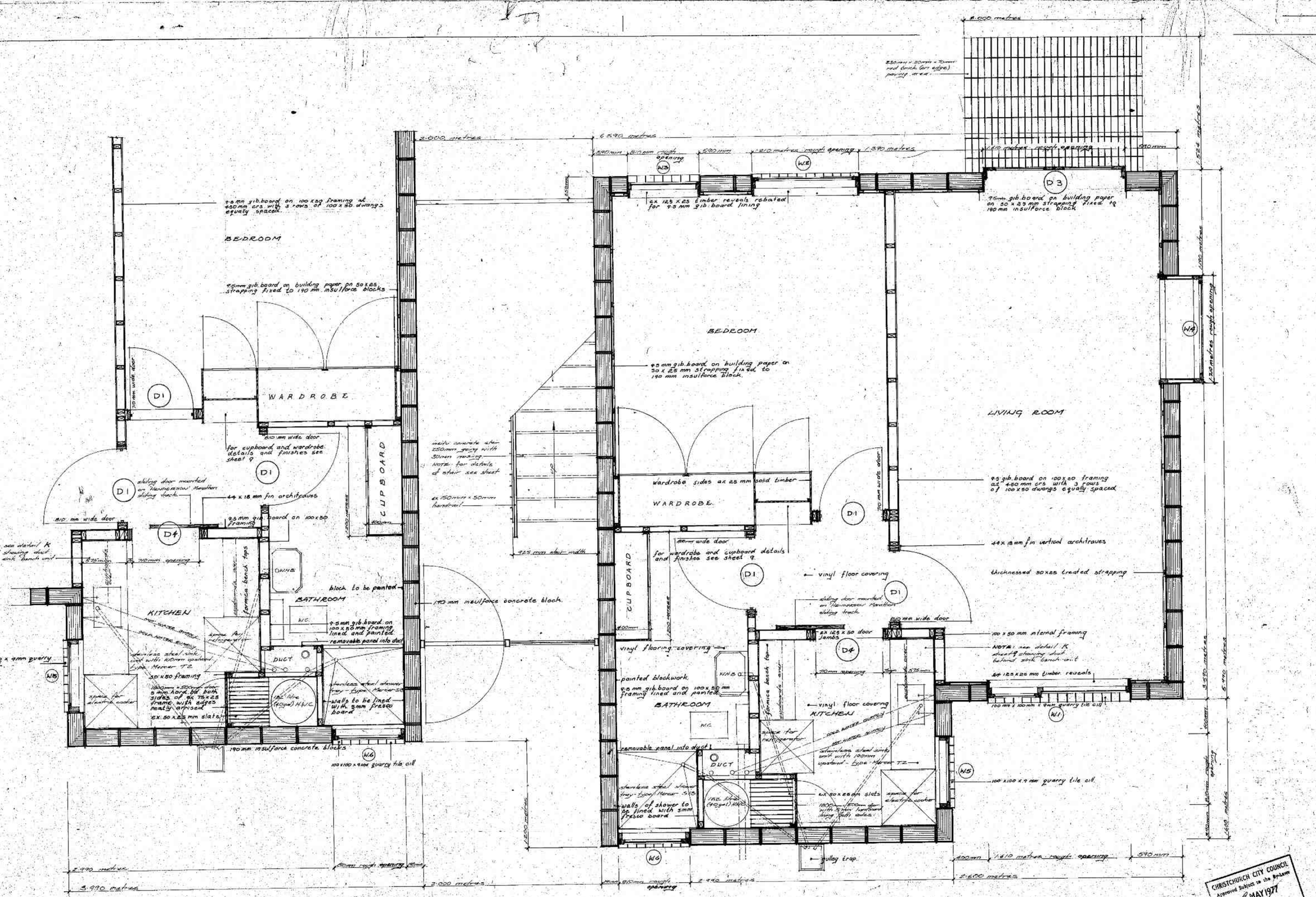
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CHRISTCHURCH CITY COUNCIL
CITY ENGINEER'S DEPARTMENT

CONSULTANT

HARMAN STREET RECLAMATION HOUSING - STAGE 1.

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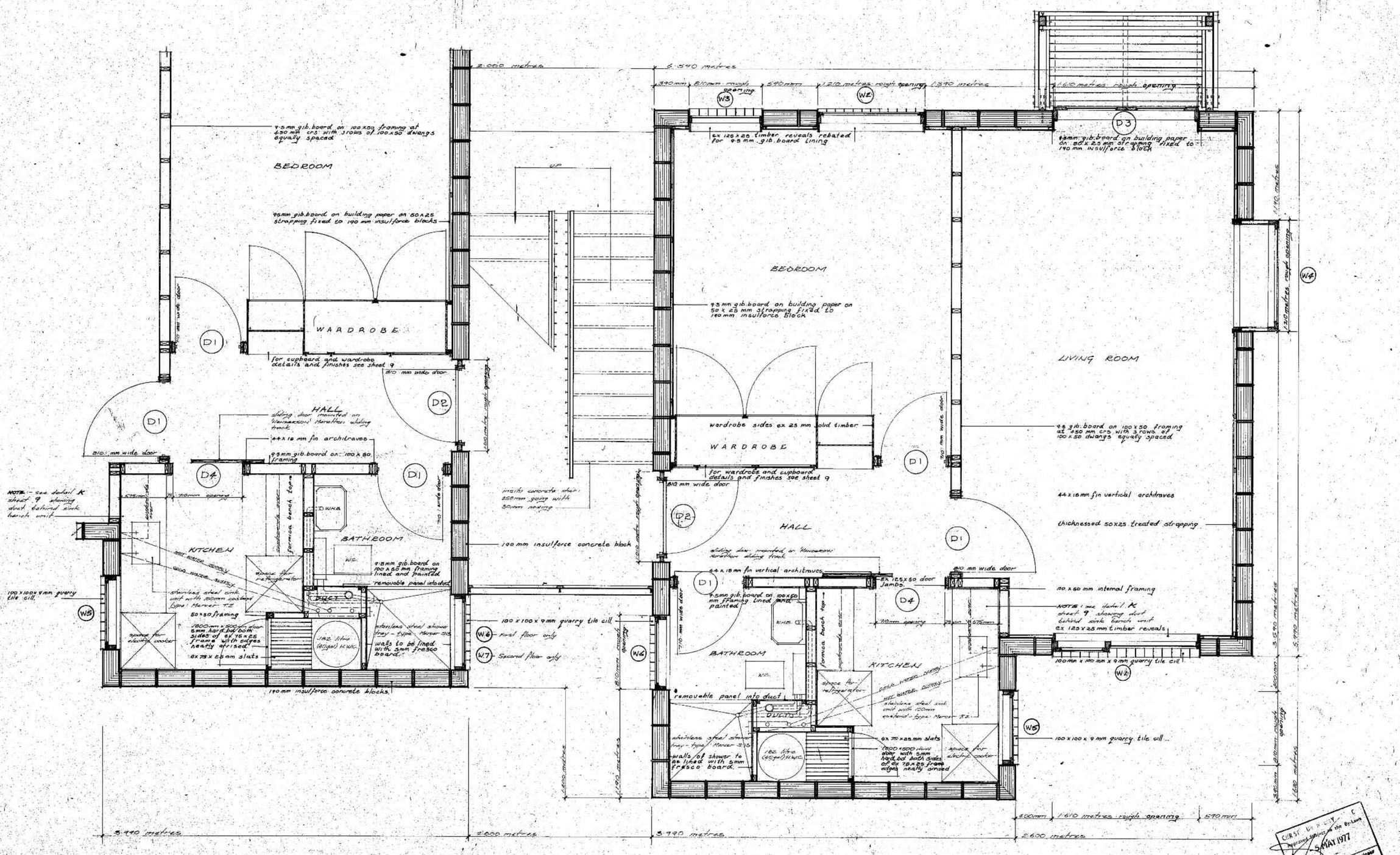
DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-laws
3 MAY 1977
City Engineer

6596
2000

CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
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CITY ENGINEER'S DEPARTMENT			DATE JANUARY 1976. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK					OF



CITY ARCHITECT'S DIVISION

CONSULTANT

CHRISTCHURCH CITY COUNCIL

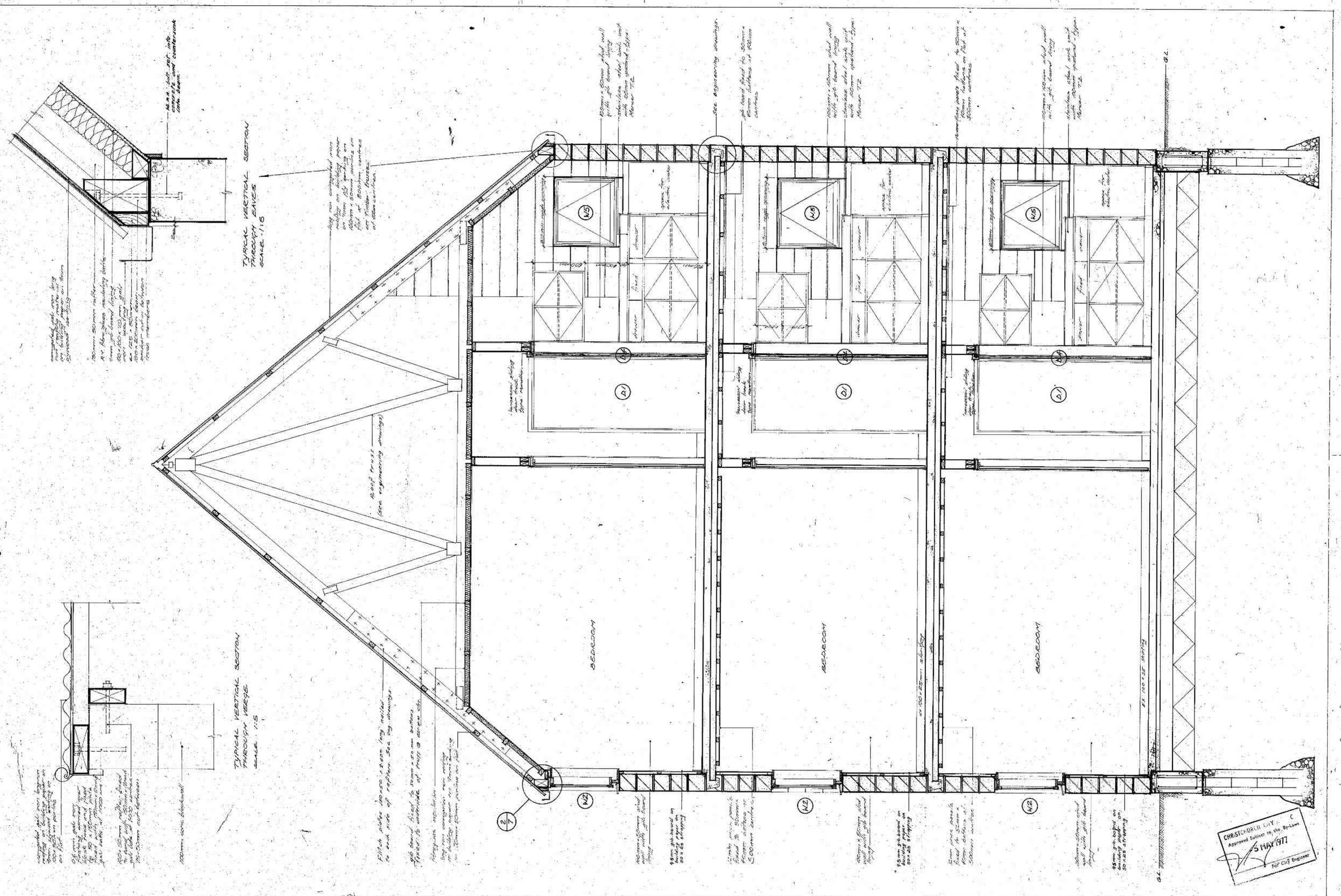
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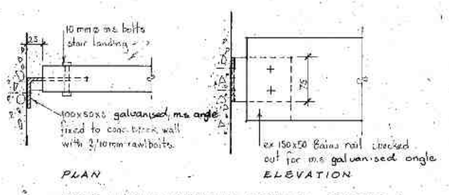
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DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

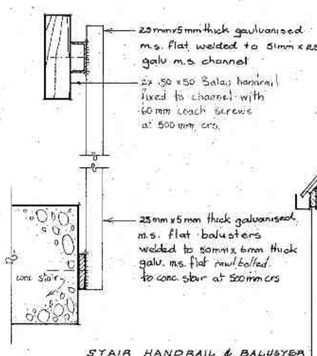
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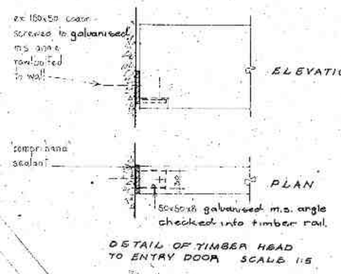
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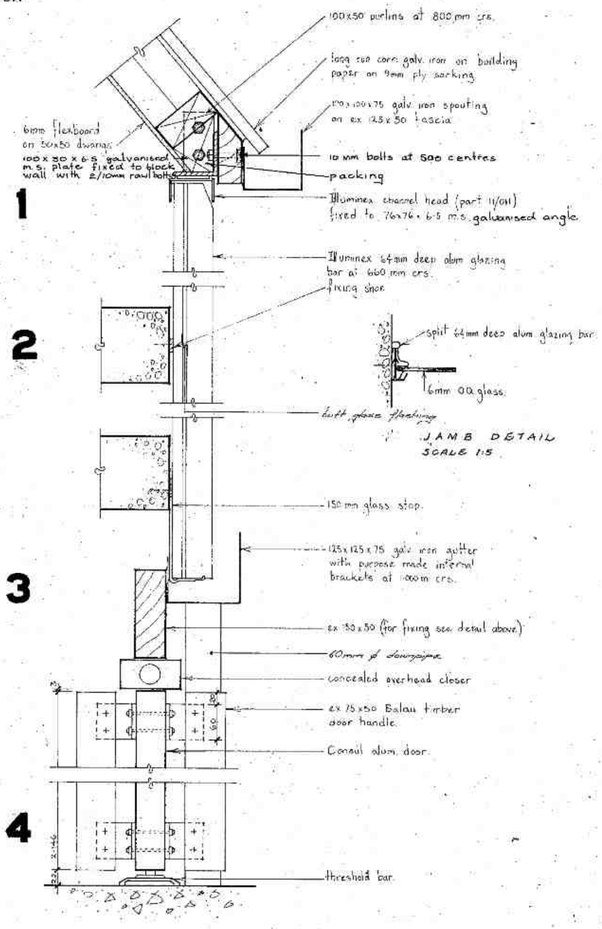
STAIR LANDING HANDRAIL DETAILS SCALE 1:5



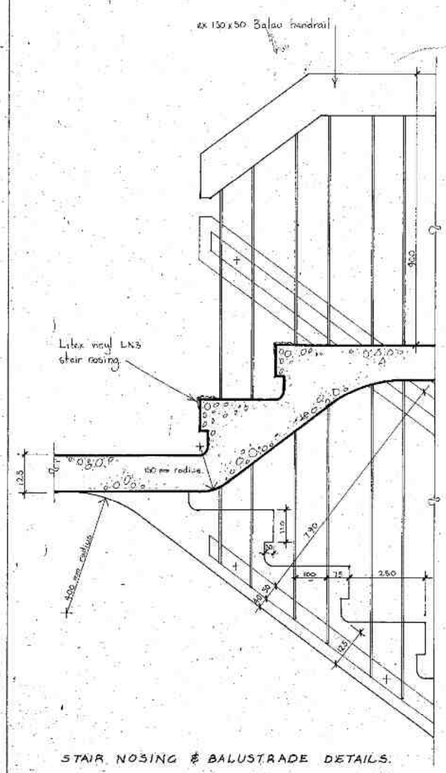
STAIR HANDRAIL & BALUSTER DETAIL SCALE 1:5



DETAIL OF TIMBER HEAD TO ENTRY DOOR SCALE 1:5

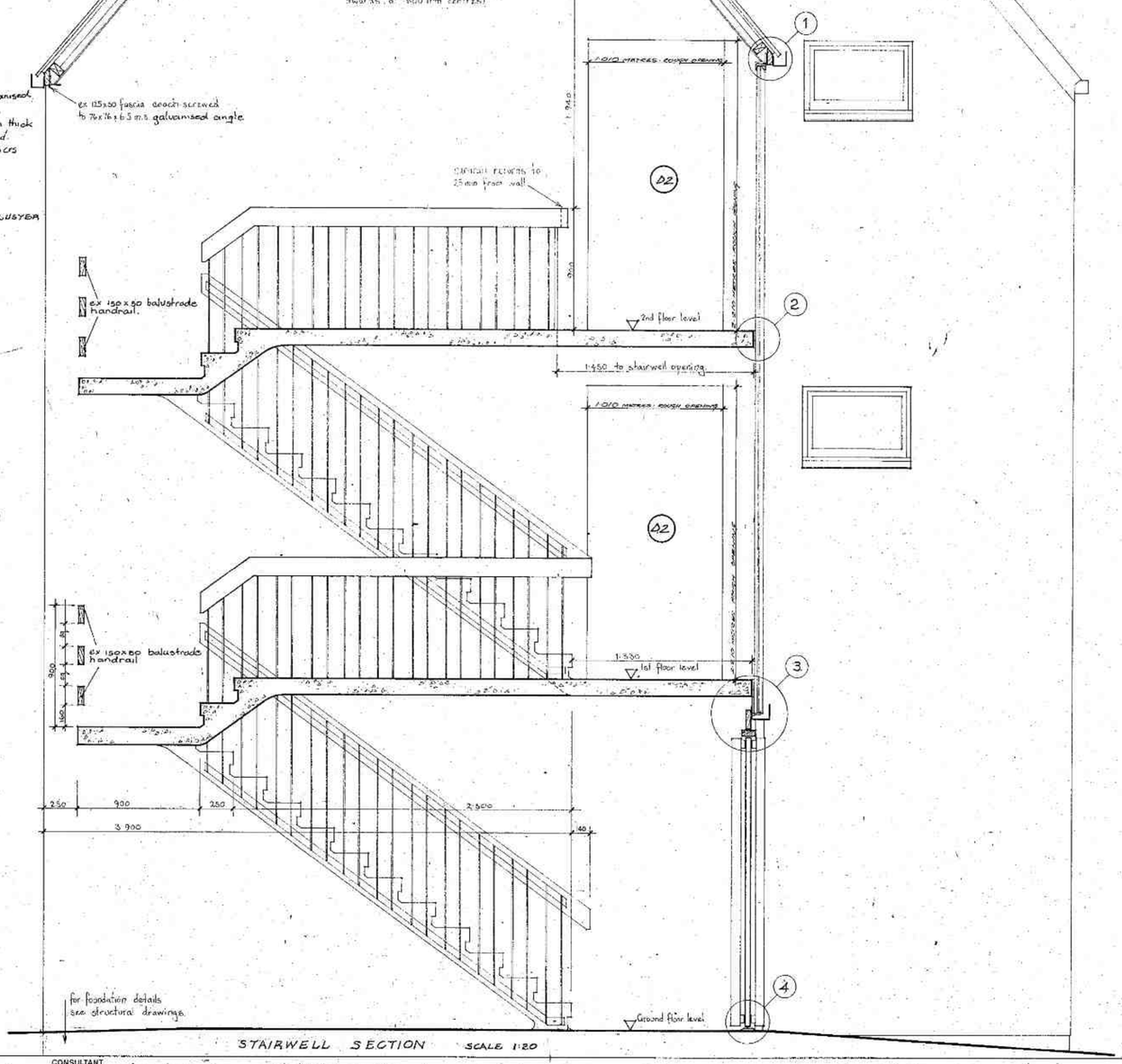


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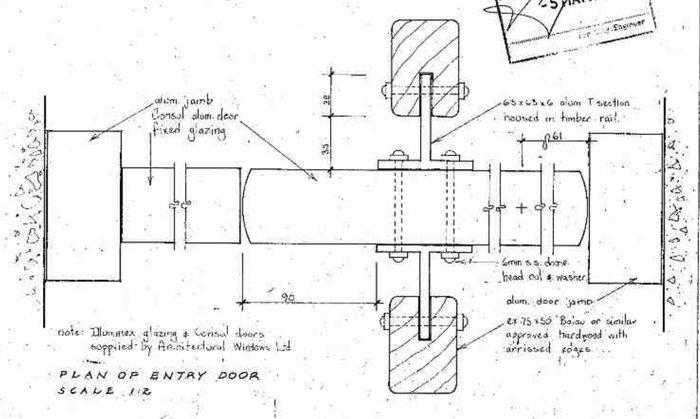


STAIR NOSING & BALUSTRADE DETAILS.

SCALE 1:10



STAIRWELL SECTION SCALE 1:20



PLAN OF ENTRY DOOR SCALE 1:2

CITY ARCHITECT'S DIVISION

CONSULTANT

CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING STAGE 1

SCALES 1:2, 1:5, 1:10, 1:20

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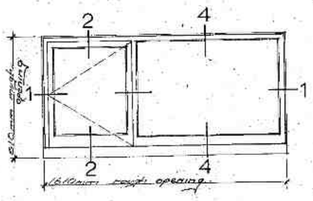
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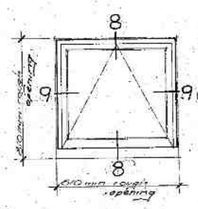
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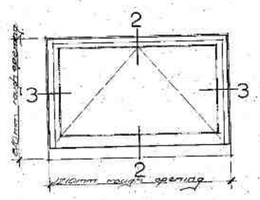
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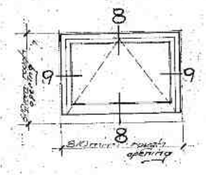
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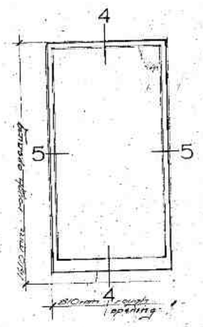
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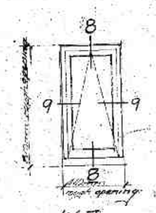
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W6. SCALE 1:20

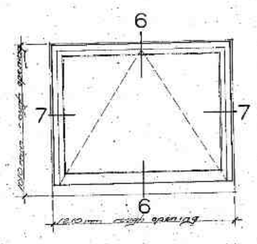


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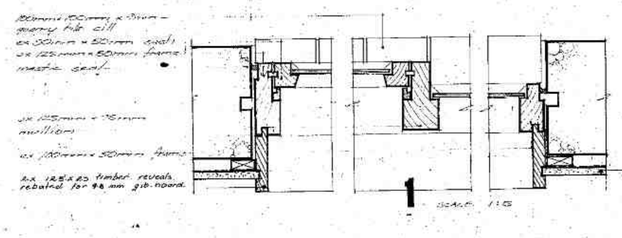


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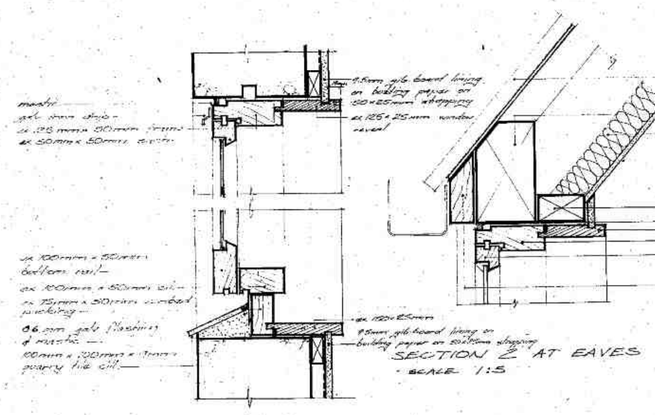
NOTE: W7 APPLIES TO SECOND FLOOR ONLY UNITS



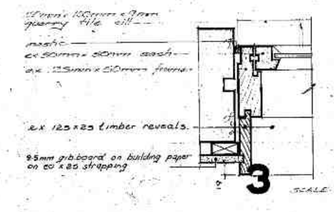
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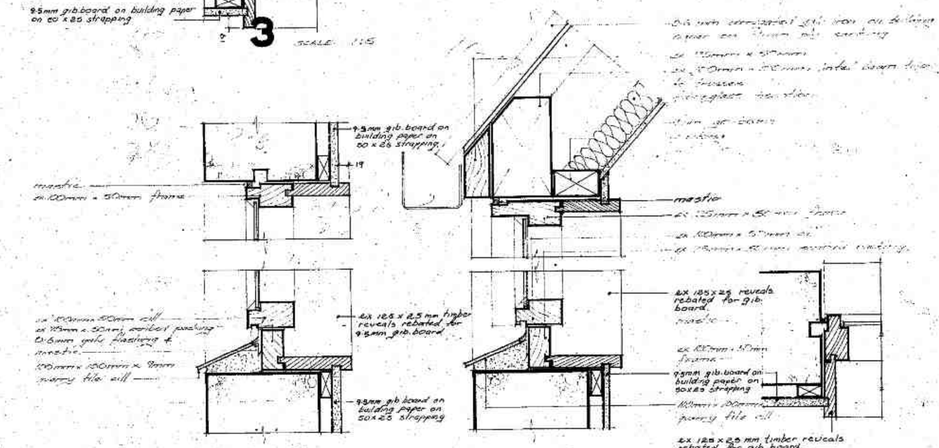
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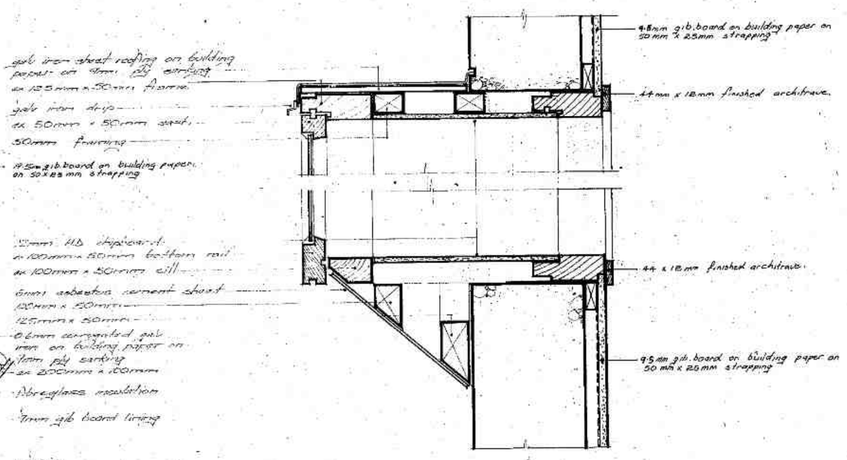
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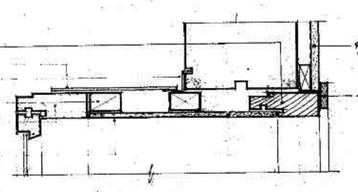
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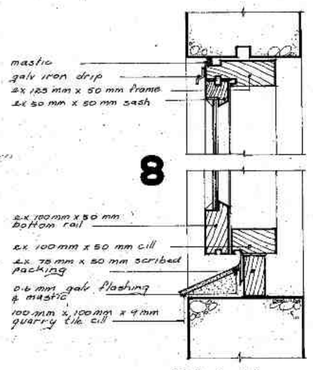
SECTION 4 AT EAVES
SCALE 1:5



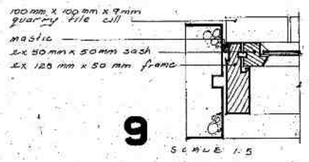
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SCALE 1:5



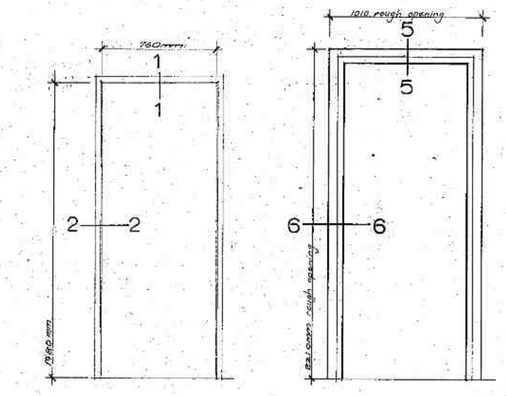
SCALE 1:5



SCALE 1:5

CHRISTCHURCH CITY C.C.
Approved Subject to the By-Laws
5 MAY 1977
For City Engineer

CITY ARCHITECT'S DIVISION CHRISTCHURCH CITY COUNCIL CITY ENGINEER'S DEPARTMENT	CONSULTANT	HARMAN STREET RECLAMATION HOUSING - STAGE 1	SCALES 1:5, 1:20	DESIGN DSN W.F.A, DRN T.N.L, TCD T.N.L, CKD	AMENDMENTS	SHEET TITLE: WINDOW DETAILS DATE JANUARY, 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK	REFERENCE: JOB A 289, FILE 84/19/6, CONT 31-16/77 SHEET 7 OF 16

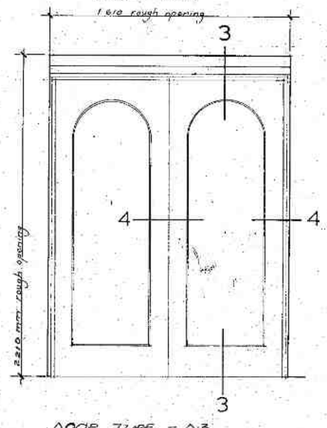


DOOR TYPE - D1

SCALE - 1:20

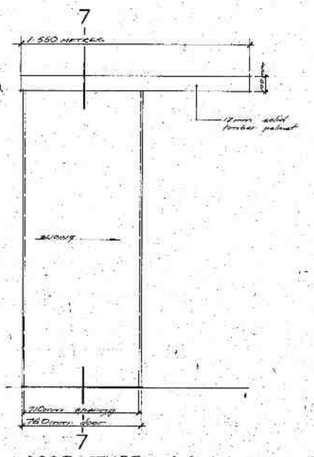
DOOR TYPE - D2

SCALE - 1:20



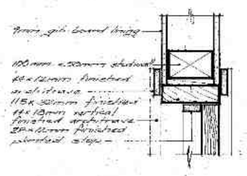
DOOR TYPE - D3

SCALE - 1:20



DOOR TYPE - D4

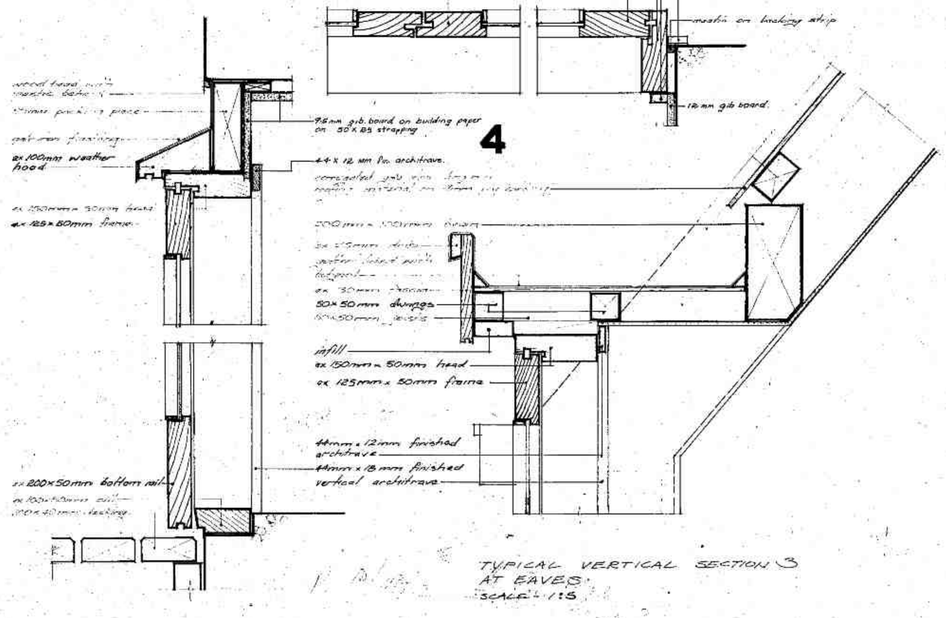
SCALE - 1:20



1



2

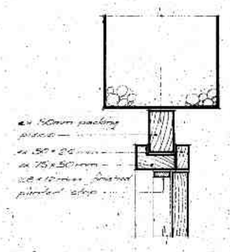


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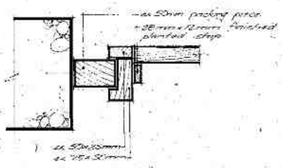
TYPICAL VERTICAL SECTION 3 AT EAVES

SCALE - 1:5

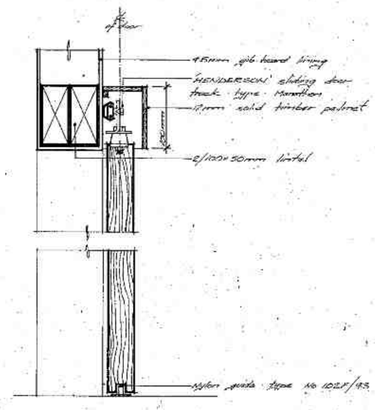
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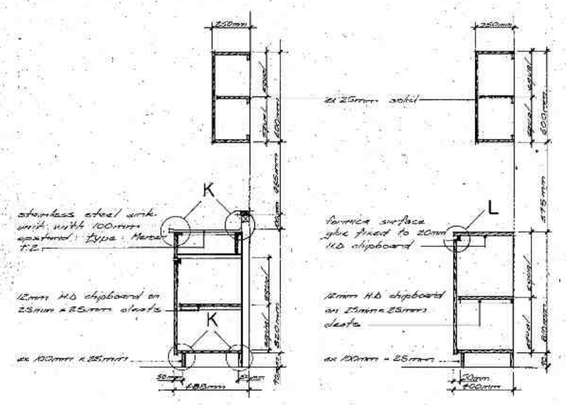
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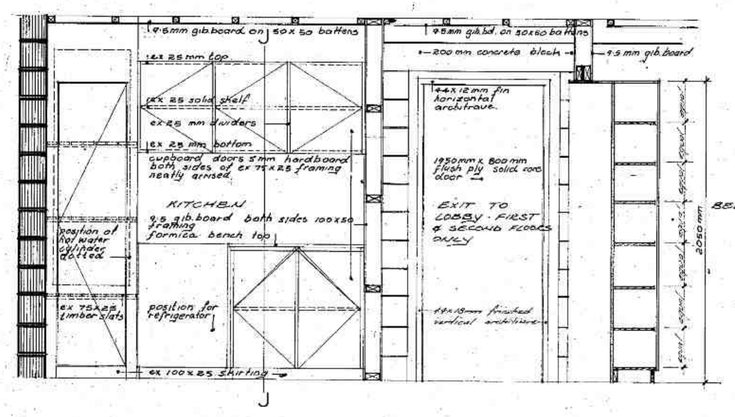
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CHRISTCHURCH CITY
Approved Subject to the By-Laws
15 MAY 1977
For City Engineer

CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET RECLAMATION HOUSING - STAGE 1	1:20 1:5	DSN W.F.A DRN T.N.L TCD T.N.L CKD		DOOR DETAILS	JOB A 239 FILE 84/19/6 CONT 531-76/77	8
CITY ENGINEER'S DEPARTMENT			DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK					OF 18

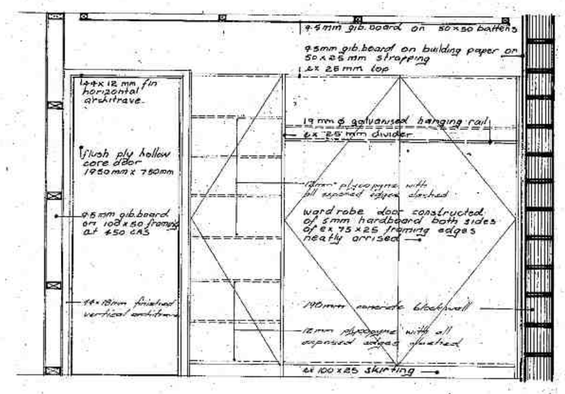


TYPICAL VERTICAL SECTION THROUGH SINK BENCH UNIT SCALE: 1:20



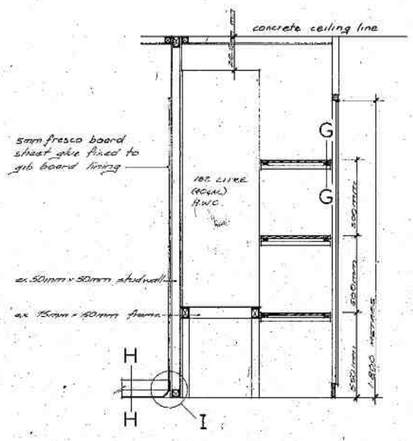
TYPICAL VERTICAL SECTION THROUGH (J) SCALE 1:20

TYPICAL ELEVATION OF CUPBOARD UNITS & H.W.C. CUPBOARD TO KITCHEN SCALE 1:20

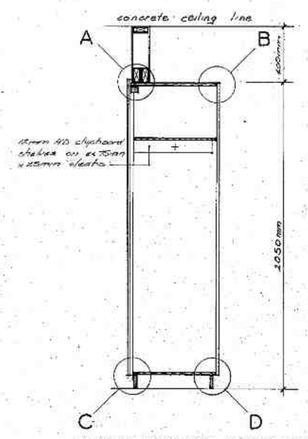


TYPICAL VERTICAL SECTION THROUGH WARDROBE UNIT TO BEDROOM SCALE: 1:20

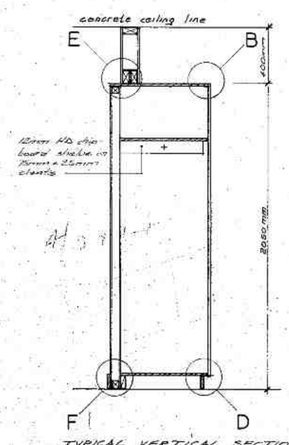
TYPICAL ELEVATION OF WARDROBE UNIT & CUPBOARD UNIT TO BEDROOM SCALE 1:20



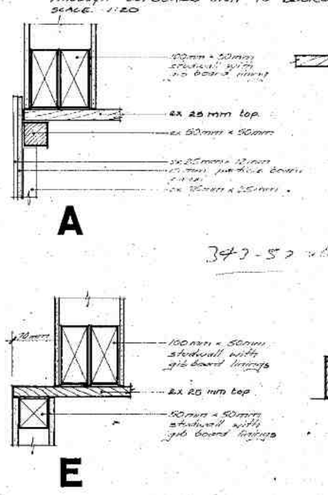
TYPICAL VERTICAL SECTION THROUGH H.W.C. CUPBOARD & SHOWER SCALE 1:20

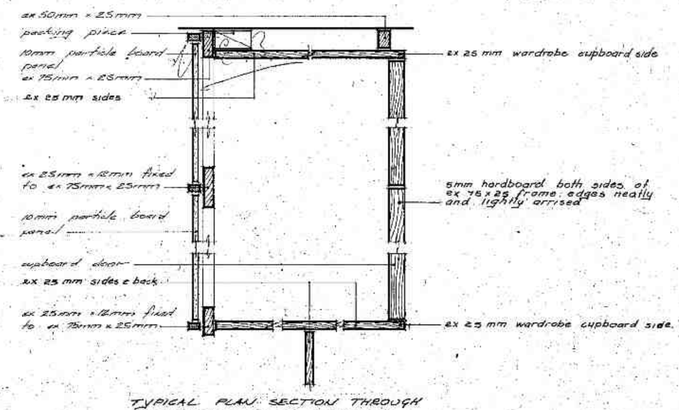


TYPICAL VERTICAL SECTION THROUGH WARDROBE UNIT TO BEDROOM · FIRST & SECOND FLOORS ONLY SCALE 1:20

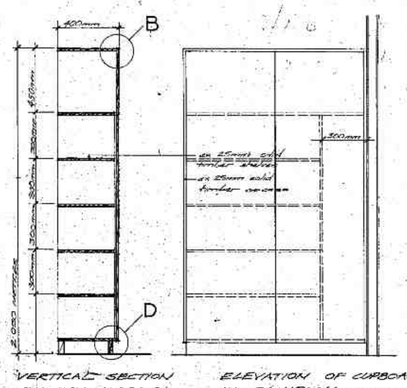


TYPICAL VERTICAL SECTION THROUGH WARDROBE UNIT TO BEDROOM · GROUND FLOOR ONLY SCALE 1:20



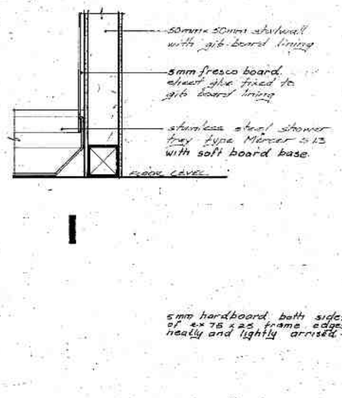


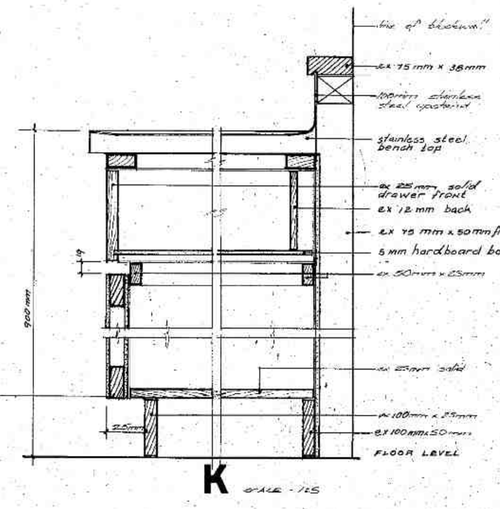
TYPICAL PLAN SECTION THROUGH WARDROBE UNIT TO BEDROOM FIRST & SECOND FLOOR ONLY SCALE 1:20



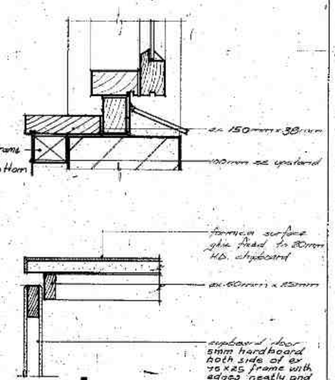
VERTICAL SECTION THROUGH CUPBOARD IN BATHROOM 1:20 APPLIES TO GROUND FLOOR ONLY

ELEVATION OF CUPBOARD IN BATHROOM. SCALE - 1:20





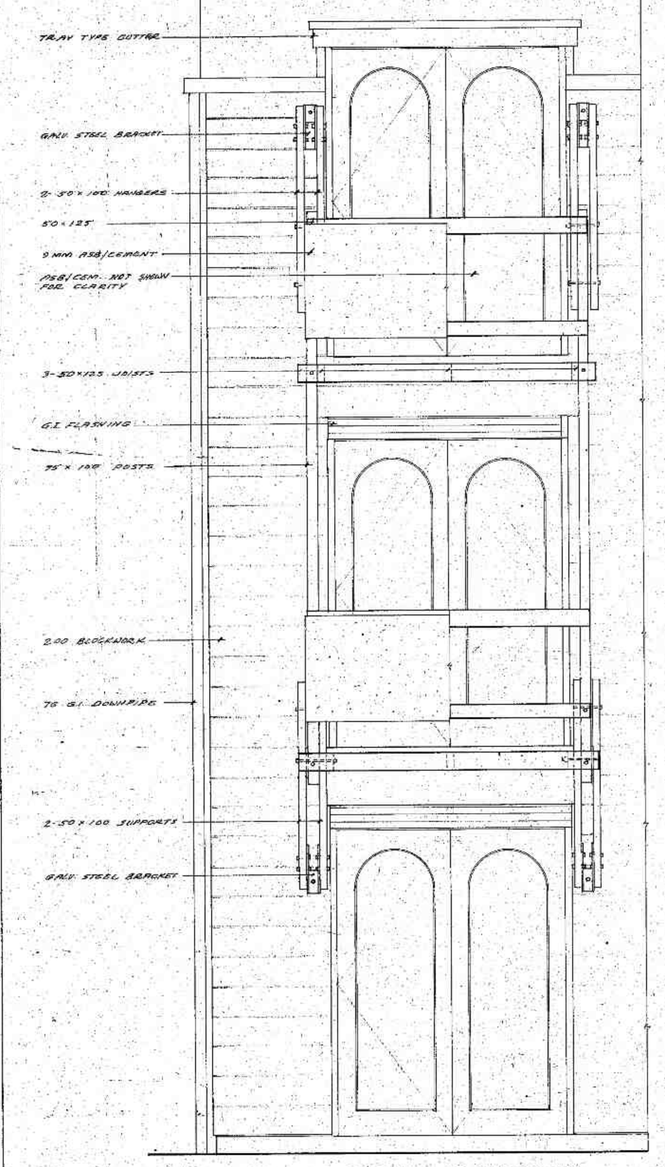
SCALE - 1:5



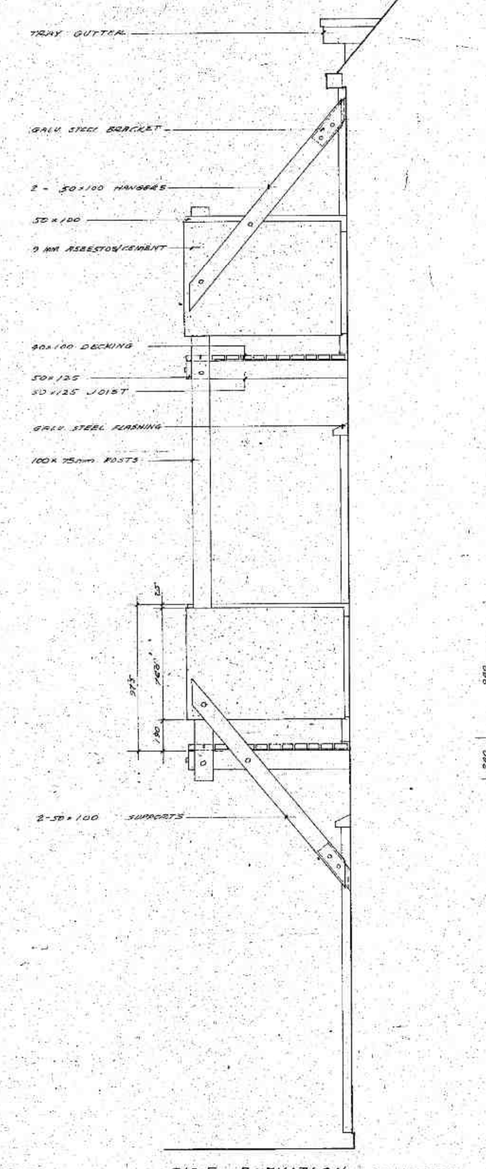
SCALE - 1:5

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
5 MAY 1977
for City Engineer

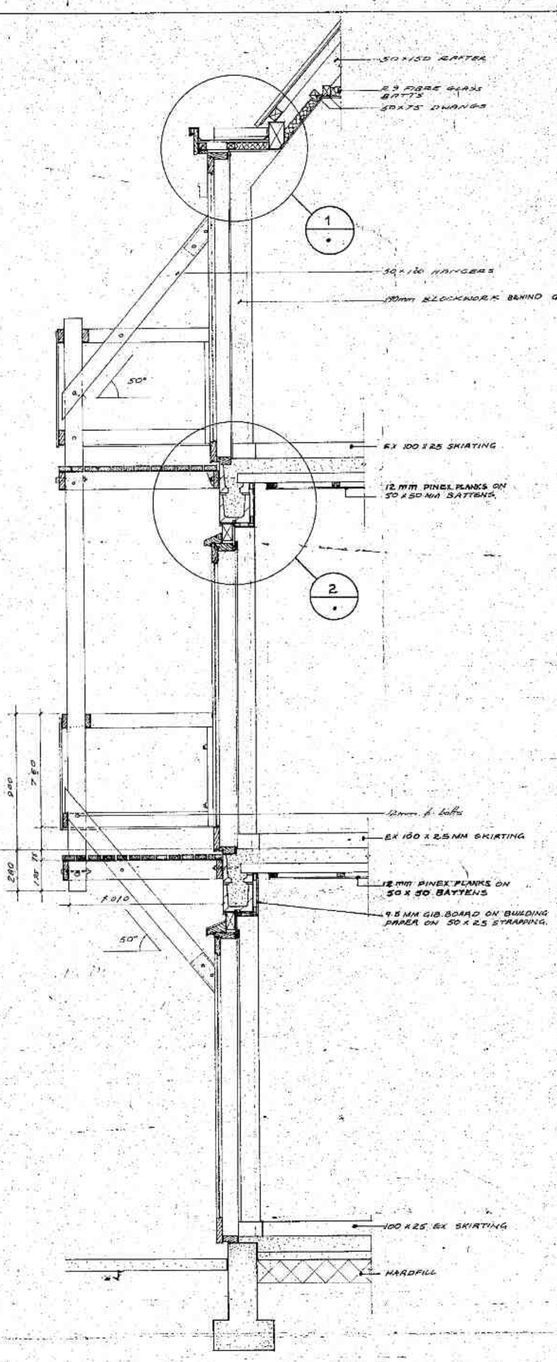
CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE / SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET RECLAMATION HOUSING - STAGE 1	1:20 1:5	DSN W.A.A. DRN T.N.L. TCD T.N.L. CKD		JOINERY DETAILS	JOB A 839 FILE 84/19/6 CONT 31-7611 9
CITY ENGINEER'S DEPARTMENT			DATE JANUARY 1976	CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK			OF 15



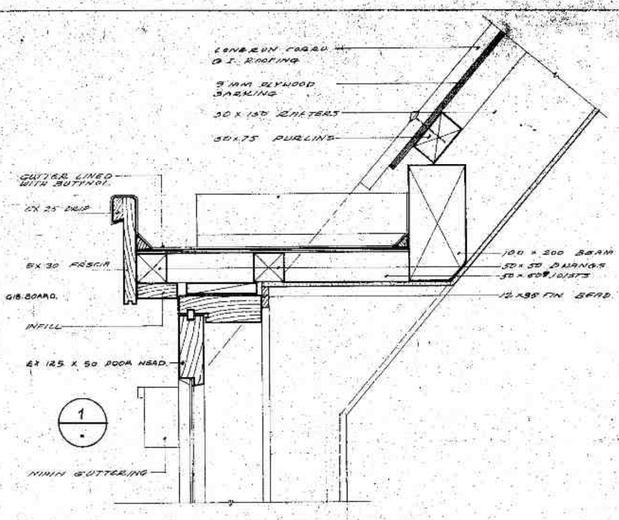
FRONT ELEVATION SCALE 1:20

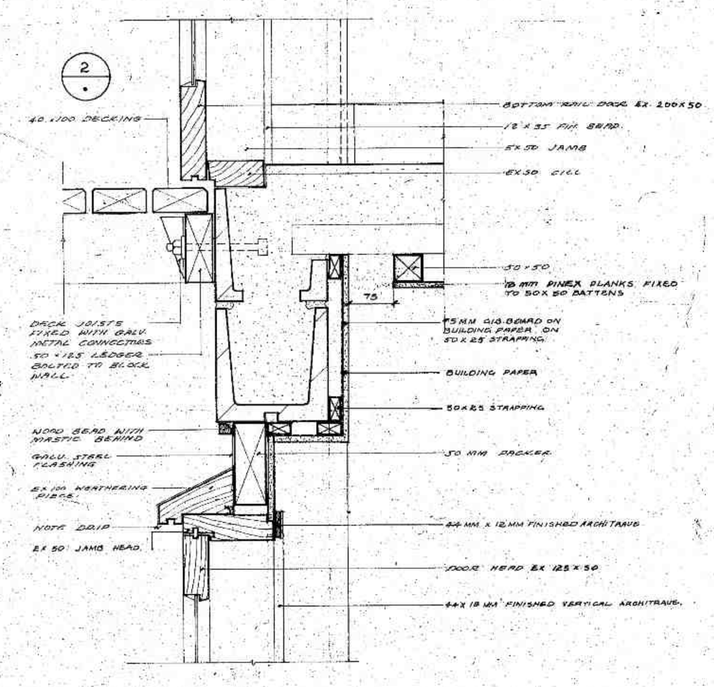


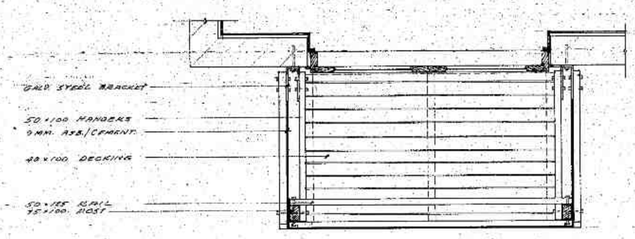
SIDE ELEVATION SCALE 1:20



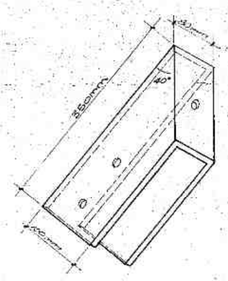
SECTION SCALE 1:20







PLAN



METAL BRACKET

CHRISTCHURCH CITY COUNCIL
Approved subject to the By-Laws
15 MAY 1977
For City Engineer

CITY ARCHITECT'S DIVISION

CONSULTANT

CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING - STAGE 1

SCALES 1:20

DESIGN DSN M.F.A. DRN B.C.M. TCD B.K.M. CKD

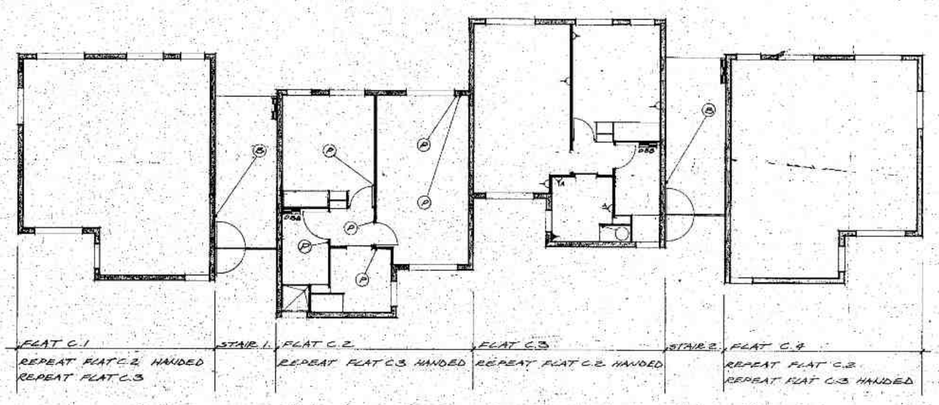
AMENDMENTS

SHEET TITLE: BALCONY DETAILS

REFERENCE: JDR A 239 FILE BU/9/6 CONT. 39-76/77

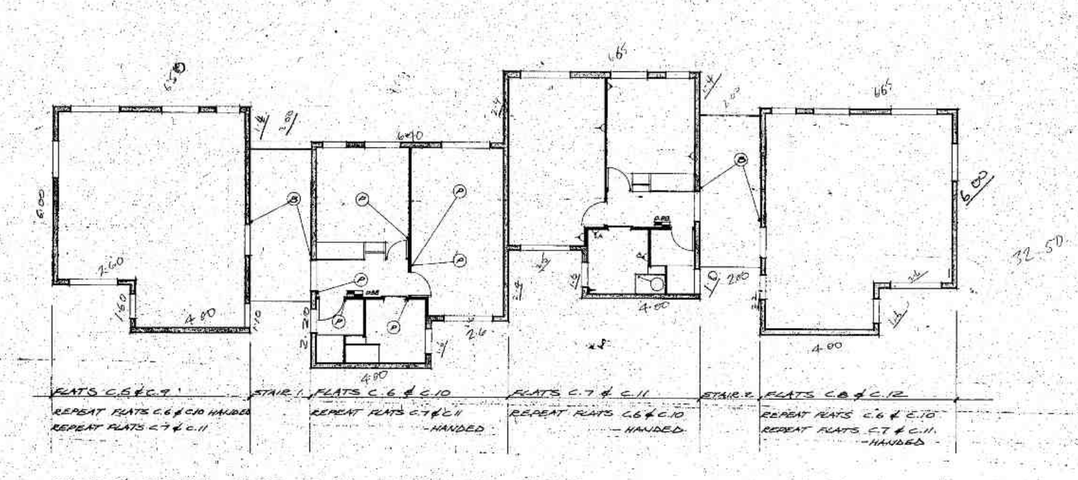
SHEET 10 OF 16

DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

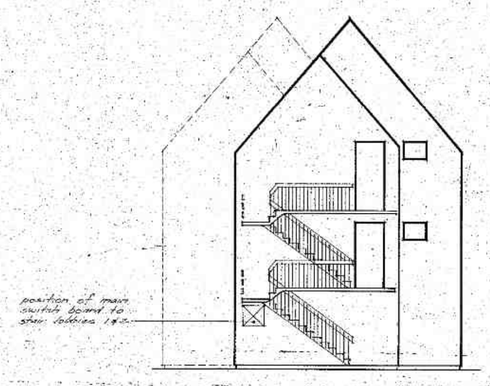


GROUND FLOOR PLAN - ELECTRICAL LAYOUT - SCALE 1:100

- (P) -INCANDESCENT PENDANT FITTING
- (B) -INCANDESCENT BULK HEAD FITTING
- -SWITCHED SOCKET UNIT 300mm above fl.
- -SWITCHED SOCKET UNIT 1100mm above fl.
- -COOKER WITH SWITCHED PERMANENT CONNECTION
- -H.W.C. WITH SWITCHED PERMANENT CONNECTION
- -DISTRIBUTION BOARD
- -MAIN SWITCH BOARD



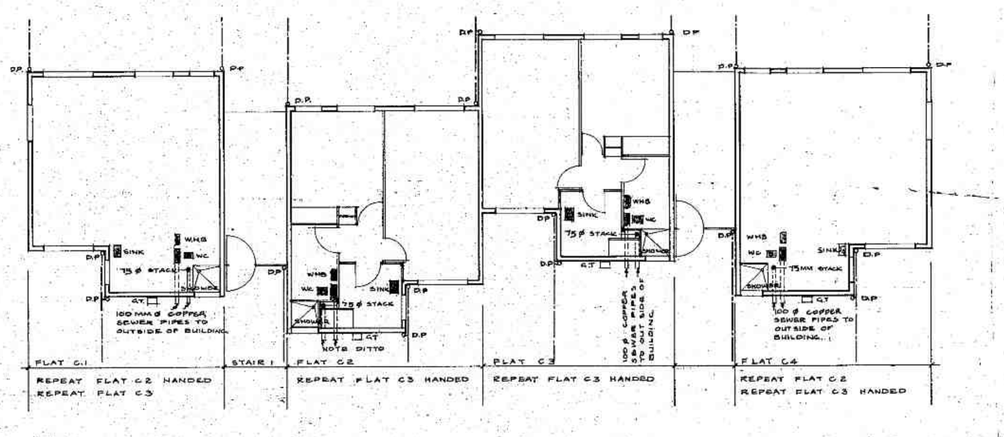
FIRST & SECOND FLOOR PLAN - ELECTRICAL LAYOUT SCALE 1:100



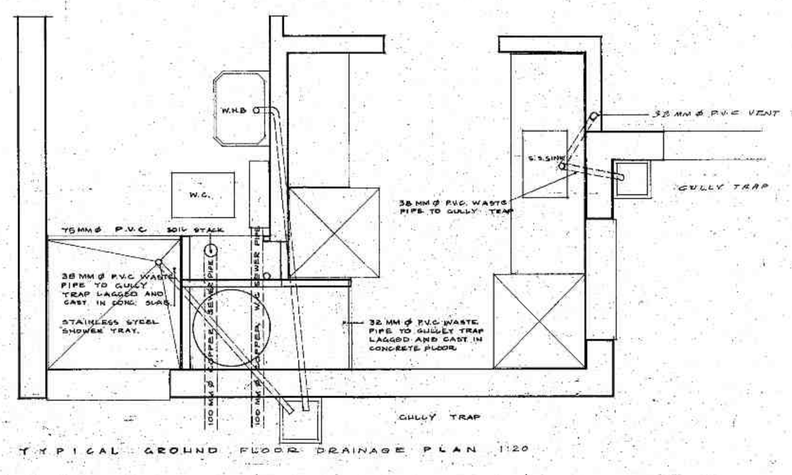
TYPICAL VERTICAL SECTION THROUGH STAIR LOBBY SHOWING POSITION OF MAIN SWITCH BOARD SCALE 1:100

CHRIST. Approved Subject to ... 9 MAY 1977 For City Engineer

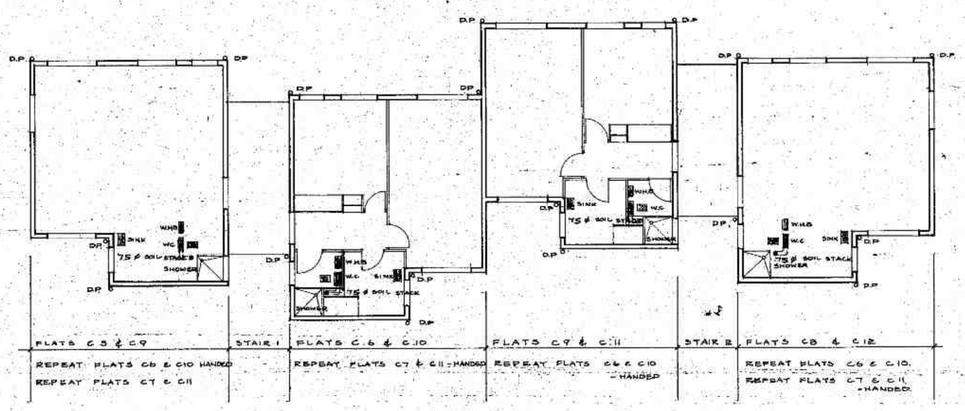
CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET RECLAMATION HOUSING - STAGE 1	1:100	DSN N.F.A DRN T.N.L TCD T.N.L CKD		ELECTRICAL LAYOUT PLANS	JOB A 230 FILE B4/19/6 CONT 39-76/77	1
CITY ENGINEER'S DEPARTMENT			DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK					OF



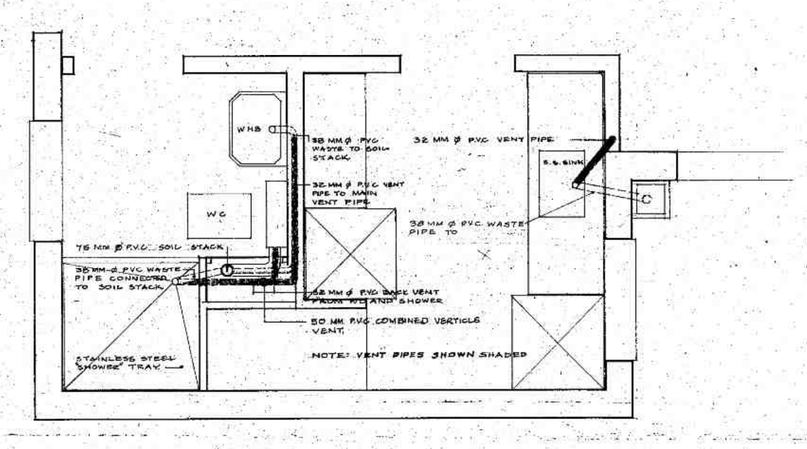
GROUND FLOOR PLAN - DRAINAGE LAYOUT - SCALE 1:100



TYPICAL GROUND FLOOR DRAINAGE PLAN 1:20



FIRST & SECOND FLOOR PLAN - DRAINAGE LAYOUT - SCALE 1:100



TYPICAL FIRST AND SECOND FLOOR DRAINAGE PLAN 1:20

CHRISTCHURCH CITY COUNCIL
Approved Subject to the Conditions
3 MAY 1977
For City Engineer

CITY ARCHITECT'S DIVISION

CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

CONSULTANT

HARMAN STREET RECLAMATION HOUSING - STAGE 1

SCALES: 1:100, 1:20

DESIGN: DSN W.F.A, DRN P.J.B, TCD P.J.B, CKD

AMENDMENTS

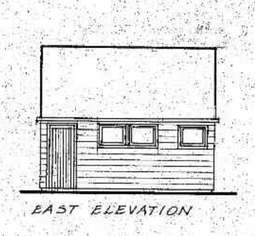
SHEET TITLE: DRAINAGE LAYOUT

REFERENCE: JOB A 239, FILE BU/19/6, CONT 31-76/77

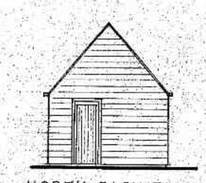
SHEET 12 OF 18

DATE JANUARY 1976

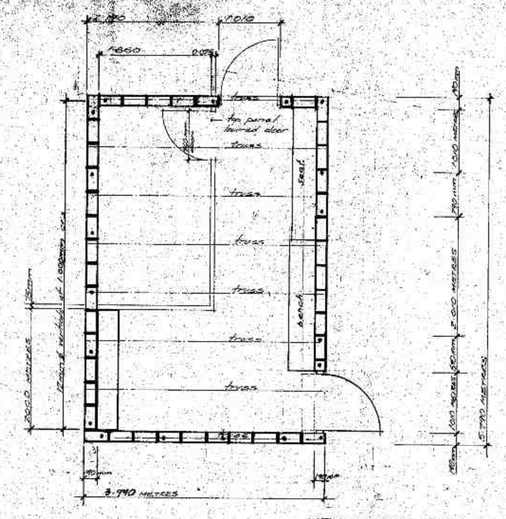
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



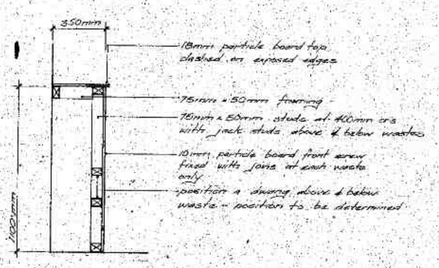
EAST ELEVATION



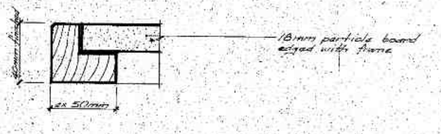
NORTH ELEVATION



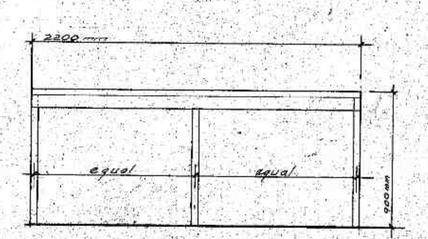
PLAN OF LAUNDRETTE TYPE L1
SCALE 1:50



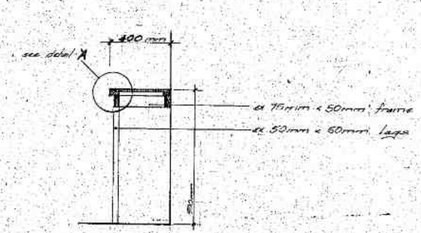
TYPICAL VERTICAL SECTION OF DUCT BEHIND WASHING MACHINES
SCALE 1:20



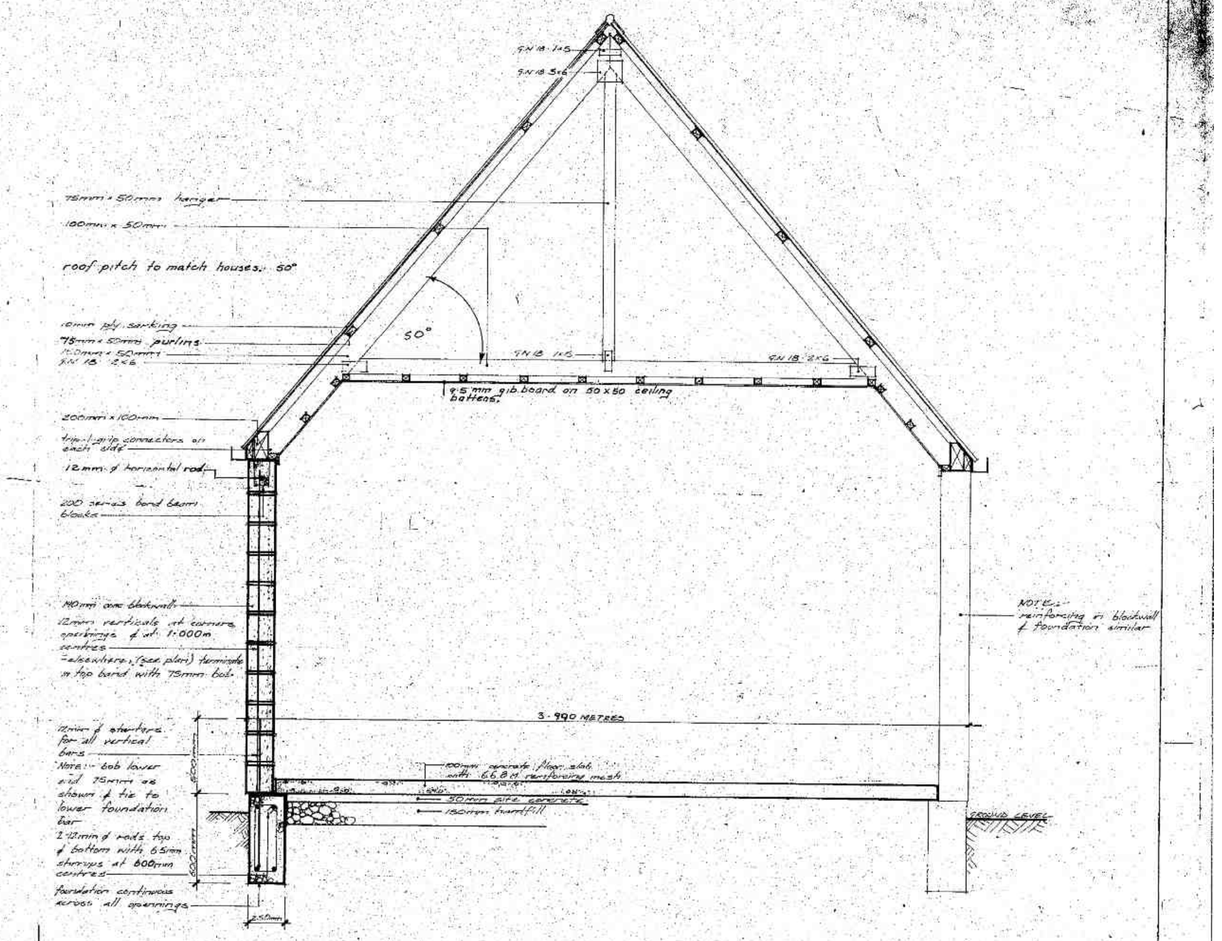
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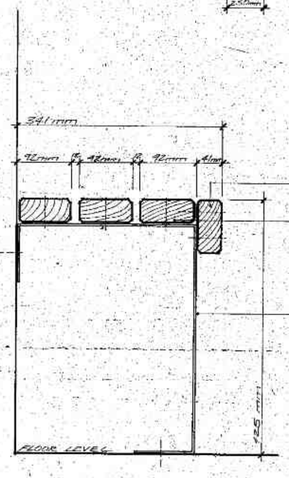


BENCH ELEVATION TO L1 & L2
SCALE 1:20



SECTION THROUGH BENCH TO L1 & L2





TYPICAL VERTICAL SECTION THROUGH SEAT (TO BOTH L1 & L2)
SCALE 1:5

Approved Subject to the Letter
6 MAY 1977
For City Engineer

CITY ARCHITECT'S DIVISION

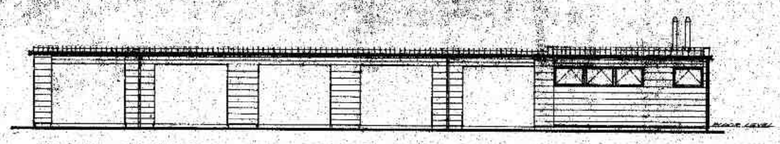
CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING - STAGE I

SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
1:50. 1:20 1:5	DSN W.R.A. DRN T.N.C. TCD T.N.C. CKD		LAUNDRIES L1 & L2. CONSTRUCTION DETAILS	JOB A239 FILE 84/A/6 CONT 39-3-1/17	13

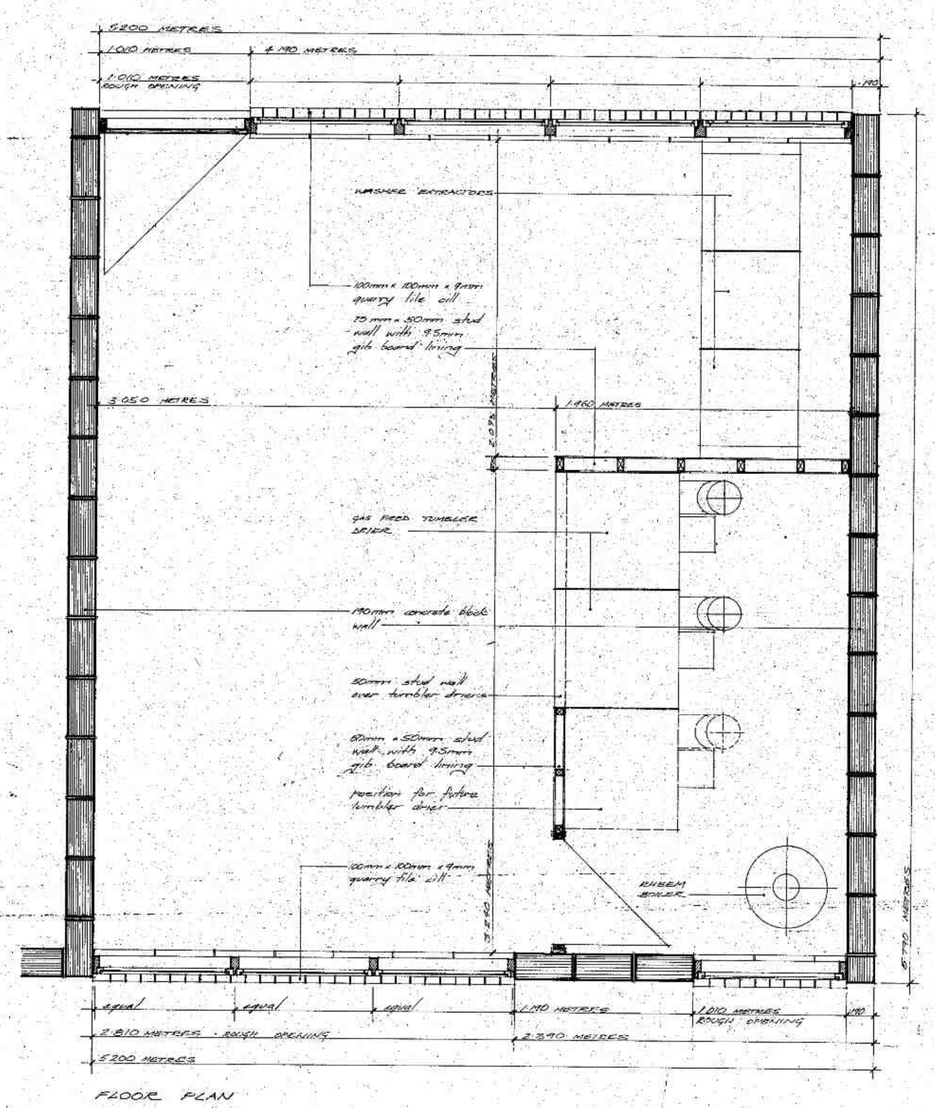
DATE JANUARY 1976 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK OF 18



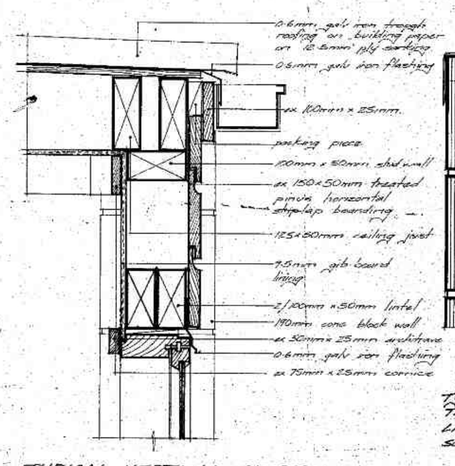
NORTH ELEVATION
SCALE · 1:100



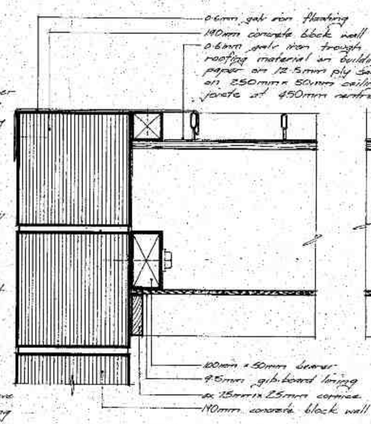
SOUTH ELEVATION
SCALE · 1:100



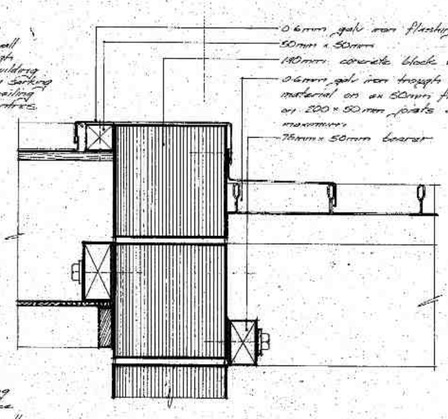
FLOOR PLAN
SCALE - 1:20



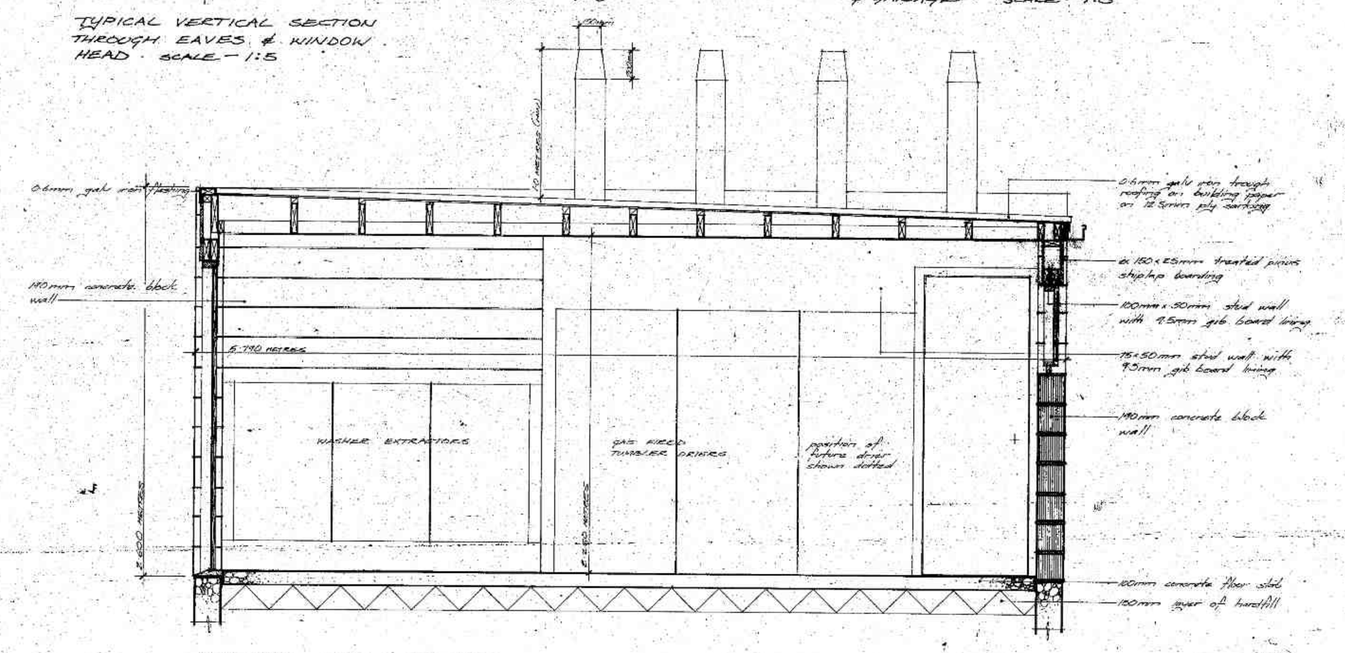
TYPICAL VERTICAL SECTION THROUGH EAVES & WINDOW HEAD · SCALE - 1:5



TYPICAL VERTICAL SECTION THROUGH BLOCK WALL OF LAUNDRETTE ON BOUNDARY
SCALE - 1:5



TYPICAL VERTICAL SECTION THROUGH FIREWALL AT ROOF LEVEL BETWEEN LAUNDRETTE & GARAGE · SCALE - 1:5



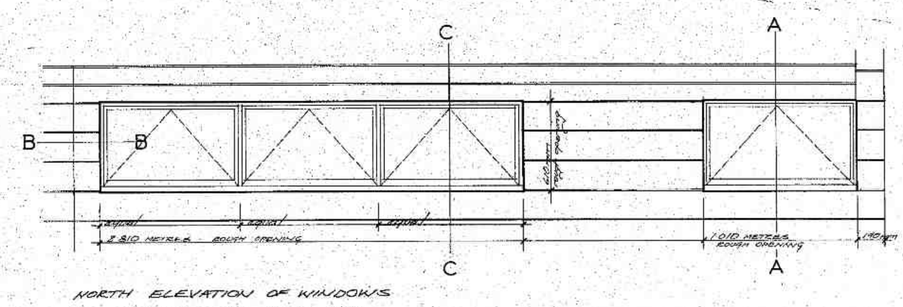
VERTICAL CROSS SECTION THROUGH LAUNDRETTE
SCALE - 1:20

EXPIRY
Approved Subject to the Bylaws
25 MAY 1977
For City Engineer

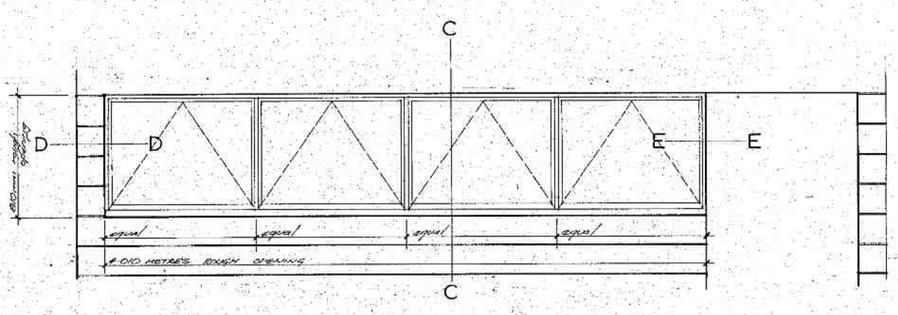
CITY ARCHITECT'S DIVISION
CONSULTANT
CHRISTCHURCH CITY COUNCIL
CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING - STAGE 1.

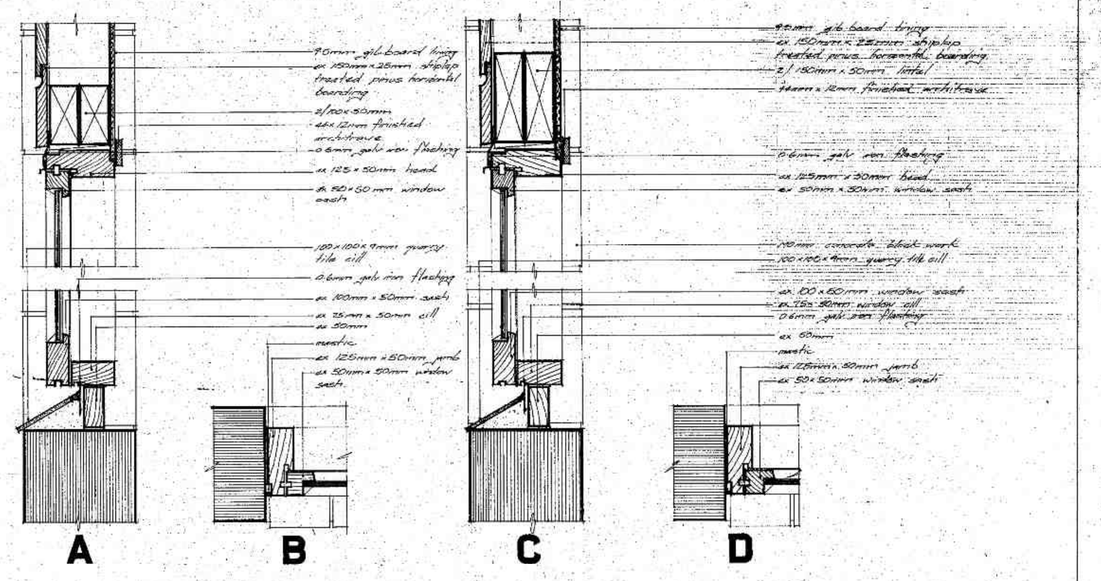
SCALES: 1 : 20 / 1 : 5 / 1 : 100
DESIGN: DSN WRA. DRN TCD CKD
AMENDMENTS
SHEET TITLE: LAUNDRETTE TYPE - L2
REFERENCE: JOB A239 FILE 80/19/6 CONT 39-TC/17
SHEET: 14 OF 15
DATE NOVEMBER 76 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

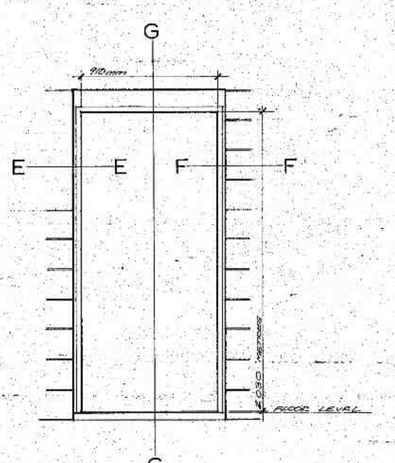


NORTH ELEVATION OF WINDOWS
TO LAUNDRETTE - SCALE - 1:20

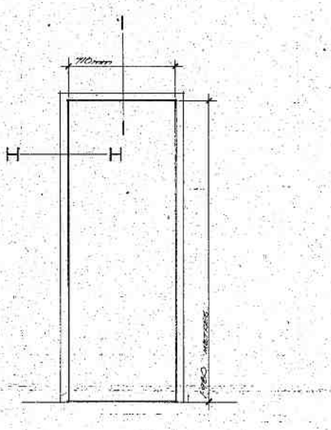


SOUTH ELEVATION OF WINDOWS
TO LAUNDRETTE SCALE 1:20

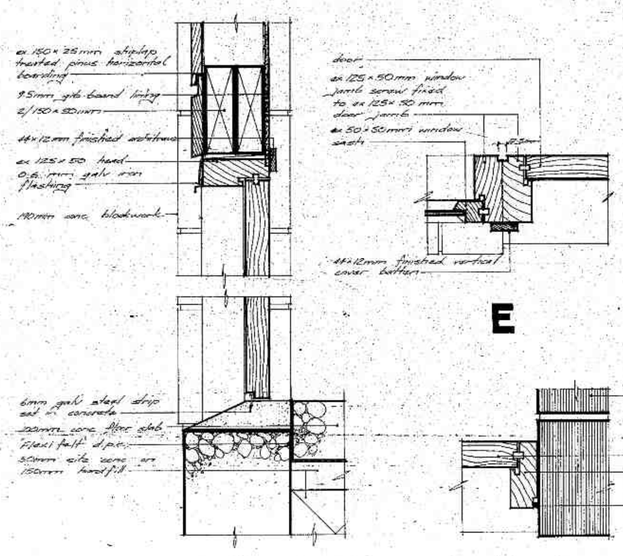




ELEVATION OF DOOR
TO LAUNDRETTE SCALE - 1:20

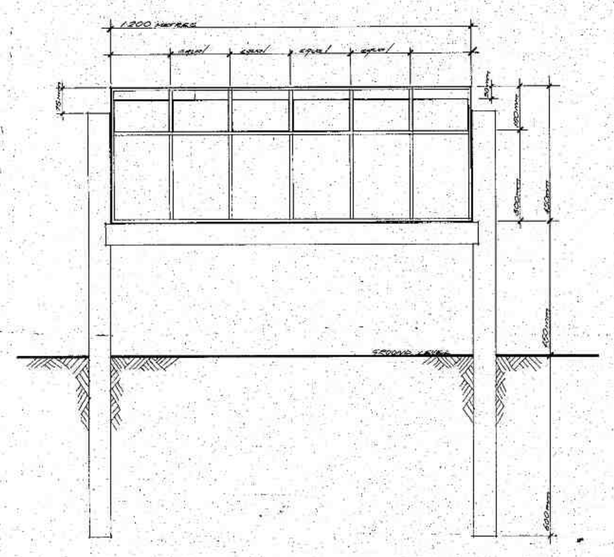


ELEVATION OF DOOR
TO PLANT ROOM SCALE - 1:20

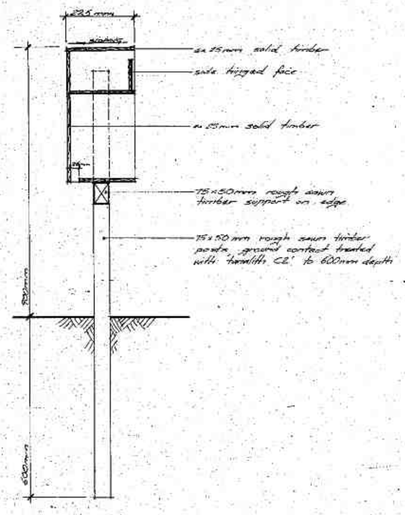


Approved Building Consent Application
- 5 MAY 1977
For City Engineer

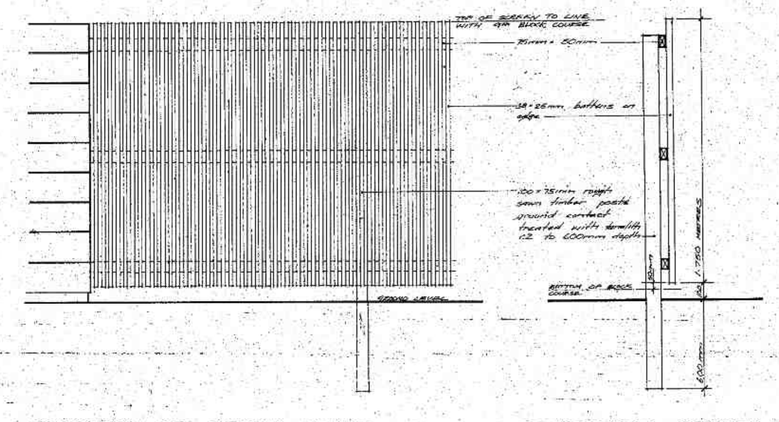
CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET RECLAMATION HOUSING - STAGE 1.	1:20 1:6	DSN W.R.A DRN TCD CKD		LAUNDRETTE TYPE - L2	JOB A239 FILE 80/14/6 CONT 39 76/77	15
CITY ENGINEER'S DEPARTMENT			DATE NOVEMBER 76 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK					OF 18



ELEVATION OF LETTER BOXES
SCALE - 1:10



VERTICAL SECTION
THROUGH LETTER BOXES
SCALE - 1:10

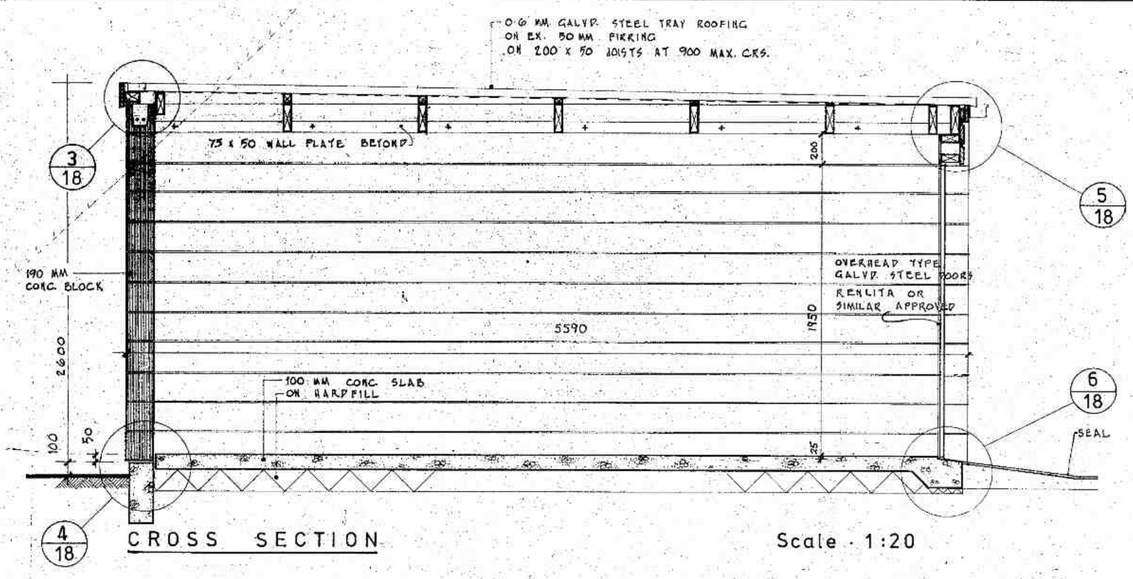


ELEVATION OF SCREEN FENCE
SCALE - 1:20

VERTICAL SECTION THROUGH
SCREEN FENCE
SCALE - 1:20

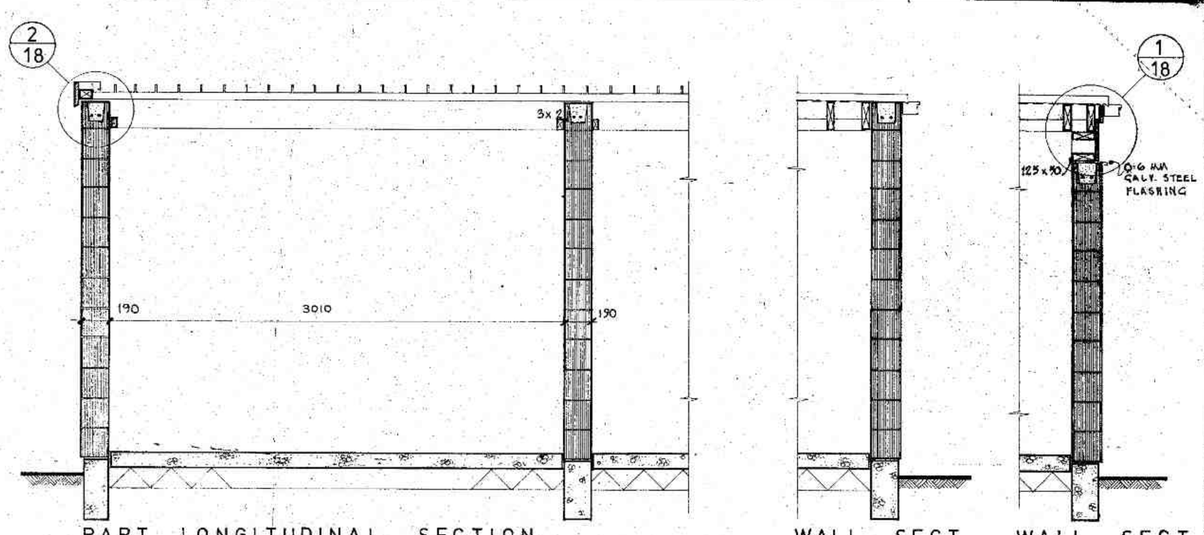
APPROVED UNDER BY-LAW NO. 5
5 MAY 1977
for City Engineer

CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET RECLAMATION HOUSING - STAGE 1.	1:20 1:10	DSN WFA DRN TCD CKD		SCREEN FENCE & LETTER BOX DETAILS	JOB A239 FILE 30/9/6 CONT 31-1/17	16
CITY ENGINEER'S DEPARTMENT			DATE NOVEMBER '6 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK					OF 18



CROSS SECTION

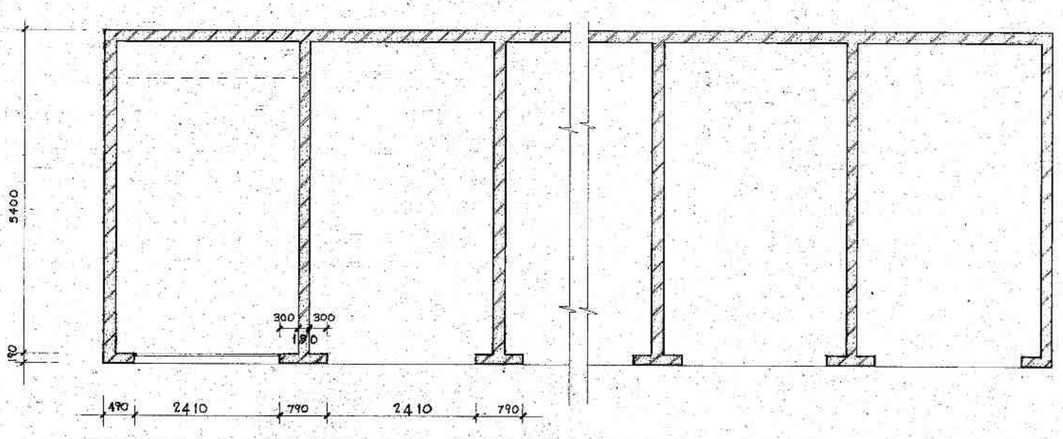
Scale · 1:20



PART LONGITUDINAL SECTION

WALL SECT. A–A

WALL SECT. B–B

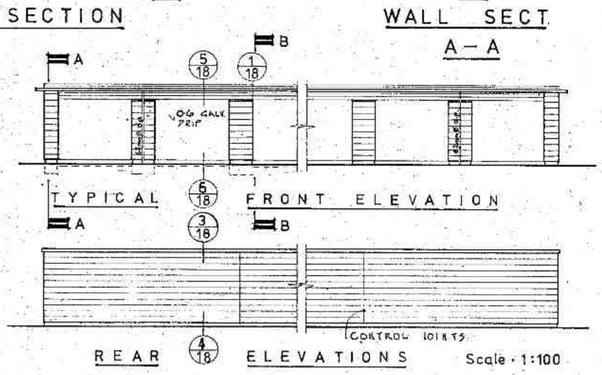


TYPICAL PLAN OF GARAGES

Scale · 1:50

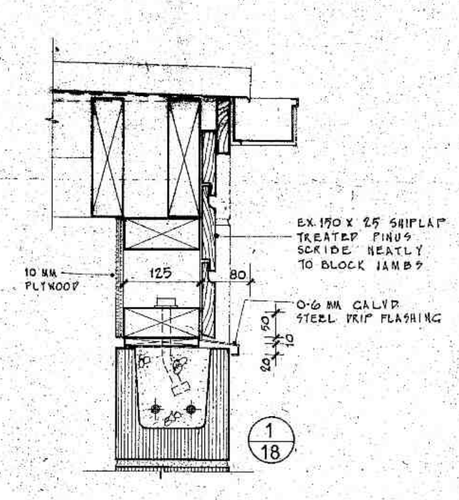


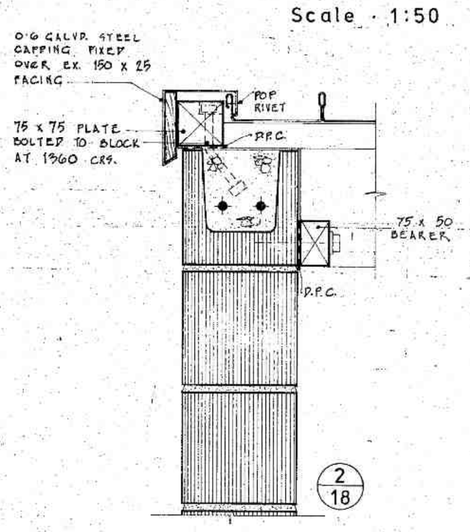
END ELEVATION



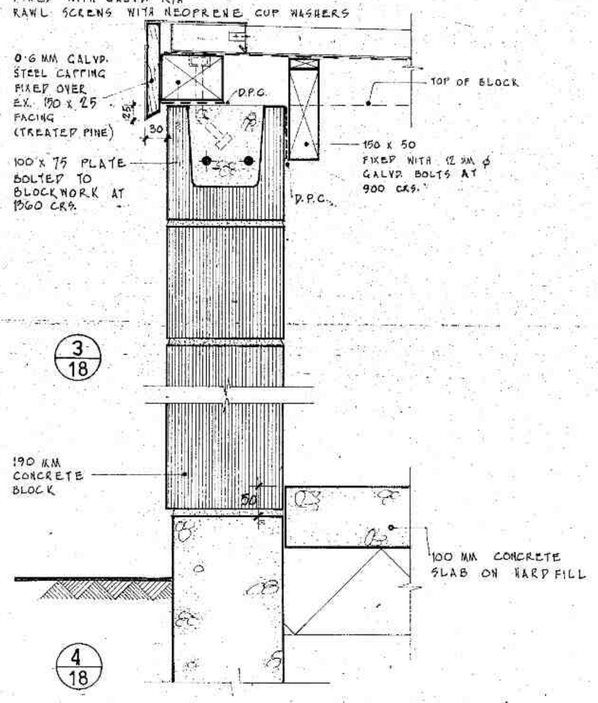
REAR ELEVATIONS

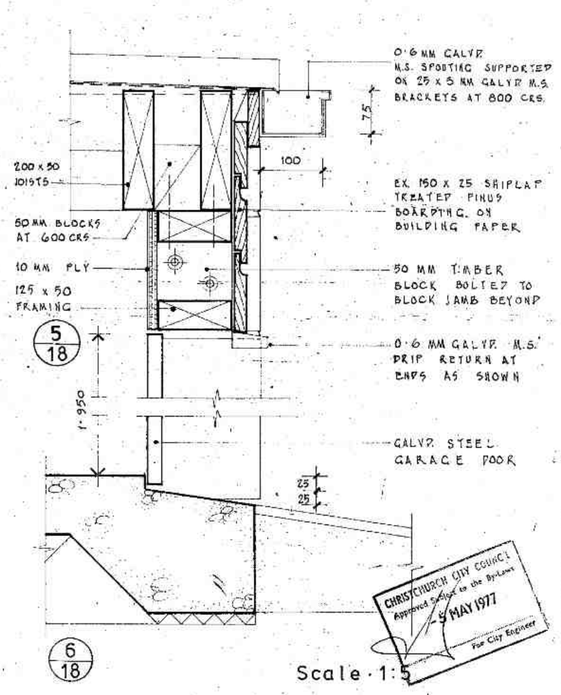
Scale · 1:100





DETAILS Scale · 1:5





Scale · 1:5

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
- 9 MAY 1977
For City Engineer

GARAGES

CITY ARCHITECT'S DIVISION

CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

CONSULTANT

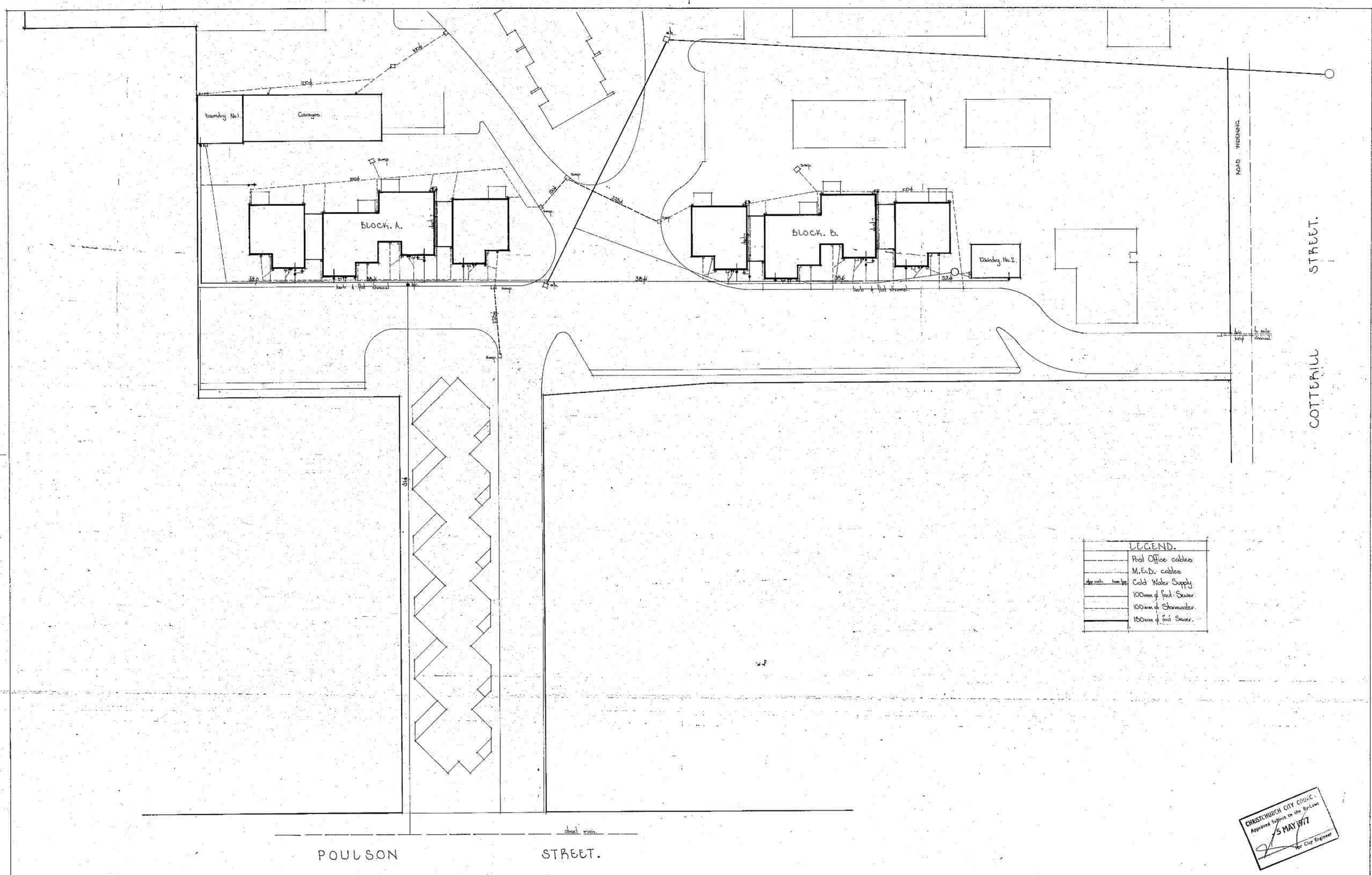
HARMAN STREET RECLAMATION HOUSING - STAGE 1.

SCALES 1:20, 1:50, 1:100, 1:5 | DESIGN DSN DRN TCD CKD | AMENDMENTS

SHEET TITLE: GARAGE DETAILS

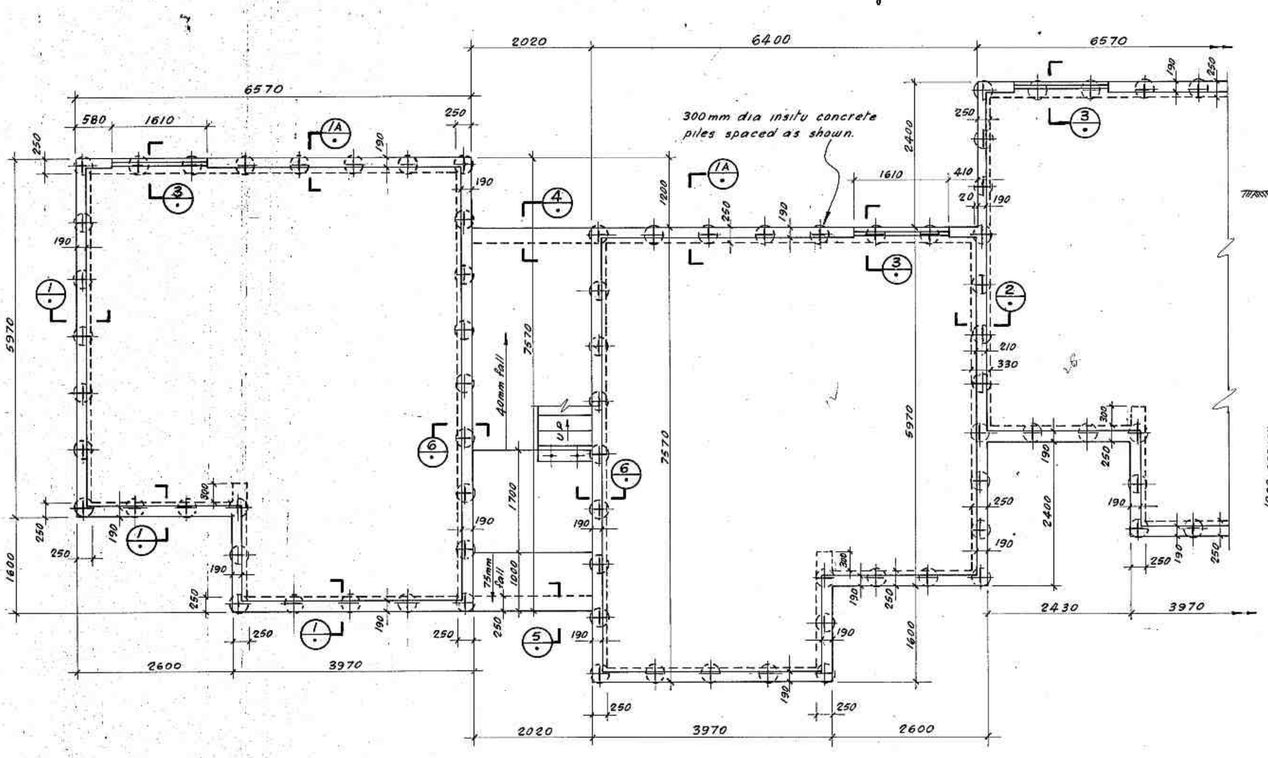
REFERENCE SHEET: JOB A237 FILE 20/9/6 CONT 39-16/77 — 17

DATE APRIL '76 CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK OF 18



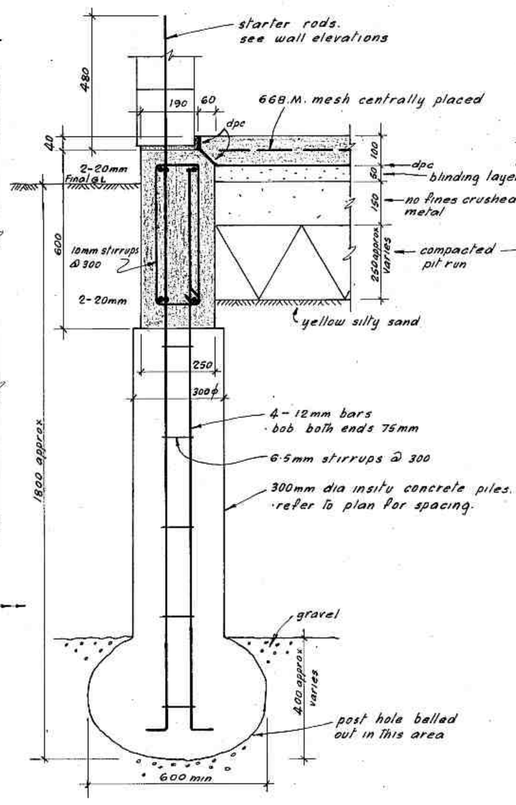
CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
5 MAY 1977
The City Engineer

CITY ARCHITECT'S DIVISION	CONSULTANT		SCALES	DESIGN	AMENDMENTS	SHEET TITLE	REFERENCE	SHEET
CHRISTCHURCH CITY COUNCIL		HARMAN STREET HOUSING	1:200	DSN W.F.A. DRN P.W.A. TCD P.W.A CKD		SERVICES PLAN. STAGE. 1.	JOB A289 FILE 20/19/6 CONT	18.
CITY ENGINEER'S DEPARTMENT			DATE OCT '76	CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK				OF 15



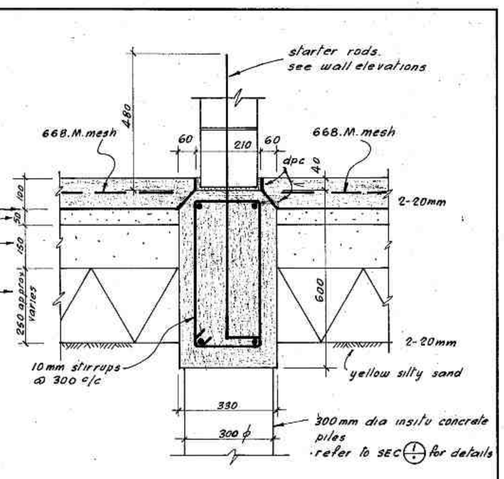
TYPICAL FOUNDATION PLAN (see Architects drawings for full layout)

scale 1:60



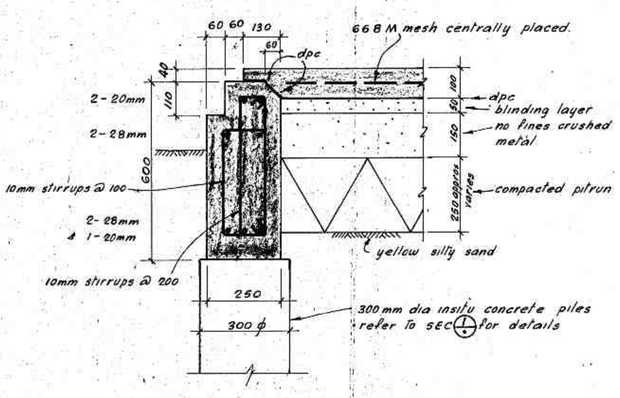
SECTION 1
SECTION 1A similar but main foundation bars 2-28mm top & btm.

scale 1:10



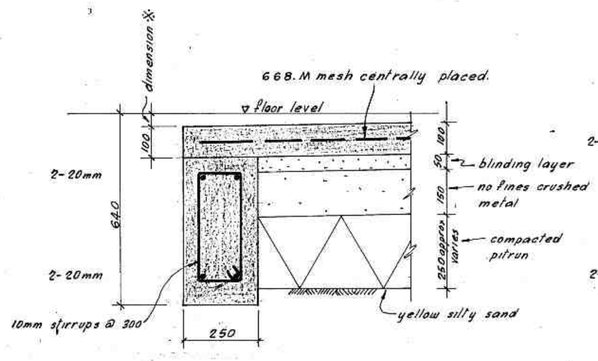
SECTION 2

scale 1:10



SECTION 3

scale 1:10



SECTION 4

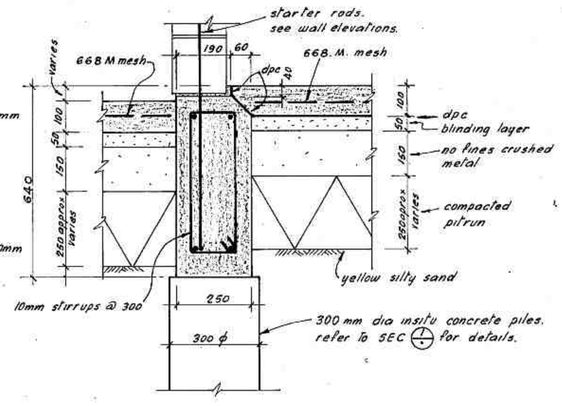
Dimension ※ 40mm fall from foot of staircase

SECTION 5

Dimension ※ 75mm fall from wall of stairwell

} see plan above

scale 1:10



SECTION 6

scale 1:10

Notes:

1. Concrete
   (a) Strength f'c = 20MPa @ 28 days
   (b) Cover to foundation beam stirrups
   Bottom 75mm Top 50mm
   Sides against formwork 50mm
2. Reinforcing
   (a) All bars except stirrups & links to be deformed Grade 275 unless shown otherwise.
   (b) Stirrups & links to be plain round Grade 275
   (c) Reinforcing to be continuous throughout.
   Unless shown otherwise laps shall be :-

10 mm	=	350 mm
12 mm	=	400 mm
16 mm	=	550 mm
20 mm	=	650 mm
24 mm	=	800 mm
28 mm	=	1000 mm

   Note that these laps do not apply to blockwork, see notes on sheet 4.
3. Refer to Architects drawings for details of bolts, inserts, chaises etc to be cast into or formed into concrete or masonry.
4. All dimensions are in mm unless specifically shown otherwise.

CHRISTCHURCH CITY COUNCIL Approved Subject to the By-Laws 25 MAY 1977 For City Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments | Initials | Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed	S.D. Smith	10/76
Drawn	A.E. Bainbridge	10/76
Traced		
Dwg. Chk.		
Des. Chk.		
Indexed		

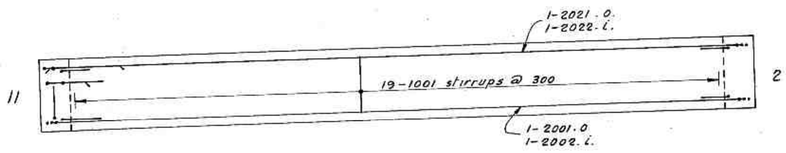
Approved: Design Engineer Date; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

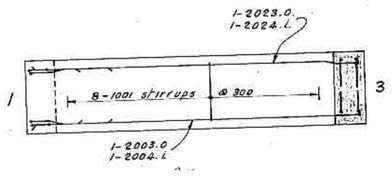
HARMAN STREET - BLOCK A THREE STOREY FLATS - FOUNDATION PLAN & DETAILS

Scales: 1:10, 1:50

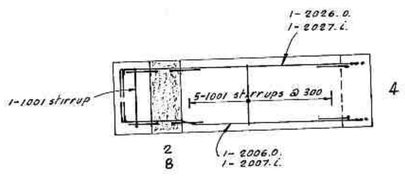
File No. 80/19/3
Issue
D.1962
Sheet 1 of 6



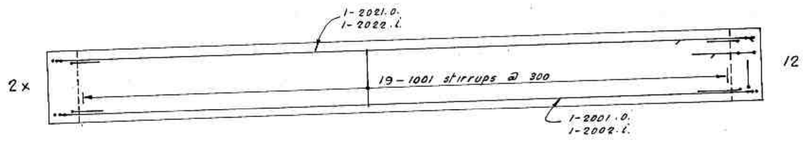
ELEVATION .1.



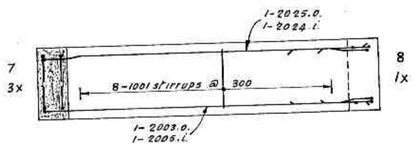
ELEVATION 2



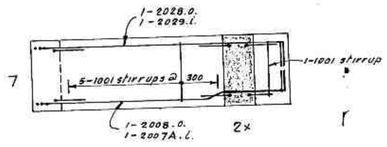
ELEVATION 3



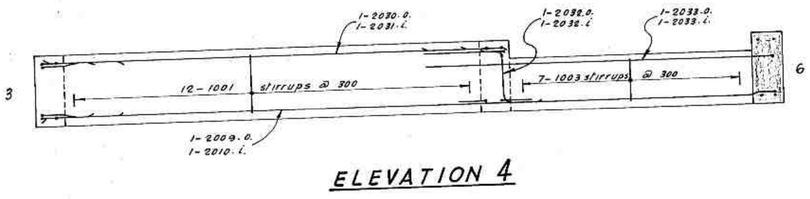
ELEVATION 1x



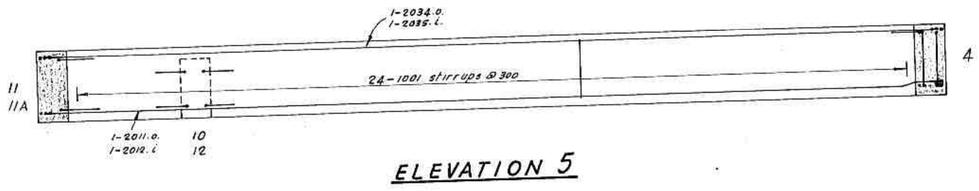
ELEVATION 2x



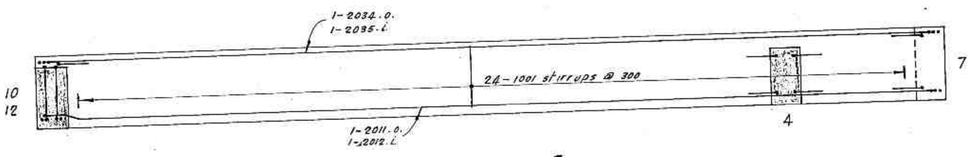
ELEVATION 3x



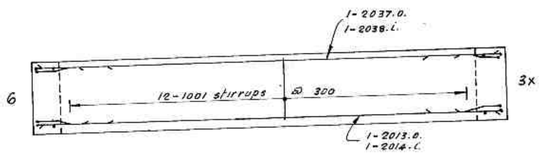
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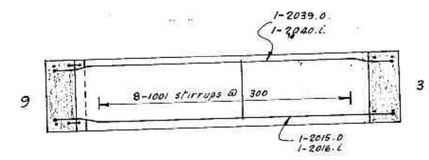
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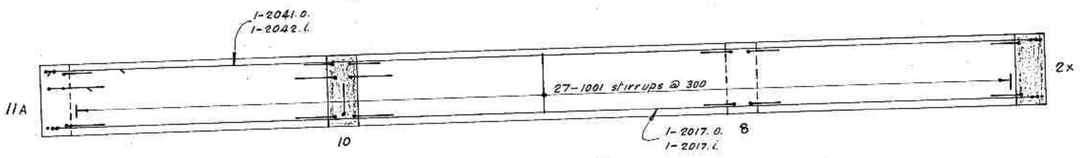
ELEVATION 6



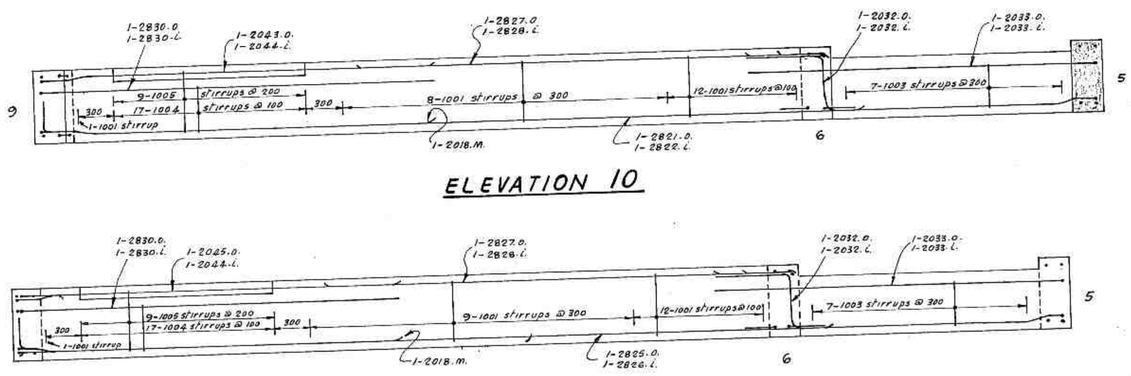
ELEVATION 7



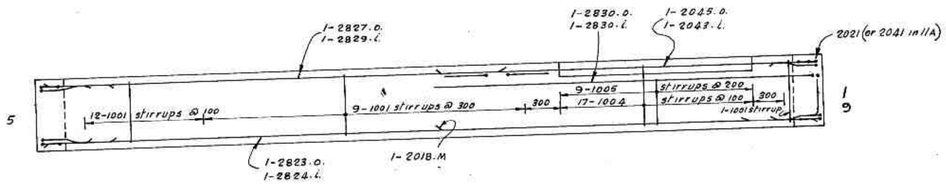
ELEVATION 8



ELEVATION 9



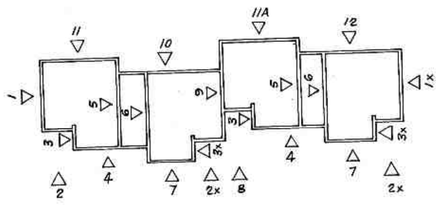
ELEVATION 10



ELEVATION 11

ELEVATION 11A similar but differences as detailed.

ELEVATION 12



KEY PLAN

scale 1:250

Notes.

1. Refer to general notes on sheet 1.
2. Blockwork starter rods omitted for clarity
3. ——— denotes termination of an obscure bar.
4. .O. means bar on outer face of beam.
   .I. means bar on internal face of beam
   .M. means bar in middle of beam.

Approved subject to City Ordinance
5 MAY 1977
For City Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
S.M.				
Compiled from				

		Date
Designed	S.D. Smith	10/76
Drawn	A.E. Bambridge	10/76
Traced		
Dwg. Chk.		
Des. Chk.		
Indexed		

Approved

Design Engineer Date

City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

HARMAN STREET - BLOCK A THREE STOREY FLATS - FOUNDATION BEAM ELEVATIONS

Scales 1:25 · 1:250

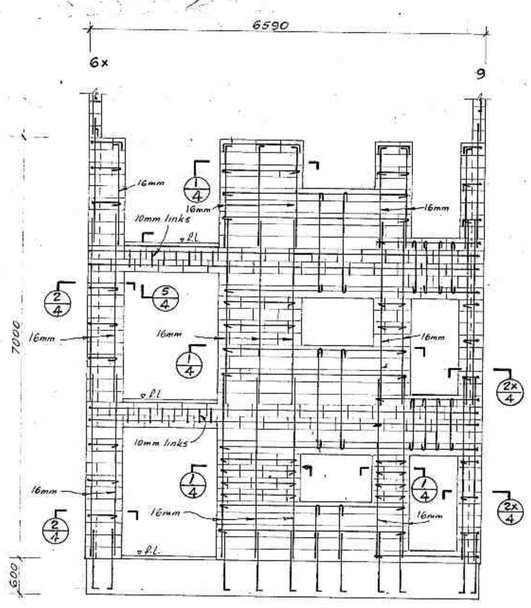
File No. BU/19/6

Issue

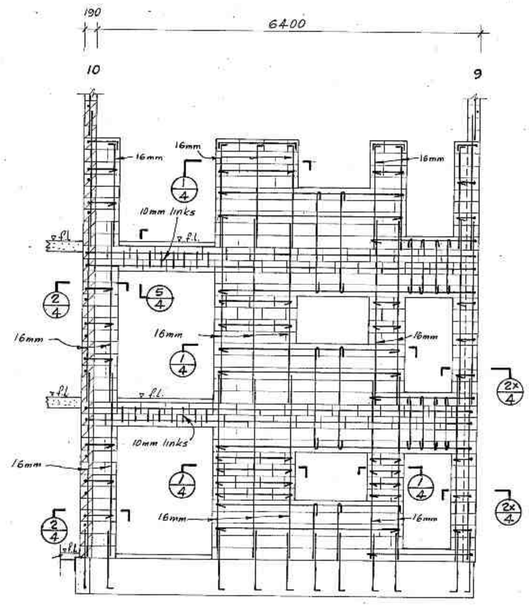
D.1962

Sheet 2 of 6

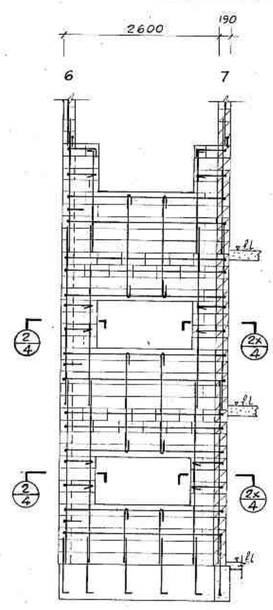
Original scale of millimetres



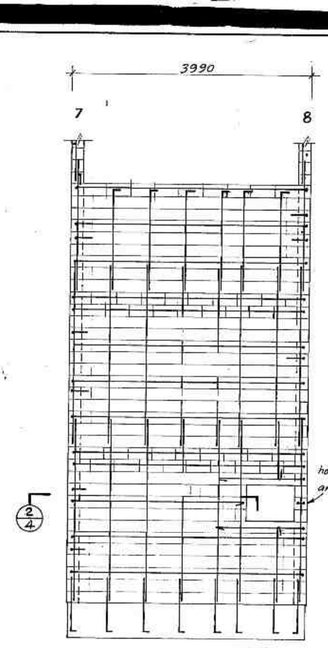
ELEVATION (1)
ELEVATION (1×) opposite hand



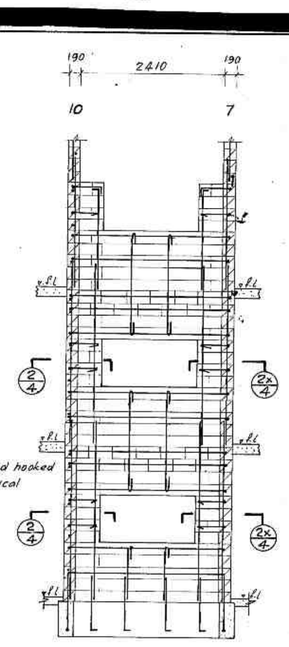
ELEVATION (2)



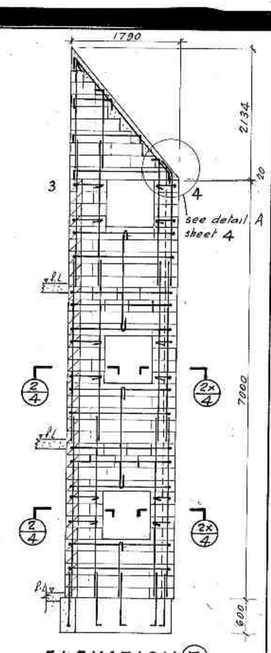
ELEVATION (3)
ELEVATION (3×) opposite hand



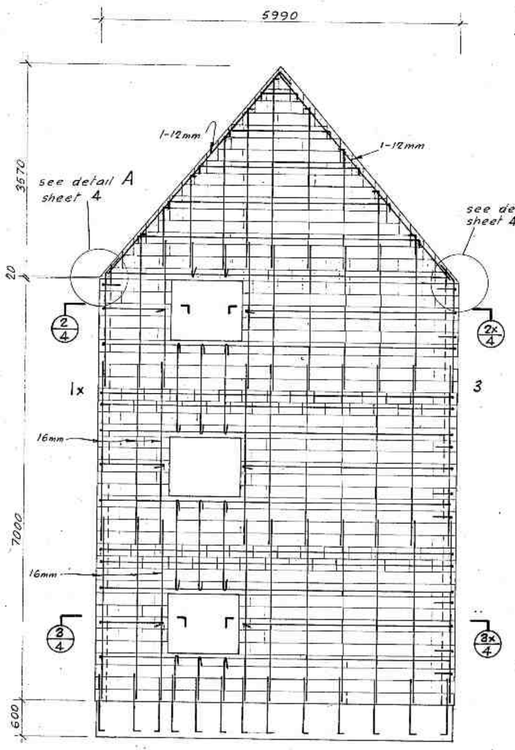
ELEVATION (4)
ELEVATION (4×) opposite hand



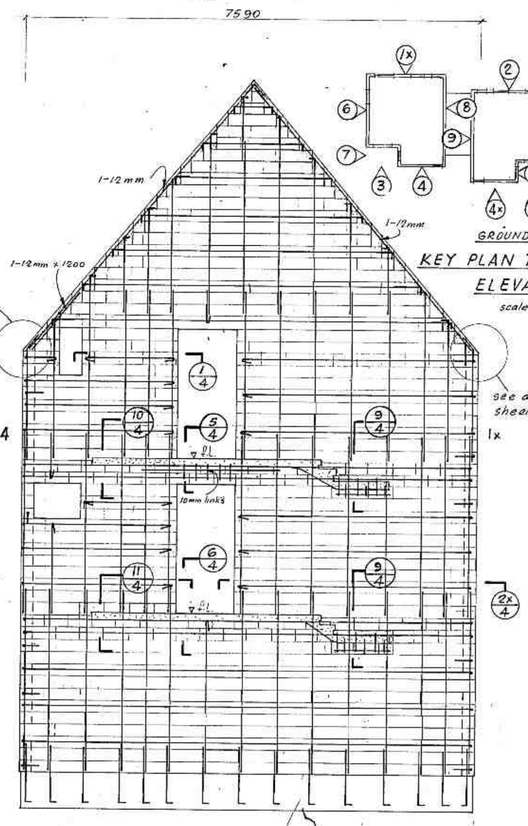
ELEVATION (5)



ELEVATION (7)
ELEVATION (7×) opposite hand

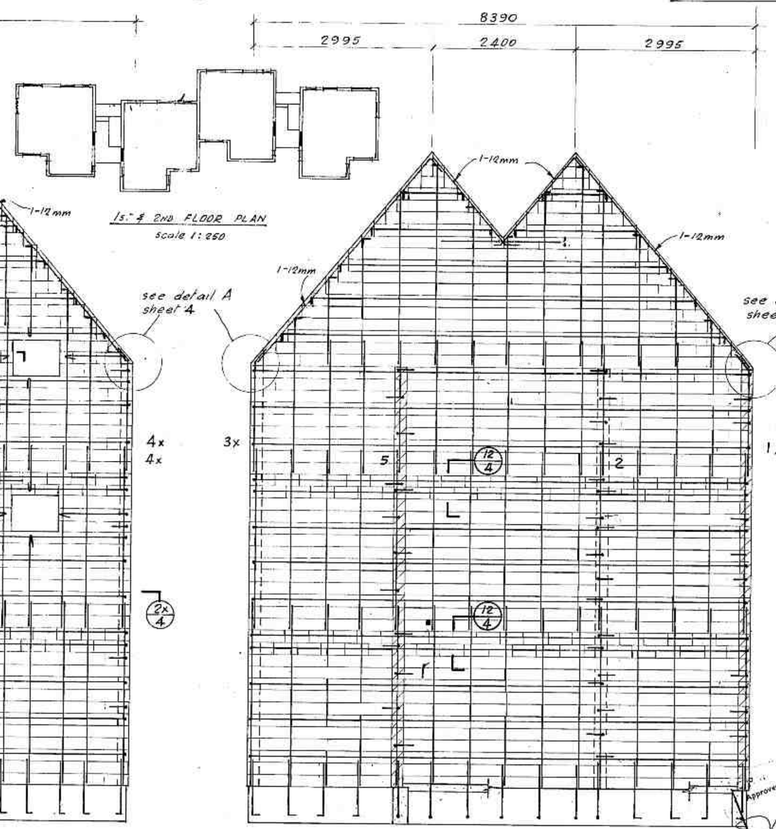


ELEVATION (6)
ELEVATION (6×) opposite hand



ELEVATION (8)

ELEVATION (9)

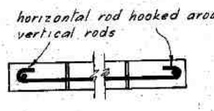


ELEVATION (10)

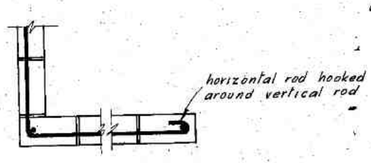
Notes:
Refer to sheet 4.

COUNCIL
Approved Subject to the By-Laws
5 MAY 1977
For City Engineer

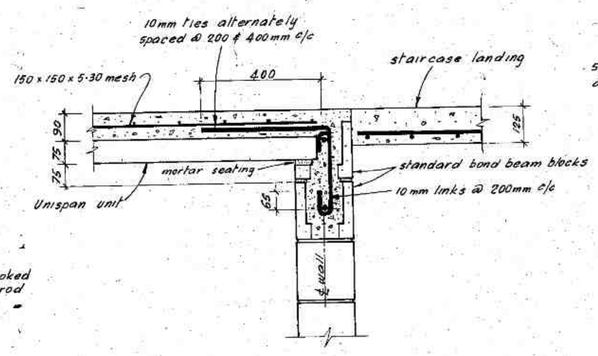
Init.	Date	Initials	Amendments	Init.	Date		Rec'd	Page	Init.	Init.	Date			Date	Approved	CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT	Scales	Dwg. No. BU/19/6
Des. Engr.	Land & Survey					Reviewed						Designed	S.D. Smith	10/75				
Asst.	Planning					Checked						Drawn	A.E. Bambridge	11/75	1:4.76	HARMAN STREET — BLOCK A THREE STOREY FLATS —	1:50	Series D.1962
City Engr.						1976						Traced			Design Engineer	ELEVATIONS OF BLOCKWALLS	1:250	
Asst.						Computer Input						Dep. Civ.						Sheet 3 of 6
Asst. (C.E.D.)												Des. Chf.						
Insp.												Indexed	J.M.W.	3/76				



SECTION (1/3) Typical
scale 1:20

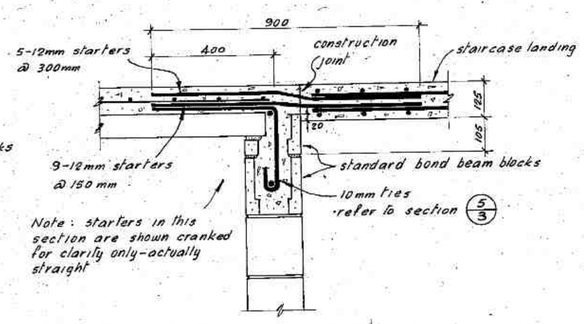


SECTION (2/3) Typical
SECTION (2x/3) opposite hand
scale 1:20

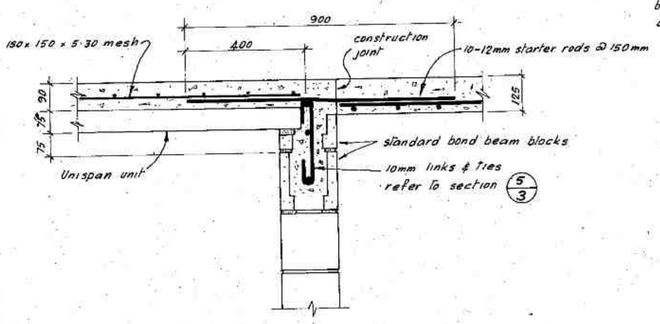


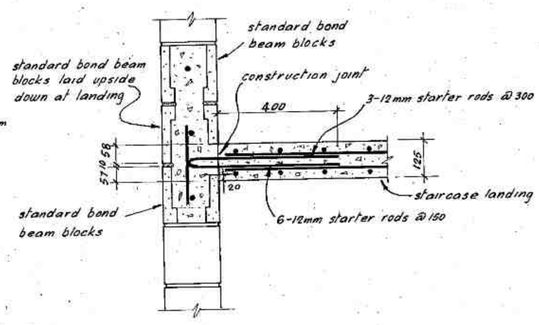
SECTION (6/3)
scale 1:10

SECTION (6/3) similar except no 10mm links

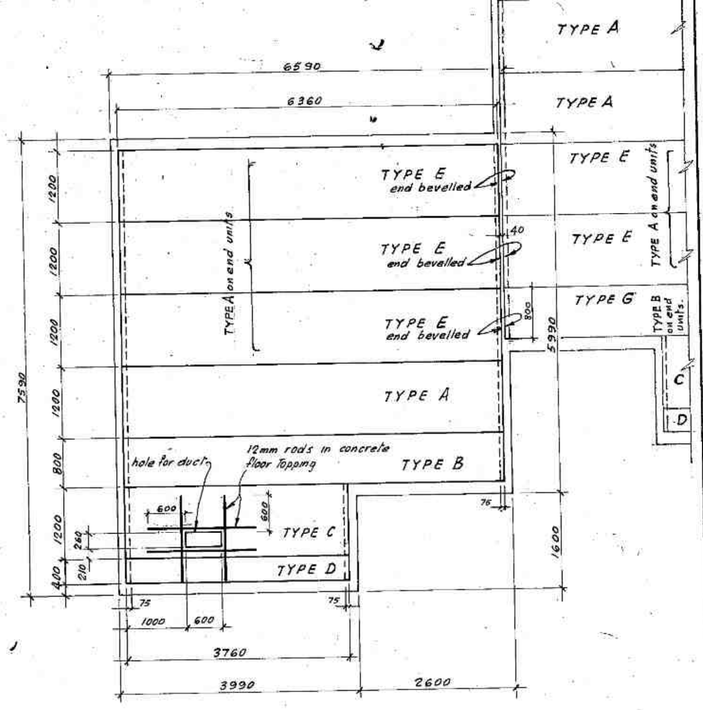


SECTION (8/3)
scale 1:10



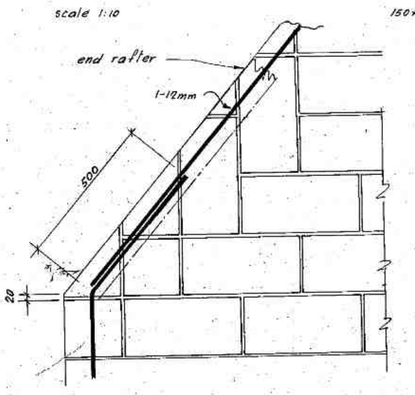


SECTION (9/3)
scale 1:10

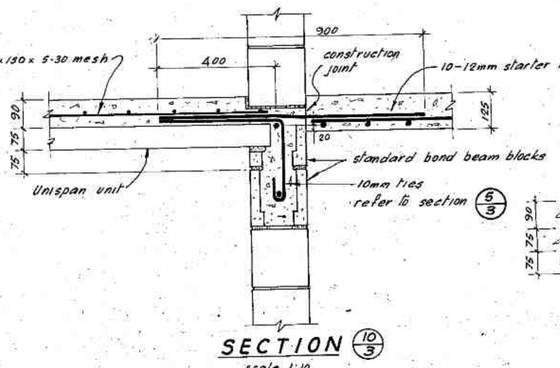


PLAN OF UNISPAN UNITS 1ST & 2ND FLOORS
scale 1:50

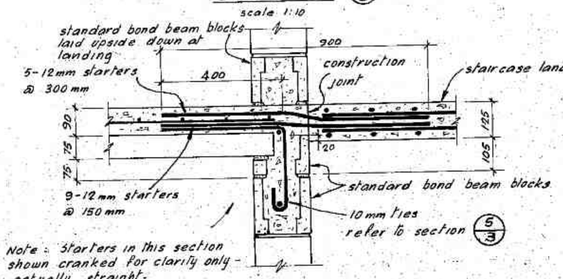
SECTION (7/3)
scale 1:10



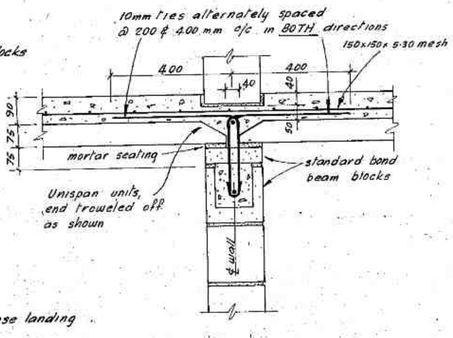
DETAIL "A" Typical
scale 1:10



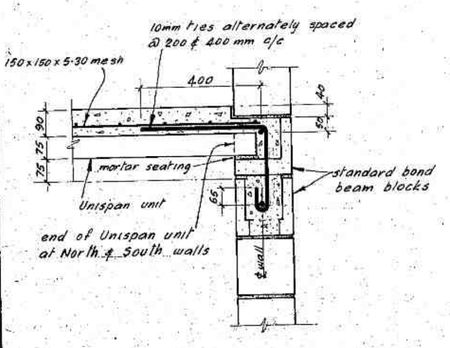
SECTION (10/3)
scale 1:10



SECTION (11/3)
scale 1:10



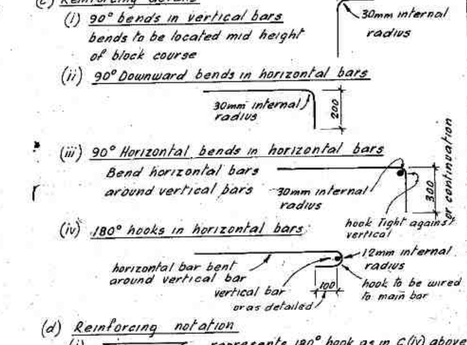
SECTION (12/3)



TYPICAL WALL/FLOOR CONNECTION DETAIL
scale 1:10

Notes

1. Blockwork (a) All blocks to be 200mm wide insulated series unless shown otherwise on the sections.
   (b) All blocks forming the bottom course of a grout lift to be provided with clean out openings in each flue.
   (c) All block cores to be filled with grout.
   (d) Refer to Architects dwgs for opening dimensions not shown.
2. Reinforcing (a) All lapped splices in blockwork including bond beams shall be 40 bar diameters minimum.
   (b) All bars to be 12mm dia unless stated otherwise.
   (c) Reinforcing details
   (i) 90° bends in vertical bars bends to be located mid height of block course
   (ii) 90° Downward bends in horizontal bars
   (iii) 90° Horizontal bends in horizontal bars Bend horizontal bars around vertical bars
   (iv) 180° hooks in horizontal bars
   (d) Reinforcing notation
   (i) ⟵ represents 180° hook as in C(iv) above
   (ii) ⟵ represents 90° bend in reinforcing
   (e) Wall vertical reinforcing is omitted from sections for clarity.
3. Construction Joints
   Construction joints shown to be roughened to 5mm amplitude and be treated in accordance with Ch 9·3A of NZS 1900
4. Refer to notes on sheet 1.



CHRISTCHURR CITY COUNCIL Approved Subject to the By-laws 15 MAY 1977 for City Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed	S.D. Smith	10/75
Drawn	A.E. Bainbridge	11/75
Traced		
Dwg. Chk	S.D. Smith	11/76
Des. Chk		
Indexed	L.M.M.	3/76

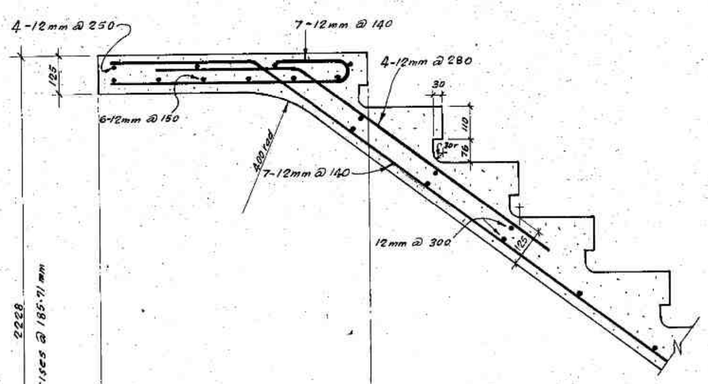
Approved
Design Engineer 1:4:76 Date
for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

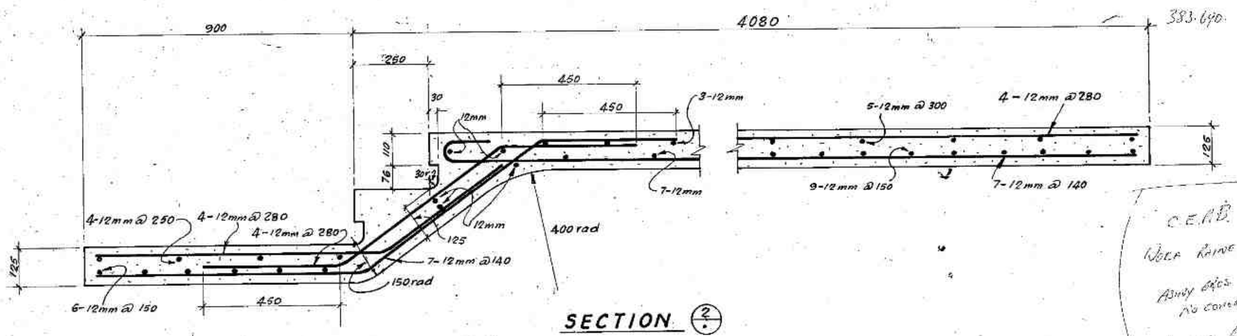
HARMAN STREET - BLOCK A THREE STOREY FLATS - BLOCKWALL DETAILS - 1ST & 2ND FLOOR PLAN -

Scales 1:10, 1:20, 1:50

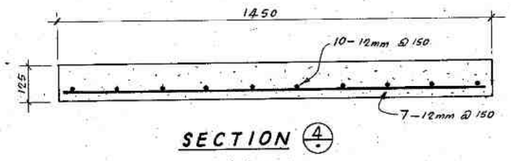
File No. BU/1916
Issue
D.1962
Sheet 4 of 6.



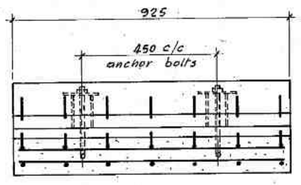
SECTION (1)
scale 1:10



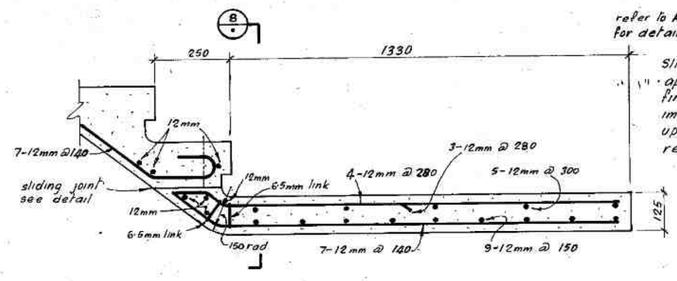
SECTION (2)
scale 1:10



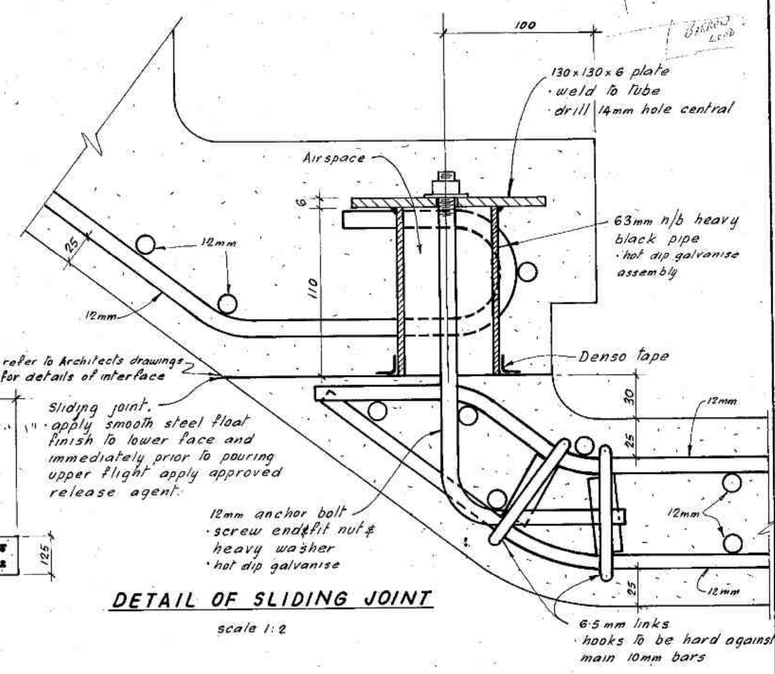
SECTION (4)
scale 1:10



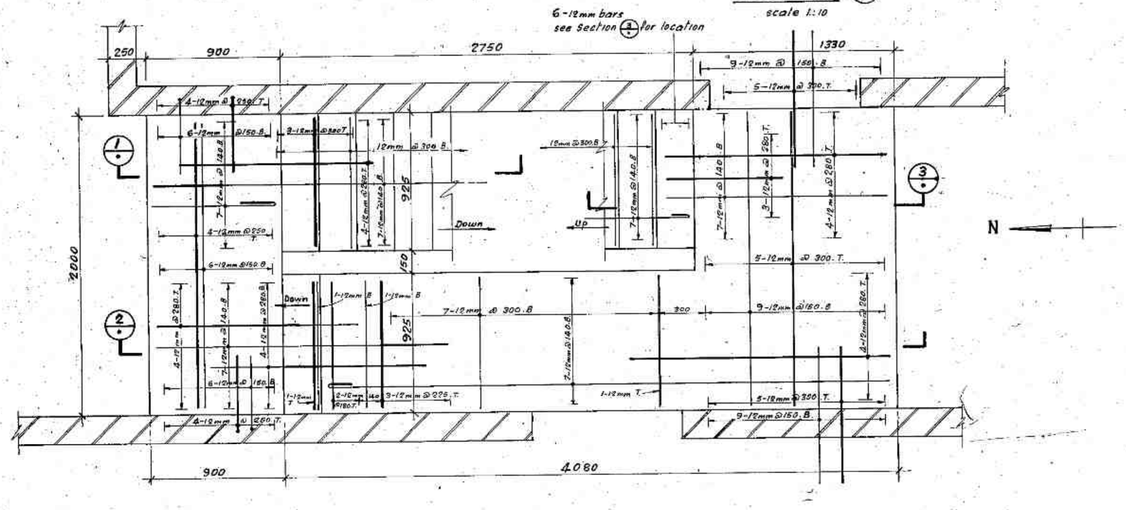
SECTION (8)
scale 1:10



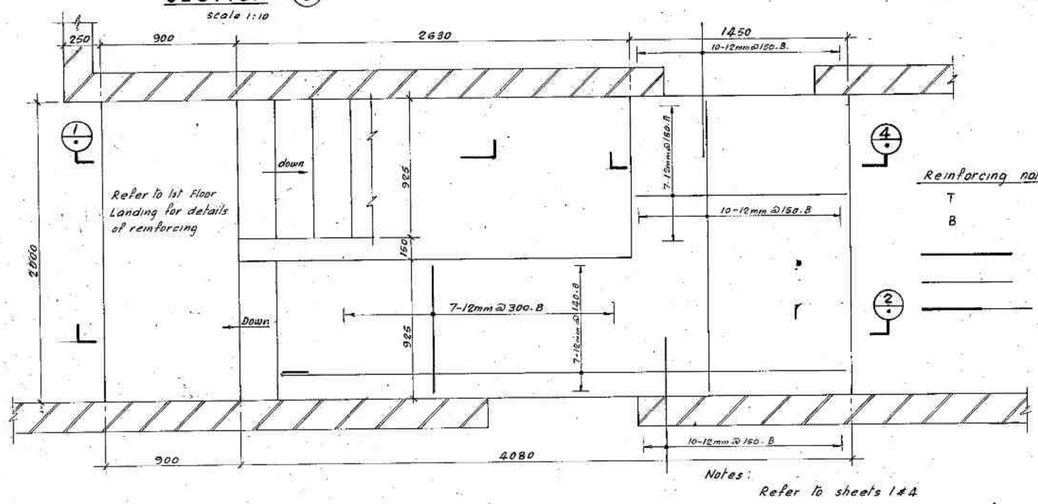
SECTION (3)
scale 1:10



DETAIL OF SLIDING JOINT
scale 1:2



PLAN OF 1ST FLOOR LANDING
scale 1:20



PLAN OF 2ND FLOOR LANDING
scale 1:20

Reinforcing notation

T	Denotes top bar
B	Denotes bottom bar
———	Denotes top bar
———	Denotes bottom bar
———	Denotes bar changing from top to bottom

Notes:
Refer to sheets 1 & 4
Refer to Architects drawings for details of handrail etc.

CHRISTCHURCH CITY COUNCIL
Approved subject to ... Survey
5 MAY 1977
For City Engineer

Service	Initials	Service	Initials
H.P. Water		Leads & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.T.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
R.M.				
Compiled from				

		Date
Designed	S.D. Smith	10/75
Drawn	A.E. Bainbridge	11/75
Traced		
Dwg. Chk.		
Des. Chk.		
Indexed	L.M.W	3/76

Approved
Design Engineer — Date 1.4.76
City Engineer

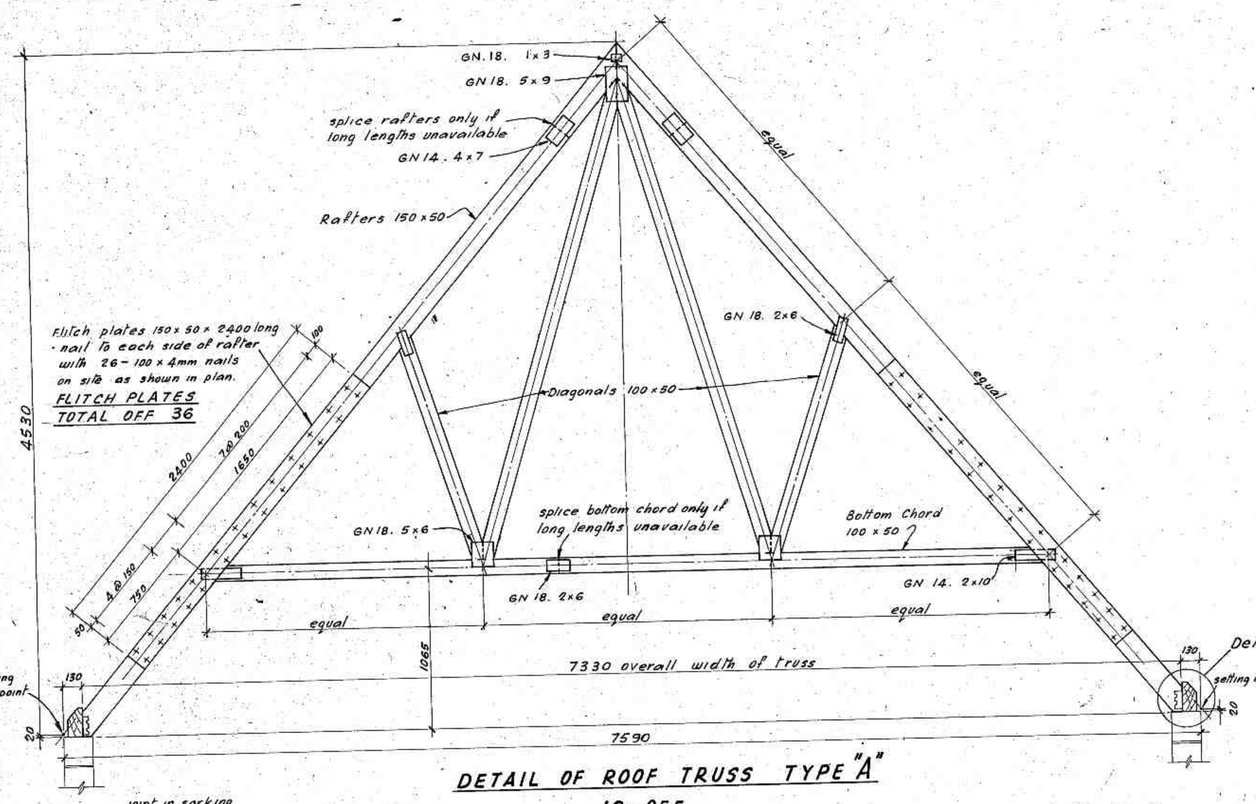
CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

HARMAN STREET - BLOCK A THREE STOREY FLATS -
DETAILS OF CONCRETE STAIRCASE

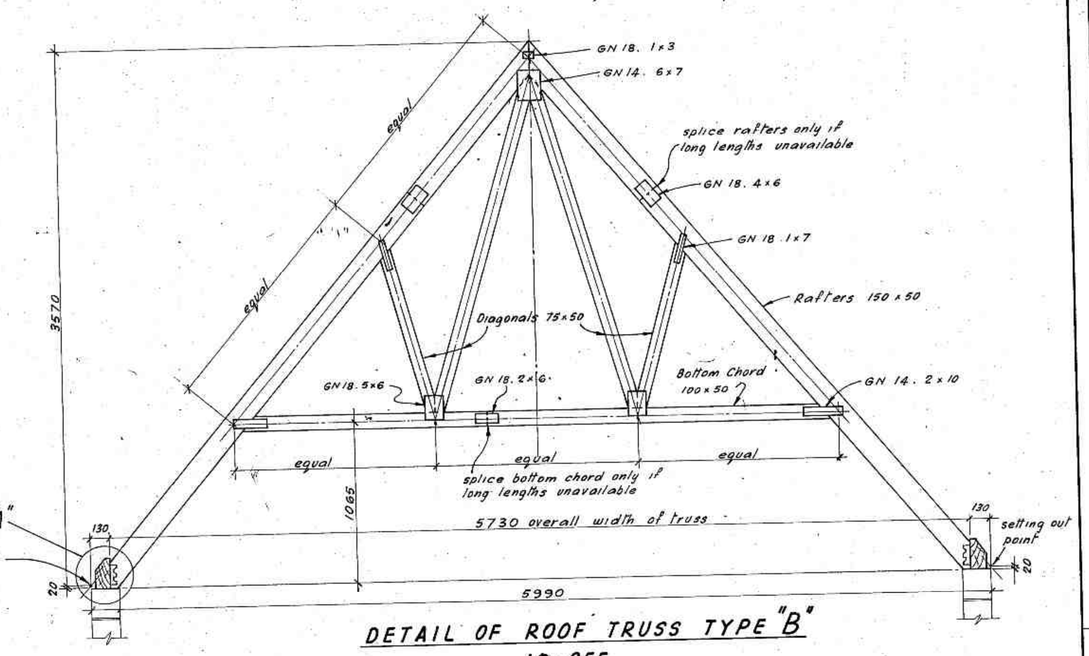
Scales
1:2
1:10
1:20

File No. BU/19/6
Issued
D.1962
Sheet 5 of 6

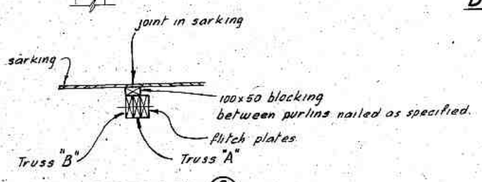
Original scale of millimetres



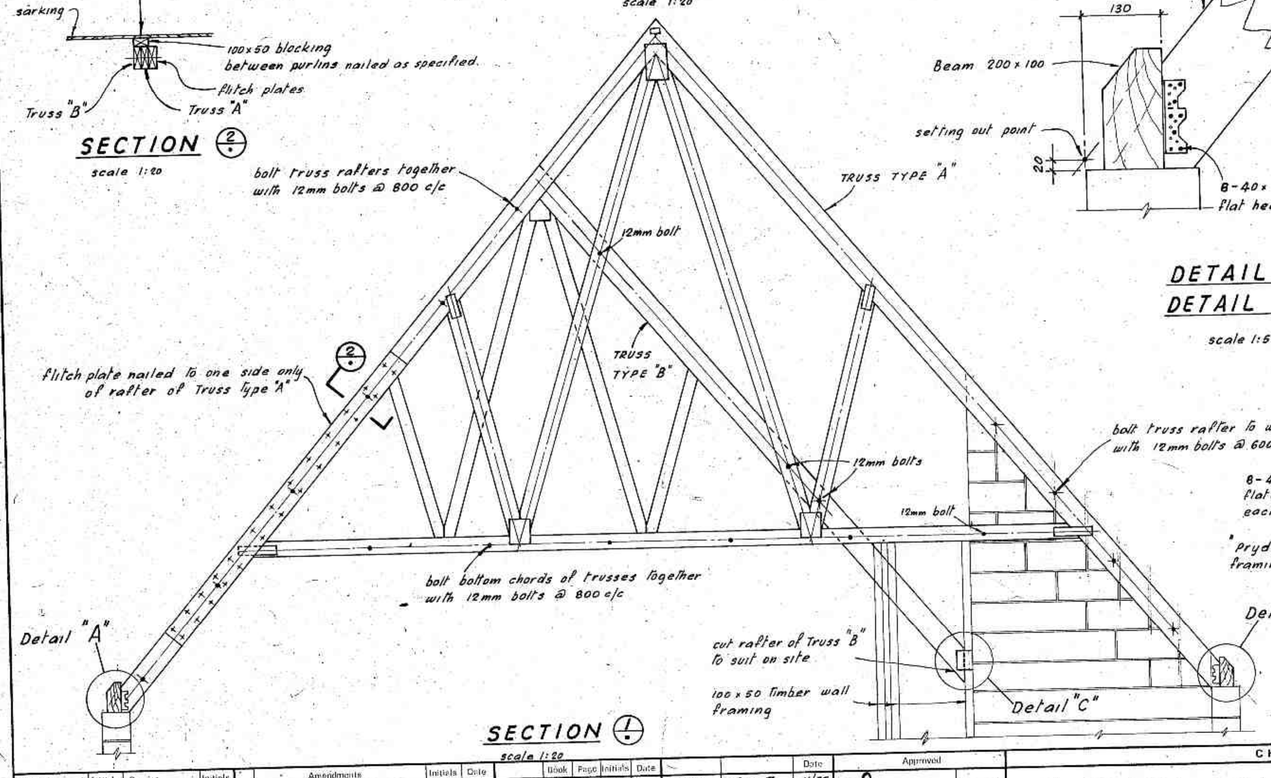
DETAIL OF ROOF TRUSS TYPE "A"
12-OFF
scale 1:20



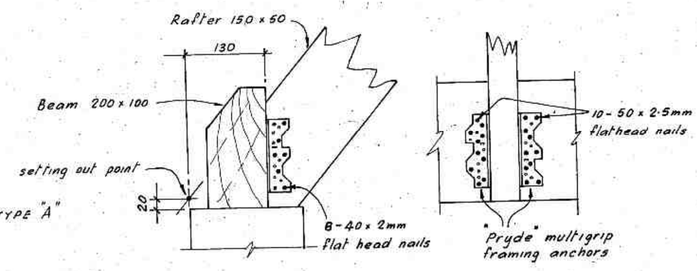
DETAIL OF ROOF TRUSS TYPE "B"
12-OFF
scale 1:20



SECTION (2)
scale 1:20

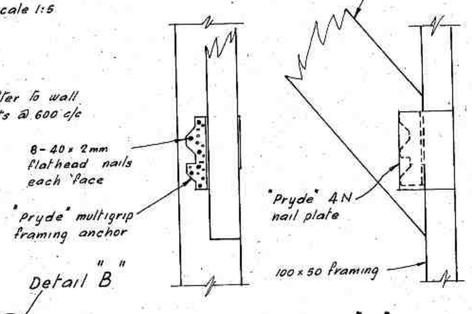


SECTION (1)
scale 1:20

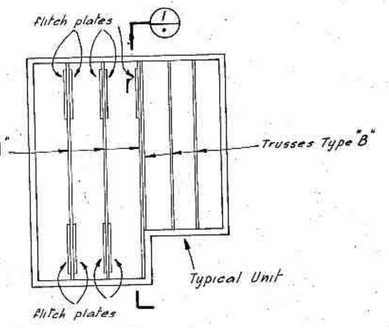


DETAIL "A"
DETAIL "B"
scale 1:5

similar except multigrip one side of rafter only



DETAIL "C"
scale 1:5



LOCATION PLAN OF TRUSSES
scale 1:100

Notes

1. Trusses to be manufactured by Gang Nail fabricator approved by the Engineer.
2. All timber to be Radiata Pine No 1 Framing Grade gauged & thicknessed & "Tanalith" treated to N.Z.T.P.A. specification C.8.
3. Gang nails are to be pressed into each side of the trusses at each joint.

CHR.ST. URCH CITY COUNCIL Approved Subject to the By-Laws - 5 MAY 1977 For City Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Controlled from				

		Date
Designed	S.D. Smith	11/75
Drawn	A.E. Bainbridge	12/75
Traced		
Dwg. Chk.		
Des. Chk.		
Indexed	L M W	3/76

Approved
Design Engineer 1.4.76 Date
City Engineer

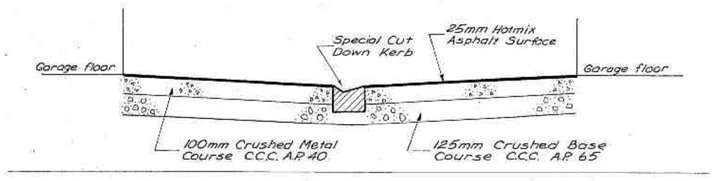
CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

HARMAN STREET - BLOCK A THREE STOREY FLATS - DETAILS OF TIMBER ROOF TRUSSES

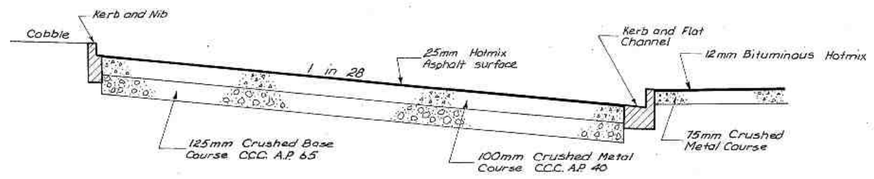
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File No 8U/19/6
Issue
D.1962
Sheet 6 of 6

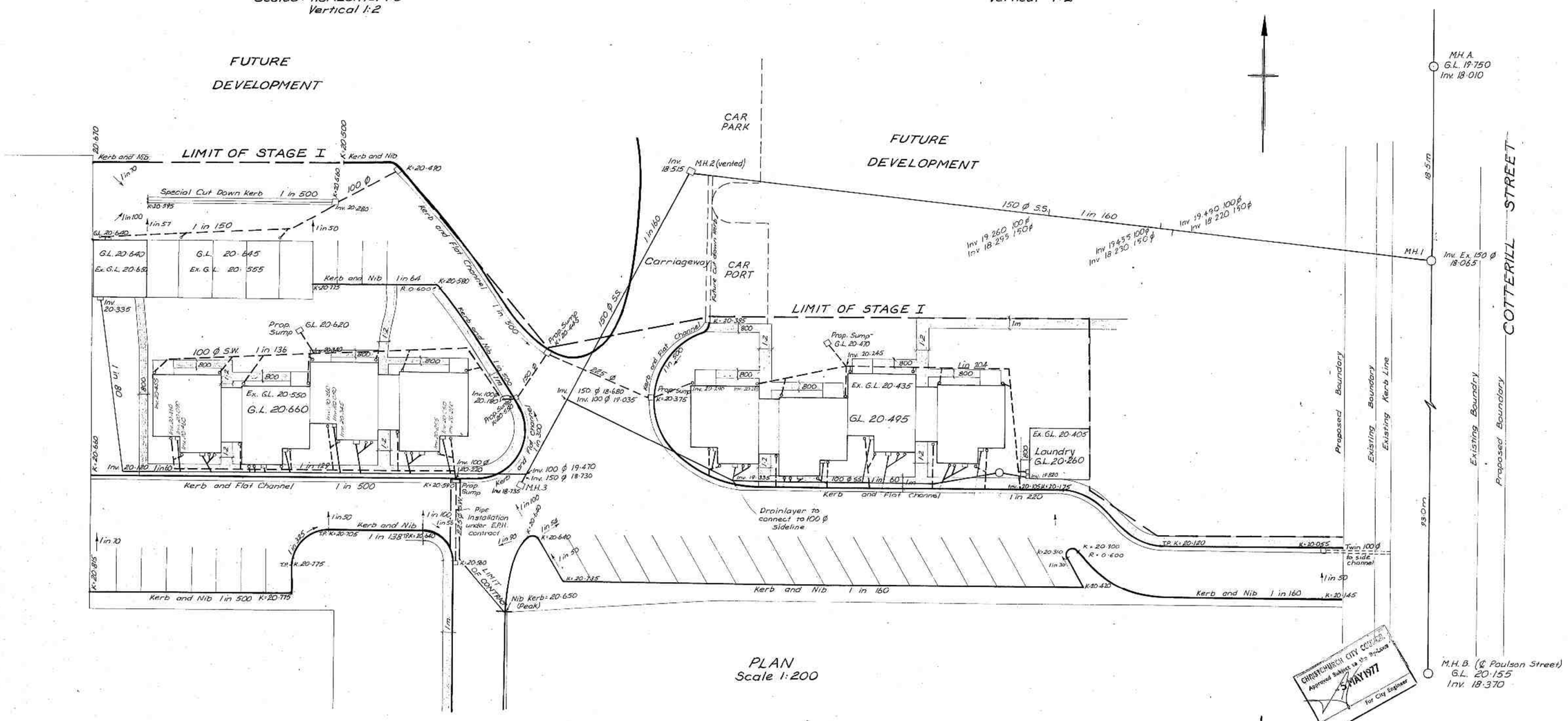
Original scale of millimetres 0 20 40 60 80 100



TYPICAL CROSS SECTION ON CARPARK
Scales: Horizontal 1:5
Vertical 1:2



TYPICAL CROSS SECTION ON ACCESS DRIVE
Scales: Horizontal 1:5
Vertical 1:2



PLAN
Scale 1:200

Service	Initials	Service	Initials
H.F. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed		
Drawn	S. Sparrow	
Traced	L. Saxon	10.76
Dwg. Chk.		
Des. Chk.		
Indexed		

Approved
Design Engineer Date
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

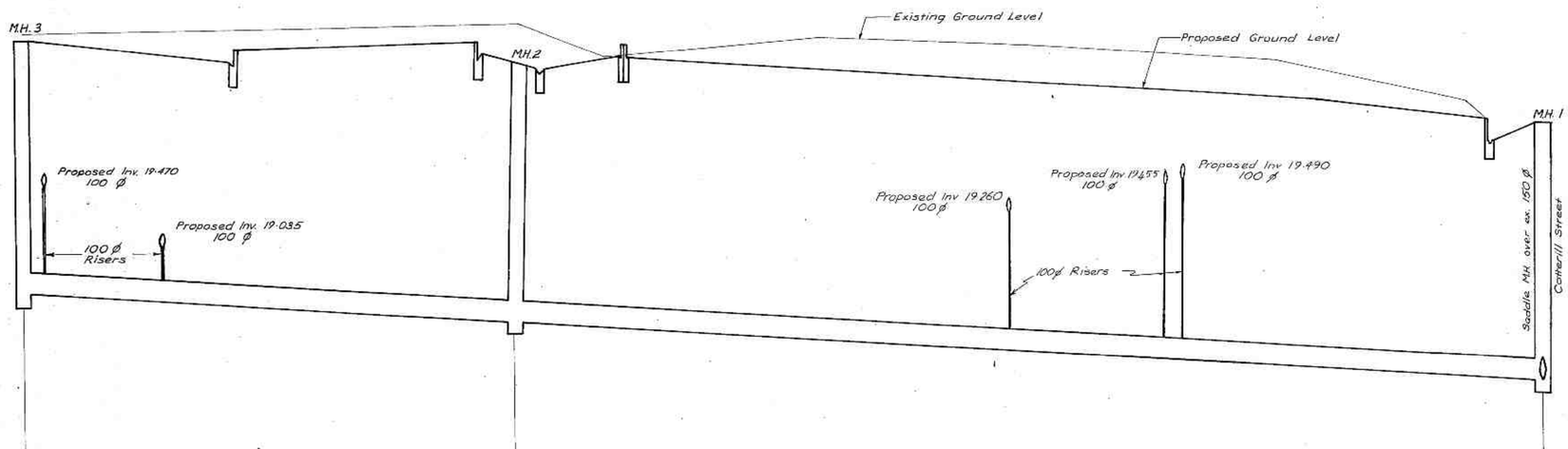
HARMAN STREET RECLAMATION HOUSING STAGE I

Scales: 1:200

METRIC
File No.
Issue
D.2072
Sheet of

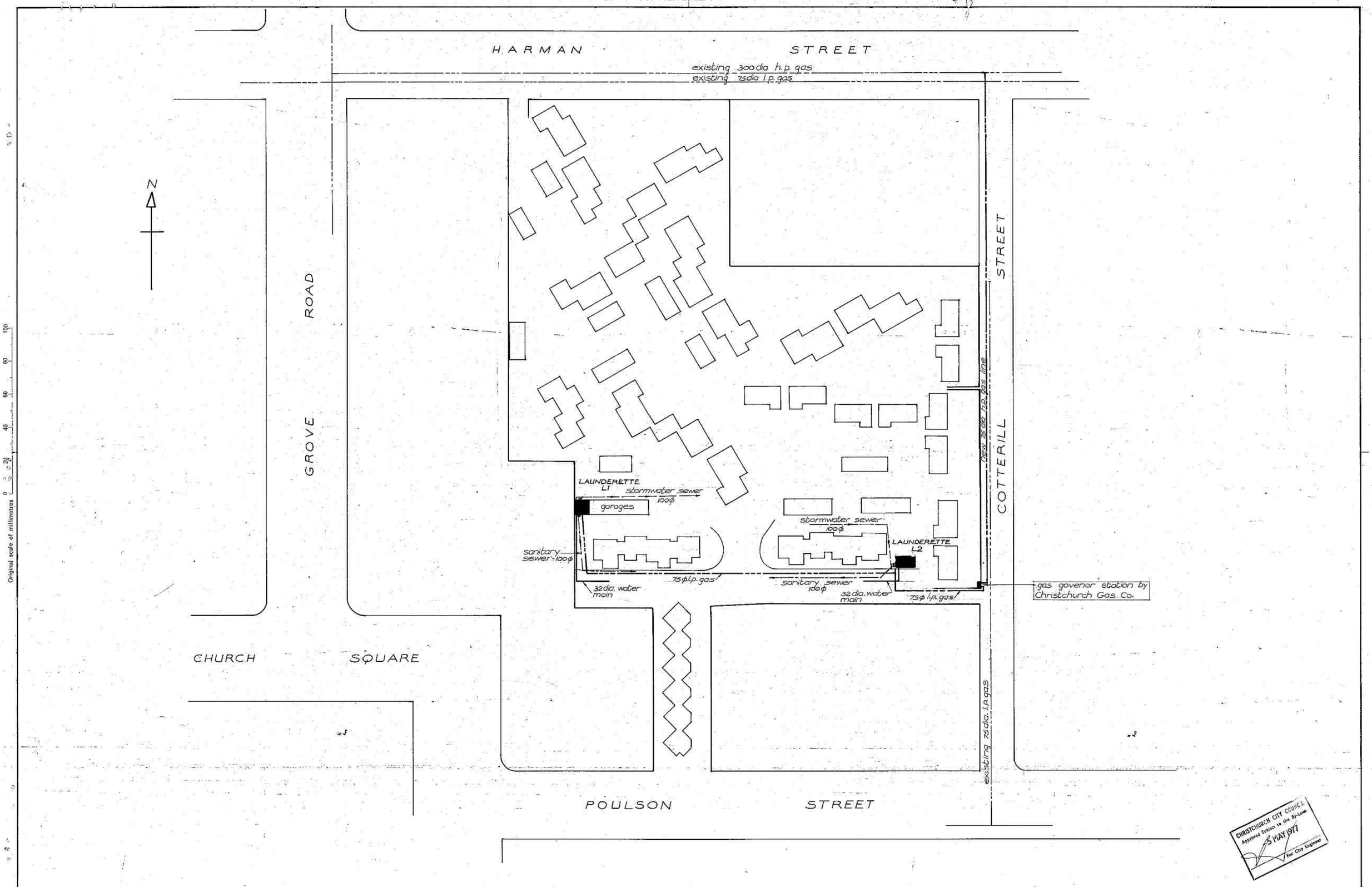
Original scale of millimetres

Original scale of millimetres 0 20 40 60 80 100



H.A.D. 17·5m

| | | |



CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
5 MAY 1977
For City Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed	I.F.C.	10/76
Drawn	P.M.	10/76
Traced	P.M.	10/76
Dwg. Chk.	I.F.C.	10/76
Des. Chk.	I.F.C.	10/76
Indexed		

Approved
5.11.76 Date
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING · STAGE I
LAUNDERETTES L1 & L2
SITE PLAN

Scales: 1:500

File No. BU/19/6
Issue
D.2071
Sheet 1 of 3

Appendix A2/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Blocks B and C				Reviewer:	Stephen Lee
	Unit	No:	Street		CPEng No:	1006840
Building Address:		85	Poulson		Company:	GHD
Legal Description:					Company project number:	513090277
					Company phone number:	6433780900
	Degrees	Min	Sec			
GPS south:					Date of submission:	
GPS east:					Inspection Date:	
					Revision:	Final
Building Unique Identifier (CCC):	BE 1110 005 and 006 EQ2				Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	3	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	
Storeys below ground	0			
Foundation type:	bored cast-insitu concrete piles		if Foundation type is other, describe:	300 dia insitu concrete piles
Building height (m):	11.50		height from ground to level of uppermost seismic mass (for IEP only) (m):	9.3
Floor footprint area (approx):	164			
Age of Building (years):	34		Date of design:	1965-1976
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	multi-unit residential		Brief strengthening description:	
Use (upper floors):	multi-unit residential			
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	3.6, timber purlins and metal cladding
Floors:	precast concrete with topping	unit type and depth (mm), topping	90
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:	fully filled concrete masonry	#N/A	

Lateral load resisting structure

Lateral system along:	fully filled CMU	**Note: Define along and across in**		
Ductility assumed, μ:	1.25	**detailed report!**	note total length of wall at ground (m):	
Period along:	0.08	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.08	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:	cast insitu	notes	
Wall cladding:			
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	full	original designer name/date	City Engineers Department (CCCC)
Structural	partial	original designer name/date	City Engineers Department (CCCC)
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:	green		
Along Damage ratio:	0%	Describe how damage ratio arrived at:	
Along Describe (summary):			
Across Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
Across Describe (summary):			
Diaphragms Damage?:	no	Describe:	
CSWs: Damage?:	no	Describe:	
Pounding: Damage?:	no	Describe:	
Non-structural: Damage?:	no	Describe:	

Recommendations

Level of repair/strengthening required:			Describe:	
Building Consent required:			Describe:	
Interim occupancy recommendations:			Describe:	
Along Assessed %NBS before e'quakes:	72%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
Along Assessed %NBS after e'quakes:	72%			
Across Assessed %NBS before e'quakes:	72%	##### %NBS from IEP below		
Across Assessed %NBS after e'quakes:	72%			

Appendix A2/D Stairwell Additional Support

GHD CLIENTS|PEOPLE|PERFORMANCE

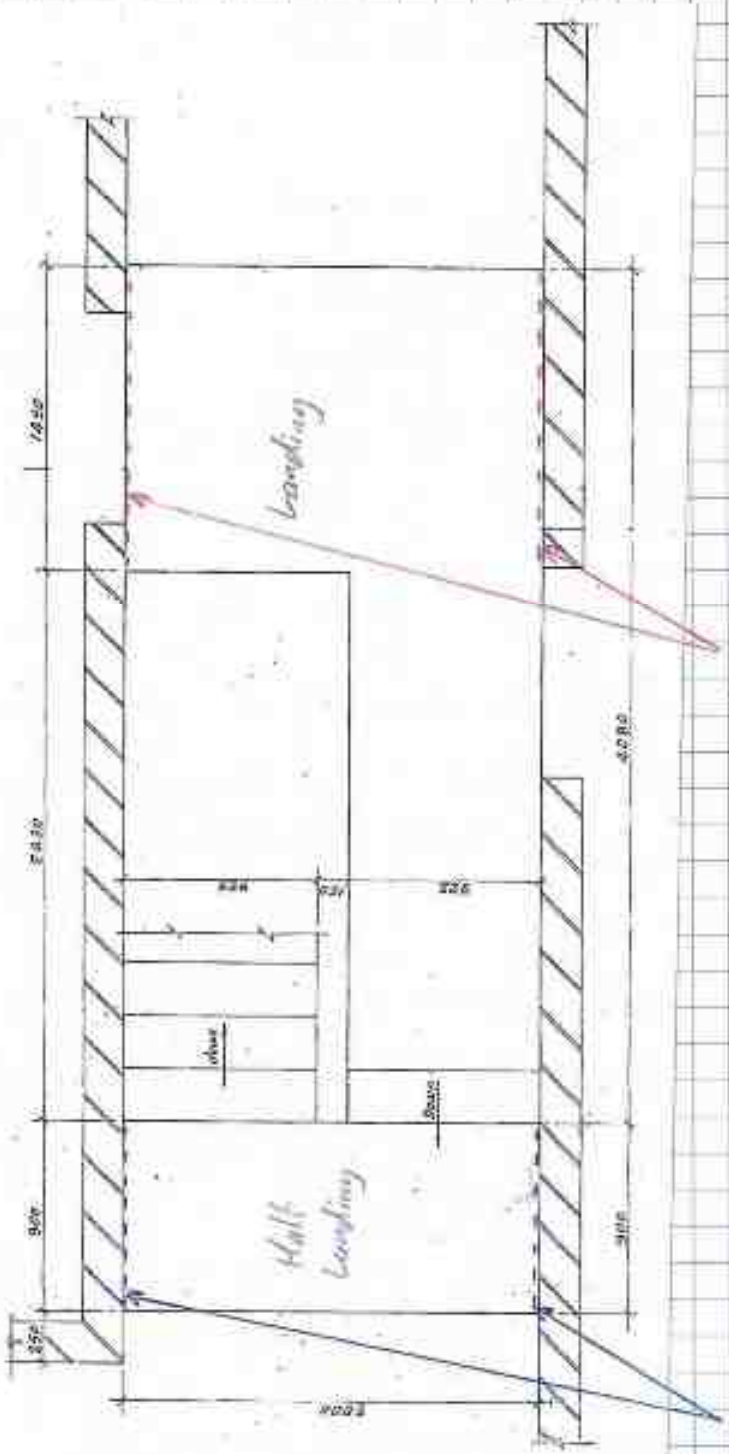
Calculations

GHD Limited

CLIENT: Christchurch City Council | JOB No: 31/31526/1 | SHEET: SK1 of SK3

JOB: Hereford Courts BBC | CALCS BY: | DATE:

SUBJECT: Strengthening to Staircase | CHECKED BY: | DATE:



GHD CLIENTS|PEOPLE|PERFORMANCE

Calculations

GHD Limited

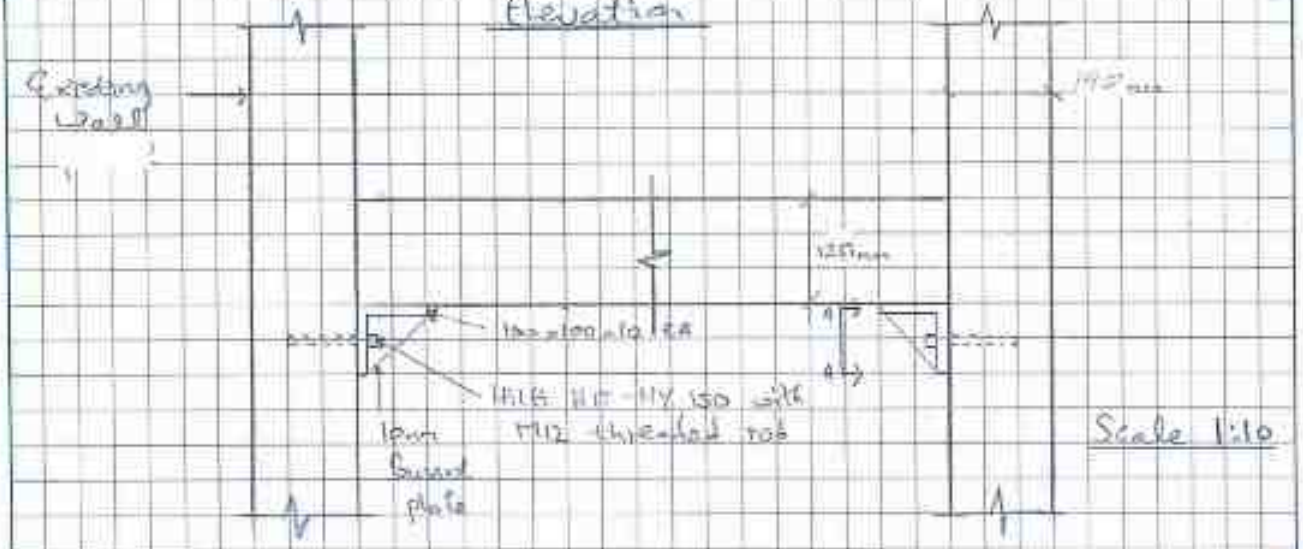
CLIENT: Christchurch City Council JOB No: 51/31526/51 SHEET: SK2 of SK3

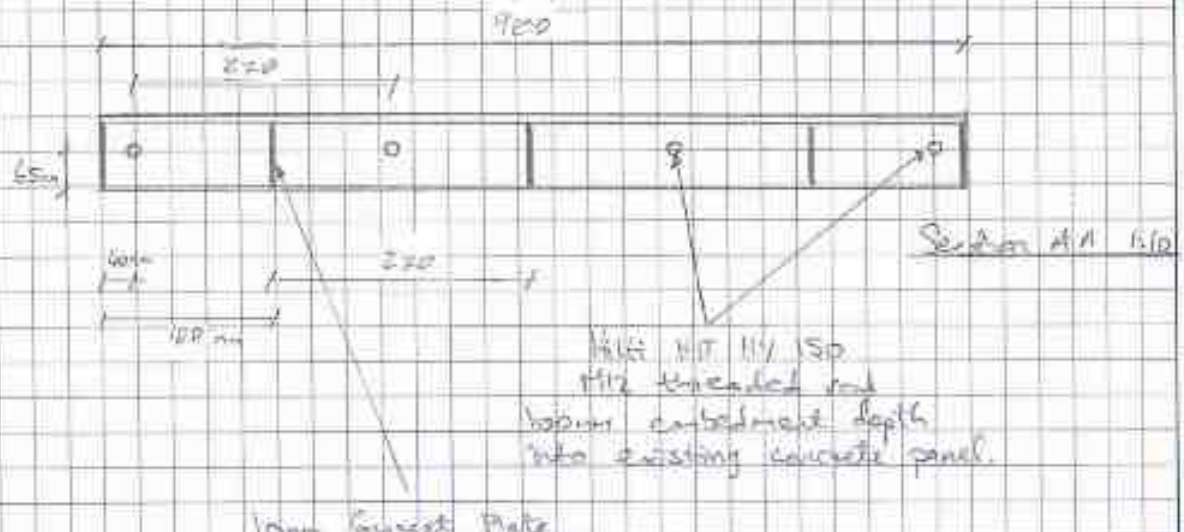
JOB: Hagley Courts TLC CALCS BY: DATE:

SUBJECT: Strengthening to Staircase CHECKED BY: H. Magruiven DATE:

Wall Headings

Elevation





All steel to be galvanised prior to installation

Stair Landing Support Detail

GHD CLIENTS|PEOPLE|PERFORMANCE

Calculations

GHD Limited

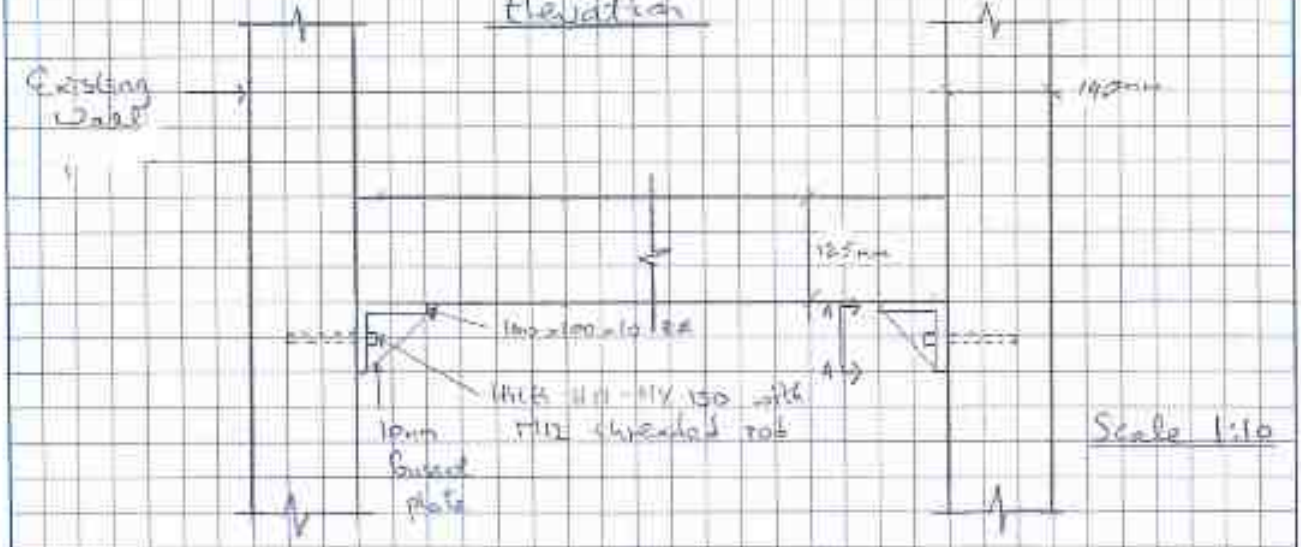
CLIENT: Christchurch City Council JOB No: 51/31526/51 SHEET SK3 of SK3

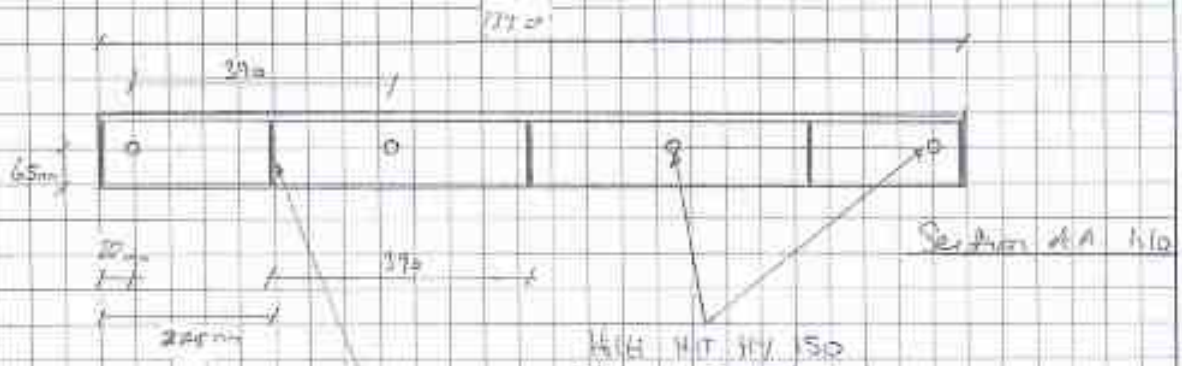
JOB: Human Courts - 32C CALCS BY: DATE:

SUBJECT: Strengthening to Staircase CHECKED BY: H. Harmitree DATE:

Loadings

Elevation





All steel to be galvanised prior to installation

Stair Landing Support Detail

www.ghd.co.nz

Specific Report A3
BE 1110 007-010 EQ2 Blocks D, E, F and G

April 2015

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   - 1.3 Lateral Load Resisting 11
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Photograph 2 East Elevation (Blocks D, E and F)
Photograph 3 South-West Elevation (Blocks D, E and F)
Photograph 4 West-South Elevation (Blocks D, E and F)
Photograph 5 North Elevation (Block G)
Photograph 6 South-East Elevation (Block G)
Photograph 7 Stairway (All Blocks)
Photograph 8 Stair at Ground Level (All Blocks)

Appendices

Appendix A3/A Photographs
Appendix A3/B Available Drawings
Appendix A3/C CERA Spreadsheet
Appendix A3/D Stairwell additional support

1. Building Description

1.1 General

The following information describes the Blocks D, E, F and G buildings at Harman Courts.

- Blocks D, E and F are situated at the east side of the site along Cotterill Street. Block G is located north of the Garages and Lounge building. See Figure 1 for the building location plan.
- Blocks D and F are similar buildings. Similarities also exist between Blocks E and G.
- Blocks D, E and F each consist of two buildings with a common precast concrete staircase connecting the two buildings. Block G consists of four buildings, each of these is similar to Block E buildings. Refer to Figures 6 and 7.
- All the blocks are two-storey with timber framed walls at the first floor supporting the timber roof trusses. At ground floor the walls are reinforced concrete masonry.
- All the buildings have similar ground floor plans (denoted by Type 'Z' units) and similar first floor plans (denoted by Type 'X' and 'Y' units) as shown in Figures 2, 3, 4 and 5. The difference between the unit types being the size and location of door and window openings.
- All the residential units are flats with external precast concrete stairs providing access.
- The roofs have a pitch of 50 degrees and consist of lightweight corrugated metal sheeting over timber purlins supported by timber trusses at 900 mm centres.
- The dimensions of the building are approximately 9.4 m width, 10.8 m long and 8.0 m in height to roof ridge.
- First floor level is constructed with 75mm thick precast concrete slabs with topping. The ground floor is 100 mm thick concrete slab with damp proof course on grade.

Figures 2 to 7 show the floor plan layouts for each block. Complete drawn information mentioned above is provided in Appendix A3/B.



Figure 1 Plan/Aerial View of Harman Courts

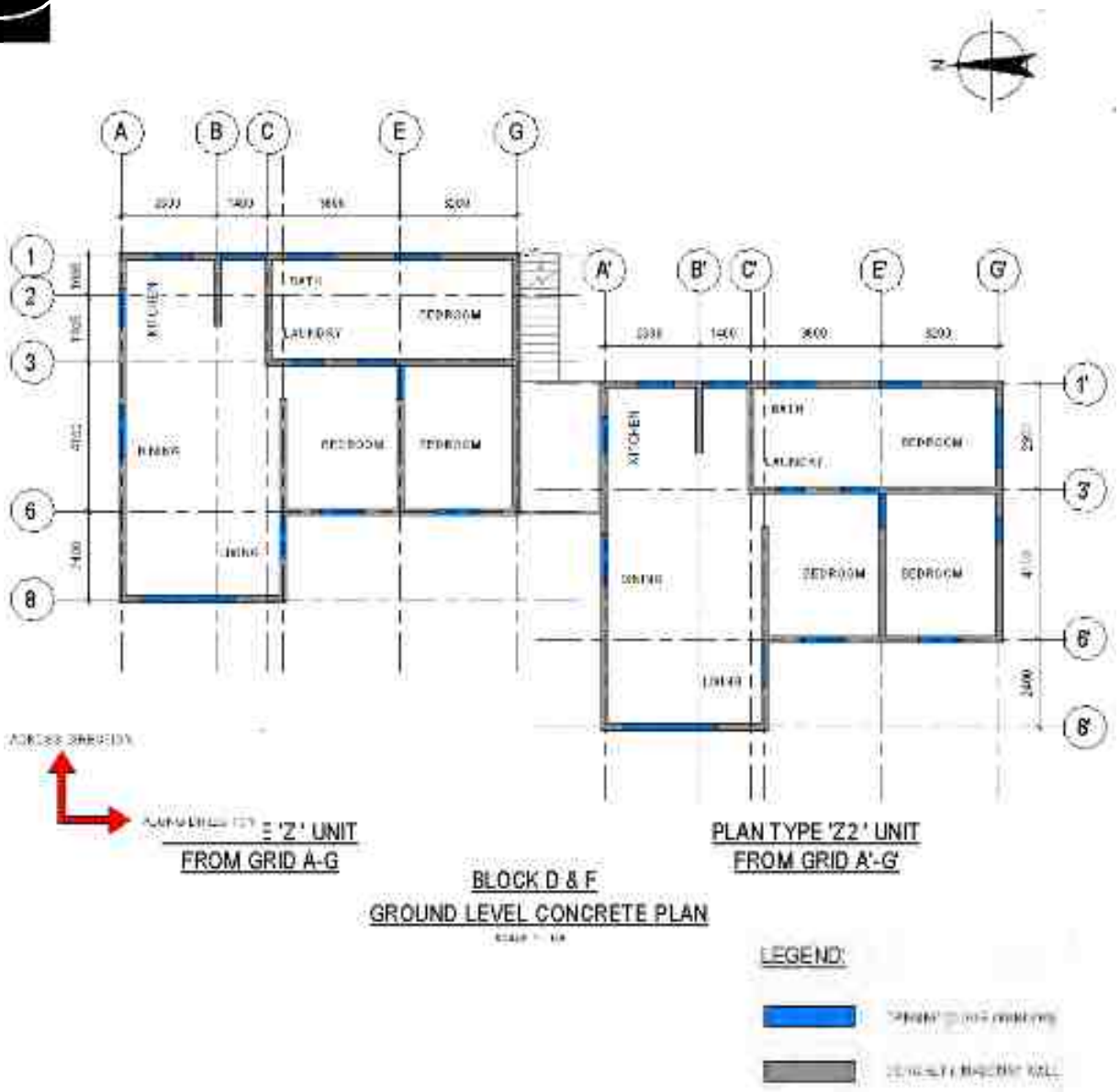


Figure 2 Blocks D & F Ground Floor Plan Showing Key Structural Elements

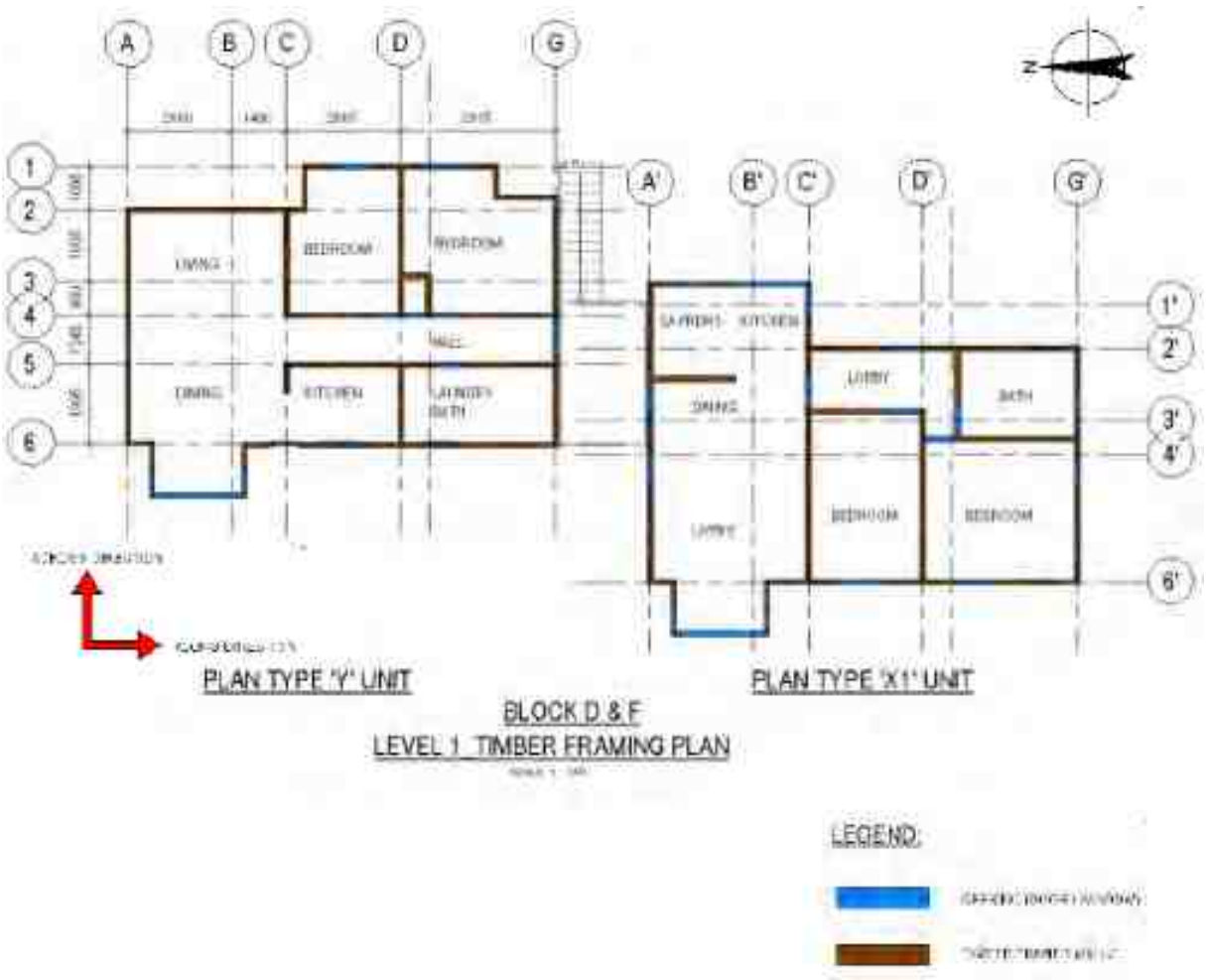


Figure 3 Blocks D & F Level 1 Framing Plan Showing Key Structural Elements

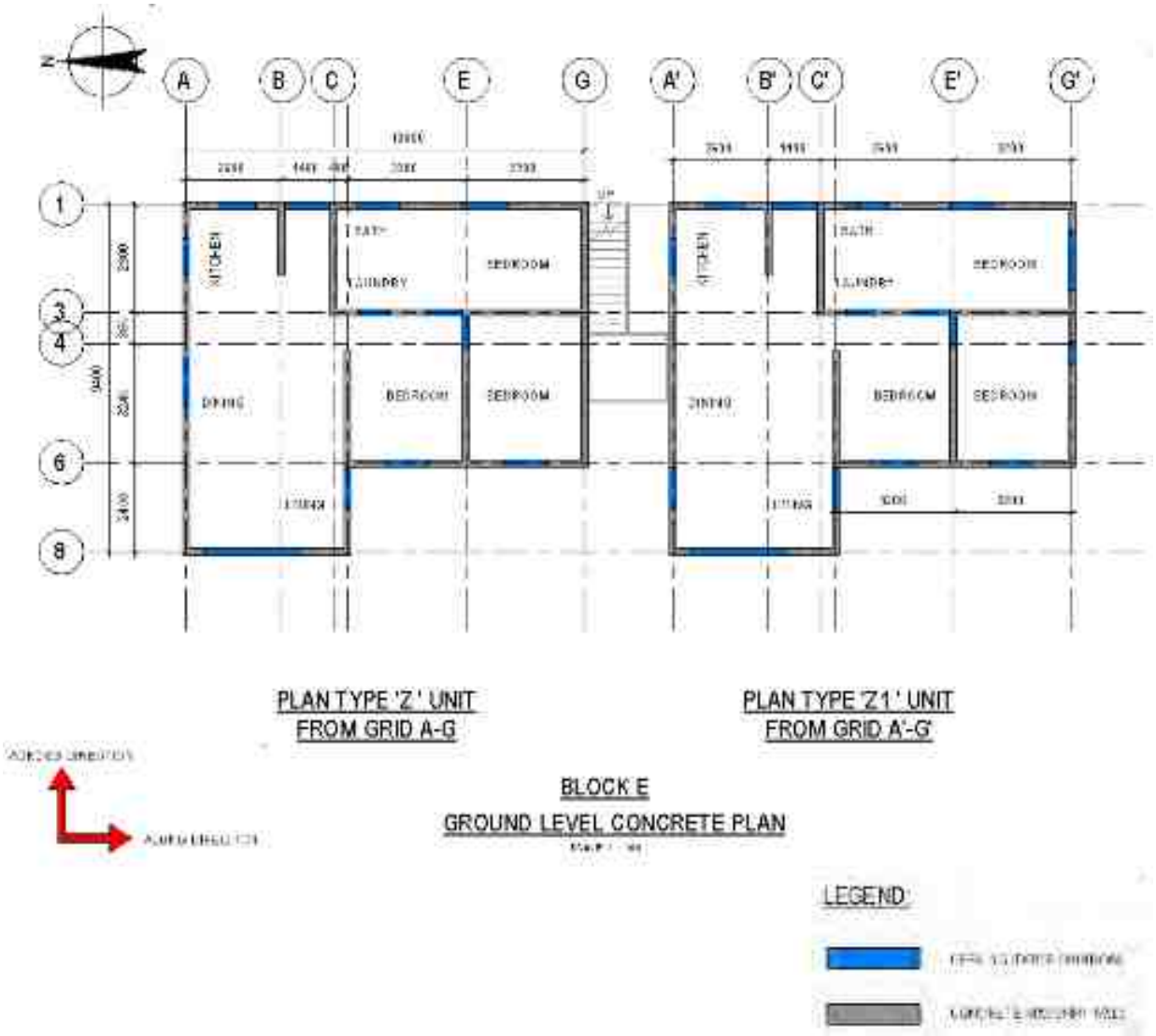


Figure 4 Block E Ground Floor Plan Showing Key Structural Elements

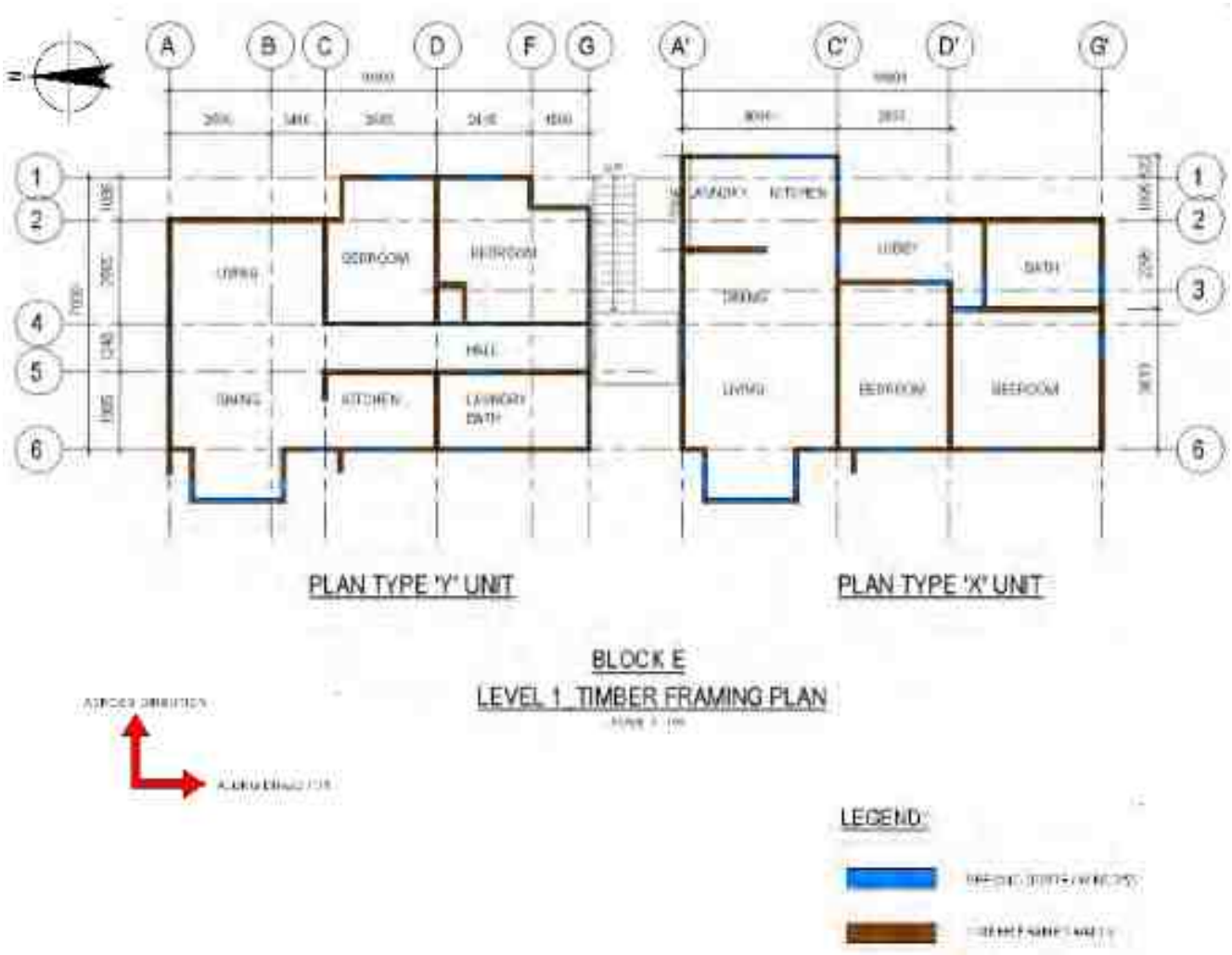


Figure 5 Block E Level 1 Framing Plan Showing Key Structural Elements

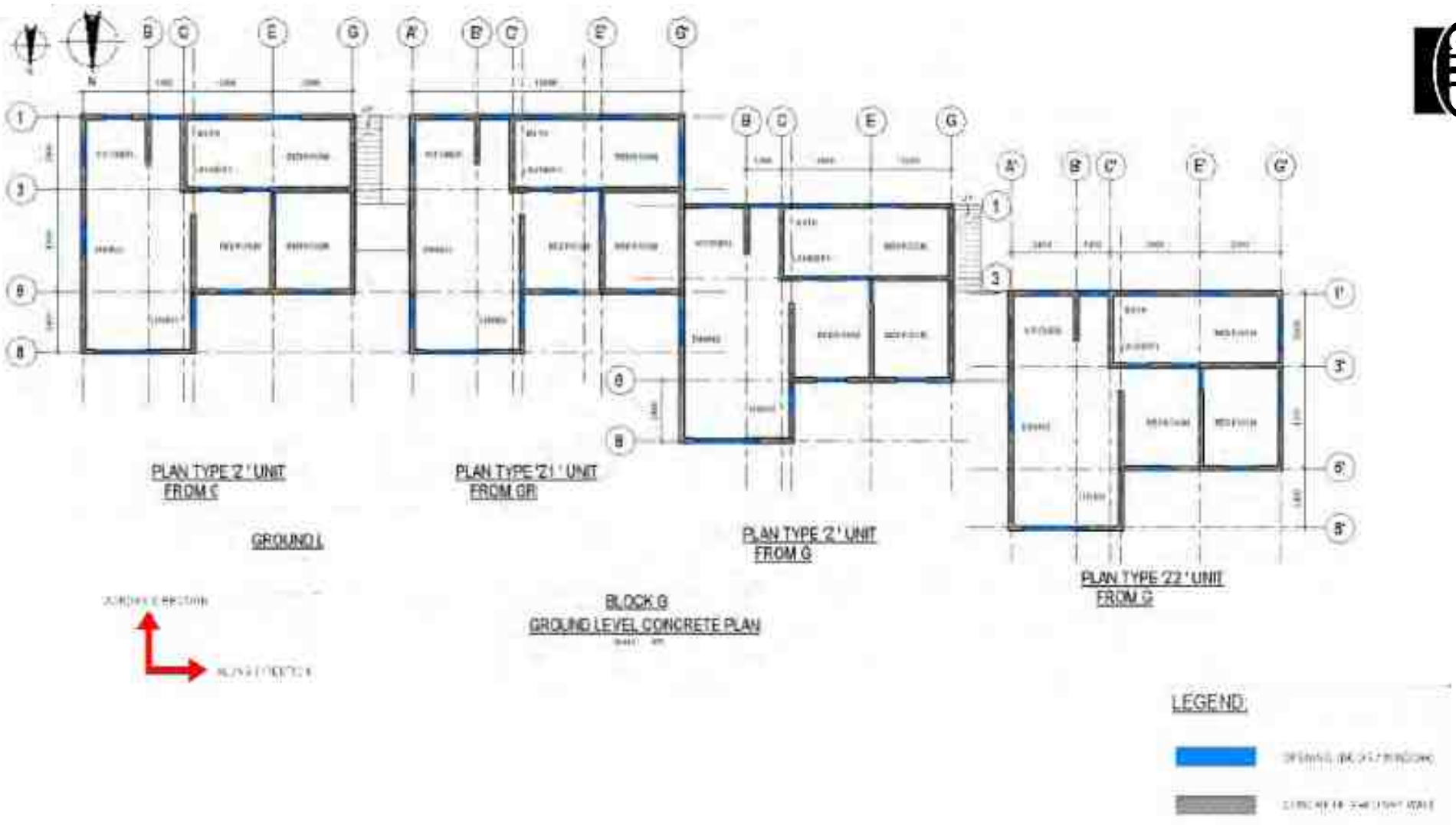

PLAN TYPE '2' UNIT
FROM G
PLAN TYPE '21' UNIT
FROM GR
PLAN TYPE '2' UNIT
FROM G
PLAN TYPE '22' UNIT
FROM G
GROUND L
BLOCK G
GROUND LEVEL CONCRETE PLAN
LEGEND

Figure 6 Block G Ground Floor Plan Showing Key Structural Elements

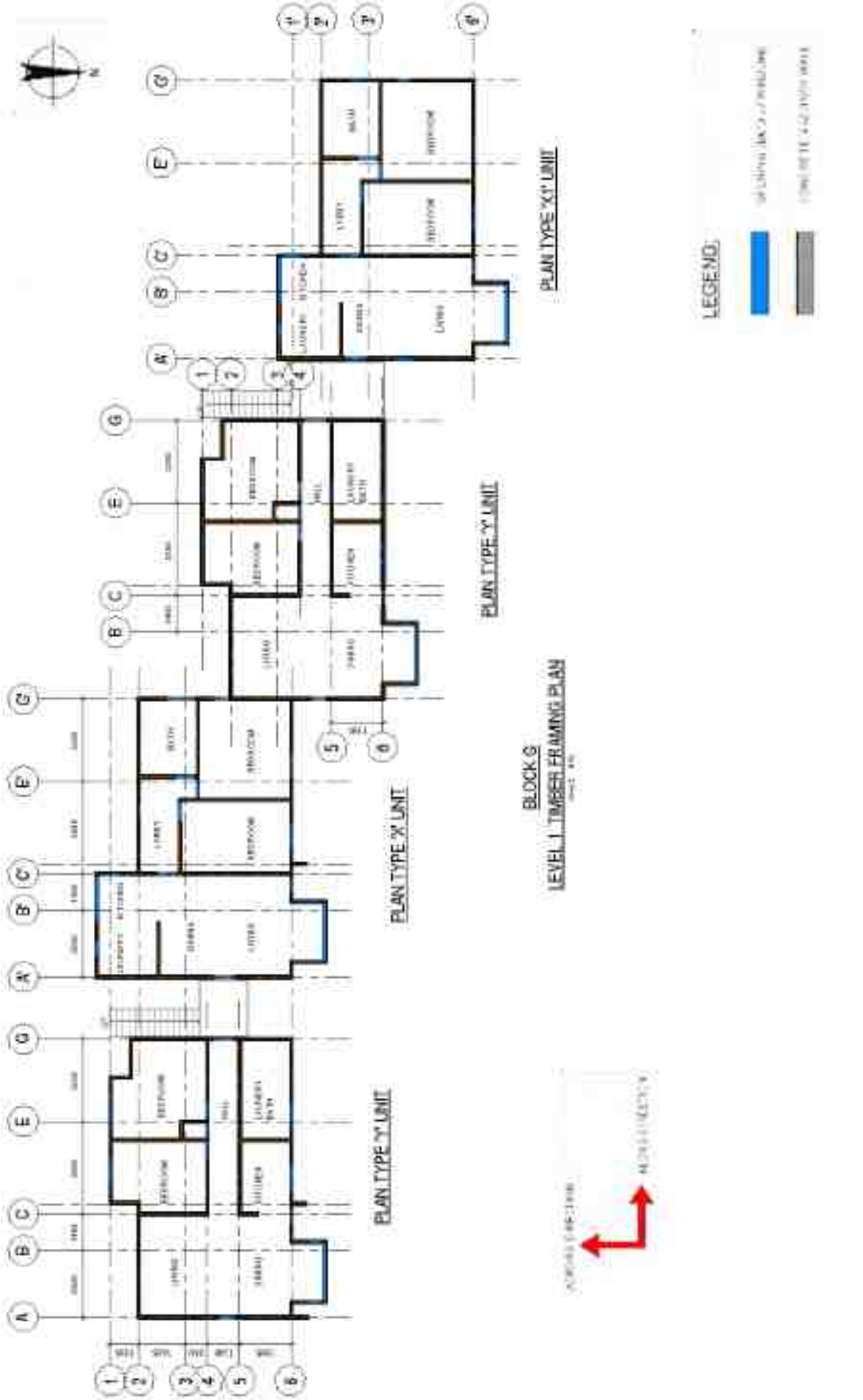


Figure 7 Block G Level 1 Framing Plan Showing Key Structural Elements

1.2 Gravity Load Resisting

The timber roof trusses support the roof gravity loads in the structure and then transfer these loads to the upper storey timber framed walls. The precast concrete floor slabs transfer the 1st floor gravity loads into the lower storey reinforced concrete masonry walls. The roof loads together with the first floor loads are transmitted by the masonry walls down to the foundations.

1.3 Lateral Load Resisting

The lateral loads acting on the structure are resisted in both the 'Across' and 'Along' directions primarily by the perimeter timber framed walls in the upper storey and the reinforced concrete masonry walls in the lower storey. The diaphragm action of the roof system transmits the roof lateral loads to the upper storey perimeter timber framed walls while the 1st floor diaphragm transmits the floor lateral load to the reinforced concrete masonry walls and then down to the foundations.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Locality Plan	Sheet 1 of 20	November 1977
2	Ground Floor Plan	Sheet 2 of 20	November 1977
3	Typical Elevations of Type A and B Blocks	Sheet 3 of 20	November 1977
4	Elevations	Sheet 4 of 20	November 1977
5	Plan Type Z	Sheet 5 of 20	November 1977
6	Typical Type X Plan	Sheet 6 of 20	November 1977
7	Plan Type Y Unit	Sheet 7 of 20	November 1977
8	Cross Section A - A	Sheet 8 of 18	November 1977
9	Cross Section B - B	Sheet 9 of 20	November 1977
10	Section D – D and Cross Section C - C	Sheet 10 of 20	November 1977
11	Cross Section F-F, End Elevation, Baluster Detail	Sheet 11 of 20	November 1977

Item	Title	Sheet No.	Drawing Date
12	Stair Plan ,Cross Section and Detail	Sheet 12 of 20	November 1977
13	Internal Elevations – Plan Z	Sheet 13 of 20	November 1977
14	Internal Elevations Type X Plan	Sheet 14 of 20	November 1977
15	Internal Elevation Plan Y	Sheet 15 of 20	November 1977
16	Architectural Joinery Details	Sheet 16 of 20	November 1977
17	Internal Elevation Line 1 to 12	Sheet S3 of 4	October 1977
18	Foundation Plan Units 5 and 6	Sheet S1 of 4	November 1977
19	Internal Elevation Line A to D, 14	Sheet S4 to 4	October 1977
20	1st Floor Uni span Layout	Sheet S2 of 4	October 1977

Available drawings is attached in Appendix A3/B

2.4 Analysis and Modelling

A seismic assessment was carried out based on non-specific design in accordance with NZS 4229:1999 and NZS 3604:2011.

3. Damage Assessment

3.1 General

Cracking was noted around the reinforced concrete arches and the precast concrete slabs. Due to the size of the cracks repair of these structural elements is recommended. The high level of reinforcement and low seismic demand mean structural performance of these elements is unlikely be significantly affected.

Minor cracking was noted in various locations around the structure. These cracks are not expected to impact the structural performance of these elements.

4. Results of Analysis

The following are the results of the structural analysis of Blocks D, E, F and G buildings.

4.1 Blocks D & F

4.1.1 Timber Framed Walls (Above first floor)

Across

The timber framed walls in the 'Across' direction were found to be rated overall at 82% NBS.

Along

The timber framed walls in the 'Along' direction were found to be rated overall at 76% NBS.

4.1.2 Concrete Masonry Walls (Ground floor)

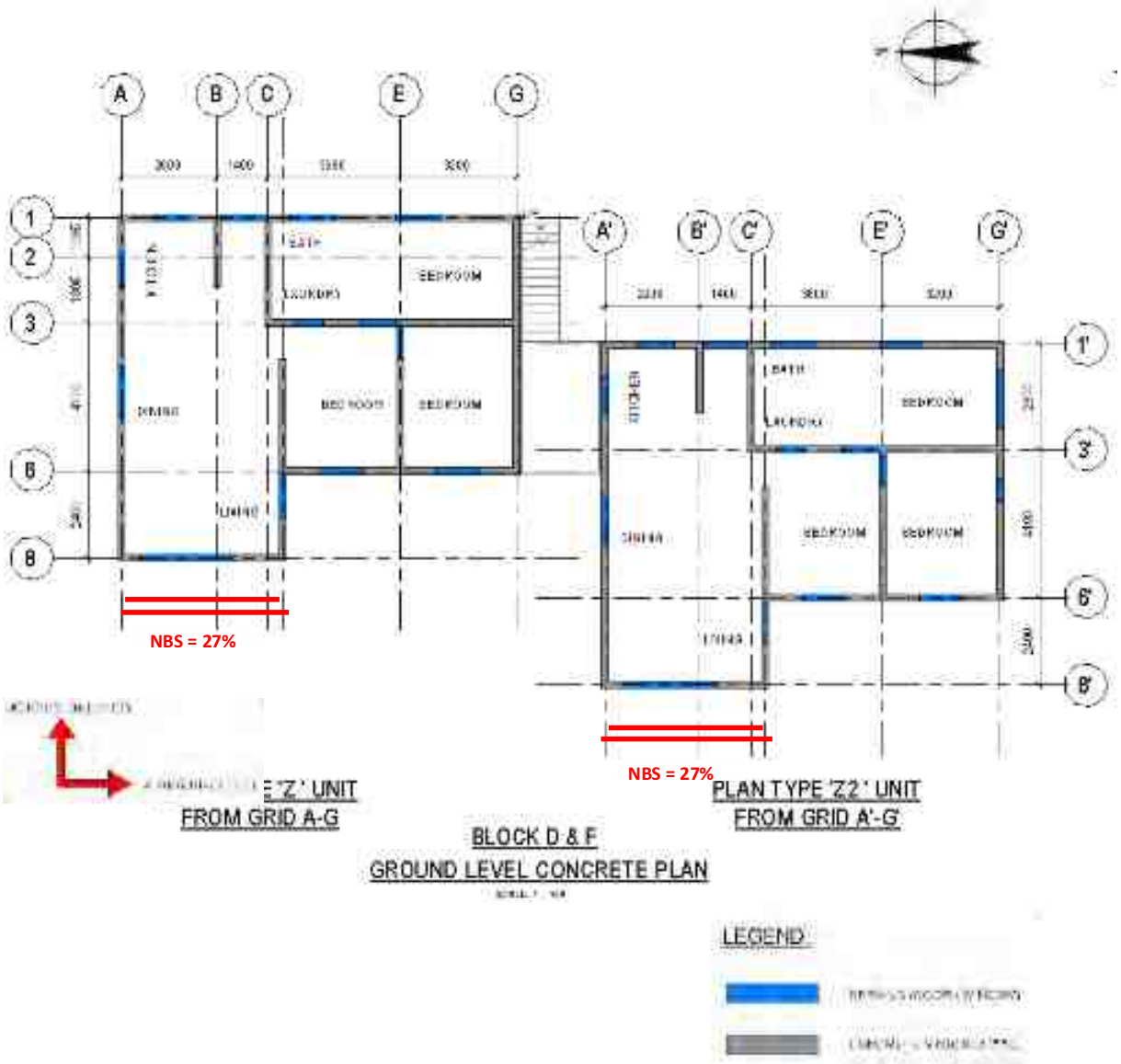
Across and Along

Overall the reinforced concrete masonry walls in both directions were found to be rated more than 100% NBS. However, it is noted that the bracing line 8 in the 'Along' direction was found to be only 27% NBS as highlighted in red in Figure 8. This is due to openings in the bracing panel.

Since the overall rating in the 'Along' direction exceeds 100% NBS and due to the presence of adequate diaphragm, the result for this particular bracing line is not considered significant.

4.1.3 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.



Note: All masonry walls exceed 100% NBS except where indicated.

Figure 8 Blocks D & F Concrete Masonry Bracing Results

4.2 Block E

4.2.1 Timber Framed Walls (Above first floor)

Across

The timber framed walls in the 'Across' direction were found to be rated overall at 82% NBS.

Along

The timber framed walls in the 'Along' direction were found to be rated overall at 76% NBS.

4.2.2 Concrete Masonry Walls (Ground floor)

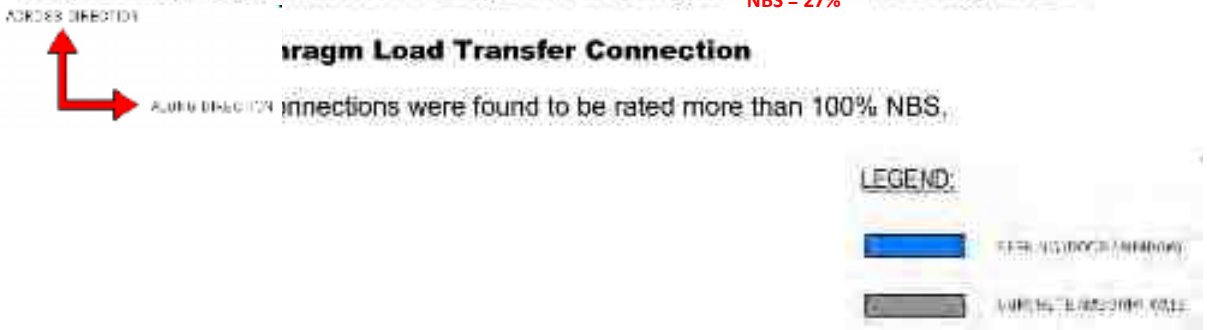
Across and Along

Overall the reinforced concrete masonry walls in both directions were found to be rated more than 100% NBS. However, it is noted that the bracing line 8 in the 'Along' direction was found to be only 27% NBS as highlighted in red in Figure 9. This is due to openings in the bracing panel.

Since the overall rating in the 'Along' direction exceeds 100% NBS and due to the presence of adequate diaphragm the result for this particular bracing line is not considered significant.

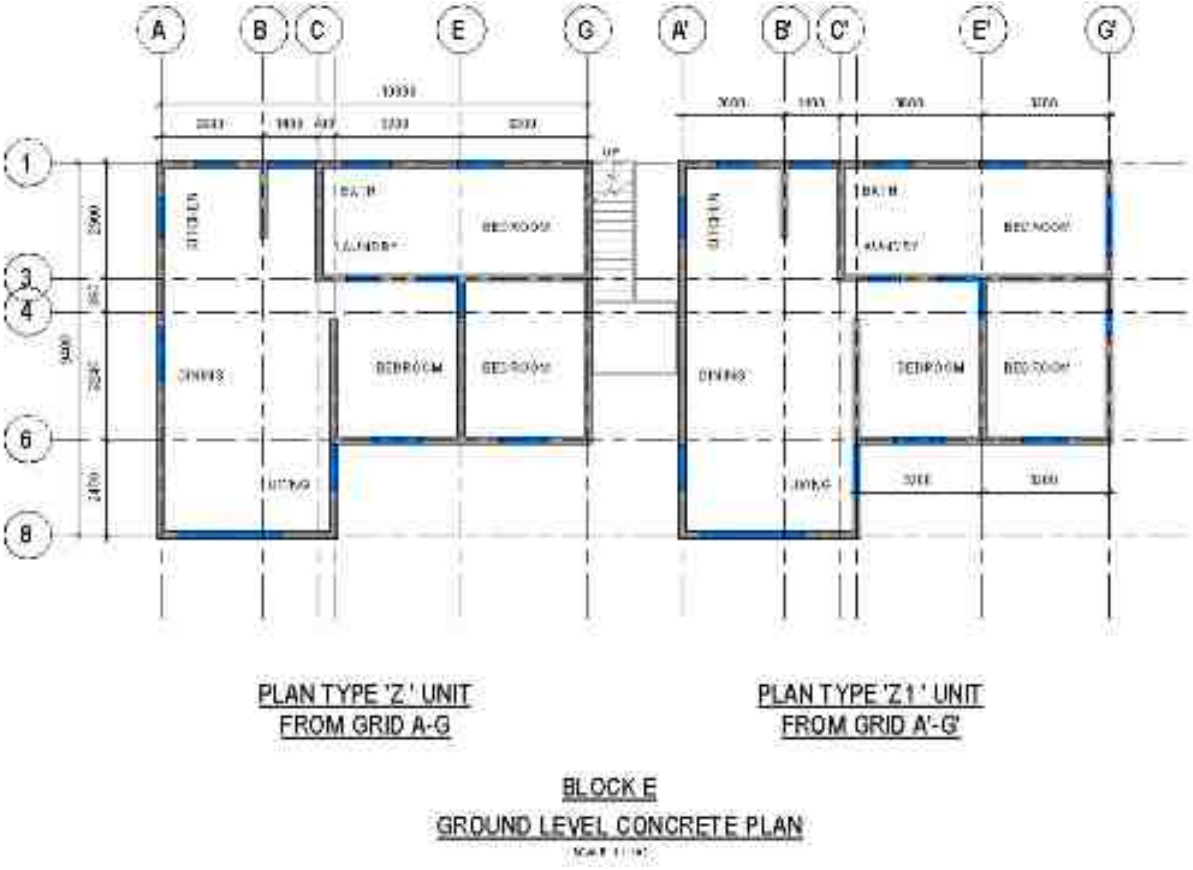
NBS = 27%

NBS = 27%



ıragm Load Transfer Connection

ınnections were found to be rated more than 100% NBS.



Note: All masonry walls exceed 100% NBS except where indicated.

Figure 9 Block E Concrete Masonry Bracing Results

4.3 Block G

4.3.1 Timber Framed Walls (Above first floor)

Across

The timber framed walls in the 'Across' direction were found to be rated overall at 82% NBS.

Along

The timber framed walls in the 'Along' direction were found to be rated overall at 76% NBS

4.3.2 Concrete Masonry Walls (Ground floor)

Across and Along

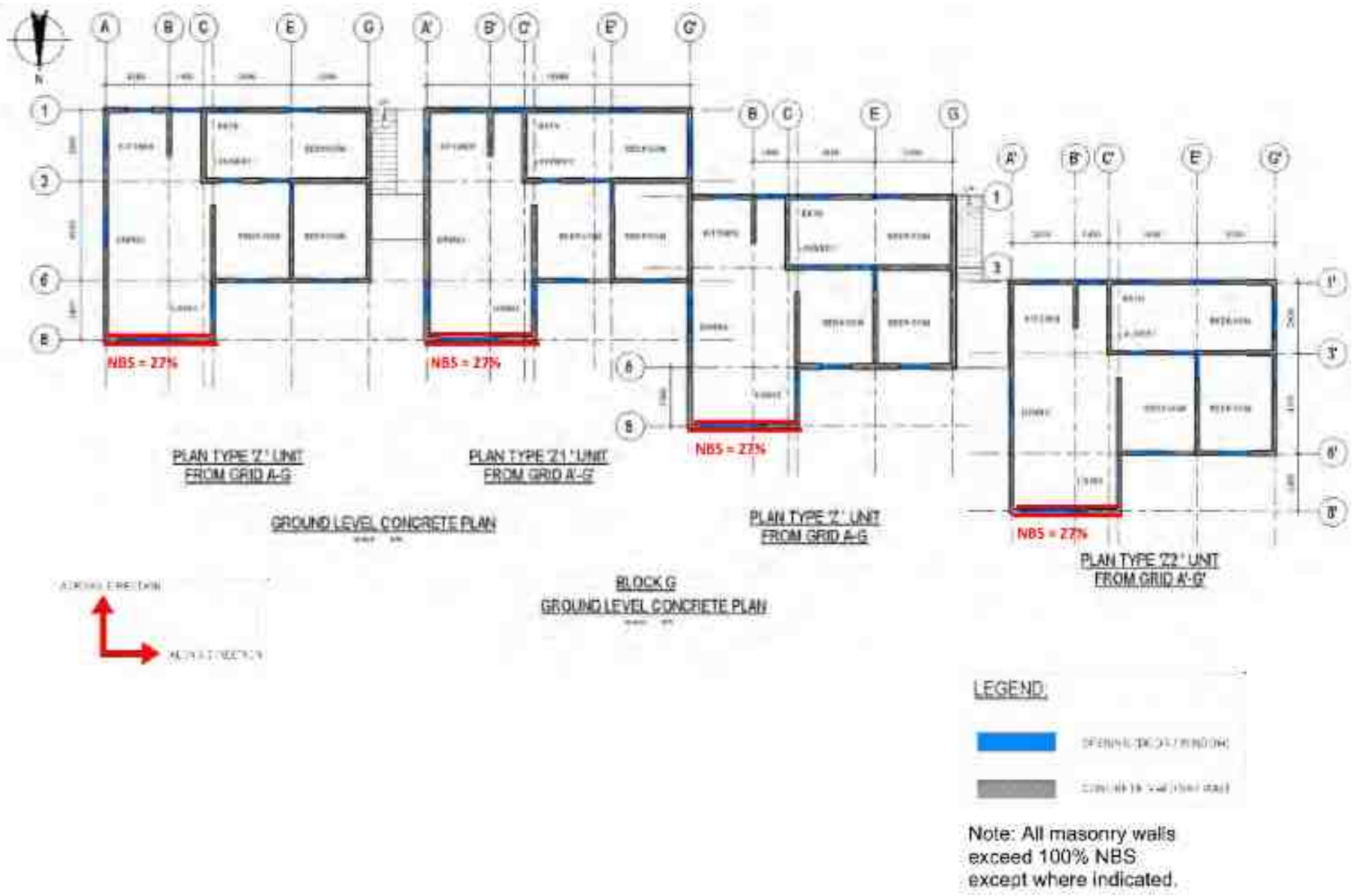
Overall the reinforced concrete masonry walls in both directions were found to be rated more than 100% NBS. However, it is noted that the bracing line 8 in the 'Along' direction was found to be only 27% NBS as highlighted in red in Figure 10. This is due to openings in the bracing panel.

Since the overall rating in the 'Along' direction exceeds 100% NBS and due to the presence of adequate diaphragm, the result for this particular bracing line is not considered significant.

4.3.3 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.

Figure 10 Block G Concrete Masonry Bracing Results



5. Stairwell Support

Additional support for the stairwells was designed by GHD and construction completed in November 2014. Refer to Appendix Appendix A3/D for further details.

6. Conclusion and Recommendations

The following table shows the overall % NBS ratings of Blocks D, E, F and G.

Table 2 Overall Rating

BUILDING	OVERALL %NBS	CLASSIFICATION
Block D	76 %	Not Earthquake Risk
Block E	76 %	Not Earthquake Risk
Block F	76 %	Not Earthquake Risk
Block G	76 %	Not Earthquake Risk

Blocks D, E, F and G individually have been assessed as having a seismic capacity of 76% NBS and are therefore classified as not an 'Earthquake Risk'.

No further assessment or strengthening is required to comply with CCC policy.

Appendices

Appendix A3/A Photographs



Photograph 1 North Elevation (Blocks D, E and F)



Photograph 2 East Elevation (Blocks D, E and F)



Photograph 3 South-West Elevation (Blocks D, E and F)



Photograph 4 West-South Elevation (Blocks D, E and F)



Photograph 5 North Elevation (Block G)



Photograph 6 South-East Elevation (Block G)



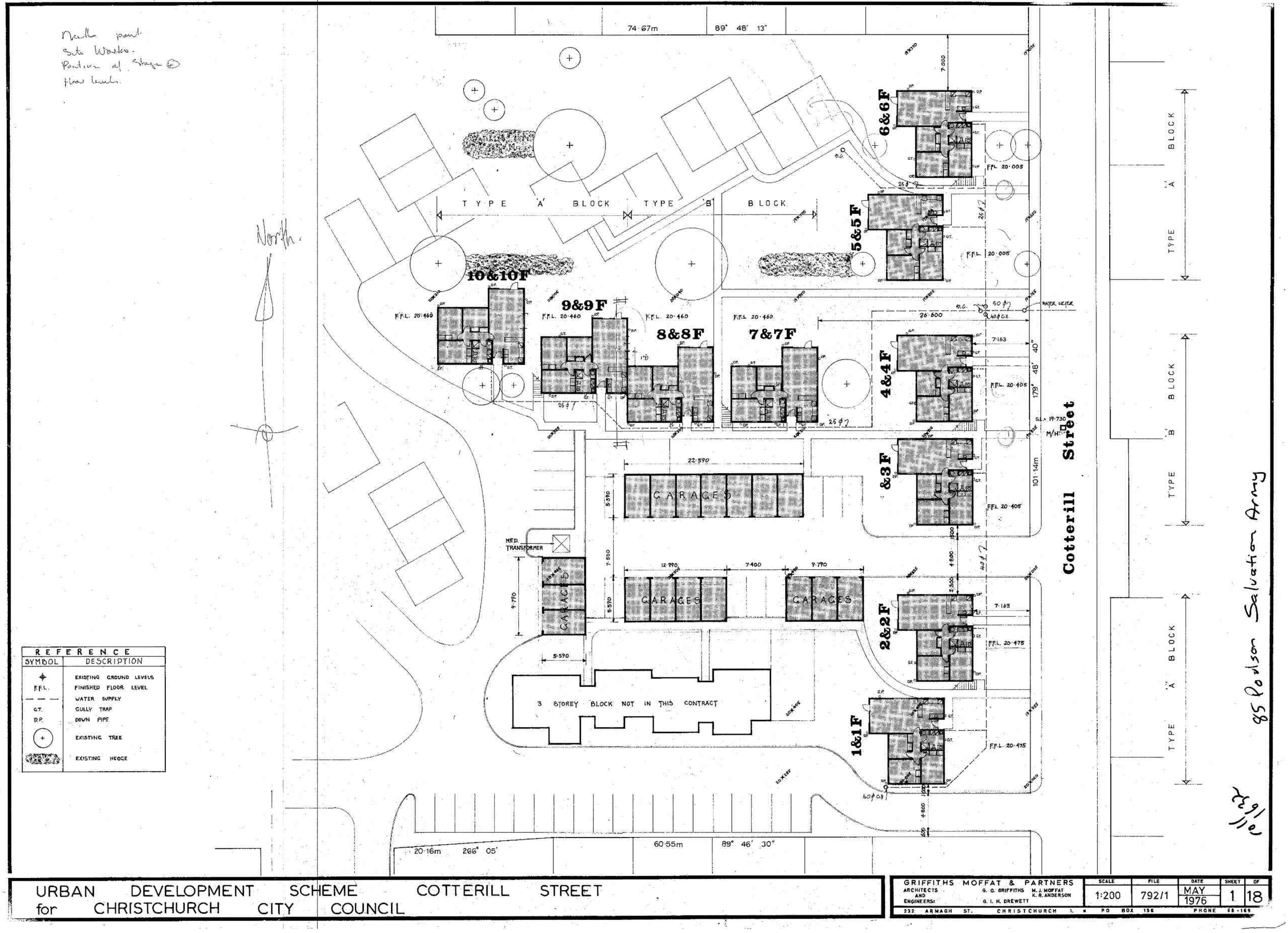
Photograph 7 Stairway (All Blocks)



Photograph 8 Stair at Ground Level (All Blocks)

Appendix A3/B Available Drawings

North part
Site Works.
Position of Stages ①
Floor levels.

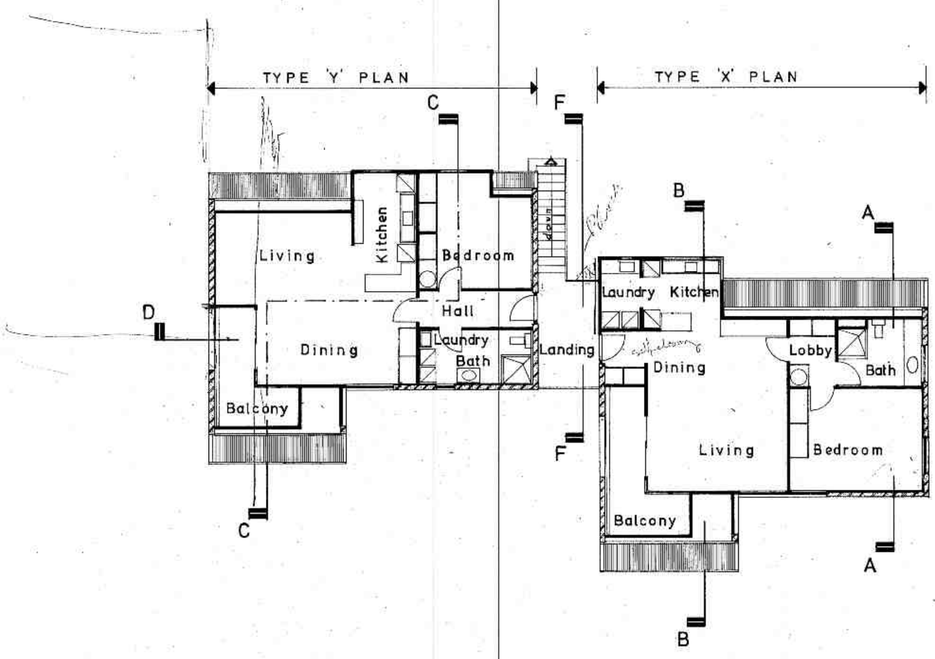


REFERENCE	
SYMBOL	DESCRIPTION
⌖	EXISTING GROUND LEVELS
F.F.L.	FINISHED FLOOR LEVEL
— — —	WATER SUPPLY
G.T.	GULLY TRAP
D.P.	DOWN PIPE
+	EXISTING TREE
	EXISTING HEDGE

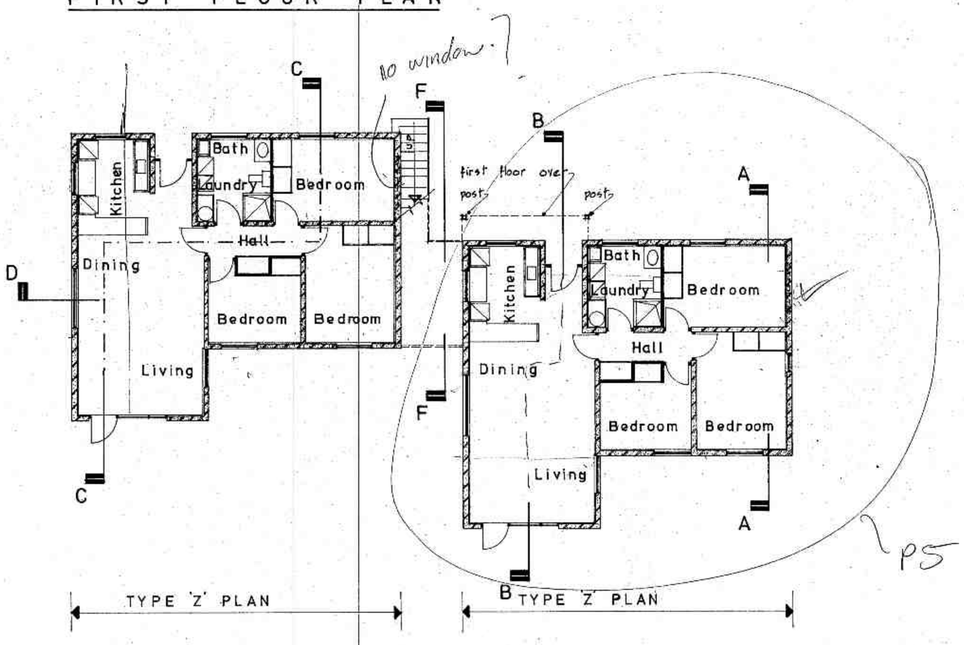
URBAN DEVELOPMENT SCHEME COTTERILL STREET for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS AND ENGINEERS: G. O. GRIFFITHS, M. J. MOFFAT, K. R. ANDERSON, G. I. H. DREWETT
232 ARMAGH ST. CHRISTCHURCH 1. PO BOX 156 PHONE 68-169

SCALE	FILE	DATE	SHEET	OF
1:200	792/1	MAY 1976	1	18

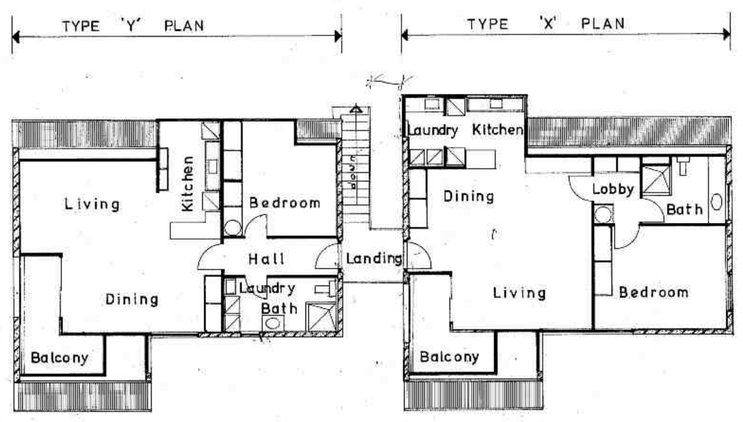


FIRST FLOOR PLAN

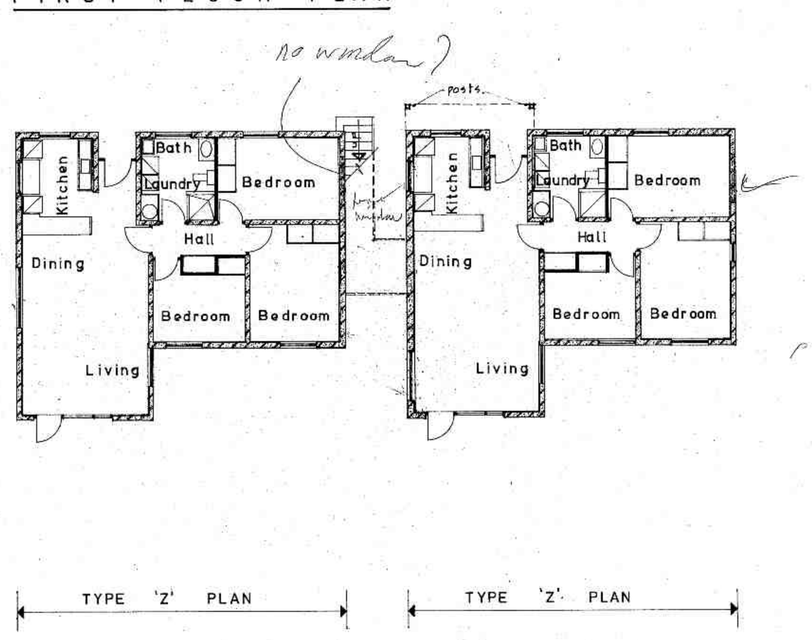


GROUND FLOOR PLAN

BLOCK TYPE A



FIRST FLOOR PLAN

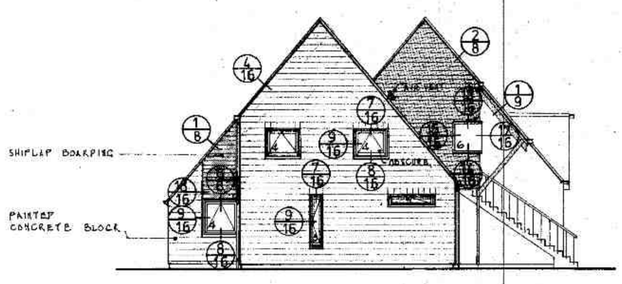


GROUND FLOOR PLAN

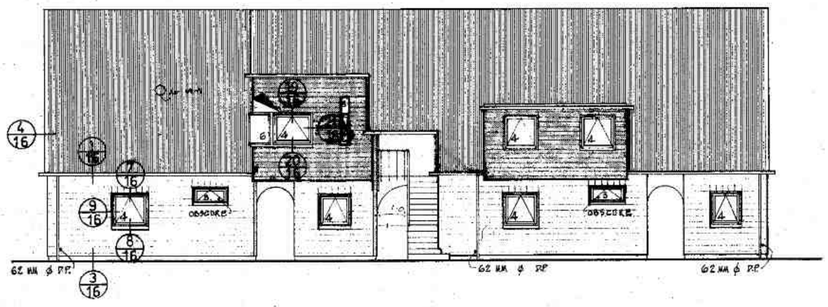
BLOCK TYPE B

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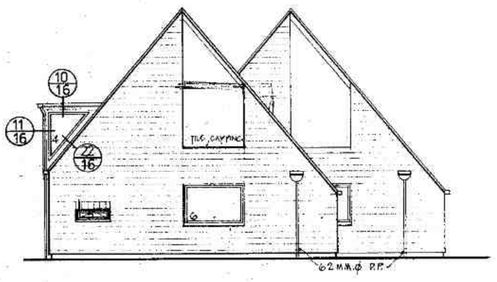
GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT G.I.H. DREWETT	K.R. ANDERSON E.J.L. HEYMEL	1:100	APRIL 1976	792/1	2	18
232 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 156	PHONE 68-189				



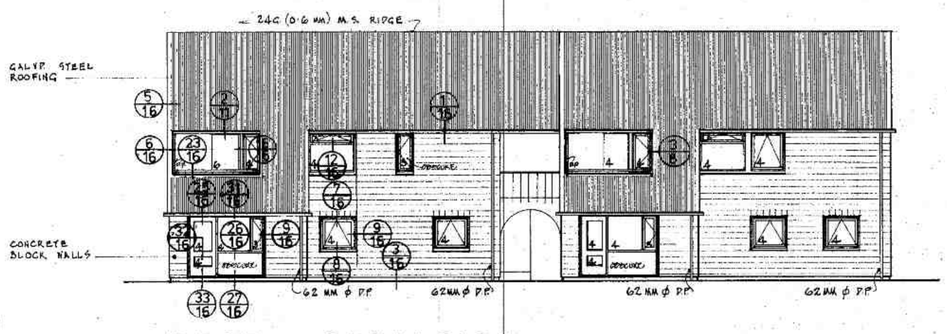
SOUTH ELEVATION



EAST ELEVATION

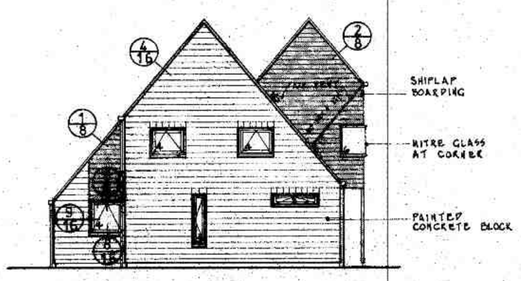


NORTH ELEVATION



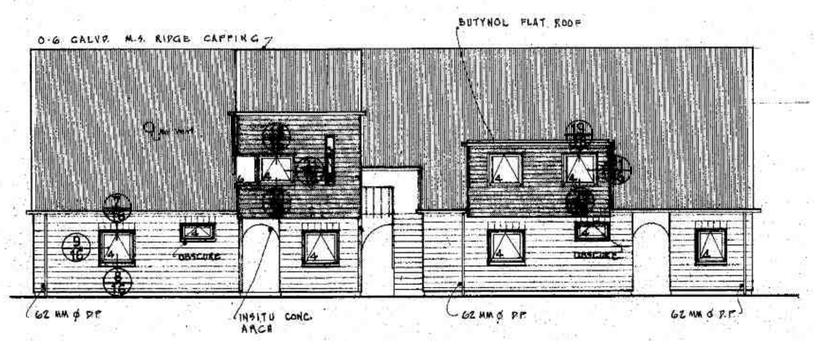
WEST ELEVATION

TYPE 'A' BLOCK

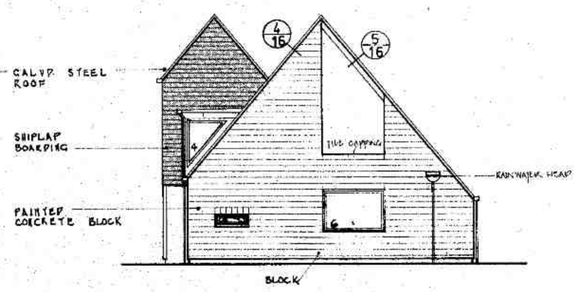


line 12

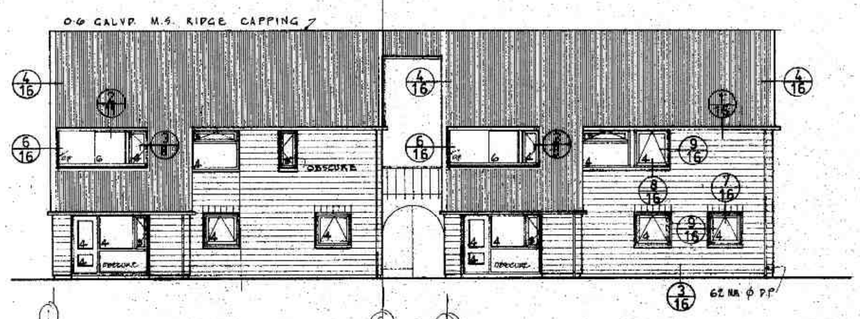
SOUTH ELEVATION



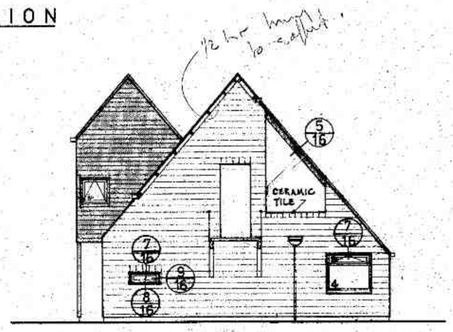
EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION



CROSS SECT. THRº STAIR

TYPE 'B' BLOCK

TYPICAL ELEVATIONS OF TYPE 'A' & TYPE 'B' BLOCKS

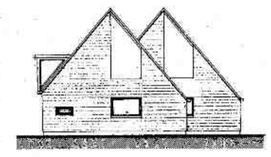
Scale · 1 : 100

URBAN DEVELOPMENT SCHEME COTTERILL STREET
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GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	M.J. MOFFAT O.I.H. DREWETT	K.B. ANDERSON E.J.L. HEYMEL	1:100	APRIL 1976	792/1	3	18
282 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 156	PHONE 68-188				



ELEVATION TO COTTERILL STREET



SOUTH ELEV.



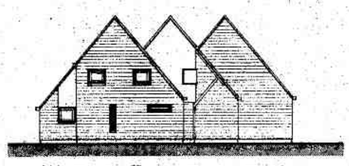
WEST ELEV. OF BLOCKS TO COTTERILL ST.



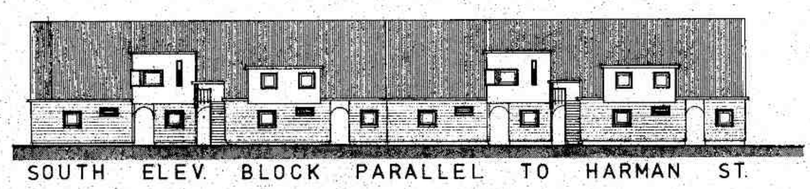
NORTH ELEV.



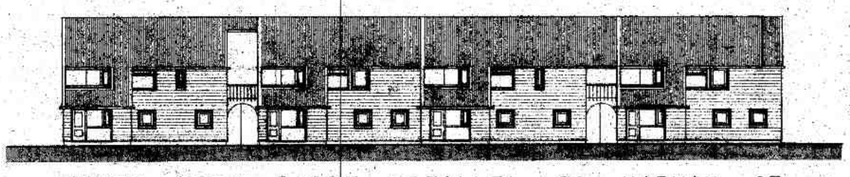
ELEV. PARTY WALL BETWEEN
UNITS No's 8 & 9 LOOKING EAST



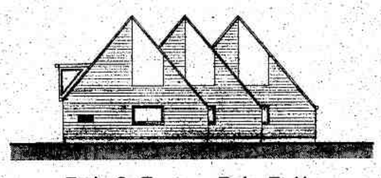
WEST ELEV.



SOUTH ELEV. BLOCK PARALLEL TO HARMAN ST.



NORTH ELEV. BLOCK PARALLEL TO HARMAN ST.



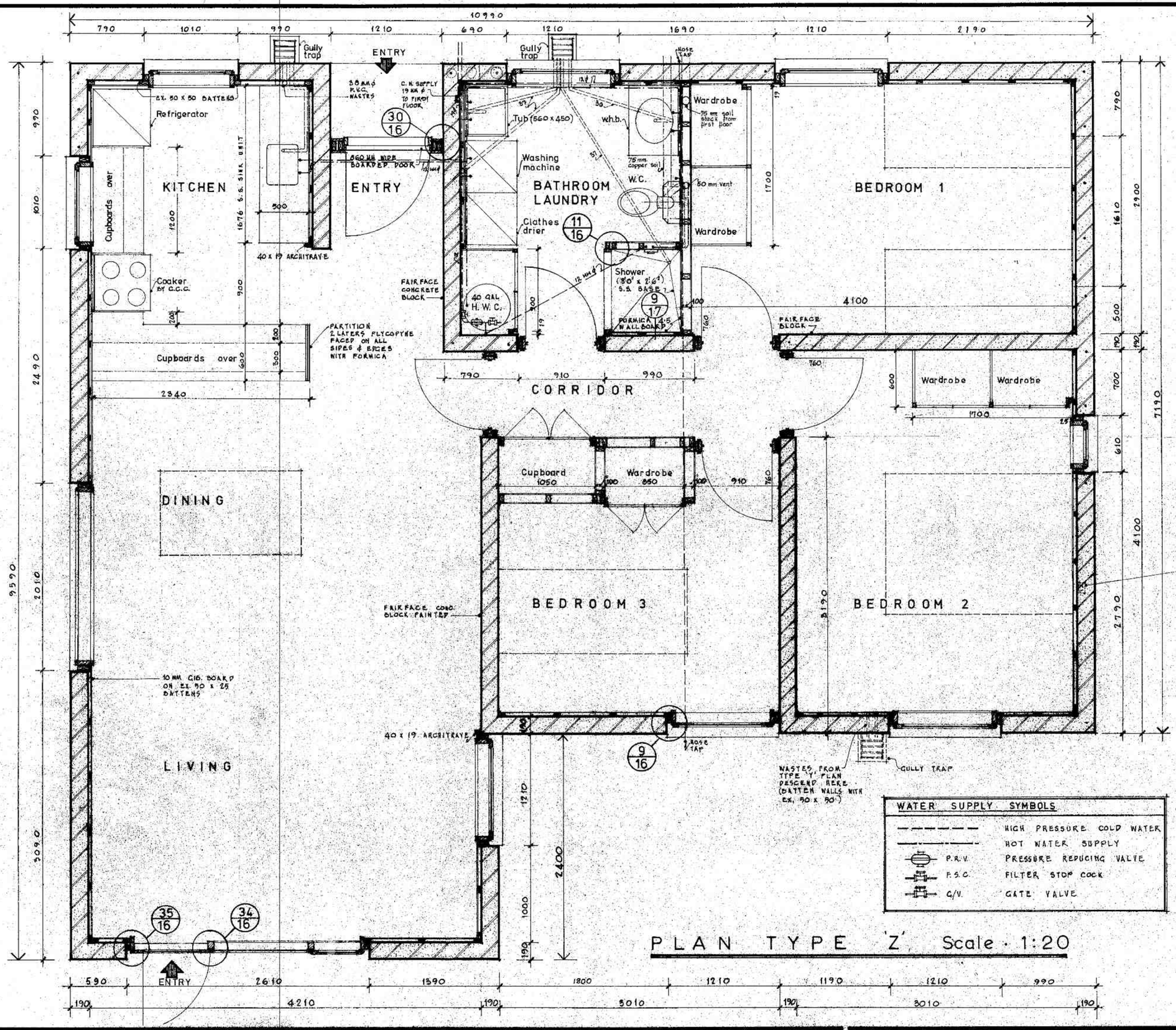
EAST ELEV.

1:200 ELEVATIONS

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GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS AND ENGINEERS: M.J. MOFFAT, G.I.H. DREWETT, K.R. ANDERSON, E.J.L. HEYMEL
233 ARMAGH STREET CHRISTCHURCH 1. PO BOX 156 PHONE 66-189

SCALE	DATE	FILE	SHEET	OF
1:20	APRIL 1976	792/1	4	18



WATER SUPPLY SYMBOLS

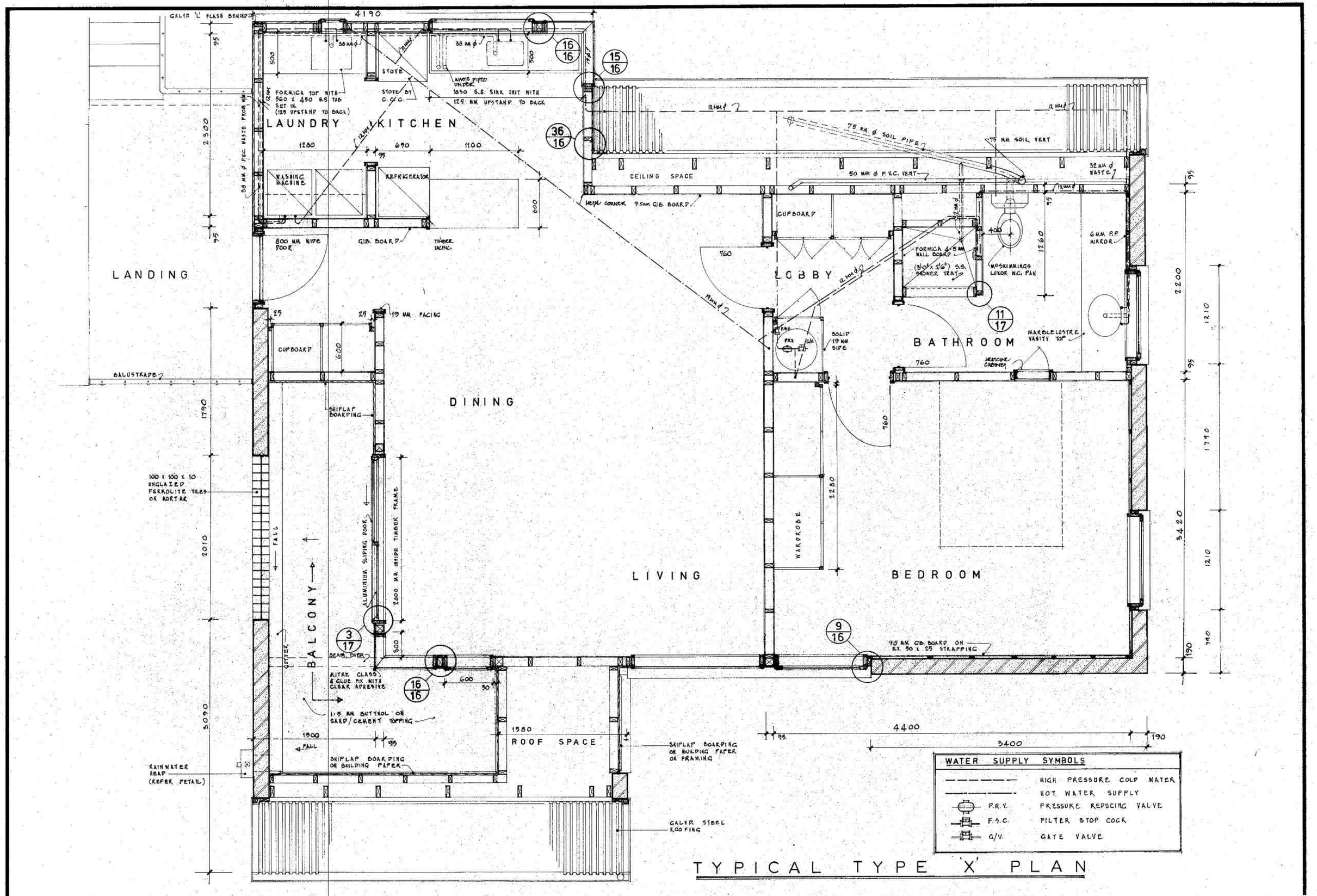
———	HIGH PRESSURE COLD WATER
———	HOT WATER SUPPLY
P.R.V.	PRESSURE REDUCING VALVE
F.S.C.	FILTER STOP COCK
G/V.	GATE VALVE

PLAN TYPE 'Z' Scale · 1:20

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GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT	K.R. ANDERSON	1:20	APRIL 1976	792/1	5	18
	O.I.H. DREWETT	E.J.L. KEYMEL					

882 ARMAGH STREET CHRISTCHURCH 1. PO BOX 158 PHONE 66-168

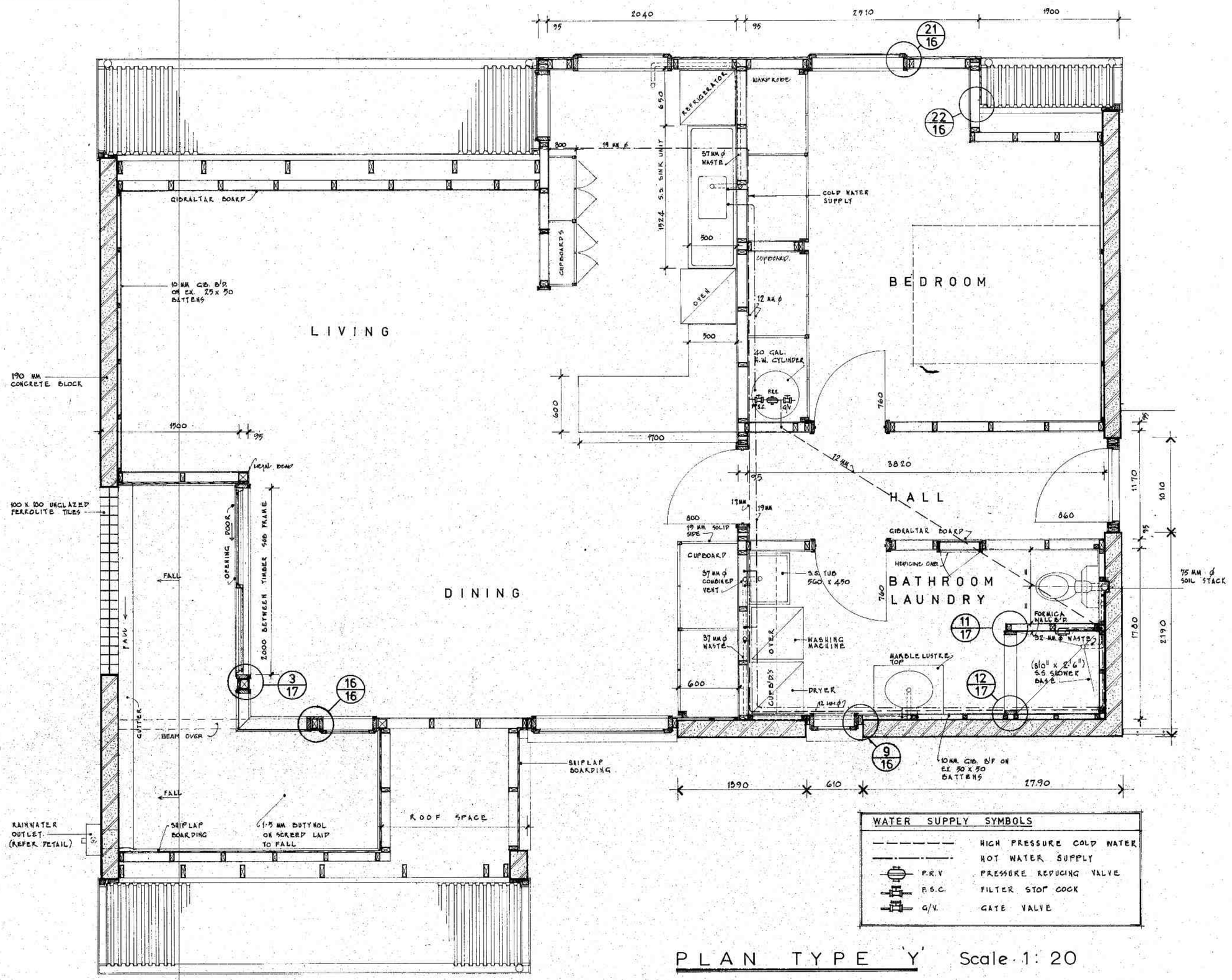


TYPICAL TYPE 'X' PLAN

URBAN DEVELOPMENT SCHEME COTTERILL STREET
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GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT G.I.H. DREWETT	K.R. ANDERSON E.J.L. HEYMEL	1:20	APRIL 1976	792/1	6	18

282 ARMAGH STREET CHRISTCHURCH 1. PO BOX 158 PHONE 88-188



WATER SUPPLY SYMBOLS

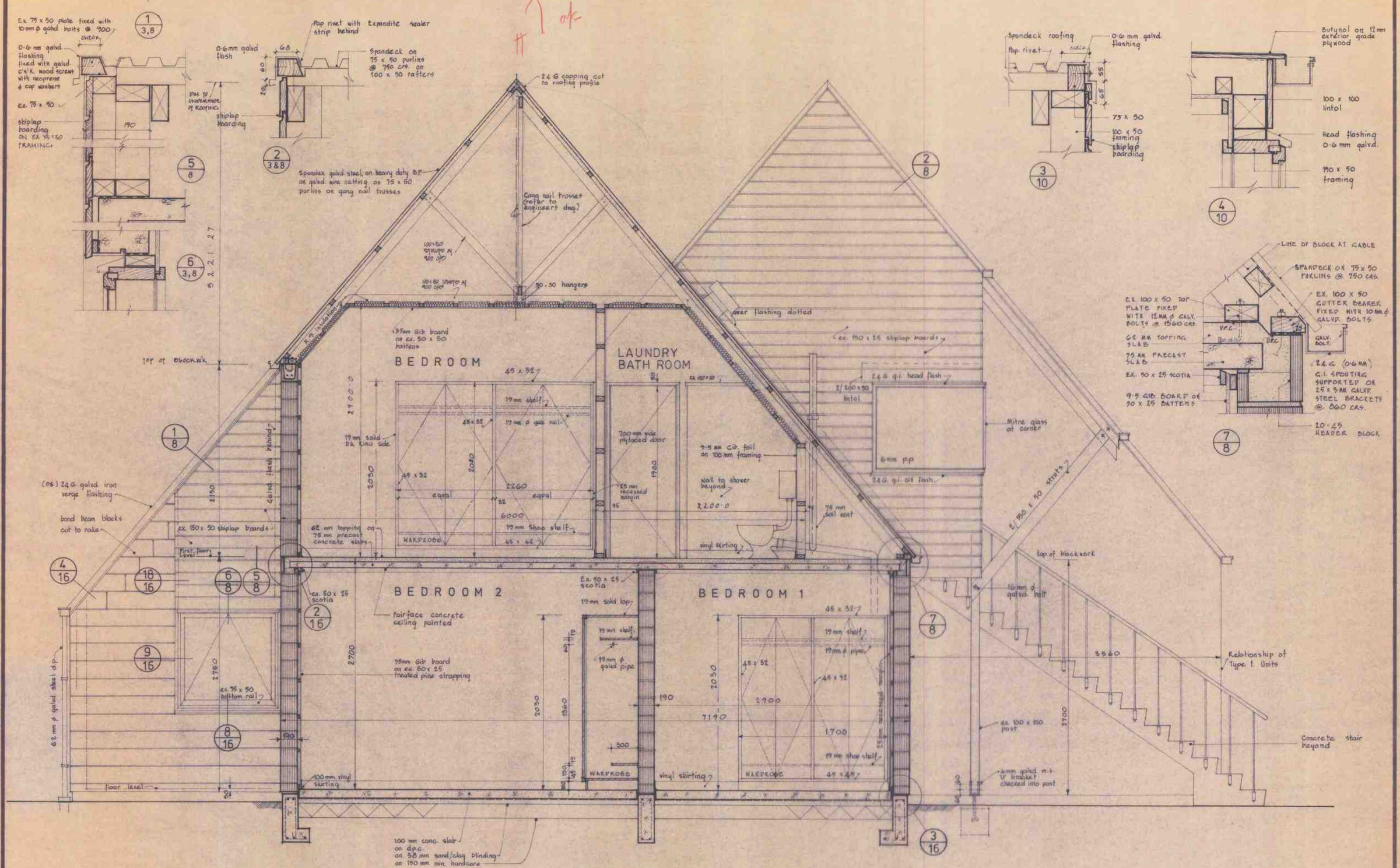
———	HIGH PRESSURE COLD WATER
—·—·—	HOT WATER SUPPLY
P.R.V	PRESSURE REDUCING VALVE
P.S.C.	FILTER STOP COCK
G/V.	GATE VALVE

PLAN TYPE 'Y' Scale 1:20

URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT	K.R. ANDERSON	1:20	APRIL 1976	792/1	7	18
	O.I.H. DREWETT	E.J.L. HEYMEL					

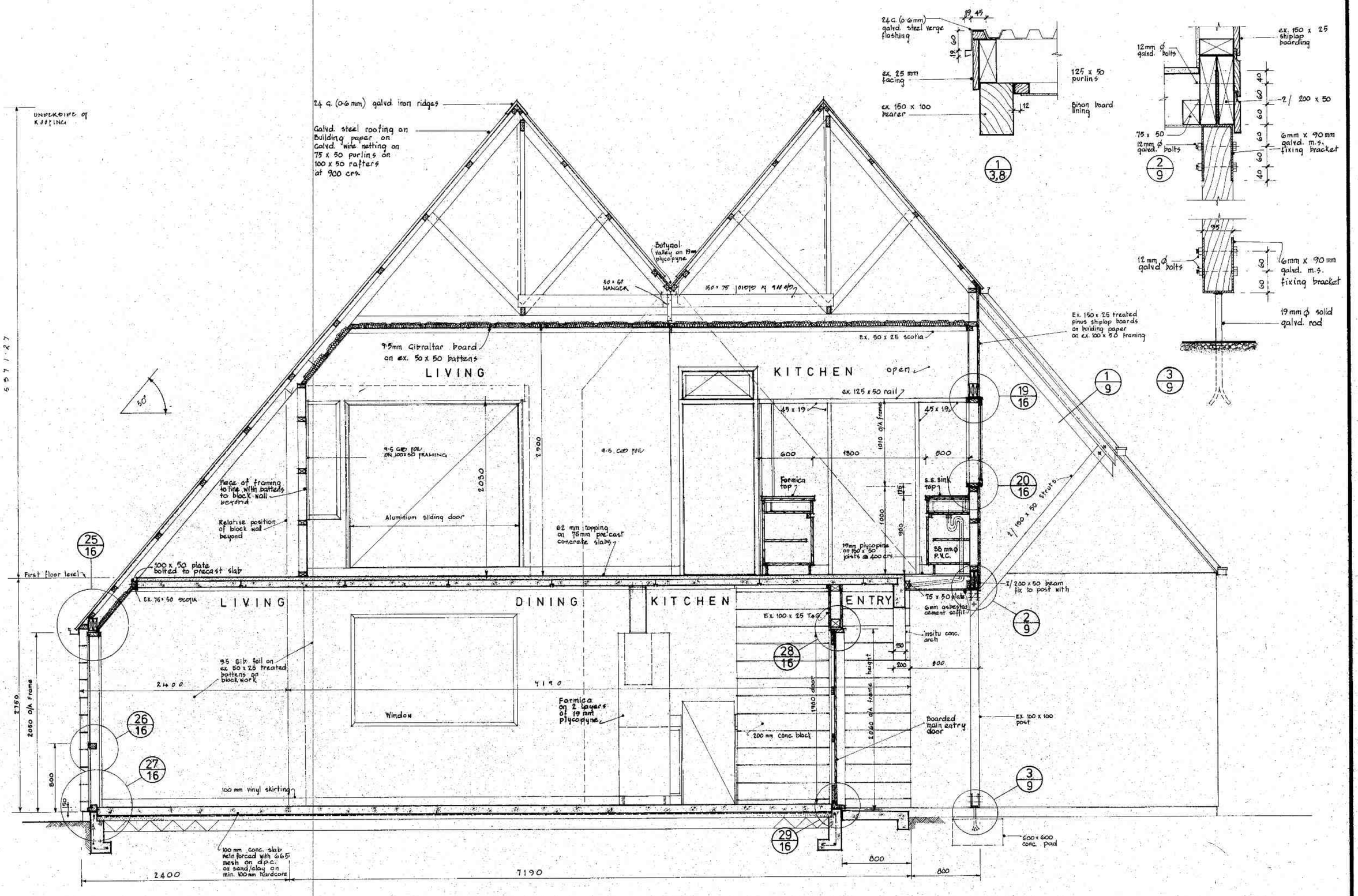
382 ARMAGH STREET CHRISTCHURCH 1. PO BOX 156 PHONE 88-188



CROSS SECTION A-A scale: 1:20

URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

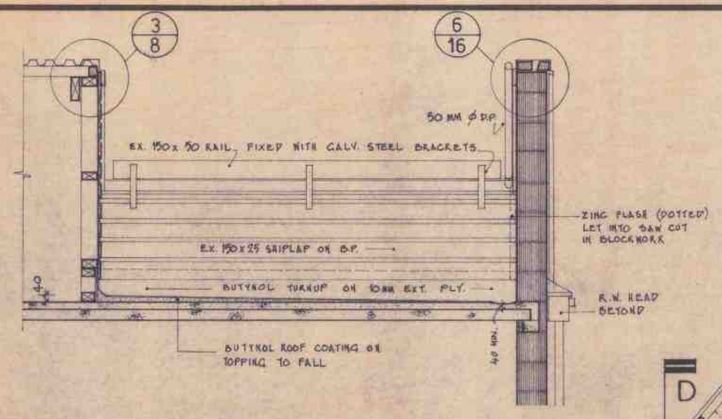
GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT G.I.H. DREWETT	K.R. ANDERSON E.J.L. HEYMEL	1:20 1:5	APRIL 1976	792/1	8	18
339 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 156	PHONE 65-169				



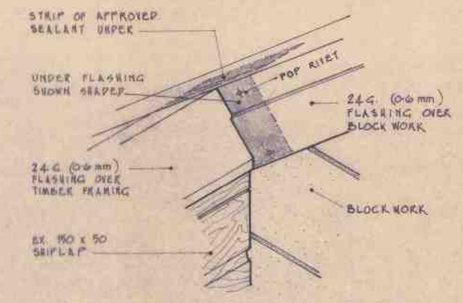
CROSS SECTION B-B scale: 1:20

URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

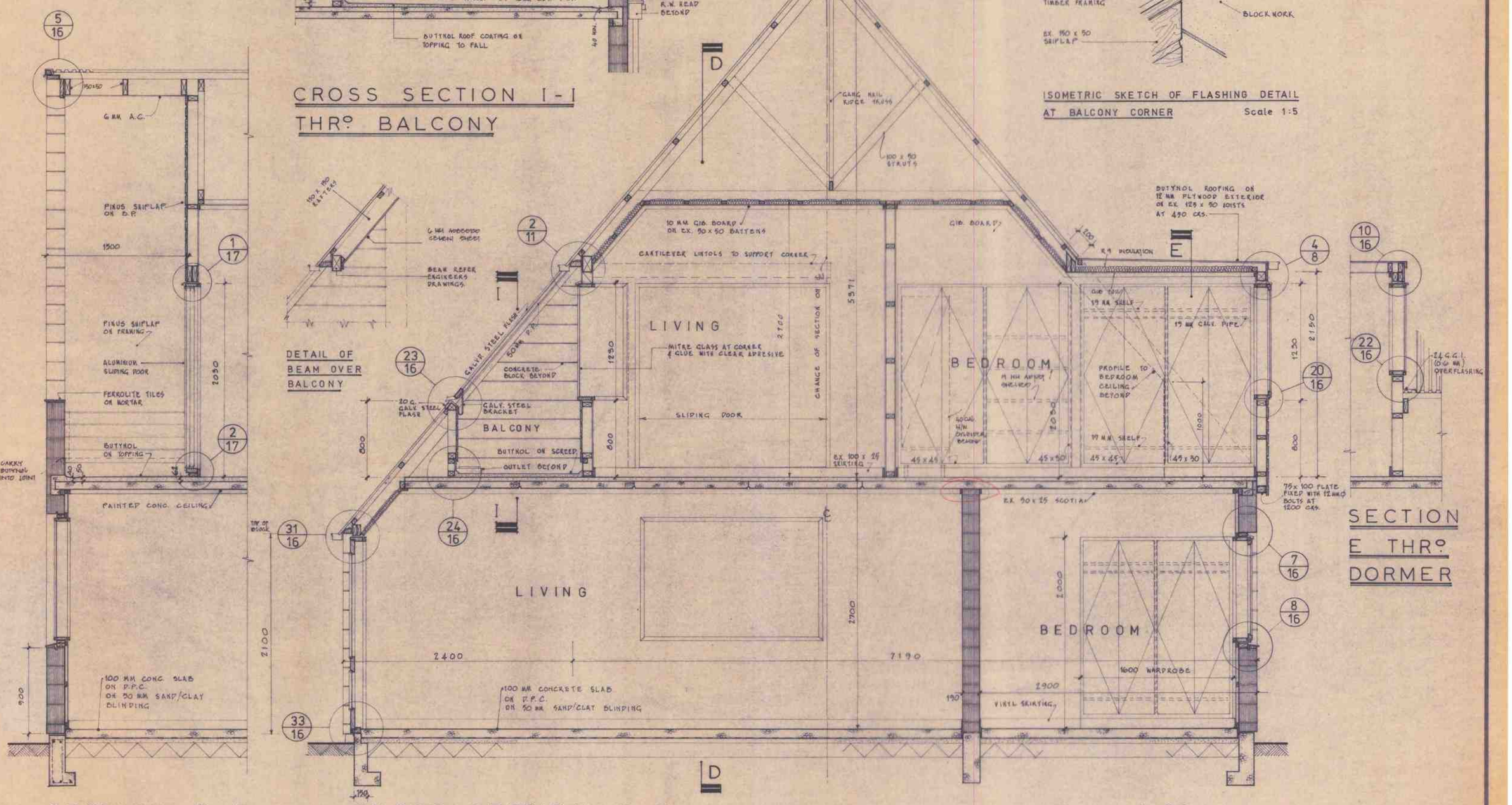
GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	M.J. MOFFAT, G.I.H. DREWETT	K.B. ANDERSON, E.J.L. HEYMEL	1 20	APRIL 1976	792/1	9	18
232 ARMAGH STREET CHRISTCHURCH 1		PO BOX 156	PHONE 69-182				



CROSS SECTION I-I THRº BALCONY



ISOMETRIC SKETCH OF FLASHING DETAIL AT BALCONY CORNER Scale 1:5



SECTION E THRº DORMER

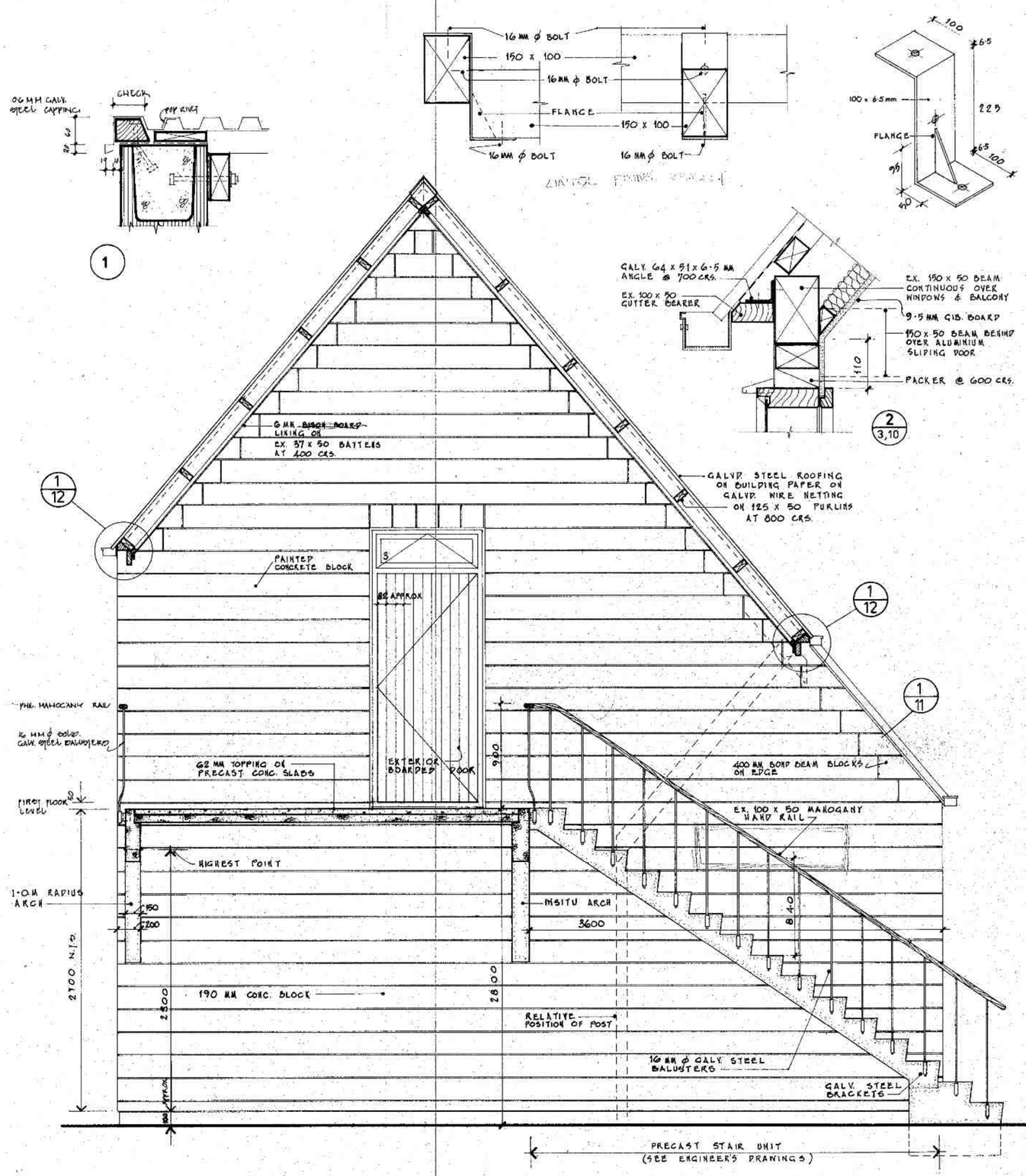
SECTION D–D

CROSS SECTION C–C

Scale· 1:20

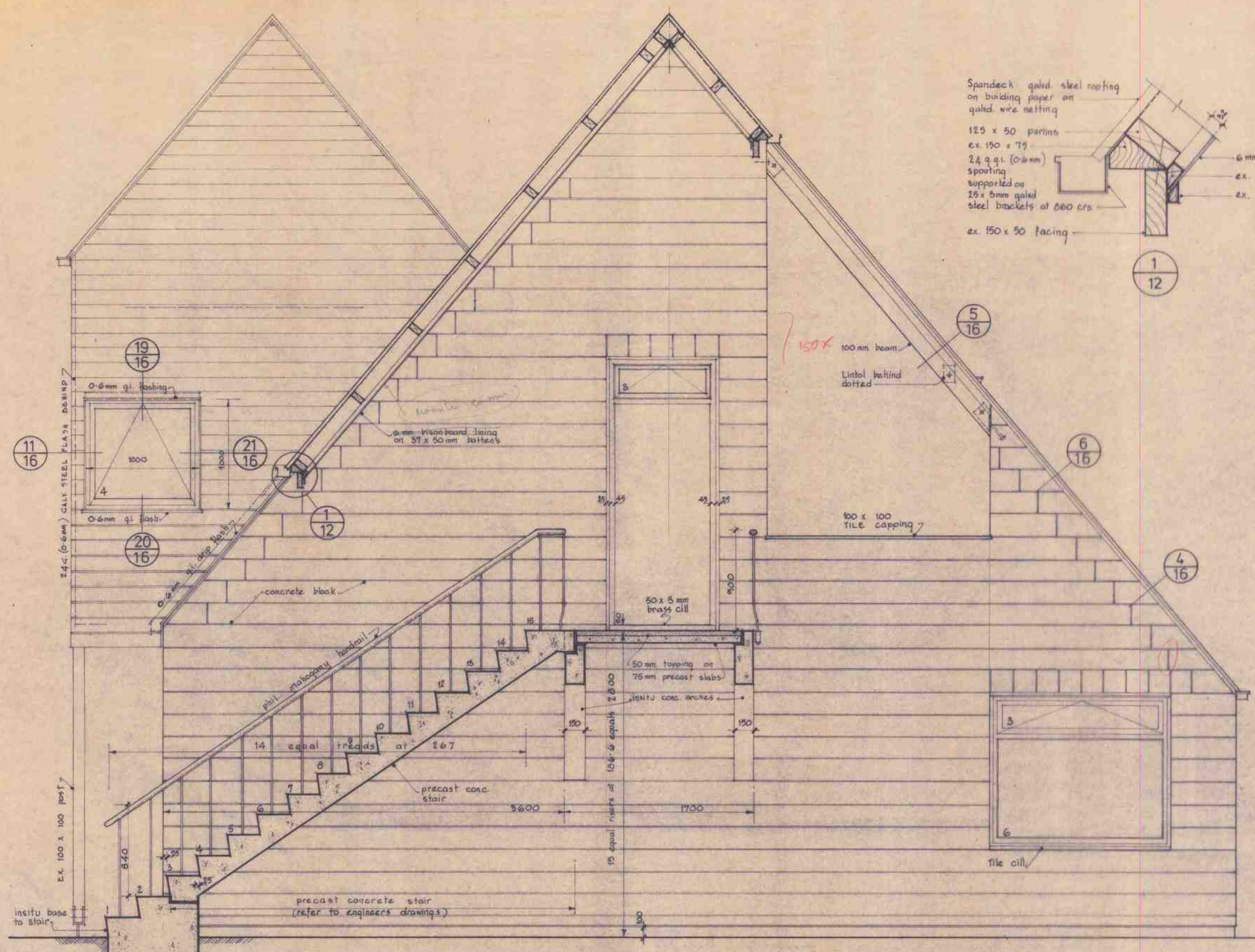
URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	M.J. MOFFAT	K.B. ANDERSON	1:20 & as shown	APRIL 1976	792/1	10	18
	G.I.H. DREWETT	E.J.L. HEYMEL					
332 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 156	PHONE 68-159				



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GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT G.I.H. DREWETT	K.R. ANDERSON E.J.L. HEYMEL	1:20 1:5	APRIL 1976	792/1	11	18
232 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 158	PHONE 66-189				



CROSS SECTION THRº STAIR TO BLOCK TYPE B

END ELEVATION OF STAIR

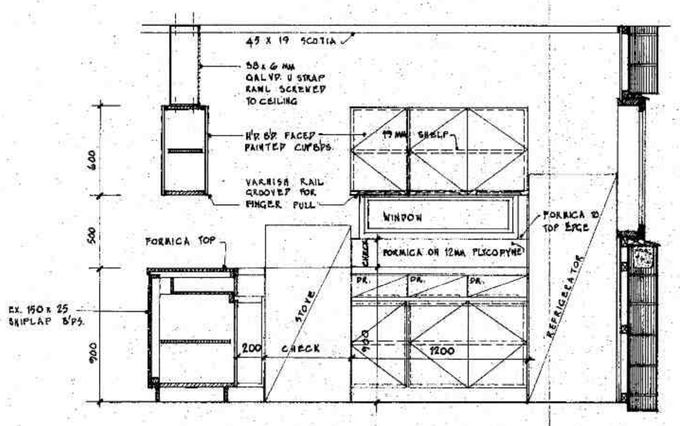
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PLAN OF STAIR

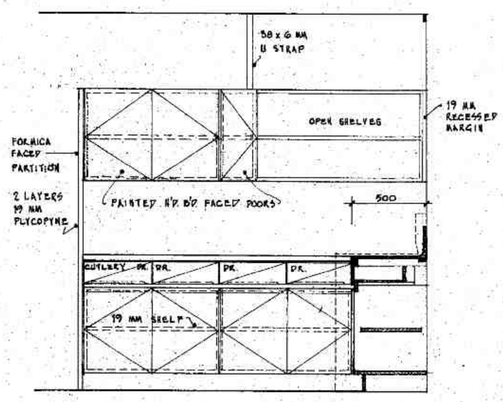
URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	M.J. MOFFAT	K.R. ANDERSON	1:20	APRIL	792/1	12	18
	G.I.H. DREWETT	E.J.L. HEYMEL	1:5	1976			

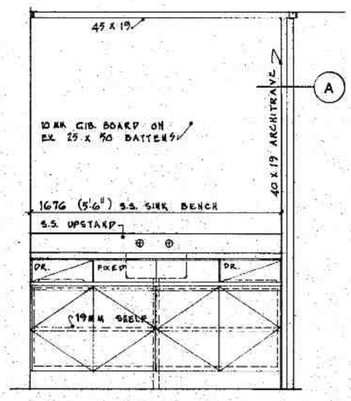
833 ARMAGH STREET CHRISTCHURCH 1. PO BOX 186 PHONE 88-189



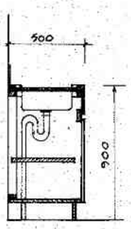
EXTERIOR WALL ELEVATION · KITCHEN



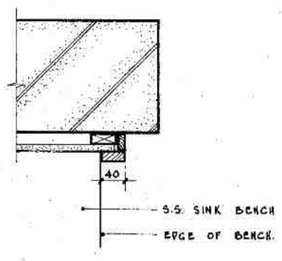
ELEVATION · SERVERY UNIT



ELEVATION · SINK UNIT

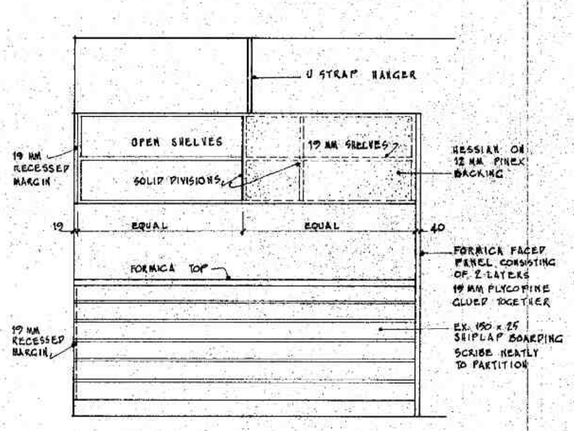


SECTION

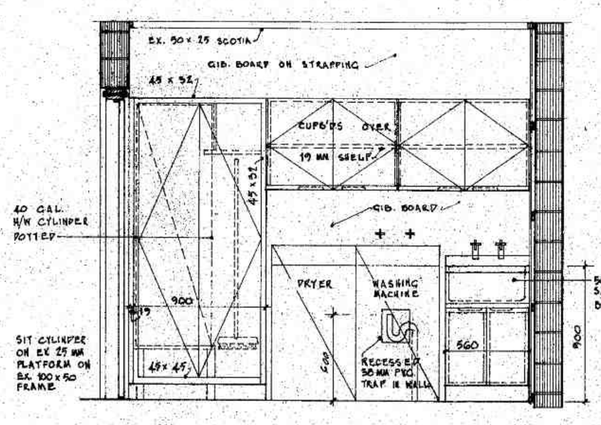


DETAIL OF WALL GIVING FINISH AT (A) ABOVE SINK BENCH

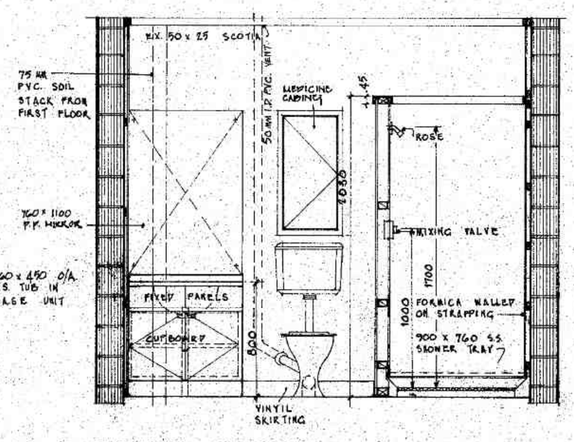
Scale · 1:5



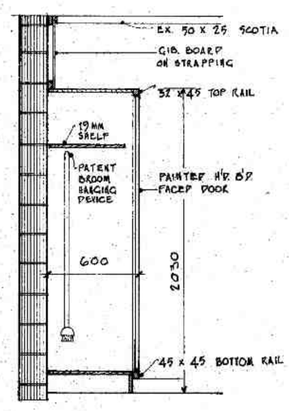
ELEVATION SERVERY UNIT TO DINING



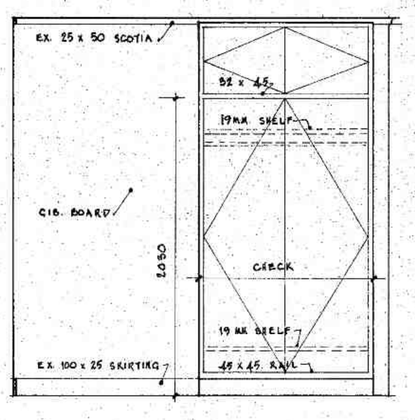
ELEVATION · LAUNDRY



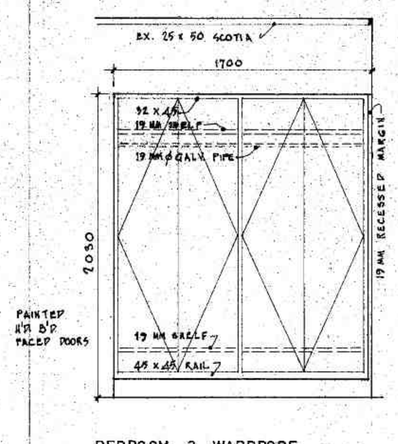
ELEVATION BATHROOM



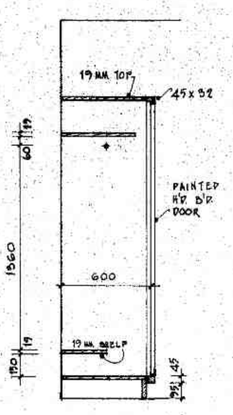
SECTION CYLINDER CUP'D



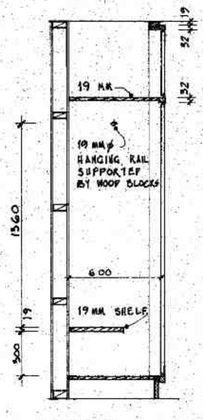
BEDROOM 3 WARDROBE



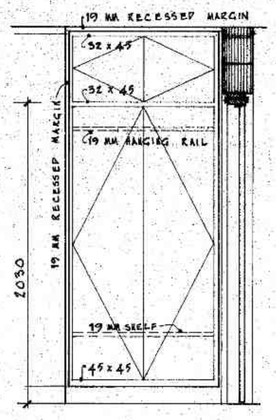
BEDROOM 2 WARDROBE



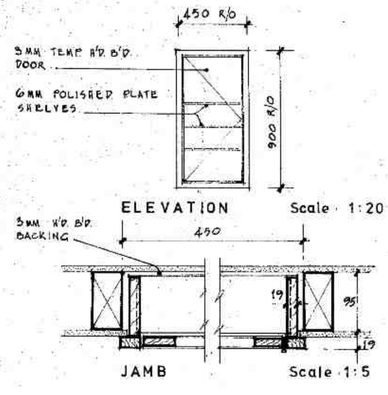
SECTION WARDROBE



SECTION COAT CUPBOARD



ELEVATION COAT CUPBOARD



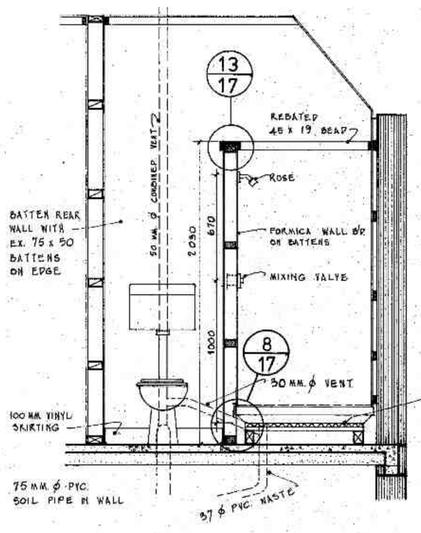
MEDICINAL CABINET DETAILS (Plans X, Y & Z)

INTERNAL ELEVATIONS · PLAN Z Scale · 1:20

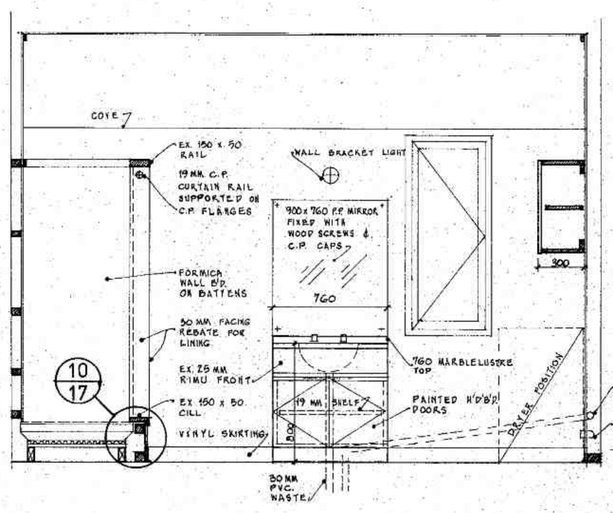
URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS:	M.J. MOFFAT, G.I.H. DREWETT	K.R. ANDERSON, E.J.L. HEYMEL	1:20	APRIL 1976	792/1	13	18

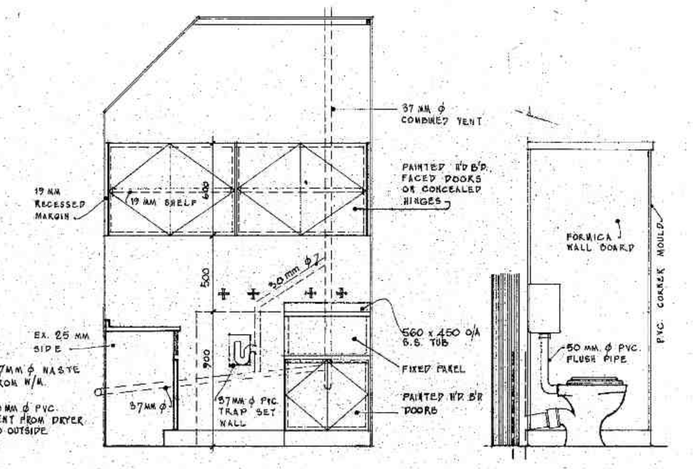
233 ARMAGH STREET CHRISTCHURCH 1. PO BOX 156 PHONE 68-189



CROSS SECTION · SHOWER

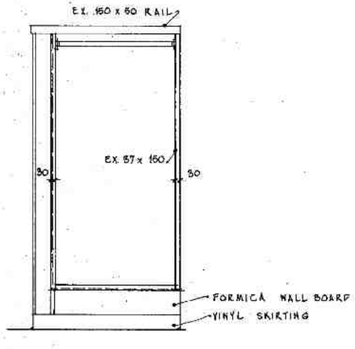


ELEVATION · EXTERIOR WALL



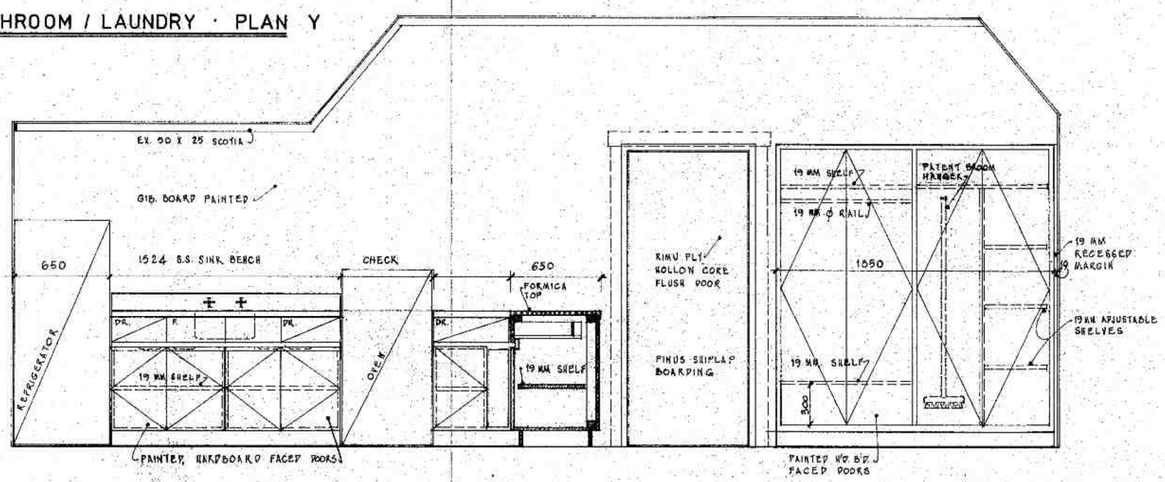
ELEVATION · LAUNDRY FITTINGS

SIDE ELEVATION · SHOWER

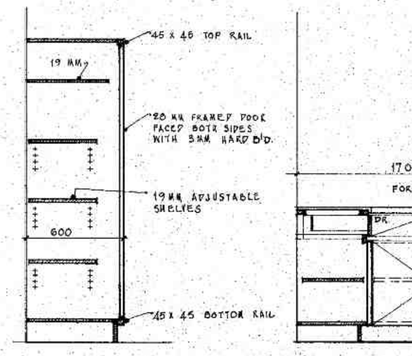


FRONT ELEVATION · SHOWER

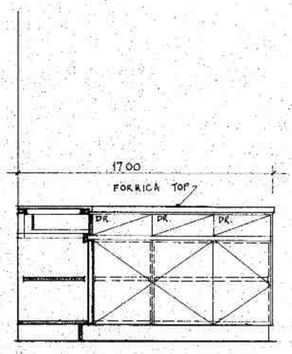
BATHROOM / LAUNDRY · PLAN Y



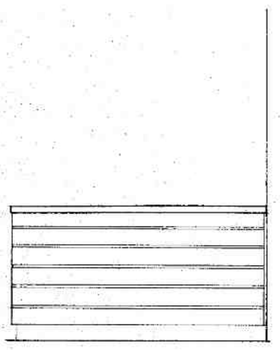
ELEVATION · INTERNAL WALL



SECTION STORAGE CUPB'D.

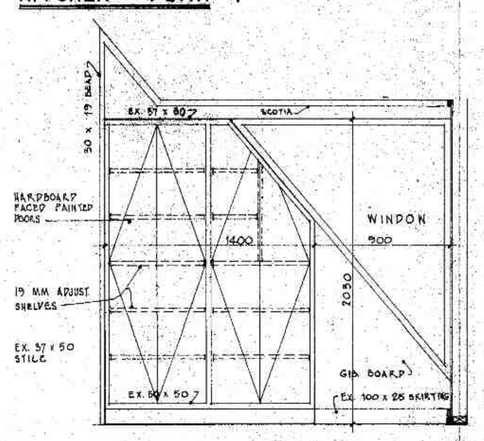


ELEVATION TO SERVERY

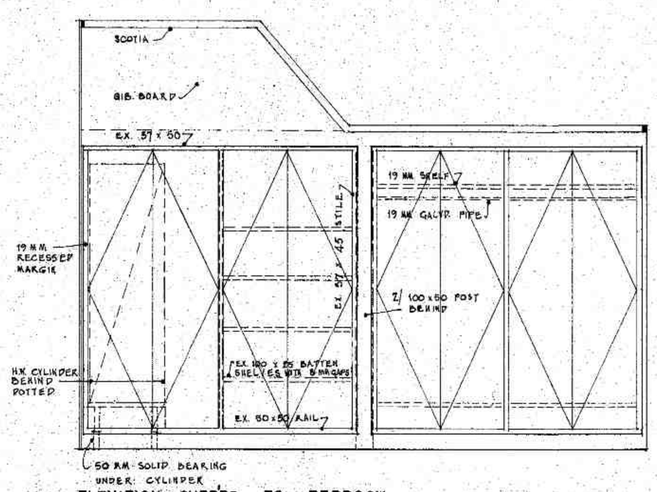


ELEVATION TO DINING AREA

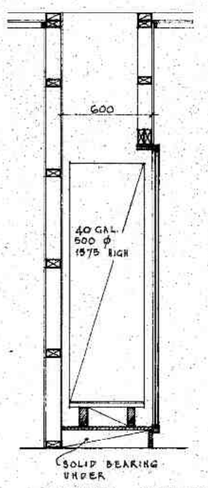
KITCHEN · PLAN Y

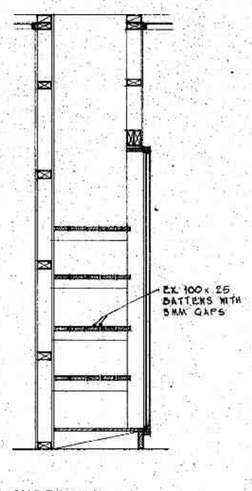


ELEVATION · STORAGE TO KITCHEN



ELEVATION · CUPBDS. TO BEDROOM

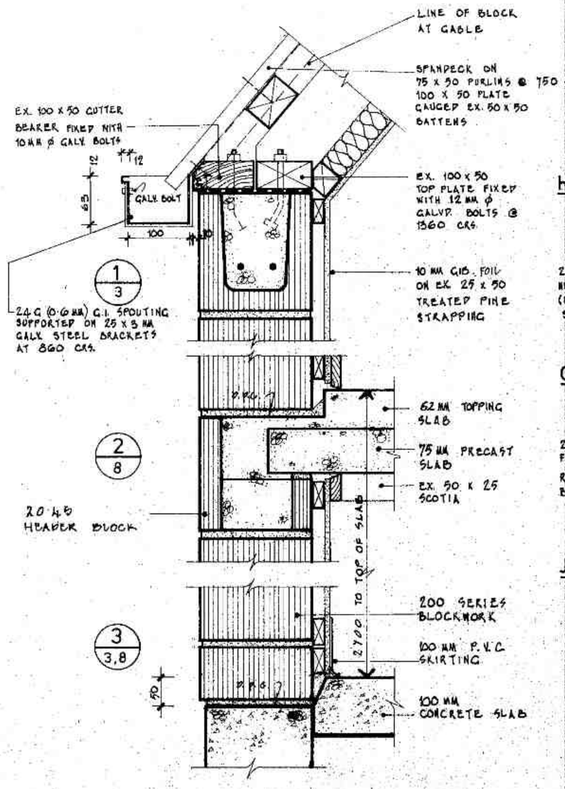


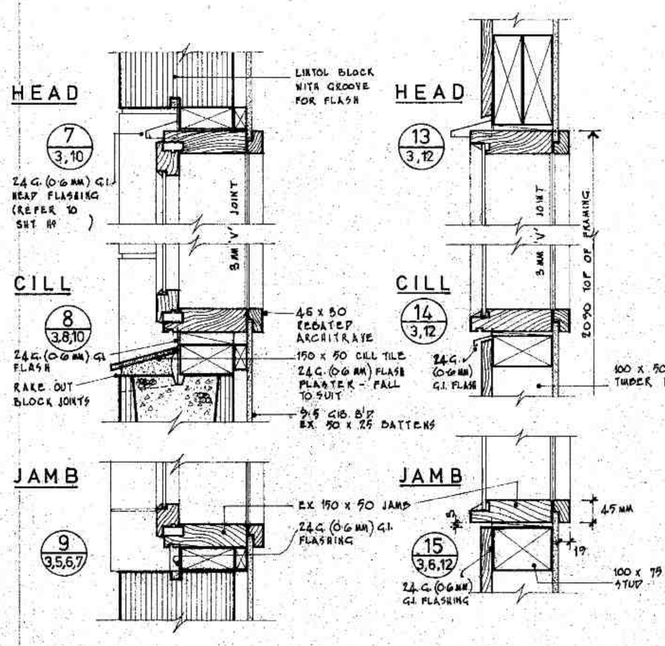


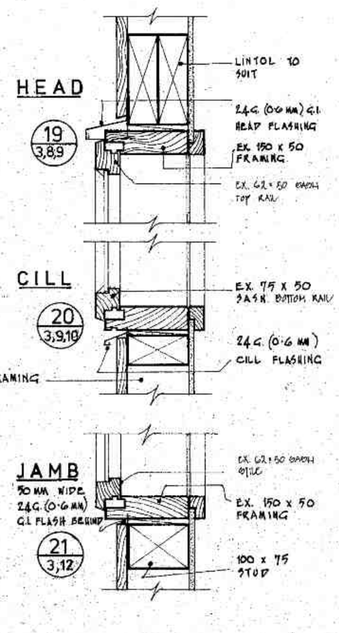
SECTIONS · CYLINDER CUPBOARD

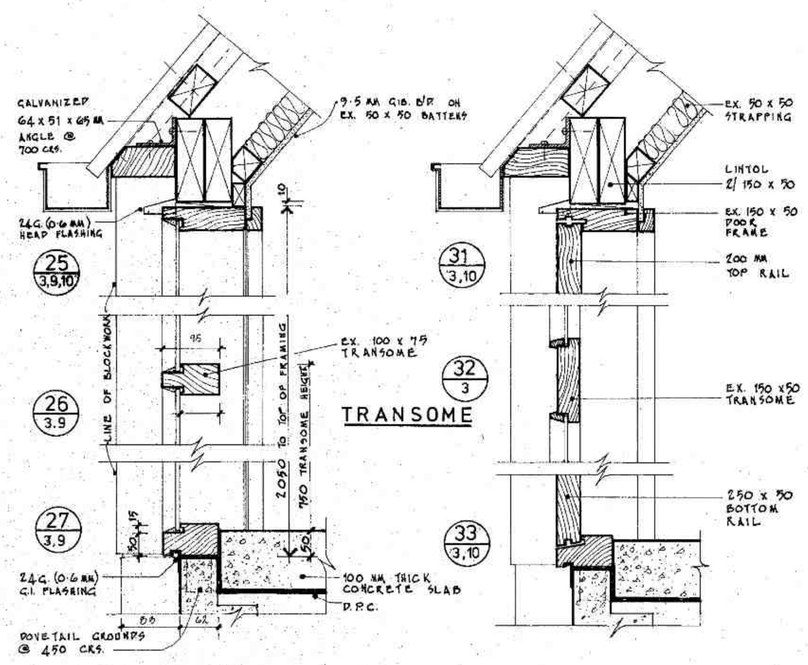
URBAN DEVELOPMENT SCHEME COTTERILL STREET
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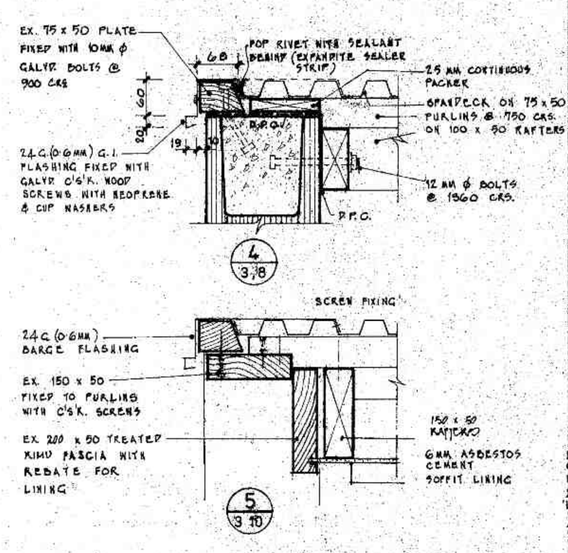
GRIFFITHS MOFFAT & PARTNERS			SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS	M.J. MOFFAT G.I.H. DREWETT	K.R. ANDERSON E.J.L. REYMEL	1:20	APRIL 1976	792/1	15	18
282 ARMAGH STREET CHRISTCHURCH 1.		PO BOX 156 PHONE 68-189					

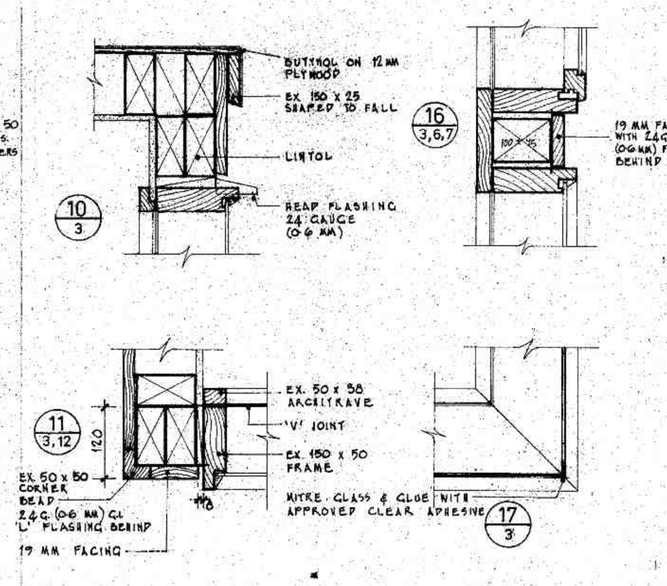


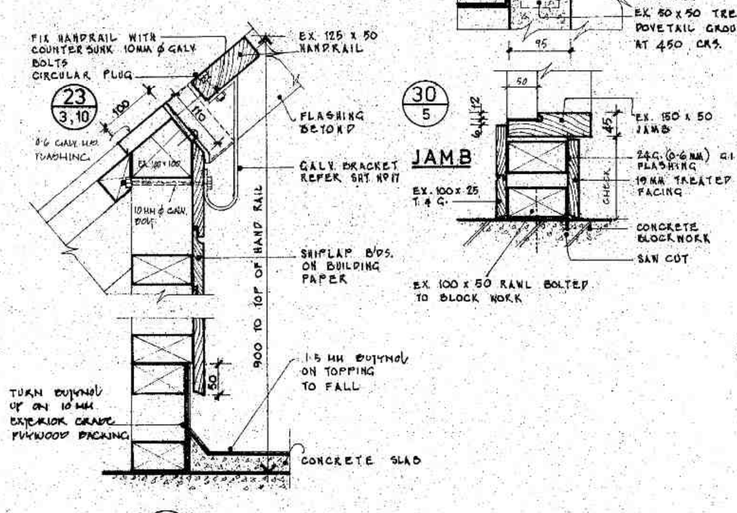


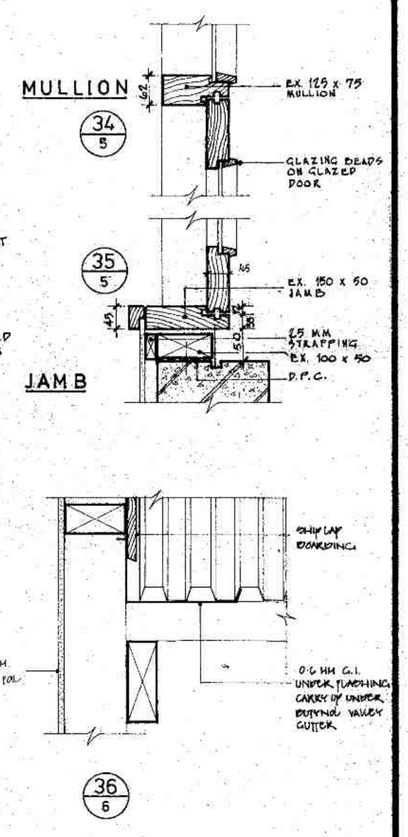








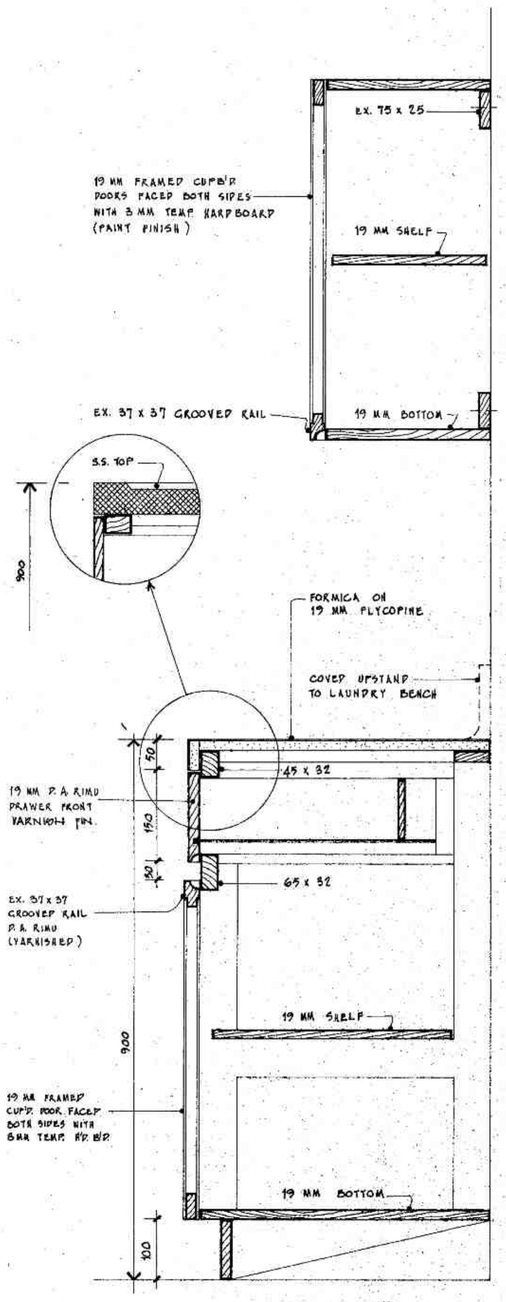




URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

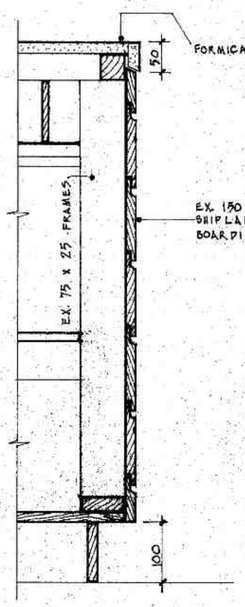
GRIFFITHS MOFFAT & PARTNERS	SCALE	DATE	FILE	SHEET	OF
ARCHITECTS AND ENGINEERS: M.J. MOFFAT K.R. ANDERSON G.H. DREWETT B.J.L. HEYMEL	1:5	APRIL 1976	792/1	16	18

233 ARMAGH STREET CHRISTCHURCH 1. PO BOX 156 PHONE 68-189

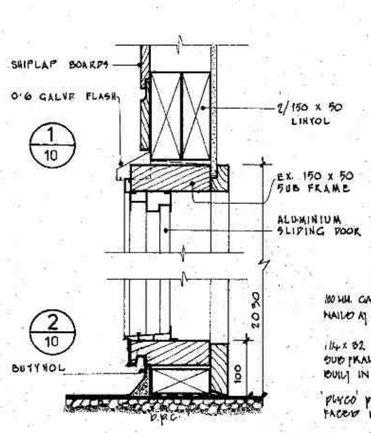


TYPICAL CROSS SECTION THRº KITCHEN BENCH & CUPBOARDS

Scale · 1:5

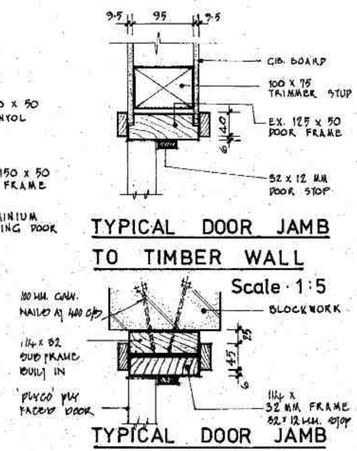


CROSS SECTION OF BOARDED FRONT TO SERVERY BENCH

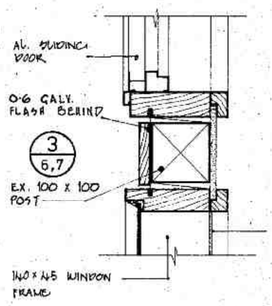


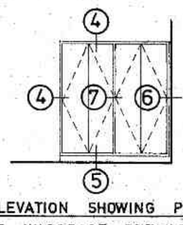
TYPICAL DOOR JAMB TO TIMBER WALL

Scale · 1:5



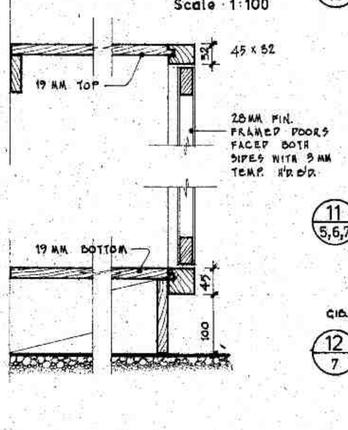
TYPICAL DOOR JAMB TO BLOCK WALL

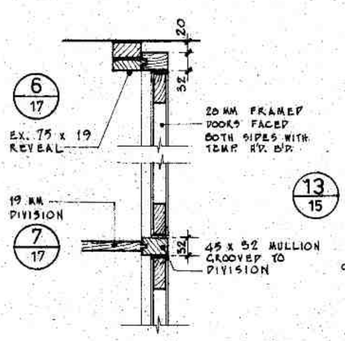




ELEVATION SHOWING POSITION OF WARDROBE DETAILS

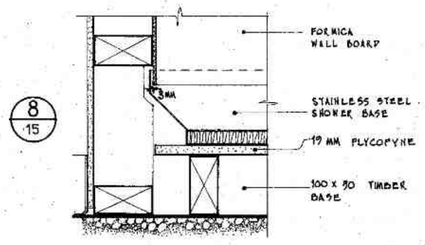
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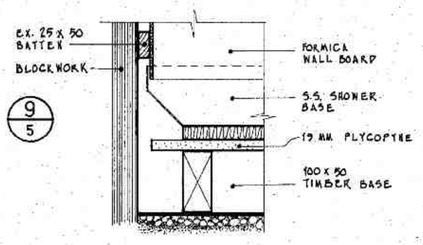


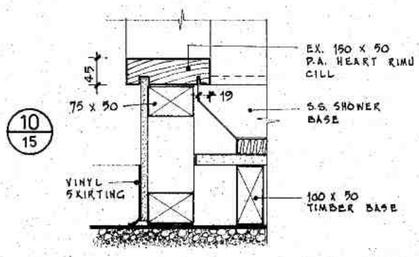


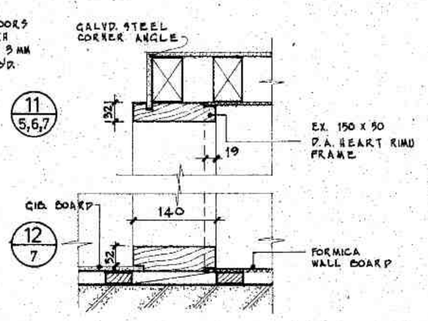
TYPICAL WARDROBE & FULL HEIGHT CUPBOARD DETAILS

Scale · 1:5



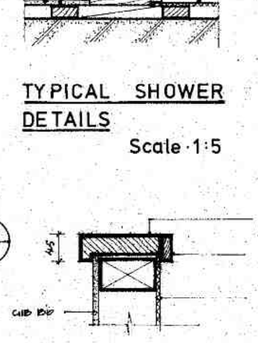


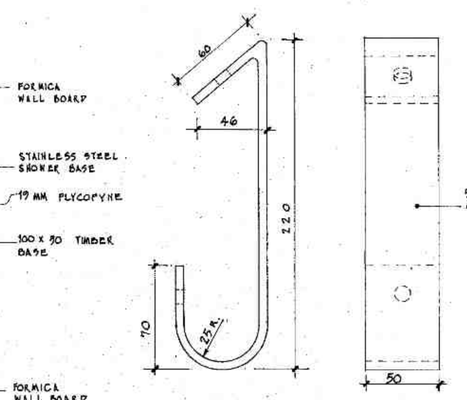




TYPICAL SHOWER DETAILS

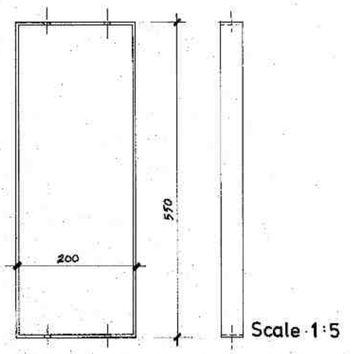
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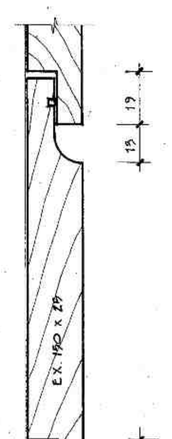
DETAIL OF BALCONY HANDRAIL BRACKET

Scale · 1:2

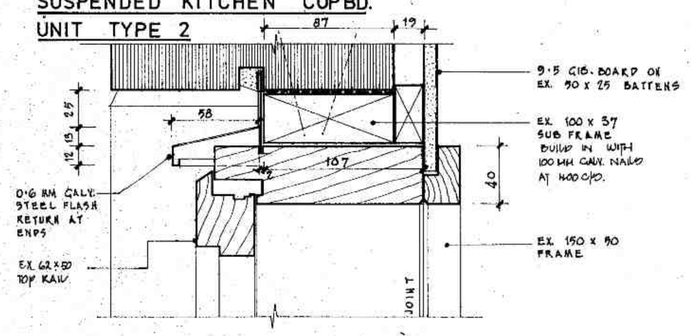


Scale · 1:5

DETAIL OF HANGER TO SUSPENDED KITCHEN CUPB'D. UNIT TYPE 2



F. S. PROFILE OF SHIPLAP BOARDS



1/2 FULL SIZE DETAILS OF TYPICAL WINDOW TO BLOCK WALL

URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL

GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS AND ENGINEERS: M.J. MOFFAT, G.I.H. DREWETT, K.R. ANDERSON, E.J.L. HEYMEL
232 ARMAGH STREET CHRISTCHURCH 1. PO BOX 158 PHONE 68-189

SCALE	DATE	FILE	SHEET	OF
1:5	APRIL 1976	792/1	17	18

Appendix A3/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Blocks D,E,F and G				Reviewer:	Stephen Lee	
		Unit	No:	Street	CPEng No:	1006840	
Building Address:			85	Poulson	Company:	GHD	
Legal Description:					Company project number:	513090277	
					Company phone number:	6433780900	
		Degrees	Min	Sec			
GPS south:					Date of submission:		
GPS east:					Inspection Date:		
					Revision:	Final	
Building Unique Identifier (CCC):	BE 1110 007-010 EQ2				Is there a full report with this summary?	yes	

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	2	single storey = 1	Ground floor elevation (Absolute) (m):		
Ground floor split?	no		Ground floor elevation above ground (m):		
Storeys below ground	0				
Foundation type:	strip footings		if Foundation type is other, describe:		
Building height (m):	5.40		height from ground to level of uppermost seismic mass (for IEP only) (m):	3.8	
Floor footprint area (approx):	71				
Age of Building (years):	34		Date of design:	1965-1976	
Strengthening present?	no		If so, when (year)?		
			And what load level (%g)?		
Use (ground floor):	multi-unit residential		Brief strengthening description:		
Use (upper floors):	multi-unit residential				
Use notes (if required):					
Importance level (to NZS1170.5):	IL2				

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	3.6, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:	fully filled concrete masonry	#N/A	

Lateral load resisting structure

Lateral system along:	fully filled CMU	**Note: Define along and across in**		
Ductility assumed, μ:	1.25	**detailed report!**	note total length of wall at ground (m):	
Period along:	0.30	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.30	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:	cast insitu	notes	
Wall cladding:	brick or tile	describe (note cavity if exists)	
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

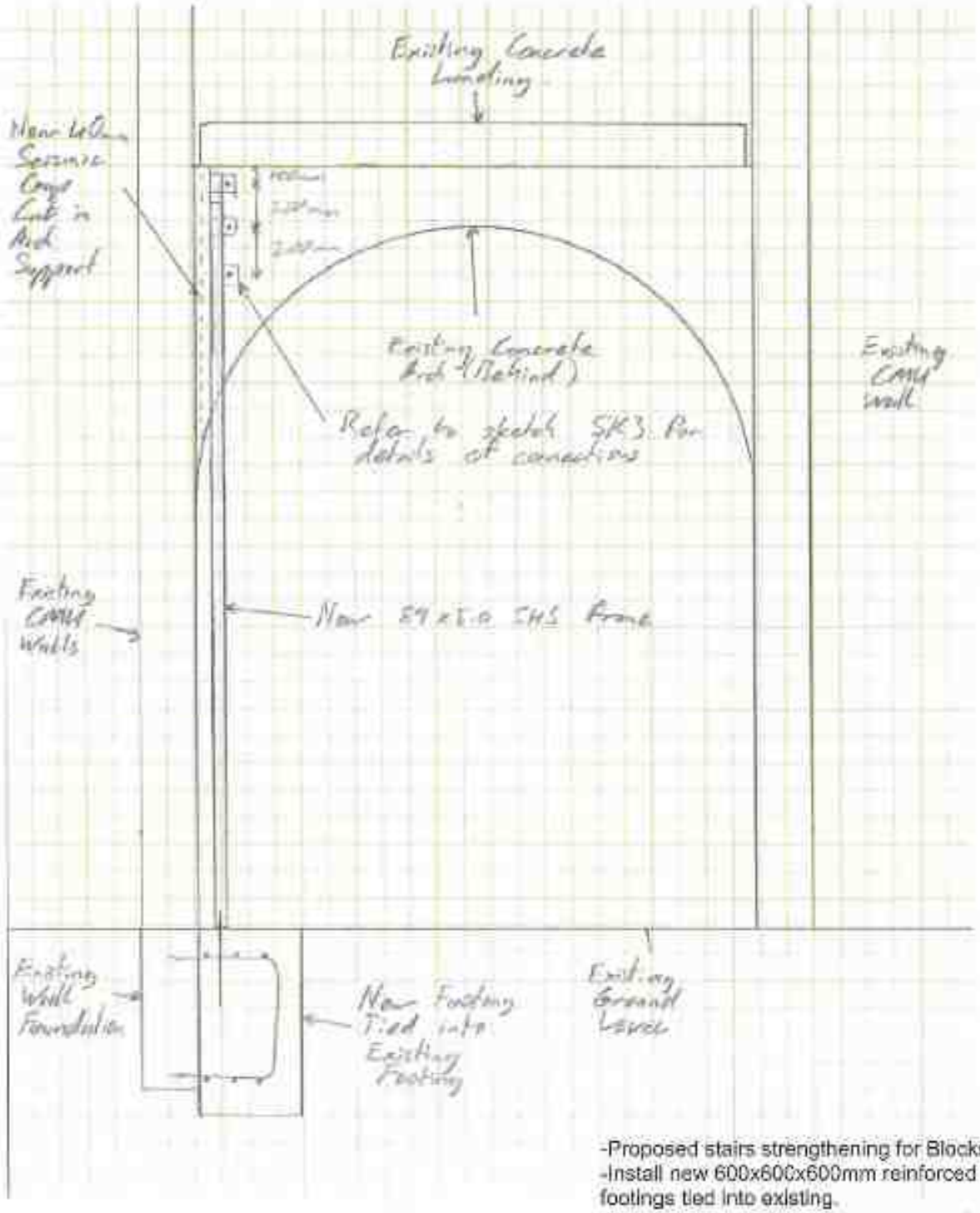
Current Placard Status:	green		
Along Damage ratio:	0%	Describe how damage ratio arrived at:	
Describe (summary):			
Across Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
Describe (summary):			
Diaphragms Damage?:	no	Describe:	
CSWs: Damage?:	no	Describe:	
Pounding: Damage?:	no	Describe:	
Non-structural: Damage?:	no	Describe:	

Recommendations

Level of repair/strengthening required:			Describe:	
Building Consent required:			Describe:	
Interim occupancy recommendations:			Describe:	
Along Assessed %NBS before e'quakes:	76%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
Assessed %NBS after e'quakes:	76%			
Across Assessed %NBS before e'quakes:	82%	##### %NBS from IEP below		
Assessed %NBS after e'quakes:	82%			

Appendix A3/D Stairwell additional support

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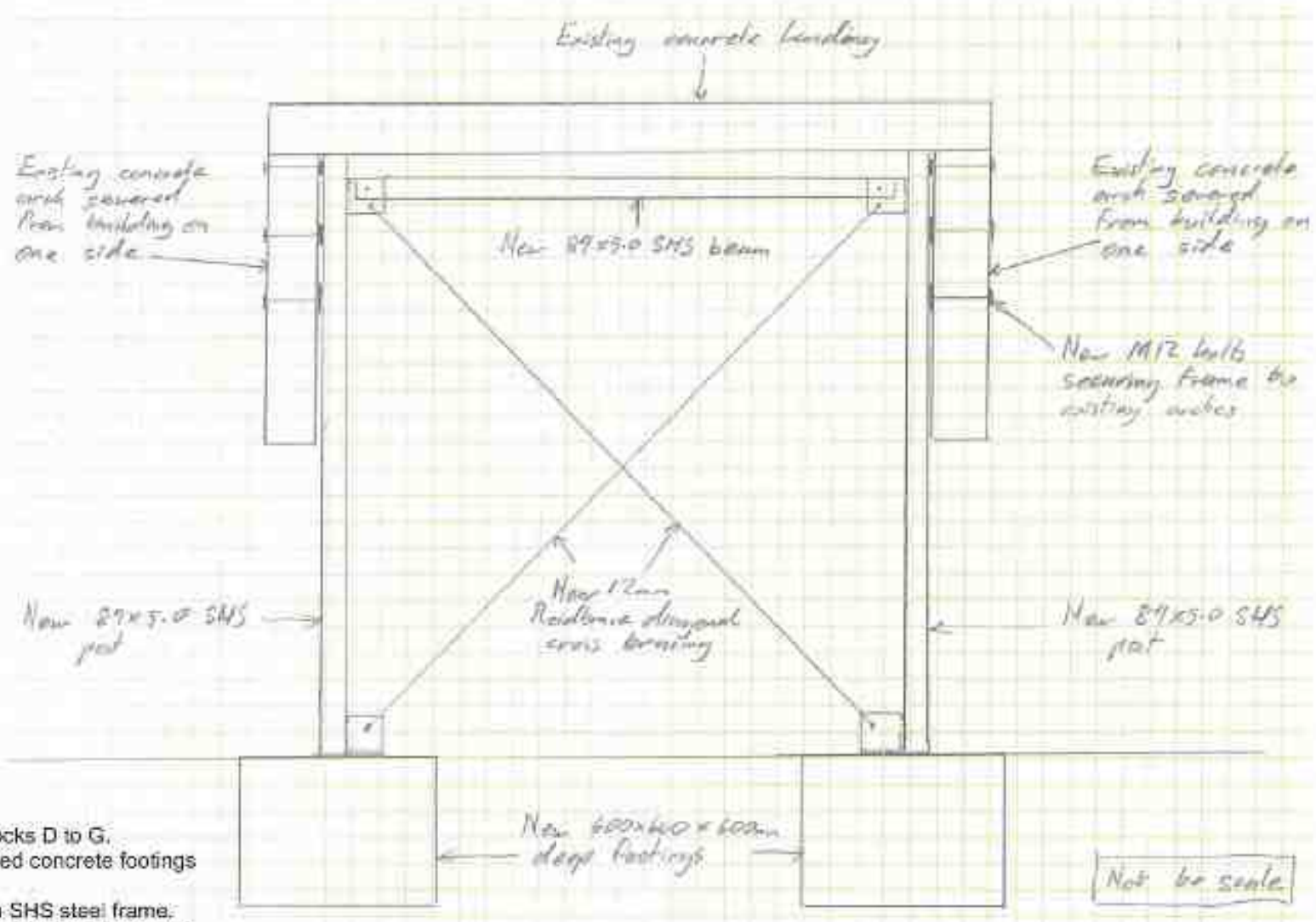


-Proposed stairs strengthening for Blocks D to G.
-Install new 600x600x600mm reinforced concrete footings tied into existing.
-Install new cross braced 50x50x5mm SHS steel frame.
-Secure steel frame to existing concrete arches three with M12 bolts drilled through at 200mm centers.
-Sever the connection between the concrete arch and the concrete masonry wall closest to the new frame.

226 Antigua St
Christchurch 8011, New Zealand
T 64 3 378 0900 F 64 3 377 8575
E chcmail@ghd.com W www.ghd.com

Project:	Harman Courts Stairs Strengthening Blocks D,E, F and G
Client:	Christchurch City Council
Title:	Proposed alterations
Job No:	51-31526-51
Drawing No:	SK1

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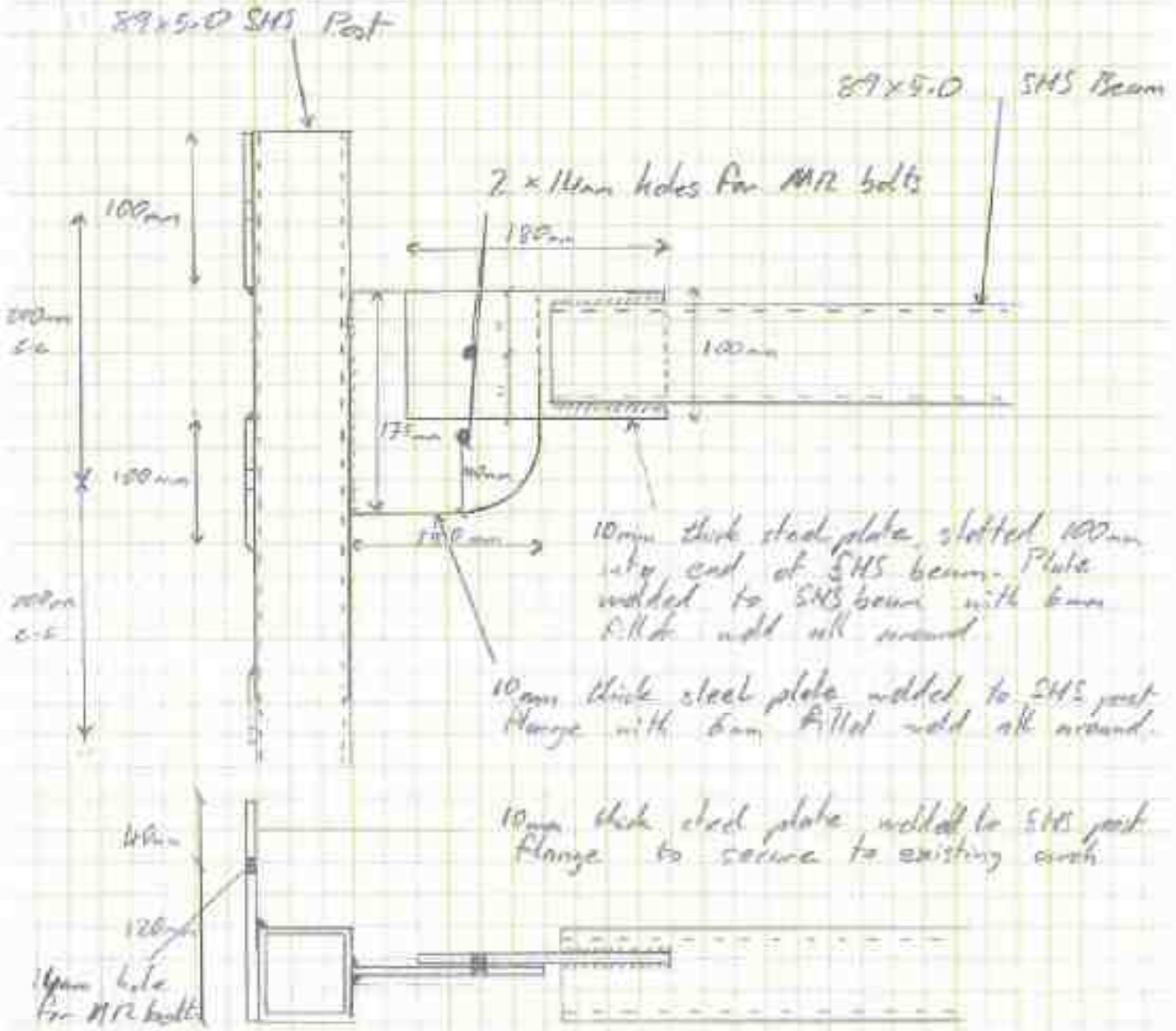
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- Secure steel frame to existing concrete arches three with M12 bolts drilled through at 200mm centers.
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Project:	Harman Courts Stairs Strengthening Blocks D,E, F and G		
Client:	Christchurch City Council		
Title:	Proposed alterations		
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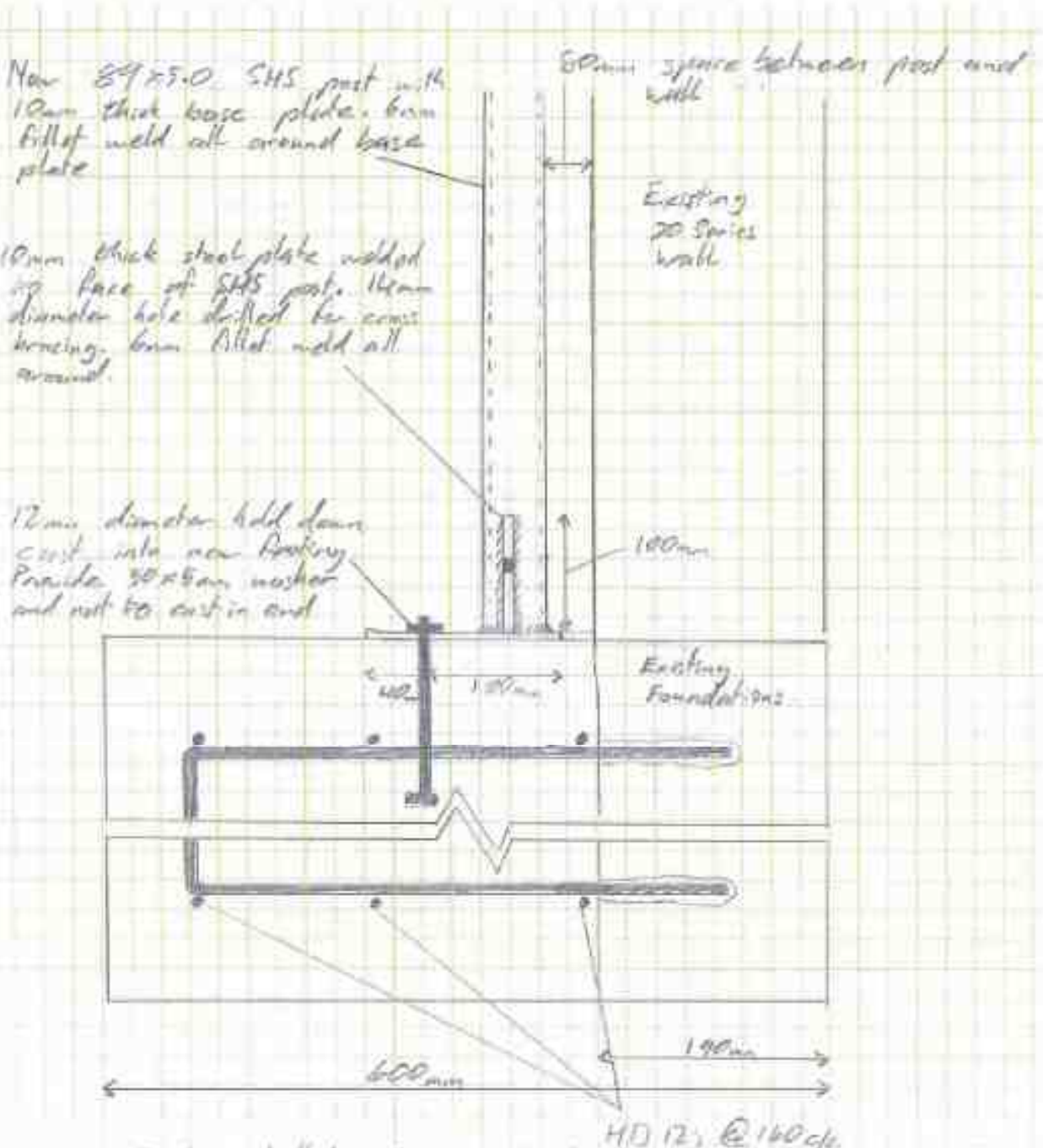


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-Secure steel frame to existing concrete arches three with M12 bolts drilled through at 200mm centers.
-Sever the connection between the concrete arch and the concrete masonry wall closest to the new frame.

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Christchurch 8011, New Zealand
T 64 3 378 0900 F 64 3 377 8575
E chrmail@ghd.com W www.ghd.com

Project:	Harman Courts Stairs Strengthening Blocks D,E, F and G		
Client:	Christchurch City Council		
Title:	Steel Frame - Corner Connection Detail		
Job No:	51-31526-51	Drawing No:	SK3

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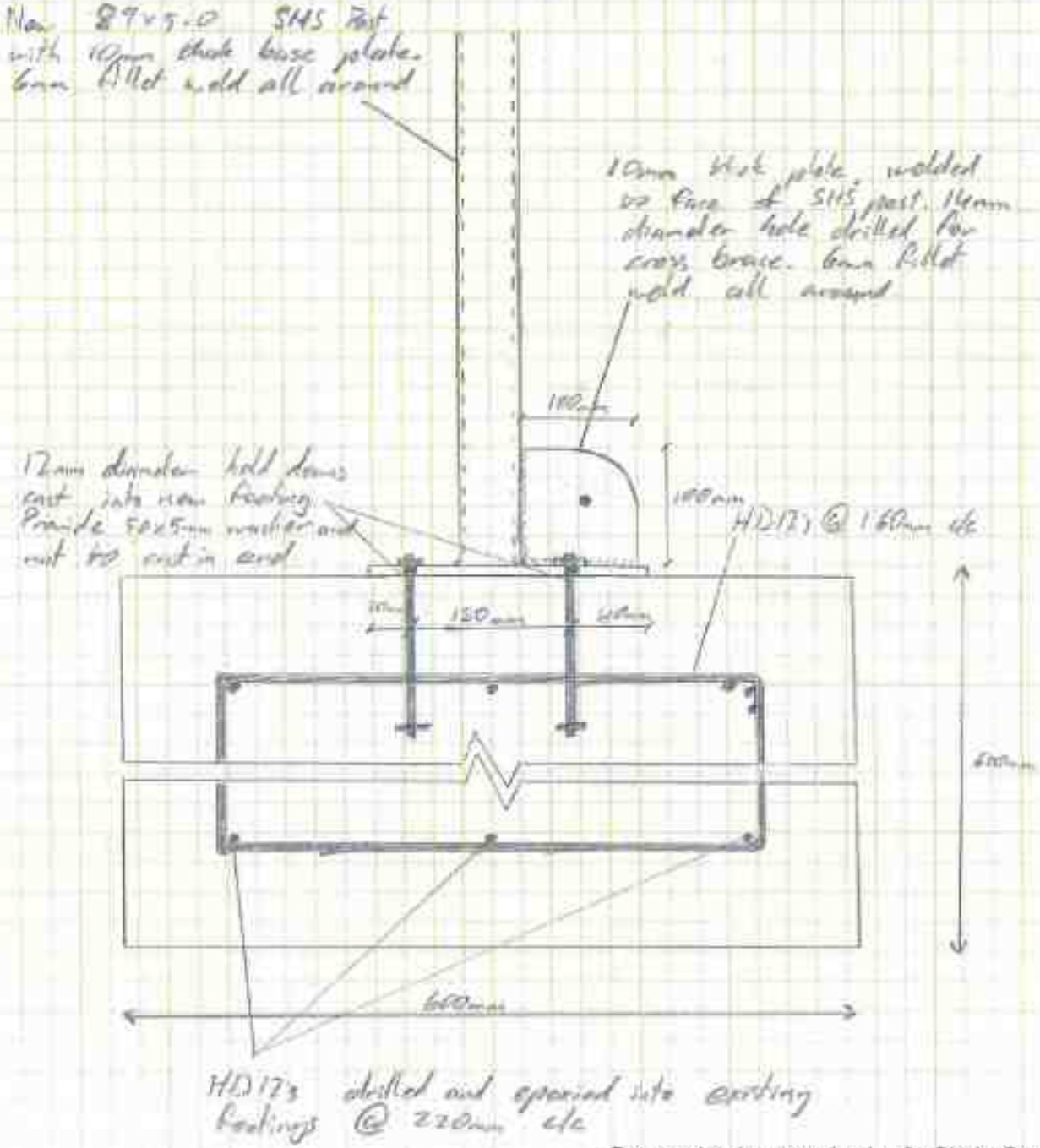


-Proposed stairs strengthening for Blocks D to G.
-Install new 600x600x600mm reinforced concrete footings tied into existing.
-Install new cross braced 50x50x5mm SHS steel frame.
-Secure steel frame to existing concrete arches three with M12 bolts drilled through at 200mm centers.
-Sever the connection between the concrete arch and the concrete masonry wall closest to the new frame.

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Project:	Harman Courts Stairs Strengthening Blocks D,E, F and G		
Client:	Christchurch City Council		
Title:	Steel Frame - Foundation Connection Detail		
Job No:	51-31526-51	Drawing No:	SK4

GHD Limited



-Proposed stairs strengthening for Blocks D to G.
-Install new 600x600x600mm reinforced concrete footings tied into existing.
-Install new cross braced 50x50x5mm SHS steel frame.
-Secure steel frame to existing concrete arches three with M12 bolts drilled through at 200mm centers.
-Sever the connection between the concrete arch and the concrete masonry wall closest to the new frame.

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Christchurch 8011, New Zealand
T 64 3 378 0900 F 64 3 377 8676
E chcmail@ghd.com W www.ghd.com

Project:	Harman Courts Stairs Strengthening Blocks D,E, F and G		
Client:	Christchurch City Council		
Title:	Steel Frame - Foundation Connection Detail 2		
Job No:	51-31526-51	Drawing No:	SK5

Specific Report A4
BE 1110 002 EQ2 Block H

February 2013

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Photograph 1: South Elevation

Photograph 2 North Elevation

Photograph 3 North West Elevation

Photograph 4 East Elevation

Appendices

Appendix A4/A	Photographs
Appendix A4/B	Available Drawings
Appendix A4/C	CERA Spreadsheet

1. Building Description

1.1 General

The following information describes Block H building of Harman Courts.

- Block H is situated north-east of Block I and north-west of Block G. See Figure 1 for building location of the site.
- Block H is a single storey timber framed structure which is subdivided into four units with roughly 20-25 square metres floor area in each unit. The units are separated by 190 mm thick reinforced concrete masonry walls which subdivide the block into four residential units.
- The dimensions of the building overall are approximately 10.0 m in width, 24.0 m long and 4.8 m in height to roof ridge.
- The Block H structure comprises timber framed walls and reinforced concrete masonry block walls supporting timber roof trusses.
- The roof has a pitch of 30 degrees and consists of lightweight corrugated metal sheeting on timber purlins supported on timber truss rafters at 900 mm centres.
- The ceiling consists of 100 mm fibre glass insulation with 9.5 mm GIB foil plasterboard on 70 x 40 battens at 400 centres.
- The external walls are timber framed walls with 100 x 50 framing at 600 mm centres. The walls have 90 mm block veneer cladding fixed with galvanized wall ties, 75 fibre glass insulation and 10 mm GIB foil plasterboard on the inside face.
- The internal walls consist of 75 x 50 framing at maximum 600 mm centres with 10 mm GIB foil plasterboard on both sides.
- The floor is 100mm thick cast-in-situ reinforced concrete slab on grade.

Figure 2 shows the floor plan layout of the whole structure. Complete drawn information mentioned above is provided in Appendix A4/B.



Figure 1 Plan/Aerial View of Harman Courts

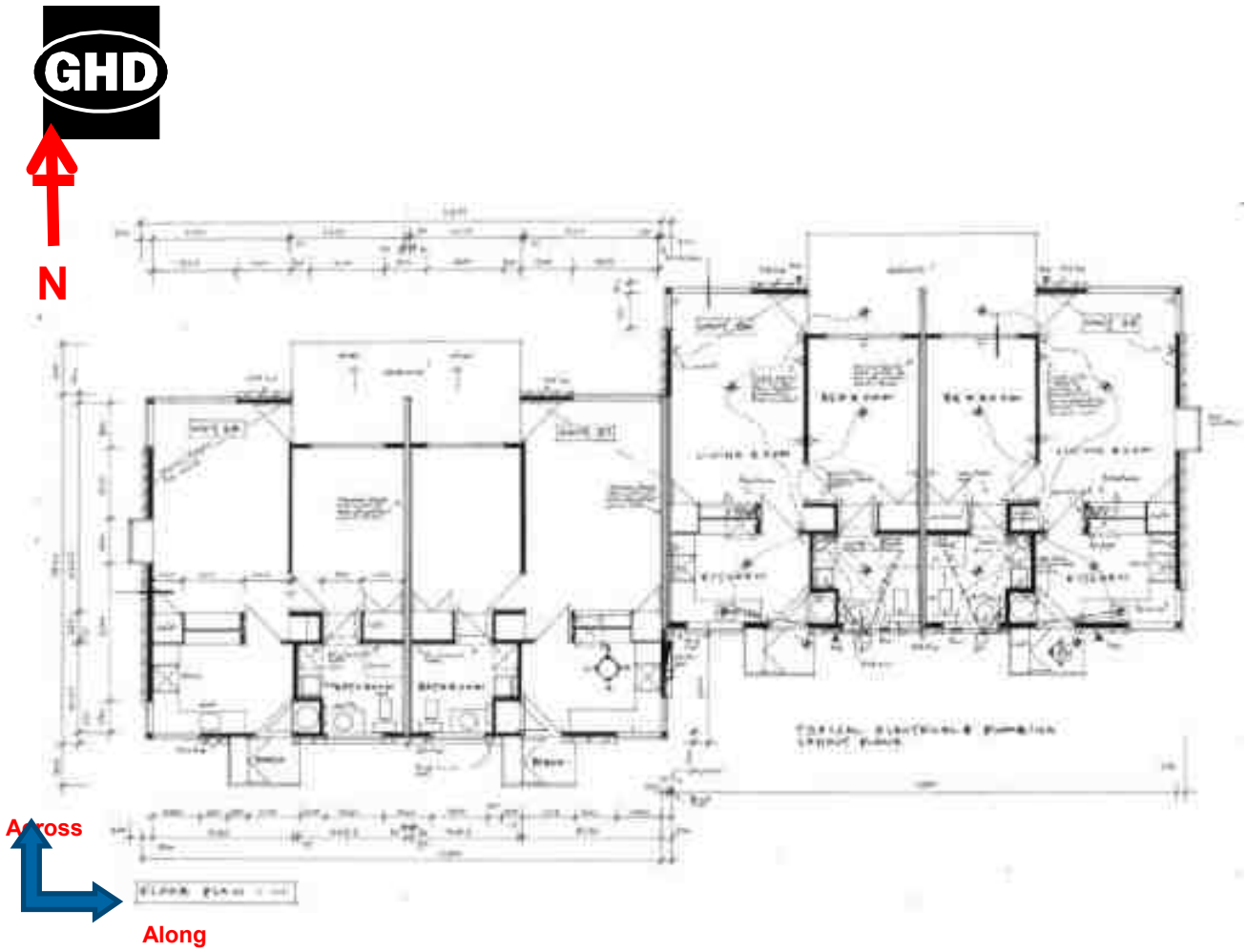


Figure 2 Block H Plan Sketch Showing Key Structural Elements

1.2 Gravity Load Resisting System

Loads imposed on the roof are transferred to the timber purlins then to the timber trusses. The trusses are supported on the timber wall frames at the front and rear of the building. The gravity load is transferred to the walls and then to the concrete strip foundations.

1.3 Lateral Load Resisting System

Reinforced masonry block walls and timber framed walls are the primary components resisting lateral loads in the 'Across' and 'Along' directions. The masonry walls are oriented in such a way that resist lateral loads in the north-south or the 'Across' direction. Timber framed walls resist lateral loads in both the north-south and east-west directions or the 'Across' and 'Along' directions. The roof trusses are fixed at the bottom chord to the supporting timber framework. 10 mm GIB foil plasterboard on 70 x 40 ceiling battens provide a ceiling diaphragm.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Elevation	Sheet A2 of 22	March 1991
2	Floor Plan	Sheet A4 of 22	March 1991
3	Section A	Sheet A8 of 22	March 1991
4	Section I	Sheet A9 of 22	April 1991
5	Foundation Plan and Floor Slab	Sheet 5 of 5	April 1991

Available drawings is attached in Appendix A4/B

2.4 Analysis and Modelling

A seismic assessment was carried out based on a specific design in accordance with NZS 1170.5:2004 and NZS 4230:2004 and Branz Bracing Data. The building was modelled using a ductility factor of 1.25 (reinforced concrete masonry walls) and 3.0 (timber framed walls) in the 'Across' and 'Along' directions respectively.

3. Damage Assessment

3.1 General

No damage was identified in the structure.

4. Results of Analysis

The following are the results of the structural analysis of Block H building.

4.1 Combined Timber Framed and Reinforced Concrete Masonry Walls

4.1.1 Overall

Across

Timber framed walls in the 'Across' direction were found to be rated overall at 100% NBS. However, the timber framed walls along Grid line 8 are rated at 88% NBS in the analysis. In view of the overall NBS rating, the particular result for Grid line 8 is not considered to be significant.

Along

The timber framed walls in the 'Along' direction were found to be rated overall at 50% NBS. The majority of the timber bracing lines were found to be less than 67% NBS but more than 34% NBS and are highlighted in blue below.

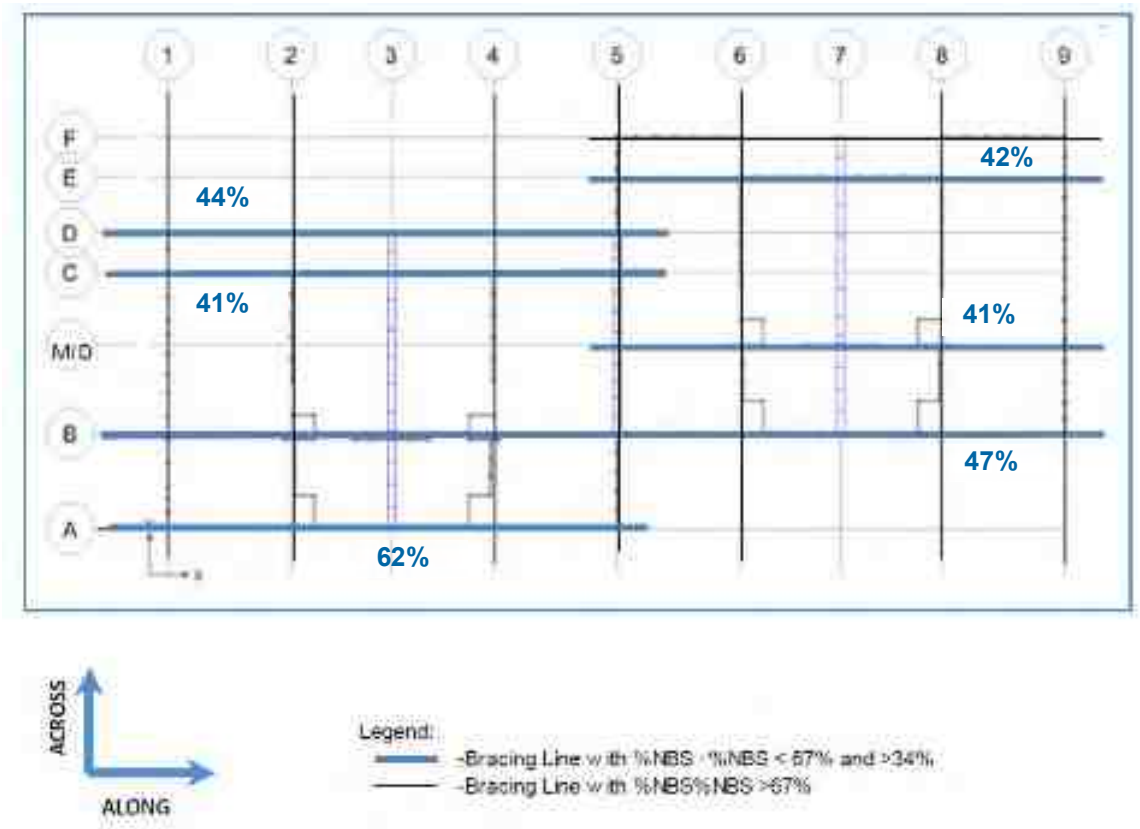


Figure 3 Plan Showing %NBS for Timber Framed Walls rated more than 34% NBS but less than 67% NBS.

4.2 Block walls

4.2.1 Out-of-Plane

The block walls were found to be rated more than 100% NBS.

4.3 Roof Timber Truss Framing

The overall roof timber truss framing members were found to be rated more than 100% NBS.

4.4 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.

5. Conclusion and Recommendation

The building overall has been assessed as having a seismic capacity of 50% NBS and is therefore classified as an ‘Earthquake Risk’.

GHD recommend that a seismic strengthening scheme is developed to achieved a minimum of 67% NBS.

Appendices

Appendix A4/A Photographs



Photograph 1: South Elevation



Photograph 2 North Elevation



Photograph 3 North West Elevation

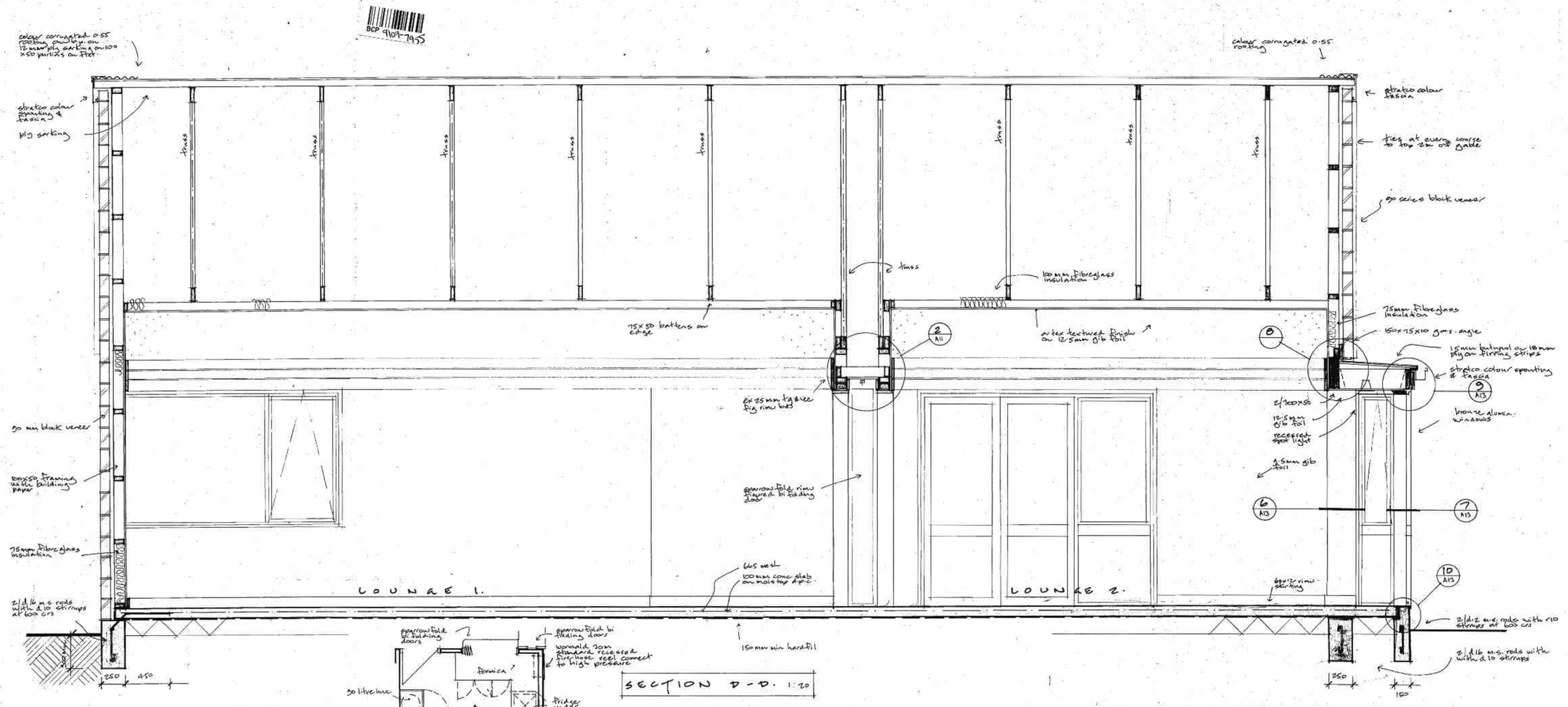


Photograph 4 East Elevation

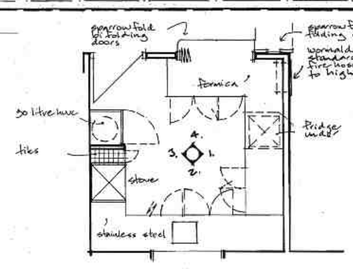
Appendix A4/B Available Drawings

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

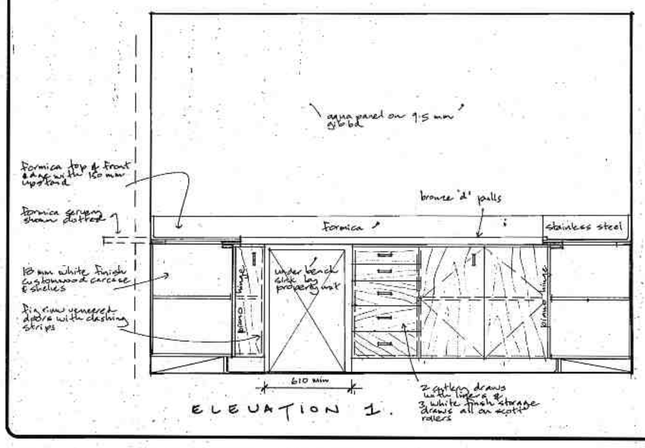
BCP 9104-7955



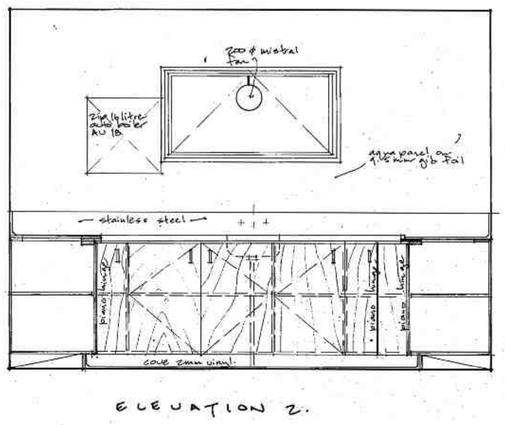
SECTION D-D. 1:20



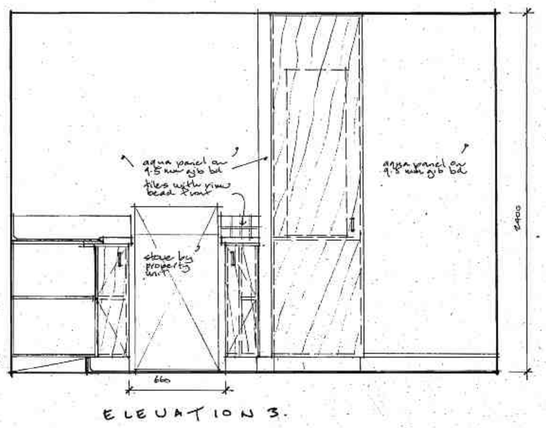
KITCHEN PLAN 1:50



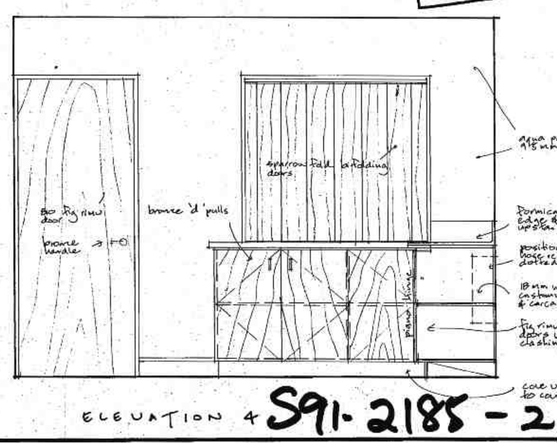
ELEVATION 1.



ELEVATION 2.



ELEVATION 3.



ELEVATION 4

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

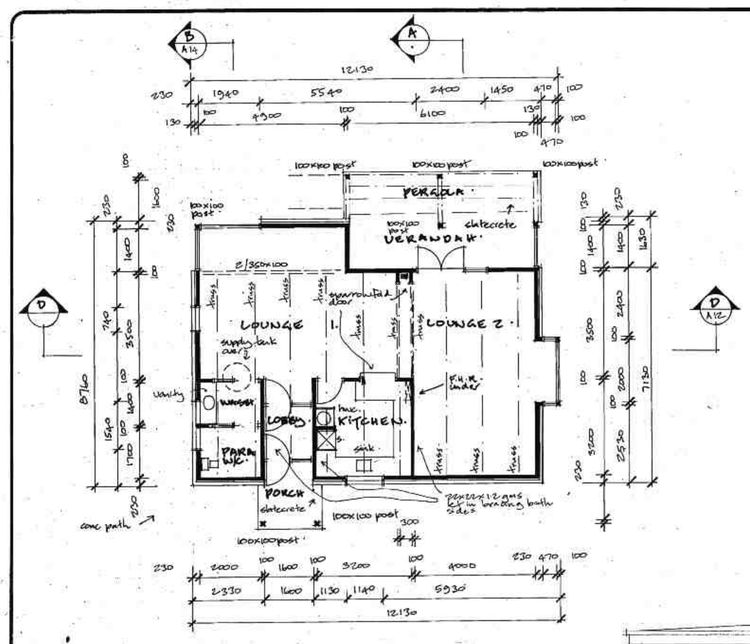
S91-2188-2/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

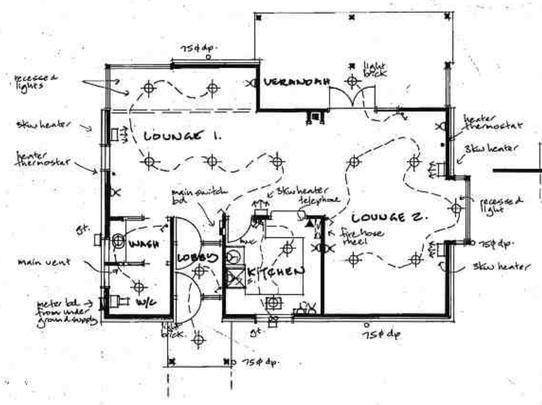
HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

SCALE 1:20,25,10 DESIGN JOB NO 11251 SHEET NUMBER A12.
DATE 8.1.91 DRAWN JEG FILE NO OF 22 total SHEETS
TRACED

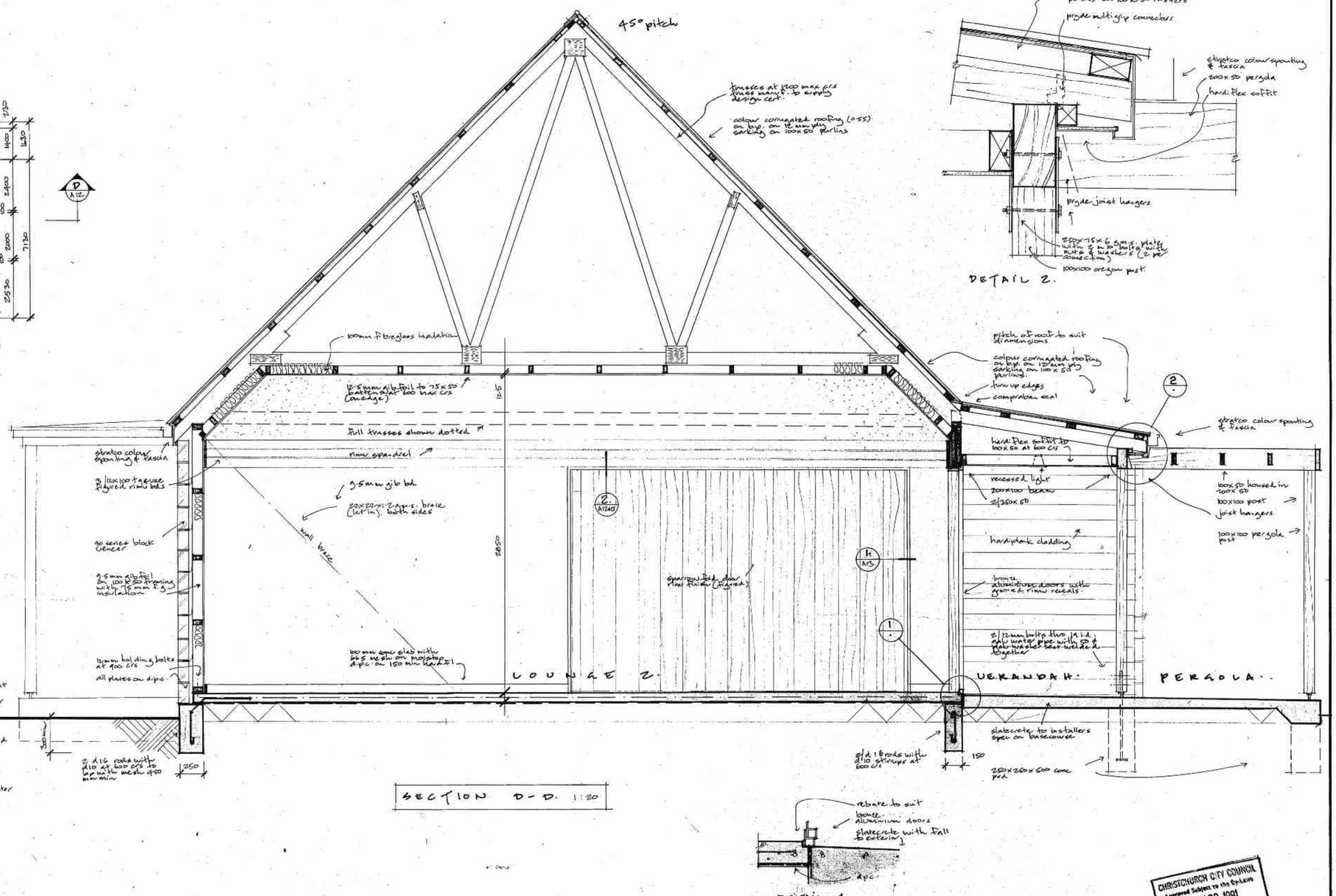
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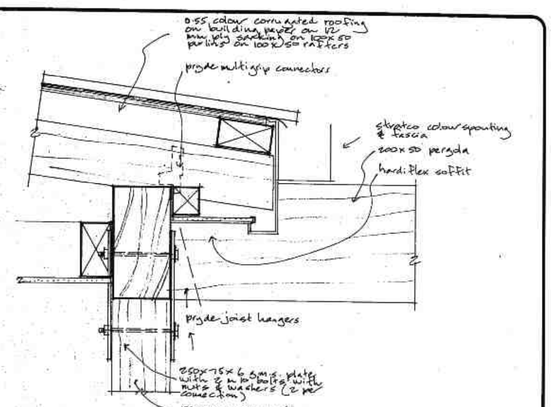
FLOOR PLAN 1:100



SERVICES PLAN 1:100

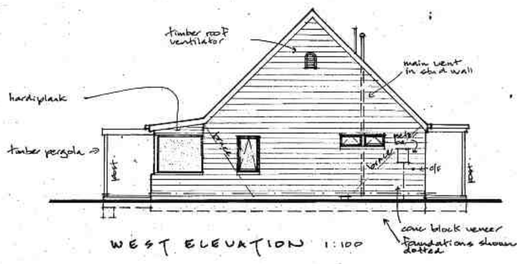


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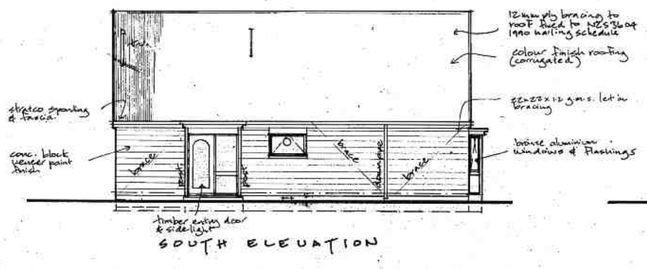


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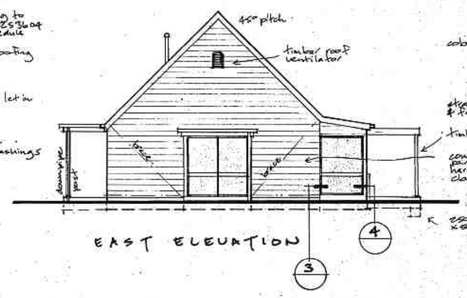
DETAIL 1.



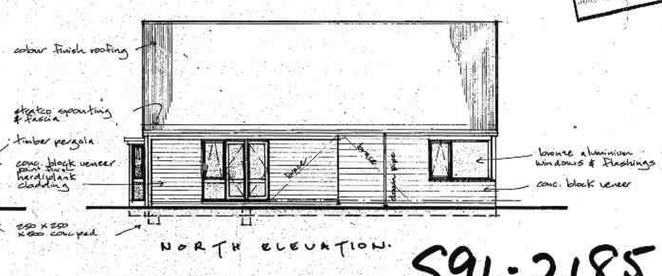
WEST ELEVATION 1:100



SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION.

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30 APR 1991
For Engineer

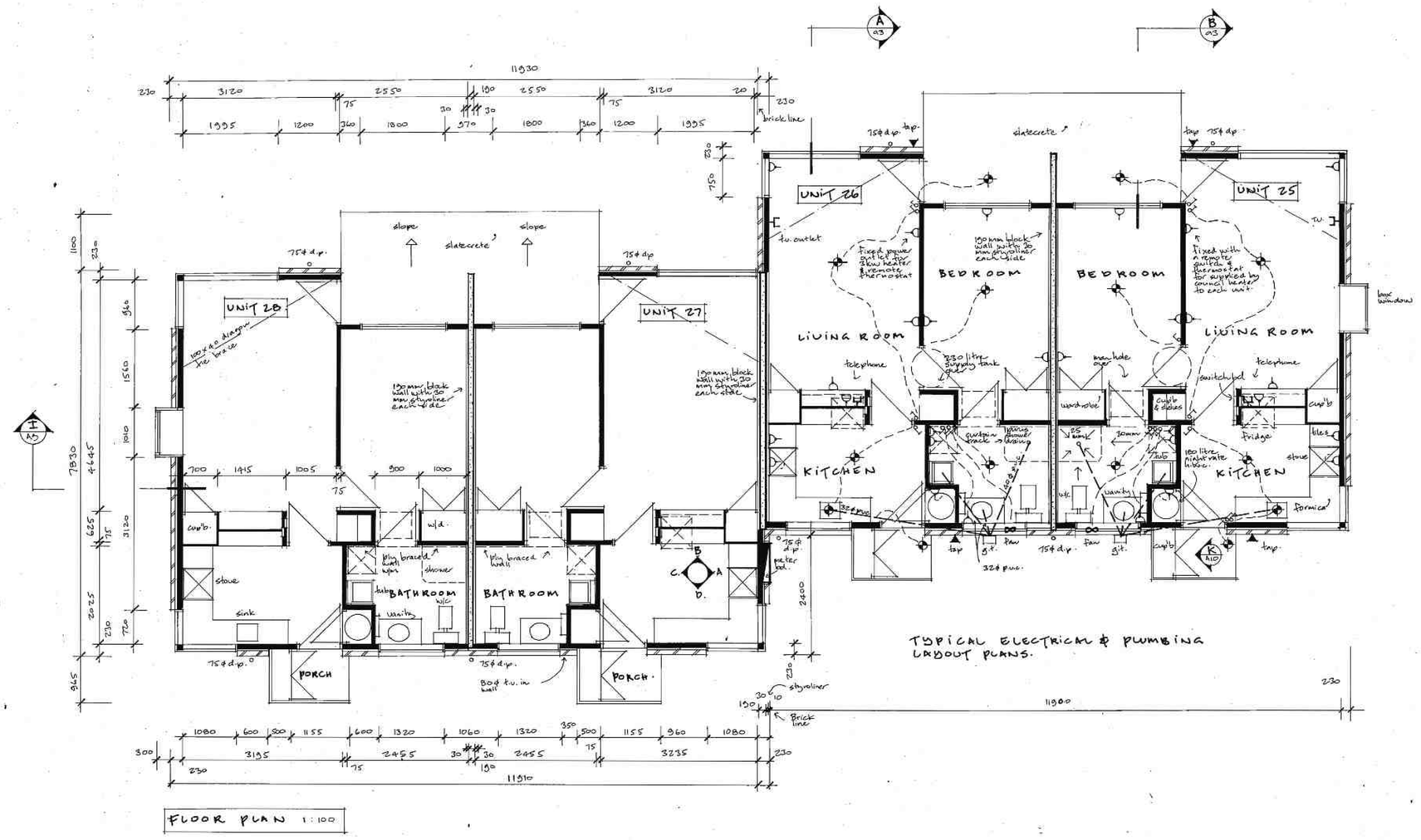
S91-2185
3/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. new residents lounger for property limit

SCALE 1:100 & 1:20 | DESIGN | JOB NO 11251 | SHEET NUMBER A11.
DATE 7.1.91. | DRAWN BEG | FILE NO | OF 22 Total SHEETS
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

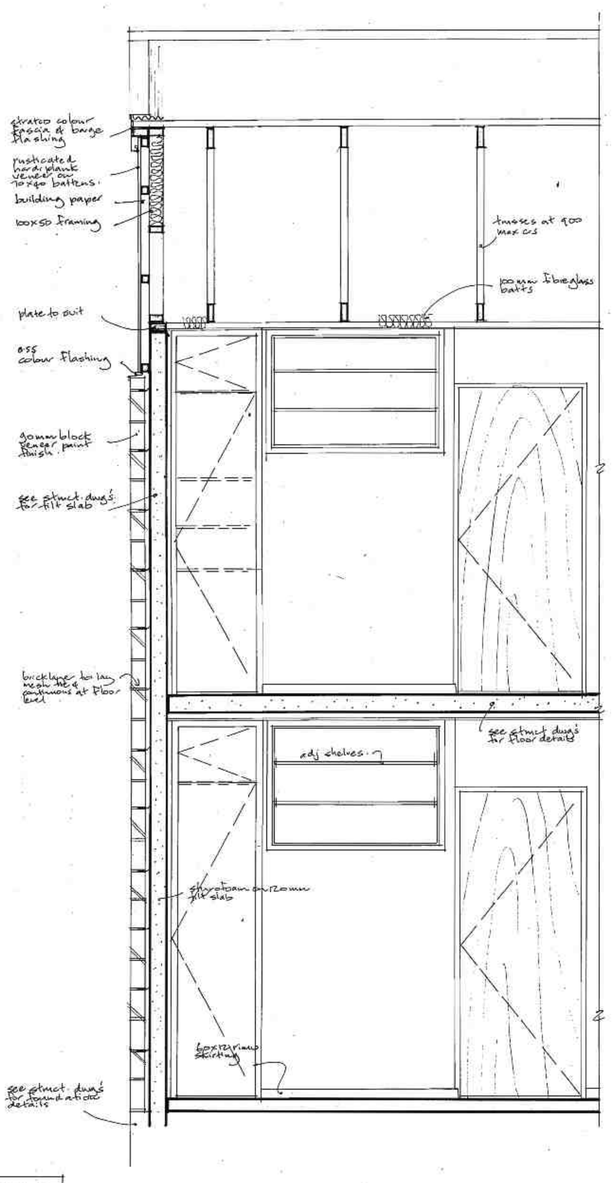
S91 2185 - 4/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

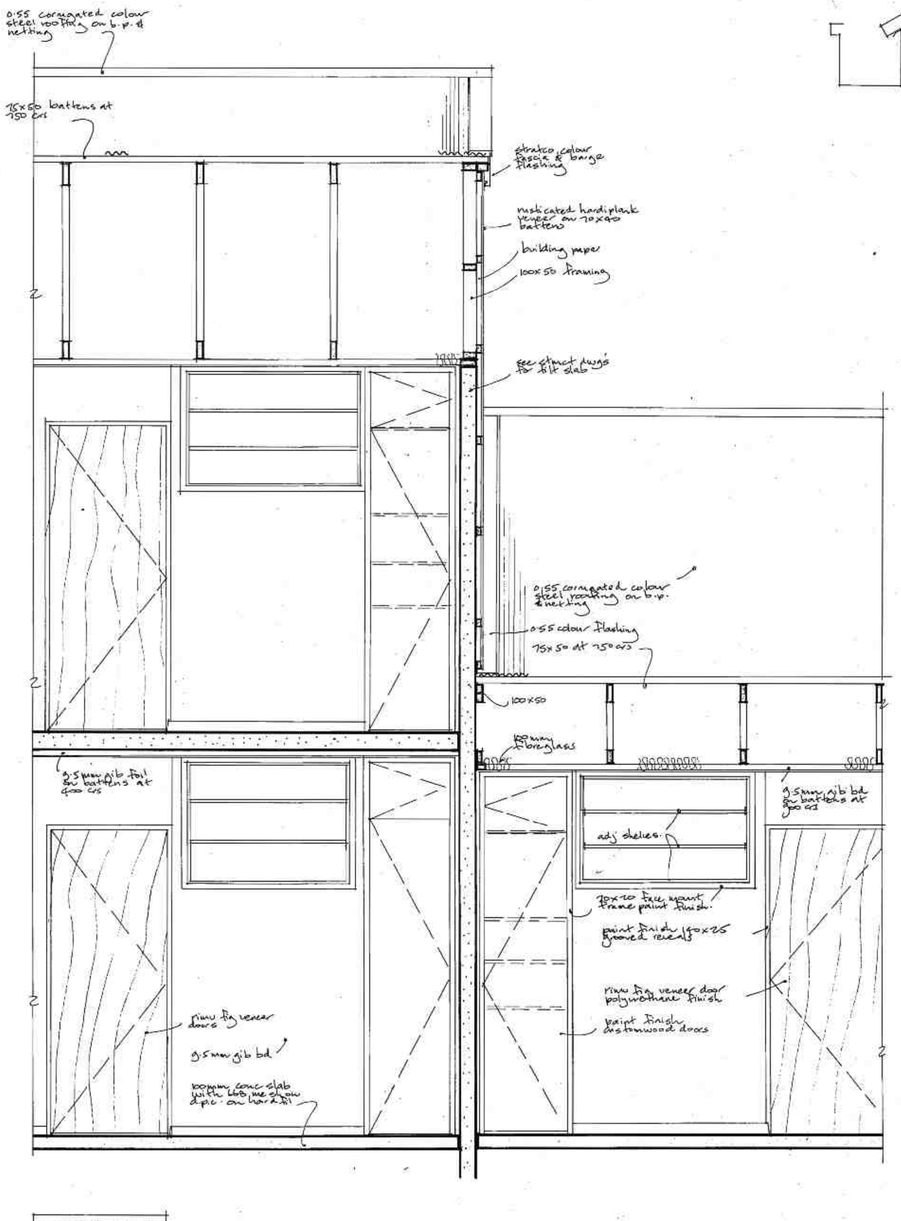
HARMAN COURTS EXTENSION 1991. units 25-28 single storey block for property unit

SCALE 1:50 | DESIGN | JOB NO 11251 | SHEET NUMBER A.4.
DATE 11 3 91. | DRAWN DRG | FILE NO | OF 22 total SHEETS
TRACED

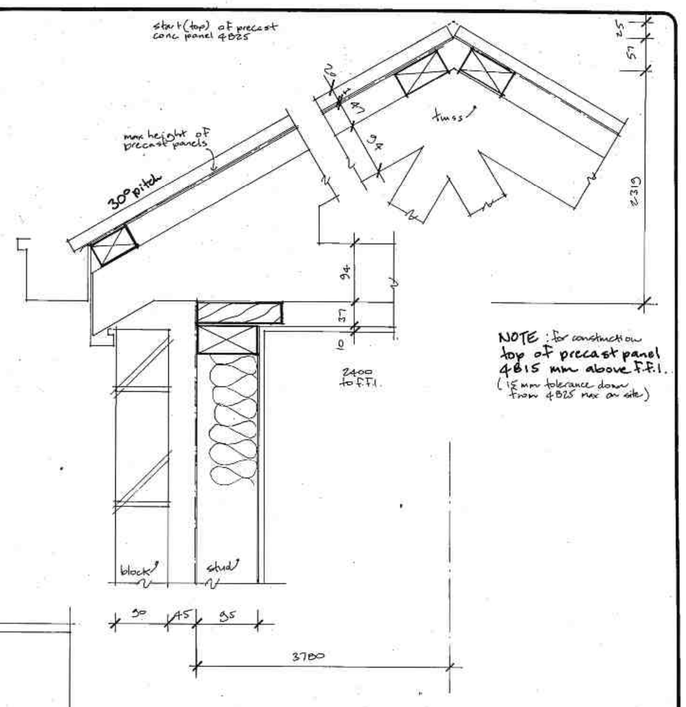
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



SECTION E.



SECTION F.



NOTE: for construction top of precast panel 4815 mm above F.F.L. (15 mm tolerance down from 4825 max on site.)

TYPICAL TRUSS & PRECAST PANEL SET OUT 1:5

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

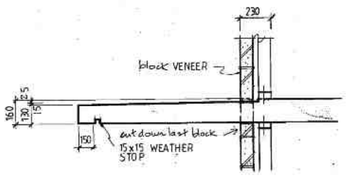
S91 2185 - 5/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

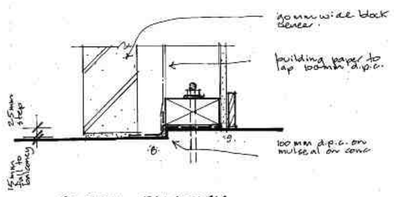
HARMAN COURTS EXTENSION 1991. two storey block cross section

SCALE 1:20 | DESIGN | JOB NO 11251 | SHEET NUMBER
DATE 19 3 91 | DRAWN BJS | FILE NO | OF 22 Total SHEETS | A 5.
TRACED

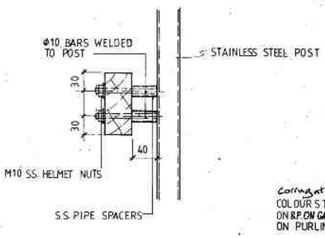
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



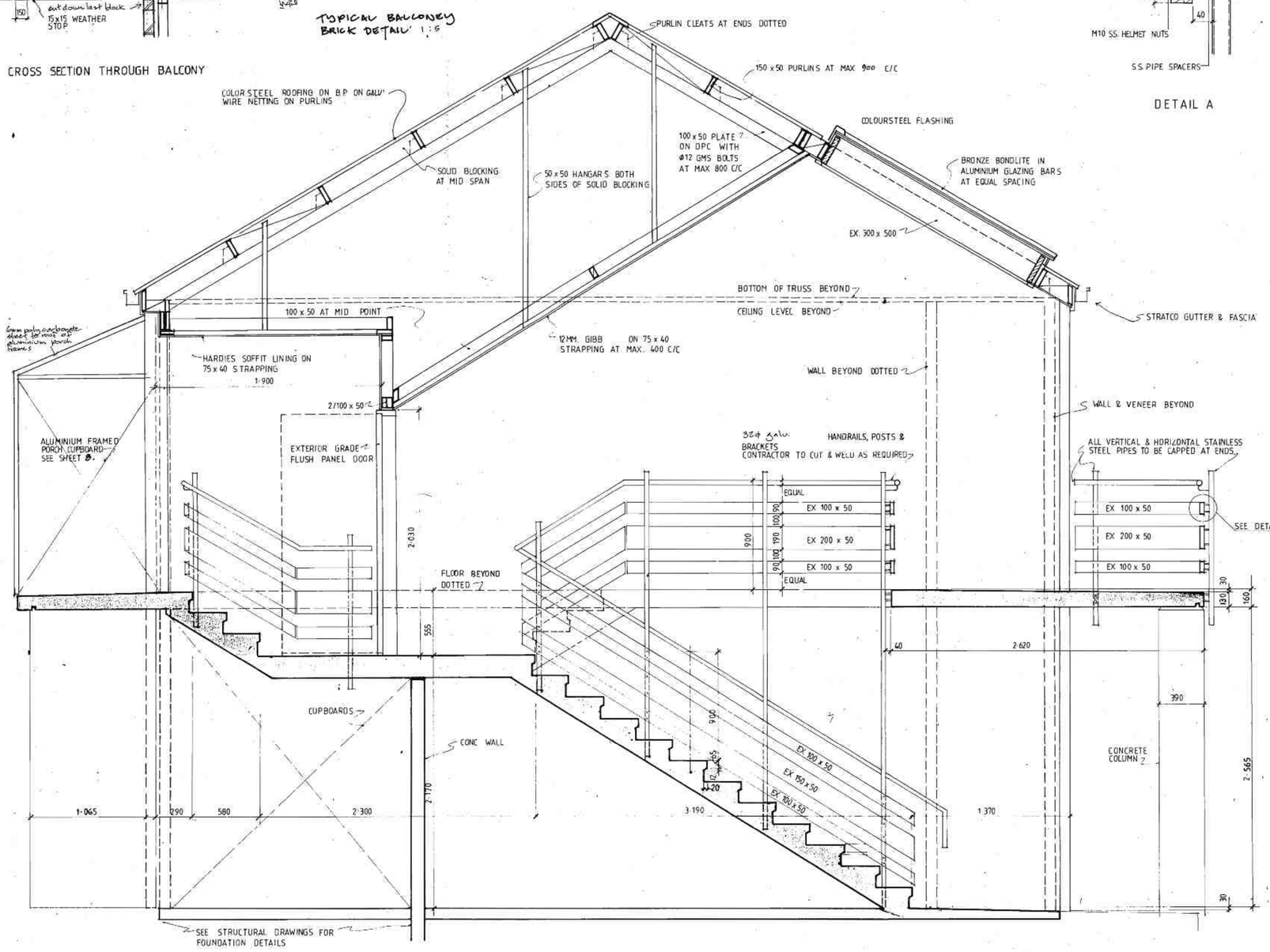
CROSS SECTION THROUGH BALCONY



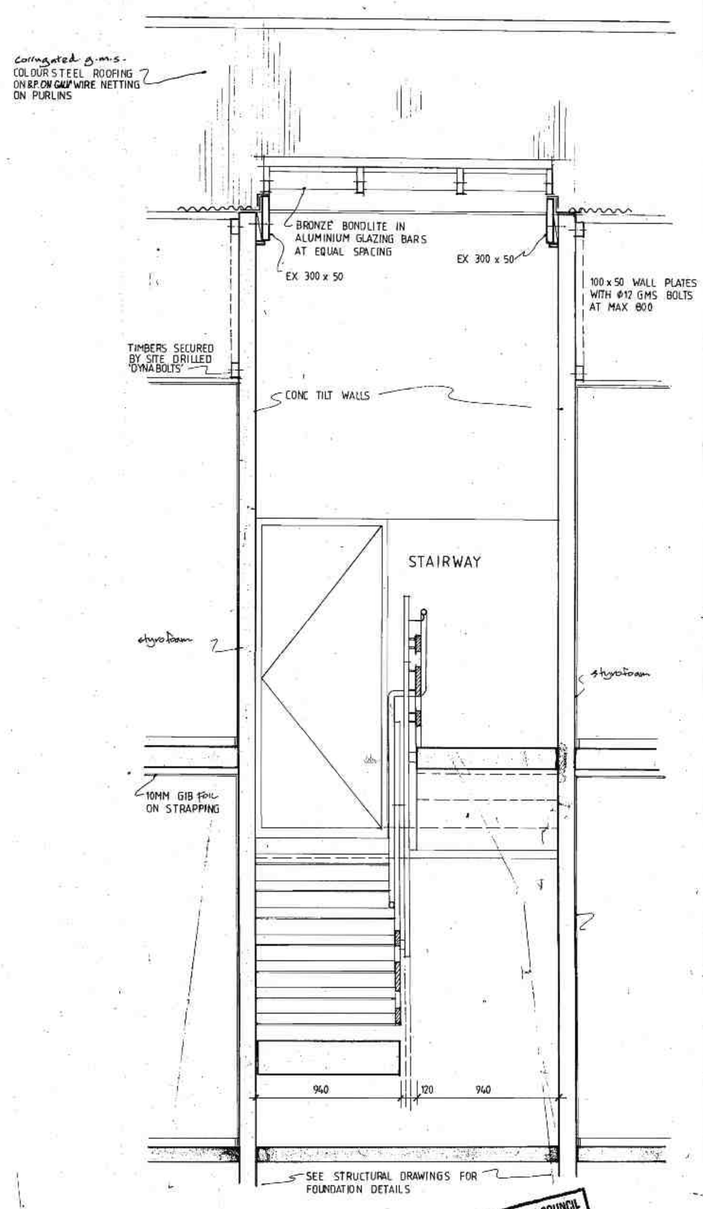
TYPICAL BALCONEY BRICK DETAIL 1:5



DETAIL A



SECTION G



SECTION H

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

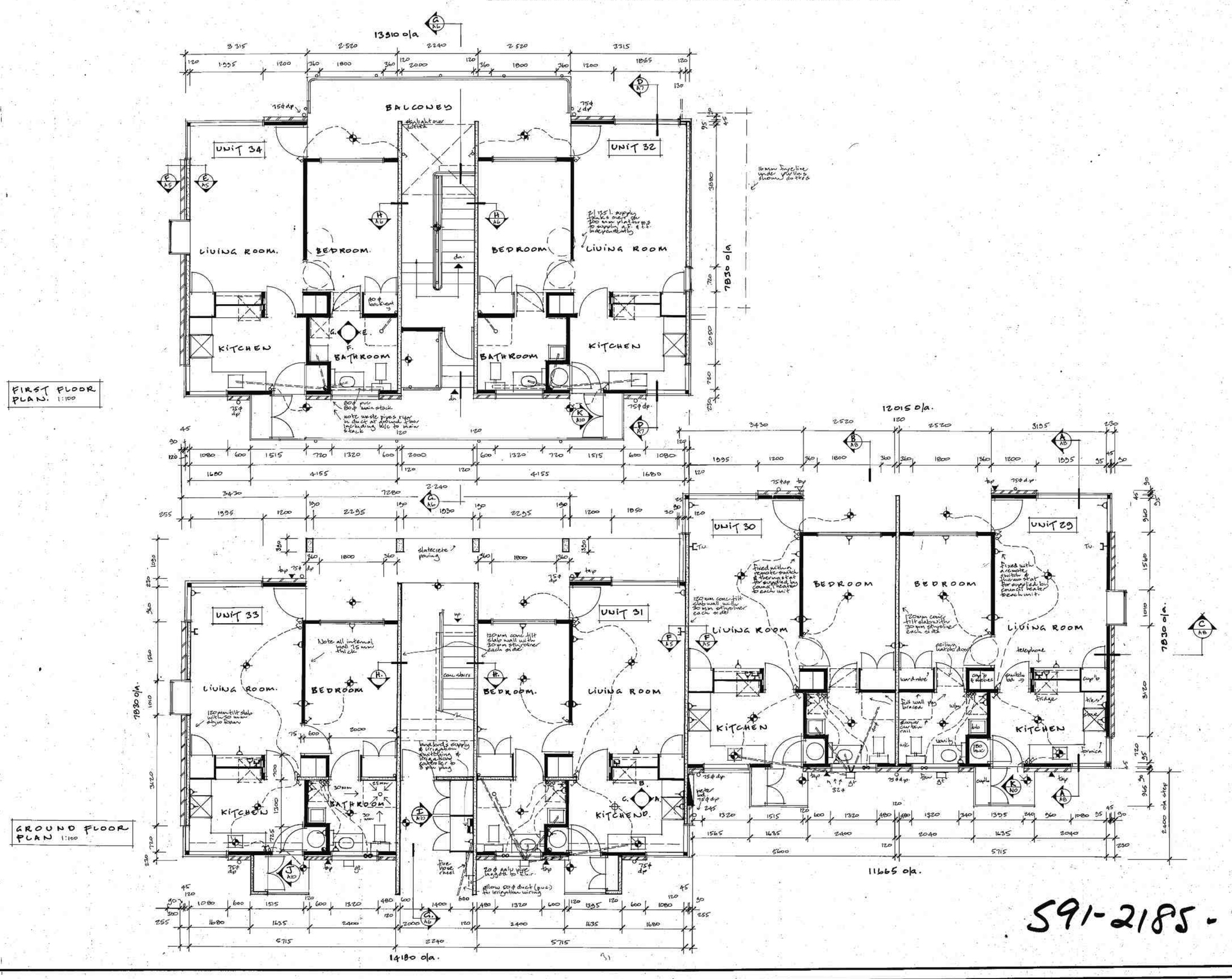
S91-2185-6/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. - STAIRWELL DETAILS

SCALE 1:20 DESIGN G.F.H. JOB NO 11251 SHEET NUMBER A.6.
DATE 2/91 DRAWN P.M. FILE NO OF 22 Total SHEETS
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



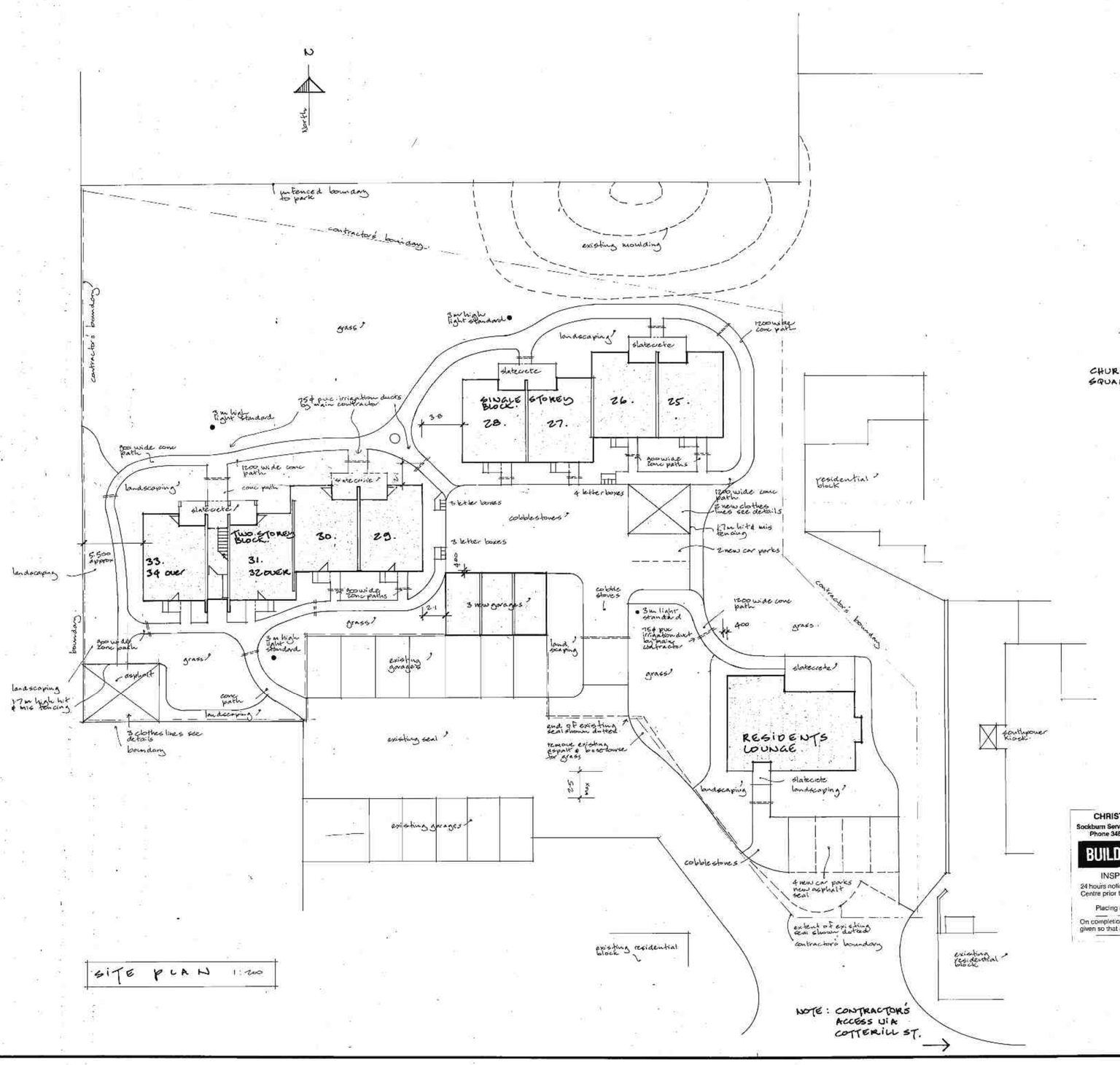
591-2185-7/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

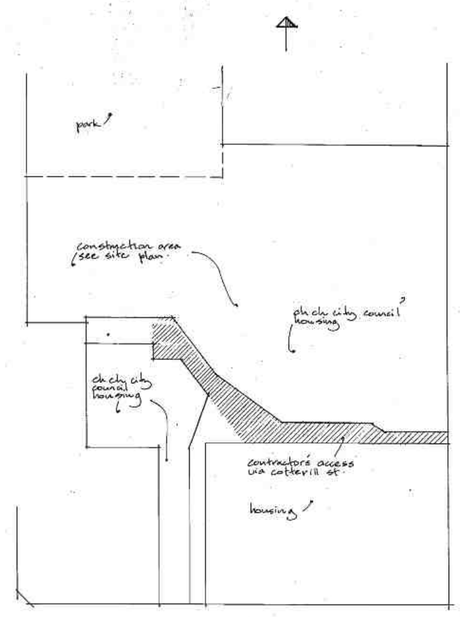
HARMAN COURTS EXTENSION 1991. units 29-34 two storey block for property unit.

SCALE 1:50 DESIGN JOB NO 11251 SHEET NUMBER
DATE 18/3/91 DRAWN BJS FILE NO OF 2 total SHEETS 3.
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



SITE PLAN 1:200



LOCATION PLAN.

NOTE

Refer sheets 6 & 7 of the engineering section for services layout to site.

CHRISTCHURCH CITY COUNCIL
Sockburn Service Centre Phone 348-5119
Beckenham Service Centre Phone 332-3099

BUILDERS - PLEASE NOTE:

INSPECTION REQUIREMENTS

24 hours notice must be given to the Council's Service Centre prior to:

Placing any concrete - fixing internal linings

On completion of any buildings, 5 days notice must be given so that a final inspection can be made.

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

591-2185-8/1

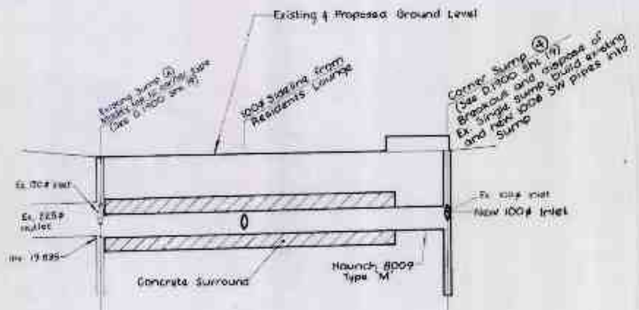
CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. site plan

SCALE 1:200 DESIGN
DRAWN BBS.
DATE 16 1 91. TRACED

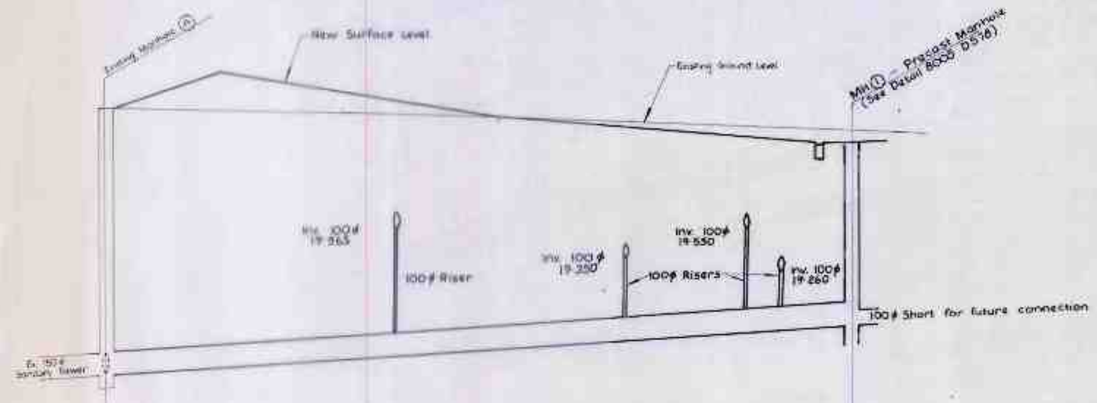
JOB NO 11251 SHEET NUMBER A1.
FILE NO OF 22 total SHEETS

IF IN DOUBT ASK ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES



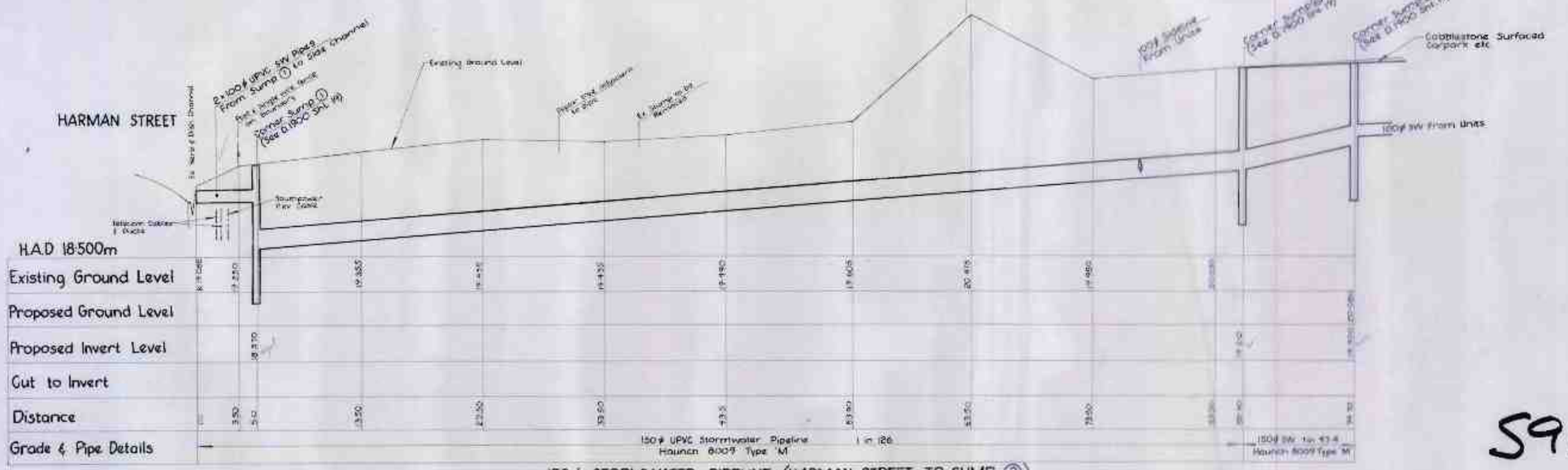
HAD 19.000m		
Existing Ground Level	20.355	20.195
Proposed Ground Level		
Proposed Invert Level	19.870	19.865
Cut to Invert		
Distance	0	21
Grade & Pipe Details	150ϕ UPVC SW Pipeline 1 in 500	

150ϕ STORMWATER PIPELINE - Ex. Sump (A) to Sump (4)



HAD 18.000m		
Existing Ground Level	20.340	20.700
Proposed Ground Level	20.340	20.700
Proposed Invert Level	19.260	19.500
Cut to Invert		
Distance	0	44m.
Grade & Pipe Details	150ϕ UPVC Sanitary Sewer 1 in 160 Haunch 8009 Type 'M'	

150ϕ SANITARY SEWER EXTENSION



150ϕ STORMWATER PIPELINE (HARMAN STREET TO SUMP (3))

NOTES:
1. All work shall be carried out in accordance with the Christchurch Drainage District Supervision Specification 1978 Sewage and Stormwater Works
2. Refer to 3089 for Standard Details and Specifications for Streetworks

591 2185.9/11

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.P.				
Completed				

		Date
Designed	G. Nordstrom	4/91
Drawn	G. Nordstrom	4/91
Traced	V. Meadowcroft	4/91
Des. Chk.	CRN	4/91
Bus. Chk.		
Released		

Approved

Design Services Manager

Date

CHRISTCHURCH CITY COUNCIL DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
LONGITUDINAL SECTIONS

Scale: Horiz 1:200, Vert 1:20

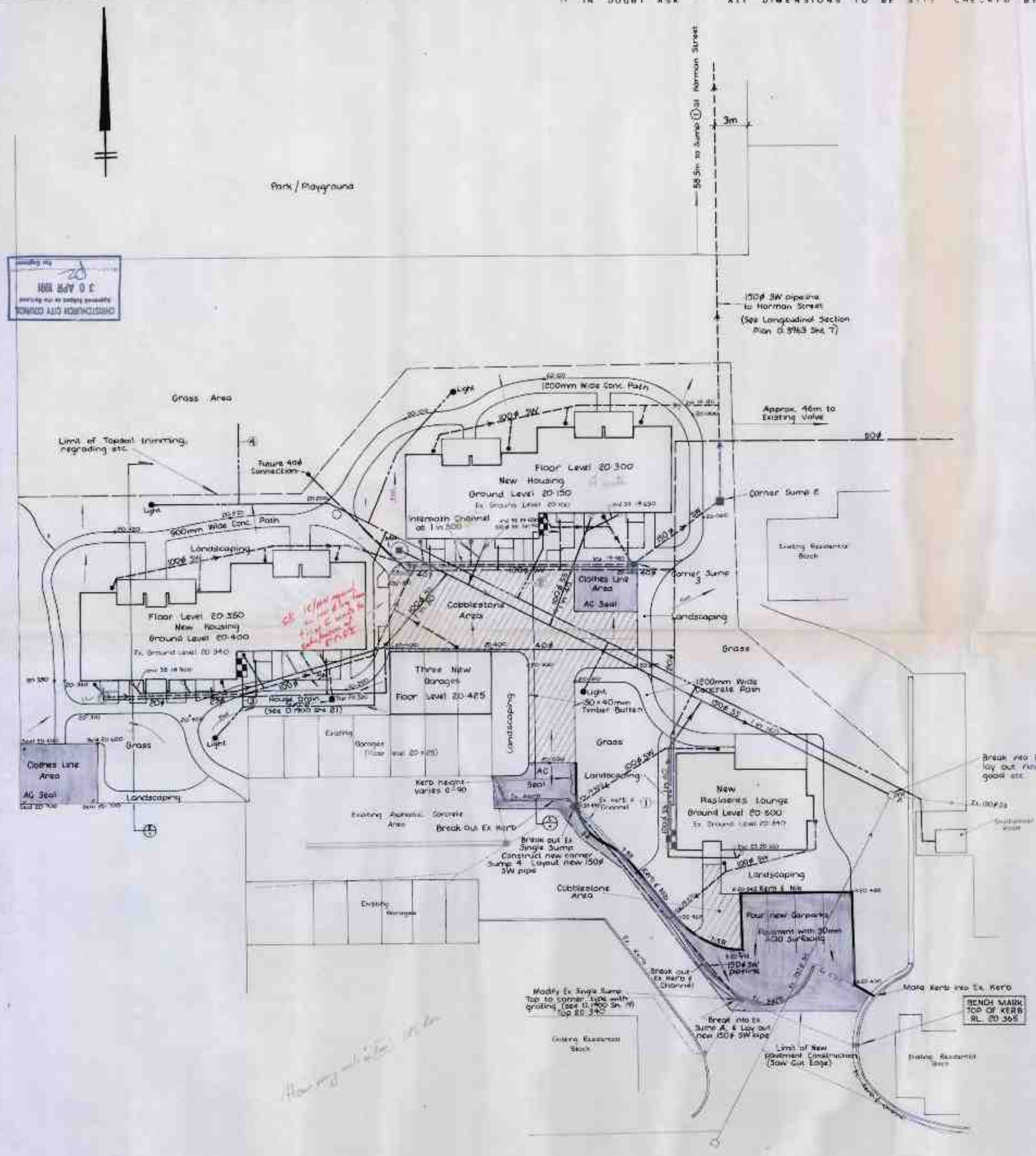
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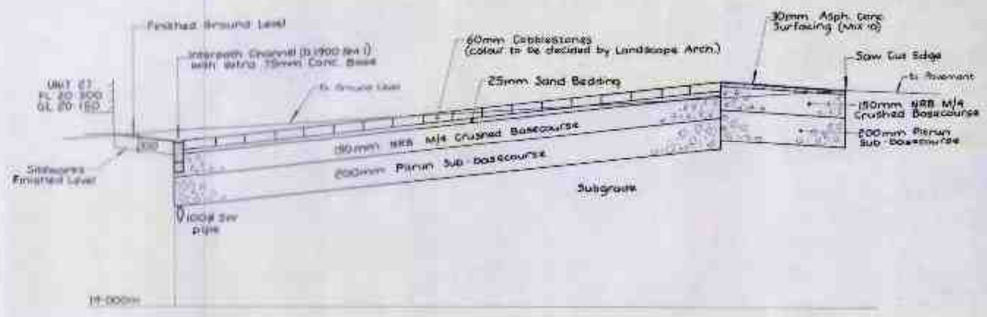
Issue

D.3963

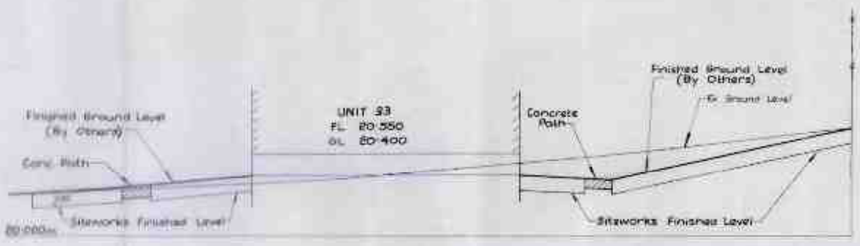
Sheet 2 of 2

IF IN DOUBT ASK ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES





SECTION ⊕
H. 1:100
V. 1:20



SECTION ⊕
H. 1:100
V. 1:20

SERVICES LEGEND

Southpower — -- — -- — 1: 40 Amp 3 Phase
2: 80 Amp 3 Phase
3: 120 Amp 3 Phase
4: 80 Amp 3 Phase (Future Connection)

HP Water Main — — — —
allow for tests as required by Irrigation Contractor

Stormwater ————

Sanitary Sewer ————

NOTES:
1. Refer to 3089 for Standard details and Streetwork Specifications.
2. Installation of Services are included in the relevant sections of the specification.

S91 2185 - 10/1

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
T.P.O.			

Amendments	Initials	Date

Boon	Page	Initials	Date
Surveyed			
Levelled			
B.M.			
Computed from			

		Date
Designed	C Nordstrom	4/91
Drawn	C Nordstrom	4/91
Traced	V Woodward	4/91
Dwg. Chk	JOH	4/91
Des. Chk		
Approved		

Approved: Design Services Manager — Date: 5/4/91

CHRISTCHURCH CITY COUNCIL — DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
SITE WORKS AND SERVICES

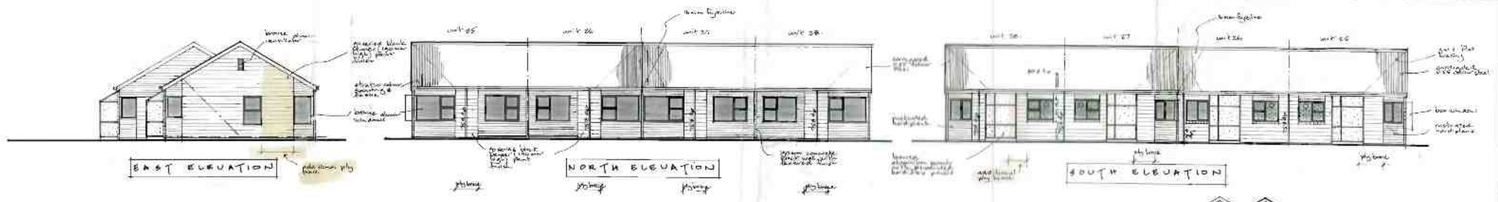
Scale: 1:200

File No.
Issue
D.3963
Sheet 67 of

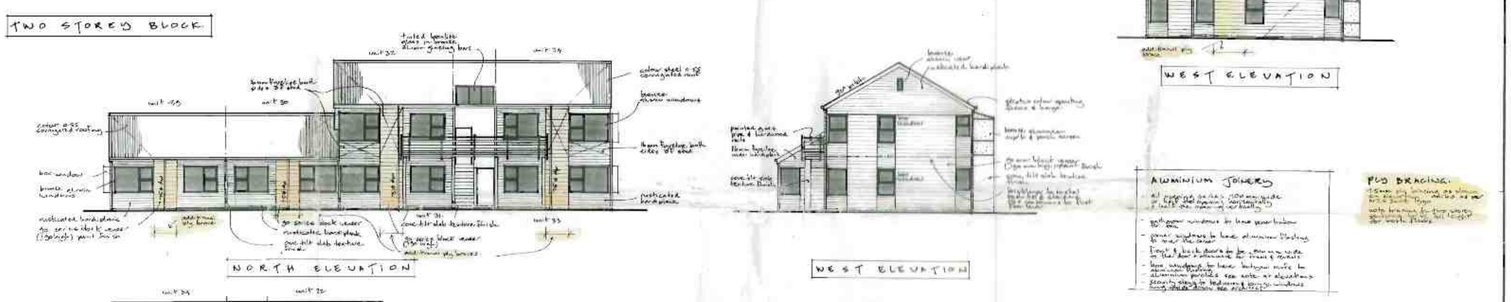
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

AMMENDMENTS		
additional ply bracing & deletion of some angle bracing	31/5/91	Brand & Grenfell

SINGLE STOREY BLOCK



TWO STOREY BLOCK



ALUMINIUM JOINERY

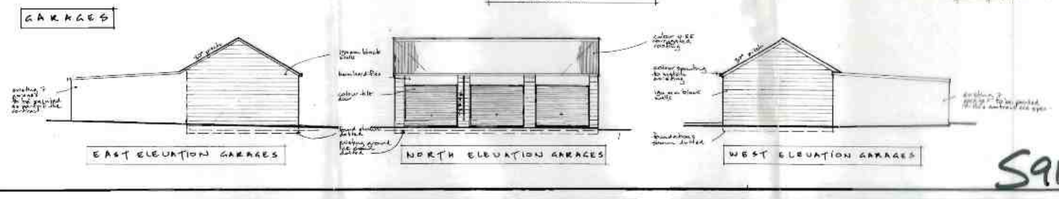
- all opening sashes 700 mm wide or half the opening (horizontally) whichever is less
- bathroom windows to have obscure glass
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 810 mm wide to the door & allowance for frame & reveals
- box windows to have horizontal roofs to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows

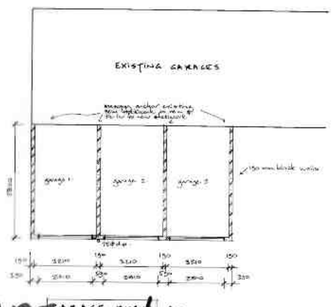
PLY BRACING:

7.5mm ply bracing as shown on elevations installed as per NZS 3604:1990

note bracing to two storey sections to be full length for both floors

GARAGES





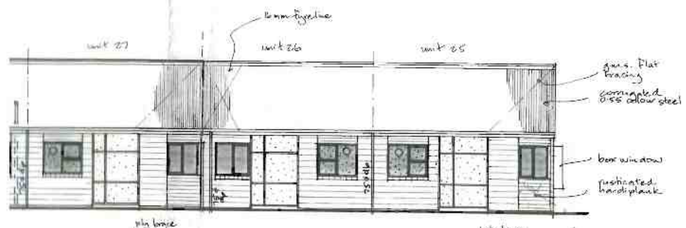
S91 2188 11/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan

SCALE 1:100 | DESIGN | JOB NO 11351 | SHEET NUMBER
DATE 25/1/91 | DRAWN BSS | TRACED | FILE NO | OF 22 total SHEETS 12.

AMMENDMENTS.		
additional ply bracing & deletion of some angle bracing	31/5/91	Brand & Grenfell





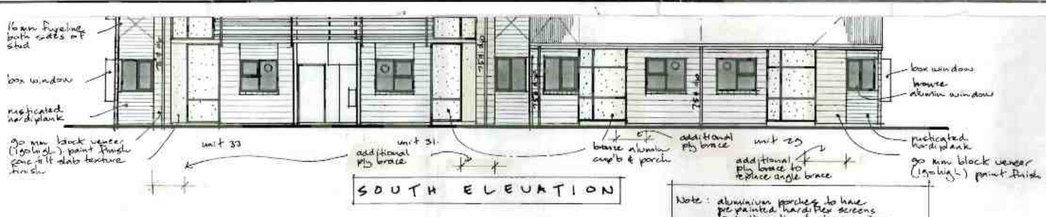
ALUMINIUM JOINERY

- all opening sashes 700 mm wide or half the opening (horizontally) whichever is less
- bathroom windows to have obscure glass
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 810 mm wide to the door & allowance for frame & reveals
- box windows to have horizontal roofs to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows

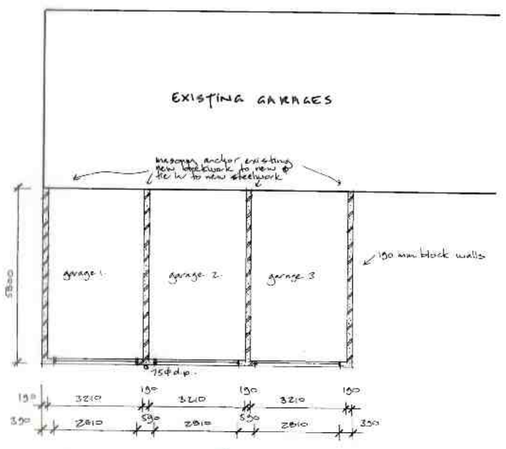
PLY BRACING:

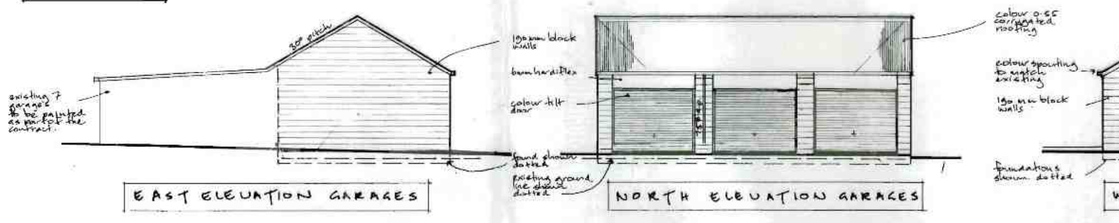
7.5mm ply bracing as shown on elevations installed as per NZS 3604:1990

note bracing to two storey sections to be full length for both floors









S91 2188 11/11

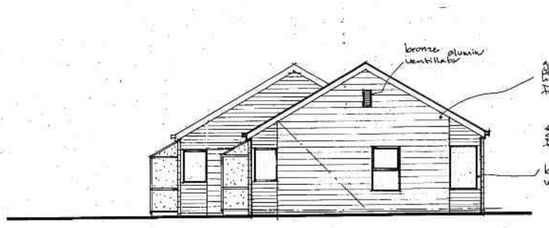
CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan

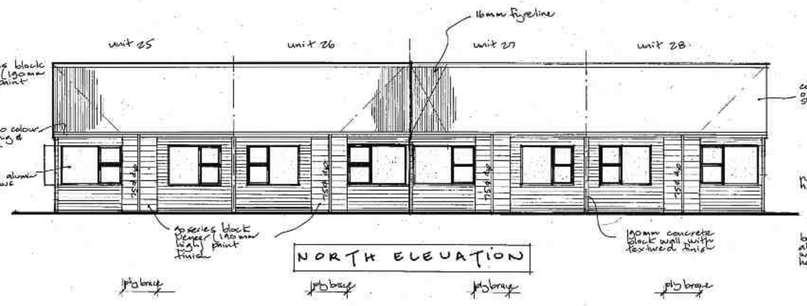
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DATE 25/1/91 | DRAWN BSS | TRACED | FILE NO | OF 22 total SHEETS 12.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

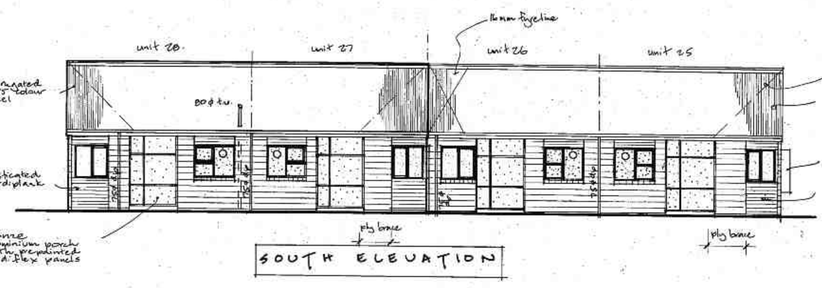
SINGLE STOREY BLOCK.



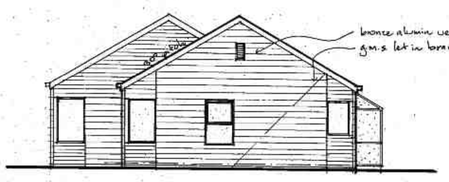
EAST ELEVATION



NORTH ELEVATION

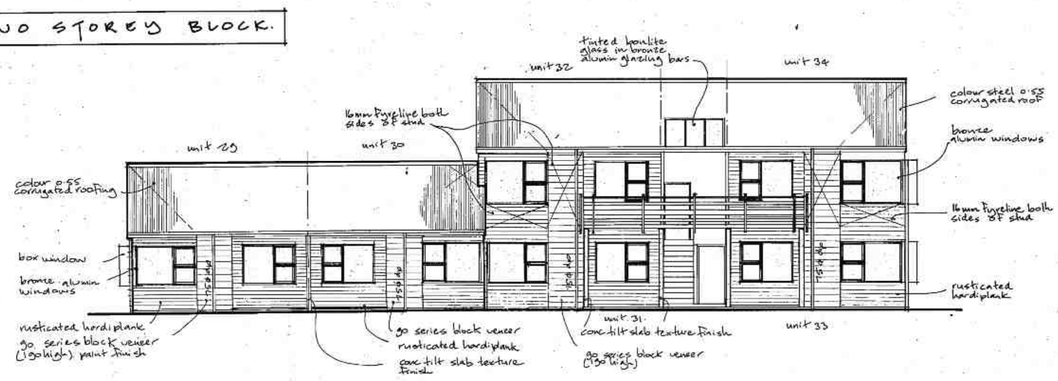


SOUTH ELEVATION

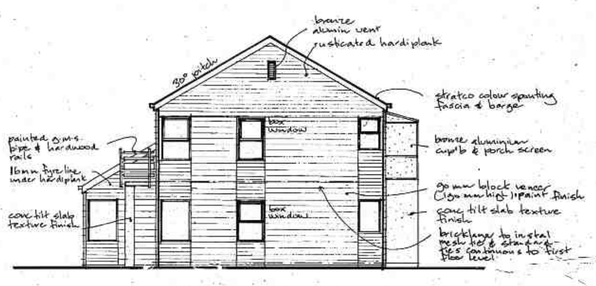


WEST ELEVATION

TWO STOREY BLOCK.



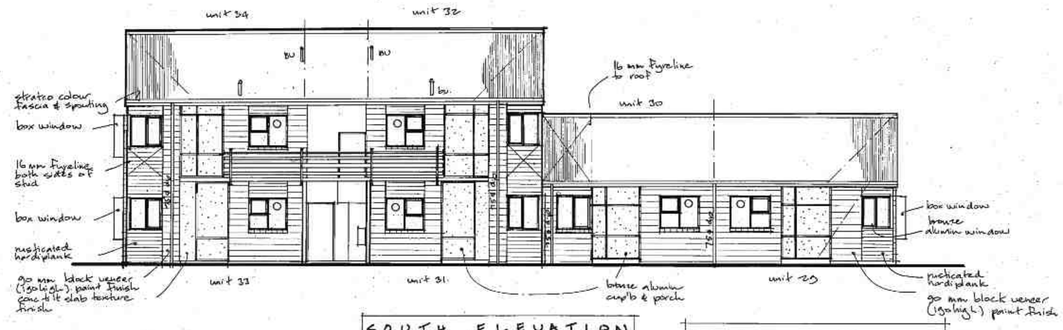
NORTH ELEVATION



WEST ELEVATION

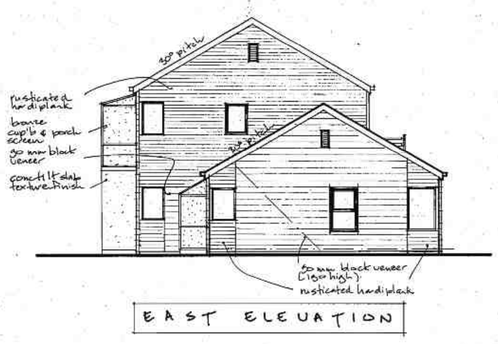
ALUMINIUM JOINERY

- all opening sashes 1000 mm wide or less to be sliding horizontally & half the opening in width
- bathroom windows to have ventilation fan
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 1810 mm wide to take door & aluminium for frame & reveals
- box windows to have bottom vents to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows facing vehicle access see architects

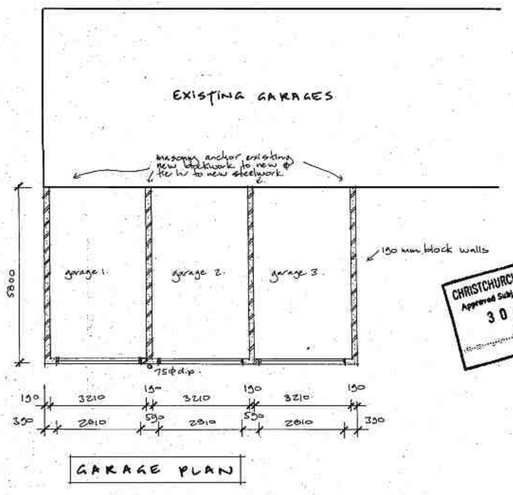


SOUTH ELEVATION

Note: aluminium porches to have pre-painted hardiflex screens to cupb portion & obscure glass to remainder with polycarbonate sheet to the roof see note.



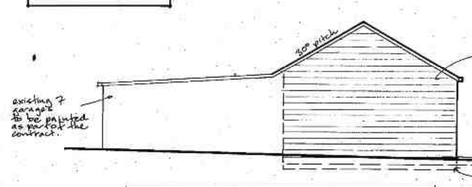
EAST ELEVATION



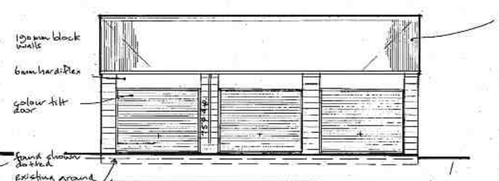
GARAGE PLAN

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30 APR 1991
For Engineer

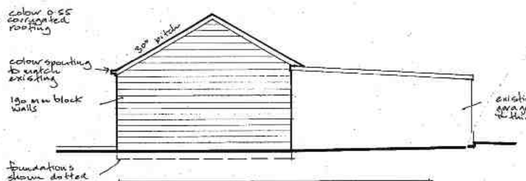
GARAGES



EAST ELEVATION GARAGES



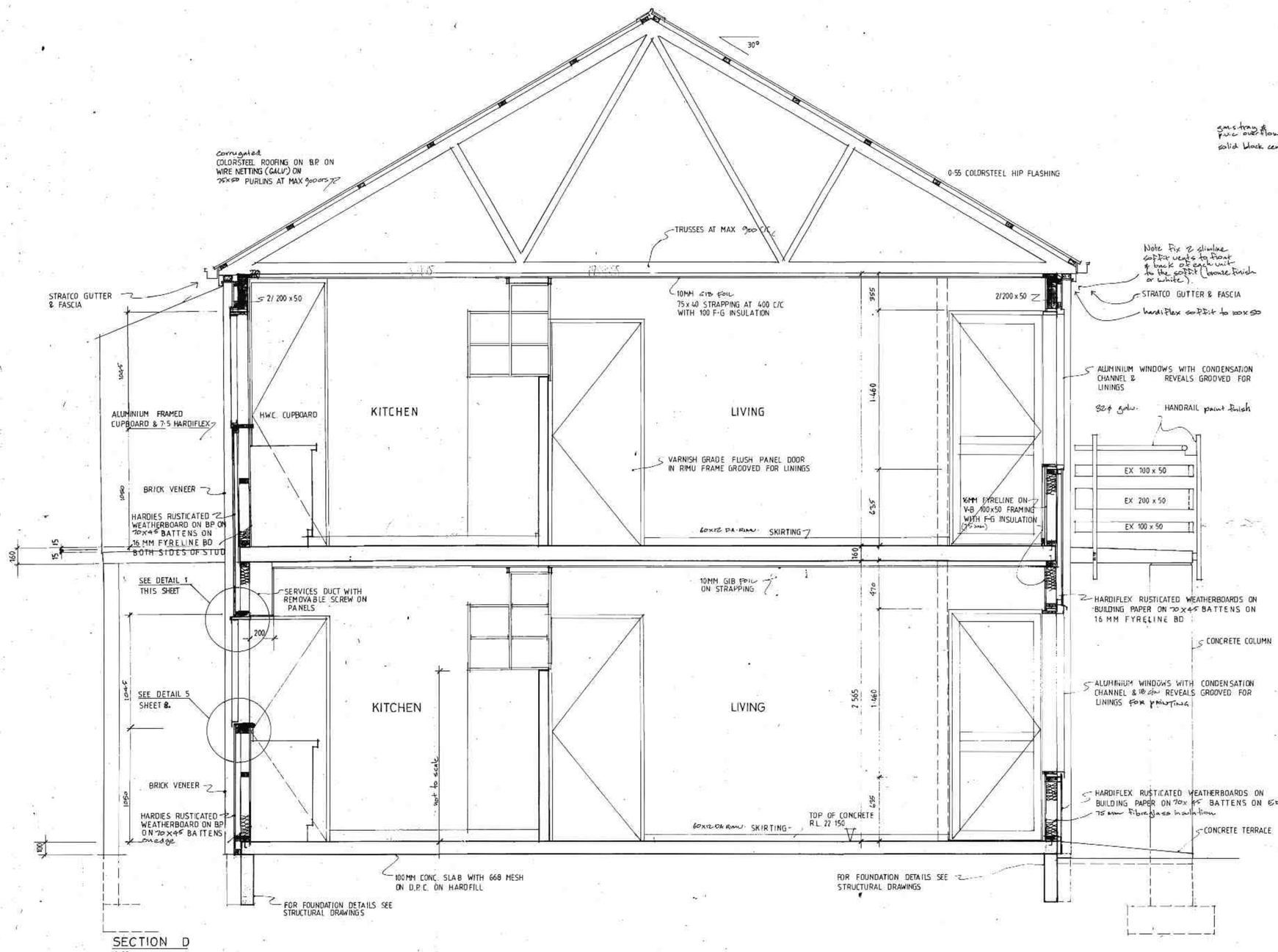
NORTH ELEVATION GARAGES



WEST ELEVATION GARAGES

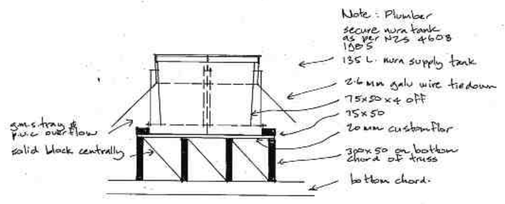
CHRISTCHURCH CITY COUNCIL CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT	HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan.	SCALE 1:100	DESIGN	JOB NO 11251.	SHEET NUMBER
		DATE 25.1.91.	DRAWN BEG TRACED	FILE NO	OF 22 total SHEETS A 2.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

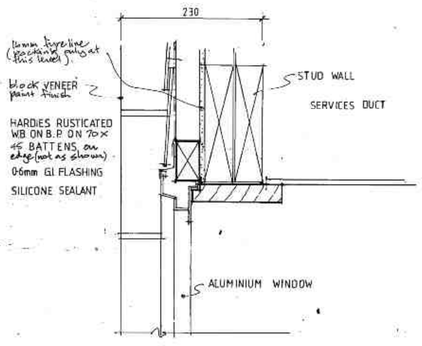


SECTION D
1:20

Note : Plumber secure nura tank as per NZS 4608 1985



TYPICAL SUPPLY TANK SUPPORT. 1:20



DETAIL 1
1:5

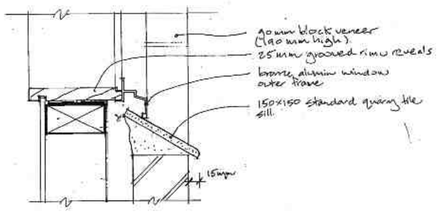
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Approved Subject to the By-Laws
3 0 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

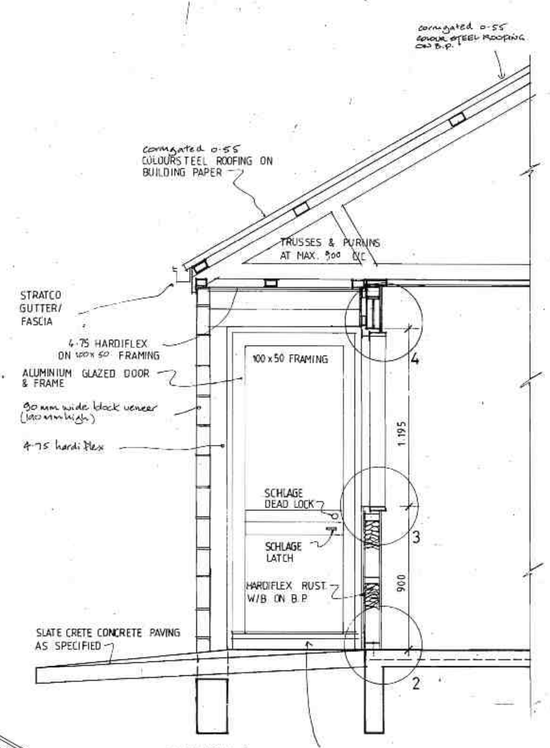
HARMAN COURTS EXTENSION 1991. two storey block cross-sections.

SCALE 1:20, 1:5 | DESIGN BRG | JOB NO 11251 | SHEET NUMBER A 7,
DATE 16.3.91 | DRAWN | TRACED | FILE NO | OF 22 Total SHEETS

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

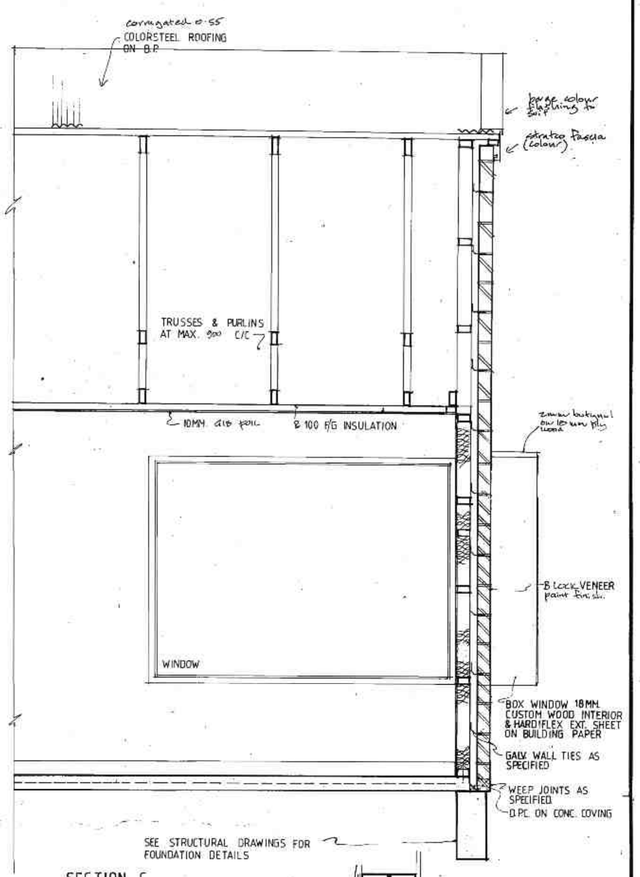


TYPICAL BLOCK SILL DETAIL

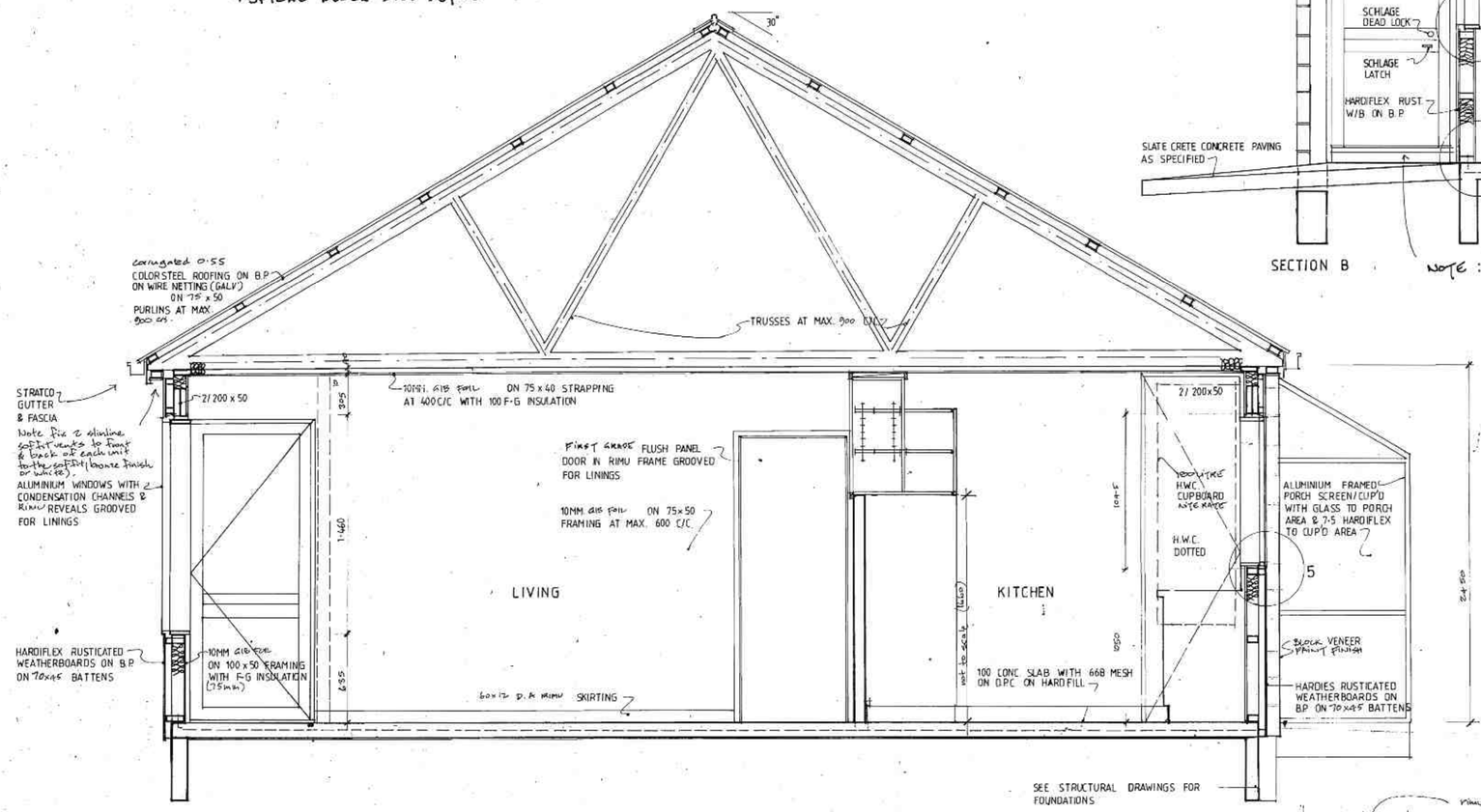


SECTION B

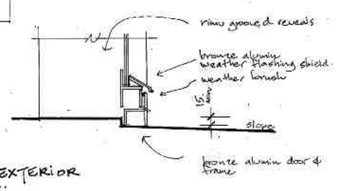
NOTE : ALUMINIUM DOORS to have a weather shield fitted bottom section to front & back doors



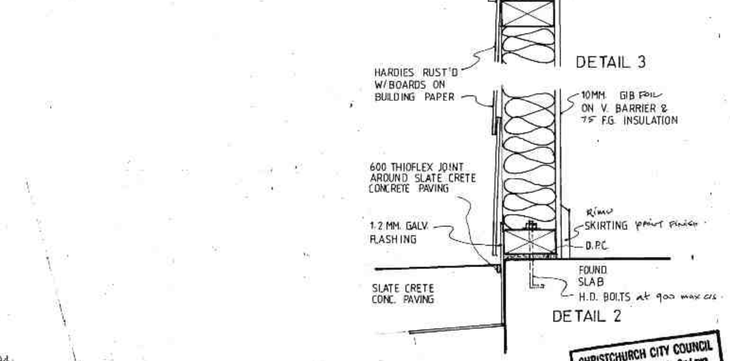
SECTION C



SECTION A



TYPICAL EXTERIOR DOOR SILL.



DETAIL 5

DETAIL 4

DETAIL 3

DETAIL 2

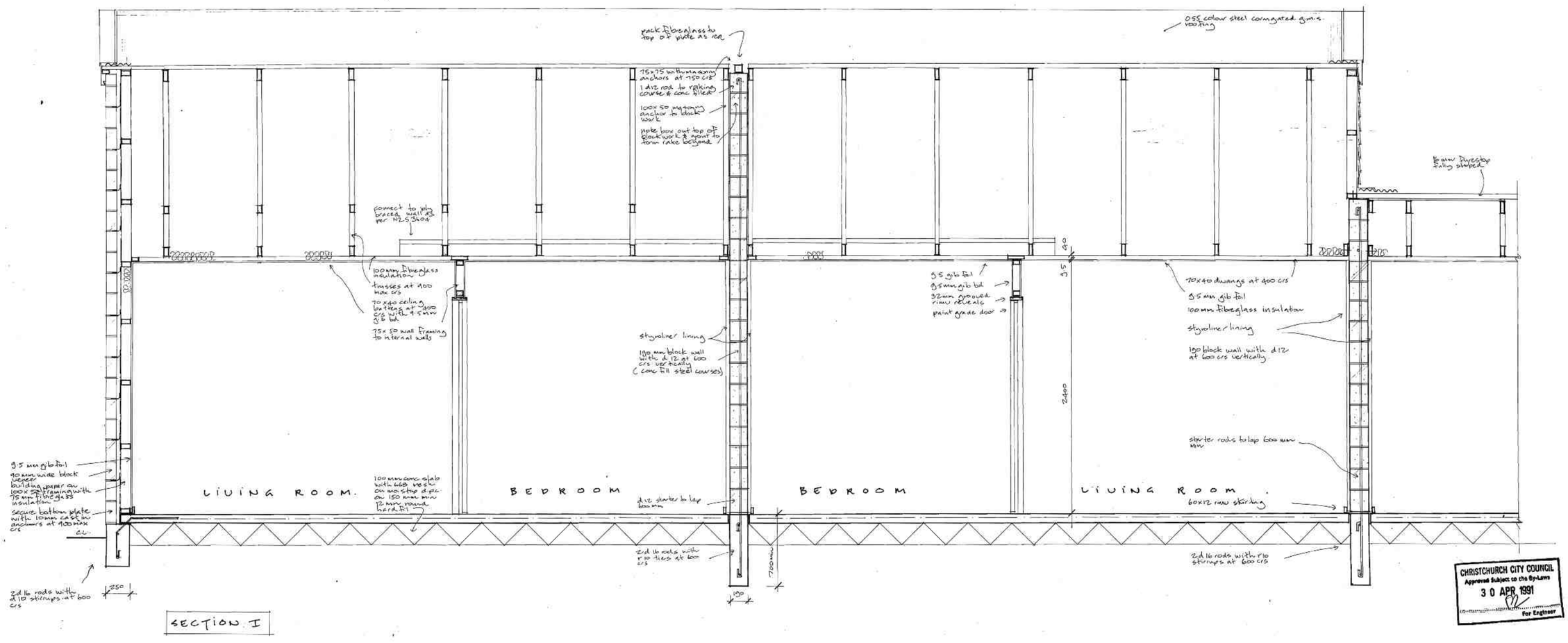
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30 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991 single storey block & part single block cross sections.

SCALE 1:20, 1:5 DESIGN BFH JOB NO 1125 SHEET NUMBER A 8.
DATE 14.3.91 DRAWN RM FILE NO OF 22 Total SHEETS
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



SECTION I

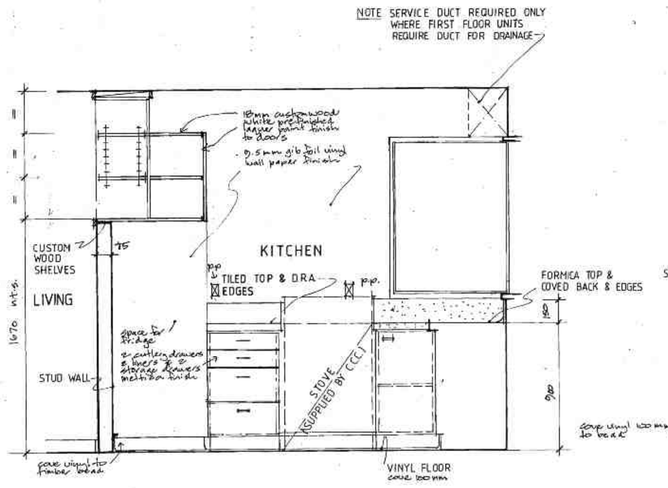
CHRISTCHURCH CITY COUNCIL
Approved Subject to cha By-Laws
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for Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

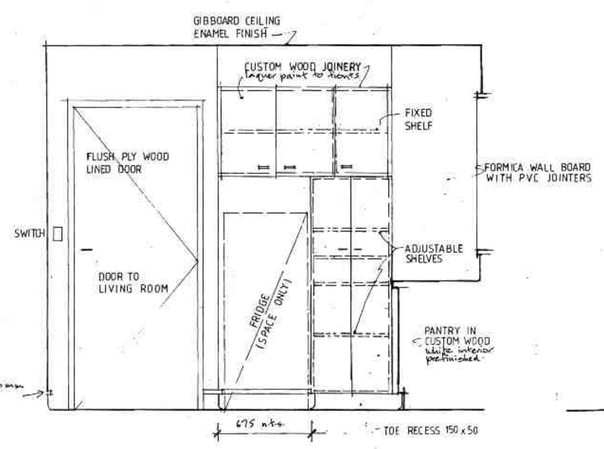
HARMAN COURTS EXTENSION 1991. single storey block cross section

SCALE 1:20 DESIGN
DATE 4/91 DRAWN BEG TRACED
JOB NO 11251 SHEET NUMBER
FILE NO OF 22 total SHEETS A 9.

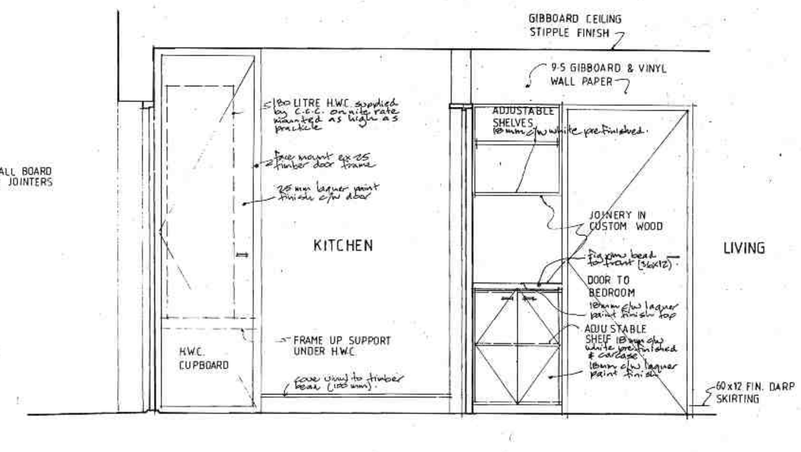
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



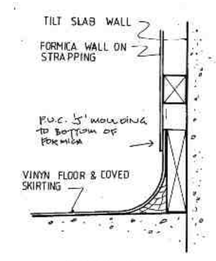
ELEVATION A



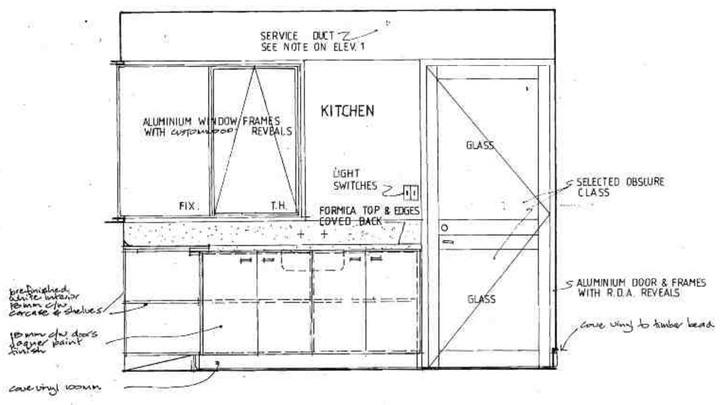
ELEVATION B



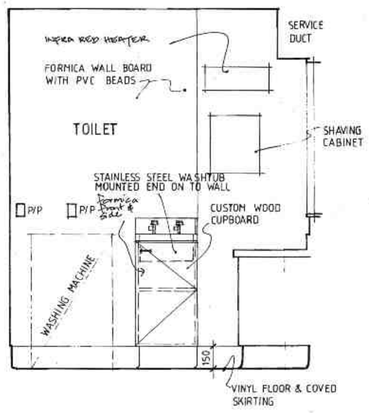
ELEVATION C



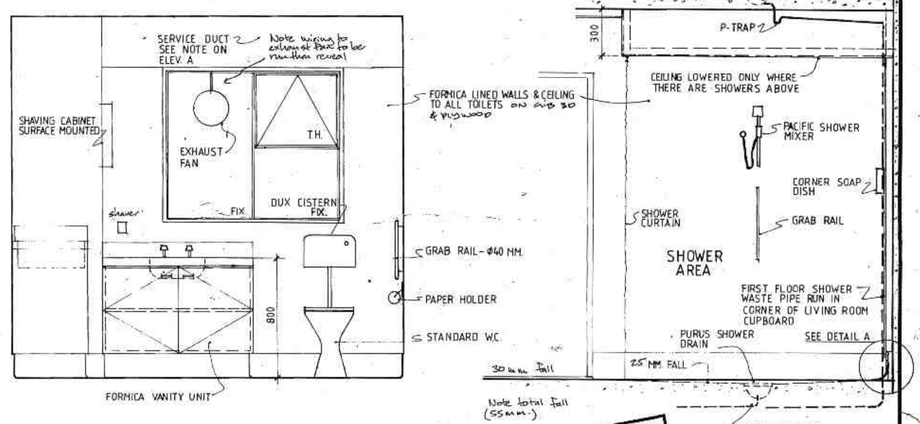
DETAIL A



ELEVATION D



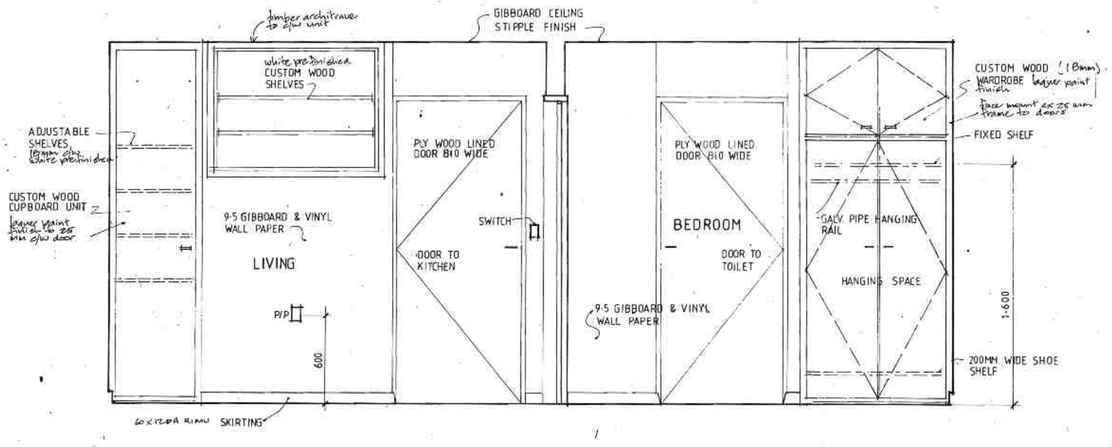
ELEVATION E



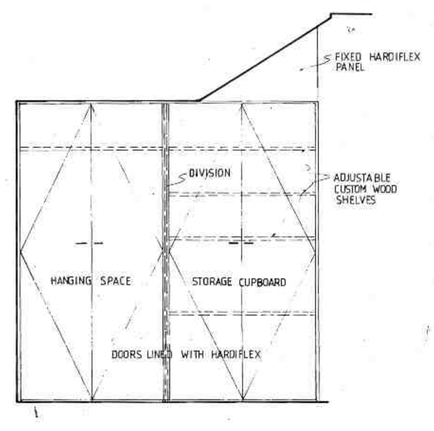
ELEVATION F

ELEVATION G
(diagramatic only).

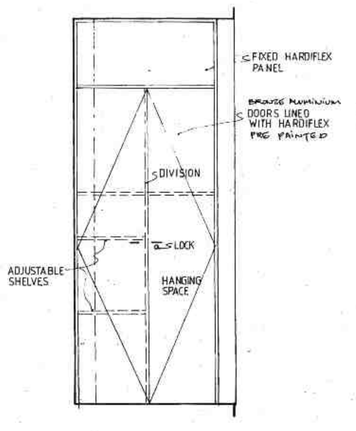
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30 APR 1991
For Engineer



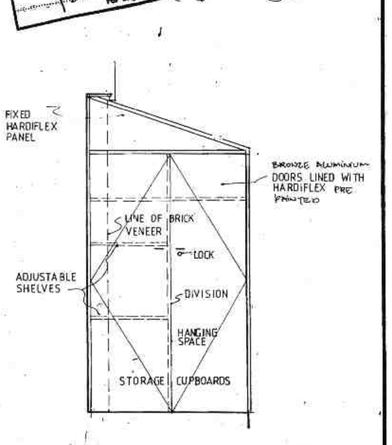
ELEVATION H



ELEVATION I



ELEVATION J
Note door frames aluminium



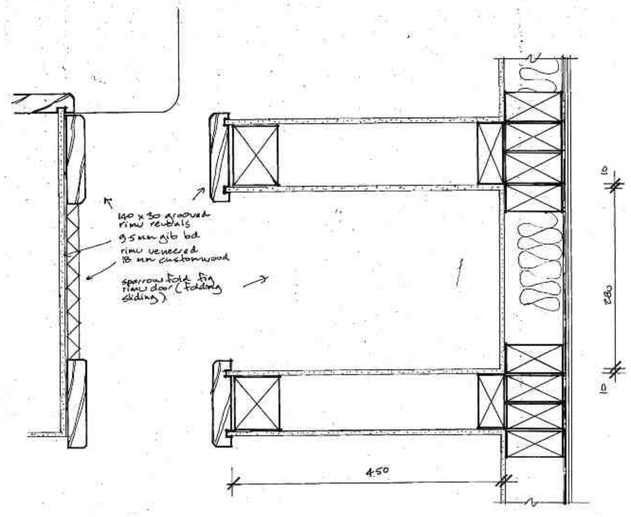
ELEVATION K
Note door frames aluminium

CHRISTCHURCH CITY COUNCIL
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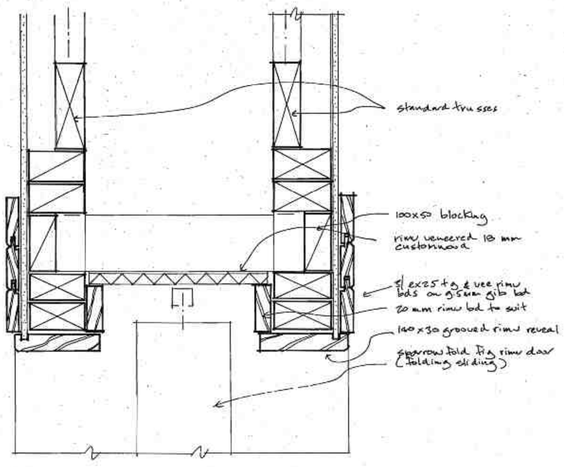
HARMAN COURTS EXTENSION 1991. typical joinery elevations & details.

SCALE 1:20 DESIGN G.F.H. JOB NO 11251 SHEET NUMBER
DATE 16 3 91 DRAWN P.M. TRACED FILE NO OF 22 total SHEETS A 10.

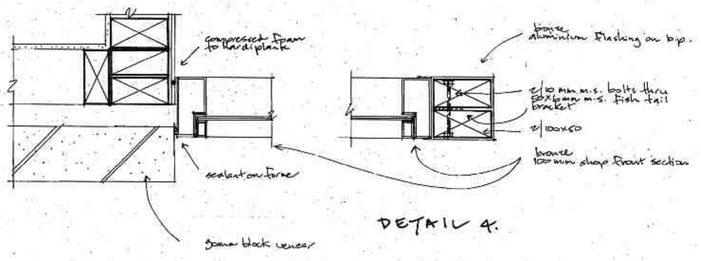
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



DETAIL 1.

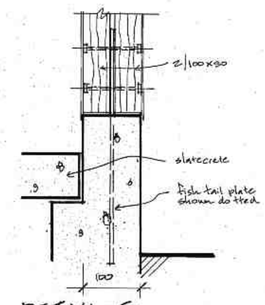


DETAIL 2.

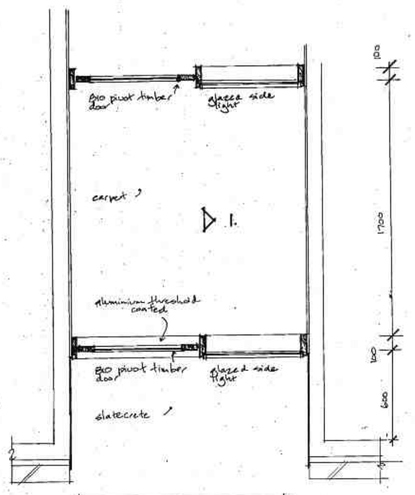


DETAIL 3.

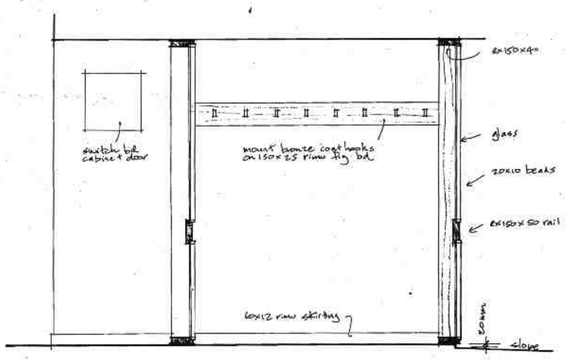
DETAIL 4.



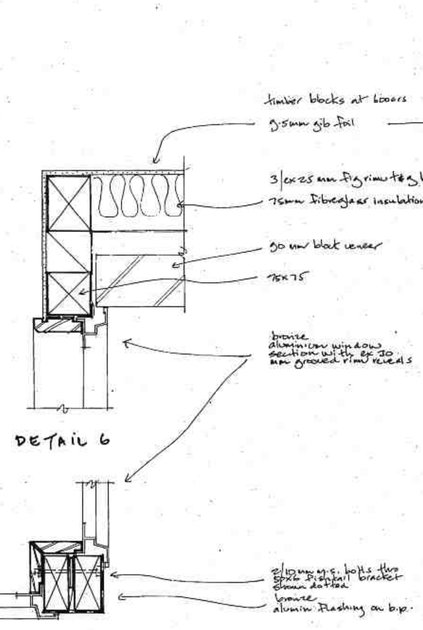
DETAIL 5.



ENTRY PLAN 1:50

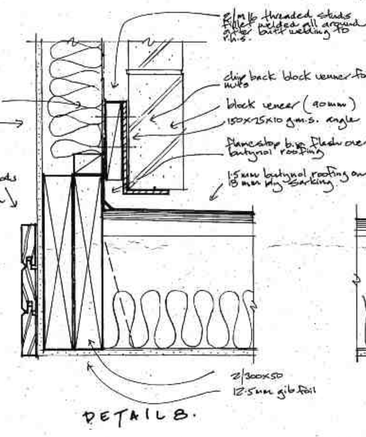


ELEVATION 1.

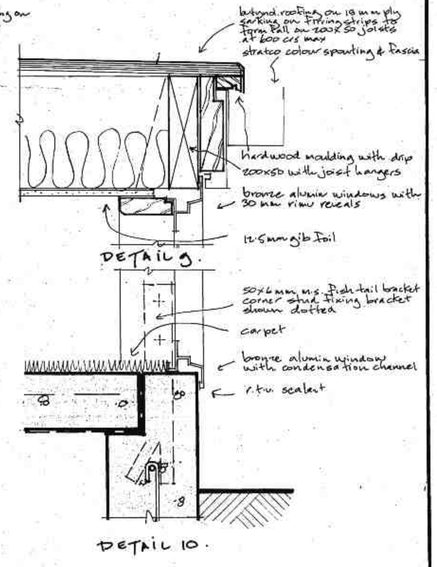


DETAIL 6

DETAIL 7

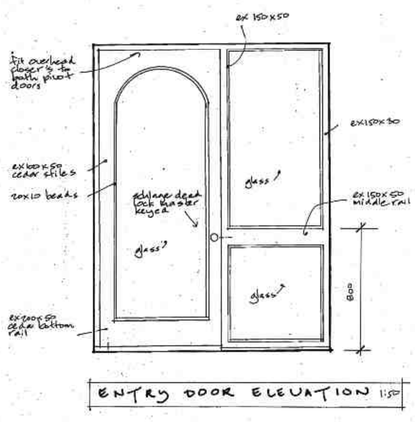


DETAIL 8.



DETAIL 9.

DETAIL 10.



ENTRY DOOR ELEVATION 1:50

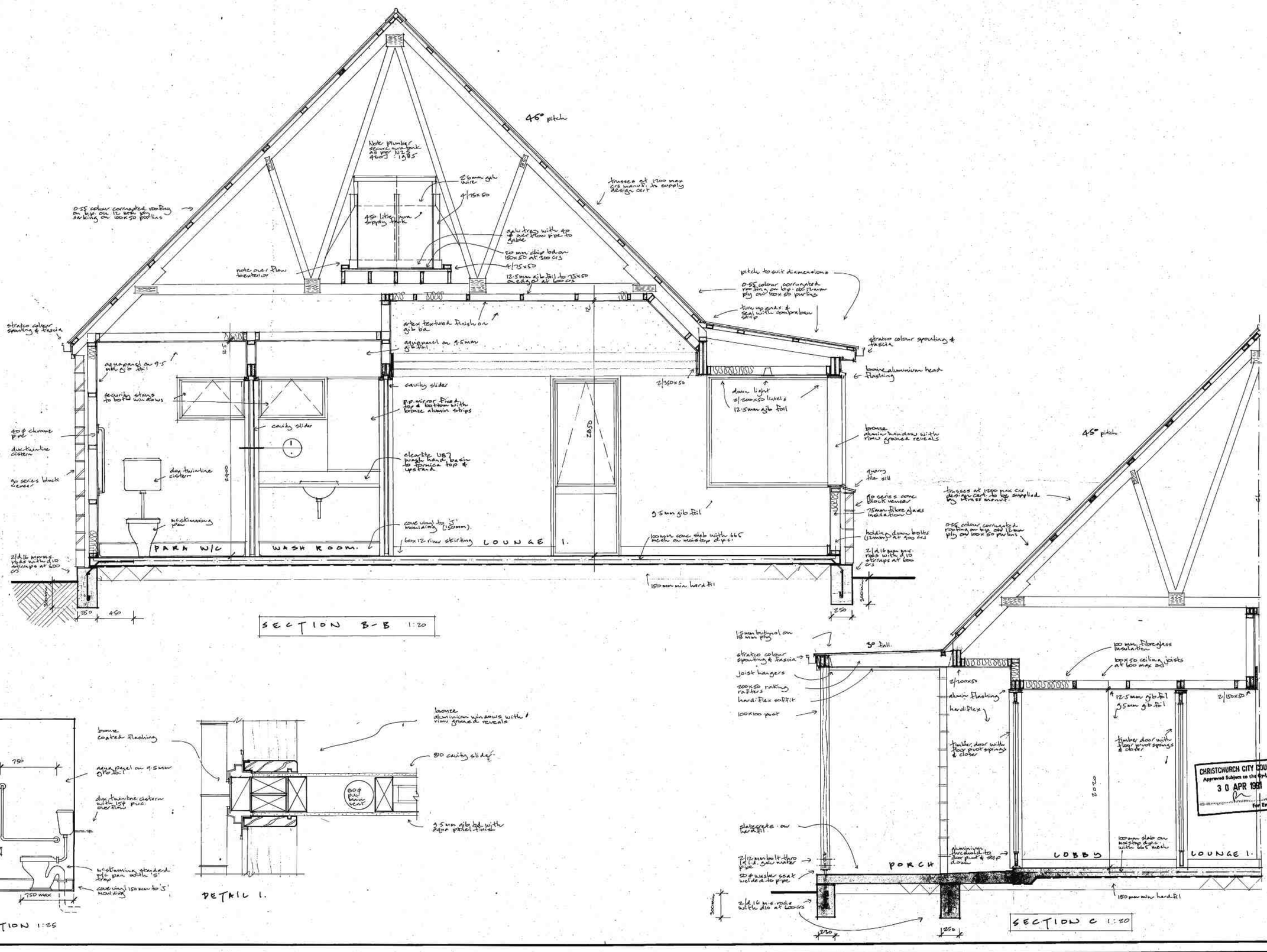
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30 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

SCALE 1:5 | DESIGN | JOB NO 11251 | SHEET NUMBER
DATE 10.91. | DRAWN JEG | FILE NO | OF 27 total SHEETS A 13.
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

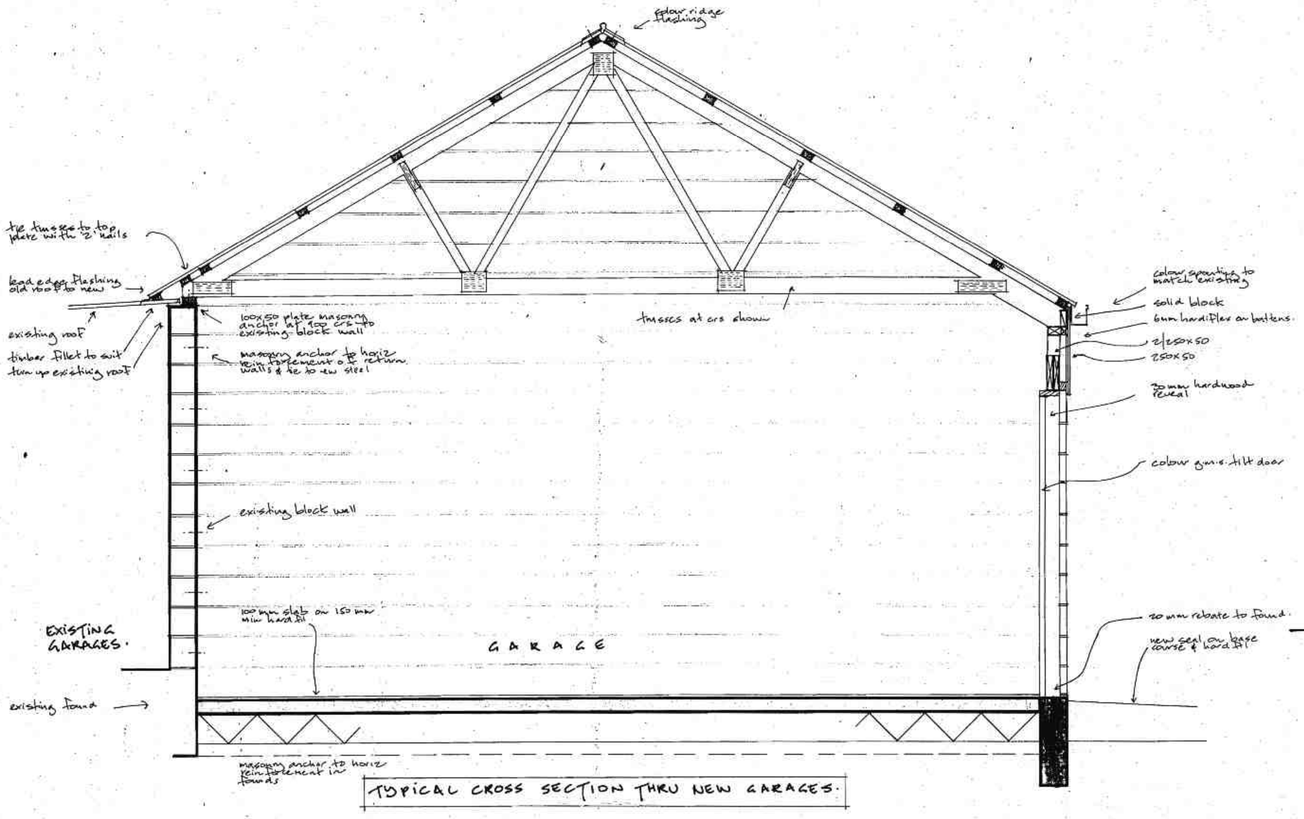


CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

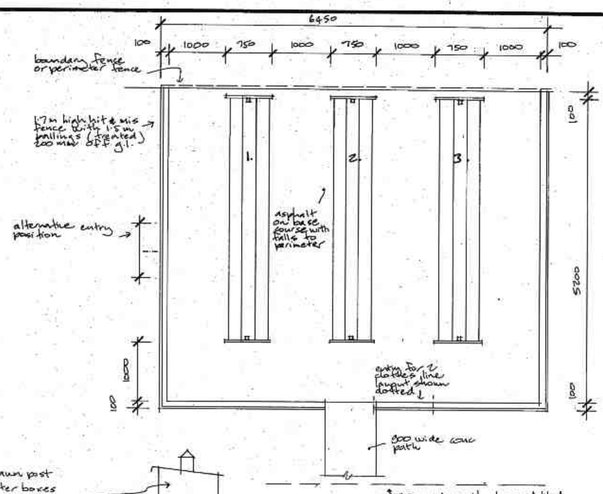
HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

SCALE 1:20,25,10 DESIGN
DATE 8.91. DRAWN BES
TRACED
JOB NO 11251
FILE NO
SHEET NUMBER
OF ## total SHEETS A14

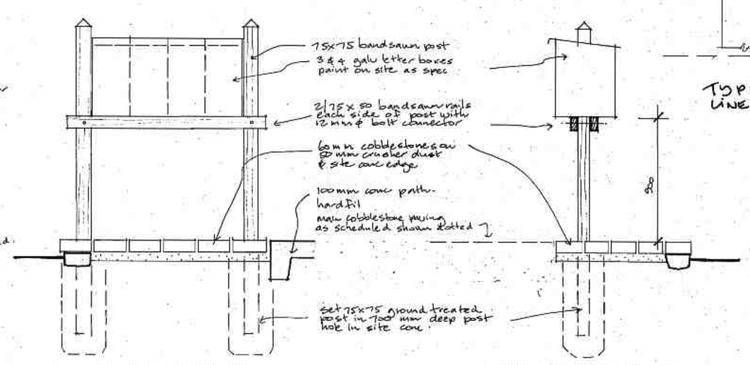
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



TYPICAL CROSS SECTION THRU NEW GARAGES.



TYPICAL CLOTHES LINE LAYOUT. 1:50



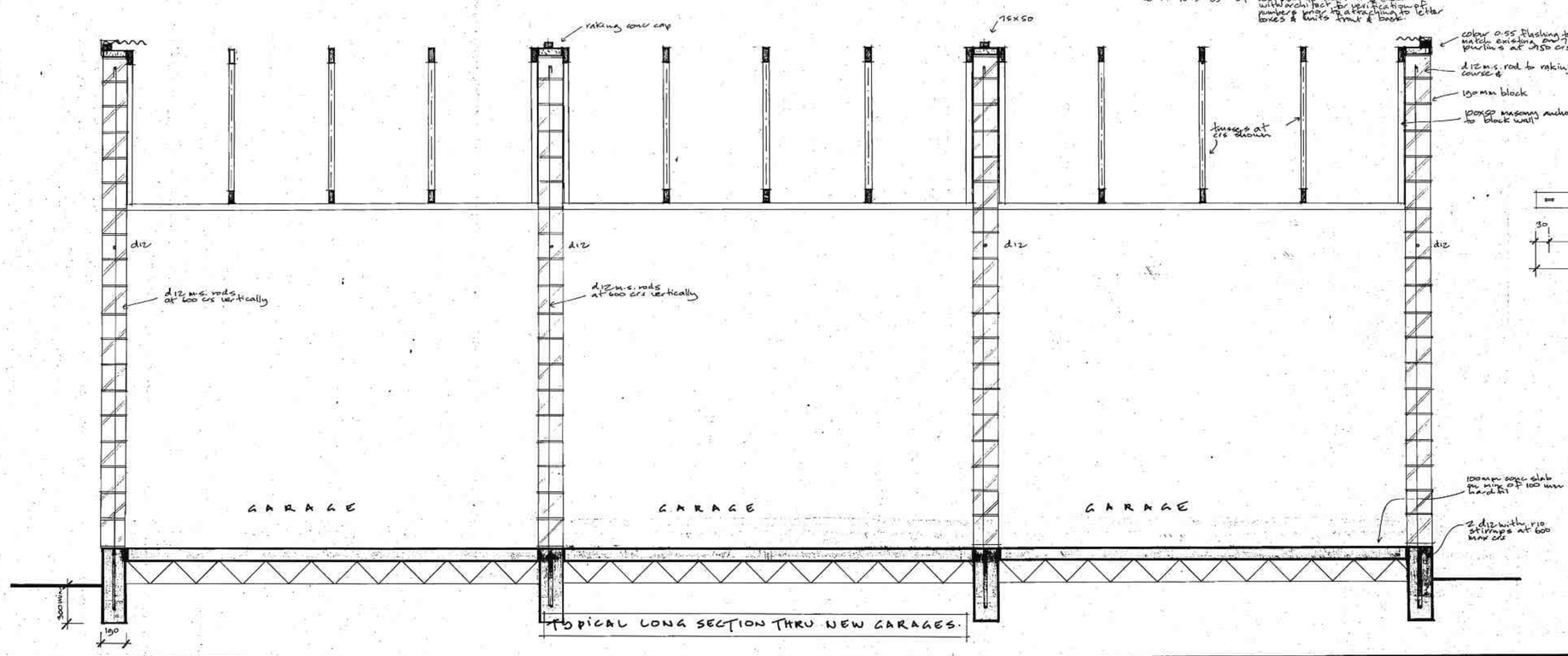
LONG SECTION.

CROSS SECTION

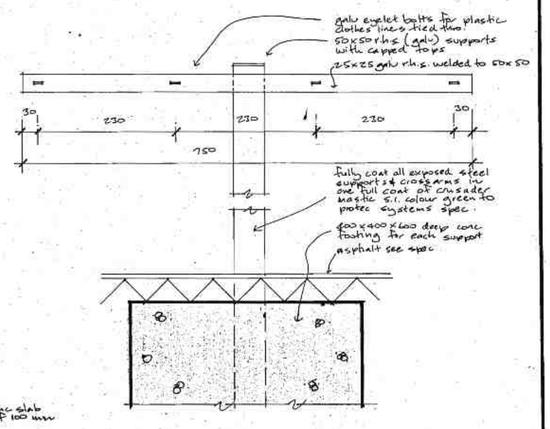
STANDARD LETTER BOX DETAILS.

10 off at 4 # & 2 off at 3 - total of 12 boxes.

Letter N°s 25-34 see plan for location & check with architect for verification of numbers & prior to attaching to letter boxes # units front & back.



TYPICAL LONG SECTION THRU NEW GARAGES.



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CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

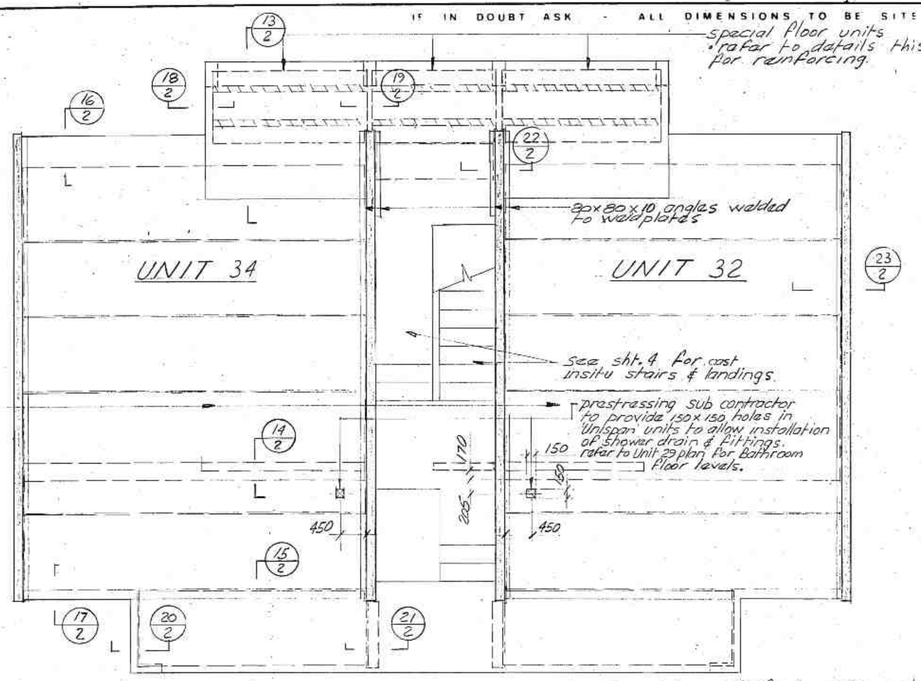
HARMAN COURTS EXTENSION 1991. 3 garages clothes line details & letter box details for property unit.

SCALE 1:20 DESIGN JOB NO 11251 SHEET NUMBER
DATE 1.2.91 DRAWN TRACED FILE NO OF 22 Total SHEETS A 15.

IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES

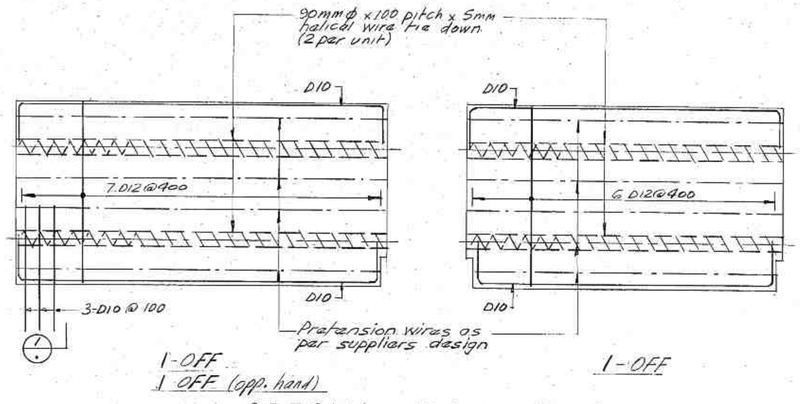
Original scale of millimetres 0 20 40 60 80 100

special floor units
•refer to details this sheet for reinforcing.

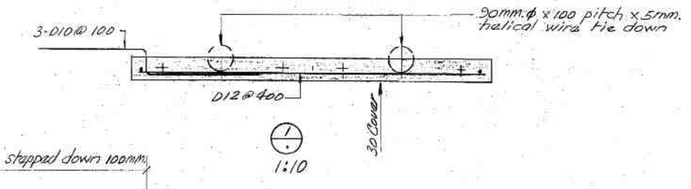


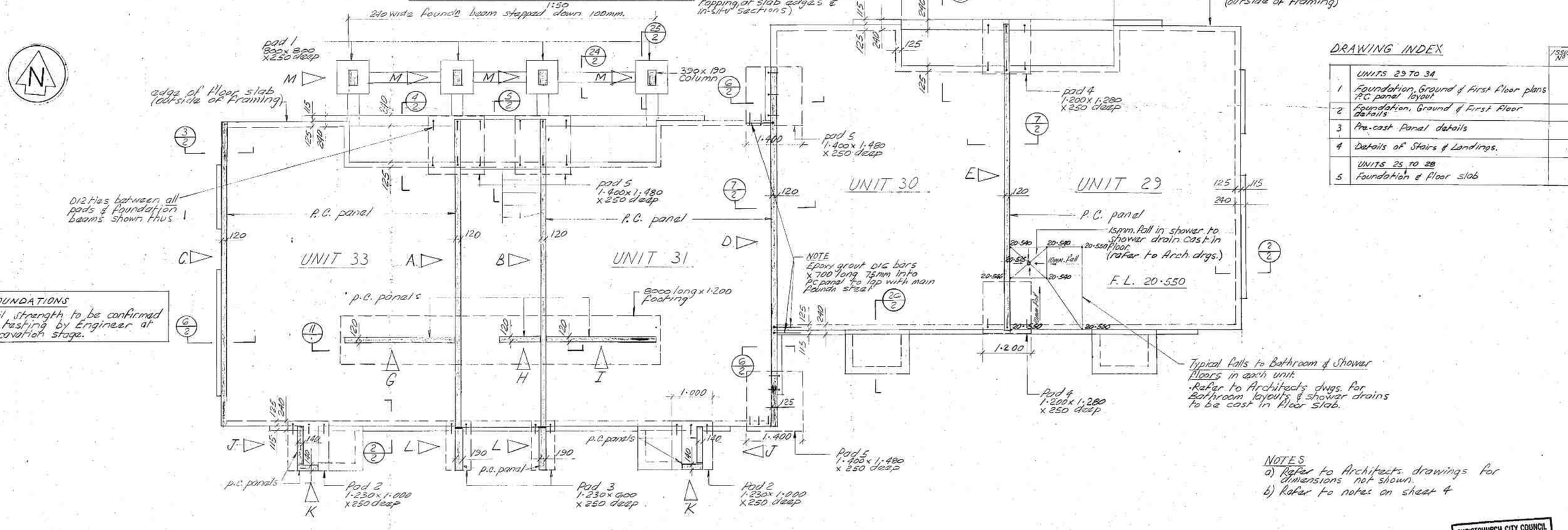
FIRST FLOOR SLAB PLAN
1:50

(refer to sections on sht 2 for details of reinforcing in topping at slab edges & in-situ sections)



SPECIAL FLOOR UNITS
1:20





FOUNDATIONS, GROUND FLOOR SLAB & P.C. PANEL PLAN
1:50

NOTES
a) Refer to Architects drawings for dimensions not shown.
b) Refer to notes on sheet 4

DRAWING INDEX

		ISSUE NO
	UNITS 29 TO 34	
1	Foundation, Ground & First Floor plans P.C. panel layout	
2	Foundation, Ground & First Floor details	
3	Pre-cast Panel details	
4	Details of Stairs & Landings.	
	UNITS 25 TO 28	
5	Foundation & Floor slab	

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Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments | Initials | Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed		
Drawn	JM	3.91
Traced	JM	3.91
Dwg. Chk.		4/91
Des. Chk.		
Indexed		

Approved: Mof Blakemell 4/4/91 Date
Design Services Manager

CHRISTCHURCH CITY COUNCIL · · · · DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
FOUNDATION, GROUND & FIRST FLOOR PLANS, P.C. PANEL LAYOUT

Scales: 1:10, 1:20, 1:50

File No
Issue
D.3963
Sheet 1 of 5

IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES

PAD 1

PAD 2

PAD 3

pad 5 - refer to detail below

- 3-D12 -

line of PC panel shown dotted

Approved

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991

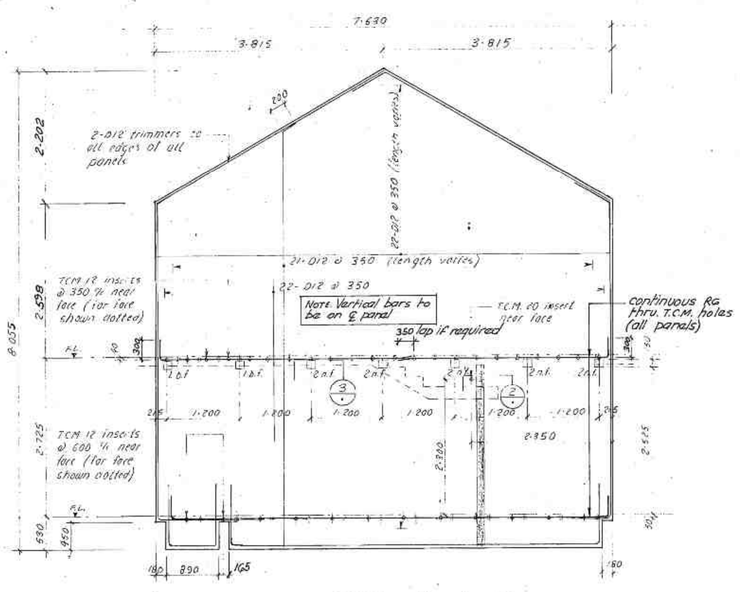
FOUNDATION, GROUND & FIRST FLOOR DETAILS

File No. D3963

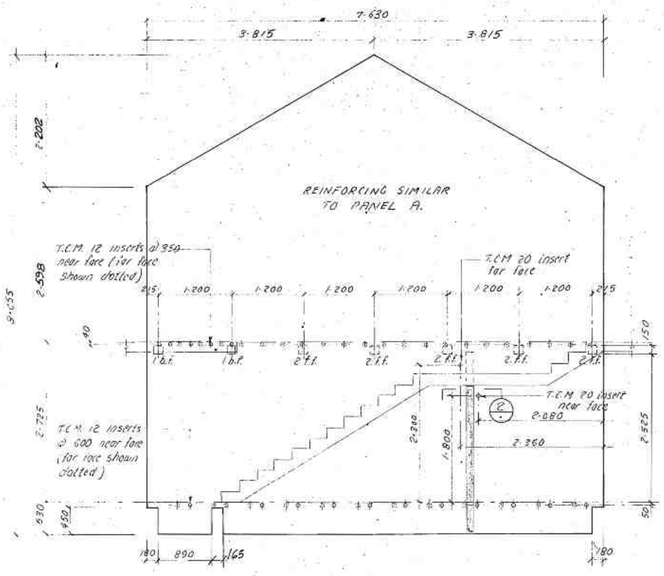
Sheet 2 of 5

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
The Engineer

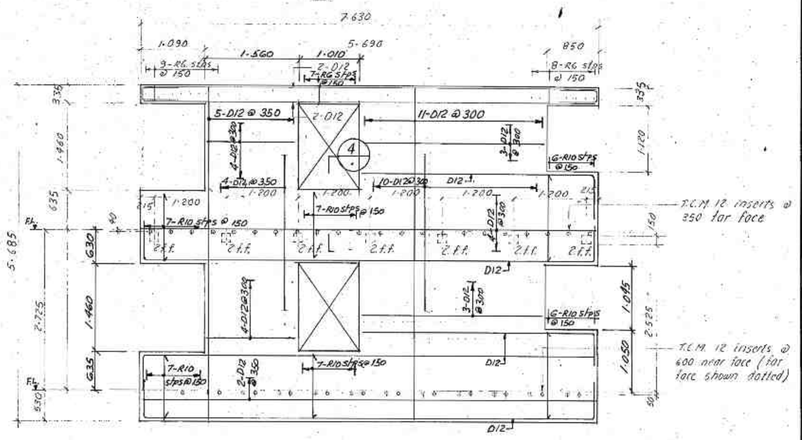
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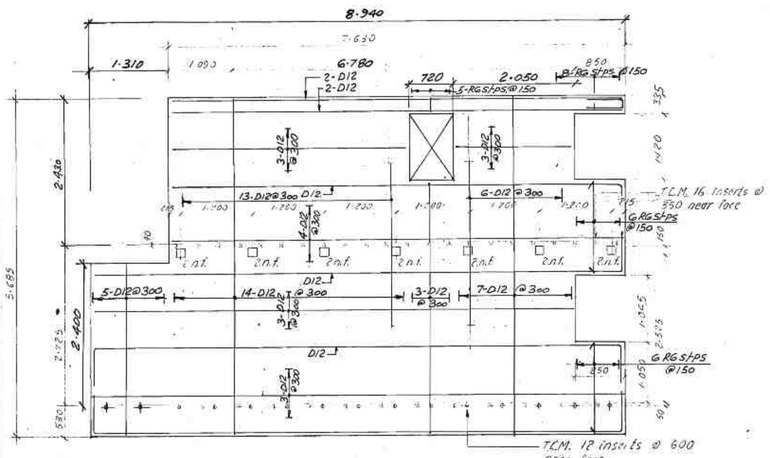
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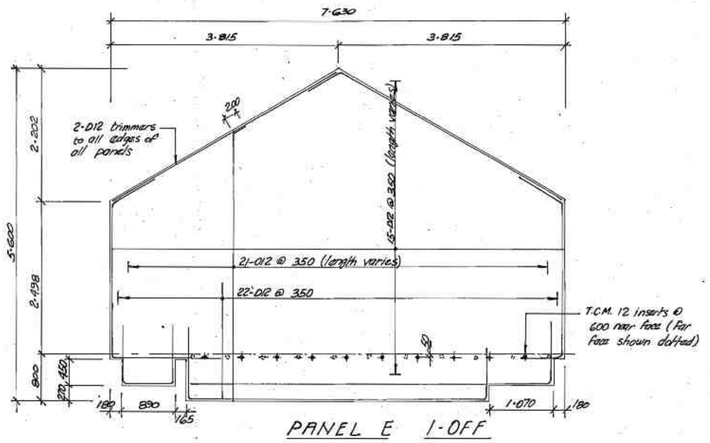
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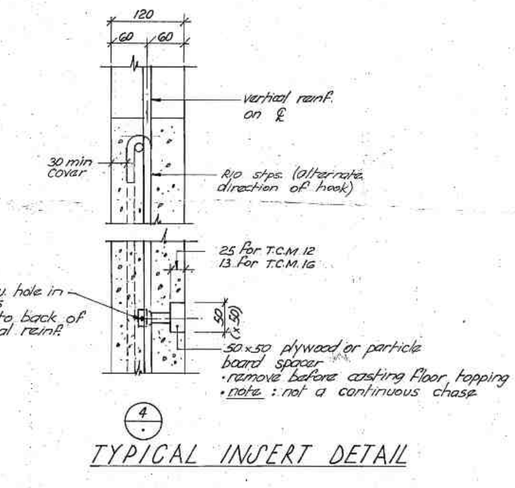
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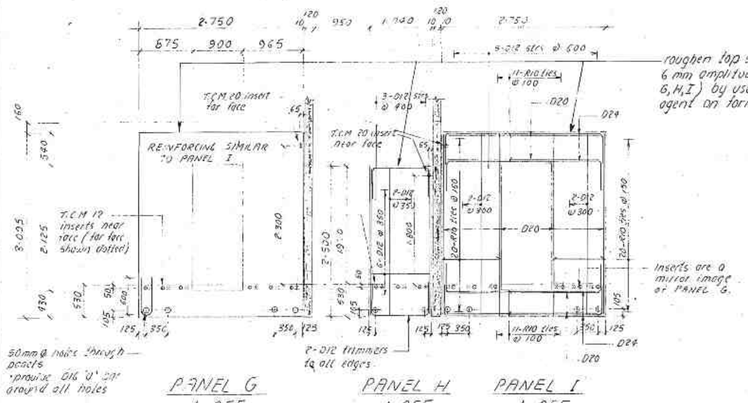
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PANEL E 1-OFF
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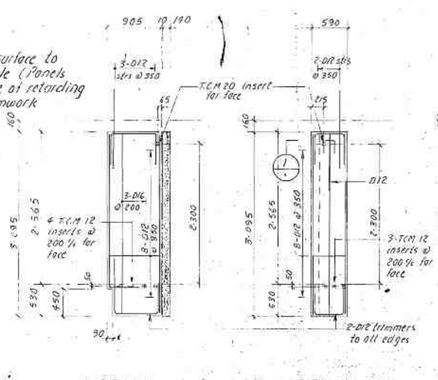
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TYPICAL INSERT DETAIL



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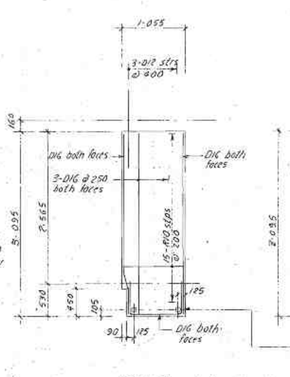
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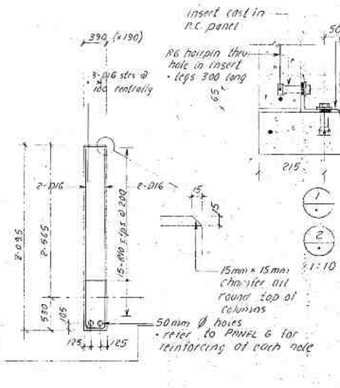


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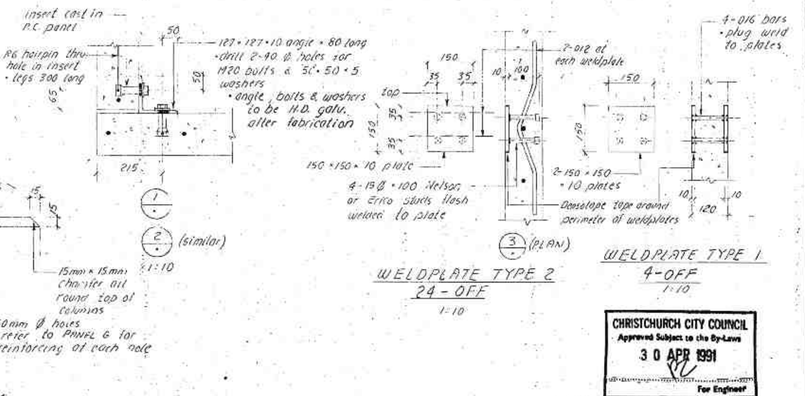
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1:50



PANEL L (190 thick) 2-OFF
1:50



COLUMN M 4-OFF
1:50



WELDPLATE TYPE 2
24-OFF
1:10

WELDPLATE TYPE 1
4-OFF
1:10

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For Engineer

NOTES Refer to notes on Sheet 4.

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				
Indexed				

		Date
Designed		
Drawn	A.O'Brien	11/88
Traced	BGB PM	11/88
Dwg. Chk.		11/88
Des. Chk.		

Approved
M.F. Bakewell 2-1-89
Design Engineer Date
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991

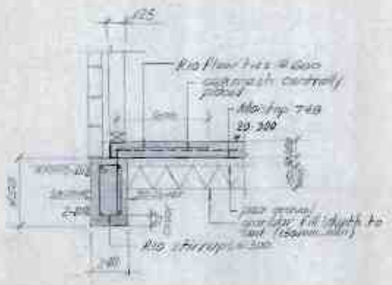
PRE-CAST PANEL DETAILS

Scales: 1:10, 1:50

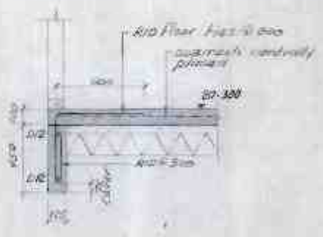
File No. Issue
D3963
Sheet 3 of 5

Original scale of millimetres 0 20 40 60 80 100

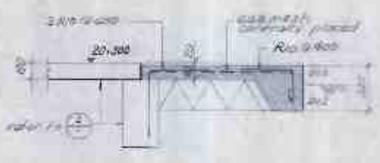
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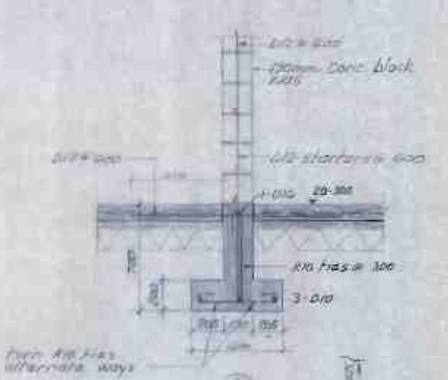
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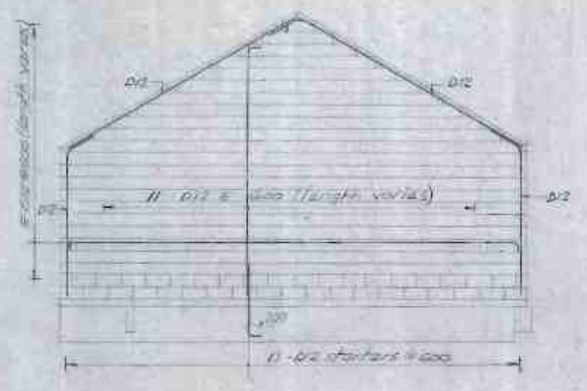
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3/20



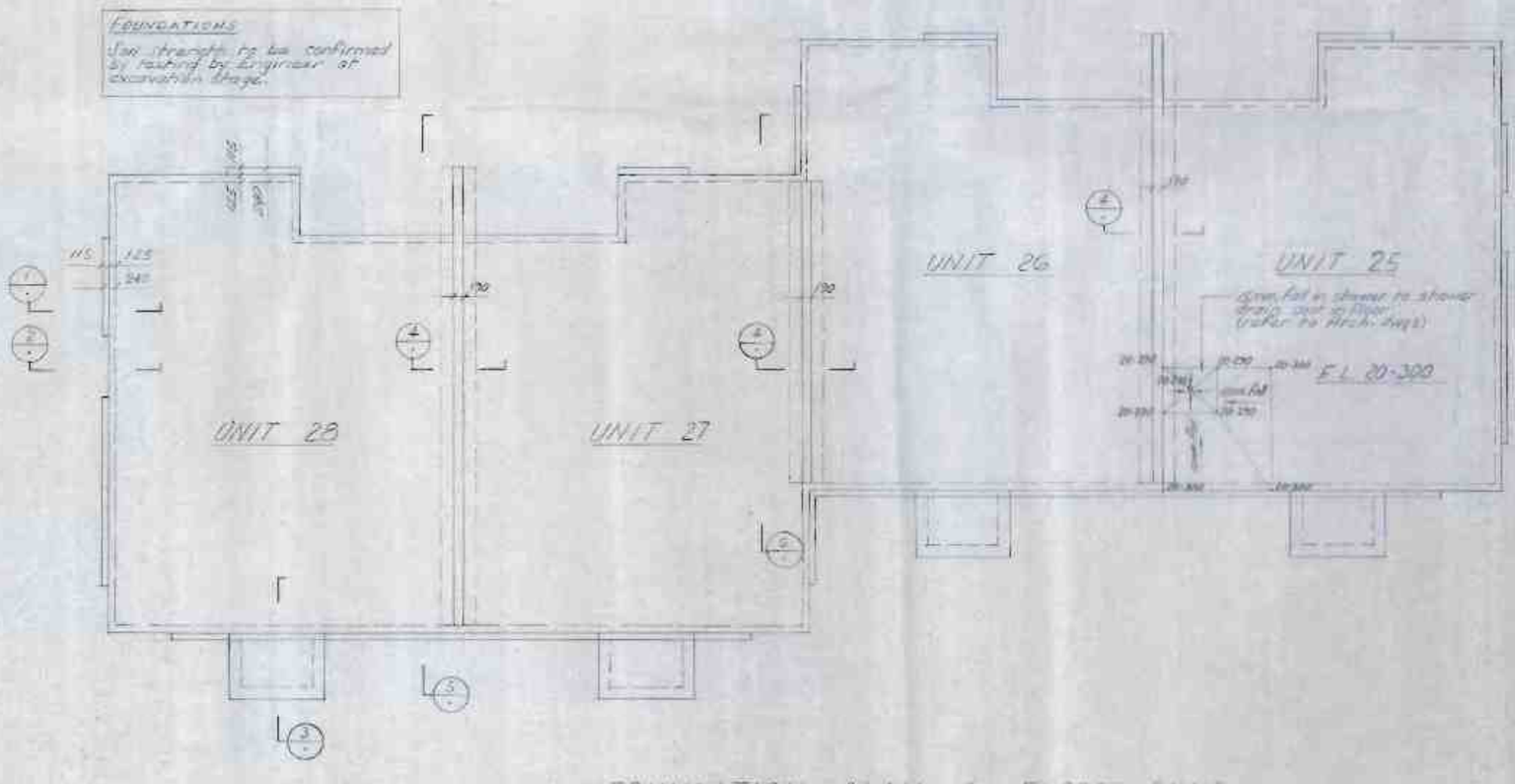
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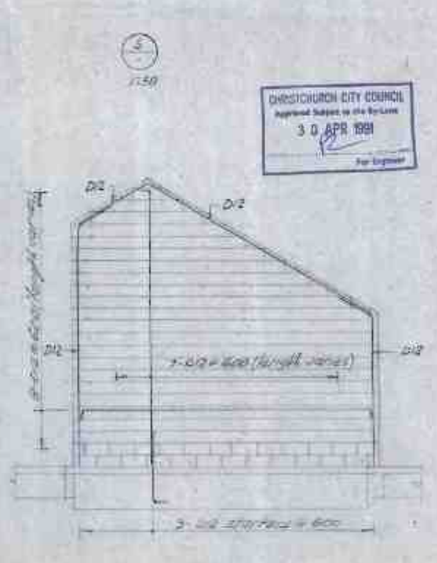
5/20

FOUNDATIONS

Soil strength to be confirmed by testing by Engineer at excavation stage.



1/50



5/20

1/50

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30 APR 1991
For Engineer

NOTES
a) Refer to Architects drawings for dimensions not shown
b) Refer to notes on sheet 4

FOUNDATION PLAN & FLOOR SLAB
1:50

Service	Inform	Service	Initials
W.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
— T.P.O.			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Computed from				

		Date
Designed		
Drawn	PM	3-91
Traced	PM	3-91
Dwg. Chk.	[illegible]	4/91
Des. Chk.		
Indexed		

Approved: M J Strickland 4/5/91 Date
Design Services Manager

CHRISTCHURCH CITY COUNCIL - DESIGN SERVICES UNIT

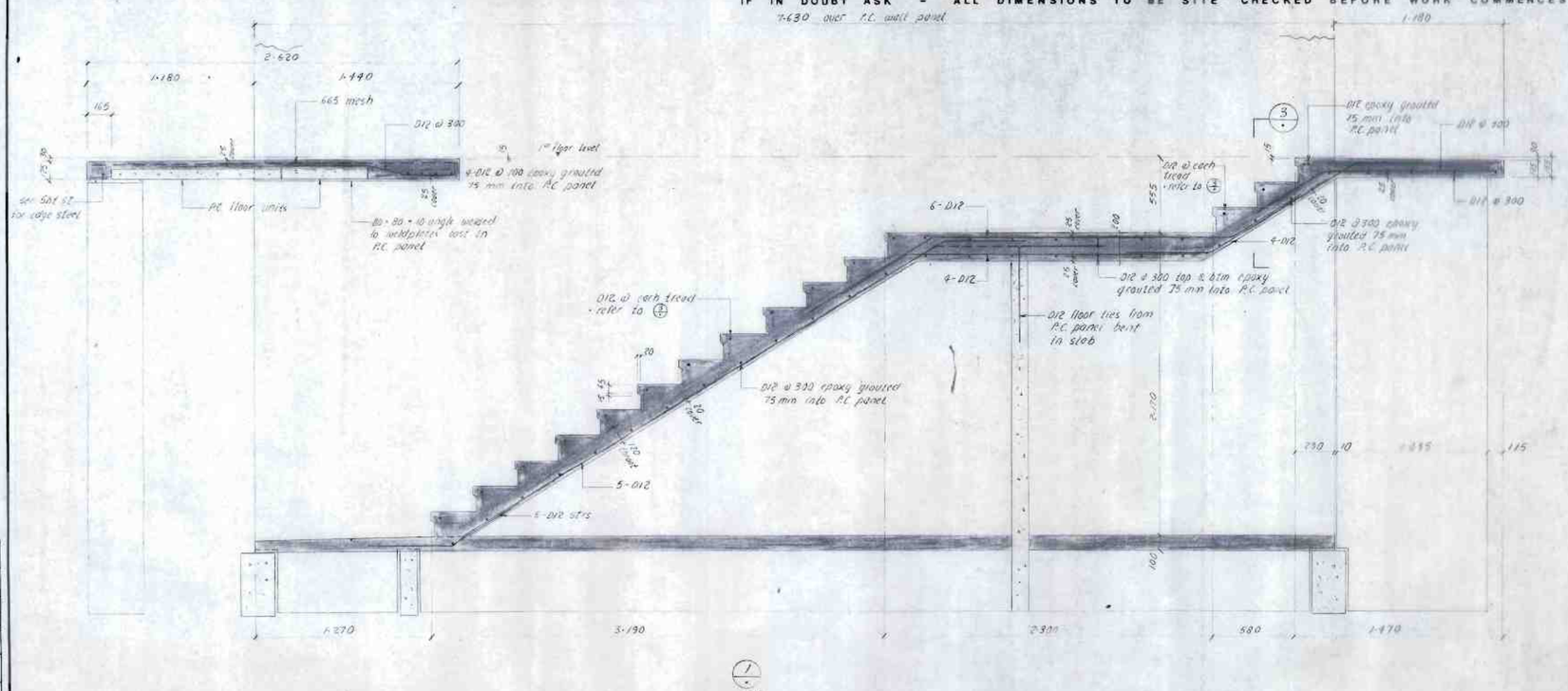
HARMAN COURTS EXTENSION 1991
FOUNDATION PLAN & FLOOR SLAB

Scales: 1:20, 1:50

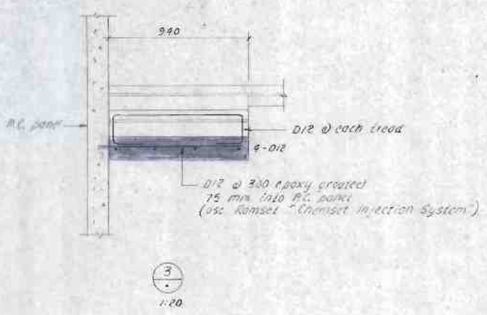
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Original scale at millimetres @ A1

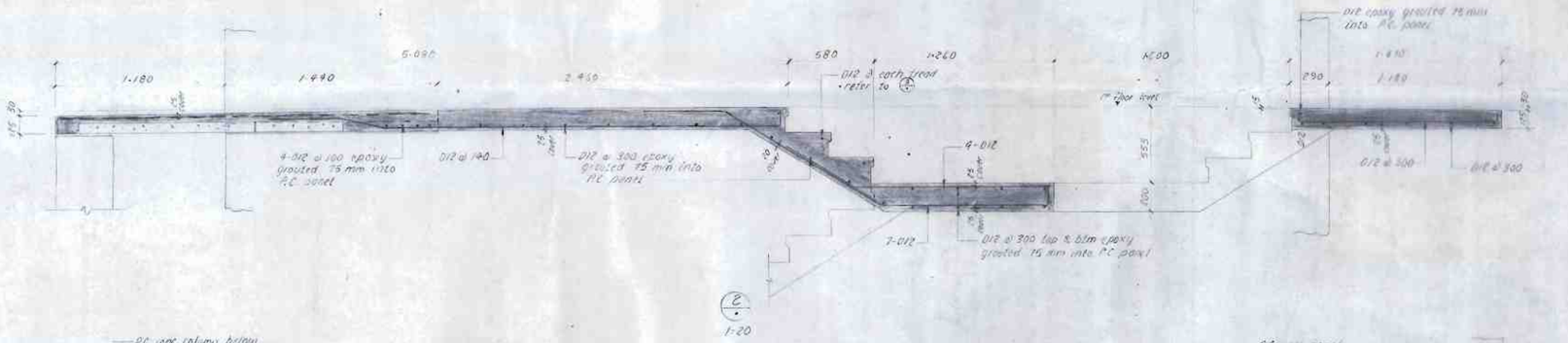
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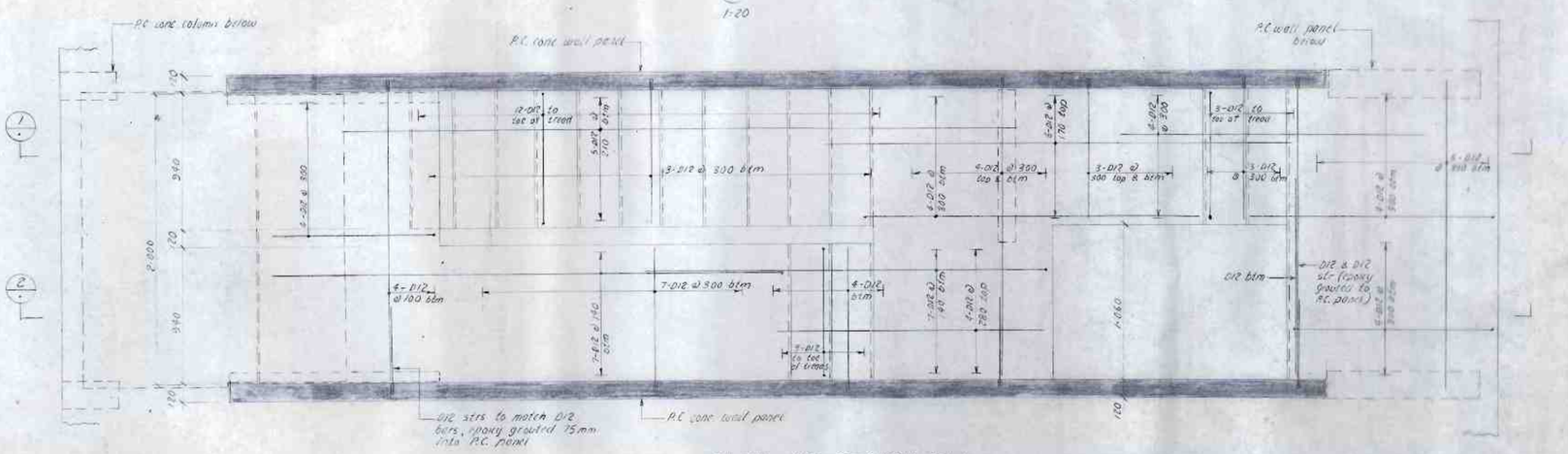
1/1 1:20



3/1 1:20



2/1 1:20



PLAN OF STAIRWELL
1:20

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30 APR 1991
For Engineer

8) STEELWORK
(a) All welds to be 6mm FW unless shown otherwise
(b) F.W. indicates 6mm fillet weld
(c) Butt welds to be full penetration
(d) All lines of contact to be welded
(e) All ends to be machine sawn. Sharp edges & burrs to be removed by grinding
(f) Site welded areas to be power wire brushed & coated with two good coats of "dry galv."

(g) Laps shall be (unless shown otherwise)
D10 300 mm
D12 400
D16 550
mesh 300

9) WELDPLATES
(a) weldplates indicated on panel elevations thus
□ L.B.F. ▭ B.F. ⁝ L.F.
L.F. = both faces B.F. = near face F.F. = far face
(b) Wrap all edges of weldplates in "Densotape" or similar material to allow expansion of plates during welding without spalling adjacent concrete
(c) Refer to weldplate details on Sht 3 for additional reinforcing at weldplates

4) LIFTING ANCHORS
(a) Contractor to supply all necessary lifting devices, strongbacks, etc. to ensure panels are not cracked or damaged during erection. Details are to be submitted to the Engineer at least 4 days prior to lifting

5) All T.C.M. Ferrier inserts to have R6 rods, 600 long through their cross holes except where shown otherwise

6) All precast panels are 120 thick unless noted otherwise

7) Use Ramset "Chemset injection system" to grout str bars into precast panels

1) CONCRETE
(a) All concrete work to be in accordance with N.Z.S. 3109:1980 & related documents
(b) Concrete to be Specified Grade
(c) Conc. strength shall be: f'c (28 day)
Paths 15 MPa
Foundn., floor slabs, floor topping 20 MPa
Precast wall panels & columns 30 MPa
Precast floor units 42 MPa
(d) Conc finishes to be the following classes as described in N.Z.S. 3114:1987
Paths & ramps U5 (broom)
Floor slabs, stairs U3
Precast wall panels: faces U3
sides F5x
All other concrete F6x
Precast floor units FG
(x implies abrupt changes shall not exceed 1mm & gradual variations shall not exceed 4mm)
(e) Cover: (i) Insitu conc - as shown
(ii) Precast wall panels - reinforcing placed centrally (unless detailed both faces) Cover to panel edges to be 30 mm
(f) Tolerances:
(i) Insitu conc: as per specification
(ii) Precast conc: length +0mm -5mm
height +6mm -5mm
width ± 2mm

2) REINFORCING
(a) All reinforcing work to be in accordance with N.Z.S. 3109:1980 & related documents
(b) All reinforcing shall be continuous throughout
R = plain round bar Grade 275
D = deformed bar Grade 275

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
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B.M.				
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		Date
Designed		
Drawn	R.O'Brien	11/88
Traced	R.O'Brien	11/88
Dwg. Chk.	[illegible]	11/88
Des. Chk.		
Indexed		

Approved
M.J. Hudson 21/11/89
Design Engineer Date
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991
DETAILS OF STAIRS & LANDINGS

Scales: 1:20

File No.
Issue
D.3963
Sheet 4 of 5

Original scale of millimetres 0 20 40 60 80 100

Appendix A4/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Block H				Reviewer:	Stephen Lee	
		Unit	No:	Street	CPEng No:	1006840	
Building Address:			85	Poulson	Company:	GHD	
Legal Description:					Company project number:	513090277	
					Company phone number:	6433780900	
		Degrees	Min	Sec			
GPS south:					Date of submission:		
GPS east:					Inspection Date:		
					Revision:	Final	
Building Unique Identifier (CCC):	BE 1110 002 EQ2				Is there a full report with this summary?	yes	

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):		
Ground floor split?	no		Ground floor elevation above ground (m):		
Storeys below ground	0				
Foundation type:	strip footings		if Foundation type is other, describe:		
Building height (m):	4.80		height from ground to level of uppermost seismic mass (for IEP only) (m):	3.6	
Floor footprint area (approx):	187				
Age of Building (years):	21		Date of design:	1976-1992	
Strengthening present?	no		If so, when (year)?		
			And what load level (%g)?		
Use (ground floor):	multi-unit residential		Brief strengthening description:		
Use (upper floors):					
Use notes (if required):					
Importance level (to NZS1170.5):	IL2				

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	2.3, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	timber	type	Lintel Beams
Columns:	timber	typical dimensions (mm x mm)	95x95
Walls:	fully filled concrete masonry	#N/A	

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls		**Note: Define along and across in detailed report!**		
Ductility assumed, μ:	3.00			note typical wall length (m)	
Period along:	0.14	0.00		estimate or calculation?	calculated
Total deflection (ULS) (mm):				estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				estimate or calculation?	
Lateral system across:	fully filled CMU				
Ductility assumed, μ:	1.25			note total length of wall at ground (m):	
Period across:	0.14	#####	enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):				estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:	brick or tile	describe (note cavity if exists)	
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:	green			
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:			Describe:	
	Building Consent required:			Describe:	
	Interim occupancy recommendations:			Describe:	
Along	Assessed %NBS before e'quakes:	50%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
	Assessed %NBS after e'quakes:	50%			
Across	Assessed %NBS before e'quakes:	100%	##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	100%			

Specific Report A5
BE 1110 004 EQ2 Block I

April 2015

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Figure 3 Block I Plan Showing Key Structural Elements (First floor) 5

Figure 4 Plan Showing % NBS for Precast Reinforced Concrete Walls (Ground Floor) - Out of Plane 10

Figure 5 Plan Showing % NBS for Precast Reinforced Concrete Walls (First Floor) - Out of Plane 11

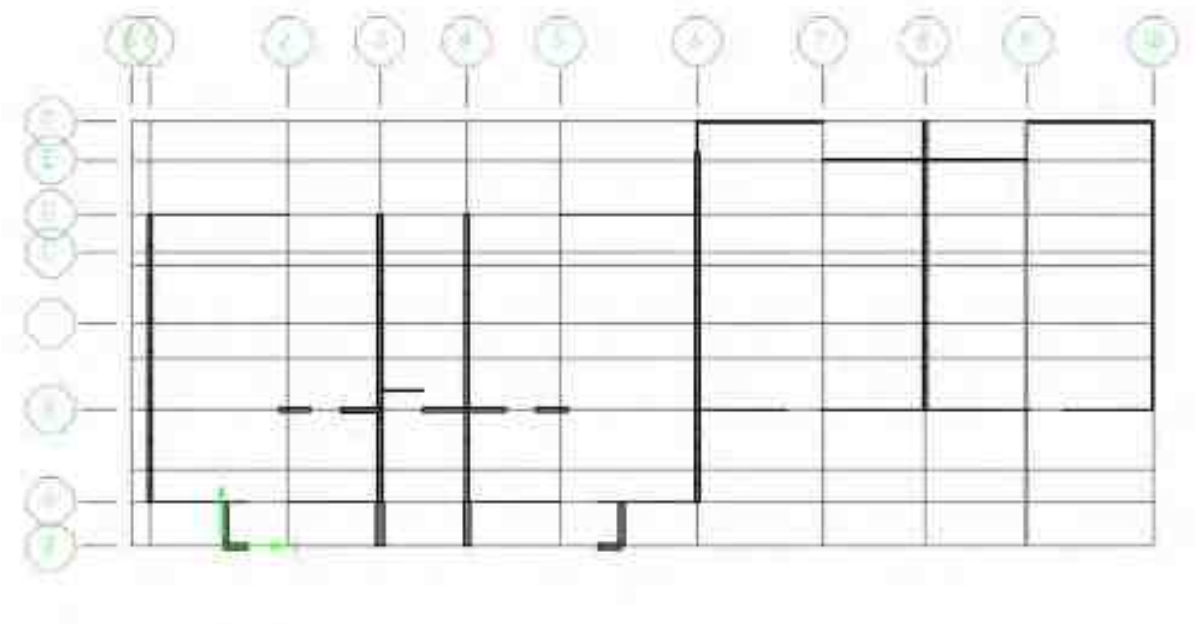


Figure 6 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Across Direction (Gro

Figure 7 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Along Direction (Ground Floor) 12

Figure 8 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Along Direction (First Floor) 13

Photograph index

Photograph 1 East Elevation of the single storey portion of the block

Photograph 2 North Elevation

Photograph 3 West Elevation of the 2 storey portion of the block

Photograph 4 South Elevation

Photograph 5 Concrete spalling at 1st floor slab (Balcony outside west apartment)

Appendices

Appendix A5/A Photographs

Appendix A5/B Available Drawings

Appendix A5/C CERA Spreadsheet

1. Building Description

1.1 General

The following information describes Block I building of Harman Courts.

- The building is situated near the north-west corner of the site near to Block Q. See Figure 1 for the building location plan.
- Block I Building has 2 attached parts. A two storey part at the west side and a single storey part at the east side. See Figures 2 and 3.
- The roofs of the two parts each have a pitch of 30 degrees and consist of lightweight corrugated metal sheeting on 150 x 50 purlins over timber trusses.
- For the two storey part of the building, the structure comprises precast concrete wall panels in the 'across' direction extending up to the roof. The precast wall panels support precast slabs at 1st floor level spanning in the 'along' direction. The precast slabs with in-situ topping are 160 mm thick overall. The single storey part of the building has a central precast concrete dividing wall which extends up to the roof.
- The front and rear walls of the building consist of timber framing with concrete masonry veneer cladding. The front and rear walls support the roof trusses. Within the two storey part of the building there are two small precast concrete panels between ground and first floor in the 'Along' direction.
- Two reinforced concrete beams are also present at 1st floor level sitting on top of the two small precast concrete walls in the 'Along' direction.
- The internal timber wall linings are plasterboard.
- There are two (2) small balconies at the front and rear of the 2 storey part of the building. The balconies are supported on reinforced concrete beams and columns.
- The external walls are supported by perimeter strip footings.
- The ground floor is 100 mm thick cast-in-situ concrete slab on grade.
- There are 4 water supply tanks in the roof space of the two storey building and 2 water supply tanks in the single storey building. Each tank has a capacity of 135 litres.
- The dimensions of the building are approximately 7.8 m width, 25.7 m long and 7.3 m height to roof ridge.

Figures 2 and 3 show the floor plan layout of the whole structure. Complete drawn information mentioned above is provided in Appendix A5/B.



Figure 1 Plan/Aerial View of Harman Courts



Figure 2 Block I Plan Showing Key Structural Elements (Ground Floor)

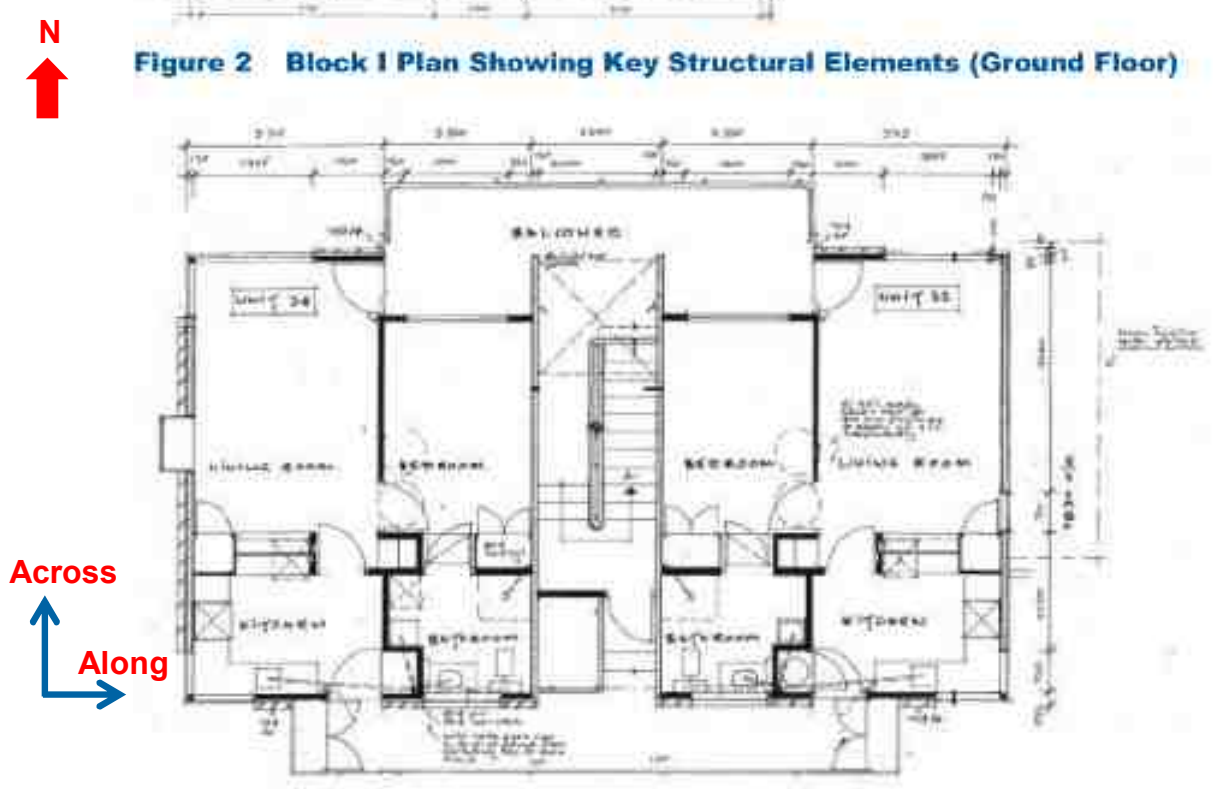


Figure 3 Block I Plan Showing Key Structural Elements (First floor)

1.2 Gravity Load Resisting System

The timber roof trusses and purlins support the lightweight roofing. The timber trusses then transmit the roof gravity loads to the timber framed walls at the front and rear of the building. The 1st floor precast Unispan floor slabs within the 2 storey part transfer the gravity loads to the precast reinforced concrete walls which then transfer the loads down to the foundations.

1.3 Lateral Load Resisting System

For the two storey part, the lateral loads acting on the structure are resisted in both the 'Across' and 'Along' directions primarily by the precast reinforced concrete walls together with some assistance from the timber framing along the front and rear elevations. The diaphragm action of the roof system transmits the roof lateral loads in the 'Across' direction to the upper storey precast reinforced concrete walls while in the 'Along' direction the lateral loads are resisted by the timber framing. The precast Unispan slab system transmits the 1st floor lateral loads to the precast reinforced concrete walls then down to the foundations.

For the single storey part of the building, the lateral loads are also resisted in both 'Across' and 'Along' directions by the precast reinforced concrete walls together with the timber framing along the front and rear elevations. The diaphragm action of the roof system transmits the roof lateral loads to the precast reinforced concrete walls then down to the foundations.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Elevations	Sheet A2 of 22	January 1991
2	Elevations	Sheet A2 of 22	April 1991
3	Ground Floor and 1st Floor Plan	Sheet A3 of 22	January 1991
4	Cross Sections	Sheet A5 of 22	March 1991
5	Stairway Details	Sheet A6 of 22	February 1991
6	Cross Sections	Sheet A7 of 22	March 1991
7	Foundation, Ground and 1st Floor Plans, PC panel Layout	Sheet 1 of 5	April 1991
8	Foundation, Ground and First Floor Details	Sheet 2 of 5	April 1991
9	Pre Cast Panel Details	Sheet 3 of 5	November 1988

Item	Title	Sheet No.	Drawing Date
10	Details of Stairs & Landings	Sheet 4 of 5	November 1988

Available drawings are attached in Appendix A5/B

2.4 Analysis and Modelling

A seismic assessment was carried out based on a specific design in accordance with NZS 1170.5:2004 and NZS 4230:2004 and Branz Bracing Data. The building was modelled using a ductility factor of 1.50 (precast reinforced concrete walls) in both directions.

3. Damage Assessment

3.1 General

No damage was identified in the structure.

4. Results of Analysis

The following are the results of the structural analysis of Block I, as assessed prior to the construction of strengthening works carried out in 2014.

4.1 Precast Reinforced Concrete Walls

4.1.1 Out-of-Plane Check

Overall the precast reinforced concrete walls were found to be rated more than 67% NBS.

Reinforced concrete walls rated more than 67% but less than 100% NBS are shown in Figures 4 and 5 and are highlighted in blue.

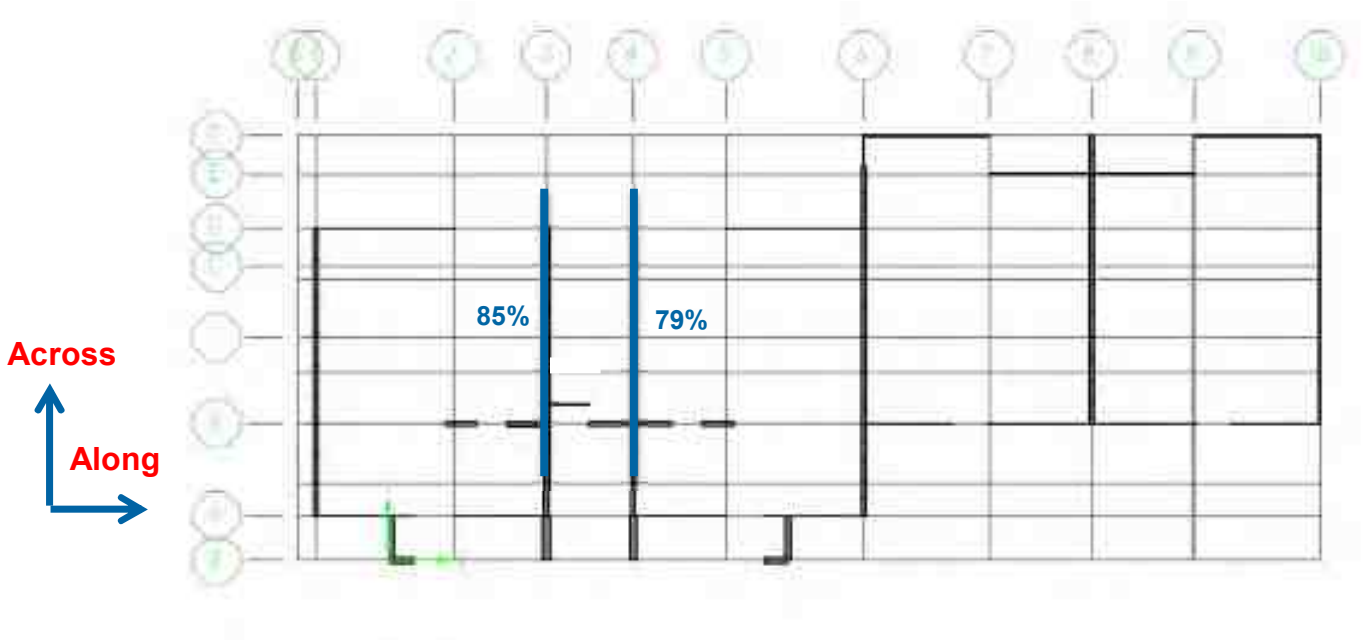


Figure 4 Plan Showing % NBS for Precast Reinforced Concrete Walls (Ground Floor) - Out of Plane

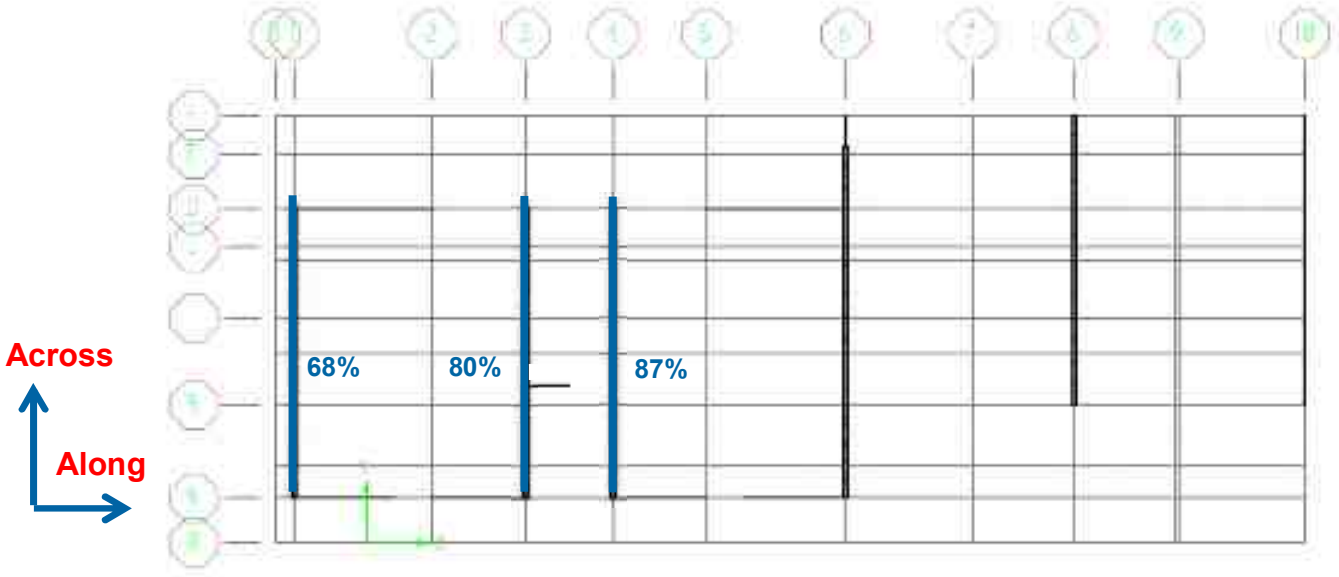


Figure 5 Plan Showing % NBS for Precast Reinforced Concrete Walls (First Floor) - Out of Plane

4.2 Precast RC Walls and Timber Framed Walls

4.2.1 Across

Ground and First Floor

The combined precast RC walls and timber framed walls in the 'Across' direction (Ground and First Floor) were found to be rated overall at more than 100% NBS. However, there is a bracing line in the 'Across' direction (Ground Floor) with a rating of more than 67% but less than 100% NBS and this is highlighted in blue in the following figure. This particular NBS rating is not considered significant in view of the overall rating.

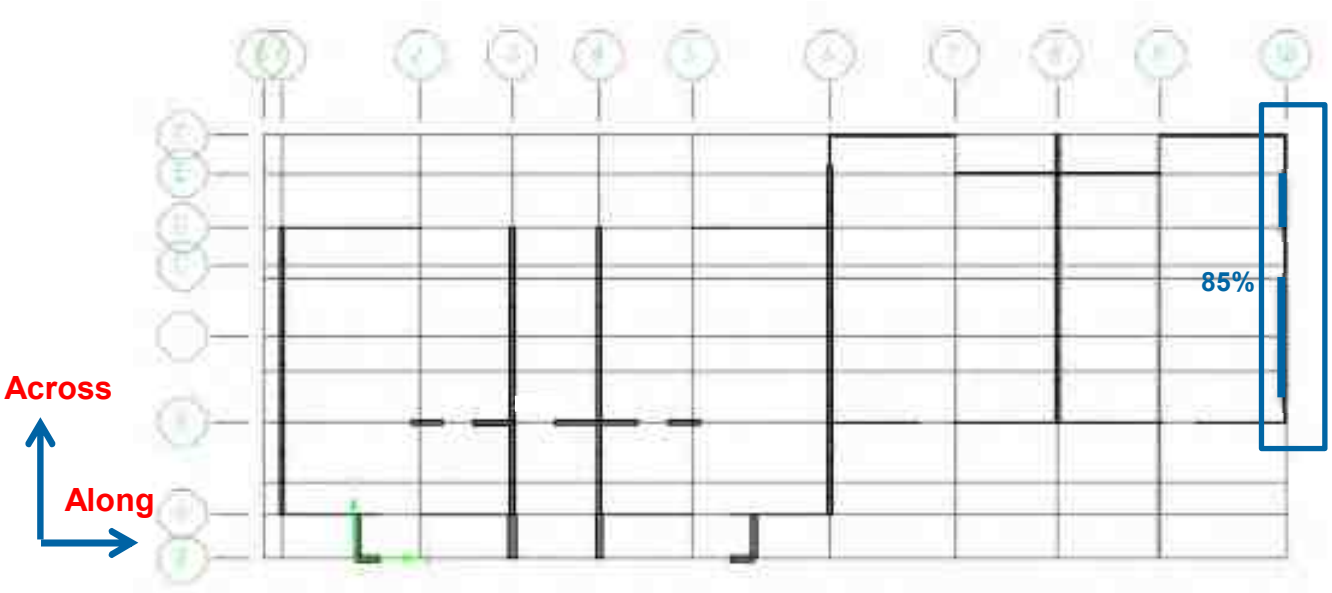


Figure 6 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Across Direction (Ground Floor)

4.2.2 Along

Ground Floor

The combined precast RC walls and timber framed walls in the 'Along' direction were found to be rated overall at more than 100% NBS.

Bracing Lines rated less than 67% are highlighted in red while bracing lines rated more than 67% but less than 100% NBS are highlighted in blue.

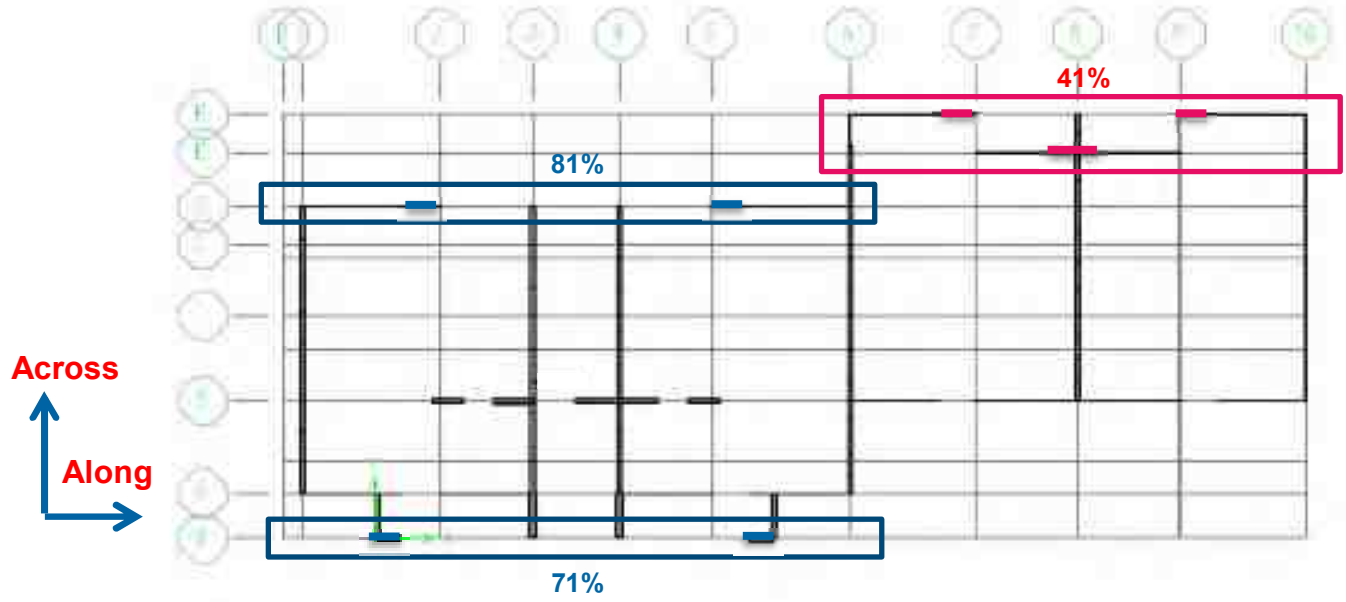


Figure 7 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Along Direction (Ground Floor)

1st Floor

The timber framed walls in the 'Along' direction were found to be rated overall at 20% NBS.

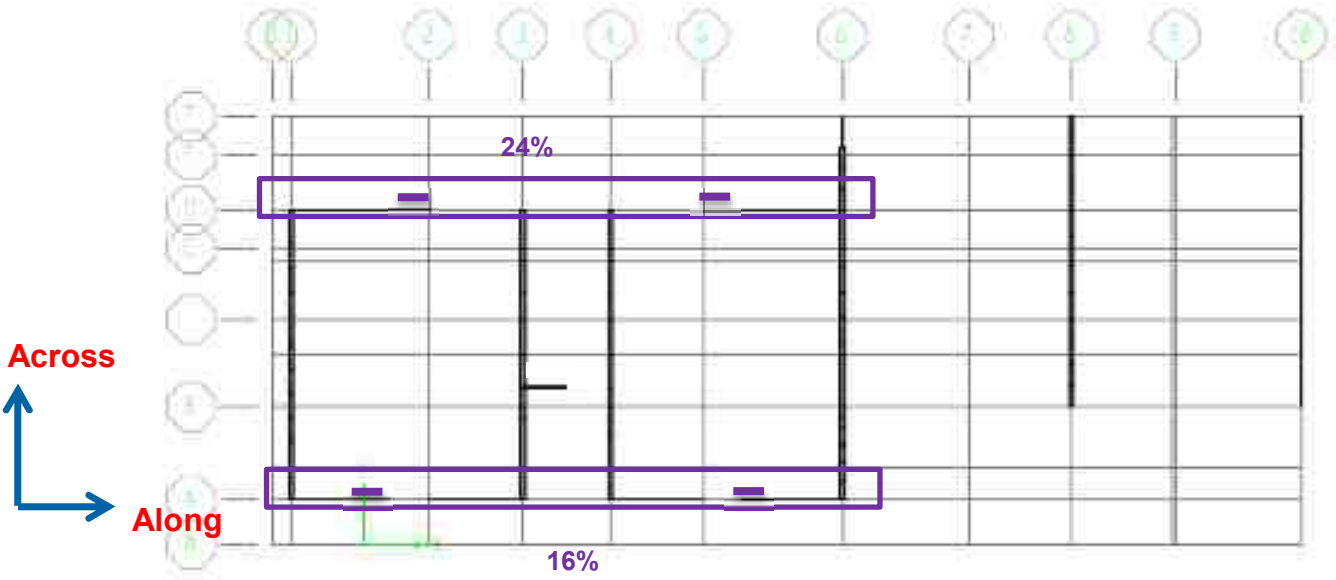


Figure 8 Plan Showing % NBS for Precast RC Walls and Timber Framed Walls – Along Direction (First Floor)

4.3 Reinforced Concrete Columns

Overall the reinforced concrete columns were found to be rated 100% NBS.

4.4 Roof Timber Truss Framing

The overall roof timber truss framing was found to be rated in excess of 100% NBS.

4.5 Roof Timber Rafters

The overall roof timber rafters were found to be rated in excess of 100% NBS.

4.6 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated in excess of 100% NBS.

5. Strengthening

Strengthening to the earthquake prone walls was designed by GHD and carried out in July 2014 by City Care Limited. Refer to appendix Appendix A5/D for further information.

The strengthening involved the installation of ecoply linings to earthquake prone walls on the first floor.

6. Conclusion and Recommendation

The building was originally assessed as having a seismic capacity of 20% NBS (in February 2013) and was therefore classified as 'Earthquake Prone'.

Following this, a strengthening scheme was developed by GHD designed to increase the %NBS to 67% NBS. This was installed in 2014 by City Care Limited. GHD did not carry out construction monitoring. City Care provided a PS3 stating that the works were carried out in accordance with GHD's design and drawings, on this basis the building is now assessed as being at 67% NBS.

Appendices

Appendix A5/A Photographs



Photograph 1 East Elevation of the single storey portion of the block



Photograph 2 North Elevation



Photograph 3 West Elevation of the 2 storey portion of the block



Photograph 4 South Elevation

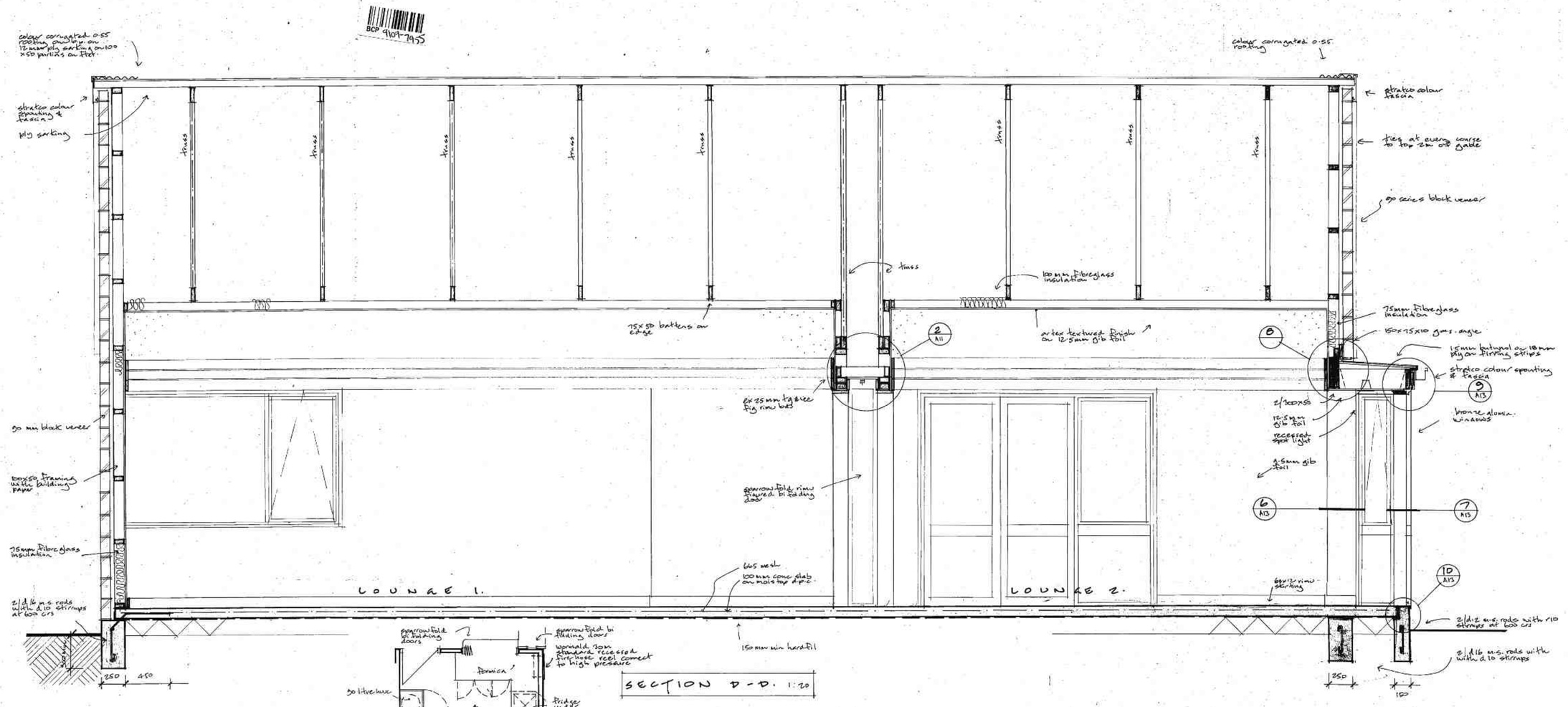


Photograph 5 Concrete spalling at 1st floor slab (Balcony outside west apartment)

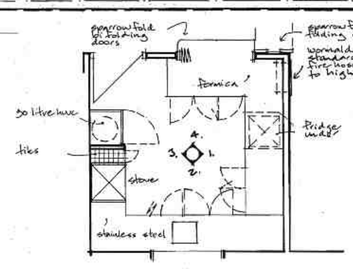
Appendix A5/B Available Drawings

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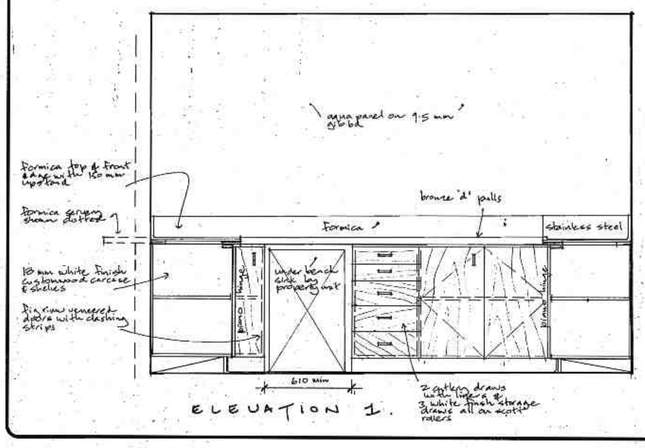
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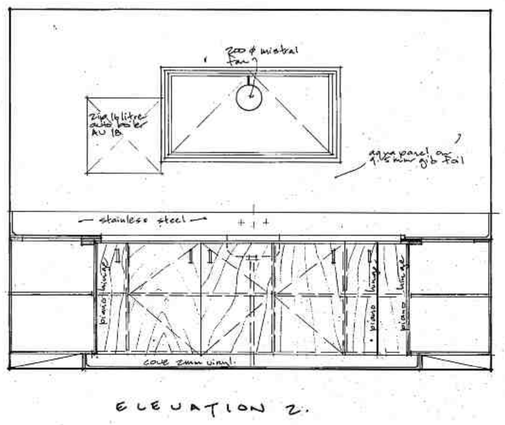
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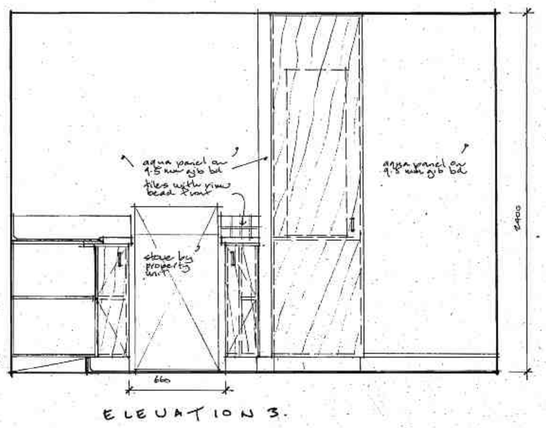
KITCHEN PLAN 1:50



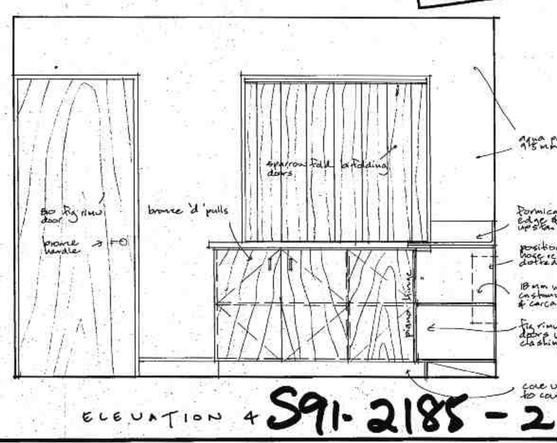
ELEVATION 1.



ELEVATION 2.



ELEVATION 3.



ELEVATION 4

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For Engineer

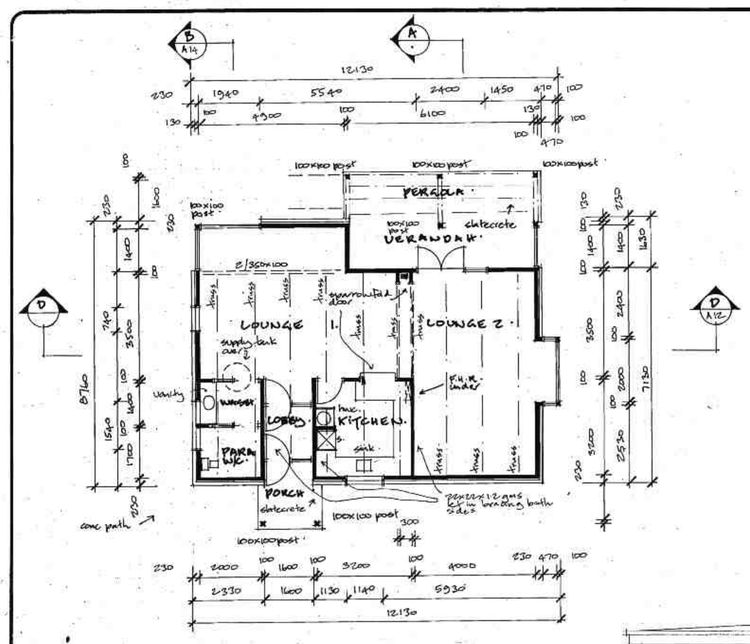
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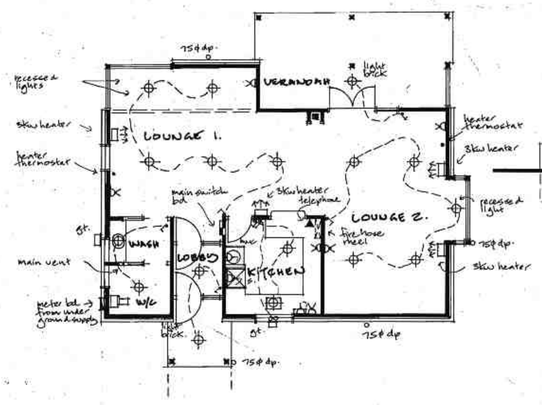
HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

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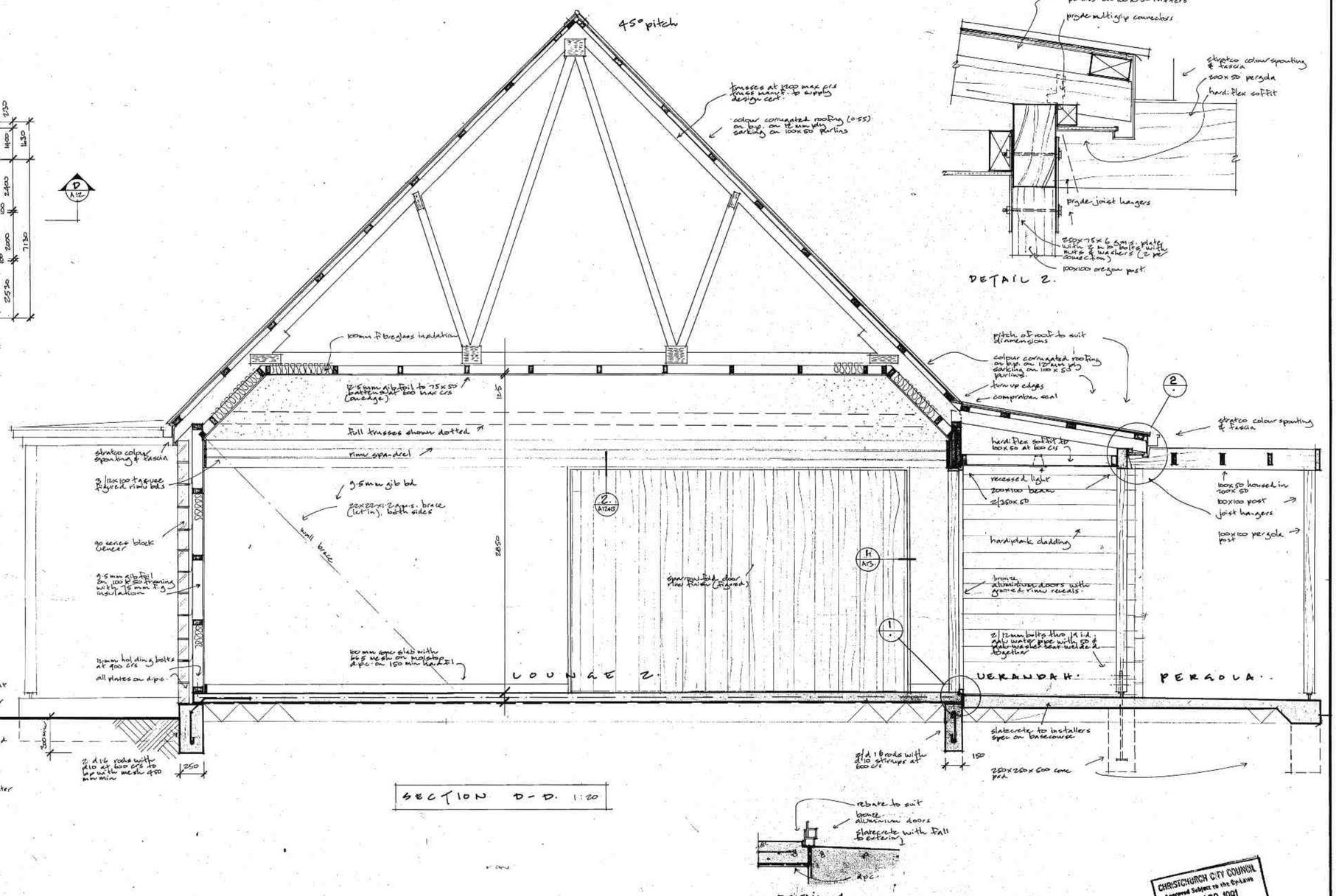
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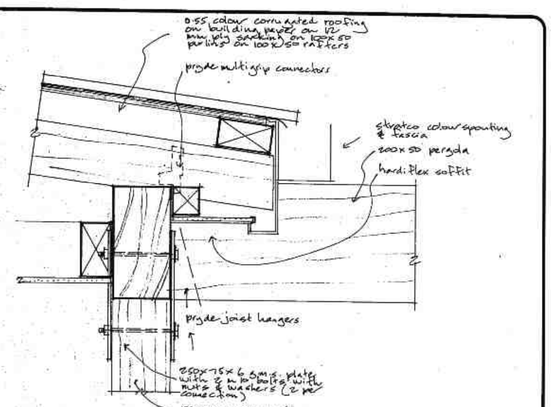
FLOOR PLAN 1:100



SERVICES PLAN 1:100

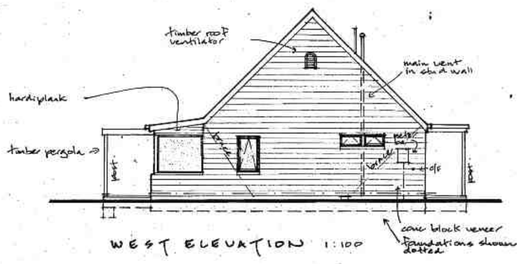


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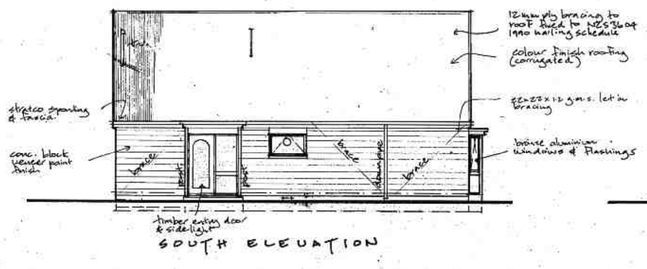


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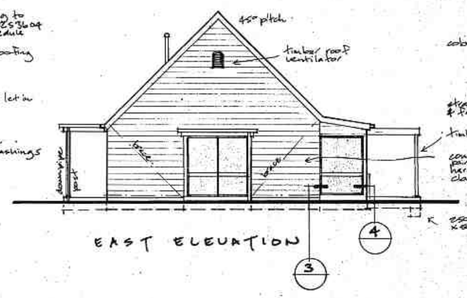
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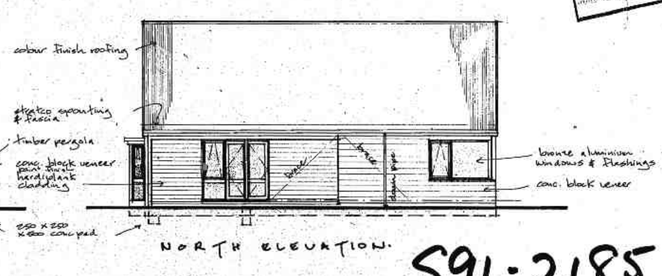
WEST ELEVATION 1:100



SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION.

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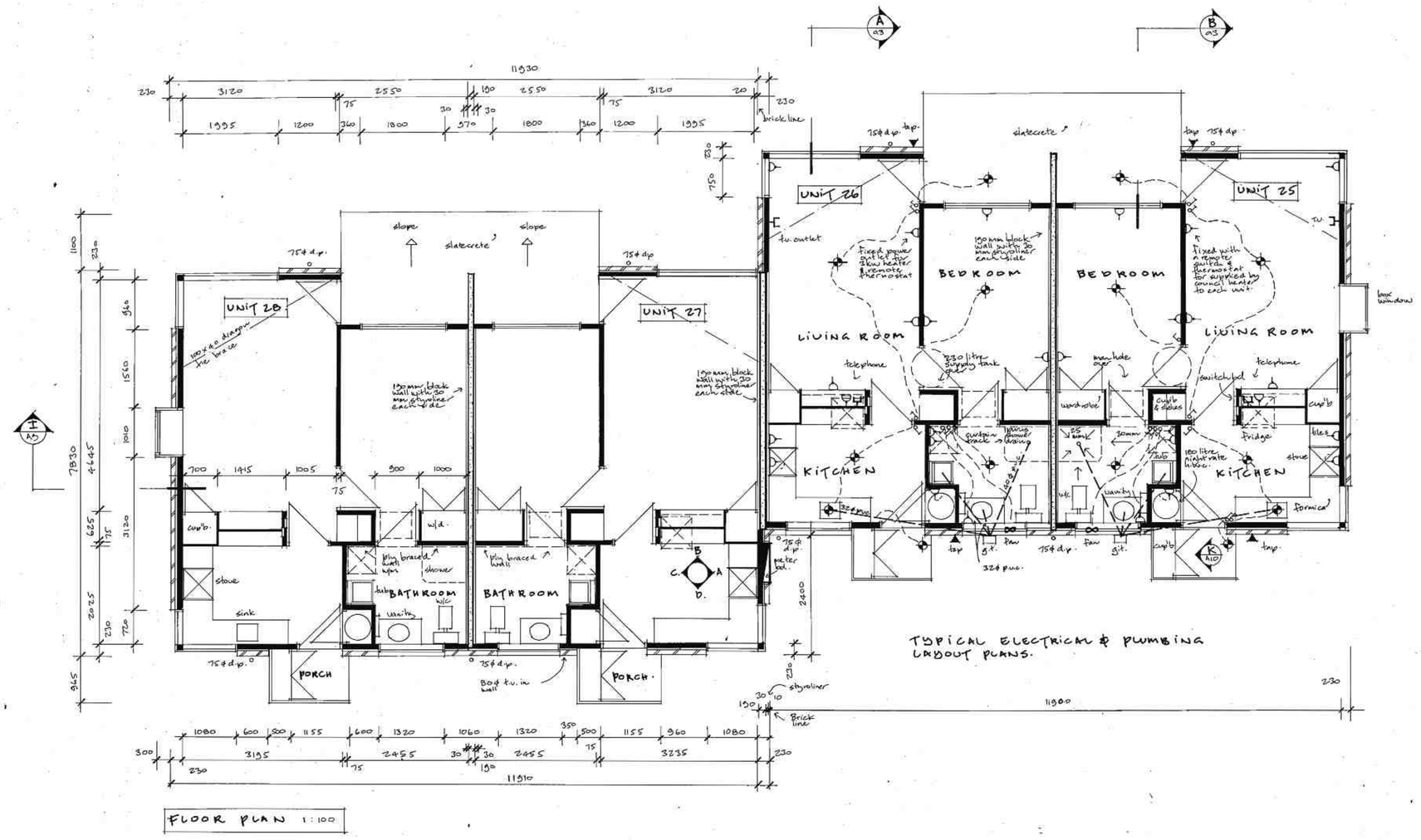
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HARMAN COURTS EXTENSION 1991. new residents lounger for property limit

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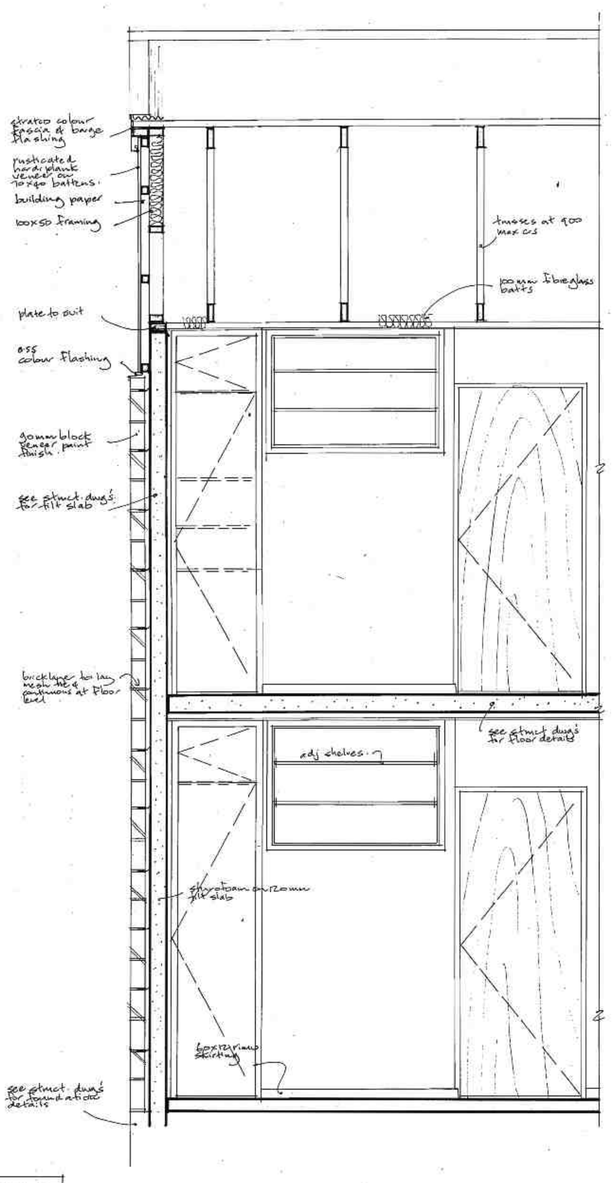
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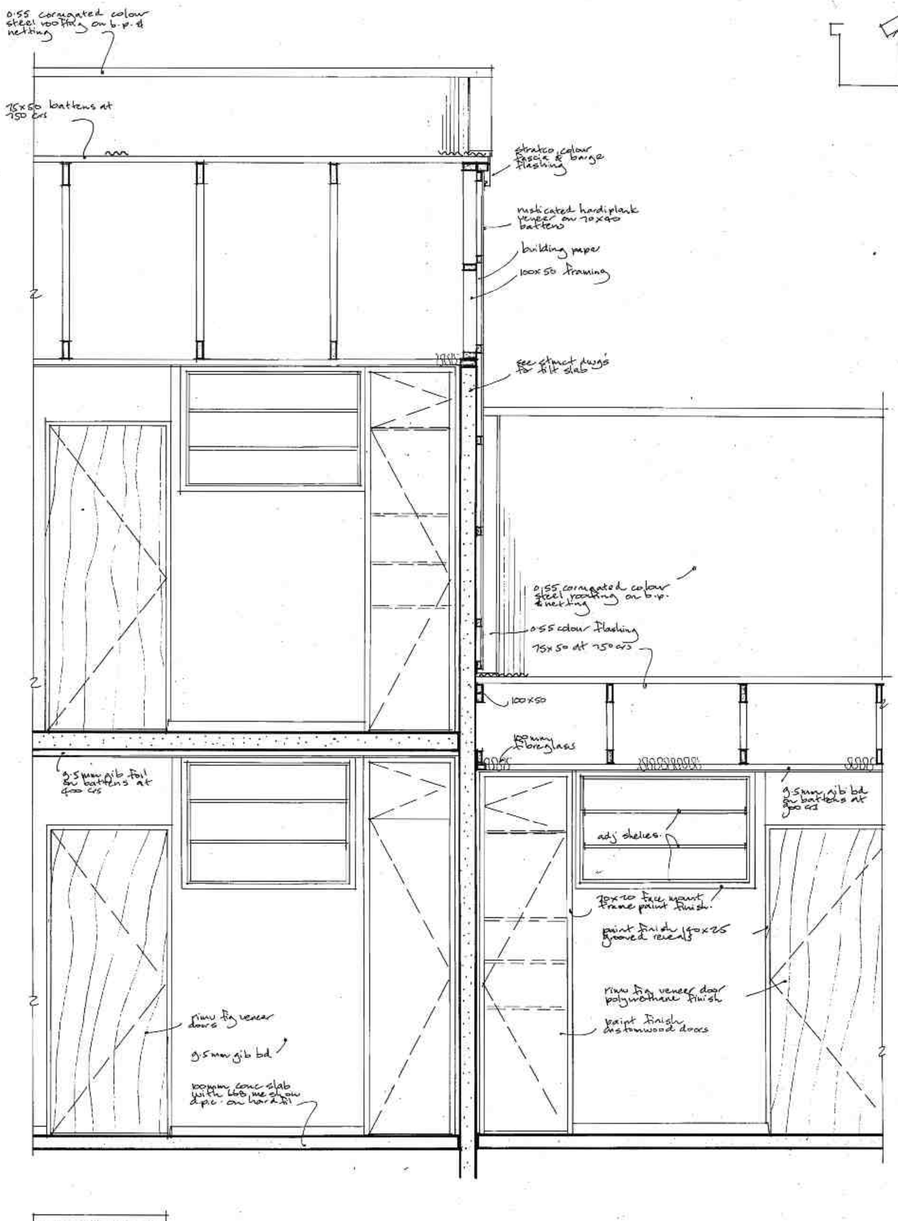
HARMAN COURTS EXTENSION 1991. units 25-28 single storey block for property unit

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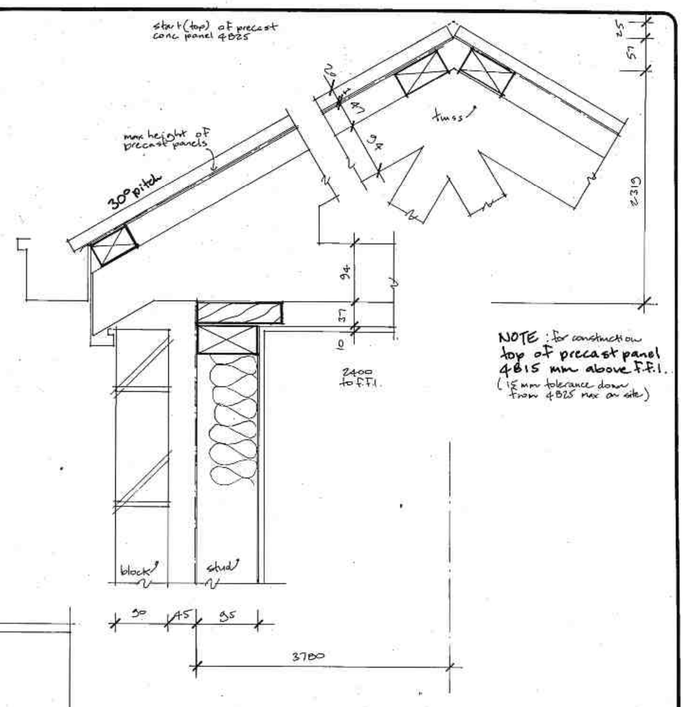
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SECTION E.



SECTION F.



NOTE: for construction top of precast panel 4815 mm above F.F.L. (15 mm tolerance down from 4825 max on site.)

TYPICAL TRUSS & PRECAST PANEL SET OUT 1:5

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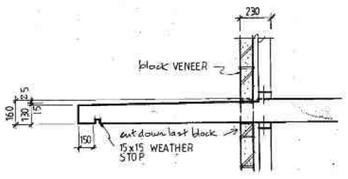
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CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

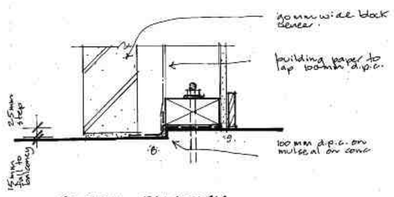
HARMAN COURTS EXTENSION 1991. two storey block cross section

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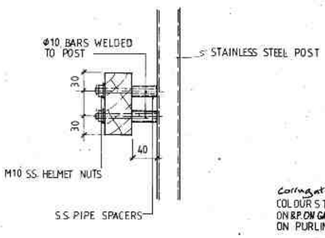
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



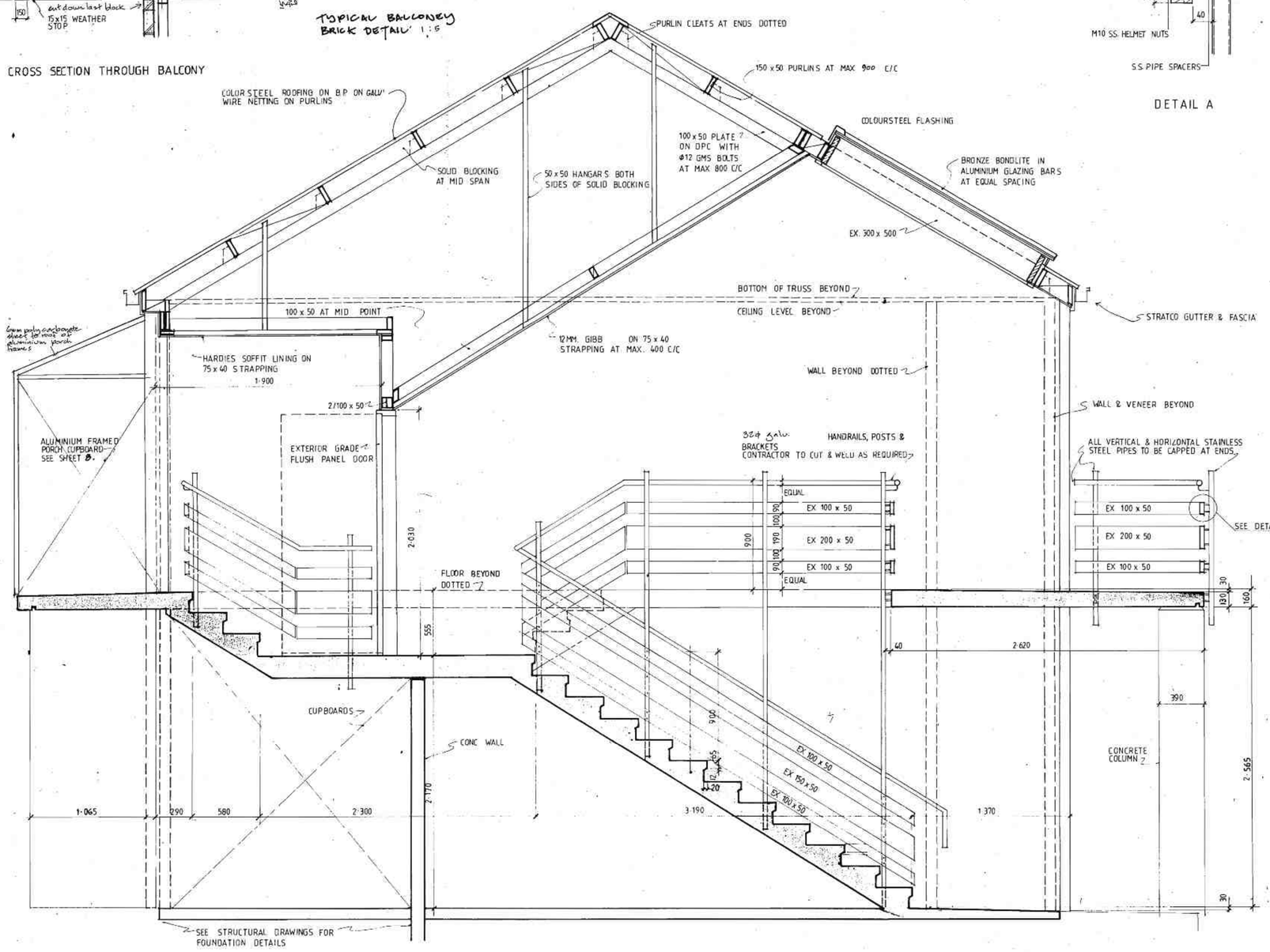
CROSS SECTION THROUGH BALCONY



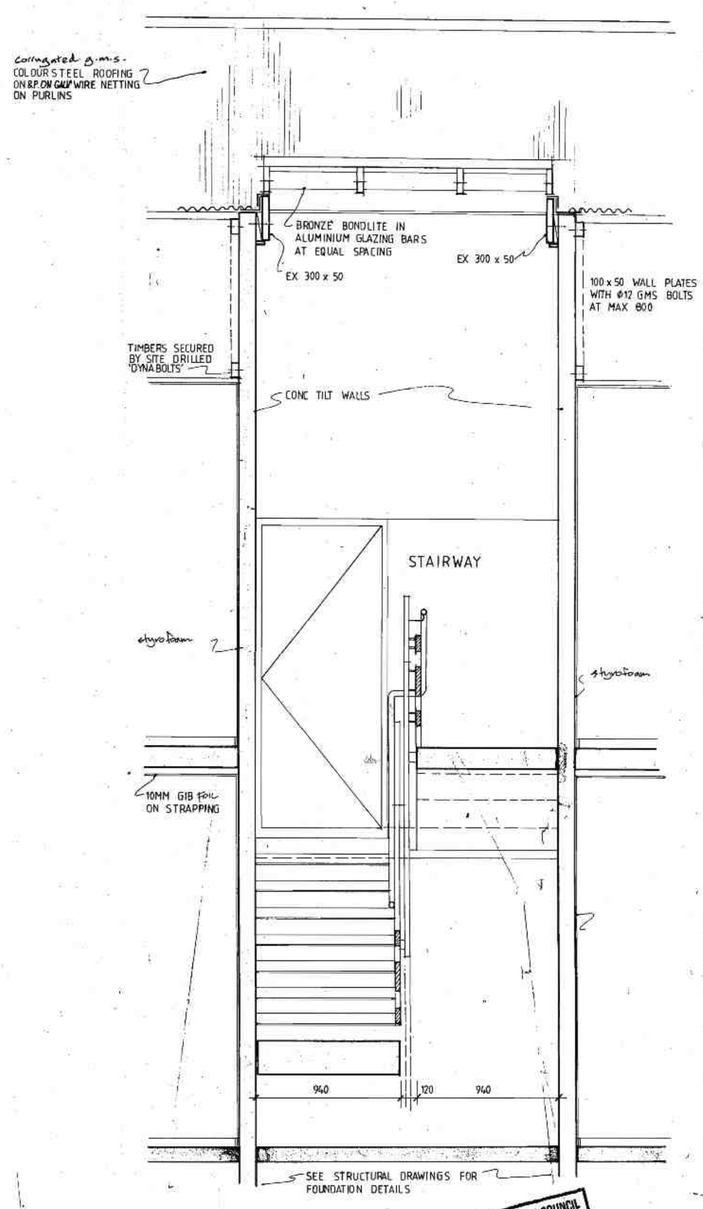
TYPICAL BALCONEY BRICK DETAIL 1:5



DETAIL A



SECTION G



SECTION H

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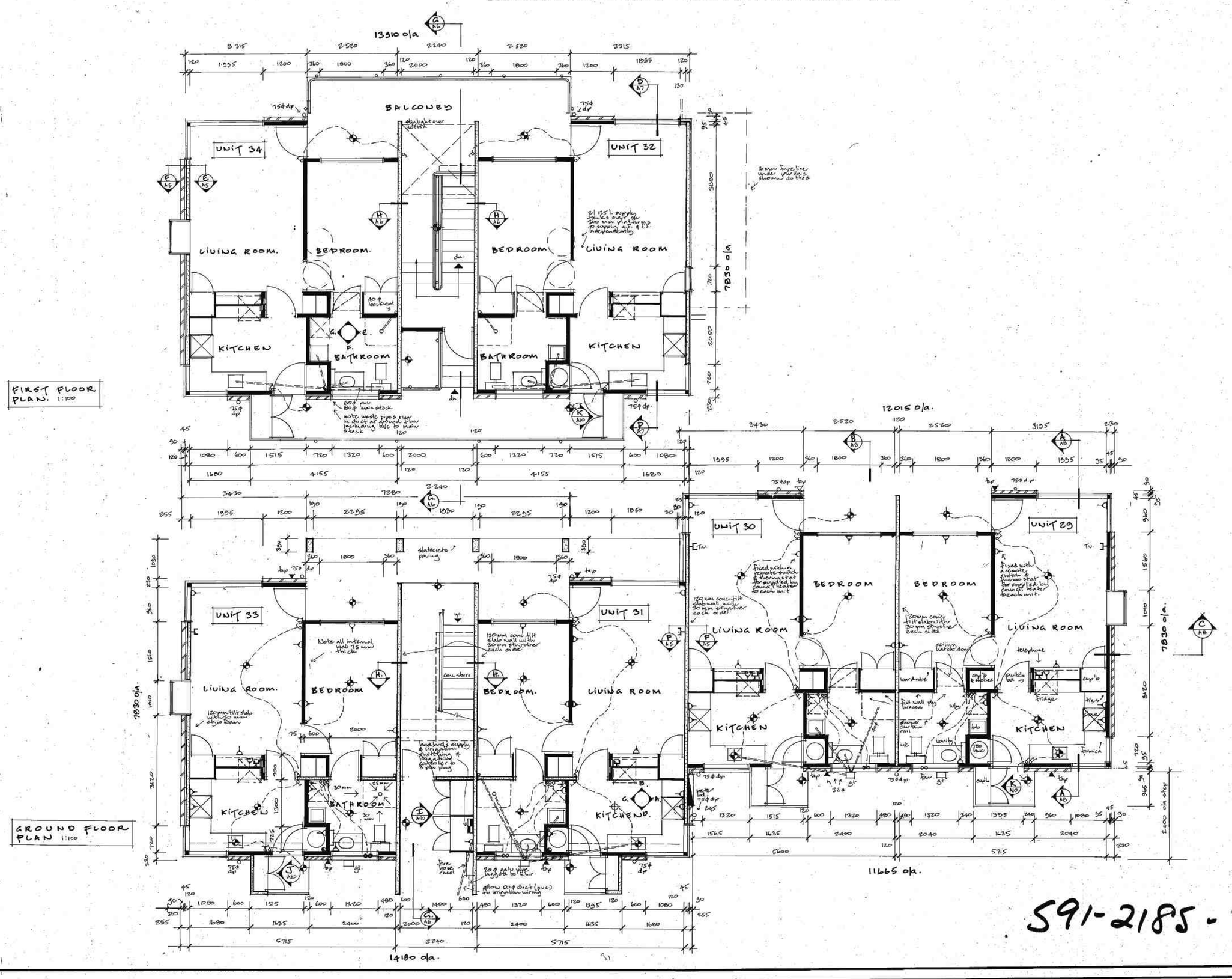
S91-2185-6/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. - STAIRWELL DETAILS

SCALE 1:20 DESIGN G.F.H. JOB NO 11251 SHEET NUMBER A.6.
DATE 2/91 DRAWN P.M. FILE NO OF 22 Total SHEETS
TRACED

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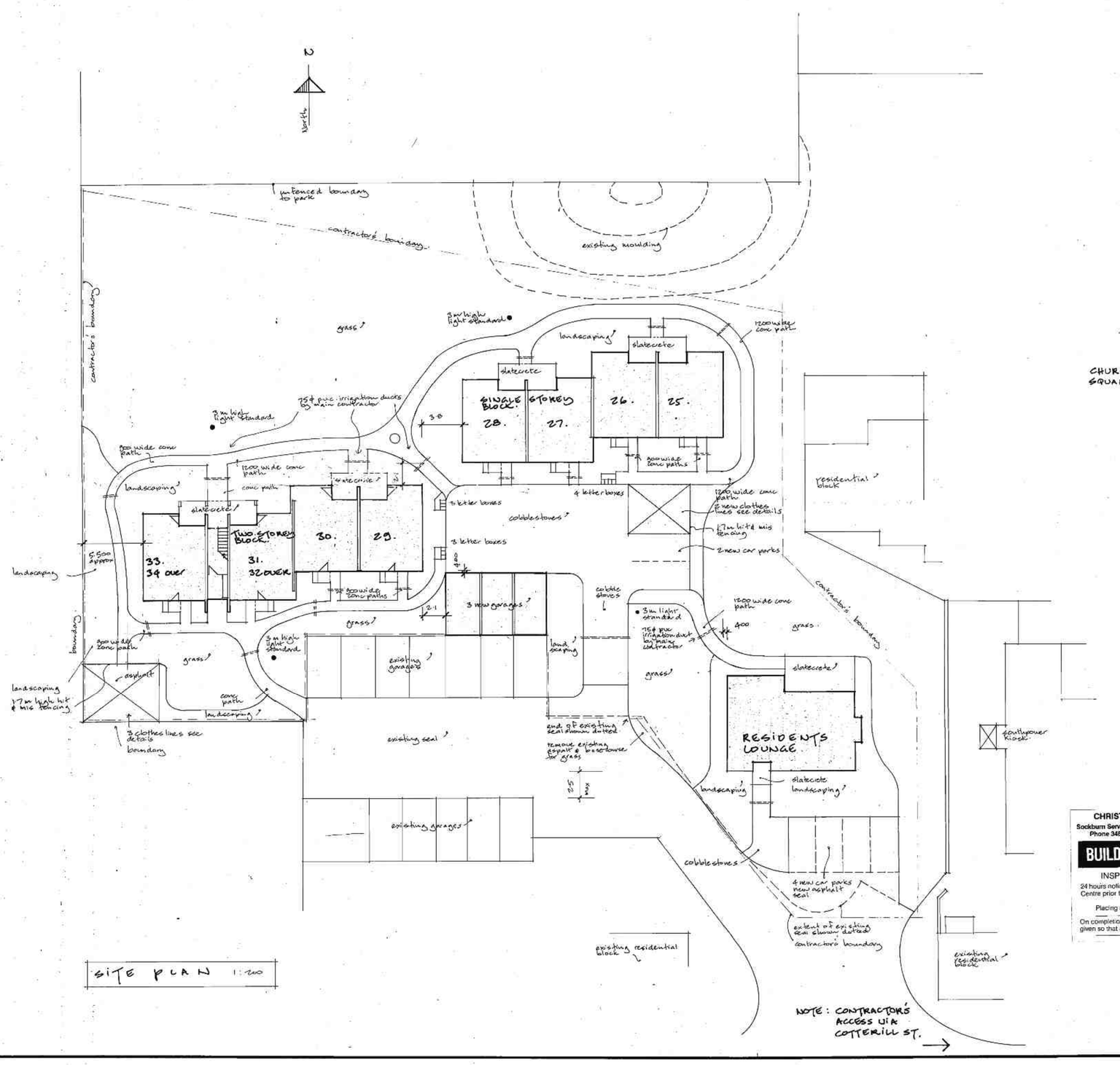
591-2185-7/11

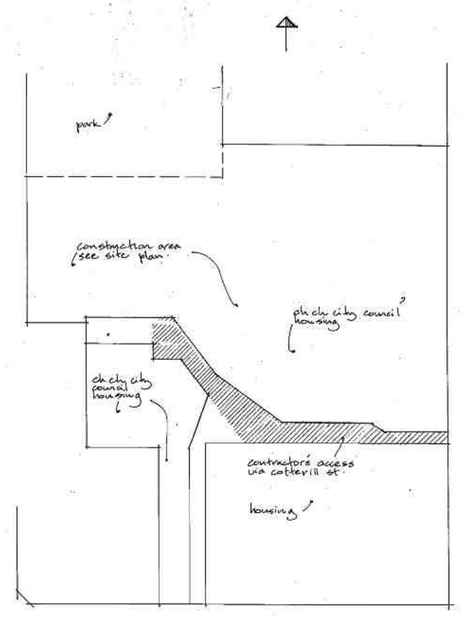
CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. units 29-34 two storey block for property unit.

SCALE 1:50 DESIGN JOB NO 11251 SHEET NUMBER
DATE 18/3/91 DRAWN BJS FILE NO OF 2 total SHEETS 3.
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK





LOCATION PLAN.

NOTE
Refer sheets 6 & 7 of the engineering section for services layout to site.

CHRISTCHURCH CITY COUNCIL
Sockburn Service Centre Phone 348-5119
Beckenham Service Centre Phone 332-3099

BUILDERS - PLEASE NOTE:

INSPECTION REQUIREMENTS

24 hours notice must be given to the Council's Service Centre prior to:

Placing any concrete - fixing internal linings

On completion of any buildings, 5 days notice must be given so that a final inspection can be made.

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For Engineer

591-2185-8/1

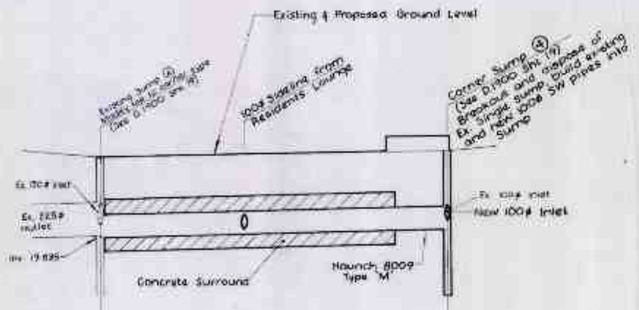
CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. site plan

SCALE 1:200 DESIGN
DRAWN BBS.
DATE 16 1 91. TRACED

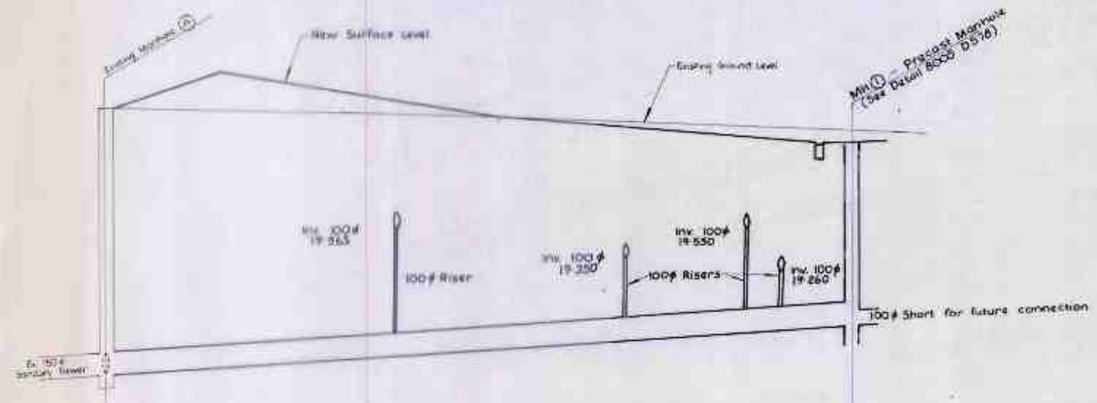
JOB NO 11251 SHEET NUMBER A1.
FILE NO OF 22 total SHEETS

IF IN DOUBT ASK ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES



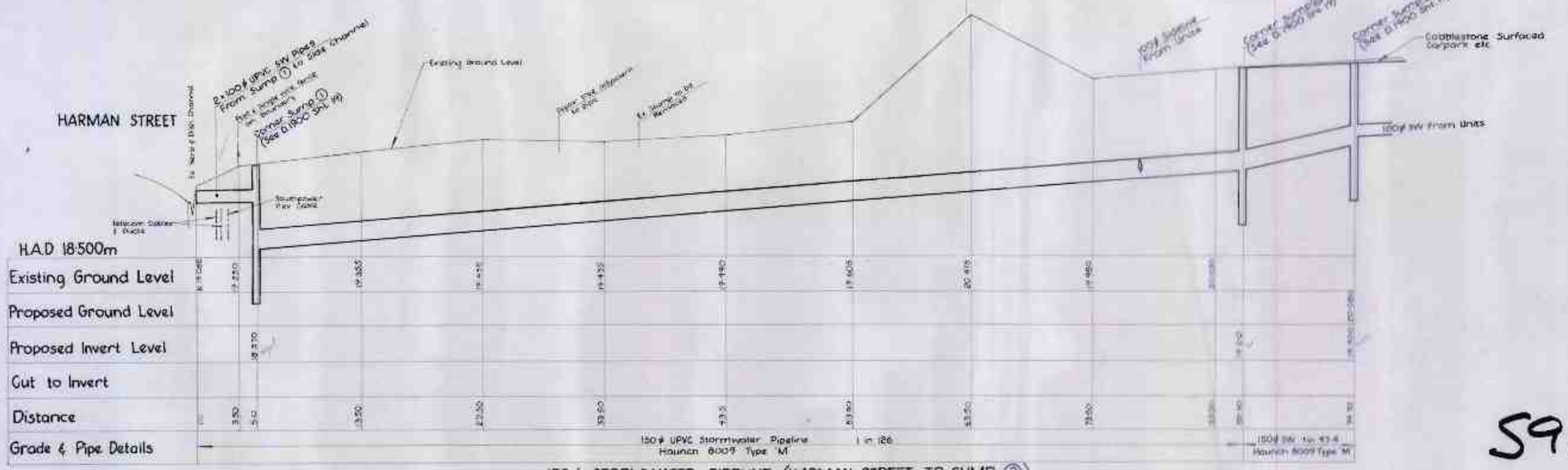
HAD 19.000m		
Existing Ground Level	20.355	20.195
Proposed Ground Level		
Proposed Invert Level	19.870	19.865
Cut to Invert		
Distance	0	21
Grade & Pipe Details	150ϕ UPVC SW Pipeline 1 in 500	

150ϕ STORMWATER PIPELINE - Ex. Sump (A) to Sump (4)



HAD 18.000m		
Existing Ground Level	20.340	20.700
Proposed Ground Level	20.340	20.700
Proposed Invert Level	19.260	19.500
Cut to Invert		
Distance	0	44m.
Grade & Pipe Details	150ϕ UPVC Sanitary Sewer 1 in 160 Haunch 8009 Type 'M'	

150ϕ SANITARY SEWER EXTENSION



150ϕ STORMWATER PIPELINE (HARMAN STREET TO SUMP (3))

NOTES:
1. All work shall be carried out in accordance with the Christchurch Drainage District Supervision Specification 1978 Sewage and Stormwater Works
2. Refer to 3089 for Standard Details and Specifications for Streetworks

591 2185.9/11

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
(P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.P.				
Completed				

		Date
Designed	G. Nordstrom	4/91
Drawn	G. Nordstrom	4/91
Traced	V. Meadowcroft	4/91
Des. Chk.	CRN	4/91
Bus. Chk.		
Released		

Approved

Design Services Manager

Date

CHRISTCHURCH CITY COUNCIL DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
LONGITUDINAL SECTIONS

Scale: Horiz 1:200, Vert 1:20

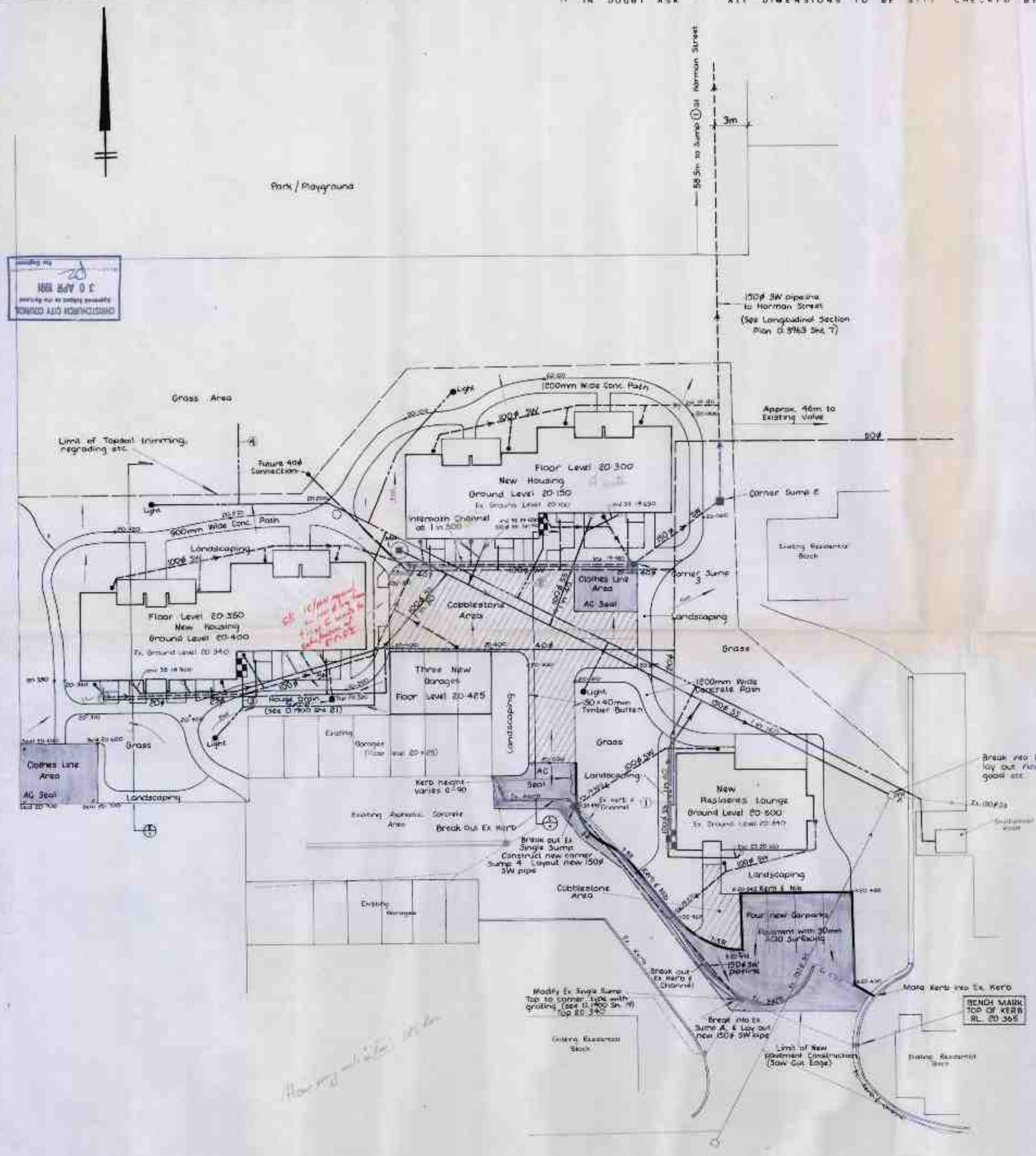
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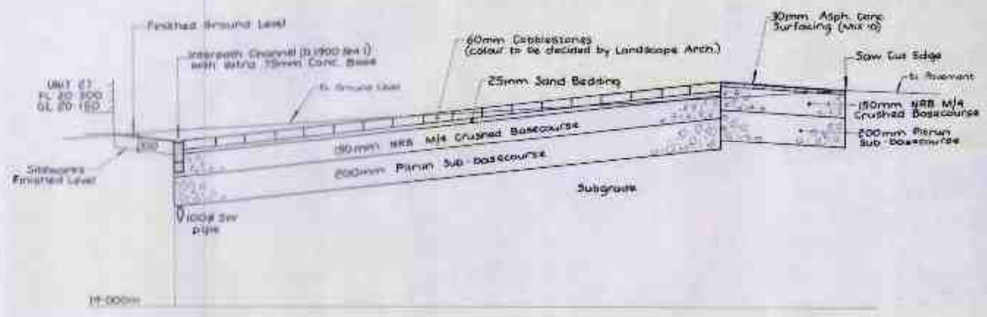
Issue

D.3963

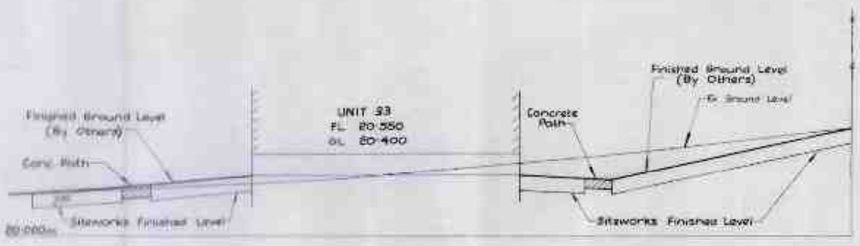
Sheet 2 of 2

IF IN DOUBT ASK ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES





SECTION ⊕
H. 1:100
V. 1:20



SECTION ⊕
H. 1:100
V. 1:20

SERVICES LEGEND

Southpower — -- — -- — 1: 40 Amp 3 Phase
2: 80 Amp 3 Phase
3: 120 Amp 3 Phase
4: 80 Amp 3 Phase (Future Connection)

HP Water Main — — — —
allow for tests as required by Irrigation Contractor

Stormwater ————

Sanitary Sewer ————

NOTES:
1. Refer to 3089 for Standard details and Streetwork Specifications.
2. Installation of Services are included in the relevant sections of the specification.

S91 2185 - 10/1

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
T.P.O.			

Amendments	Initials	Date

Boon	Page	Initials	Date
Surveyed			
Levelled			
B.M.			
Computed from			

		Date
Designed	C Nordstrom	4/91
Drawn	C Nordstrom	4/91
Traced	V Woodward	4/91
Dwg. Chk	JOH	4/91
Des. Chk		
Approved		

Approved: Design Services Manager — Date: 5/4/91

CHRISTCHURCH CITY COUNCIL — DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
SITE WORKS AND SERVICES

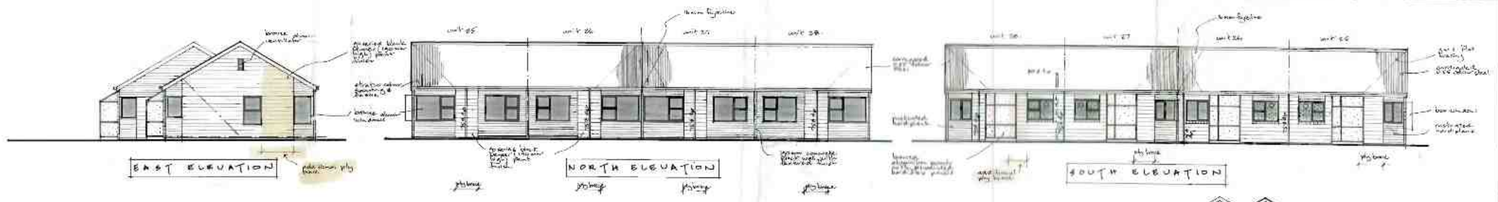
Scale: 1:200

File No.
Issue
D.3963
Sheet 67 of

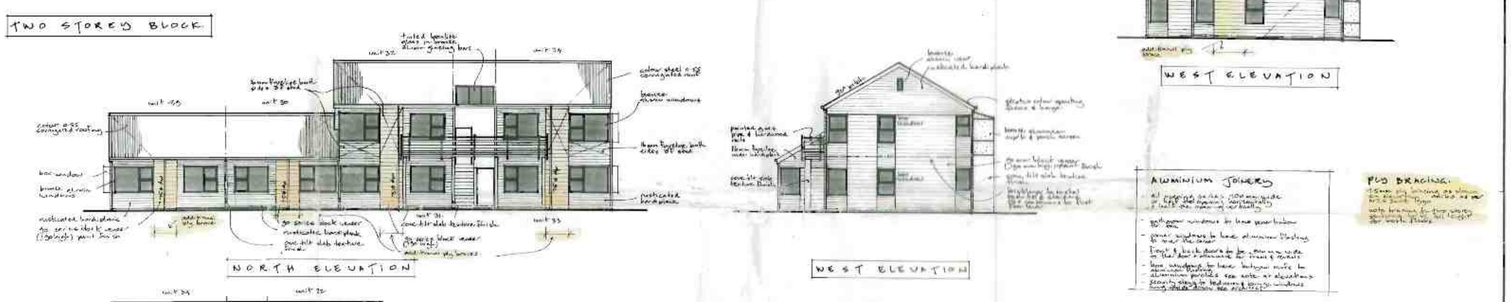
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

AMMENDMENTS		
additional ply bracing & deletion of some angle bracing	31/5/91	Brand & Grenfell

SINGLE STOREY BLOCK



TWO STOREY BLOCK



ALUMINIUM JOINERY

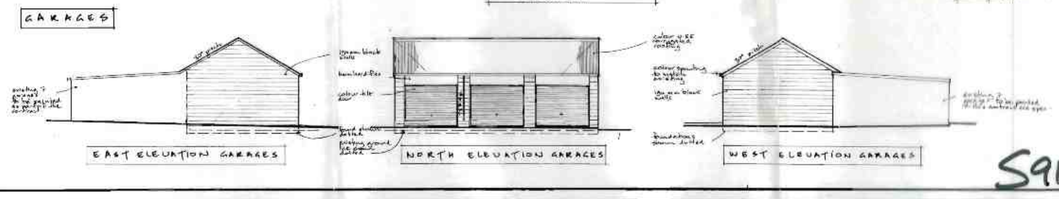
- all opening sashes 700 mm wide or half the opening (horizontally) whichever is less
- bathroom windows to have obscure glass
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 810 mm wide to the door & allowance for frame & reveals
- box windows to have horizontal roofs to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows

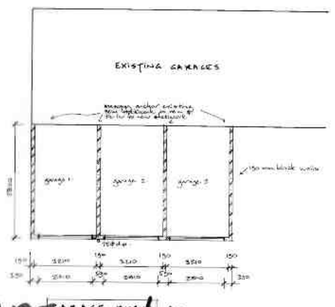
PLY BRACING:

7.5mm ply bracing as shown on elevations installed as per NZS 3604:1990

note bracing to two storey sections to be full length for both floors

GARAGES





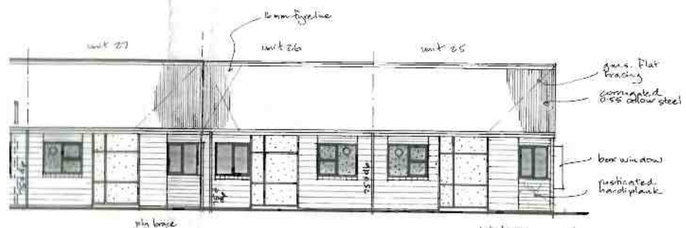
S91 2188 11/11

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan

SCALE 1:100 | DESIGN | JOB NO 11351 | SHEET NUMBER
DATE 25/1/91 | DRAWN BSS | TRACED | FILE NO | OF 22 total SHEETS 12.

AMMENDMENTS.		
additional ply bracing & deletion of some angle bracing	31/5/91	Brand & Grenfell





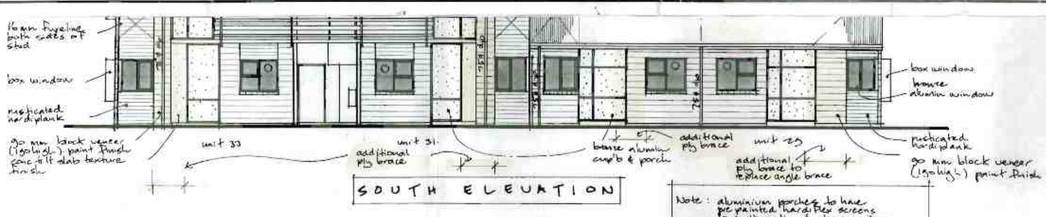
ALUMINIUM JOINERY

- all opening sashes 700 mm wide or half the opening (horizontally) whichever is less
- bathroom windows to have obscure glass
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 810 mm wide to the door & allowance for frame & reveals
- box windows to have horizontal roofs to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows

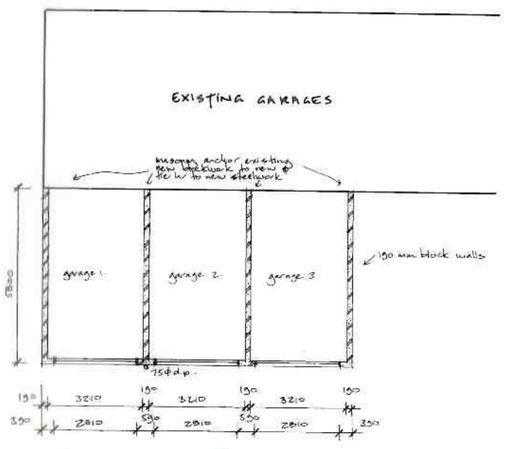
PLY BRACING:

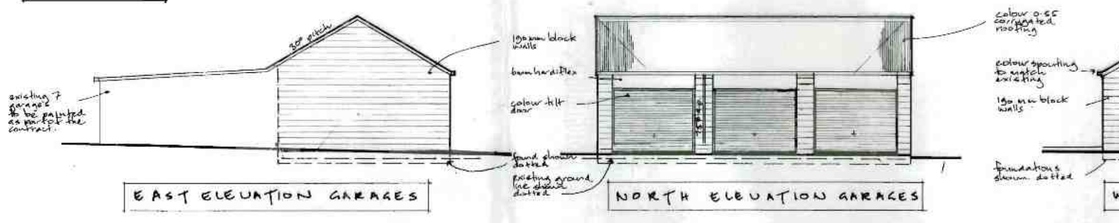
7.5mm ply bracing as shown on elevations installed as per NZS 3604:1990

note bracing to two storey sections to be full length for both floors









S91 2188 11/11

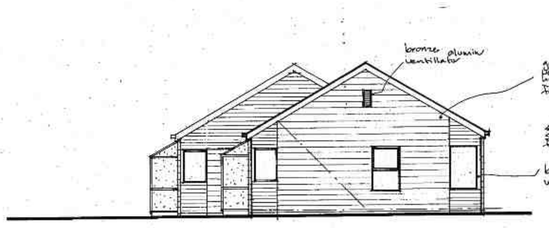
CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan

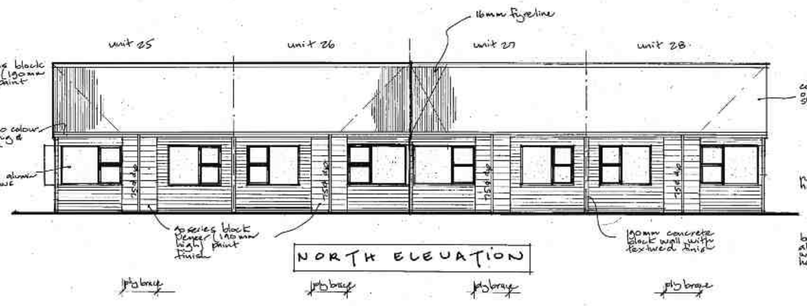
SCALE 1:100 | DESIGN | JOB NO 11351 | SHEET NUMBER
DATE 25/1/91 | DRAWN BSS | TRACED | FILE NO | OF 22 total SHEETS 12.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

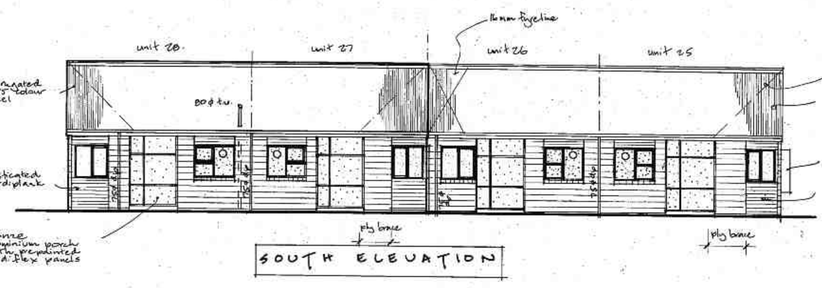
SINGLE STOREY BLOCK.



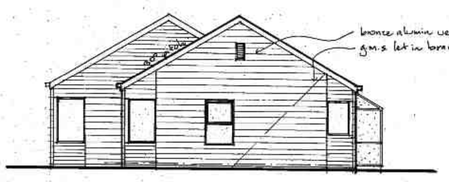
EAST ELEVATION



NORTH ELEVATION

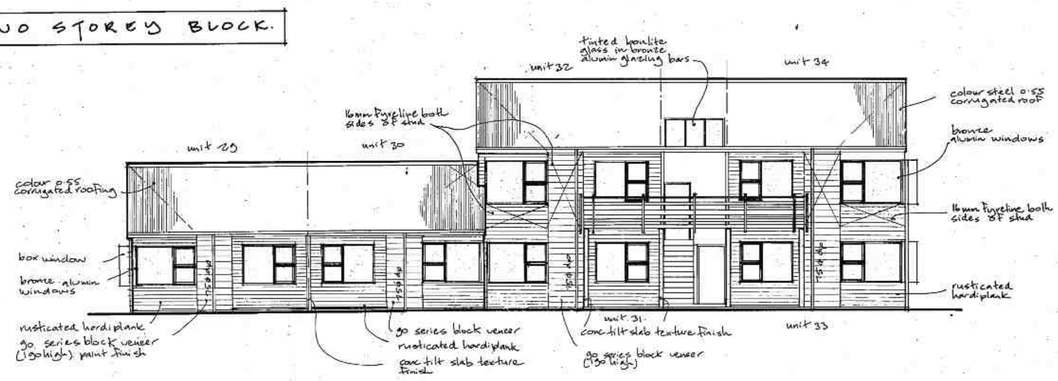


SOUTH ELEVATION

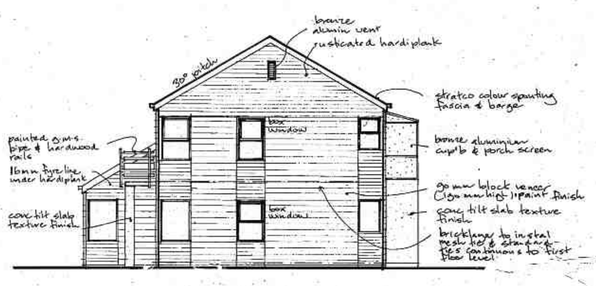


WEST ELEVATION

TWO STOREY BLOCK.



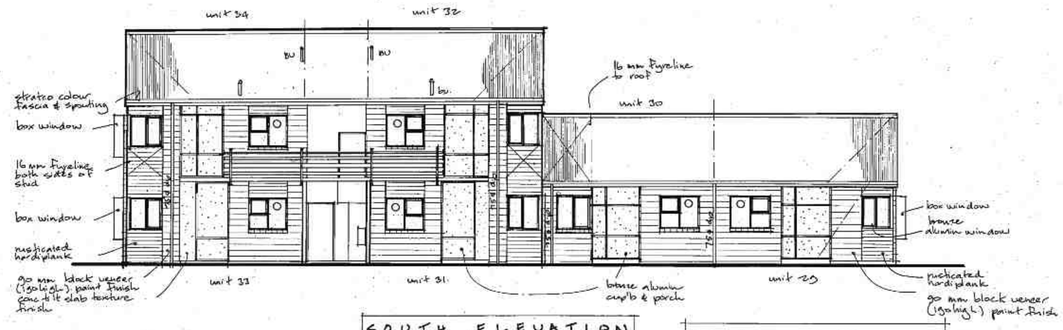
NORTH ELEVATION



WEST ELEVATION

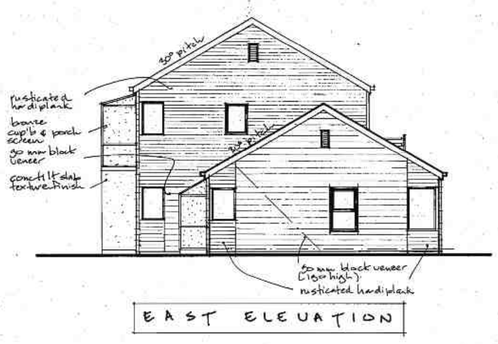
ALUMINIUM JOINERY

- all opening sashes 1000 mm wide or less to be sliding horizontally & half the opening in width
- bathroom windows to have ventilation fan
- corner windows to have aluminium flashing to cover the corner
- front & back doors to be 1810 mm wide to take door & aluminium for frame & reveals
- box windows to have bottom vents to aluminium flashing
- aluminium porches see note at elevations
- security stays to bedroom & lounge windows facing vehicle access see architects

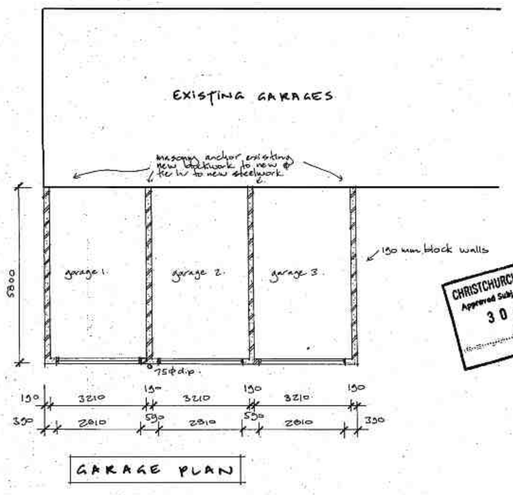


SOUTH ELEVATION

Note: aluminium porches to have pre-painted hardiflex screens to cupb portion & obscure glass to remainder with polycarbonate sheet to the roof see note.



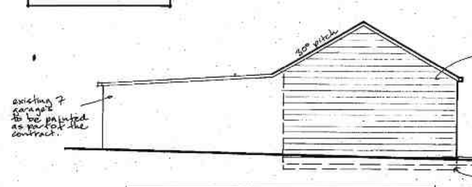
EAST ELEVATION



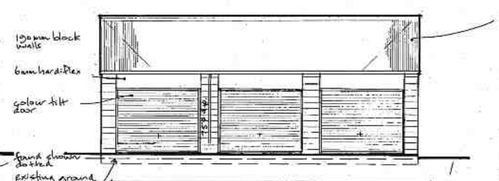
GARAGE PLAN

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

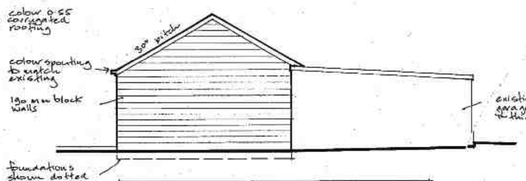
GARAGES



EAST ELEVATION GARAGES



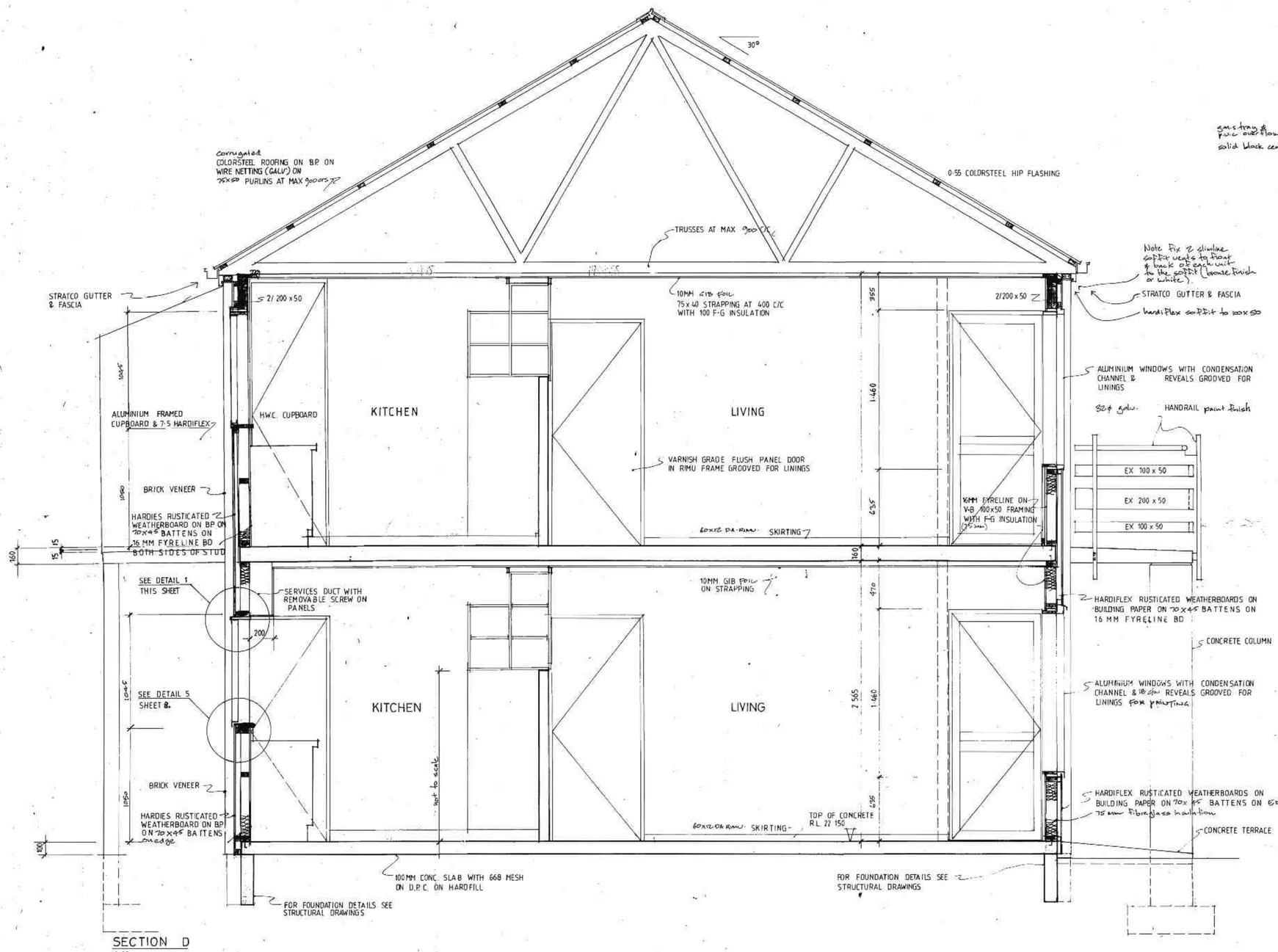
NORTH ELEVATION GARAGES



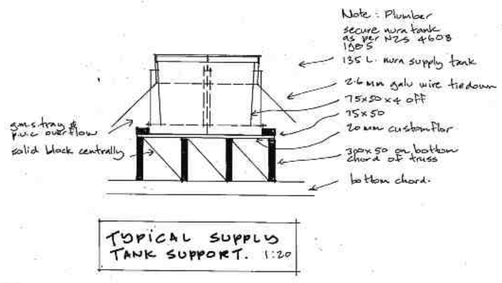
WEST ELEVATION GARAGES

CHRISTCHURCH CITY COUNCIL CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT	HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan.	SCALE 1:100	DESIGN	JOB NO 11251.	SHEET NUMBER
		DATE 25.1.91.	DRAWN BEG TRACED	FILE NO	OF 22 total SHEETS A 2.

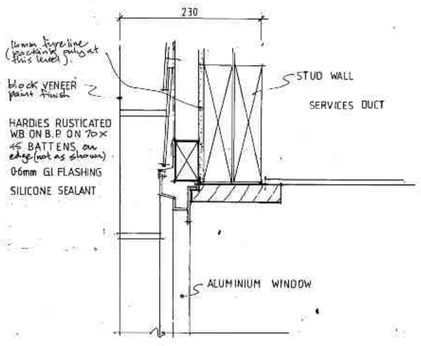
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



SECTION D
1:20



TYPICAL SUPPLY TANK SUPPORT. 1:20



DETAIL 1
1:5

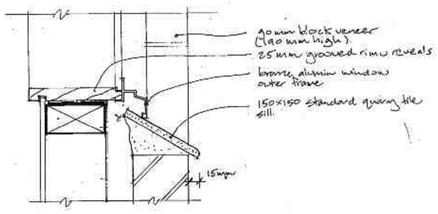
CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
3 0 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

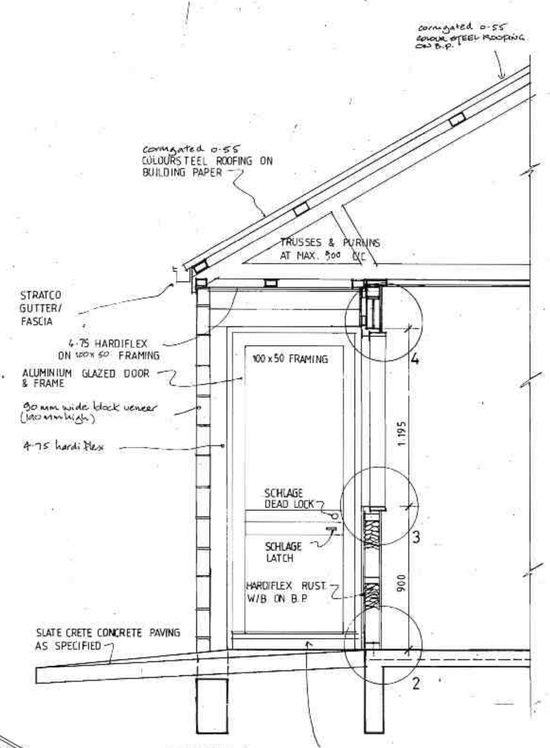
HARMAN COURTS EXTENSION 1991. two storey block cross-sections.

SCALE 1:20, 1:5 | DESIGN BRG | JOB NO 11251 | SHEET NUMBER A 7,
DATE 16.3.91 | DRAWN | TRACED | FILE NO | OF 22 Total SHEETS

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

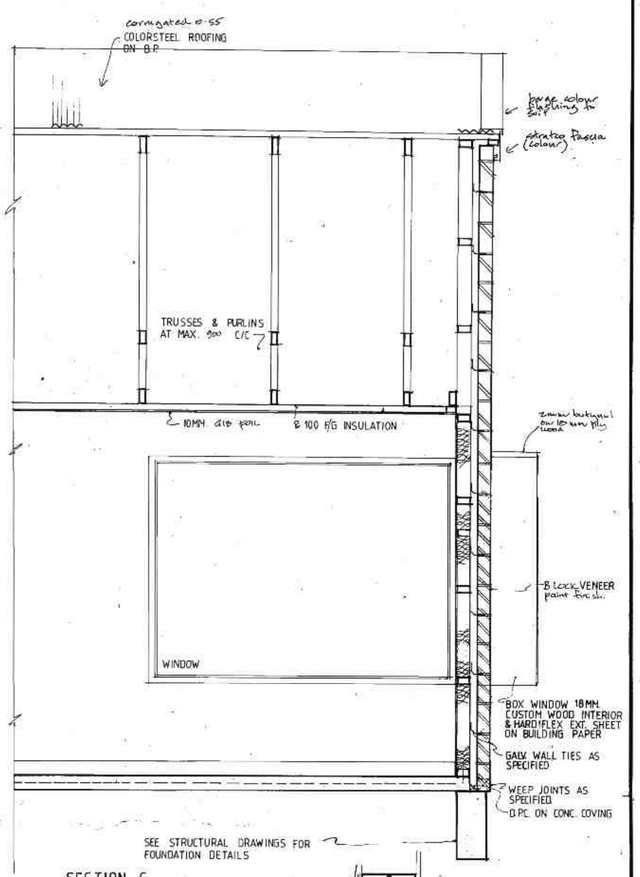


TYPICAL BLOCK SILL DETAIL

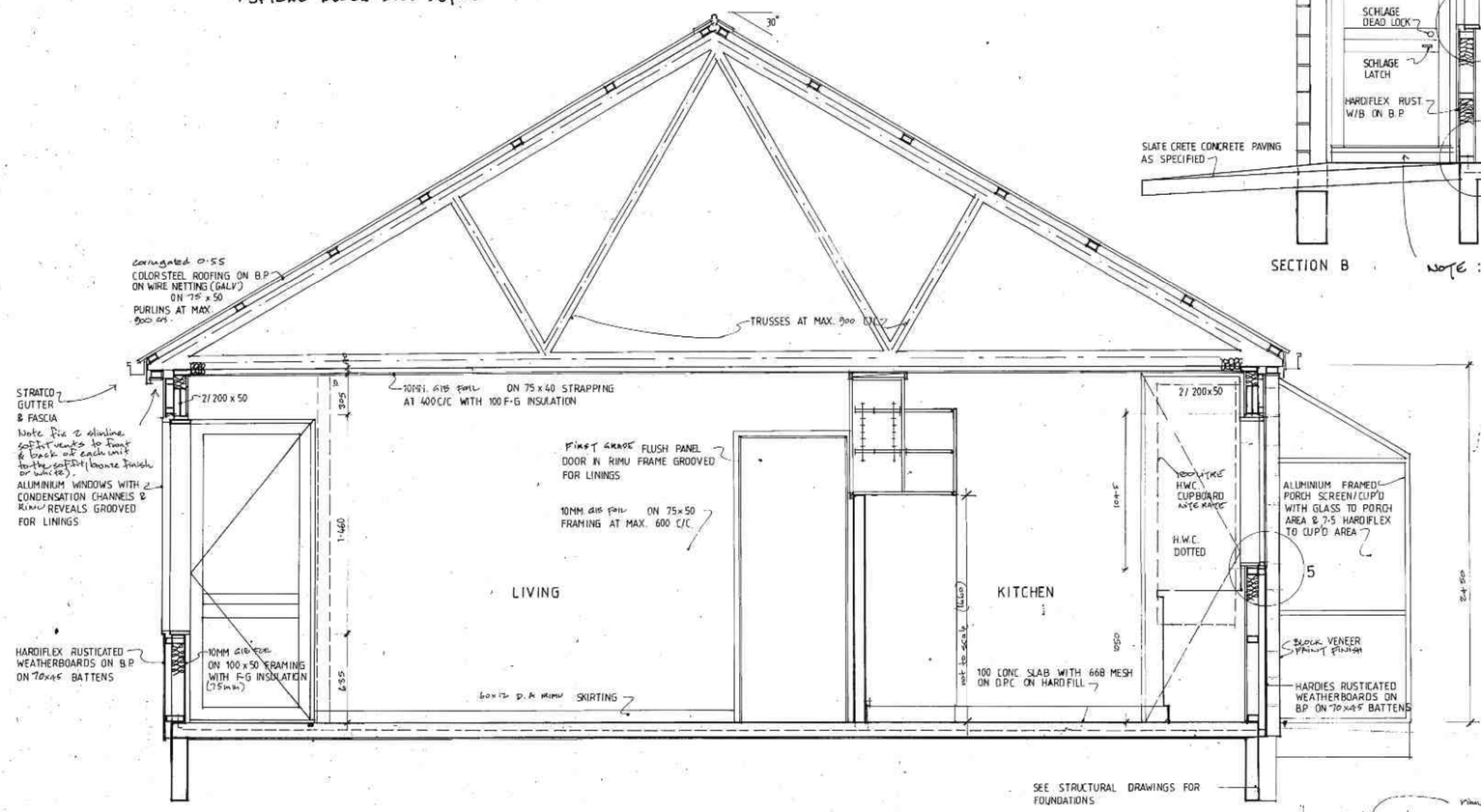


SECTION B

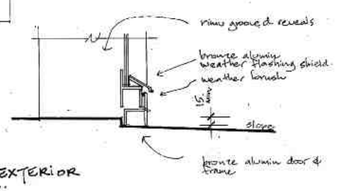
NOTE : ALUMINIUM DOORS to have a weather shield fitted bottom section to front & back doors



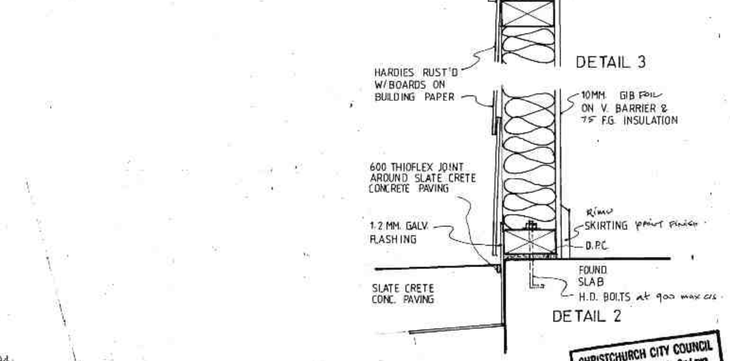
SECTION C



SECTION A



TYPICAL EXTERIOR DOOR SILL.



DETAIL 5

DETAIL 4

DETAIL 3

DETAIL 2

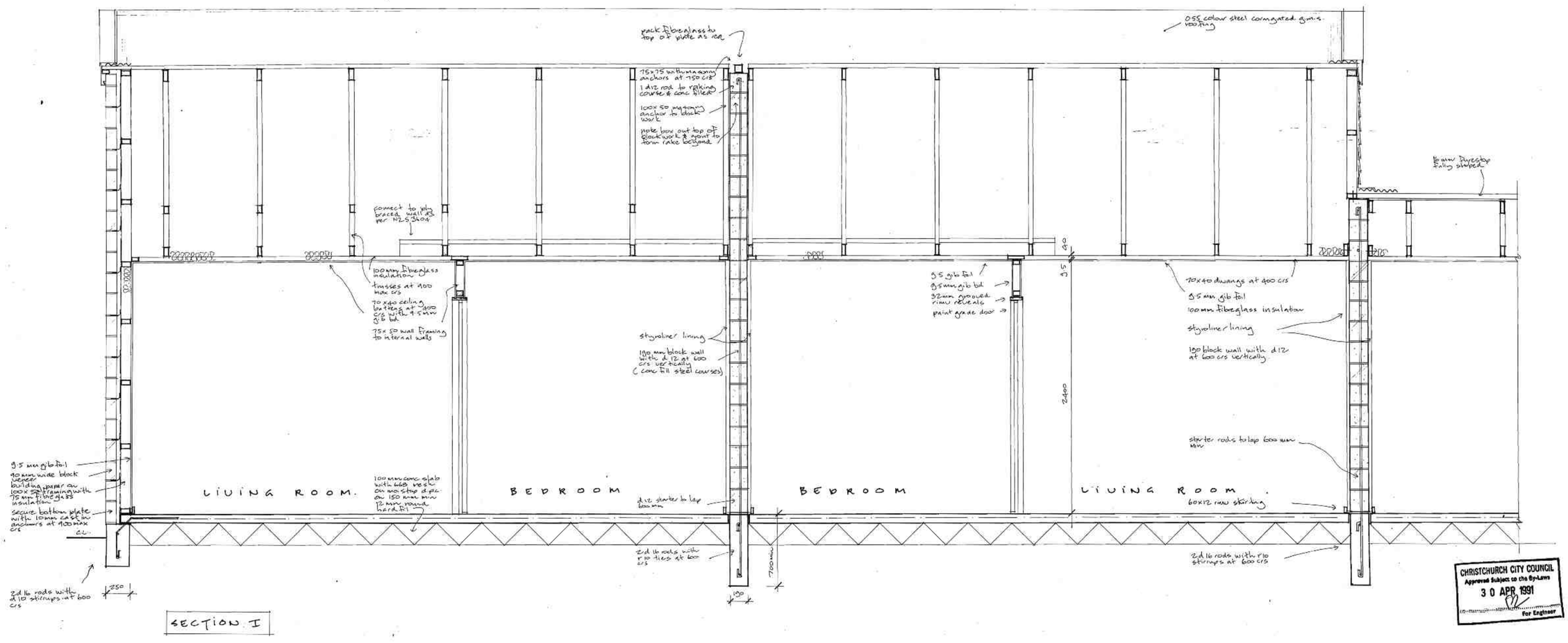
CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991 single storey block & part single block cross sections.

SCALE 1:20, 1:5 DESIGN BFH JOB NO 1125 SHEET NUMBER A 8.
DATE 14.3.91 DRAWN RM FILE NO OF 22 Total SHEETS
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



SECTION I

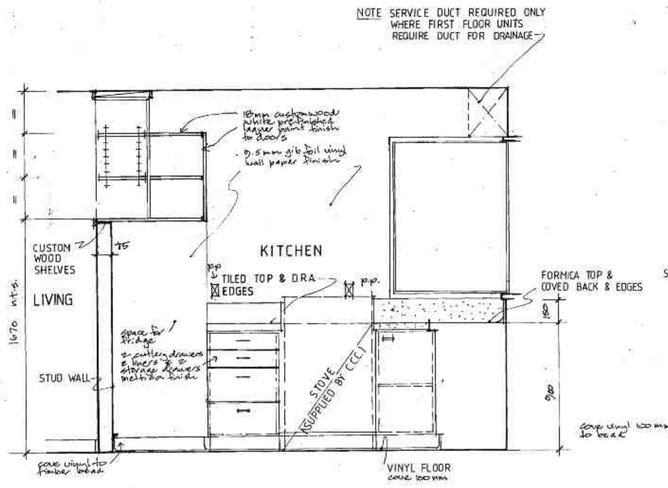
CHRISTCHURCH CITY COUNCIL
Approved Subject to cha By-Laws
30 APR 1991
for Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

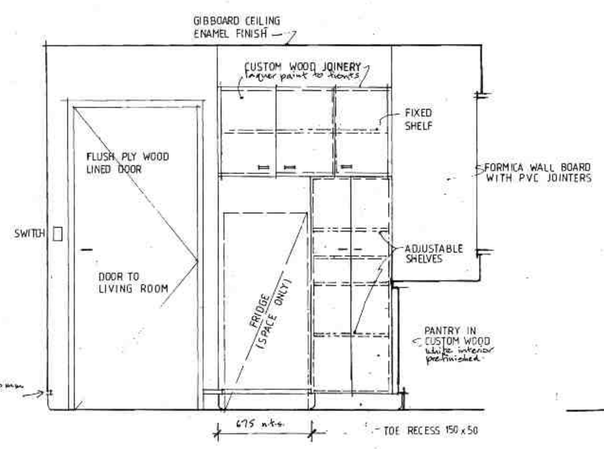
HARMAN COURTS EXTENSION 1991. single storey block cross section

SCALE 1:20 DESIGN
DATE 4/91 DRAWN BEG TRACED
JOB NO 11251 SHEET NUMBER
FILE NO OF 22 total SHEETS A 9.

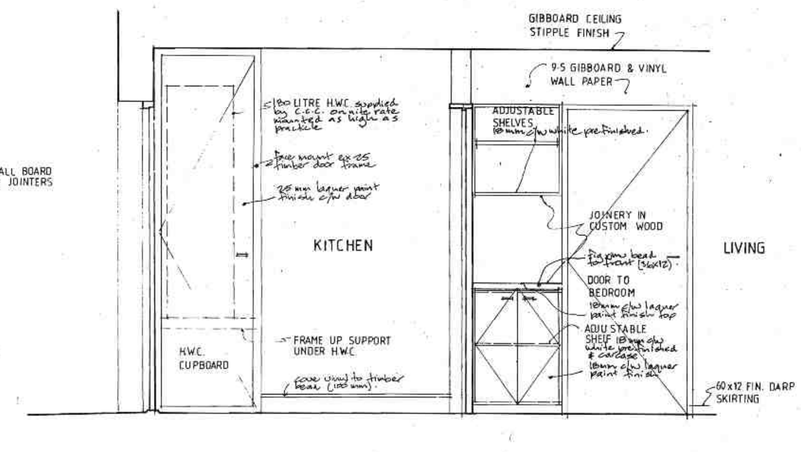
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



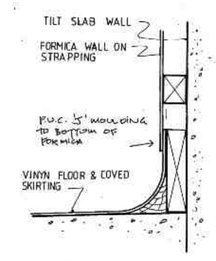
ELEVATION A



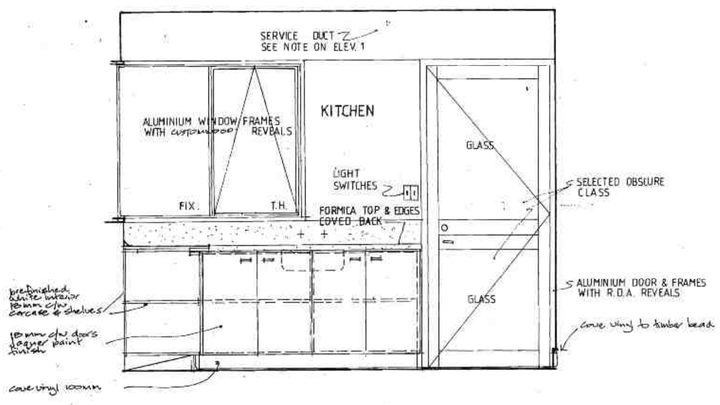
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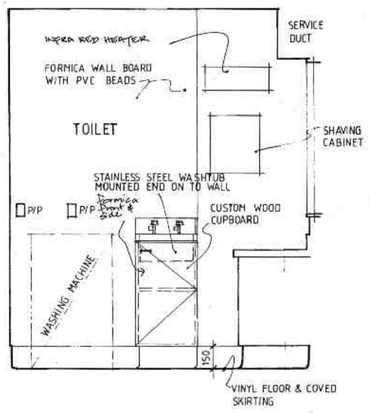
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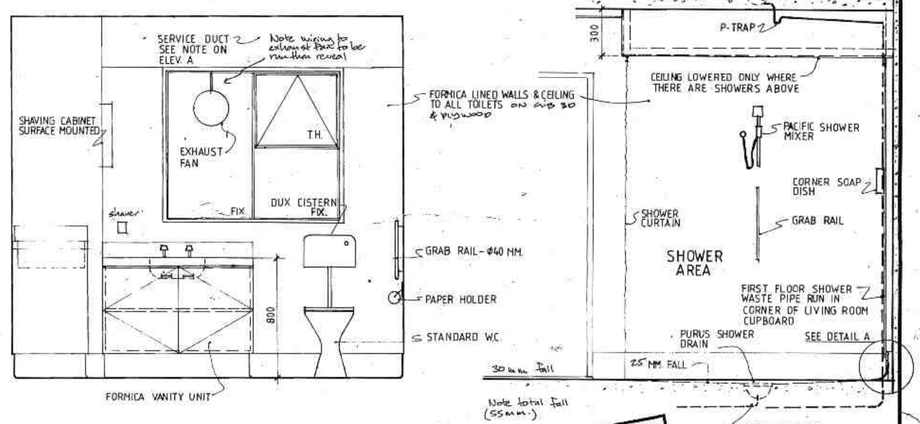
DETAIL A



ELEVATION D



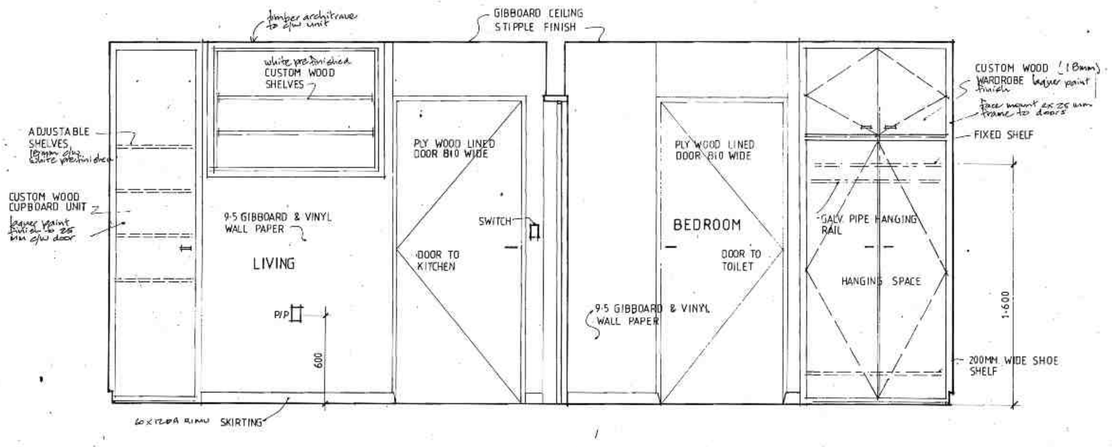
ELEVATION E



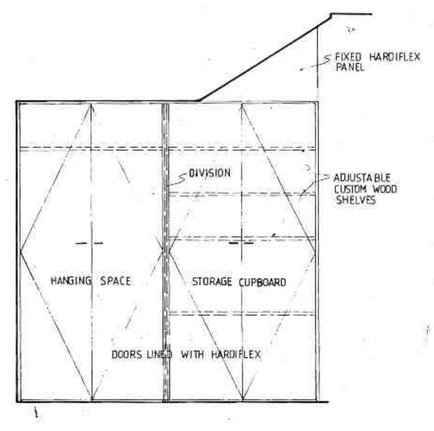
ELEVATION F

ELEVATION G
(diagramatic only).

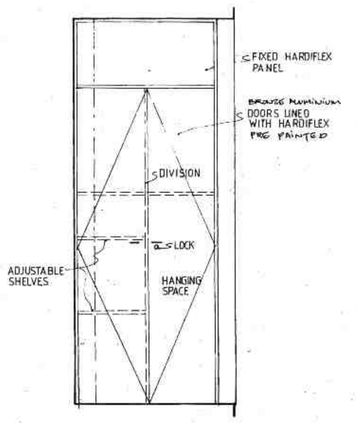
CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer



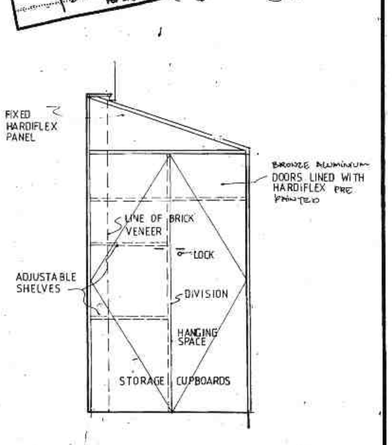
ELEVATION H



ELEVATION I



ELEVATION J
Note door frames aluminium



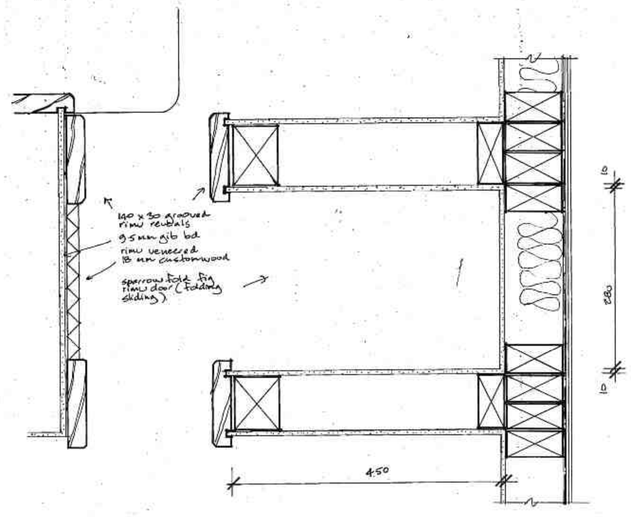
ELEVATION K
Note door frames aluminium

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

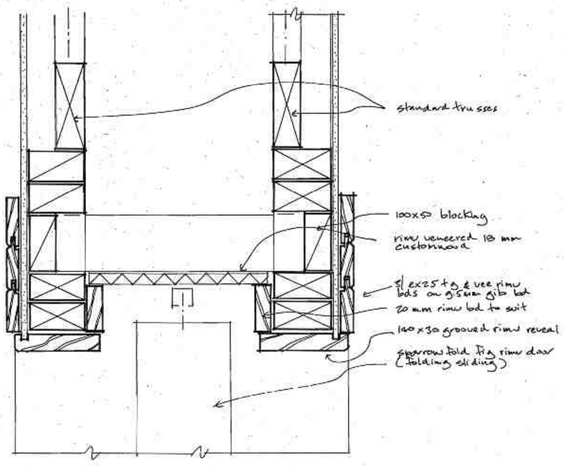
HARMAN COURTS EXTENSION 1991. typical joinery elevations & details.

SCALE 1:20 DESIGN G.F.H. JOB NO 11251 SHEET NUMBER
DATE 16 3 91 DRAWN P.M. TRACED FILE NO OF 22 total SHEETS A 10.

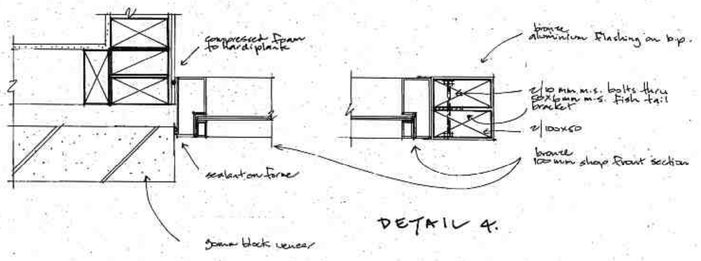
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



DETAIL 1.

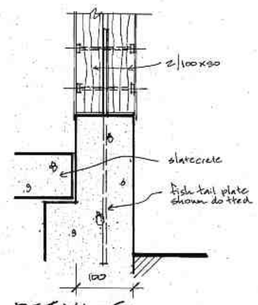


DETAIL 2.

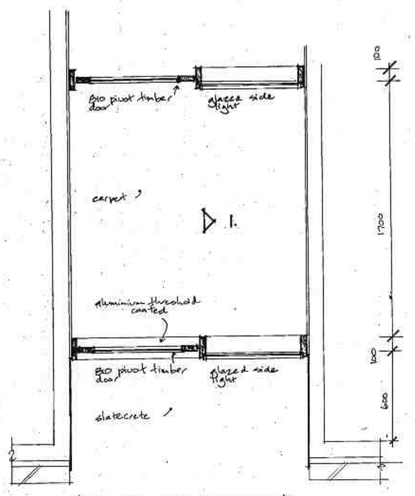


DETAIL 3.

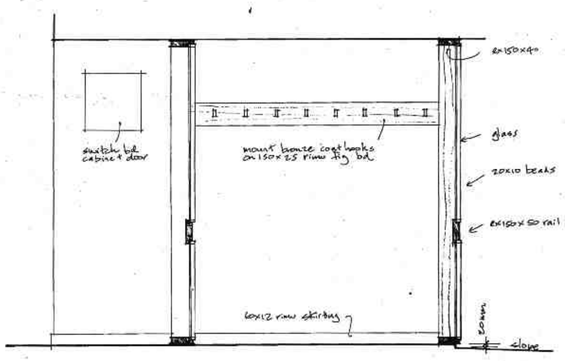
DETAIL 4.



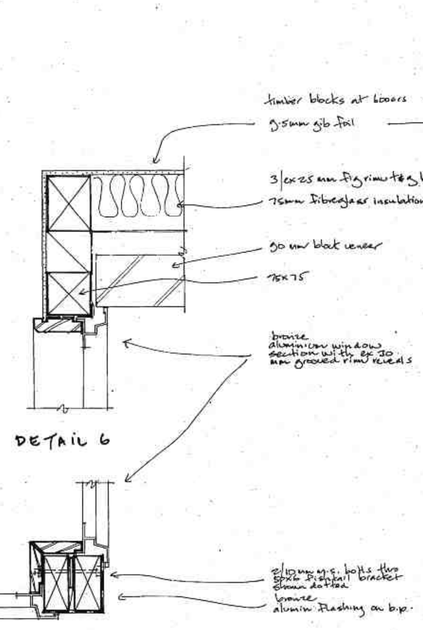
DETAIL 5.



ENTRY PLAN 1:50

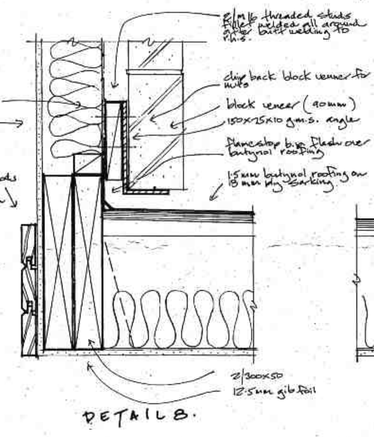


ELEVATION 1.

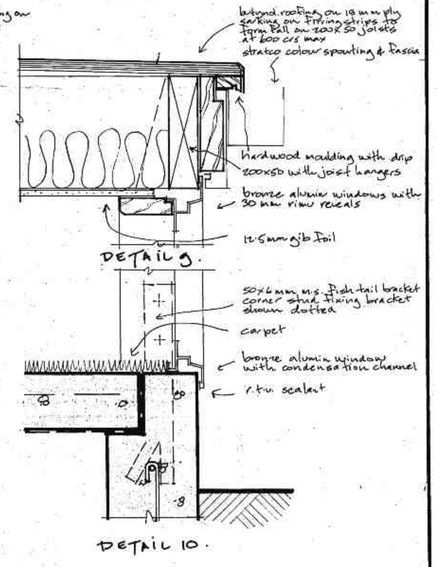


DETAIL 6

DETAIL 7

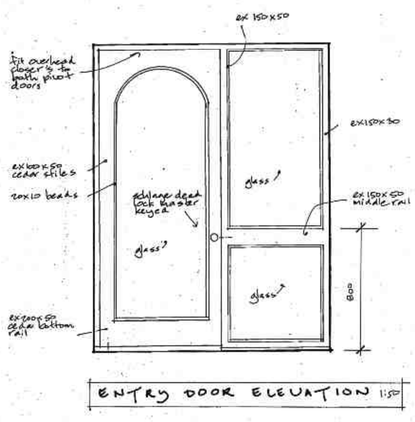


DETAIL 8.



DETAIL 9.

DETAIL 10.



ENTRY DOOR ELEVATION 1:50

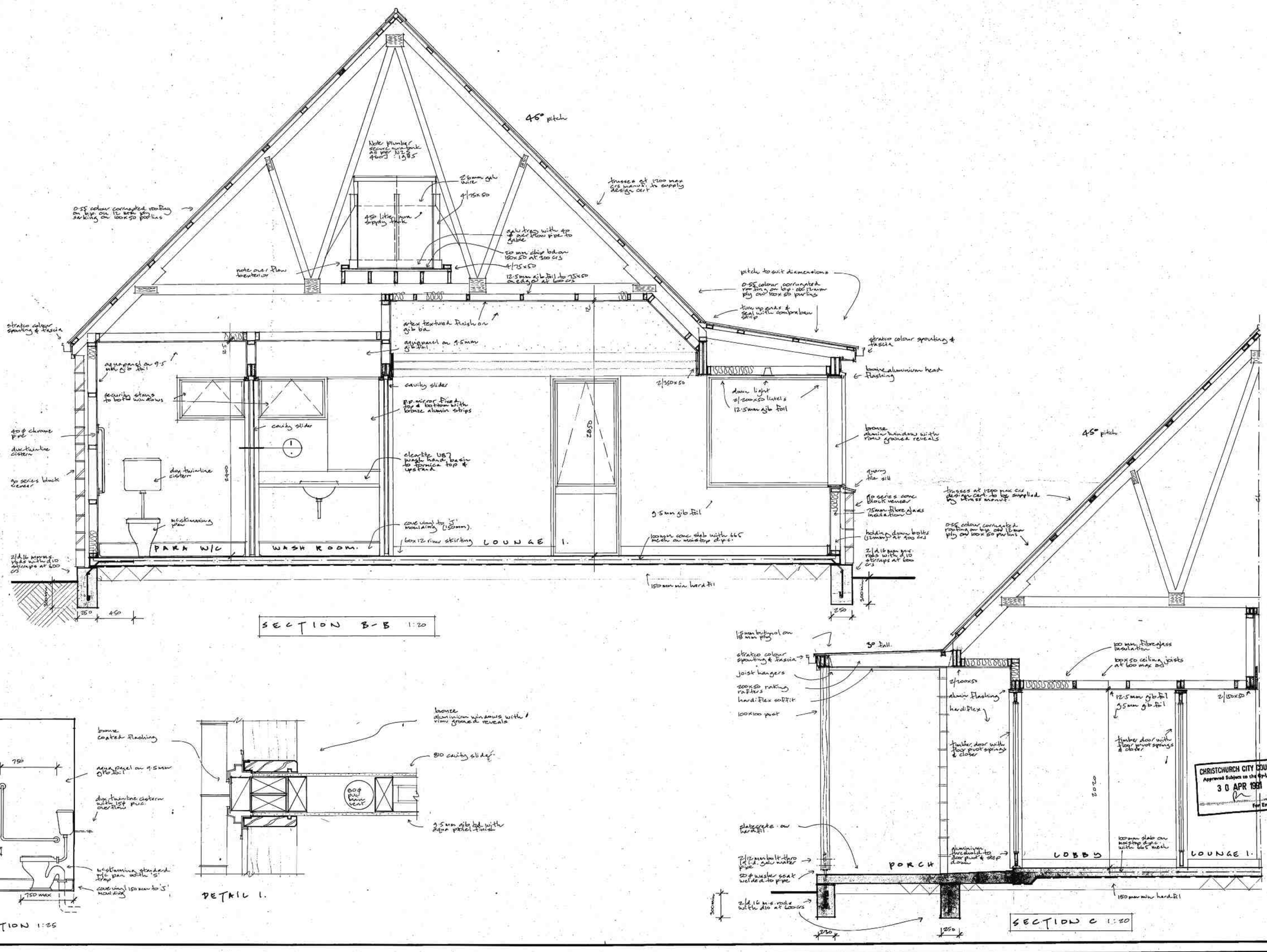
CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

SCALE 1:5 | DESIGN | JOB NO 11251 | SHEET NUMBER
DATE 10.91. | DRAWN JEG | FILE NO | OF 82 total SHEETS A 13.
TRACED

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

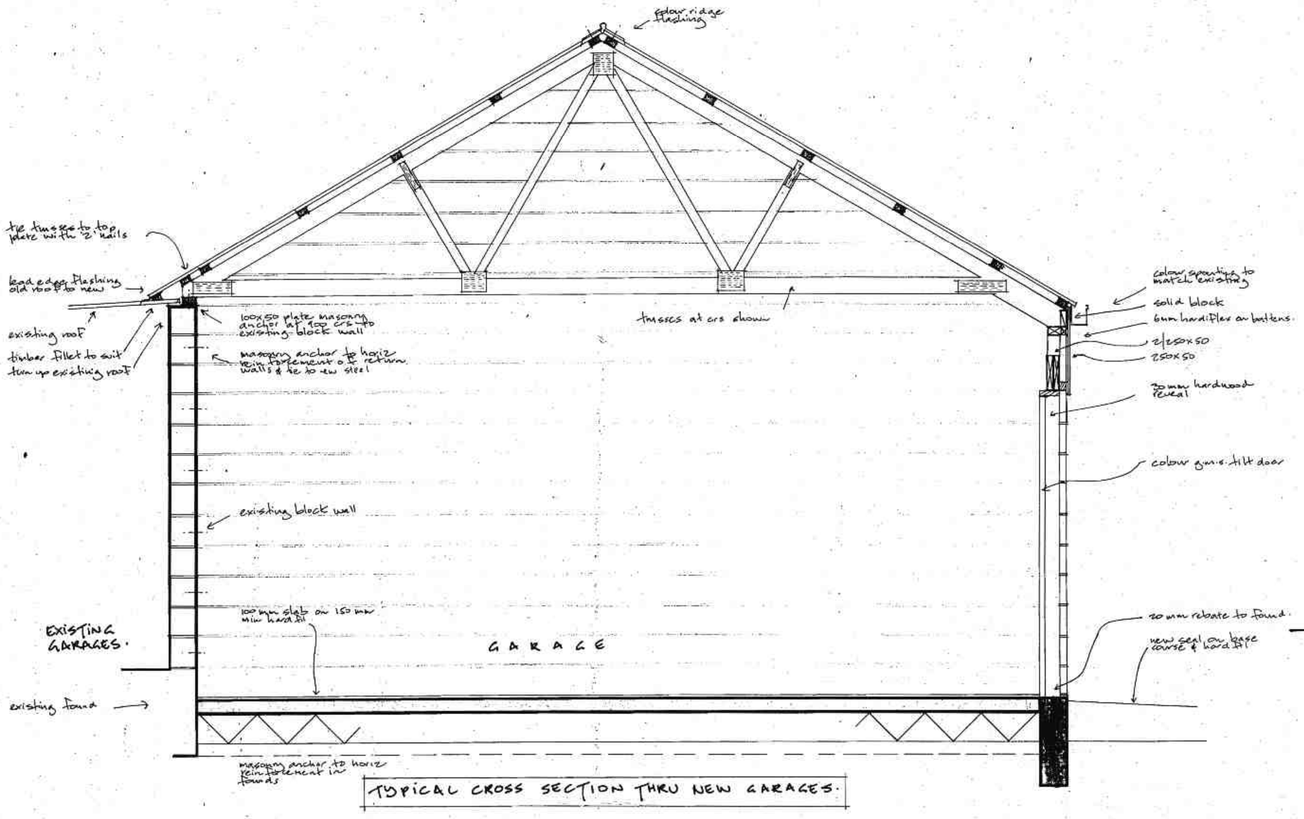


CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION : CITY WORKS & PLANNING DEPARTMENT

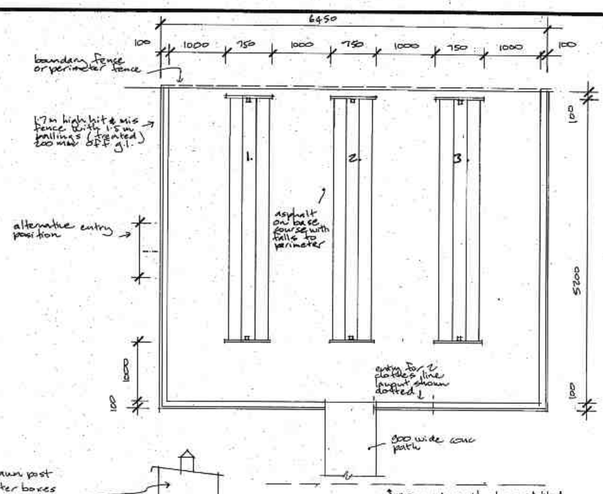
HARMAN COURTS EXTENSION 1991. new residents lounge for property unit

SCALE 1:20,25,10 DESIGN
DATE 8.91. DRAWN BES
TRACED
JOB NO 11251
FILE NO
SHEET NUMBER
OF ## total SHEETS A14

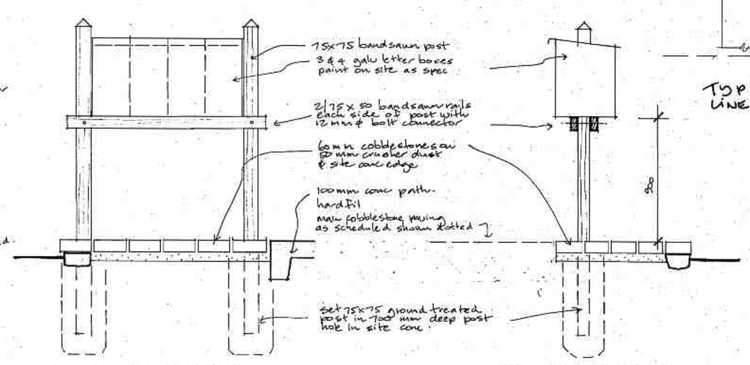
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



TYPICAL CROSS SECTION THRU NEW GARAGES.



TYPICAL CLOTHES LINE LAYOUT. 1:50



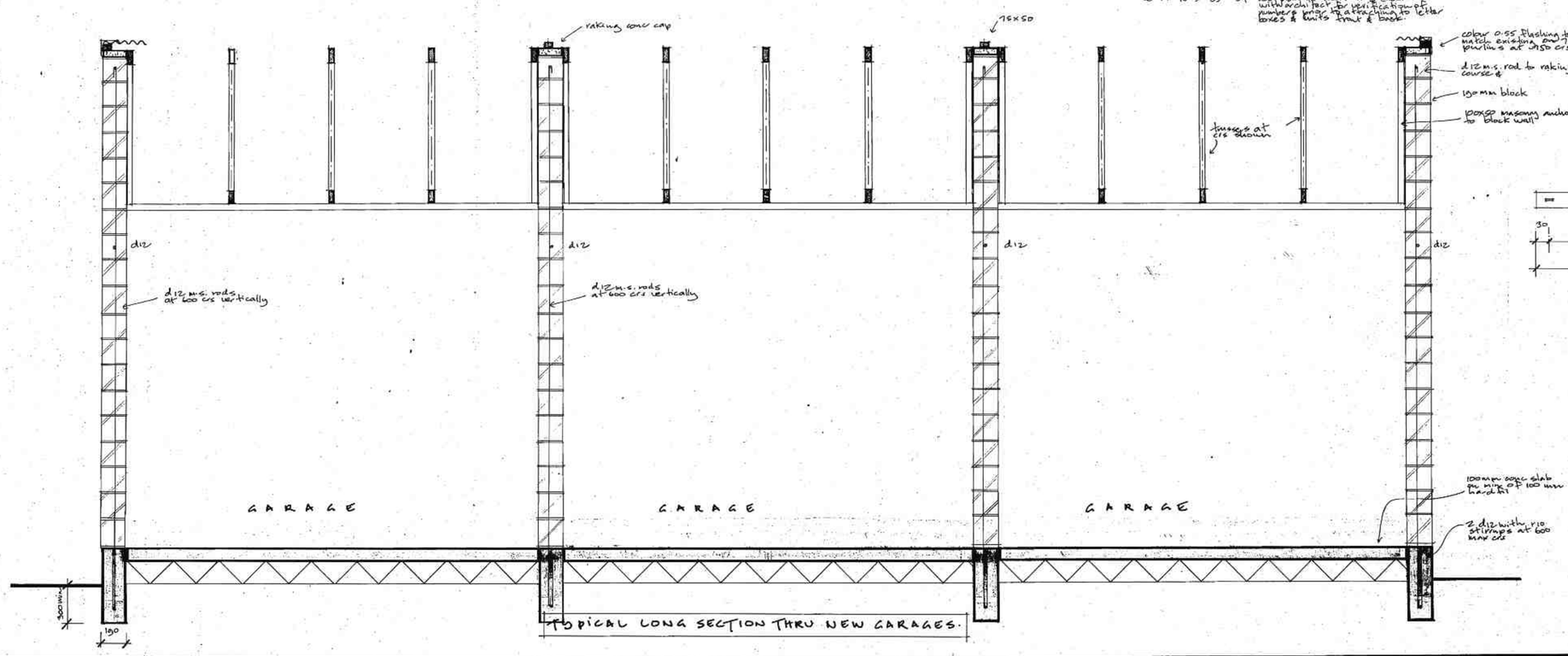
LONG SECTION.

CROSS SECTION

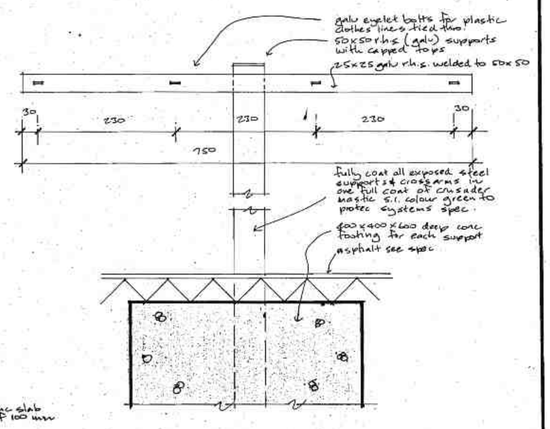
STANDARD LETTER BOX DETAILS.

10 off at 4 # & 2 off at 3 - total of 12 boxes.

Letter N°s 25-34 see plan for location & check with architect for verification of numbers & prior to attaching to letter boxes # units front & back.



TYPICAL LONG SECTION THRU NEW GARAGES.



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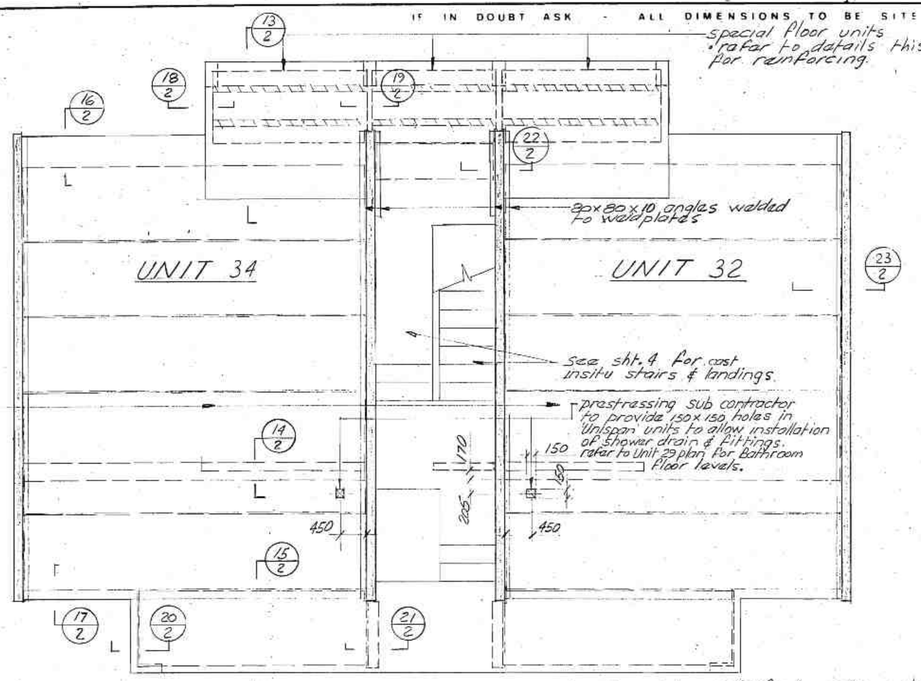
HARMAN COURTS EXTENSION 1991. 3 garages clothes line details & letter box details for property unit.

SCALE 1:20 DESIGN JOB NO 11251 SHEET NUMBER
DATE 1.2.91 DRAWN TRACED FILE NO OF 22 Total SHEETS A 15.

IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES

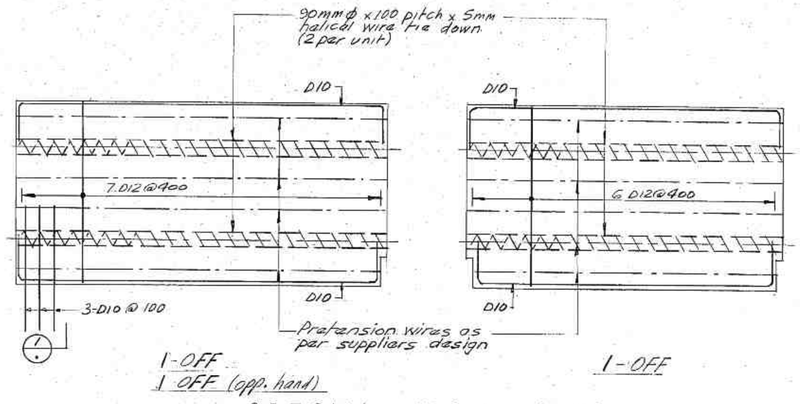
Original scale of millimetres 0 20 40 60 80 100

special floor units
•refer to details this sheet for reinforcing.

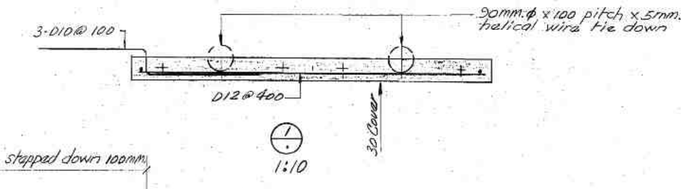


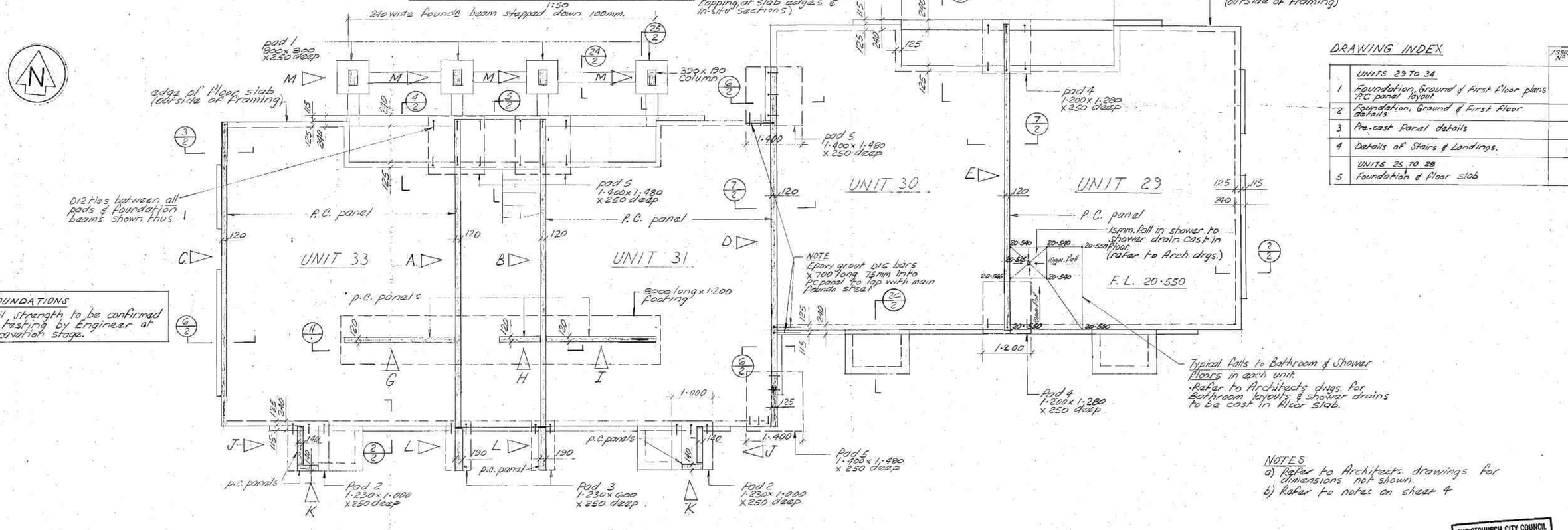
FIRST FLOOR SLAB PLAN
1:50

(refer to sections on sht 2 for details of reinforcing in topping at slab edges & in-situ sections)



SPECIAL FLOOR UNITS
1:20





FOUNDATIONS, GROUND FLOOR SLAB & P.C. PANEL PLAN
1:50

NOTES
a) Refer to Architects drawings for dimensions not shown.
b) Refer to notes on sheet 4

DRAWING INDEX

		ISSUE NO
	UNITS 29 TO 34	
1	Foundation, Ground & First Floor plans P.C. panel layout	
2	Foundation, Ground & First Floor details	
3	Pre-cast Panel details	
4	Details of Stairs & Landings.	
	UNITS 25 TO 28	
5	Foundation & Floor slab	

CHRISTCHURCH CITY COUNCIL
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For Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments | Initials | Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed		
Drawn	JM	3.91
Traced	JM	3.91
Dwg. Chk.		4/91
Des. Chk.		
Indexed		

Approved: Mof Blakemell 4/4/91 Date
Design Services Manager

CHRISTCHURCH CITY COUNCIL · · · · DESIGN SERVICES UNIT

HARMAN COURTS EXTENSION 1991
FOUNDATION, GROUND & FIRST FLOOR PLANS, P.C. PANEL LAYOUT

Scales: 1:10, 1:20, 1:50

File No
Issue
D.3963
Sheet 1 of 5

IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES

PAD 1

PAD 2

PAD 3

pad 5 - refer to detail below

- 3-D12 -

line of PC panel shown dotted

Approved

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991

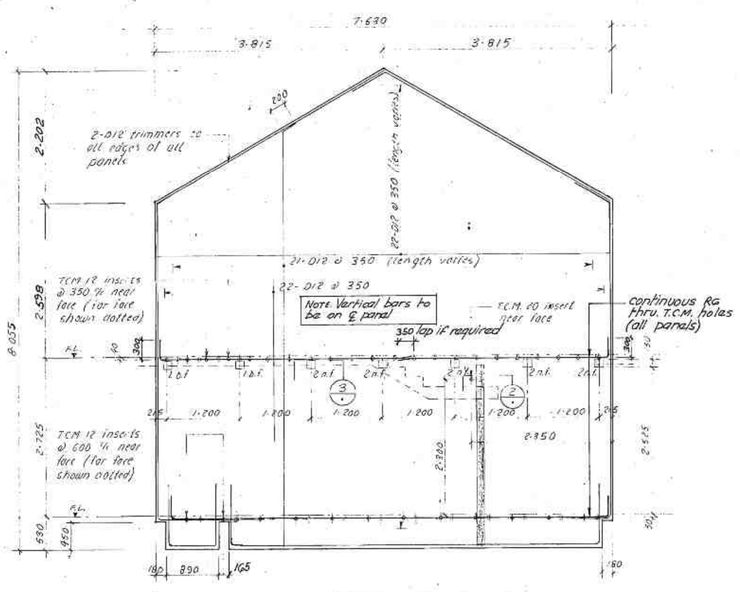
FOUNDATION, GROUND & FIRST FLOOR DETAILS

File No. D3963

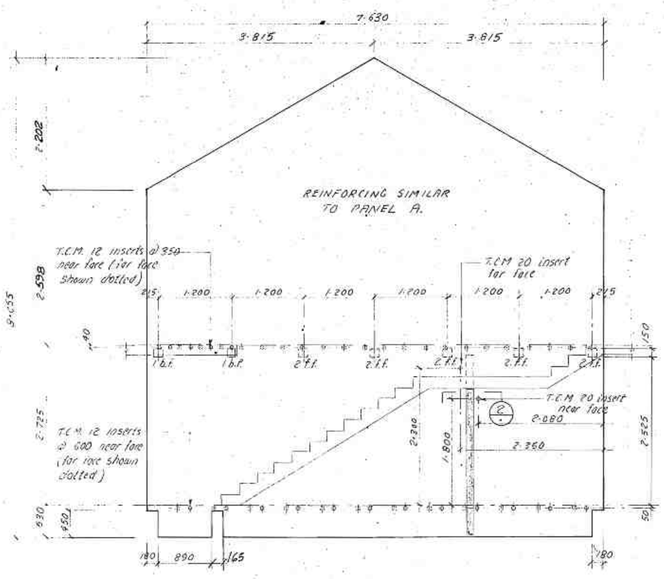
Sheet 2 of 5

CHRISTCHURCH CITY COUNCIL
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30 APR 1991
The Engineer

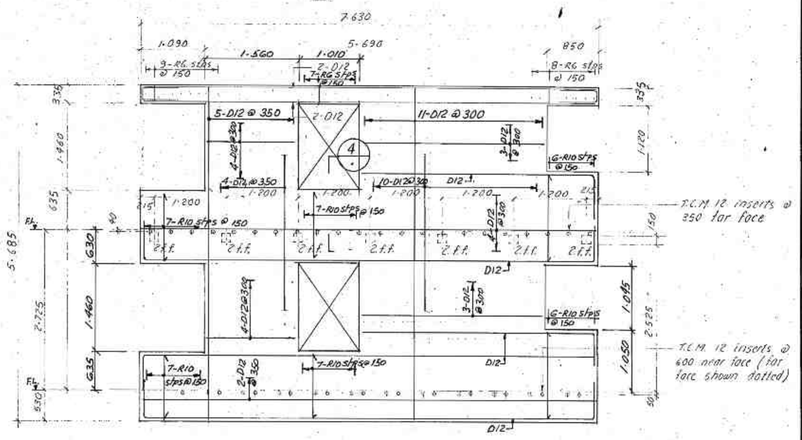
IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES



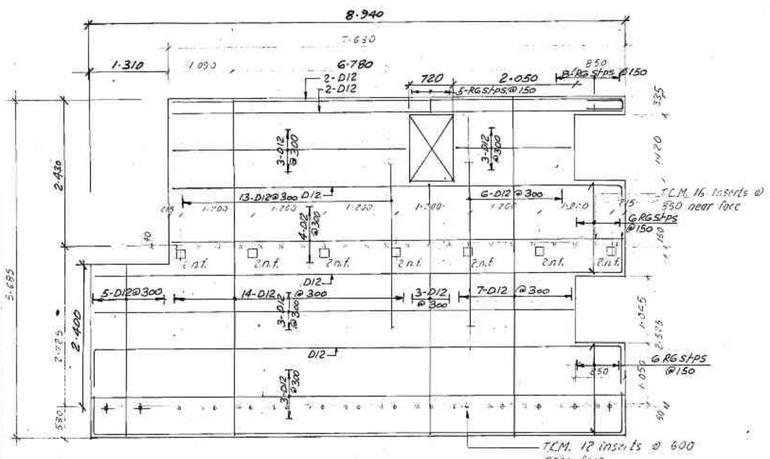
PANEL A 1-OFF
1:50



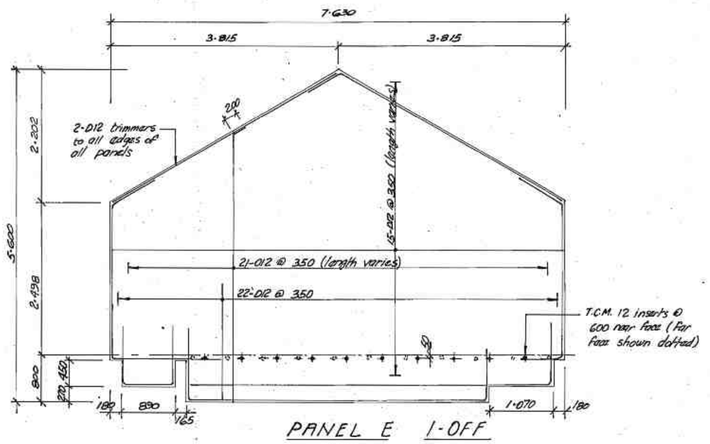
PANEL B 1-OFF
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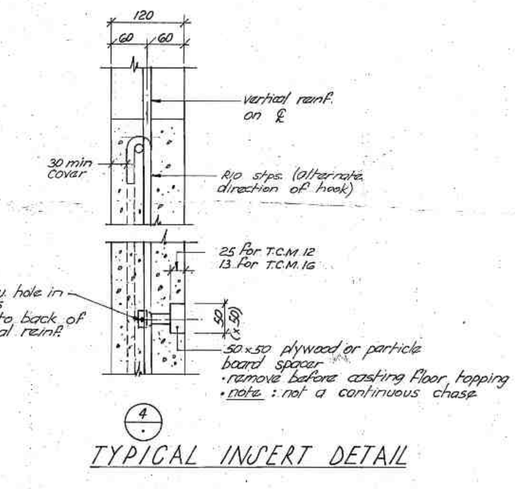
PANEL C 1-OFF
1:50



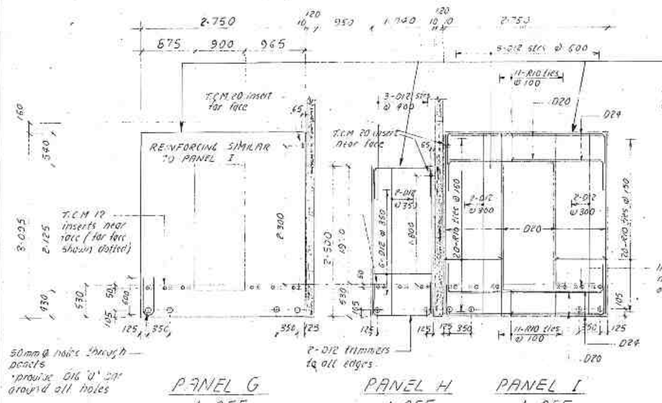
PANEL D 1-OFF
1:50



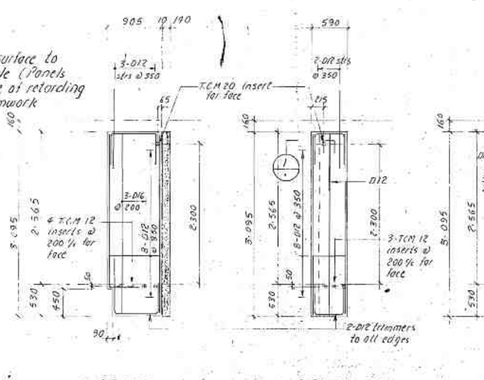
PANEL E 1-OFF
1:50



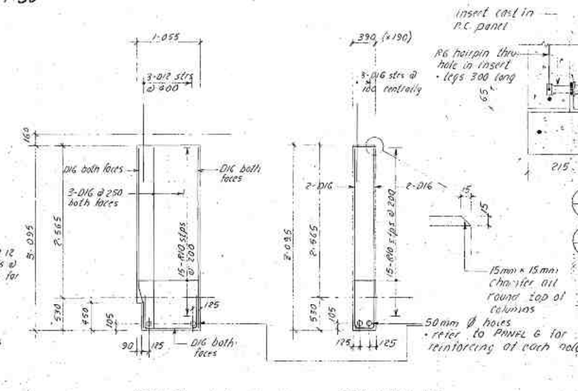
④
TYPICAL INSERT DETAIL



PANEL G 1-OFF 1:50
PANEL H 1-OFF 1:50
PANEL I 1-OFF 1:50

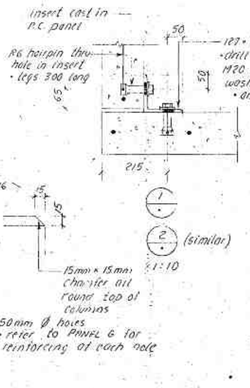


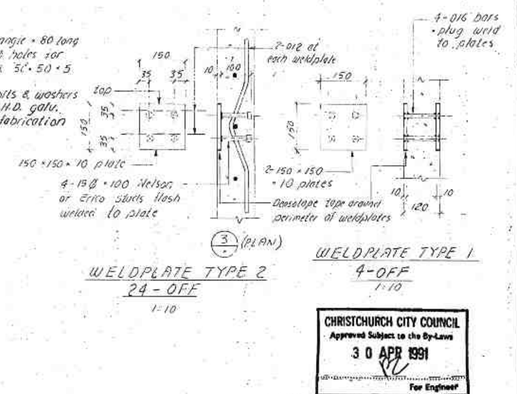
PANEL J (140 thick) 2-OFF 1:50
PANEL K (140 thick) 2-OFF 1:50



PANEL L (190 thick) 2-OFF 1:50

COLUMN M 4-OFF 1:50





WELDPLATE TYPE 2
24 - OFF
1:10

WELDPLATE TYPE 1
4-OFF
1:10

NOTES Refer to notes on Sheet 4.

CHRISTCHURCH CITY COUNCIL
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30 APR 1991
for Engineer

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				
Indexed				

		Date
Designed		
Drawn	A.O'Brien	11/88
Traced	BGB PM	11/88
Dwg. Chk.		11/88
Des. Chk.		

Approved: M.F. Bakewell 2/1/89 (Design Engineer / Date)
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991

PRE-CAST PANEL DETAILS

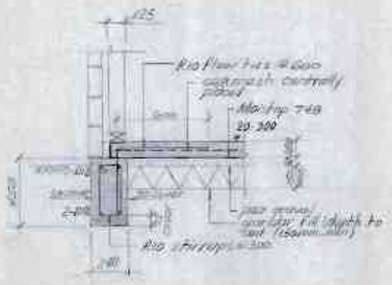
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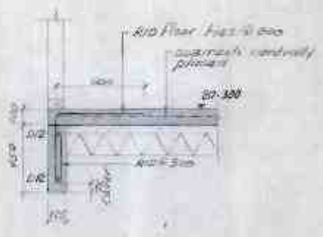
Sheet 3 of 5

Original scale of millimetres 0 20 40 60 80 100

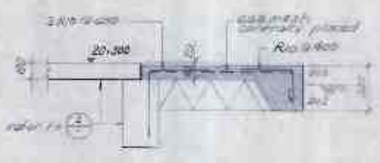
IF IN DOUBT ASK ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES



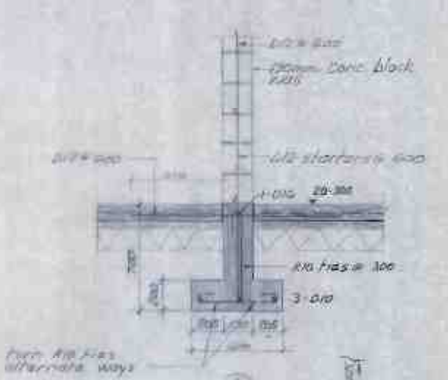
1/20



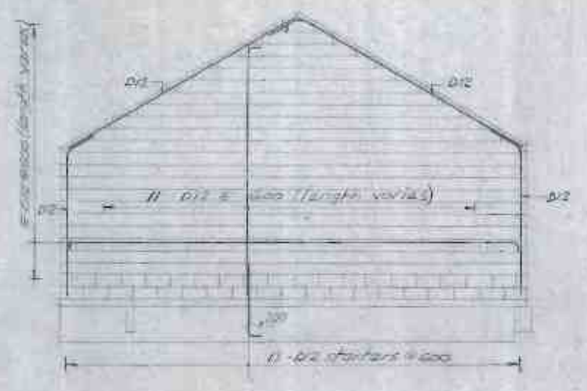
2/20



3/20



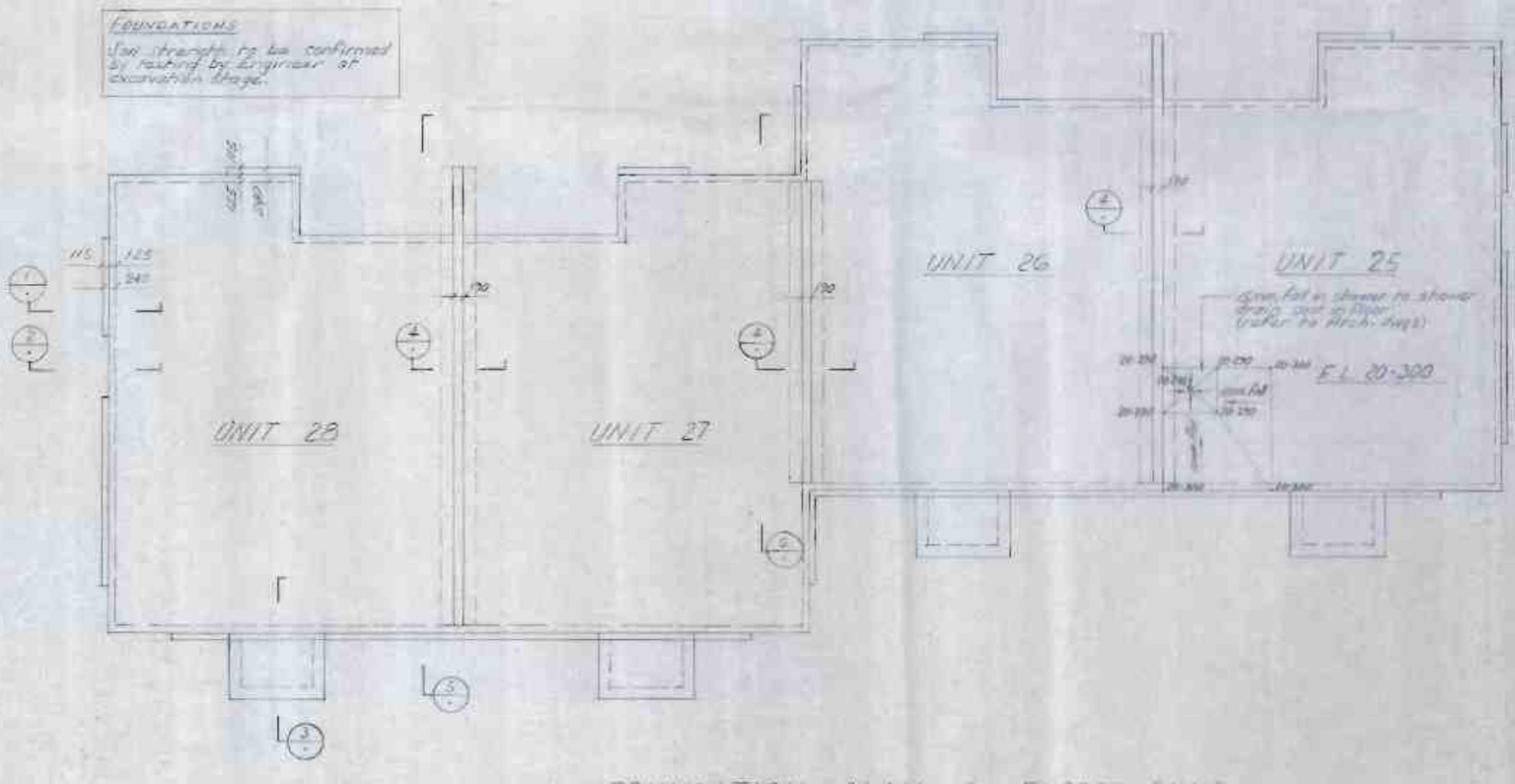
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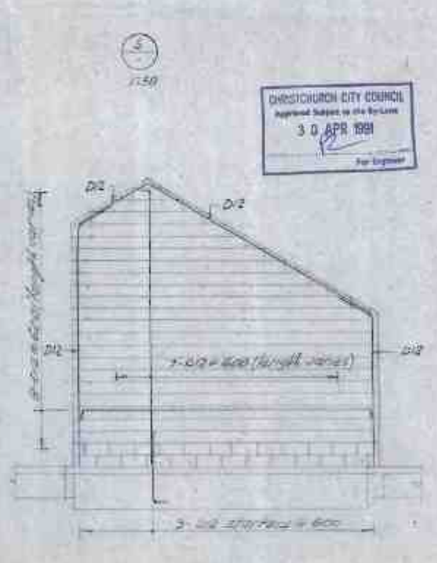
5/20

FOUNDATIONS

Soil strength to be confirmed by testing by Engineer at excavation stage.



1/50



5/20

1/50

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

NOTES
a) Refer to Architects drawings for dimensions not shown
b) Refer to notes on sheet 4

FOUNDATION PLAN & FLOOR SLAB
1:50

Service	Inform	Service	Initials
W.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
— T.P.O.			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Computed from				

		Date
Designed		
Drawn	PM	3-91
Traced	PM	3-91
Dwg. Chk.	[illegible]	4/91
Des. Chk.		
Indexed		

Approved: M J Strickland 4/5/91 Date
Design Services Manager

CHRISTCHURCH CITY COUNCIL - DESIGN SERVICES UNIT

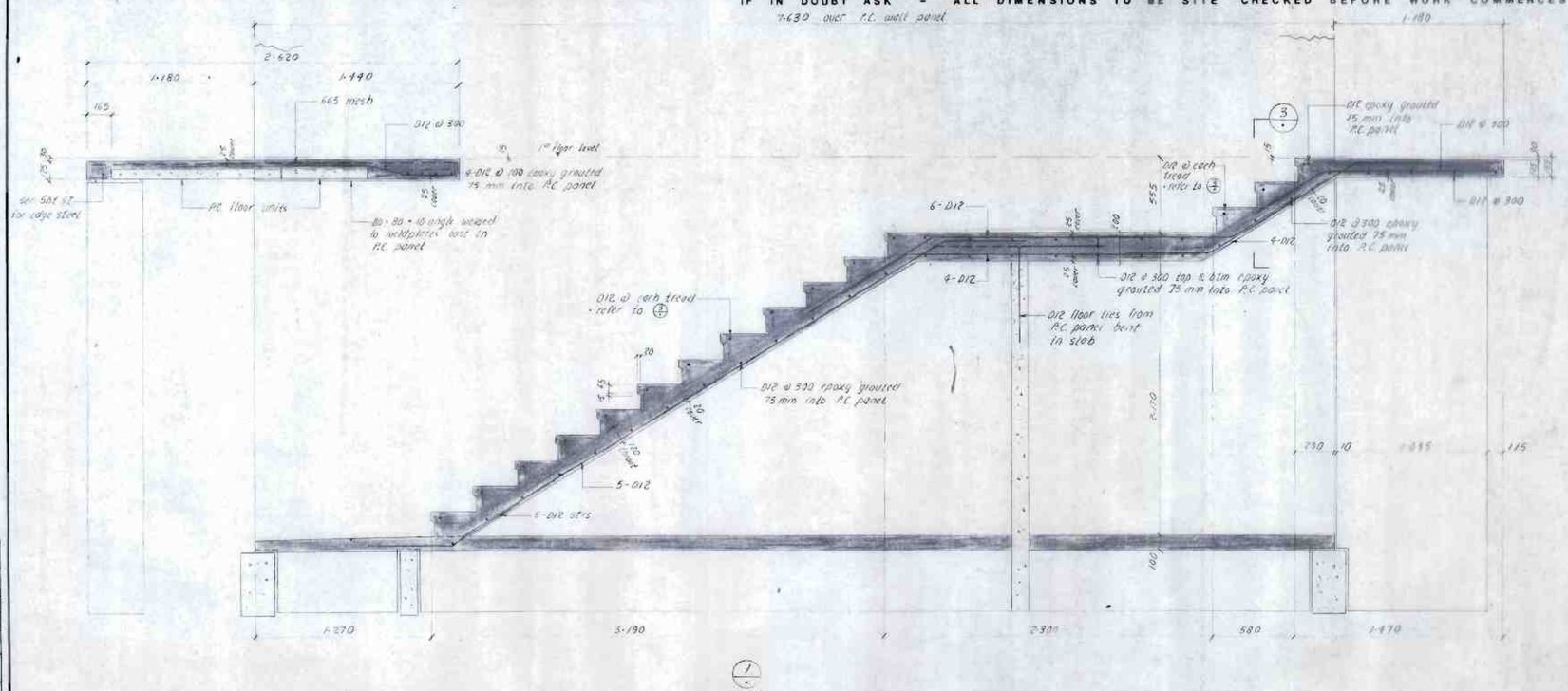
HARMAN COURTS EXTENSION 1991
FOUNDATION PLAN & FLOOR SLAB

Scales: 1:20, 1:50

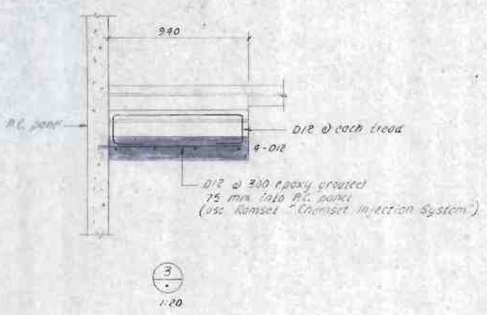
File No:
Issue
D.3963
Sheet 5 of 5

Original scale at millimetres @ A1

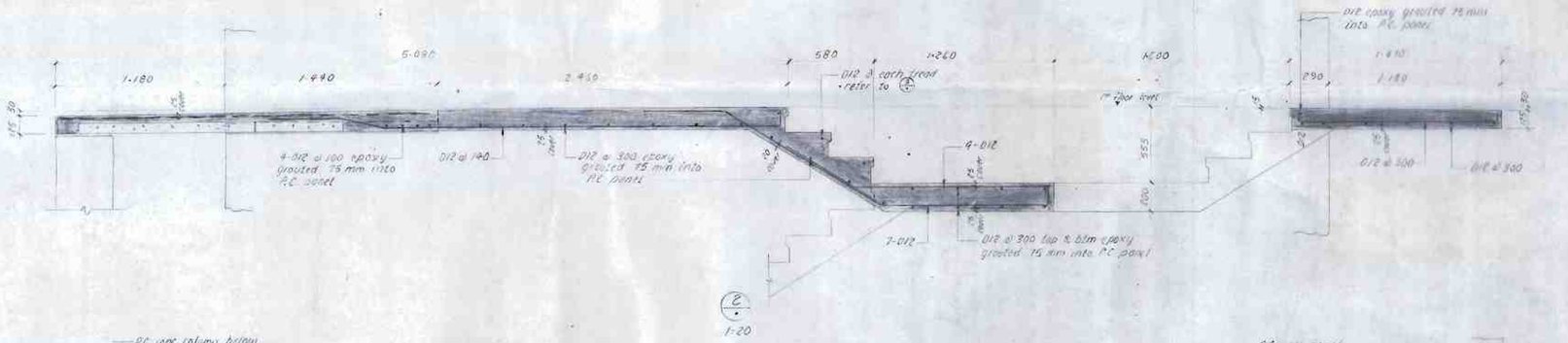
IF IN DOUBT ASK - ALL DIMENSIONS TO BE SITE CHECKED BEFORE WORK COMMENCES



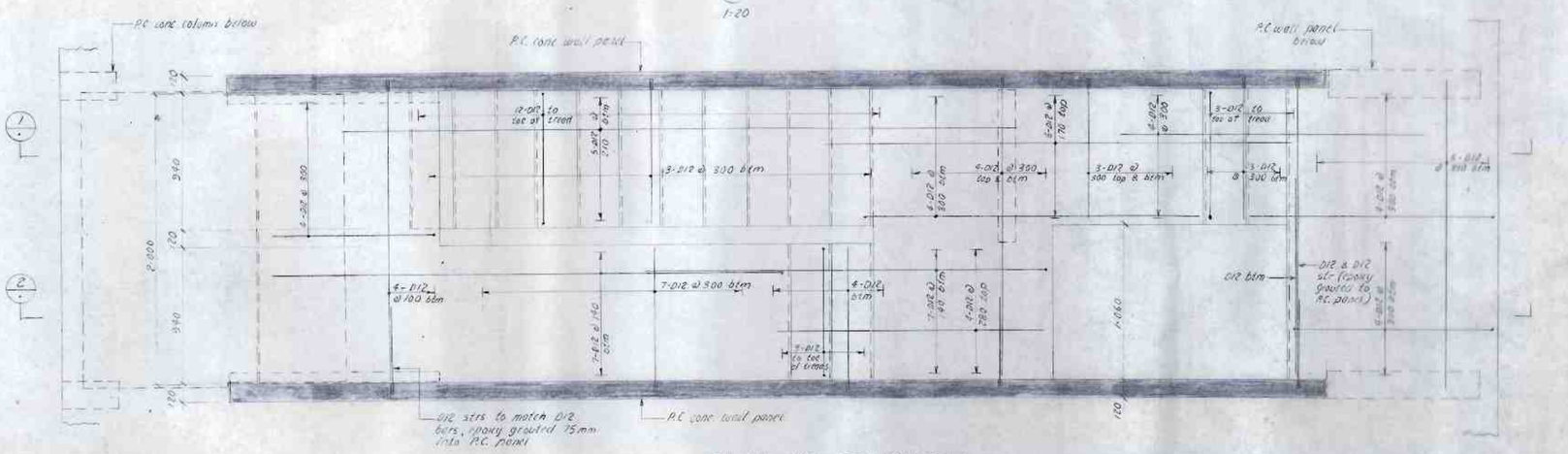
1/1 1:20



3/1 1:20



2/1 1:20



PLAN OF STAIRWELL
1:20

CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-Laws
30 APR 1991
For Engineer

8) STEELWORK
(a) All welds to be 6mm FW unless shown otherwise
(b) F.W. indicates 6mm fillet weld
(c) Butt welds to be full penetration
(d) All lines of contact to be welded
(e) All ends to be machine sawn. Sharp edges & burrs to be removed by grinding
(f) Site welded areas to be power wire brushed & coated with two good coats of "dry galv."

(g) Laps shall be (unless shown otherwise)
D10 300 mm
D12 400
D16 550
mesh 300

9) WELDPLATES
(a) weldplates indicated on panel elevations thus
□ L.B.F. ▭ B.F. ⁝ L.F.
L.F. = both faces B.F. = near face F.F. = far face
(b) Wrap all edges of weldplates in "Densotape" or similar material to allow expansion of plates during welding without spalling adjacent concrete
(c) Refer to weldplate details on Sht 3 for additional reinforcing at weldplates

4) LIFTING ANCHORS
(a) Contractor to supply all necessary lifting devices, strongbacks, etc. to ensure panels are not cracked or damaged during erection. Details are to be submitted to the Engineer at least 4 days prior to lifting

5) All T.C.M. Ferrier inserts to have R6 rods, 600 long through their cross holes except where shown otherwise

6) All precast panels are 120 thick unless noted otherwise

7) Use Ramset "Chemset injection system" to grout str bars into precast panels

1) CONCRETE
(a) All concrete work to be in accordance with N.Z.S. 3109:1980 & related documents
(b) Concrete to be Specified Grade
(c) Conc. strength shall be: f'c (28 day)
Paths 15 MPa
Foundn., floor slabs, floor topping 20 MPa
Precast wall panels & columns 30 MPa
Precast floor units 42 MPa
(d) Conc finishes to be the following classes as described in N.Z.S. 3114:1987
Paths & ramps U5 (broom)
Floor slabs, stairs U3
Precast wall panels: faces U3
sides F5x
All other concrete F6x
Precast floor units FG
(x implies abrupt changes shall not exceed 1mm & gradual variations shall not exceed 4mm)
(e) Cover: (i) Insitu conc - as shown
(ii) Precast wall panels - reinforcing placed centrally (unless detailed both faces) Cover to panel edges to be 30 mm
(f) Tolerances:
(i) Insitu conc: as per specification
(ii) Precast conc: length +0mm -5mm
height +6mm -5mm
width ± 2mm

2) REINFORCING
(a) All reinforcing work to be in accordance with N.Z.S. 3109:1980 & related documents
(b) All reinforcing shall be continuous throughout
R = plain round bar Grade 275
D = deformed bar Grade 275

Service	Initials	Service	Initials
H.P. Water		Lands & Survey	
Sewer		Planning	
S.W. Drainage			
Gas			
Cables (M.E.D.)			
" (P.O.)			

Amendments	Initials	Date

	Book	Page	Initials	Date
Surveyed				
Levelled				
B.M.				
Compiled from				

		Date
Designed		
Drawn	R.O'Brien	11/88
Traced	R.O'Brien	11/88
Dwg. Chk.	[illegible]	11/88
Des. Chk.		
Indexed		

Approved
M.J. Hudson 21/11/89
Design Engineer Date
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY WORKS AND PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1991
DETAILS OF STAIRS & LANDINGS

Scales: 1:20

File No.
Issue
D.3963
Sheet 4 of 5

Original scale of millimetres 0 20 40 60 80 100

Appendix A5/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Block I				Reviewer:	James Li
		Unit	No:	Street	CPEng No:	157838
Building Address:			85	Poulson	Company:	GHD
Legal Description:					Company project number:	513090277
					Company phone number:	6433780900
		Degrees	Min	Sec		
GPS south:					Date of submission:	
GPS east:					Inspection Date:	
					Revision:	Final V2
Building Unique Identifier (CCC):	BE 1110 004 EQ2				Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	2	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	
Storeys below ground	0			
Foundation type:	other (describe)		if Foundation type is other, describe:	Ground beams
Building height (m):	7.30		height from ground to level of uppermost seismic mass (for IEP only) (m):	4.15
Floor footprint area (approx):	200			
Age of Building (years):	21		Date of design:	1976-1992
Strengthening present?	yes		If so, when (year)?	
			And what load level (%g)?	34%
Use (ground floor):	multi-unit residential		Brief strengthening description:	additional ply linings (in 2013)
Use (upper floors):				
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	3.5, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:			

Lateral load resisting structure

Lateral system along:	concrete shear wall	**Note: Define along and across in**	enter wall data in "IEP period calcs"	
Ductility assumed, μ:	3.00	**detailed report!**	worksheet for period calculation	
Period along:	0.24	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	concrete shear wall		enter wall data in "IEP period calcs"	
Ductility assumed, μ:	3.00		worksheet for period calculation	
Period across:	0.24	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:	brick or tile	describe (note cavity if exists)	
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:	green		
Along Damage ratio:	0%	Describe how damage ratio arrived at:	
Describe (summary):			
Across Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
Describe (summary):			
Diaphragms Damage?:	no	Describe:	
CSWs: Damage?:	no	Describe:	
Pounding: Damage?:	no	Describe:	
Non-structural: Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:		Describe:	
	Building Consent required:		Describe:	
	Interim occupancy recommendations:		Describe:	
Along	Assessed %NBS before e'quakes:	67% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
	Assessed %NBS after e'quakes:	67%		
Across	Assessed %NBS before e'quakes:	100% ##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	100%		

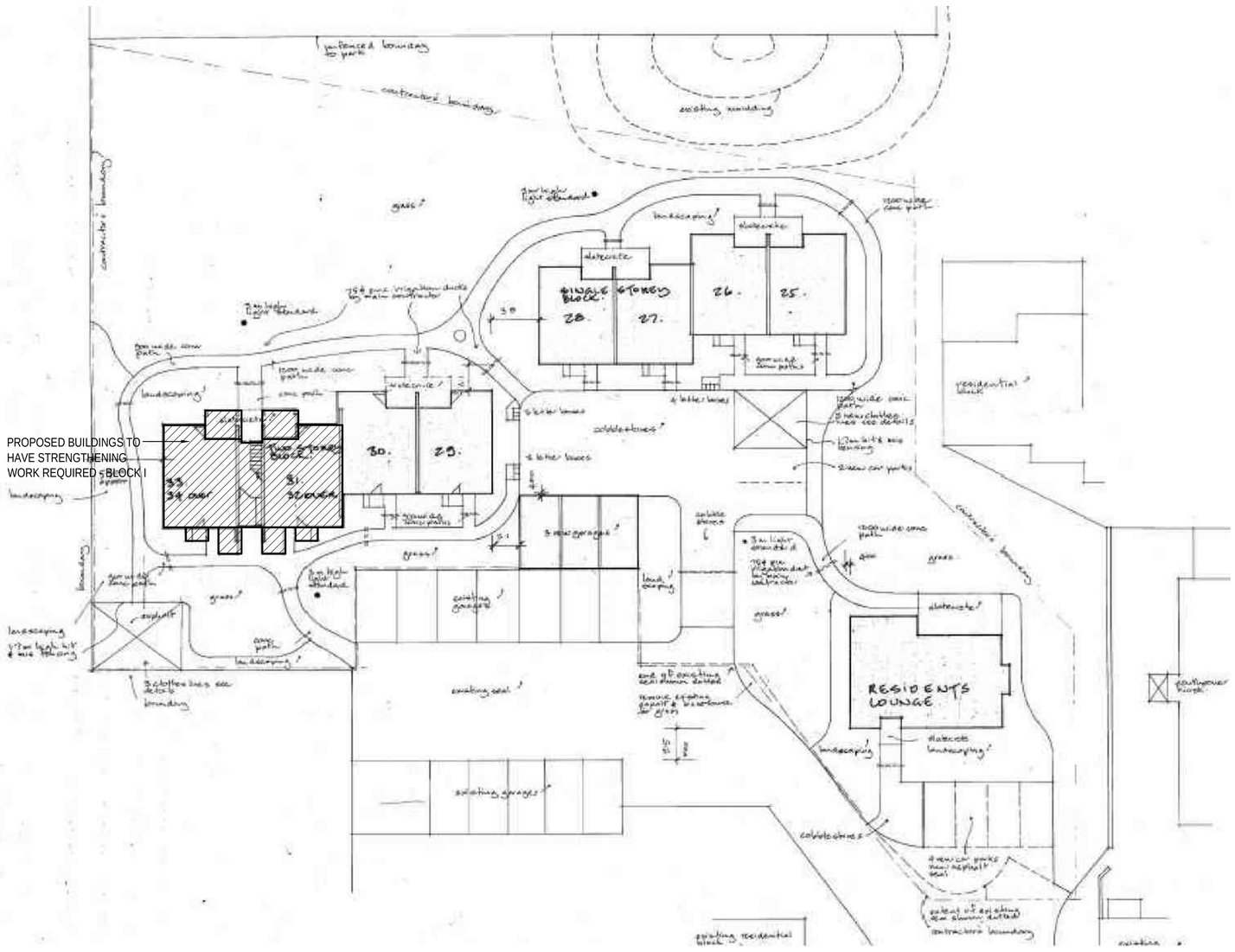
Appendix A5/D Strengthening Design

N



LOCATION PLAN

SCALE 1:200



SITE PLAN

SCALE 1:200

0 10 20 30 40 50mm

SCALE 1:1 AT ORIGINAL SIZE

FOR CONSENT

No	Revision	Drawn	Job Manager	Project Director	Date
A	FOR CONSENT	KM	HDM	NW	08/04/13

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Christchurch 8011, New Zealand
T 64 3 378 0900 **F** 64 3 377 8575
E chcmail@ghd.com **W** www.ghd.com

DO NOT SCALE

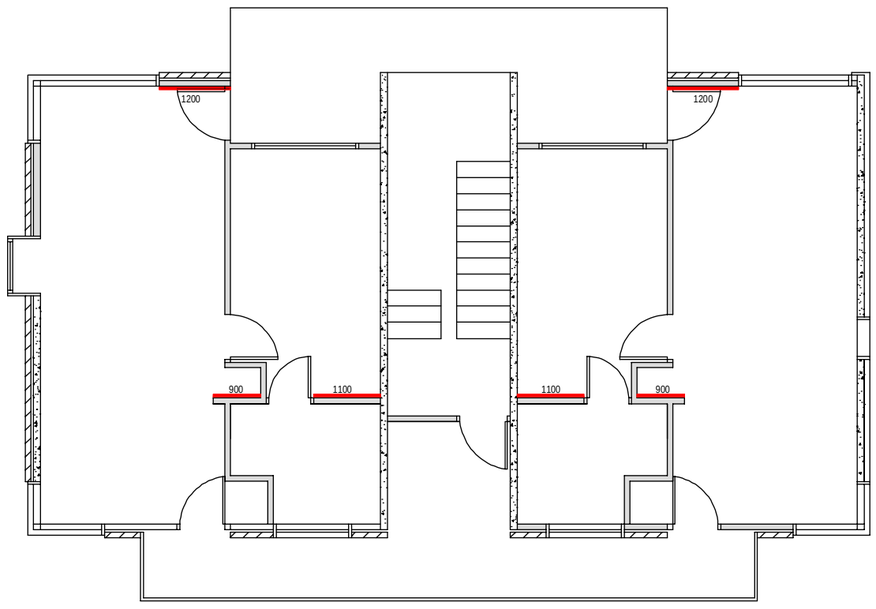
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Drawn	KM	Designer	CJ
Drafting Check	HDM	Design Check	JL
Approved (Project Director)	N WADDINGTON		
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client **CHRISTCHURCH CITY COUNCIL**
Project **HARMAN COURTS**
Title **SITE AND LOCATION PLAN**

Original Size **A1** Drawing No: **51_30902_77_S001** Rev: **A**

Plot Date: 9 April 2013 - 7:56 AM Plotted by: Kelly Millar Cad File No: G:\51\31526 - CCC\04 - Harman Courts\CAD\Drawings\51_30902_77_S001-S003.dwg



PROPOSED FIRST FLOOR PLAN STRENGTHENING

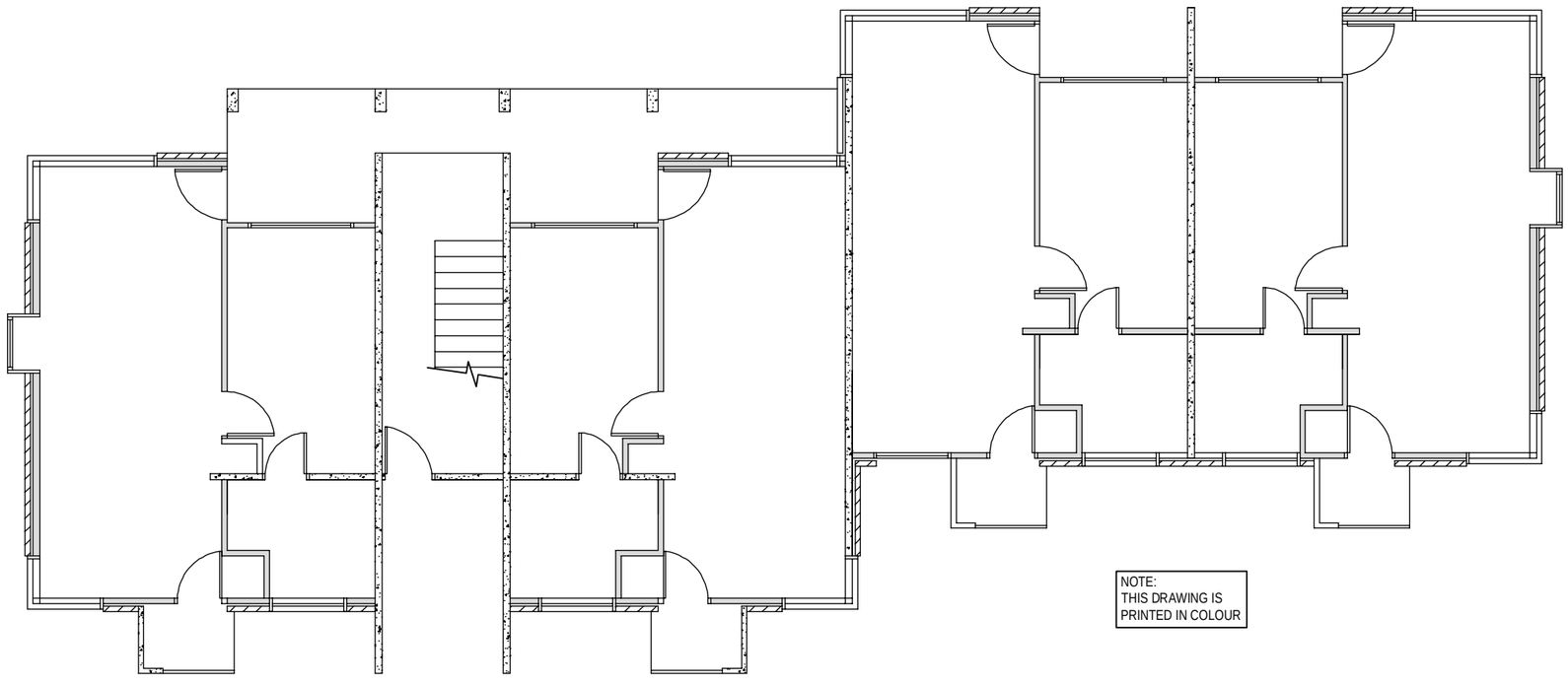
SCALE 1:50

GENERAL NOTES :

1. EP1 7mm ECOPLY.
2. ECOPLY TO BE PROVIDED TO ONE SIDE ONLY AS SHOWN IN PLAN VIEW.
3. GIB HANDIBRAC HOLD DOWN CONNECTIONS TO BOTTOM OF BRACING ELEMENT.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

LEGEND :

- MASONRY CLADDING
- PRECAST CONCRETE PANEL
- TIMBER FRAMED WALL
- OPENINGS
- ECOPLY STRENGTHENING



NOTE:
THIS DRAWING IS PRINTED IN COLOUR

0 10 20 30 40 50mm

SCALE 1:1 AT ORIGINAL SIZE

EXISTING GROUND FLOOR PLAN

SCALE 1:50

FOR CONSENT

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	FOR CONSENT		KM	HDM	NW	08/04/13

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Drafting Check	HDM	Design Check	JL
Approved (Project Director)	N WADDINGTON		
Date			
Scale	1:50, 1:10	This Drawing must not be used for Construction unless signed as Approved	

Client **CHRISTCHURCH CITY COUNCIL**
Project **HARMAN COURTS**
Title **GROUND AND FIRST FLOOR STRENGTHENING PLAN AND DETAILS**

Original Size **A1**
Drawing No: 51_30902_77_S002 **Rev: A**

Plot Date: 9 April 2013 - 9:27 AM Plotted by: Cormac Joy Cad File No: N:\NZ\Christchurch\Projects\51\31526 - CCC\04 - Harman Courts\CAD\Drawings\51_30902_77_S001-S003.dwg

GIB EzyBrace® Systems

GIB Bottom Plate Fixing

JUNE 2011

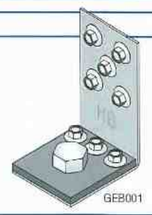
Bottom plate fixings for GIB® Bracing Elements			
Brace type	**Concrete slabs**		**Timber floors**
	External wall	**Internal wall**	**External and Internal walls**
GS1-N	As per NZS 3604:2011. No specific additional fastening required	As per NZS 3604:2011. Alternatively use 75 x 3.8mm shot-fired fasteners with 16mm washers, 150mm and 300mm from each end of the bracing element and at 600mm thereafter.	Pairs of 100 x 3.75mm flat head hand driven nails or 3 / 90 x 3.15mm power driven nails at 600mm centres in accordance with NZS 3604:2011
GS2-N	Not applicable		
GSP-H BL1-H BLP-H	Intermediate fastenings to comply with NZS 3604:2011. In addition: GIB Handibrac® fixings or metal wrap-around strap fixings and bolt as illustrated on pages 19 and 20.		Pairs of 100 x 3.75mm flat head hand driven nails or 3 / 90 x 3.15mm power driven nails at 600mm centres in accordance with NZS 3604:2011. In addition: GIB Handibrac® fixings or metal wrap-around strap fixings and bolt as illustrated below.
BLG-H	Not applicable	As for GSP-N, BL1-H, BLP-H on concrete slab above	

GIB Panel Hold-down Details

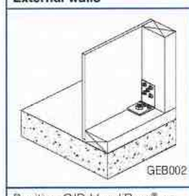
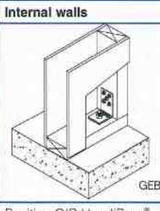
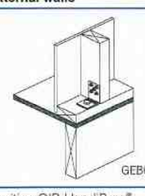
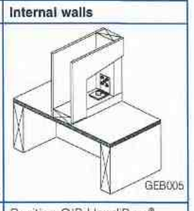
GIB HandiBrac® – RECOMMENDED METHOD

Developed in conjunction with MiTek™ NZ, the GIB HandiBrac® has been designed and tested for use as a hold-down in GIB® BL and GSP bracing elements.

- The GIB HandiBrac® registered design provides for quick and easy installation
- The GIB HandiBrac® provides a flush surface for the wall linings because it is fitted inside the framing. There is no need to check in the framing as recommended with conventional straps
- The GIB HandiBrac® is suitable for both new and retrofit construction
- The design also allows for installation and inspection at any stage prior to fitting internal linings



GEB001

Concrete Floor		Timber Floor	
External walls	**Internal walls**	**External walls**	**Internal walls**
 GEB002	 GEB003	 GEB004	 GEB005
Position GIB HandiBrac® as close as practicable to the internal edge of the bottom plate	Position GIB HandiBrac® at the stud / plate junction	Position GIB HandiBrac® in the centre of the perimeter joist or bearer	Position GIB HandiBrac® in the centre of floor joist or full depth solid block
Hold-down fastener requirements			
A mechanical fastening with a minimum characteristic uplift capacity of 15kN.		12x150mm galvanised coach screw	

Refer to gib.co.nz/cad for CAD details.

Construction

Ecoply® Bracing Specification – EP1

April 2009

Single sided structural plywood brace

Specification No.	Minimum Wall Length	Lining Requirements	BUs/m Wind	BUs/m Earthquake
EP1	0.6 m	7mm Ecoply® or 12mm Shadowclad® one side	130	130

Framing

Wall framing must comply with:

- NZBC B1 - Structure: AS1 Clause 3 Timber (NZS3604)
- NZBC B2 - Durability: AS1 Clause 3.2 Timber (NZS3602)

Framing dimensions and height are as determined by the NZS3604 stud and top plate tables for load bearing and non load bearing walls. Kiln dried verified structural grade timber must be used. Machine stress graded timber, such as Laserframe®, is recommended.

Bottom Plate Fixing

Use GIB Handibrac® hold-down connections at each end of the bracing element. Refer to installation instructions supplied with the connectors for correct installation instructions and bolt types to be used for either concrete or timber floors. Within the length of the bracing element, bottom plates are fixed in accordance with the requirements of NZS 3604:1999.

Lining

One layer 7mm Ecoply structural ply wood or 12mm Shadowclad exterior wall cladding fixed directly to framing or over cavity battens. If part sheets are used, ensure nailing at required centres is carried out around the perimeter of each sheet or part sheet. A 2-3mm expansion gap should be left between sheets.

Fastening the Ecoply®

Fasteners

Fasten with 50 x 2.8 mm galvanised or stainless steel flat head nails for direct fix or 60 x 2.8mm over cavity battens. Place fasteners no less than 7 mm from sheet edges.

Where fasteners are in contact with CCA treated timber or plywood, or the bracing panel forms part of an exterior envelope, fasteners must be stainless steel. Stainless steel fasters must be annular grooved.

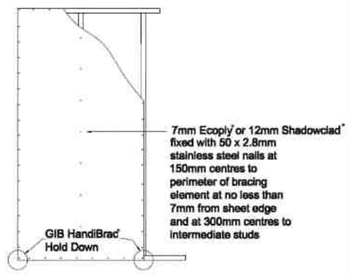
Fastening Centres

Fasteners are placed at 150 mm centres around the perimeter of each sheet and 300 mm centres to intermediate studs.

Fastening to Cavity Battens

The brace element may be fixed over cavity battens.

The cavity battens must be a minimum of 40 x 20mm nailed staggered formation at 150mm centres to studs around the perimeter of the brace element, and nailed to the intermediate studs within the element at 300mm centres, with 50mm x 2.8mm flat head galvanised or annular grooved stainless steel nails.



Ecoply® Bracing Systems are designed to meet the requirements of the NZBC and have been tested and analysed using the P21 method referenced in NZS3604:1999 listed as an acceptable solution B1/AS1 Structure. Testing was carried out using Ecoply, Shadowclad and Laserframe MSG8 timber framing manufactured by Carter Holt Harvey Limited trading as Carter Holt Harvey Woodproducts New Zealand, and GIB® products manufactured by Winstone Wallboards Ltd. **Substituting materials may compromise performance of the system**. GIB® and GIB HandiBrac® are registered trade marks of Fletcher Building Holdings Ltd.

0800 746 399
www.chhwoodproducts.co.nz
www.ecoply.co.nz

SPECIFICATION

0 10 20 30 40 50mm
SCALE 1:1 AT ORIGINAL SIZE

FOR CONSENT

No	Revision	Drawn	Job Manager	Project Director	Date
A	FOR CONSENT	KM	HDM	NW	08/04/13

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Drawn	KM	Designer	CJ
Drafting Check	HDM	Design Check	JL
Approved (Project Director)	N WADDINGTON		
Date			
Scale	N.T.S	This Drawing must not be used for Construction unless signed as Approved	

Client CHRISTCHURCH CITY COUNCIL
Project HARMAN COURTS
Title STRENGTHENING STRUCTURAL NOTES

Original Size A1 Drawing No: 51_30902_77_S003 Rev: A

Plot Date: 9 April 2013 - 7:57 AM Plotted by: Kelly Millar Cad File No: G:\51\31526 - CCC\04 - Harman Courts\CAD\Drawings\51_30902_77_S001-S003.dwg

Specific Report A6
BE 1110 003 EQ2 Residents' Lounge

February 2013

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Photograph 8 Splitting of timber post at the verandah north entrance

Appendices

Appendix A6/A Photographs
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1. Building Description

1.1 General

The following information describes the Lounge building at Harman Courts

- The Lounge building is situated south west of Block H and north west of Block Q. See Figure 1 for the building location plan.
- The lounge structure comprises timber framed walls supporting timber roof trusses.
- The roof has a pitch of 45 degrees and is made up of lightweight corrugated metal sheeting on 100 x 50 purlins over timber trusses.
- The walls utilise timber framed wall construction. The timber walls incorporate two 22 x 22 x 1.2 galvanised mild steel (gms.) braces on each elevation except the south elevation which includes three such braces. The timber wall linings are plasterboard internally. The floor is 100mm thick cast-in-situ concrete slab on grade.
- The external timber framed walls have concrete block veneer cladding and are supported by perimeter beam/strip footings.
- A water supply tank is located in the roof space at the east side of the structure. The tank capacity is 450 litres.
- The dimensions of the building are approximately 12.2 m in width, 8.8 m long and 5.9 m in height to roof ridge.

Figure 2 shows the floor plan layout of the whole structure. Complete information mentioned above is provided in Appendix A6/B.



Figure 1 Plan/Aerial View of Harman Courts

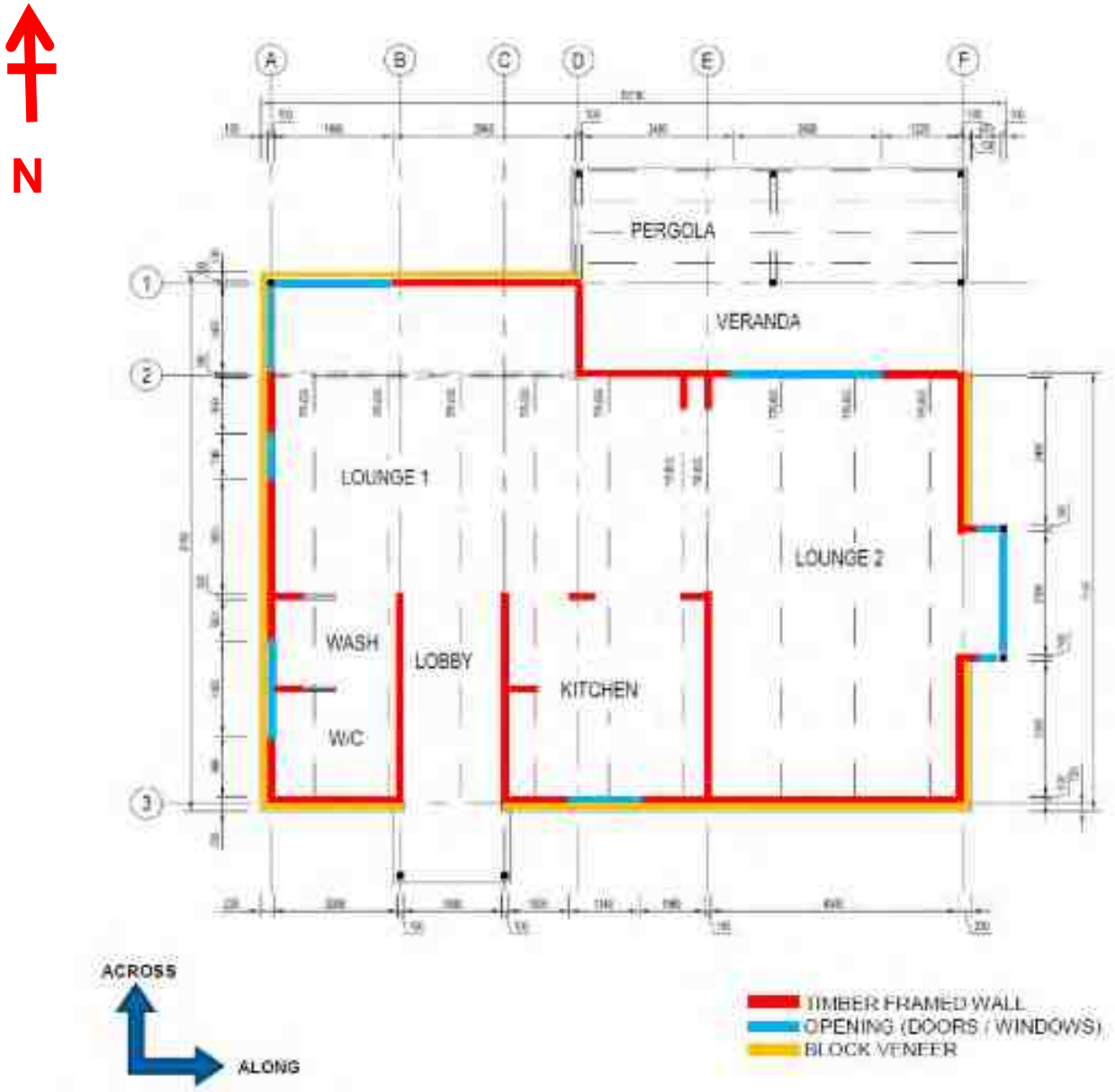


Figure 2 Lounge Plan Sketch Showing Key Structural Elements

1.2 Gravity Load Resisting System

Roof gravity loads are transferred through the lightweight metal sheeting to the timber purlins and then to the timber truss rafters. The loads are then transferred to the supporting timber framed walls which in-turn transmit the loads to the beam/strip footings.

1.3 Lateral Load Resisting System

The timber framed walls resist the lateral loads in both the 'Across' and 'Along' directions. The diaphragm action of the roofing system transmits the roof lateral loads to the timber framed walls which then transfer the lateral loads down to the foundations.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Roof spaces were inspected where access was gained. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Floor Plan, Section A and Elevations	Sheet A11 of 22	January 1991
2	Section D and Elevations	Sheet A12 of 22	January 1991
3	Details	Sheet A13 of 22	January 1991
4	Section B and Section C	Sheet A14 of 22	January 1991

Available drawings is attached in Appendix A6/B

2.4 Analysis and Modelling

A seismic assessment was carried out based on non-specific design in accordance with NZS3604:2011. However it is noted that the 450L water tank is outside the code limitations. This is addressed in the calculations.

3. Damage Assessment

3.1 General Observations

It was observed that the columns supporting the verandah had split (Photograph 8). It is not known whether this is related to the recent earthquakes.

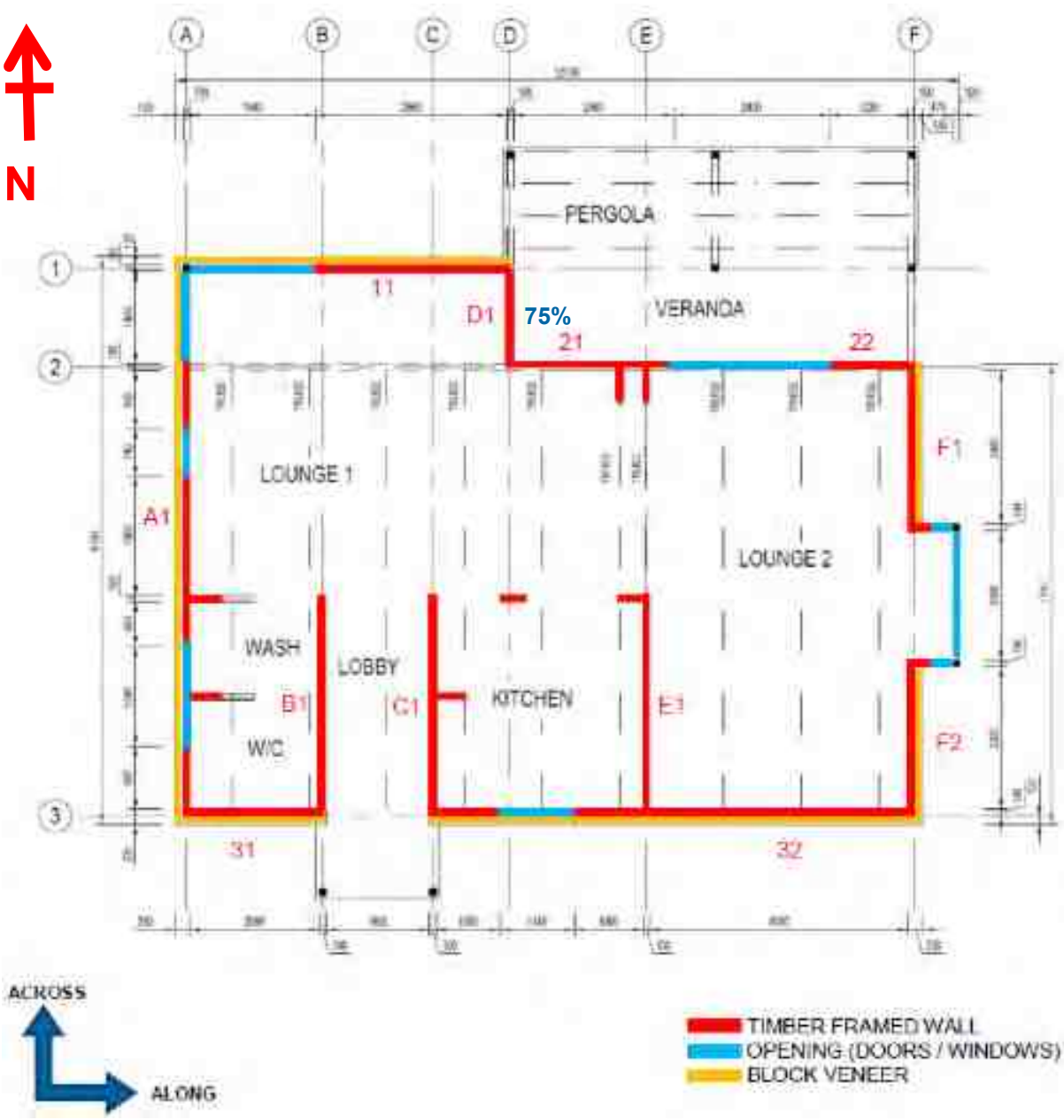
4. Results of Analysis

The following are the results of the structural analysis of the Residents' Lounge Building.

4.1 Timber Framed Walls

Across

The timber framed walls in the 'Across' direction were found to be overall rated above 100% NBS. However, the timber bracing panel line D in the 'Across' direction was found to be rated at 75% NBS in the analysis. In view of the overall NBS rating, the particular result for bracing panel line D is not considered to be significant.



Along

The timber framed walls in the 'Along' direction were found to be rated overall at 83% NBS.

4.2 Roof Diaphragm Load Transfer Connection

The roof diaphragm connections were found to be rated more than 100% NBS.

5. Conclusion and Recommendation

The building overall has been assessed as having a seismic capacity of 83% NBS and is therefore not an ‘Earthquake Risk’.

GHD recommend repairing or replacing the timber columns located at the veranda north entrance that have split.

No further assessment or strengthening is required to comply with CCC policy.

Appendices

Appendix A6/A Photographs



Photograph 1 Pergola and verandah at north facing elevation



Photograph 2 West elevation



Photograph 3 East elevation



Photograph 4 Front entrance at south facing elevation



Photograph 5 Water tank in the roof space



Photograph 6 Timber framed walls with plasterboards lining



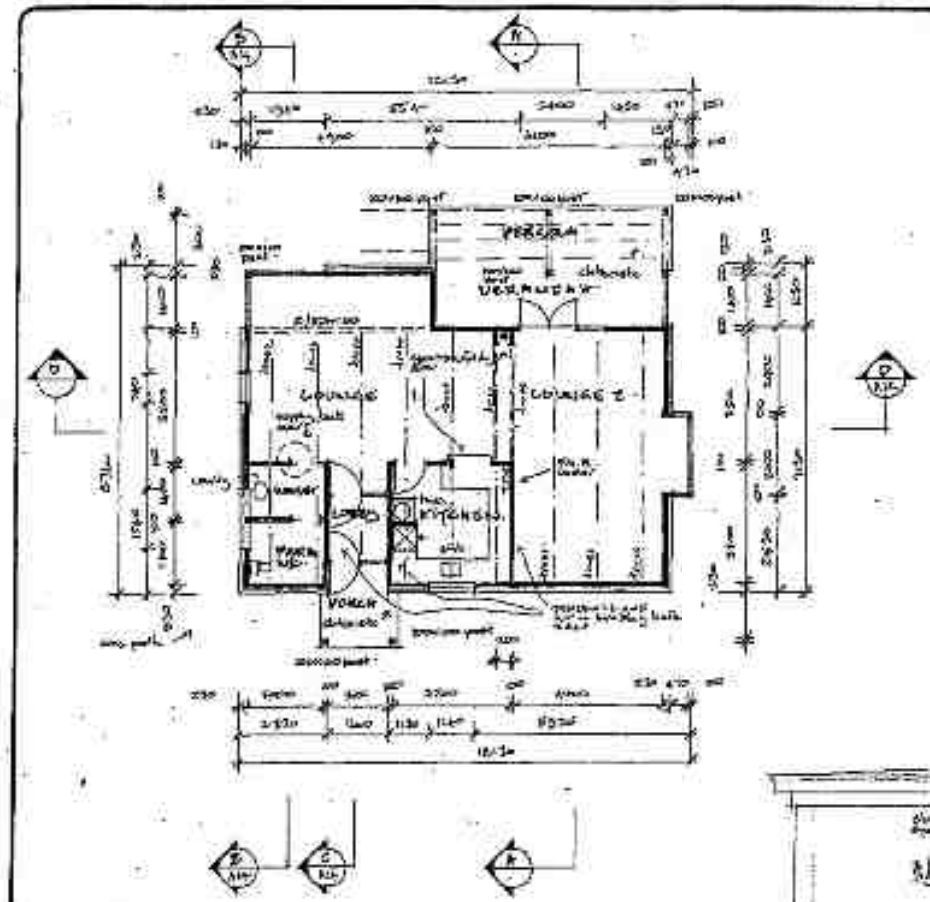
Photograph 7 Timber trusses with plywood boards lining



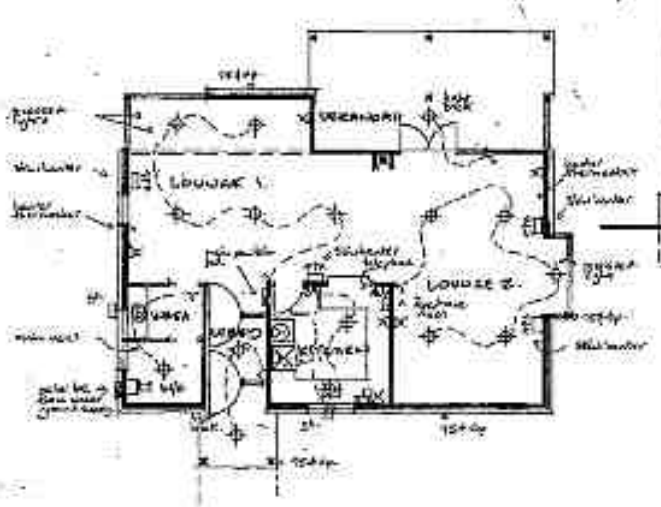
Photograph 8 Splitting of timber post at the verandah north entrance

Appendix A6/B Available Drawings

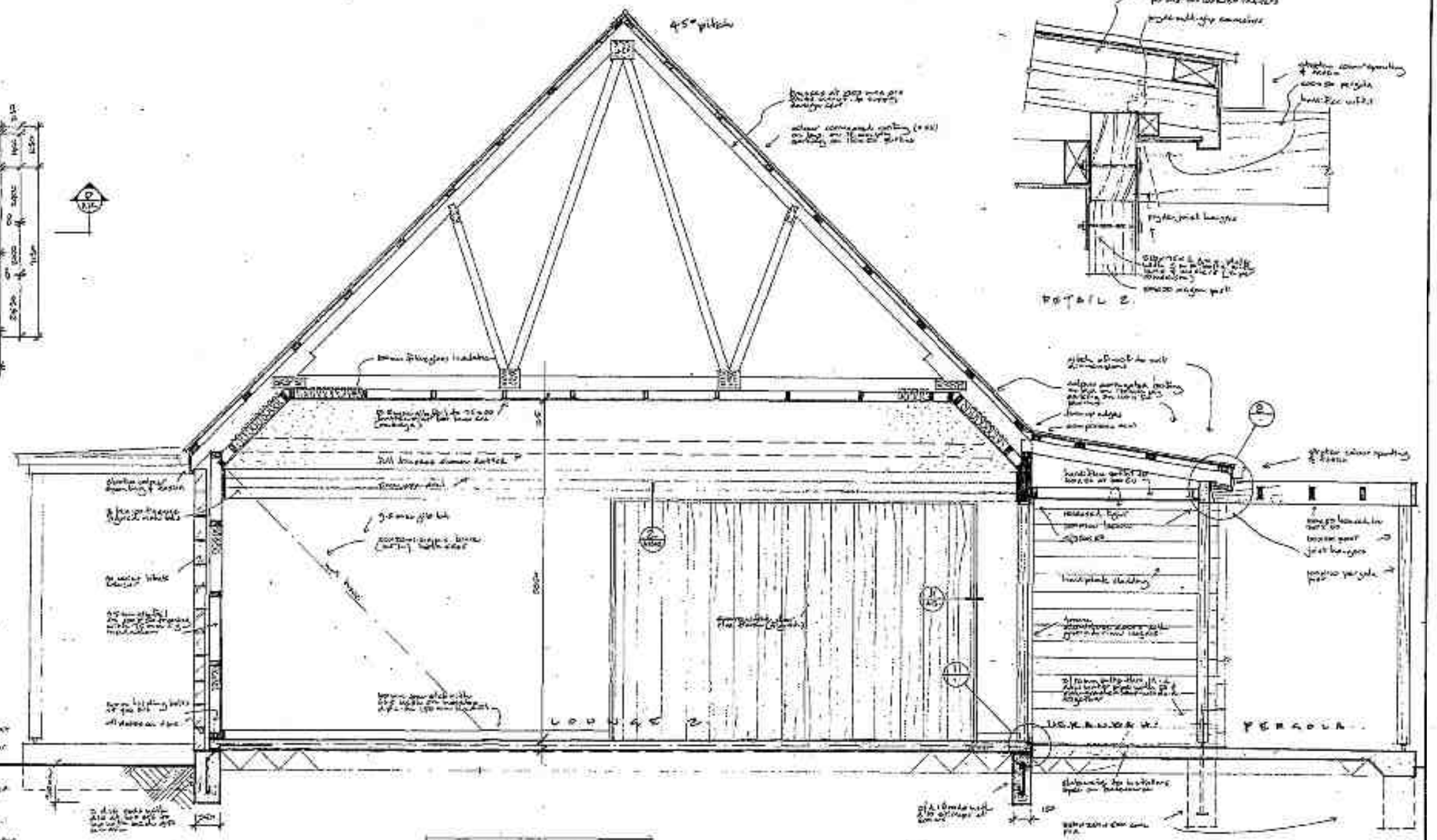
CONTRACTOR SHALL VERIFY DIMENSIONS BEFORE STARTING WORK



FLOOR PLAN 1:100

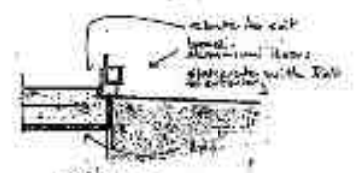


SERVICES PLAN 1:200

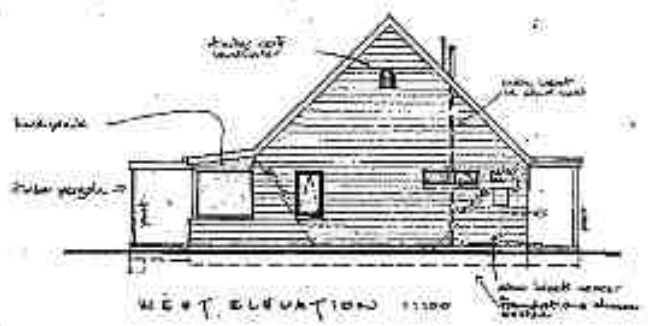


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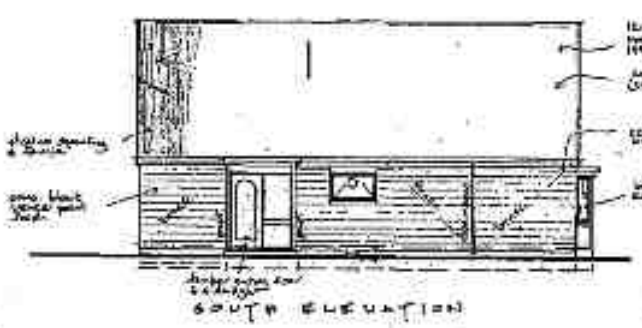
DETAIL 2



DETAIL 1



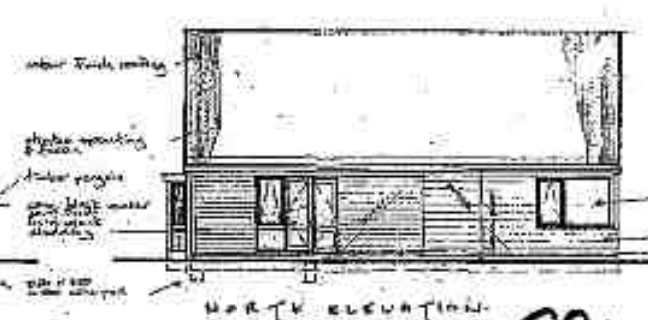
WEST ELEVATION 1:100



SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION

CHRISTCHURCH CITY COUNCIL
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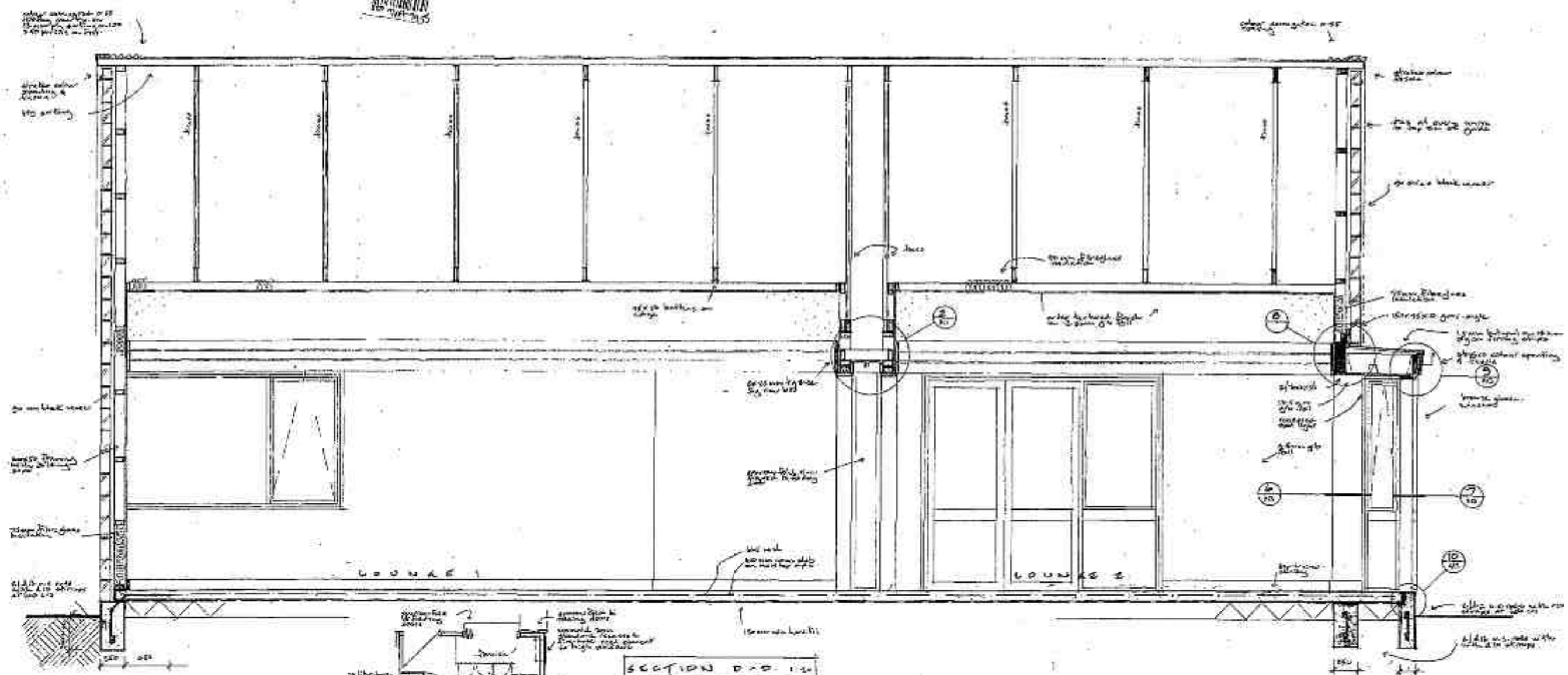
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DATE 7.1.91 | DRAWN BJS | FILE NO | OF 2 SHEETS
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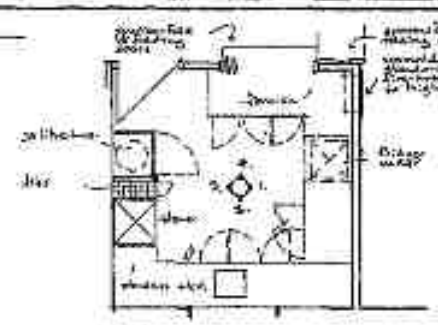
CHRISTCHURCH CITY COUNCIL
3 0 APR 1991
To Planner

S91-2185
3/11

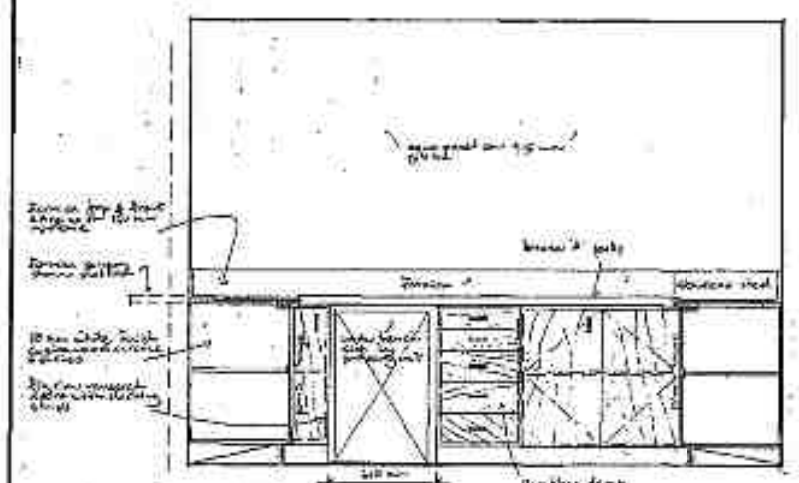
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



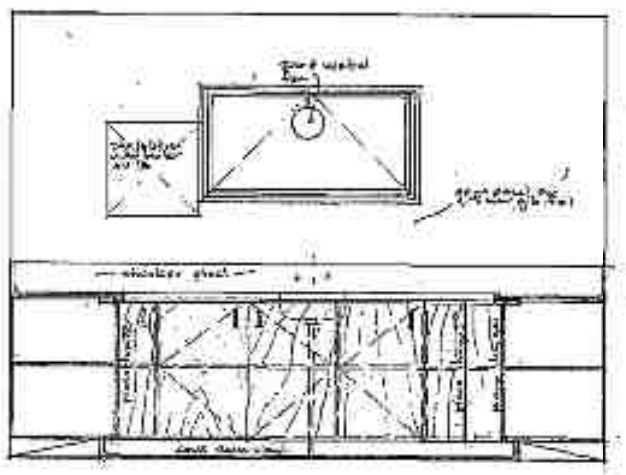
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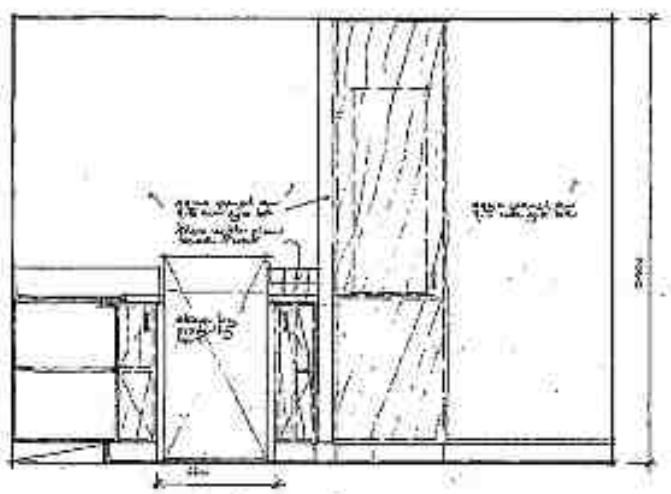
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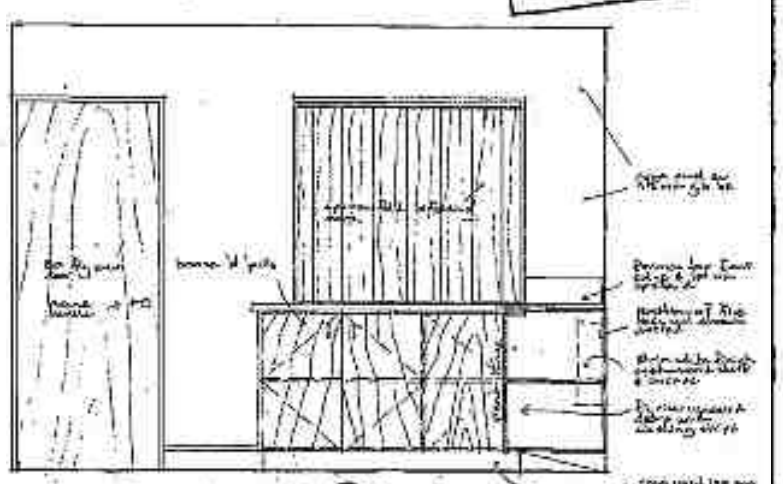
ELEVATION 1



ELEVATION 2



ELEVATION 3



ELEVATION 4

CHRISTCHURCH CITY COUNCIL
30 APR 1991

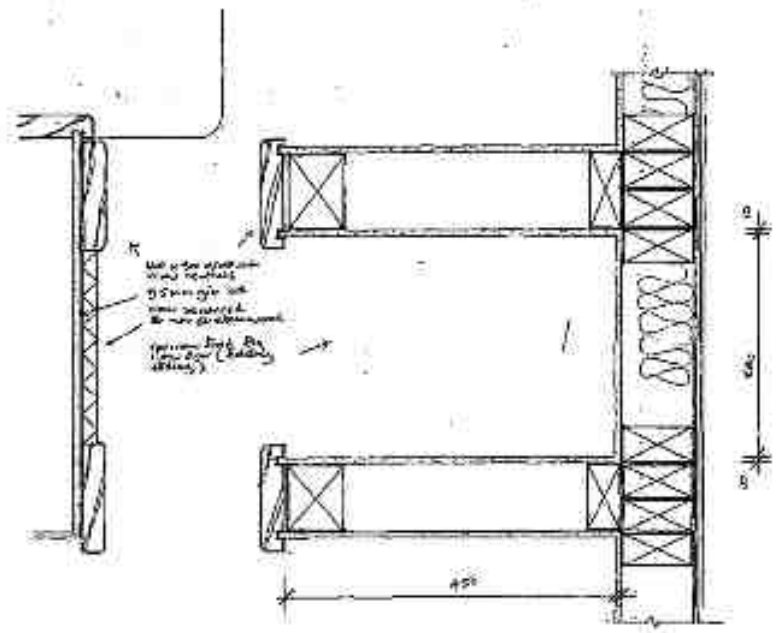
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CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

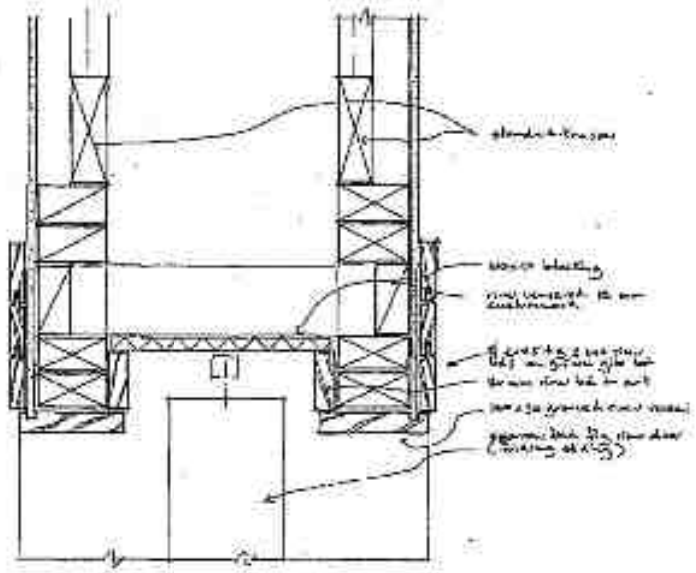
PARKMAN COURTS EXTENSION 1991. new residents lounge for property unit.

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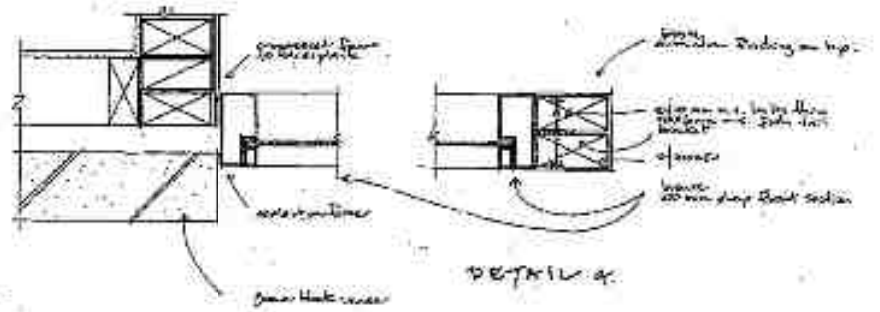
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



DETAIL 1.

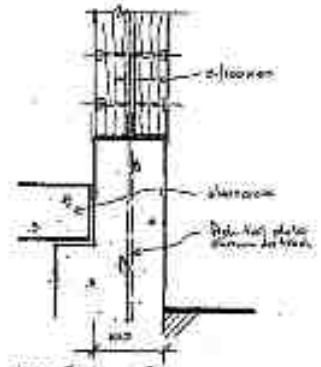


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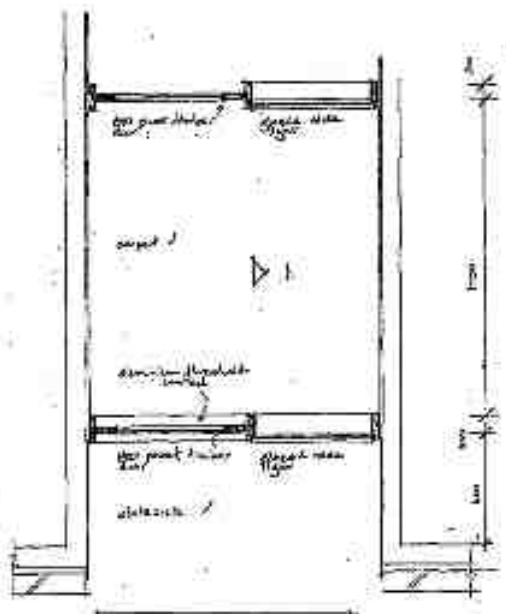


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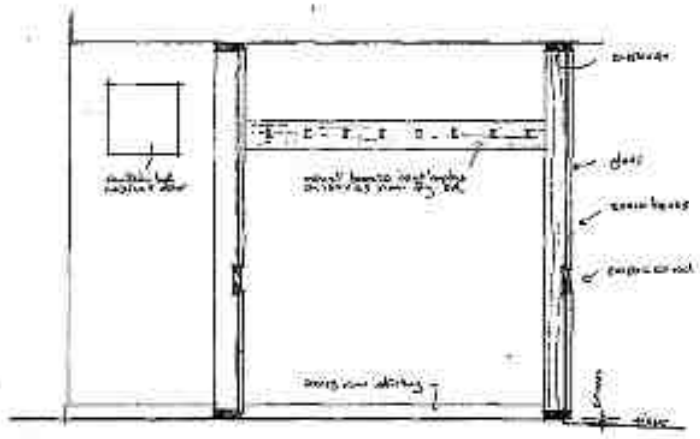
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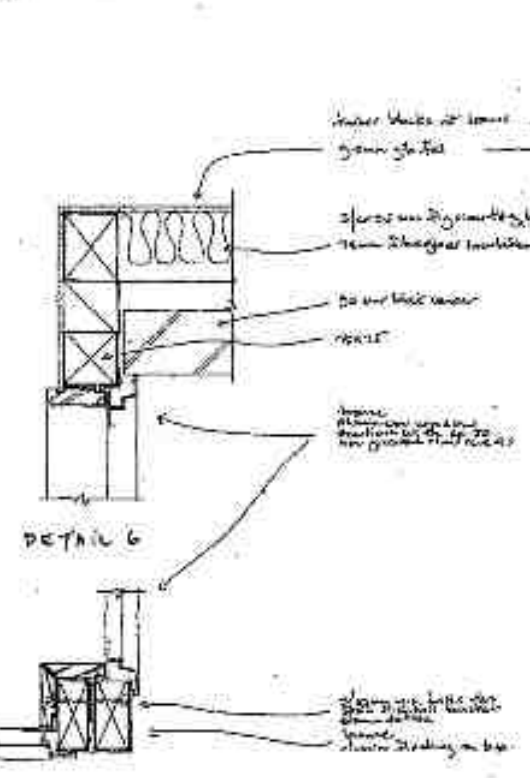
DETAIL 5



ENTRY PORCH PLAN

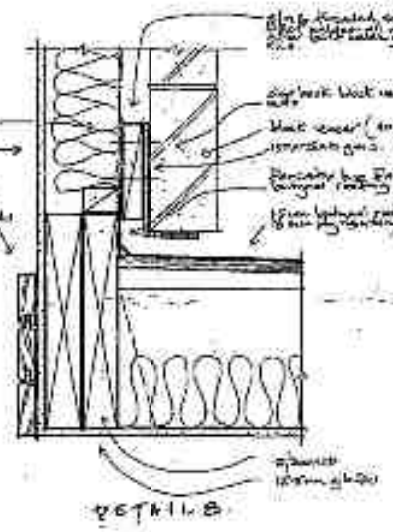


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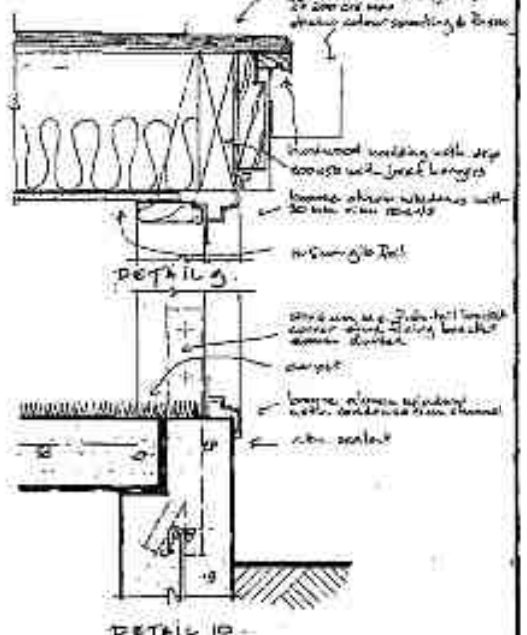


DETAIL 6

DETAIL 7

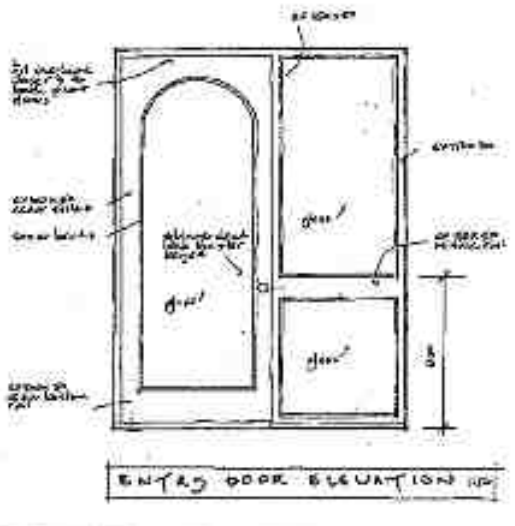


DETAIL 8



DETAIL 9.

DETAIL 10.



ENTRY DOOR ELEVATION

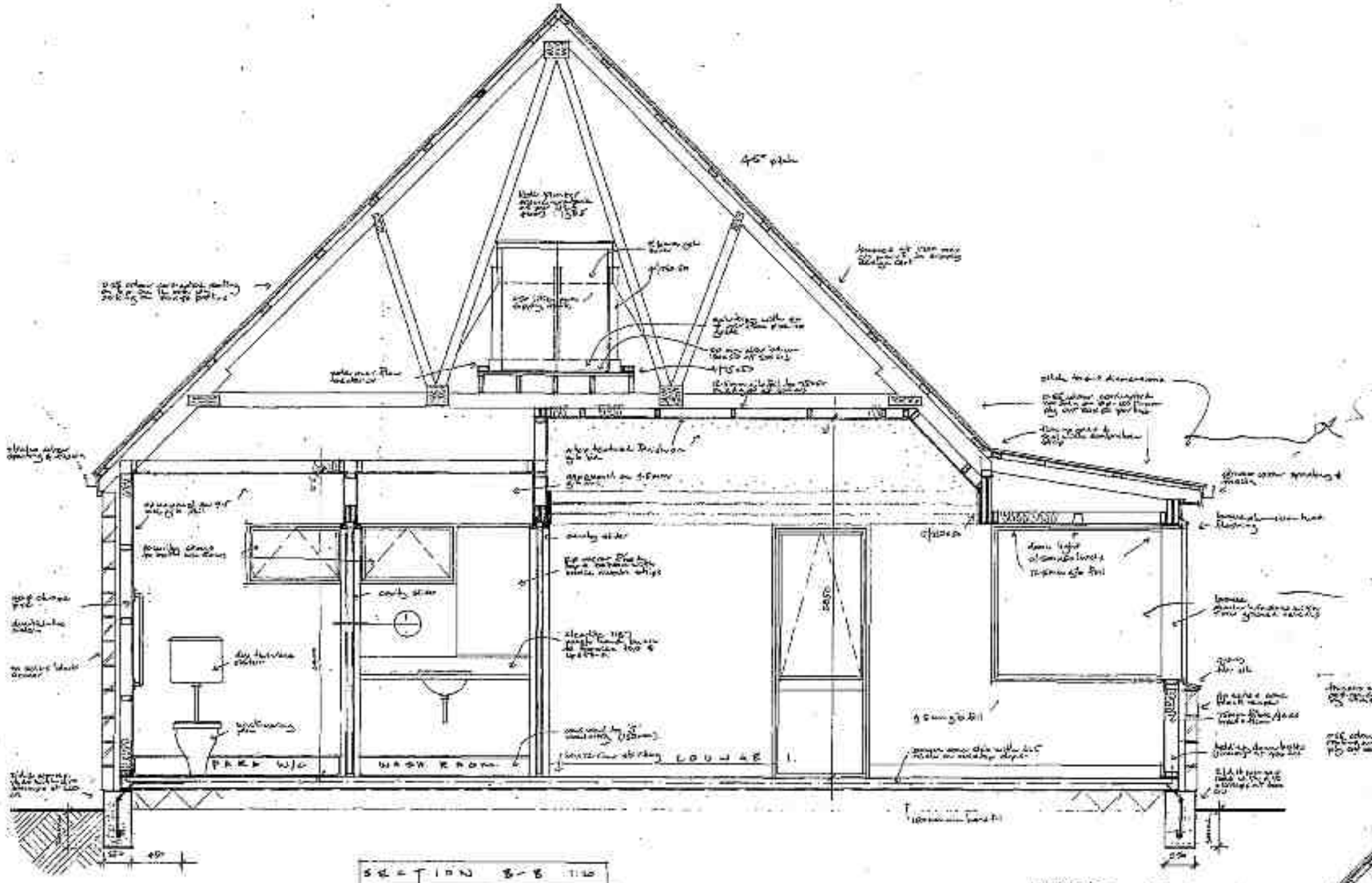
CHRISTCHURCH CITY COUNCIL
30 APR 1991

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION · CITY WORKS & PLANNING DEPARTMENT

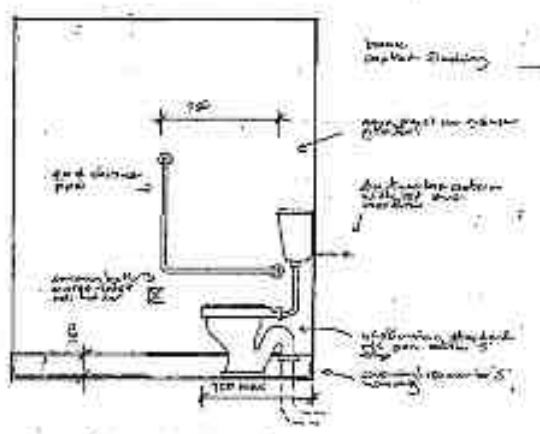
HERMAN COURTS EXTENSION 1991. new residents lounge for property unit

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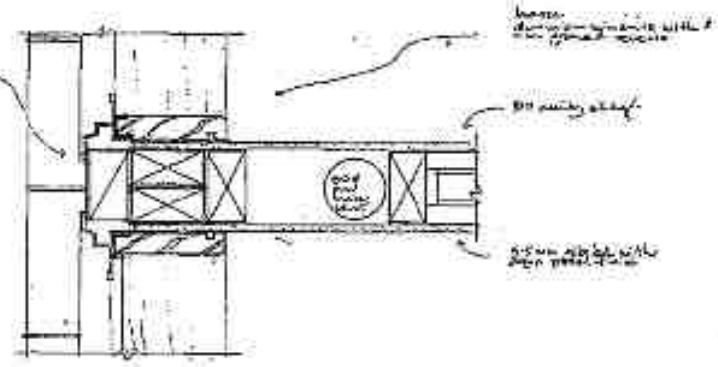
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



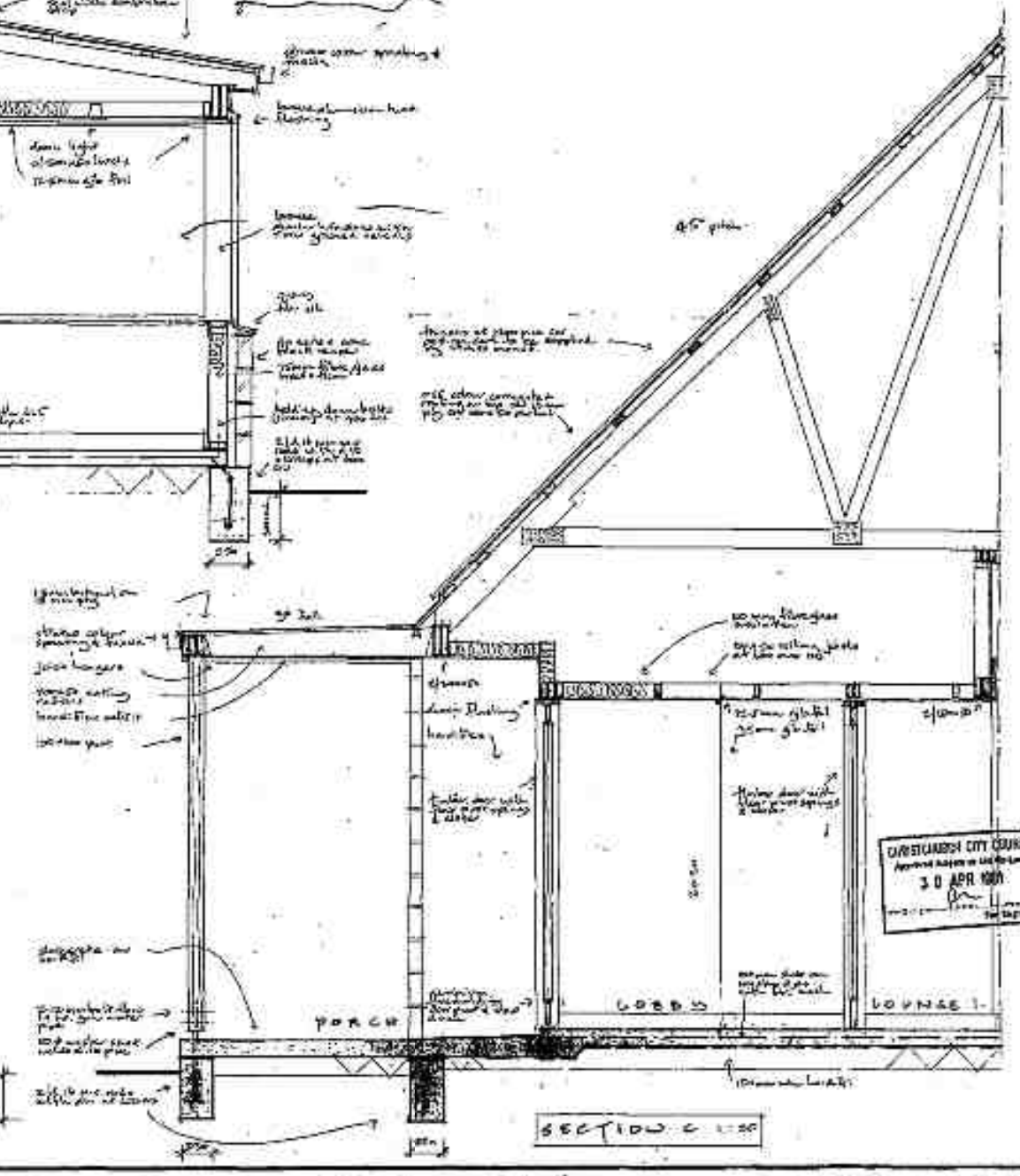
SECTION B-B 1:50



W.C. ELEVATION 1:25



DETAIL 1



SECTION C 1:50

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CITY ARCHITECTS DIVISION / CITY WORKS & PLANNING DEPARTMENT

BERMAN COURTS EXTENSION 1991. new recreation lounge for existing unit

SCALE 1:50 @ A1 / 1:100 @ A3 | DESIGN | DRAWN RHS | TRACED | JOB NO 9151 | FILE NO | DATE 8.91 | SHEET NUMBER | OF 1 SHEETS | 14

Appendix A6/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Lounge				Reviewer:	Stephen Lee
	Unit	No:	Street		CPEng No:	1006840
Building Address:		85	Poulson		Company:	GHD
Legal Description:					Company project number:	513090277
					Company phone number:	6433780900
	Degrees	Min	Sec			
GPS south:					Date of submission:	
GPS east:					Inspection Date:	
					Revision:	Final
Building Unique Identifier (CCC):	BE 1110 003 EQ2				Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):		
Ground floor split?	no		Ground floor elevation above ground (m):		
Storeys below ground	0				
Foundation type:	other (describe)		if Foundation type is other, describe:	Ground beams	
Building height (m):	5.90		height from ground to level of uppermost seismic mass (for IEP only) (m):	4.15	
Floor footprint area (approx):	95				
Age of Building (years):	21		Date of design:	1976-1992	
Strengthening present?	no		If so, when (year)?		
			And what load level (%g)?		
Use (ground floor):	multi-unit residential		Brief strengthening description:		
Use (upper floors):					
Use notes (if required):					
Importance level (to NZS1170.5):	IL2				

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	3.5, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:			

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls	**Note: Define along and across in detailed report!**		
Ductility assumed, μ:	3.00		note typical wall length (m)	
Period along:	0.24	0.00	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			
Ductility assumed, μ:	3.00		note total length of wall at ground (m):	
Period across:	0.24	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:	brick or tile	describe (note cavity if exists)	
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:	green			
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:			Describe:	
	Building Consent required:			Describe:	
	Interim occupancy recommendations:			Describe:	
Along	Assessed %NBS before e'quakes:	83%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
	Assessed %NBS after e'quakes:	83%			
Across	Assessed %NBS before e'quakes:	100%	##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	100%			

Specific Report A7
BE 1110 011-015 EQ2 Blocks M, N, O, P and Q (Garages)

February 2013

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

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Appendix A7/A Photographs
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1. Building Description

1.1 General

Blocks M, N, O, P and Q are all single storey reinforced concrete masonry buildings that serve as garages for Harman Courts Residential Complex.

Block M is a five (5) unit garage building with base dimensions of approximately 5.60 m x 16.20 m for the width and length respectively and a building height of 2.70 m. The garage building was constructed in 1977. The building has a flat roof composed of lightweight metal roof cladding on 50 mm x 200 mm timber joists spanning across the width of the unit. The garage walls are 190 mm thick reinforced concrete masonry. The timber roof joists are supported by a 50 mm x 75 mm timber bearer bolted to a 190 mm thick reinforced concrete masonry block beam at the top of the reinforced masonry block wall. The garage walls are supported by a 180 mm wide x 450 mm deep reinforced concrete foundation beams.

Blocks N, O and P are of similar construction to Block M except for the number of garage units and some member sizes as stated below;

- Block N consists of four (4) garage units with an overall base dimension of approximately 5.6 m x 13.0 m for its width and length respectively.
- Block O consists of three (3) garage units with a base dimension of approximately 5.6 m x 9.8 m for its width and length respectively.
- Block P consists of a seven (7) garage units with a base dimension of approximately 5.6 m x 22.6 m for its width and length respectively.

The above three (3) blocks (N, O and P) were constructed in 1978. The flat metal clad roof is supported on 50 mm x 150 mm timber joists running across the units. The walls of these units are 140 mm thick. The timber roof joists are supported by a 50 mm x 75 mm timber bearer bolted to a 140 mm thick reinforced concrete masonry block beam at the top of the reinforced concrete masonry block wall. The garage walls are supported by a 130 mm wide x 450 mm deep reinforced concrete foundation beams.

Block Q is an extended garage of what was an existing five (5) unit garage building. An additional single garage unit was added to the west end of the original garage block and a three (3) unit garage was also added at the rear. The overall building width is approximately 11.4 m by 16.2 m for its length. The extended garages were constructed in 1991. The roof of the single garage extension is flat and matches the original garage block.

The roof of the three (3) unit garage at the rear of the original block is pitched. It is 4.3 m high and is composed of lightweight metal roof cladding on timber purlins supported by timber trusses and 190 mm thick reinforced concrete masonry block walls. The timber trusses are spaced at 800 mm centres. The walls of the garage extension are supported by a 190 mm wide x 600 mm deep reinforced concrete foundation beams.

100 mm thick concrete slabs on ‘hard fill’ serve as the flooring construction for the garages. An overhead type galvanized steel door is used to access the garage units.

See Figure 1 for the location of the garages.



Figure 1 Plan/Aerial View of Harman Courts

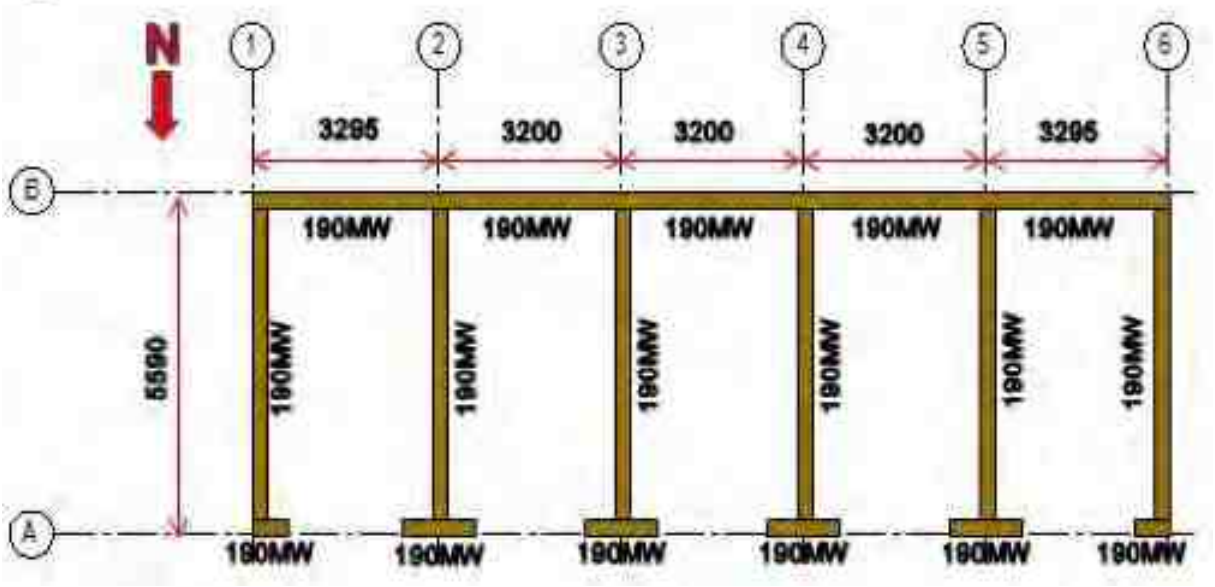


Figure 2 Masonry Block Wall Layout (Block M)

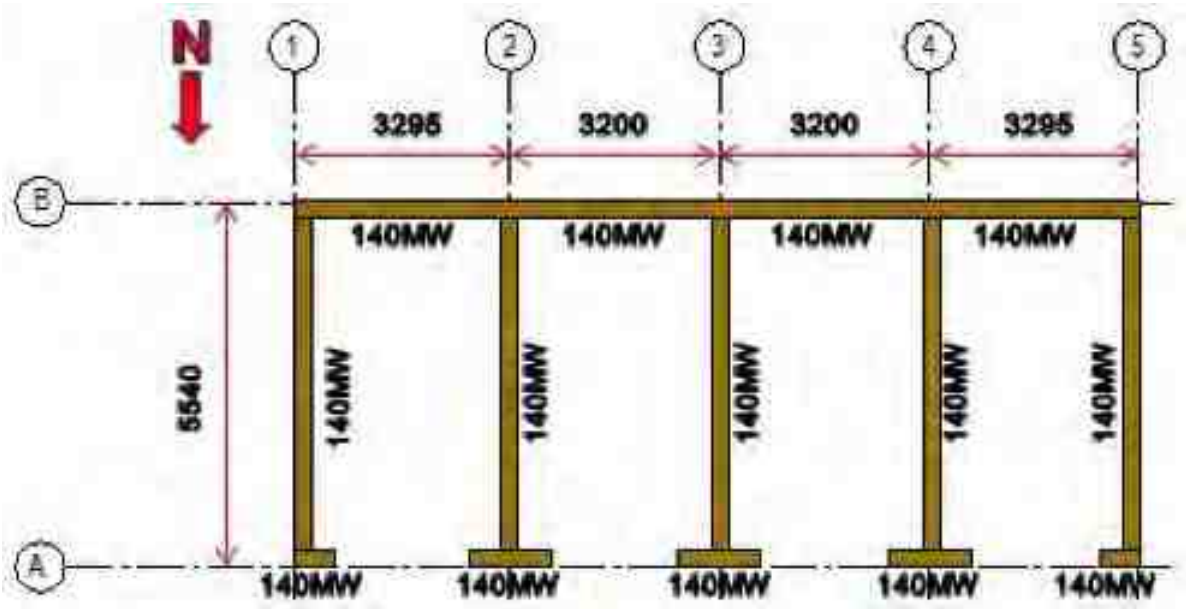


Figure 3 Masonry Block Wall Layout (Block N)

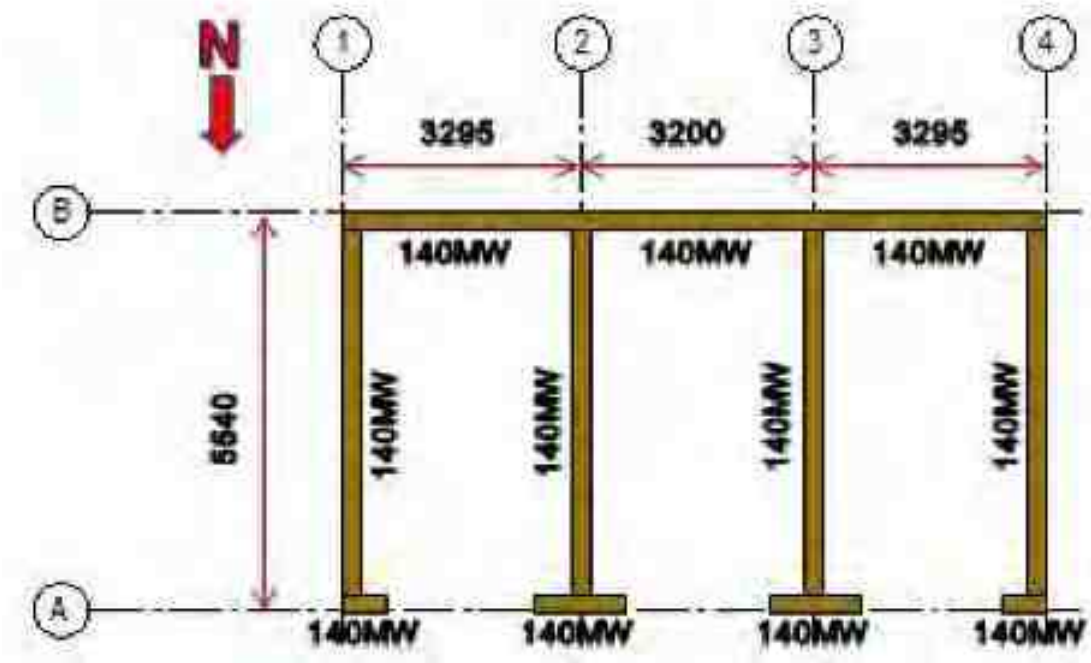


Figure 4 Masonry Block Wall Layout (Block O)

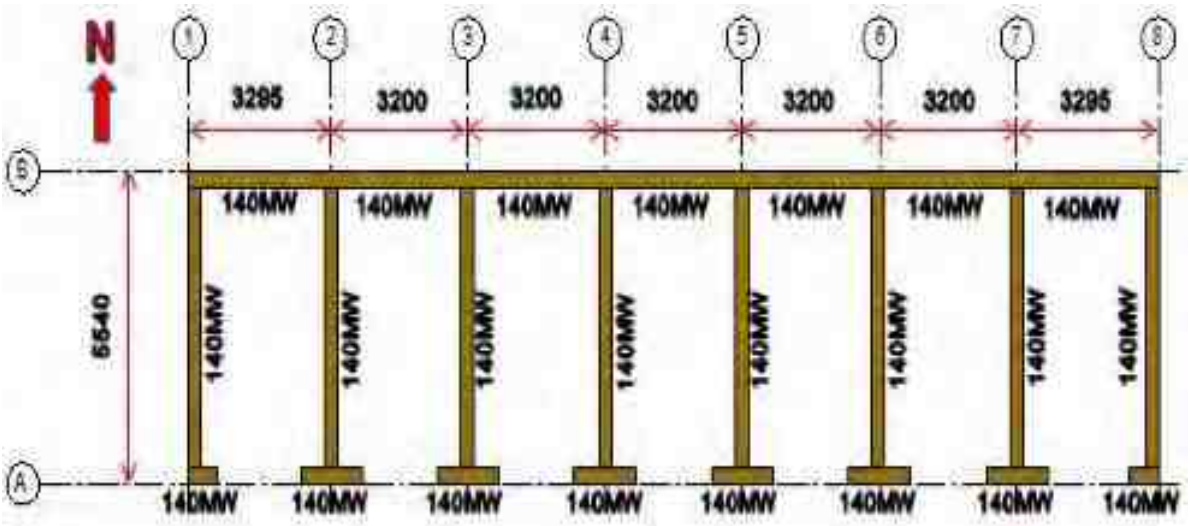


Figure 5 Masonry Block Wall Layout (Block P)

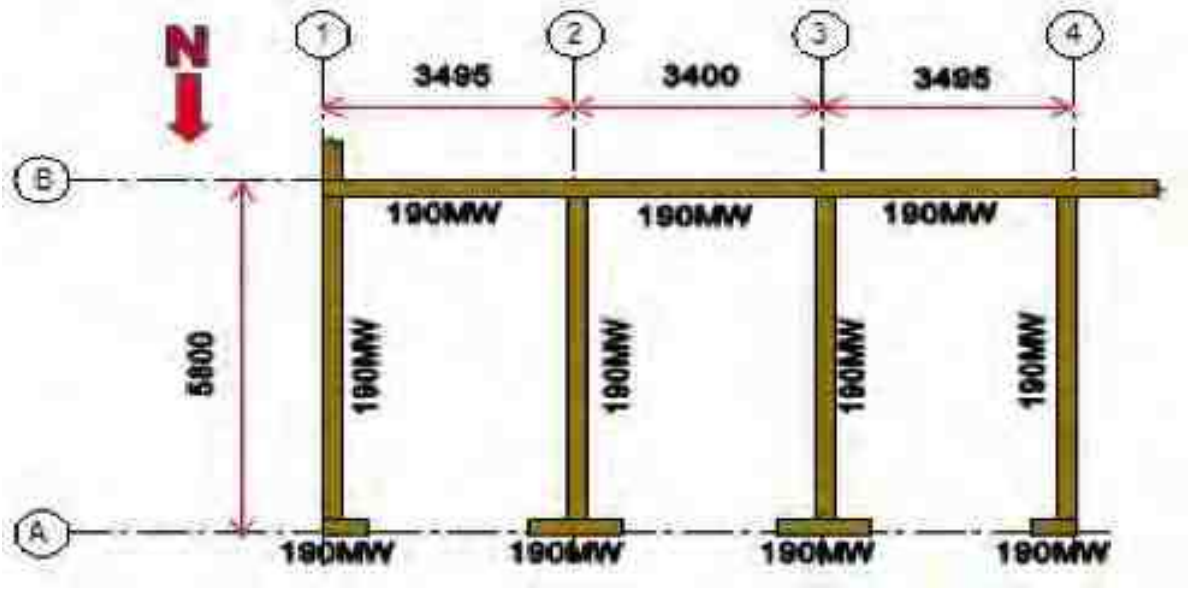


Figure 6 Masonry Block Wall Layout (Block Q)

1.2 Gravity Load Resisting System

1.2.1 Blocks M, N, O and P

Gravity loads on the garage structures are carried by the lightweight metal roofing on timber joists supported directly by the reinforced concrete masonry block walls. The masonry block walls then transfer the vertical load to the ground beam foundations.

1.2.2 Block Q

Gravity loads on the structures are carried by the lightweight metal roofing on timber purlins supported by timber truss rafters which in turn are supported by the reinforced masonry block walls. The masonry block walls then transfer the vertical load to the ground beam foundations.

1.3 Lateral Load Resisting System

1.3.1 Blocks M, N, O and P

The lateral loads acting on these garage structures in both directions, are resisted by the reinforced concrete masonry block walls. The lightweight metal roof serves as a diaphragm which transfers the lateral loads to the masonry block walls and then to the foundations.

1.3.2 Block Q

The timber truss rafters and metal decking serve as a stiff diaphragm and transfer the lateral loads to the reinforced concrete masonry walls which in turn transmit the lateral loads to the foundations.

2. Assessment Methodology

2.1 Inspection

An inspection of the building was undertaken on the 1st of November 2012. 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.

2.2 Investigation and Opening Up Works

Both the interior and exterior of the buildings were inspected. Surveying of the roof space from the access panel was limited due to the location of the panel. The level of the foundations in the subfloor prevented visual inspections of these elements.

The construction plans were made available for the building inspections. Construction plans were confirmed as accurate and correct by close comparison to the buildings on-site. Reinforcement in structural elements was consistently found to match that specified in the construction plans provided.

A Hilti PS 200 Ferroscan was used to confirm the position, depth and diameter of the reinforcement in structural elements. This scanning equipment using electro-magnetic fields allowed for the determination of the capacity of the various elements in the building.

2.3 Available Drawings

Available existing drawings were provided to GHD and these are itemised in the table below.

Table 1 Available Drawings

Item	Title	Sheet No.	Drawing Date
1	Typical Plan of Garages and Sections	Sheet 17 of 18	April 1976
2	Block M Site Plan	Sheet 18 of 18	October 1976
3	Locality Plan	Sheet 1 of 20	November 1977
4	Typical Plan of Garages and Sections	Sheet 18 of 20	November 1977
5	Site Plan and Typical Garage Plan	Sheet S1 of 4	November 1977
6	Site Plan	Sheet A1 of 22	January 1991
7	Elevation and Garage Plan	Sheet A2 of 22	January 1991
8	Typical Cross and Longitudinal Section thru New Garages	Sheet A15 of 22	February 1991

Available drawings is attached in Appendix A7/B

2.4 Analysis and Modelling

A seismic assessment was carried out in accordance with NZS 4230:2004. A three-dimensional model was prepared for each garage block which was analysed using Etabs software.

3. Damage Assessment

3.1 Blocks N, O and P

No damage was identified in the Blocks N, O and P.

3.2 Block M

A full height vertical crack approximately 2 mm in width was noted in the east gable wall of Block M. This damage is not expected to affect structural performance.

3.3 Block Q

Minor cracking was noted in the concrete ground slab of Block Q, however it is unclear whether this is earthquake related.

4. Results of Analysis

The following are the results of the structural analysis of Blocks M, N, O, P and Q.

4.1 Reinforced Masonry Block Walls

In-Plane Bending

All walls are rated above 100% NBS for both directions ('Along' and 'Across').

Out-of-Plane Bending

All walls are rated above 100% NBS for both earthquake directions.

Plan Irregularity

It is noted that the structural layout of the garage blocks has plan irregularity (Refer NZS 1170.5 Cl 4.5.2.2). However, this effect is not considered significant, in view of the high NBS achieved by the reinforced concrete masonry walls. (Minimum NBS rating of walls is 300%)

5. Conclusion

Blocks M, N, O, P, and Q have been assessed and have a seismic rating above 100% NBS and are therefore classified as not an ‘Earthquake Risk’.

No further assessment or strengthening is required to comply with CCC policy.

Appendices

Appendix A7/A Photographs

Block M



Photograph 1 North East face of Block M Garage



Photograph 2 Typical Interior of Block M Garage



Photograph 3 Typical roof framing of Block M Garage

Block N, O, and P



Photograph 4 North West face of Block N Garage



Photograph 5 Northern face of Block O Garage



Photograph 6 South East face of Block P Garage



Photograph 7 Typical interior of Block N, O and P Garage

Block Q



Photograph 8 Northern face of Block Q Garage



Photograph 9 Close up of 1 door extension Garage



Photograph 10 North East face of Block Q Garage



Photograph 11 Western face of Block Q Garage

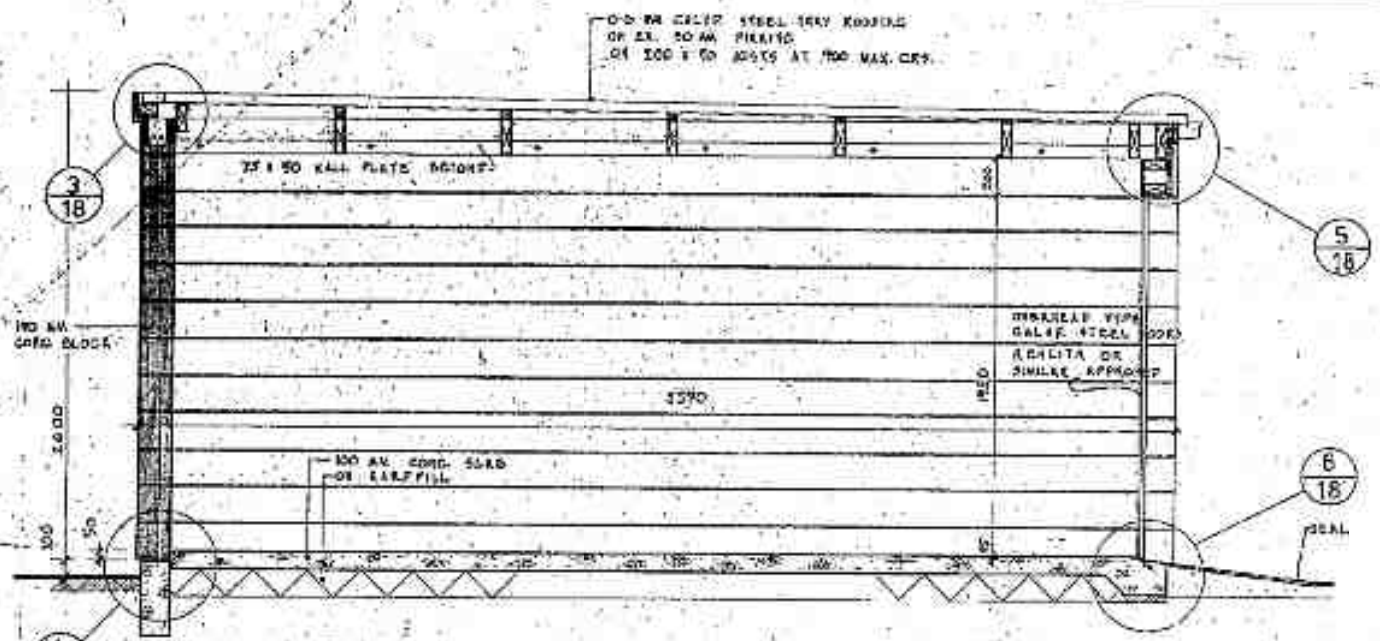


Photograph 12 Typical interior of Block Q Garage



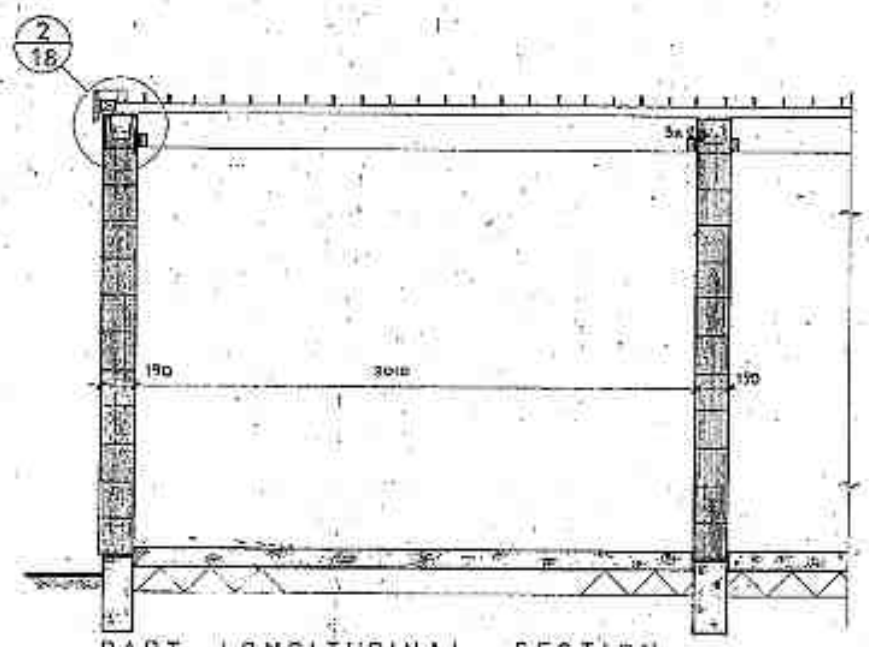
Photograph 13 Typical roof framing of Block Q Garage

Appendix A7/B Available Drawings

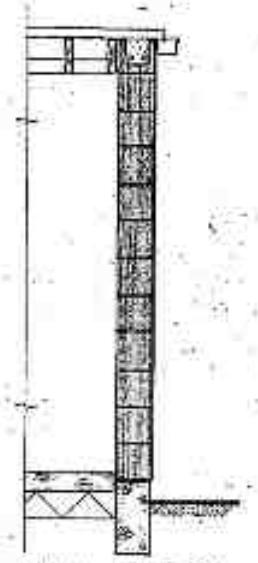


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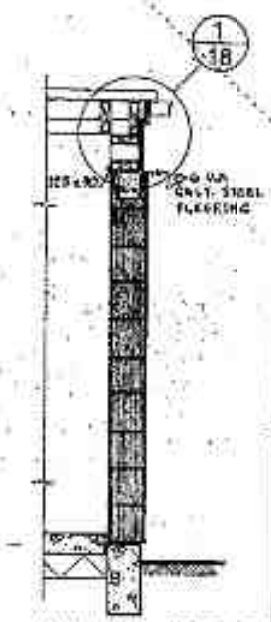
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PART LONGITUDINAL SECTION



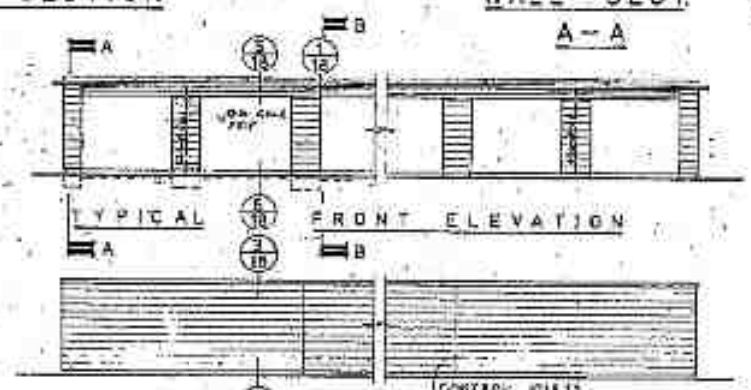
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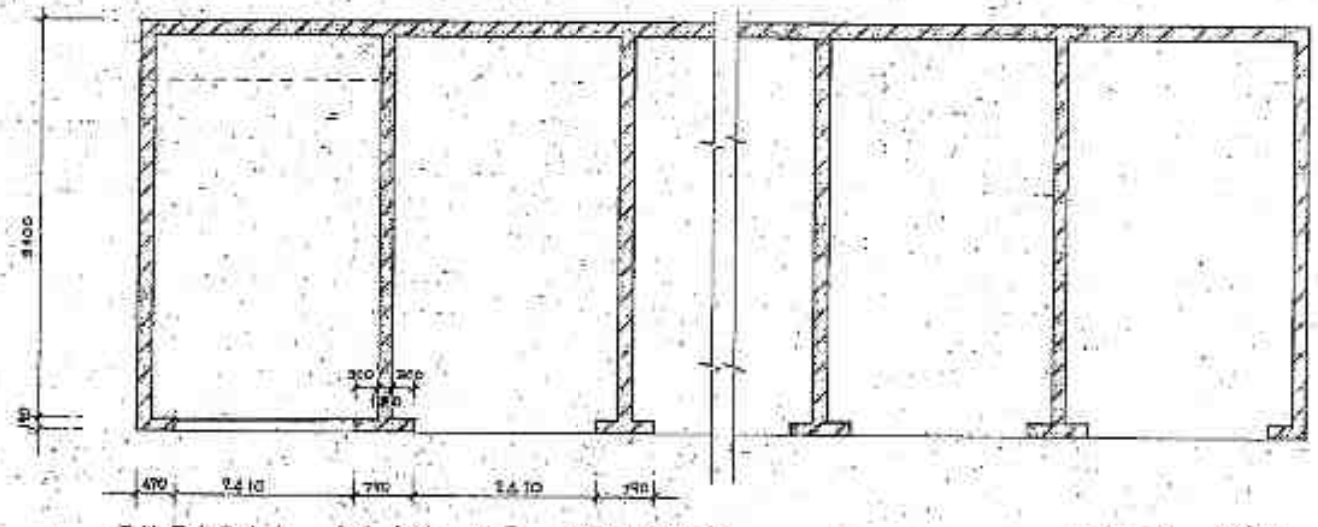


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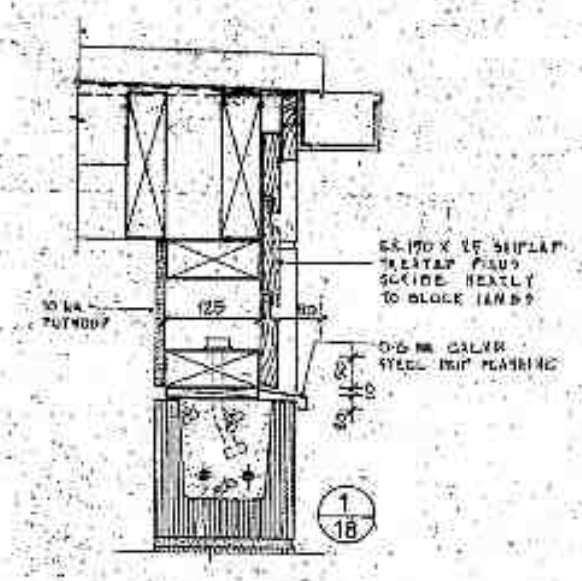
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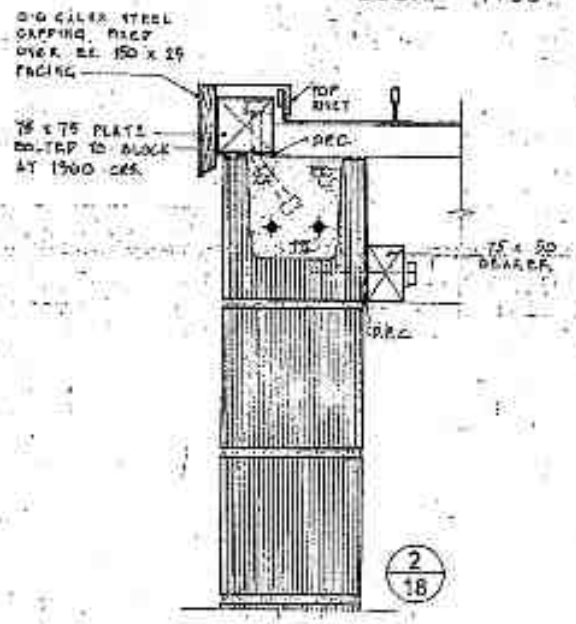




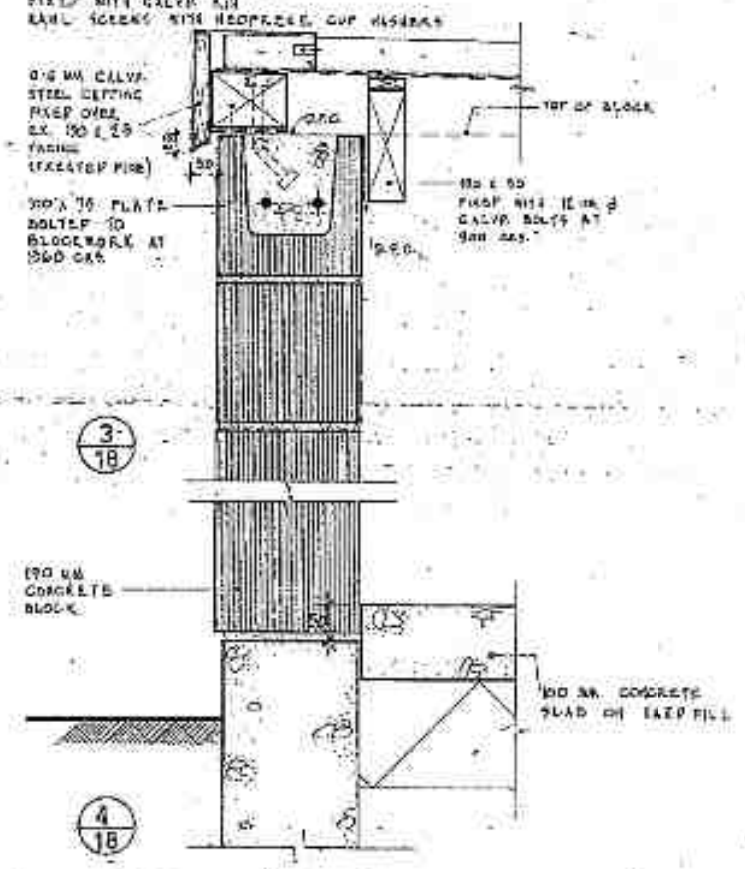
TYPICAL PLAN OF GARAGES

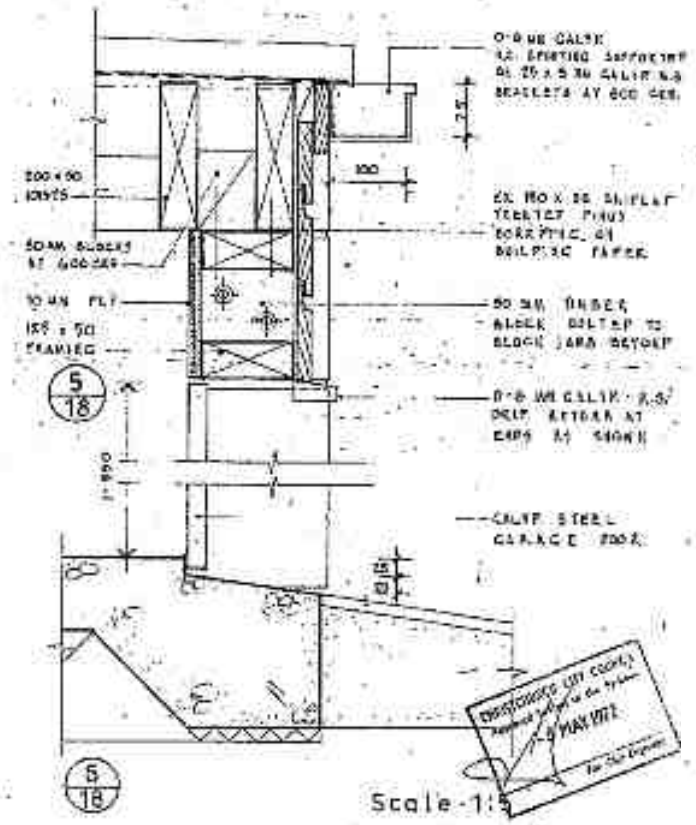
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DETAILS Scale - 1:5





GARAGES

CITY ARCHITECT'S DIVISION

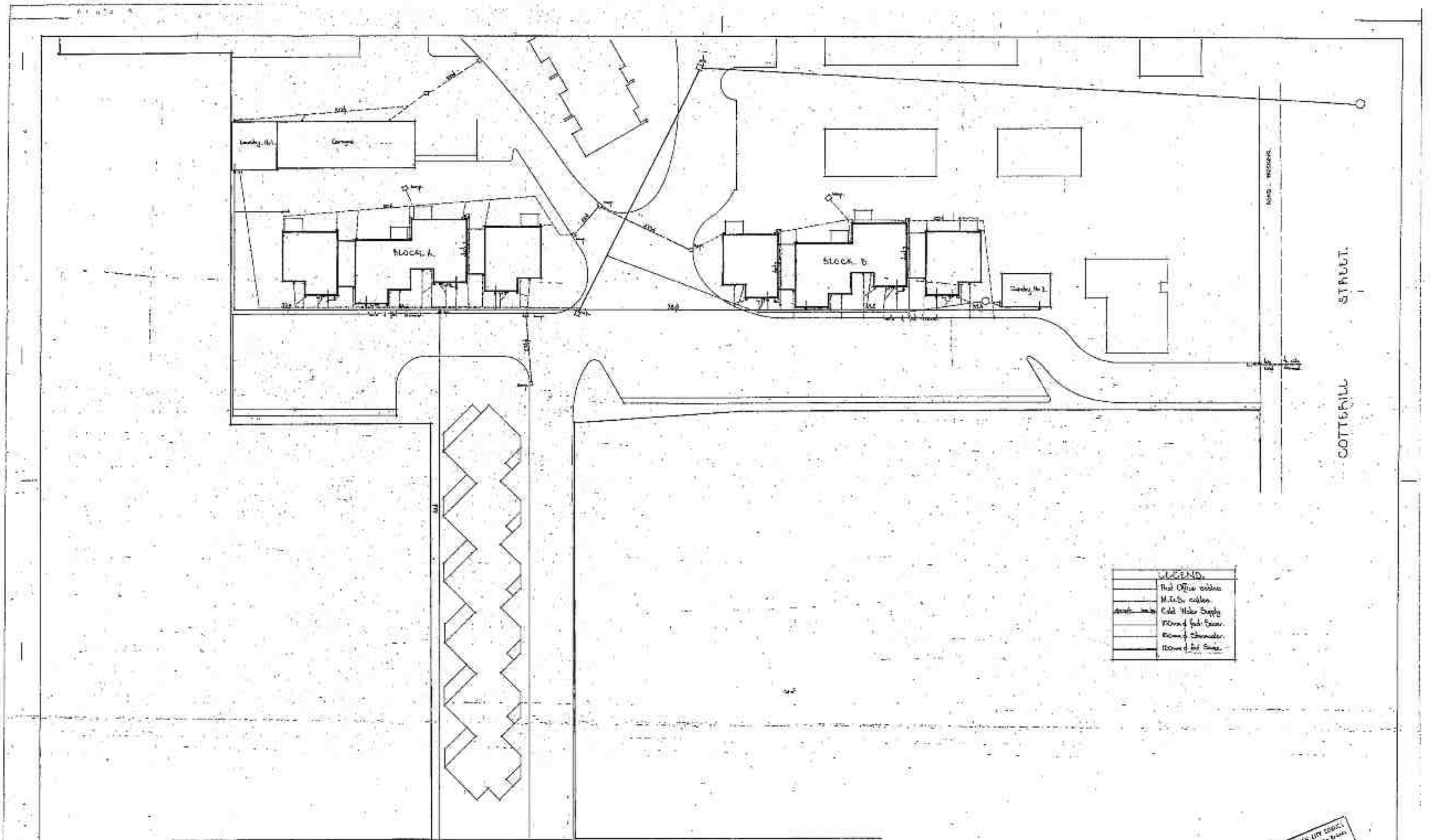
CHRISTCHURCH CITY COUNCIL

CITY ENGINEER'S DEPARTMENT

HARMAN STREET RECLAMATION HOUSING - STAGE 1.

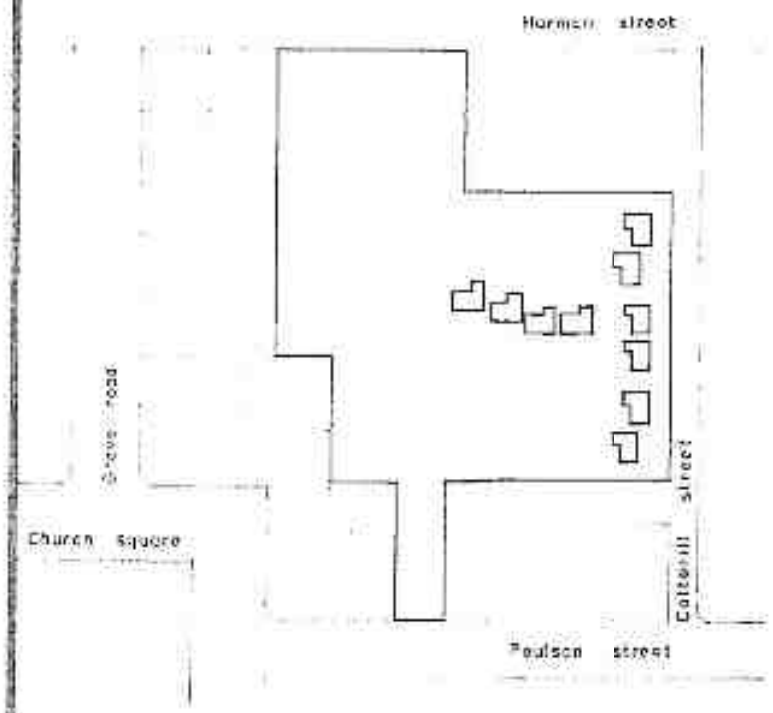
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CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE WORKING FROM



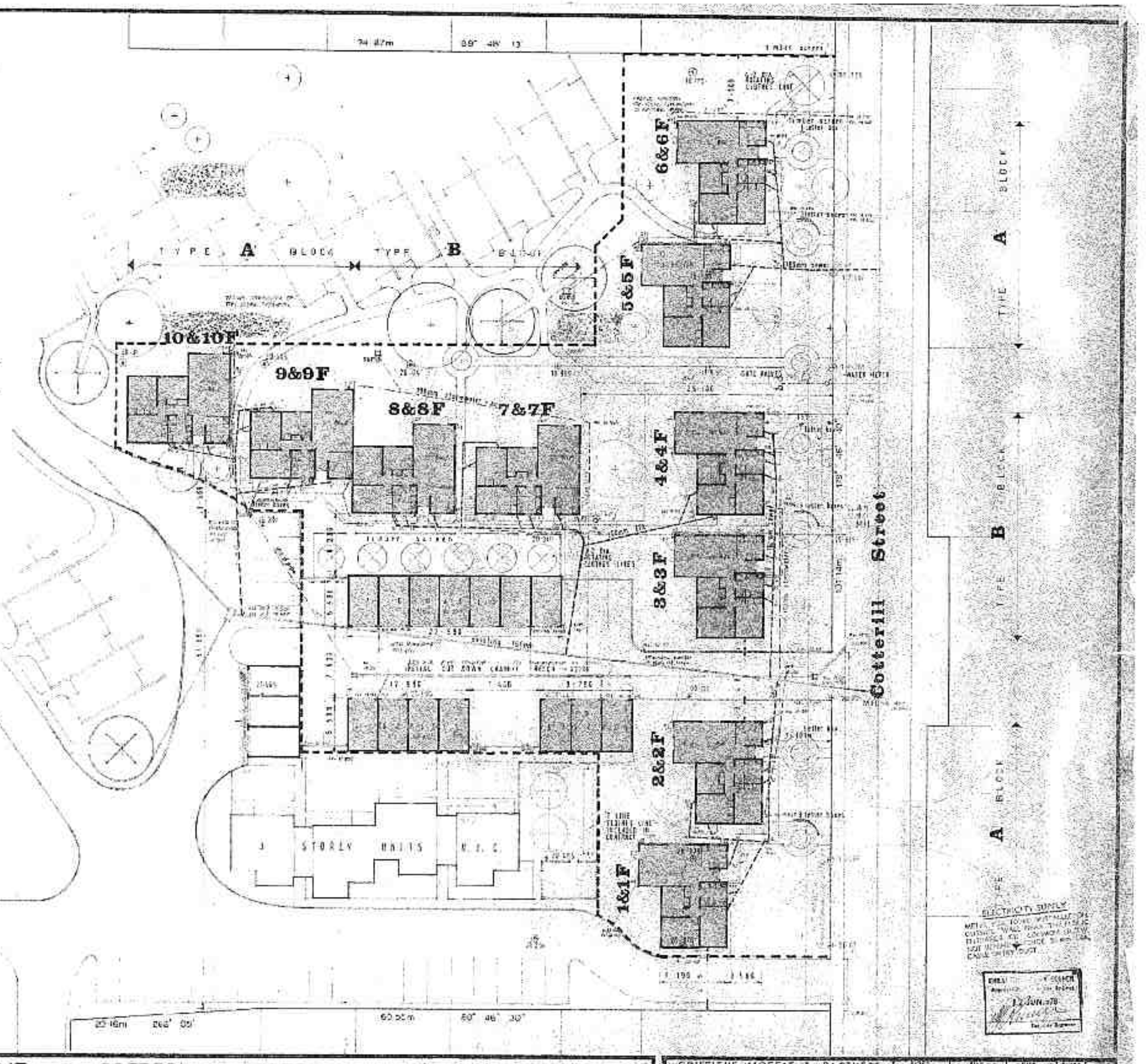
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APPROVED by the Council
9 MAY 1979
CITY ENGINEER

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LOCALITY PLAN





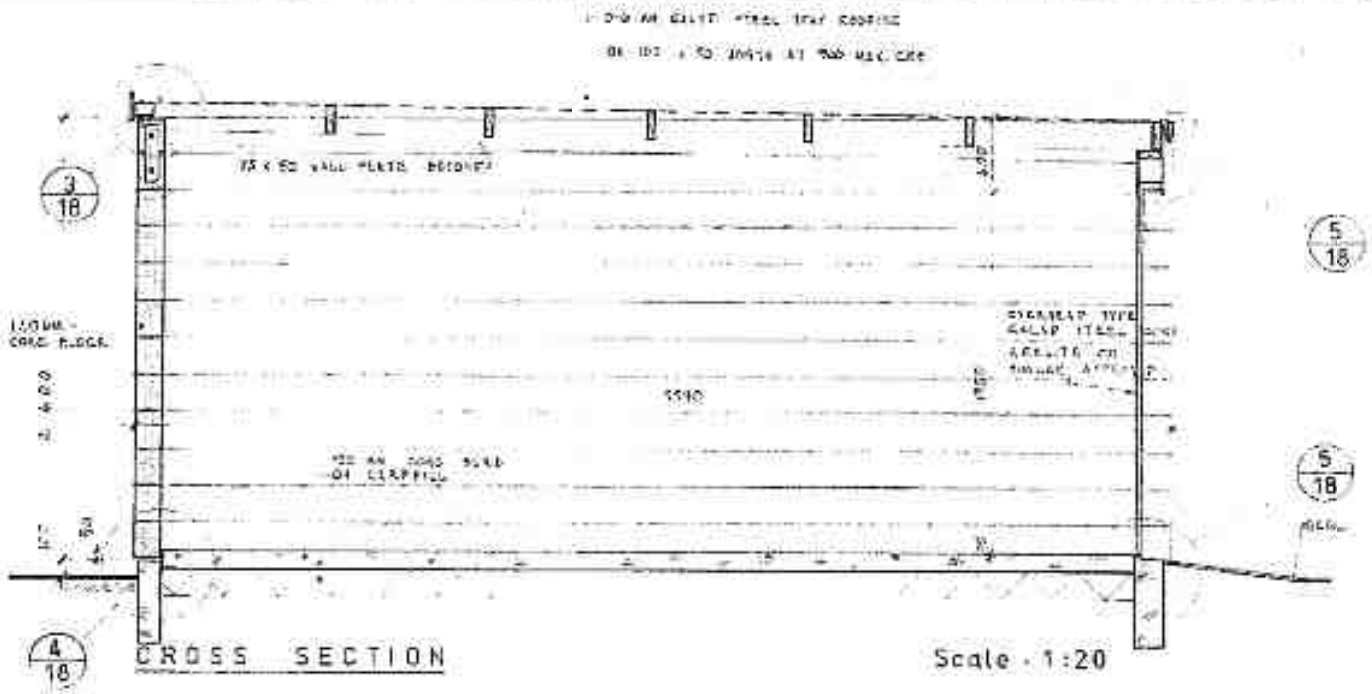
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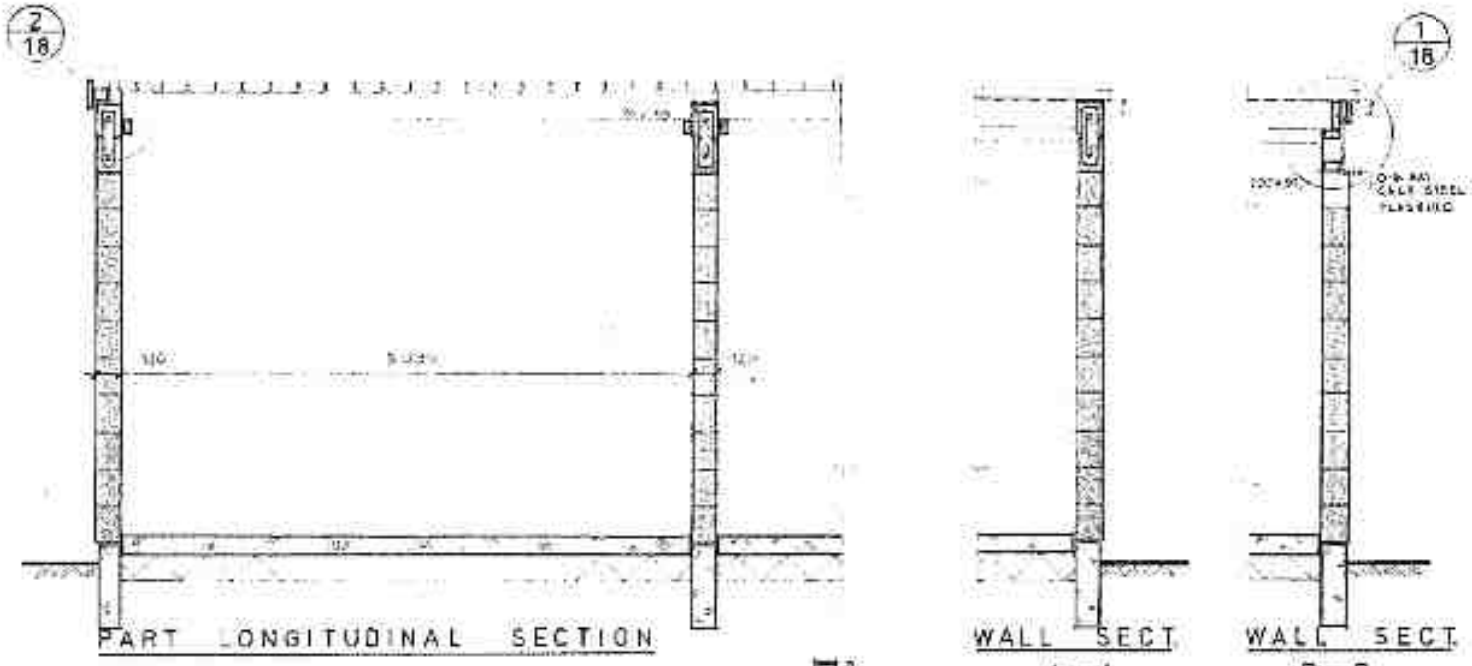
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— — —	WATER SUPPLY
SV	STOP VALVE
MH	SEWER MAN HOLE
	EXISTING TREE
	EXISTING KERB
— — —	225mm SEWER
	EXISTING CLOSE
— — —	150mm STORMWATER
— — —	STORMWATER MAIN SW. SEWER
— — —	EXTENT OF CONTRACT
HY	HOSE TAP

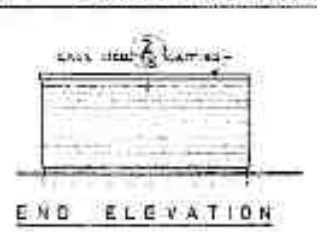
URBAN DEVELOPMENT SCHEME COTTERILL STREET
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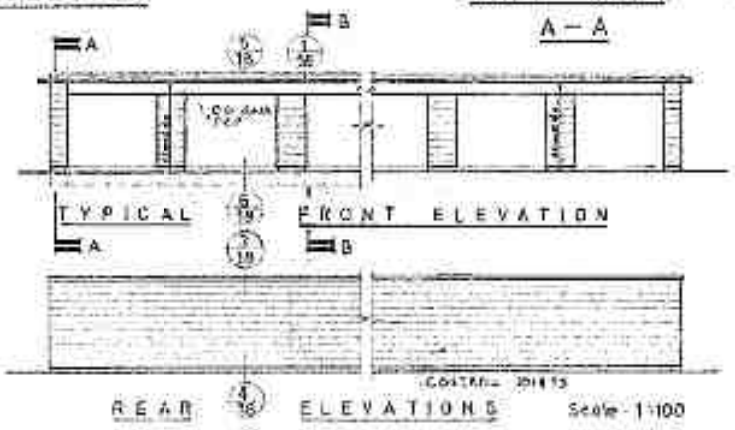
GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS AND ENGINEERS

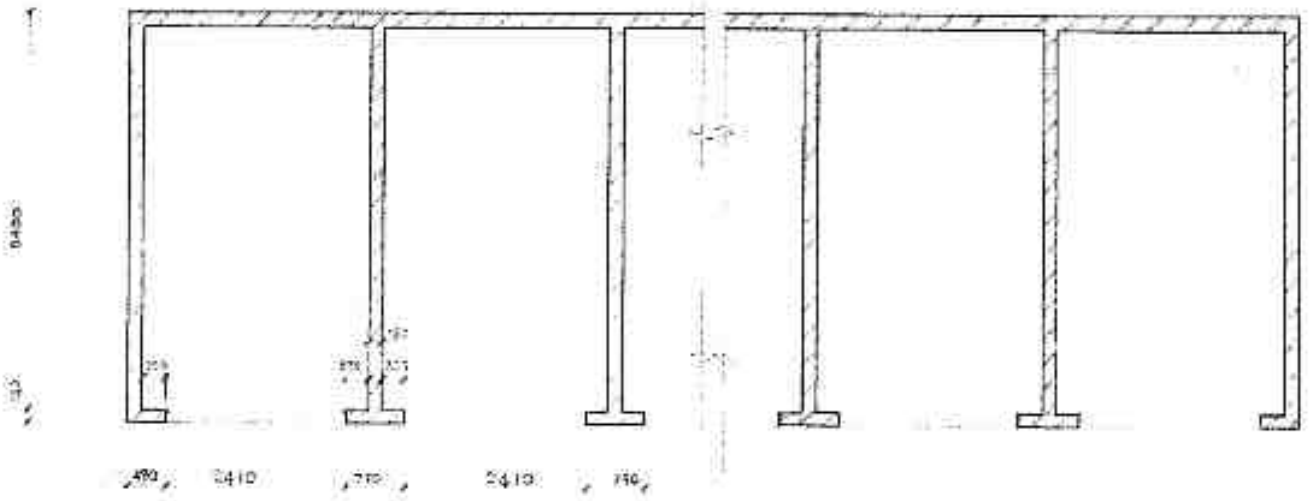
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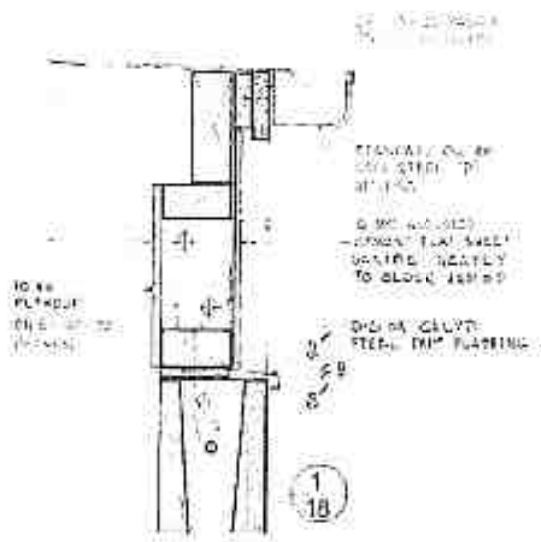


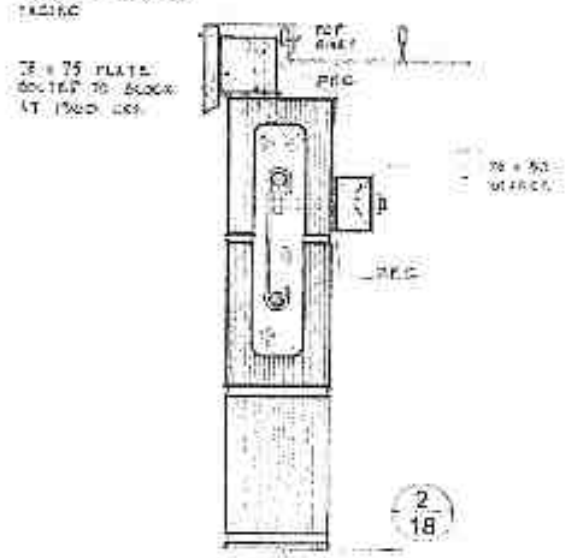


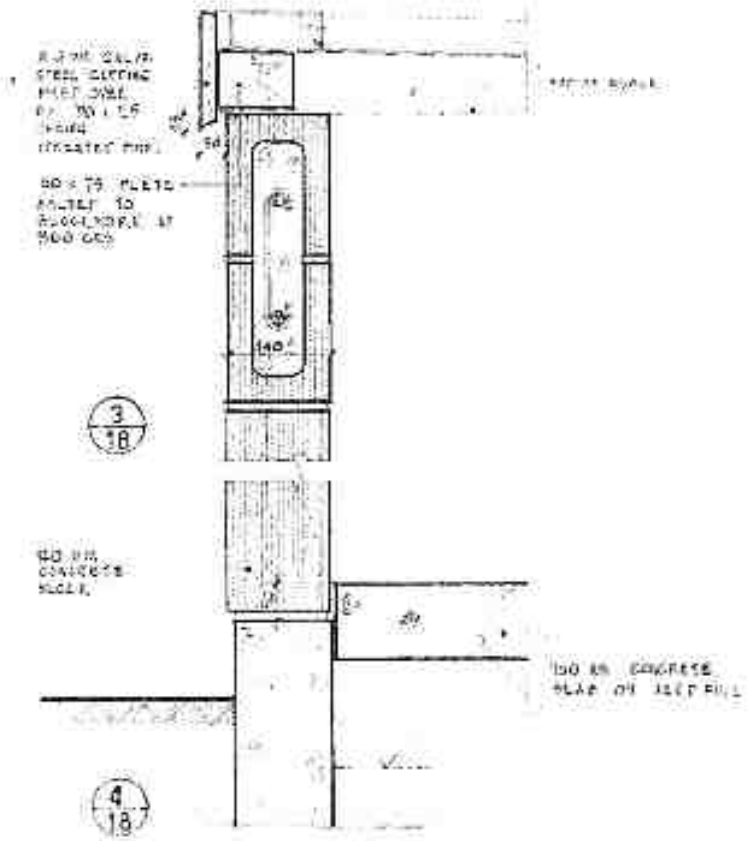


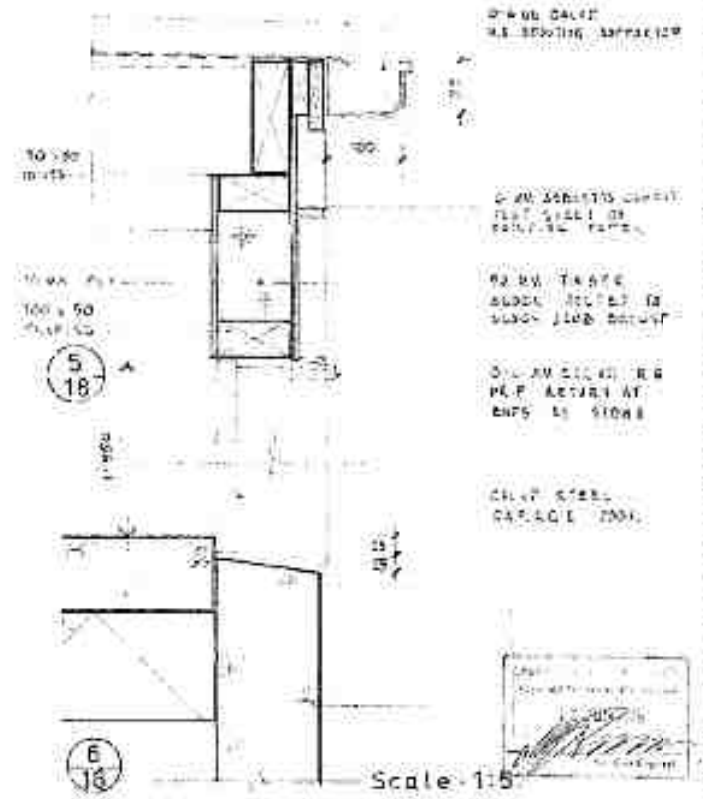












GARAGES

URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL STAGE III

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ARCHITECTS AND ENGINEERS — M.J. MOFFAT, G.H.E. DENWARD, K.B. ANDERSON, B.R.A. [illegible]		NOV 77	792/1	18	20
288 ARMAGH STREET CHRISTCHURCH 1 — P.O. BOX 124 — PHONE 74-640					

PLAN BLOCK TYPE A

PLAN BLOCK TYPE B

SITE PLAN

FOUNDATION PLAN UNITS 1,2,3,4,5,6,7,8,9,10

FOUNDATION PLAN UNITS 11 & 12

PLAN LINE 14

SECTION A

SECTION B

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

SECTION 6

SECTION 7

SECTION 8

TYPICAL GARAGE PLAN

UNIT	FOUNDATION TO SUIT
1 to 4 & 7	600
5 & 8 to 10	750
11 and 12	900

NOTE

CONTRACTOR TO VERIFY DIMENSIONS BEFORE COMMENCING WORK

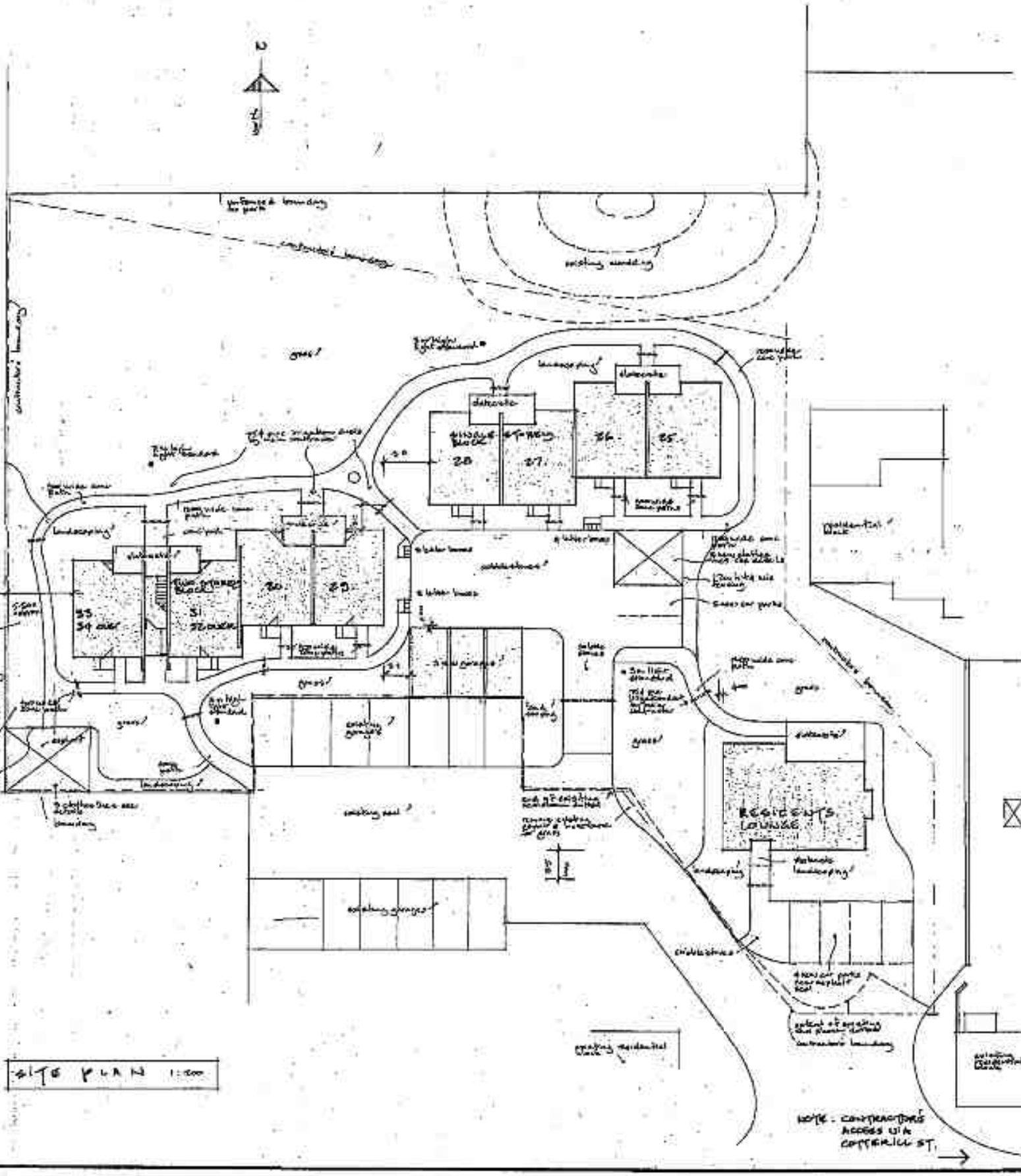
URBAN DEVELOPMENT SCHEME COTTERILL STREET
for CHRISTCHURCH CITY COUNCIL STAGE III

GRIFFITHS MOFFAT & PARTNERS
ARCHITECTS AND ENGINEERS
M.J. MOFFAT G.H. DUWETT
R.R. ANDERSON E.J. HEYMEL
C.C. MACLAREN

SCALE	DATE	FILE	SHEET	OF
1:100, SO, 20	NOV.1977	792/1	S1	4

388 ARMAGH STREET CHRISTCHURCH 1 P.O. BOX 496 PHONE 794-858

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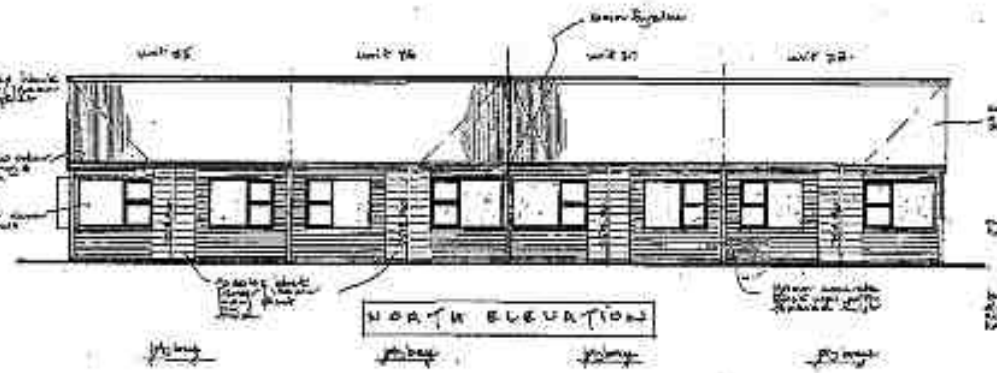

existing boundary
existing dwelling
garage
landscaping
existing garages
existing residential
RESIDENTS LOUNGE
existing tennis courts
existing carparks
existing grass
existing asphalt
existing concrete
existing gravel
existing trees
existing shrubs
existing fence
existing hedge
existing lawn
existing building
existing path
existing kerb
existing drive
existing wall
existing steps
existing ramp
existing sign
existing light
existing power pole
existing telephone pole
existing manhole
existing sump
existing water meter
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existing electricity meter
existing telephone box
existing letterbox
existing rubbish bin
existing clothesline
existing seat
existing table
existing bench
existing flagpole
existing notice board
existing noticeboard
existing shelter
existing toilet
existing changing room
existing office
existing reception
existing kitchen
existing laundry
existing lounge
existing dining room
existing bedroom
existing bathroom
existing shower
existing basin
existing toilet
existing urinal
existing cubicle
existing partition
existing door
existing window
existing roof
existing gutter
existing downpipe
existing chimney
existing vent
existing skylight
existing awning
existing canopy
existing verandah
existing balcony
existing deck
existing ramp
existing steps
existing handrail
existing balustrade
existing fence
existing gate
existing hedge
existing trees
existing shrubs
existing lawn
existing grass
existing garden
existing path
existing driveway
existing carpark
existing garage
existing shed
existing building
existing dwelling
existing residential
existing commercial
existing industrial
existing public
existing private
existing boundary
existing road
existing footpath
existing kerb
existing channel
existing drain

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

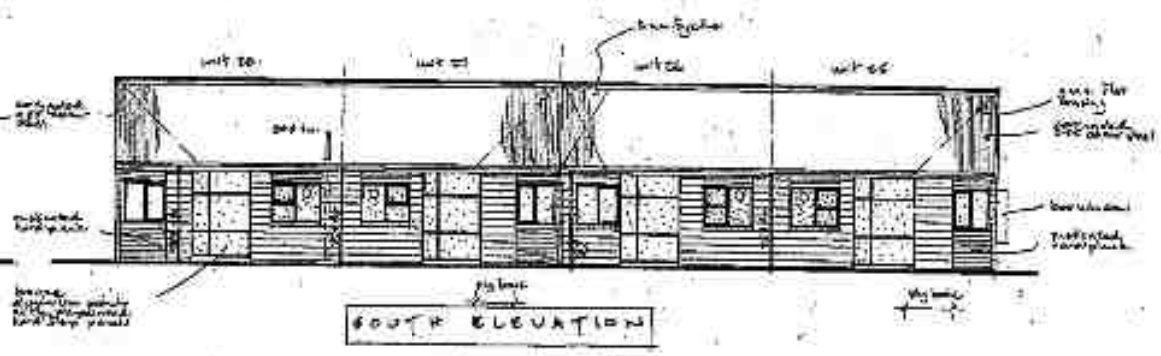
SINGLE STOREY BLOCK



EAST ELEVATION



NORTH ELEVATION

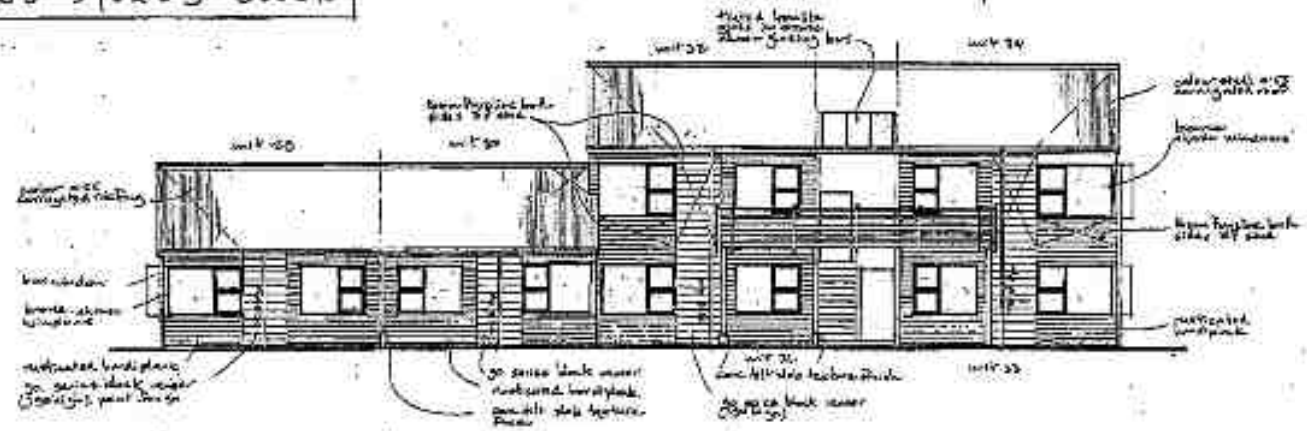


SOUTH ELEVATION

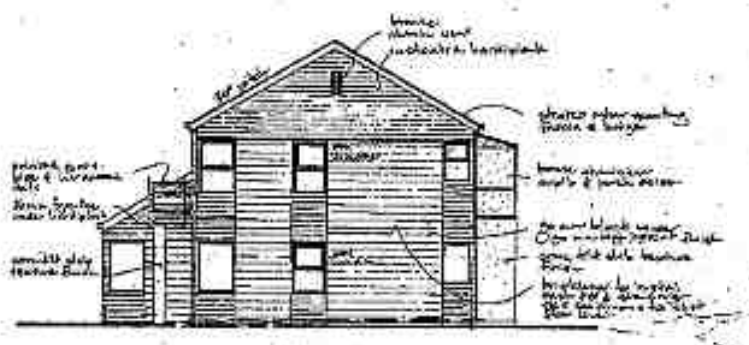


WEST ELEVATION

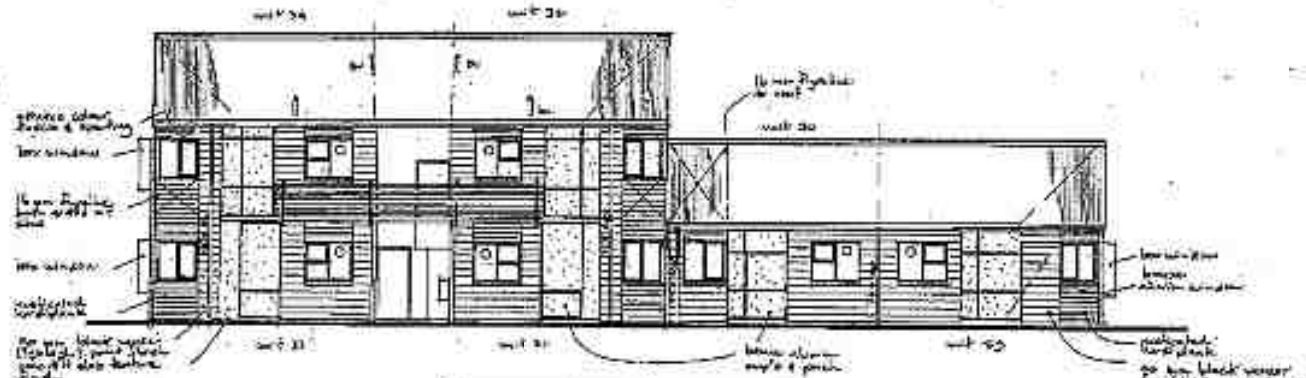
TWO STOREY BLOCK



NORTH ELEVATION



WEST ELEVATION

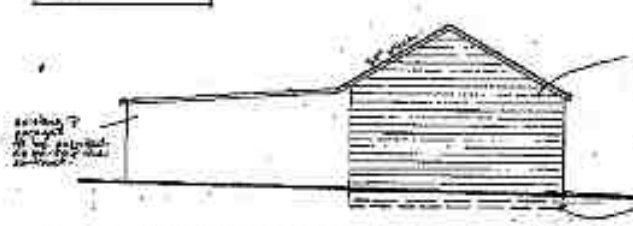


SOUTH ELEVATION

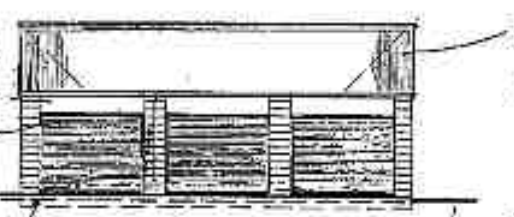


EAST ELEVATION

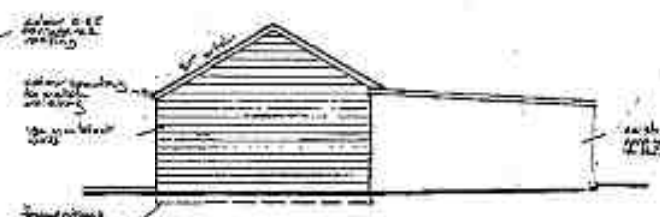
GARAGES



EAST ELEVATION GARAGES



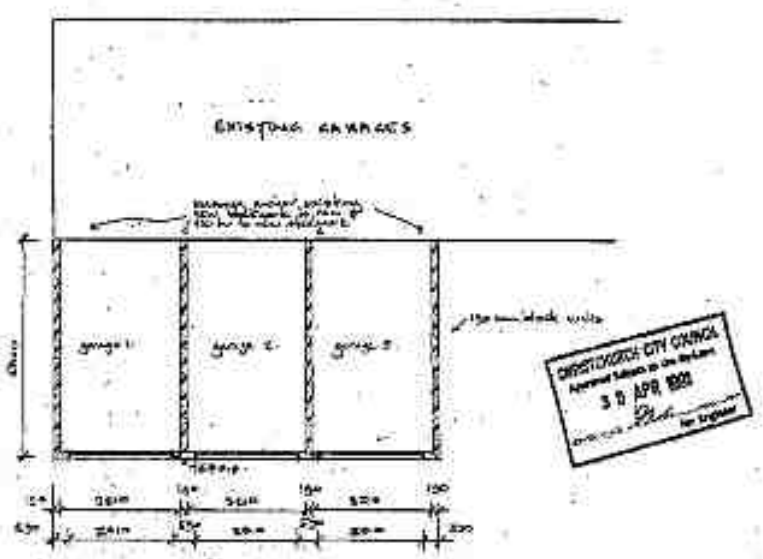
NORTH ELEVATION GARAGES



WEST ELEVATION GARAGES

ALUMINIUM JOINERY

- all exposed joinery components shall be of aluminium
- [illegible] windows to have powdercoat finish
- [illegible] to have aluminium flashing & sill cover
- [illegible] to be glazed with [illegible]
- [illegible] to have [illegible] walls to aluminium flashing
- aluminium [illegible] to be [illegible]
- [illegible] to have [illegible] with [illegible]



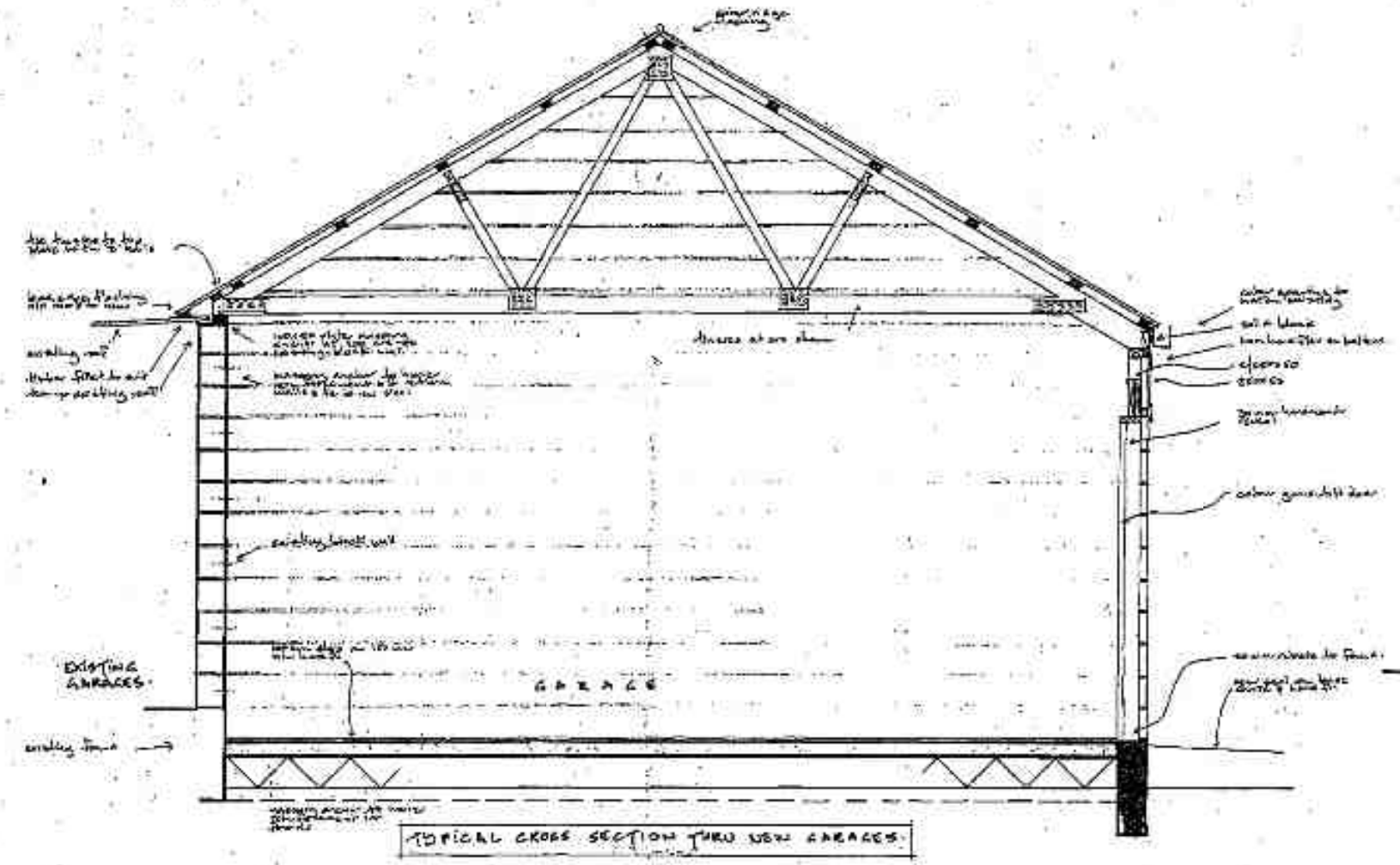
GARAGE PLAN

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION · CITY WORKS & PLANNING DEPARTMENT

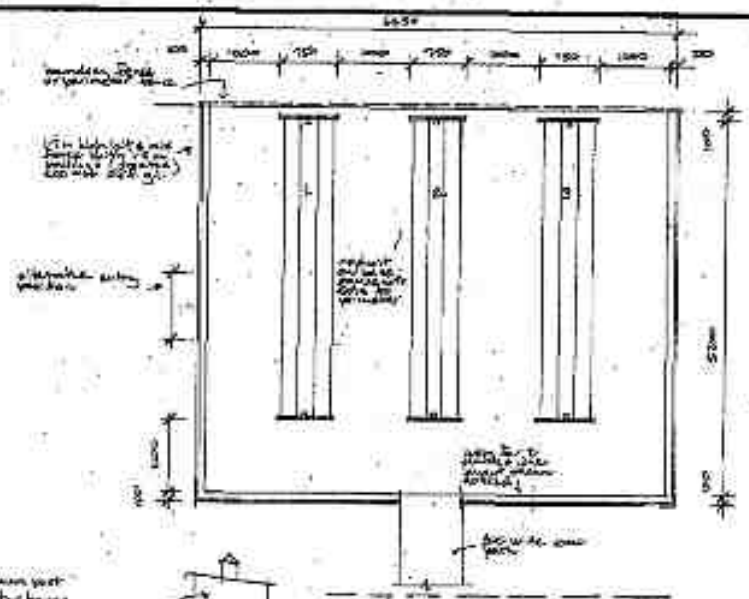
HARMAN COURTS EXTENSION 1991. Elevations & Garage Plan

SCALE 1:100 DESIGN
DRAWN BLS
DATE 25.5.91 TRACED
JOB NO 1161
FILE NO
SHEET NUMBER
OF [illegible] SHEETS 12

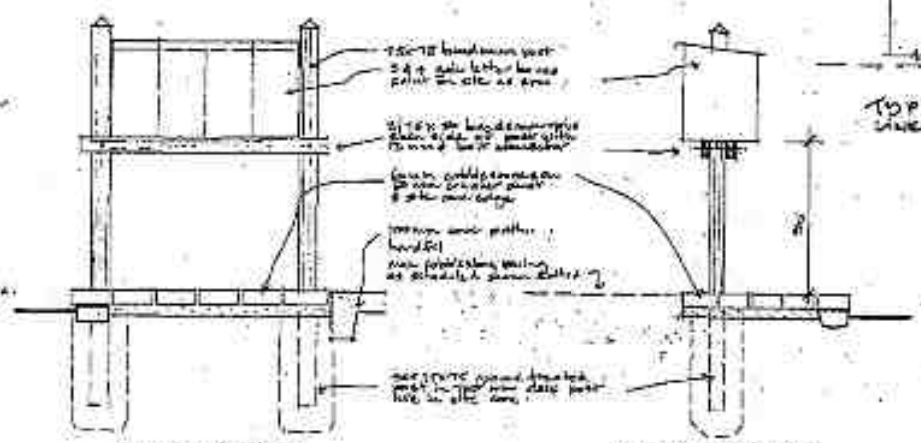
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK



TYPICAL CROSS SECTION THRU NEW GARAGES



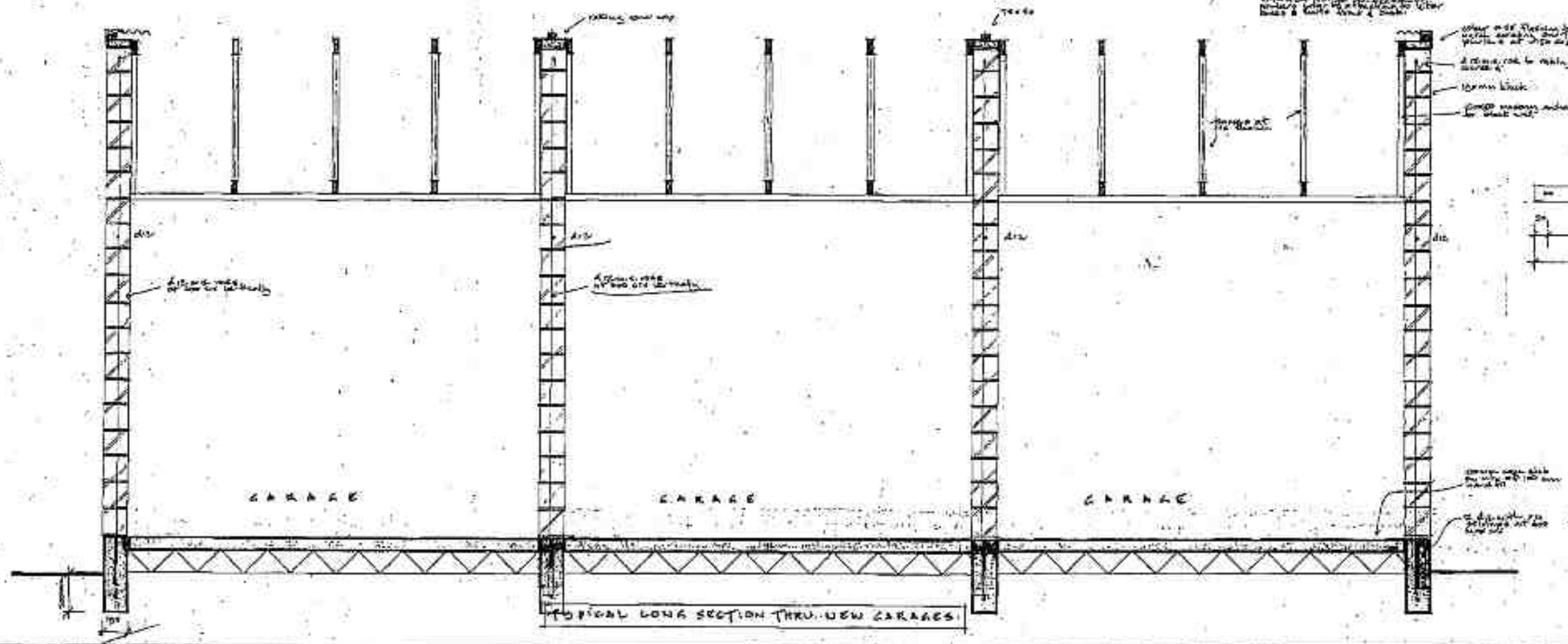
TYPICAL CLOTHES LINE LAYOUT 1:50



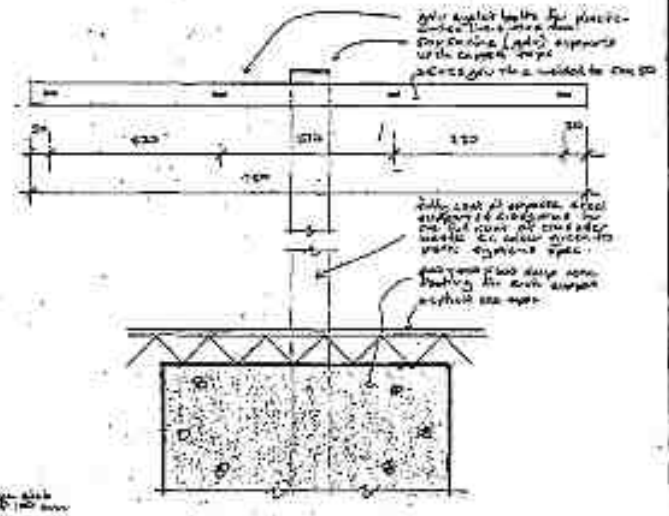
LONG SECTION

CROSS SECTION

STANDARD LETTER BOX DETAILS



TYPICAL LONG SECTION THRU NEW GARAGES



CHRISTCHURCH CITY COUNCIL
Approved Subject to the By-laws
30 APR 1951
for Engineer

CHRISTCHURCH CITY COUNCIL
CITY ARCHITECTS DIVISION: CITY WORKS & PLANNING DEPARTMENT

HARMAN COURTS EXTENSION 1951. 3 garages' clothes line details, letter box details for groups of 3

SCALE 1:50 DESIGN
DATE 12.3.51 DRAWN JMcG TRACED

JOB NO 1951 SHEET NUMBER
FILE NO OF section SHEETS 15

Appendix A7/C CERA Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Harman Courts - Garages				Reviewer:	Stephen Lee
	Unit	No:	Street		CPEng No:	1006840
Building Address:		85	Poulson		Company:	GHD
Legal Description:					Company project number:	513090277
					Company phone number:	6433780900
	Degrees	Min	Sec			
GPS south:					Date of submission:	
GPS east:					Inspection Date:	
					Revision:	Final
Building Unique Identifier (CCC):	BE 1110 011-015 EQ2				Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	
Storeys below ground	0			
Foundation type:	other (describe)		if Foundation type is other, describe:	Ground beams
Building height (m):	4.30		height from ground to level of uppermost seismic mass (for IEP only) (m):	4.15
Floor footprint area (approx):	127			
Age of Building (years):	34		Date of design:	1976-1992
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	parking		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	0.3, timber purlins and metal cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:			

Lateral load resisting structure

Lateral system along:	fully filled CMU			
Ductility assumed, μ:	1.25	**Note: Define along and across in**	note total length of wall at ground (m):	
Period along:	1.00	##### **detailed report!** enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	1.00	##### enter height above at H31	estimate or calculation?	calculated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:			
Roof Cladding:	Metal	describe	
Glazing:			
Ceilings:	strapped or direct fixed		GIB board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	Griffiths Moffats and Partners
Structural	partial	original designer name/date	Griffiths Moffats and Partners
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:

(refer DEE Table 4-2)			
Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%	$Damage_Ratio \quad \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:		Describe:	
	Building Consent required:		Describe:	
	Interim occupancy recommendations:		Describe:	
Along	Assessed %NBS before e'quakes:	100% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Detailed Analysis
	Assessed %NBS after e'quakes:	100%		
Across	Assessed %NBS before e'quakes:	100% ##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	100%		

Appendix B Geotechnical Investigation Reports and Analysis

Unknown No: M35/12082
Well Name: CCC BorelogID 73
Owner: CCC borelog

Environment Canterbury
Your regional council

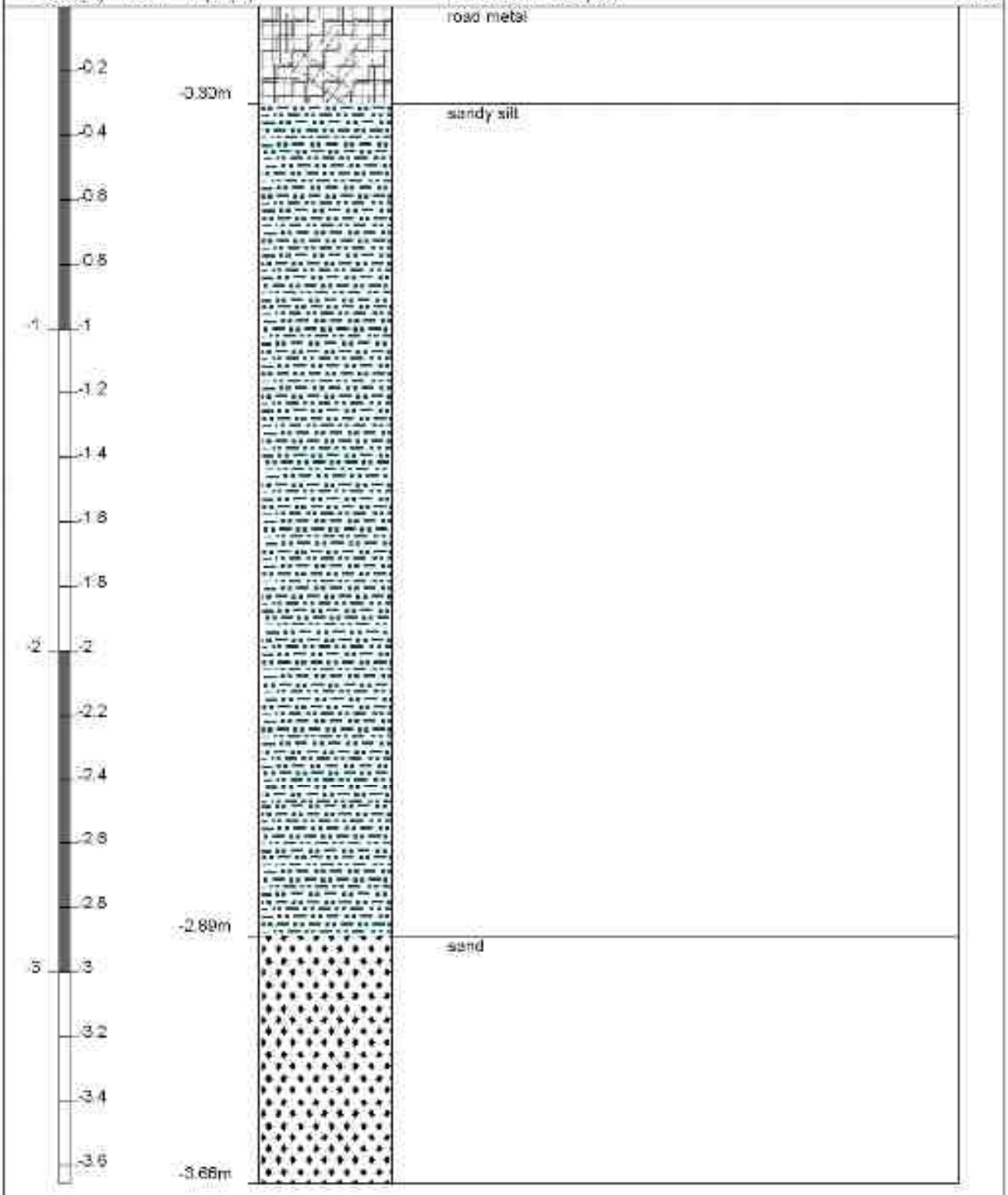
Street of Well:	Grove Rd / Ha	**File No:**	
Locality:		**Allocation Zone:**	Christchurch/West Melton
NZGM Grid Reference:	M35:79132-40590 QAR 3		
NZGM X-Y:	2479132 - 5740590		
Location Description:	Grove Rd / Hazeldean Rd	**Uses:**	Foundation/Investigation Bore
ECan Monitoring:			
Well Status:	Filled in		

Drill Date:		**Water Level Count:**	0
Well Depth:	3.66m -GL	**Strata Layers:**	3
Initial Water Depth:		**Aquifer Tests:**	0
Diameter:		**Isotope Data:**	0
		Yield/Drawdown Tests:	0
Measuring Point Ait:	10.20m MSD QAR 3	**Highest GW Level:**	
GL Around Well:	0.00m -MP	**Lowest GW Level:**	
MP Description:	ToC	**First Reading:**	
		Last Reading:	
Driller:		**Calc. Min. GWL:**	
Drilling Method:		**Last Updated:**	27 Mar 2008
Casing Material:		**Last Field Check:**	
Pump Type:			
Yield:		**Screens:**	
Drawdown:		**Screen Type:**	
Specific Capacity:		**Top GL:**	
		Bottom GL:	
Aquifer Type:			
Aquifer Name:			

Borelog for well M35/12082

Gridref: M35:79132-40590 Accuracy : 3 (1=high, 5=low)
Ground Level Altitude : 10.2 +MSD
Well name : CCC BorelogID 73
Drill Method : Not Recorded
Drill Depth : -3.66m Drill Date :

Environment Canterbury Regional Council



Unknown No: M35/16828
Well Name: CCC BorelogID 6526
Owner: CCC borelog

Street of Well:
File No:
Locality: Addington
Allocation Zone: Christchurch/West Melton
NZGM Grid Reference: M35:79473-40200 QAR 3
NZGM X-Y: 2479473 - 5740200
Location Description:
Uses: Foundation/Investigation Bore
ECan Monitoring:
Well Status: Filled in

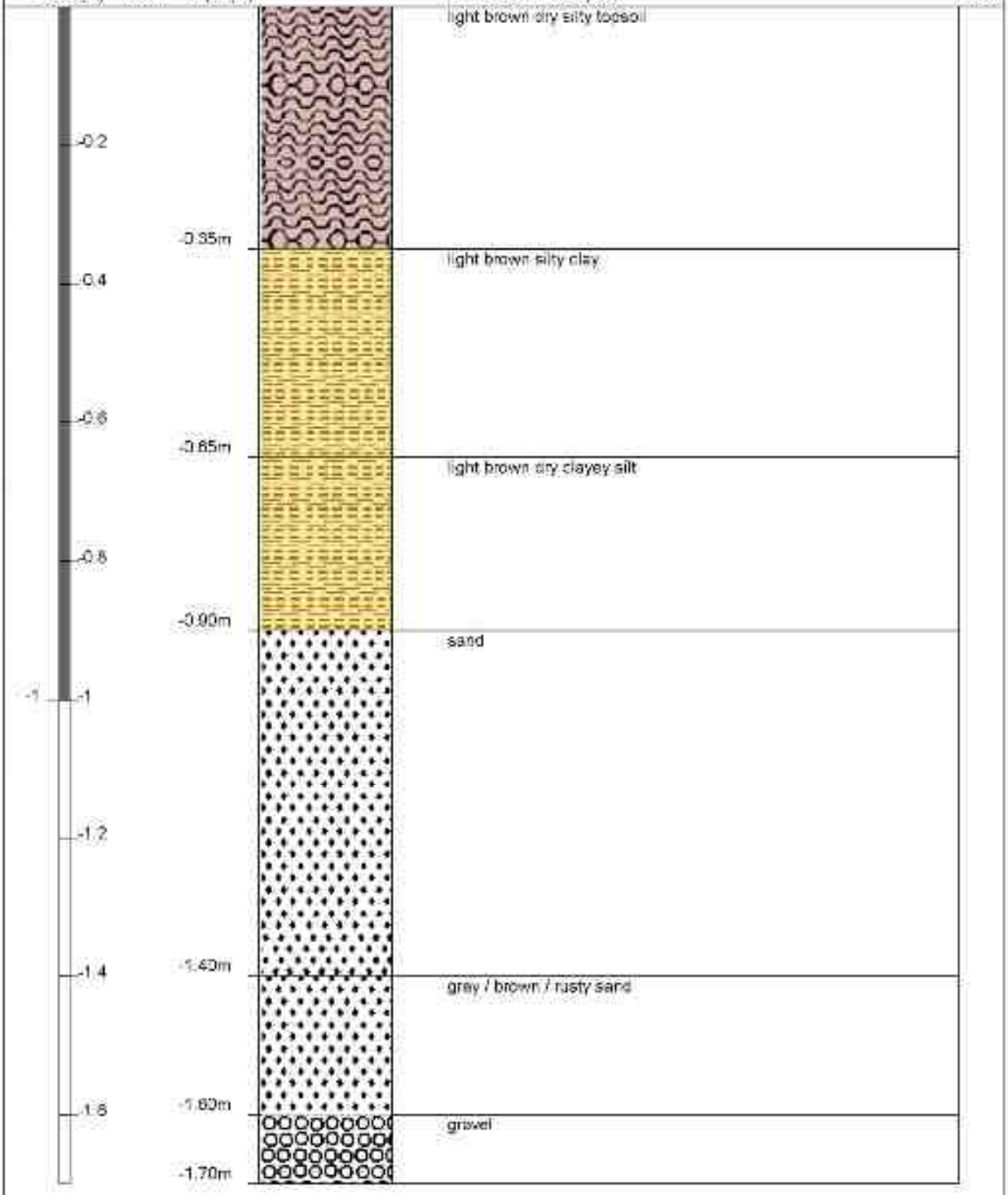
Drill Date: 15 Feb 2007
Water Level Count: 0
Well Depth: 1.70m -GL
Strata Layers: 6
Initial Water Depth:
Aquifer Tests: 0
Diameter:
Isotope Data: 0
Yield/Drawdown Tests: 0

Measuring Point Ait: 11.08m MSD QAR 3
Highest GW Level:
GL Around Well: 0.00m -MP
Lowest GW Level:
MP Description: ToC
First Reading:
Last Reading:
Driller:
Calc. Min. GWL:
Drilling Method:
Last Updated: 12 Mar 2010
Casing Material:
Last Field Check:
Pump Type:
Yield:
Screens:
Drawdown:
Screen Type:
Specific Capacity:
Top GL:
Bottom GL:
Aquifer Type: Water Table
Aquifer Name: Springston Formation

Borelog for well M35/16828

Gridref: M35:79473-40200 Accuracy : 3 (1=high, 5=low)
Ground Level Altitude : 11.08 +MSD
Well name : CCC BorelogID 6526
Drill Method : Not Recorded
Drill Depth : -1.7m Drill Date : 15/02/2007

Environment Canterbury
Regional Council



Bore or Well No: M35/2194
Well Name:
Owner: BROWN D.H.& SON LTD.

Street of Well: MOORHOUSE AVE
Locality: ADDINGTON
NZGM Grid Reference: M35:793-406 QAR 4
NZGM X-Y: 2479300 - 5740600
Location Description:
ECan Monitoring:
Well Status: Not Used

File No:
Allocation Zone: Christchurch/West Melton
Uses:

Drill Date:
Well Depth: 24.30m -GL
Initial Water Depth:
Diameter:

Measuring Point Ait: 9.50m MSD QAR 3
GL Around Well: 0.00m -MP
MP Description:

Driller: not known
Drilling Method: Unknown
Casing Material:
Pump Type: Unknown
Yield:
Drawdown:
Specific Capacity:

Aquifer Type: Unknown
Aquifer Name: Riccarton Gravel

Water Level Count: 0
Strata Layers: 15
Aquifer Tests: 0
Isotope Data: 0
Yield/Drawdown Tests: 0

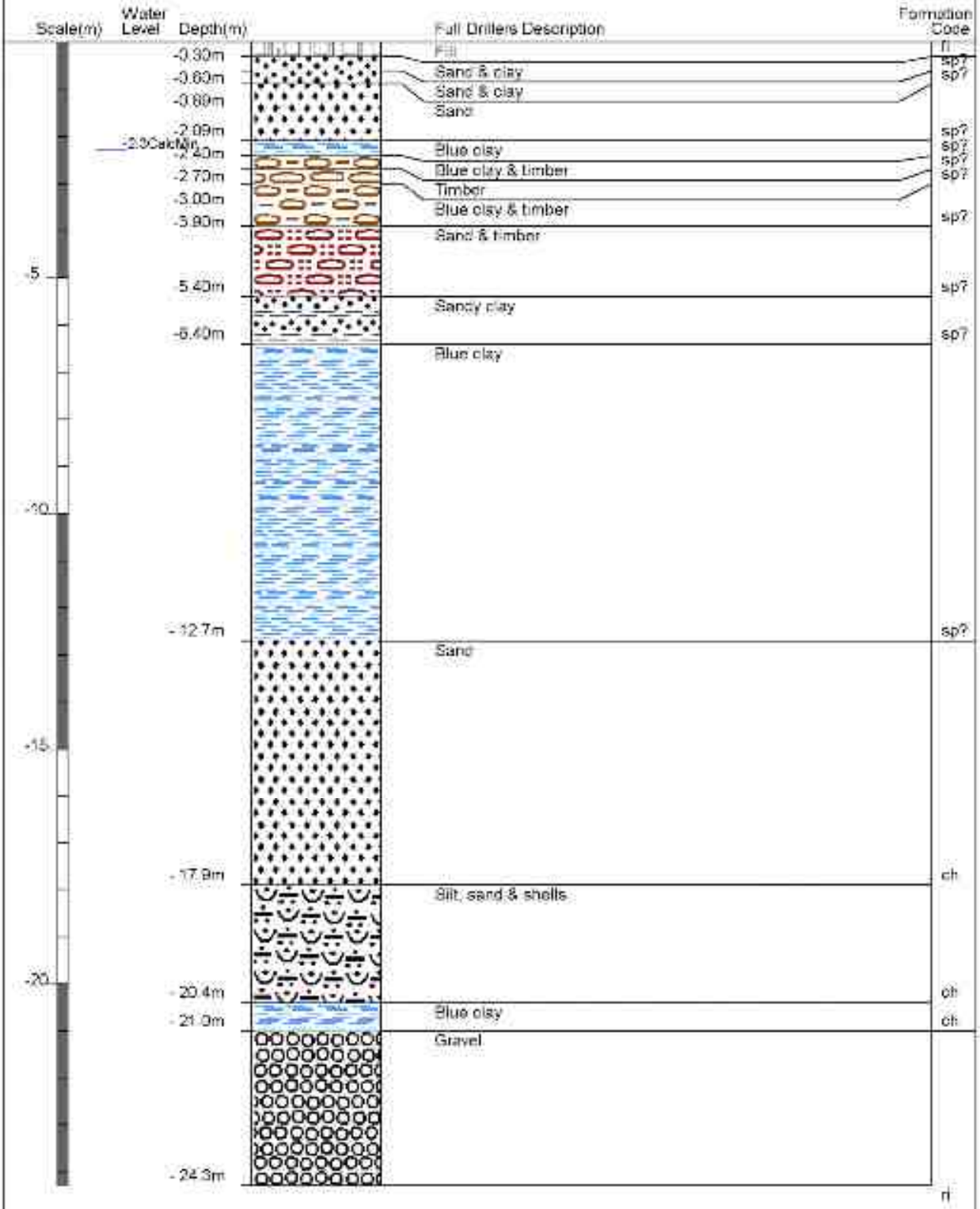
Highest GW Level:
Lowest GW Level:
First Reading:
Last Reading:
Calc. Min. GWL: -2.30m -MP
Last Updated: 18 Oct 2006
Last Field Check:

Screens:
Screen Type:
Top GL:
Bottom GL:

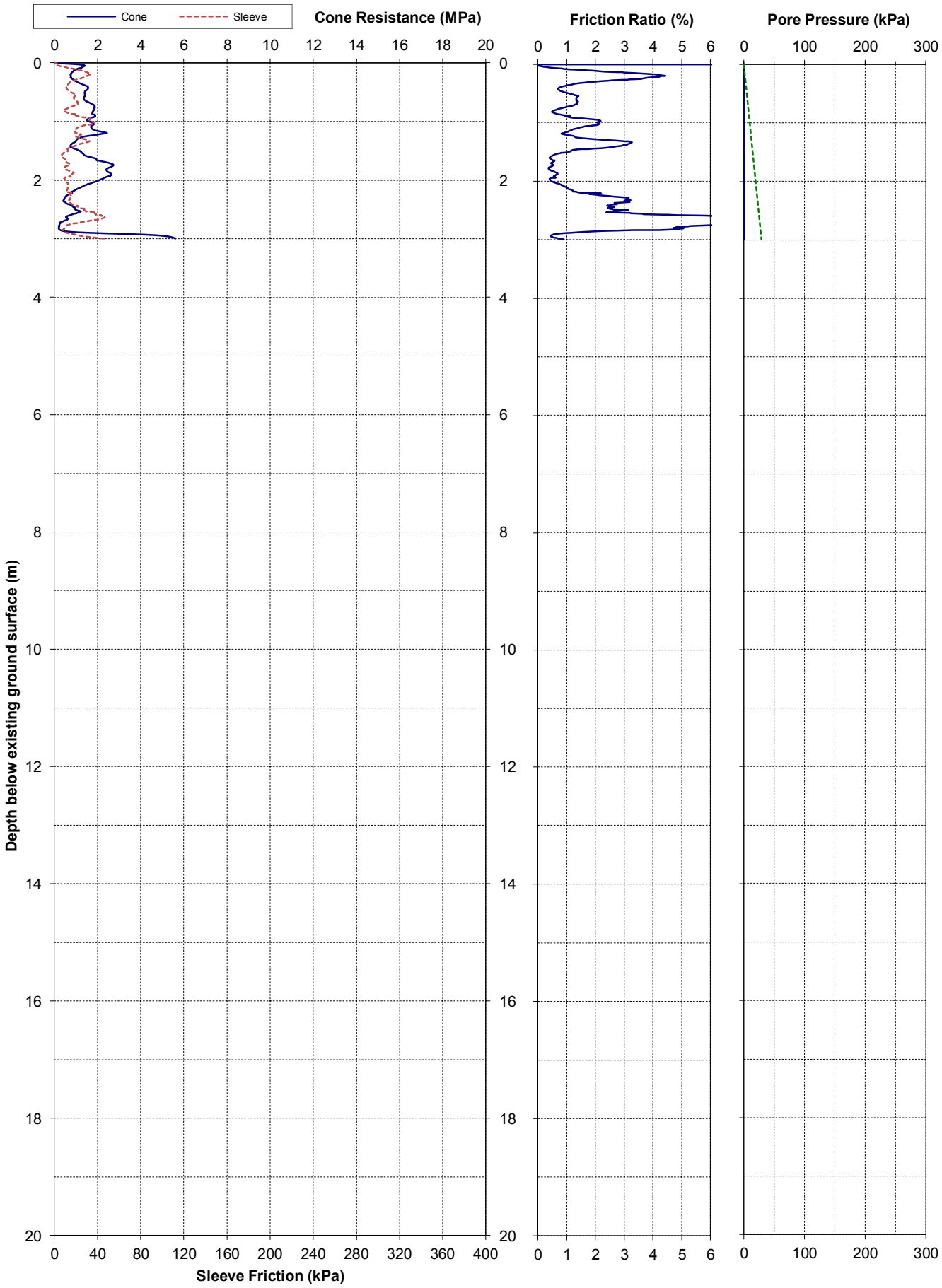
Borelog for well M35/2194

Gridref: M35:793-405 Accuracy : 4 (1=high, 5=low)
Ground Level Altitude : 9.5 +MSD
Driller : not known
Drill Method : Unknown
Drill Depth : -24.28m Drill Date :

Environment Canterbury Regional Council

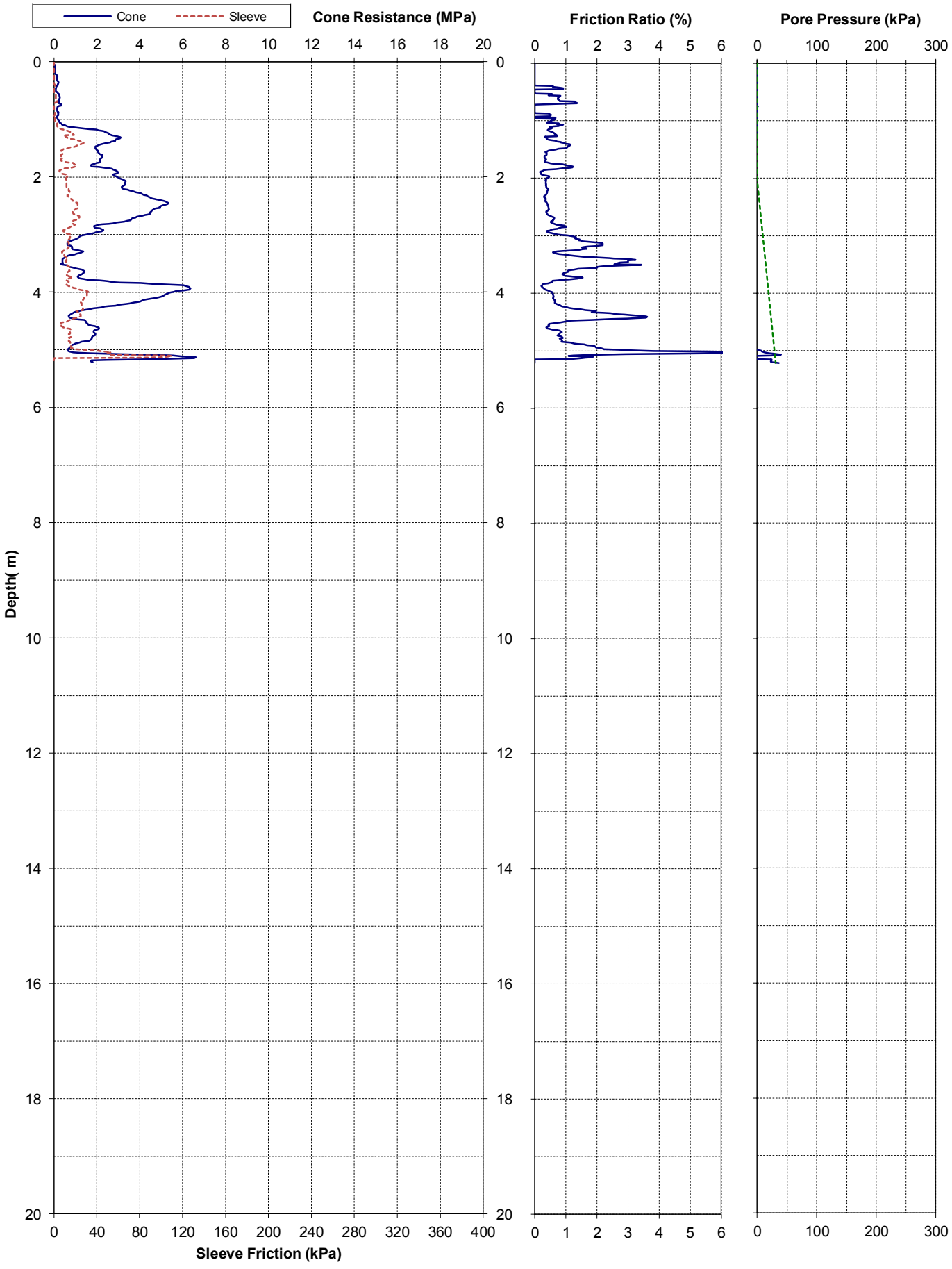


Project:	Historical Geotechnical CPT Investigations			Page: 1 of 1	CPT-HIS-0246
Test Date:	3-Oct-2000	Suburb:	Addington		
Pre-Drill:	0 m			Located By: Google Earth	Locations based on supplied address
Position:	5740484 mE	2479179 mN	10.2 mRL	Coord. System: NZMG	
Address:	62 Harman St			Datum Reference: Lyttelton Vertical Datum (MSL 1937)	



Plotted: 6/11/2012 6:08 p.m.

Project:	Christchurch 2011 Earthquake - CCC Ground Investigations			Page: 1 of 1		CPT-CBD-116
Test Date:	20-Jul-2011	Location:	Central City	Operator:	Opus	
Pre-Drill:	1.5m	Assumed GWL:	2mBGL	Located By:	Survey GPS	
Position:	2479130mE	5740438.9mN	10.71mRL	Coord. System:	NZMG & MSL	
Other Tests:				Comments:		



CPT ANALYSIS NOTES

Soil Type

Interpretation using chart of Robertson & Campanella (1983). This is a simple but well proven interpretation using cone tip resistance (q_C) and friction ratio (f_R) only. No normalisation for overburden stress is applied. Cone tip resistance measured with the piezocone is corrected with measured pore pressure (u_C).

- sand (and gravel)
- silt-sand
- silt
- clay-silt
- clay
- peat

Liquefaction Screening

The purpose of the screening is to highlight susceptible soils, that is sand and silt-sand in a relatively loose condition. This is not a full liquefaction risk assessment which requires knowledge of the particular earthquake risk at a site and additional analysis. The screening is based on the chart of Shibata and Teparaksa (1988).

- high susceptibility
- medium susceptibility
- low susceptibility

High susceptibility is here defined as requiring a shear stress ratio of 0.2 to cause liquefaction with D_{50} for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Medium susceptibility is here defined as requiring a shear stress ratio of 0.4 to cause liquefaction with D_{50} for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Low susceptibility is all other cases.

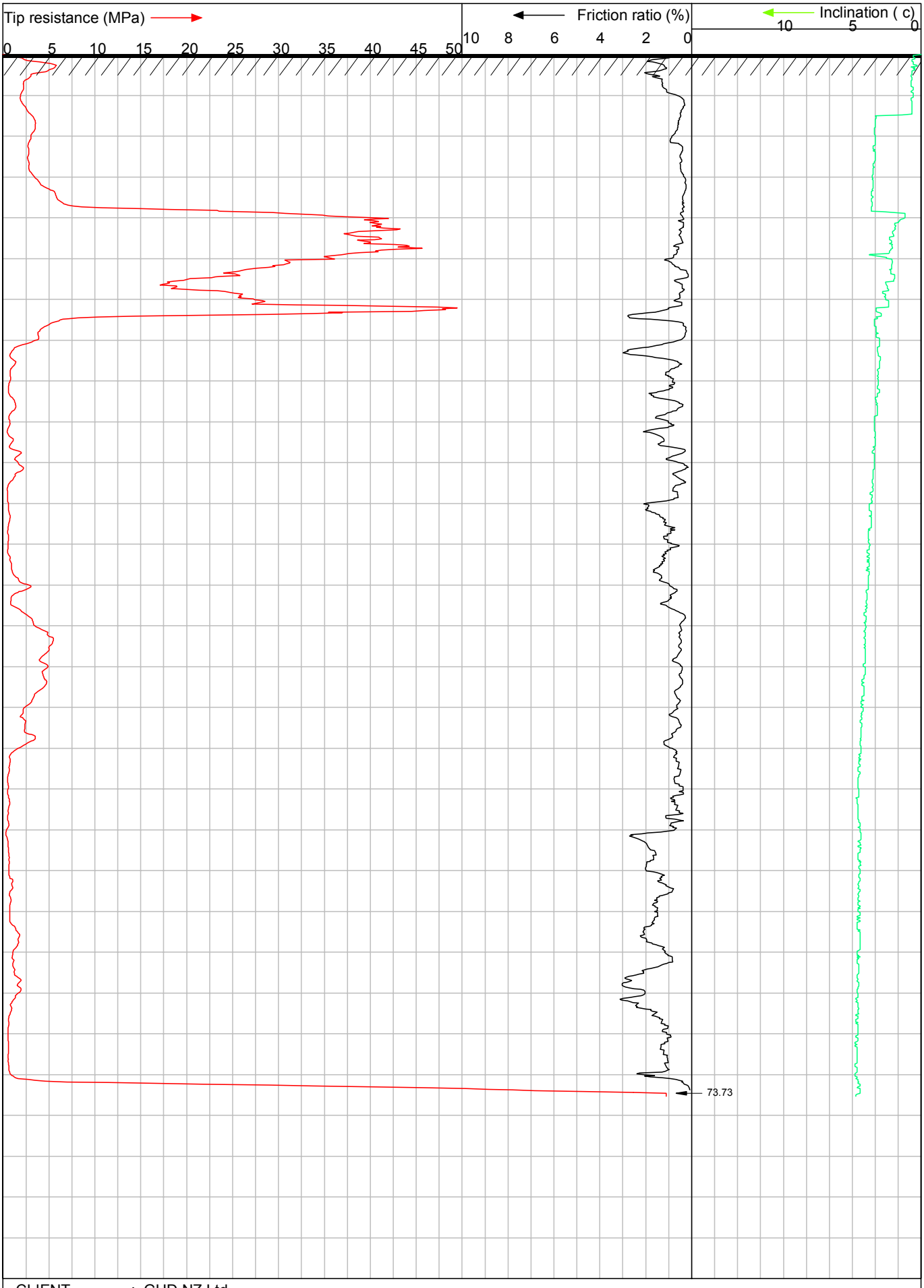
Relative Density (D_R)

Based on the method of Baldi et. al. (1986) from data on normally consolidated sand.

Undrained Shear Strength (S_U)

Derived from the bearing capacity equation using $S_U = (q_C - \sigma_{VO})/15$.

McMILLAN
DRILLING SERVICES

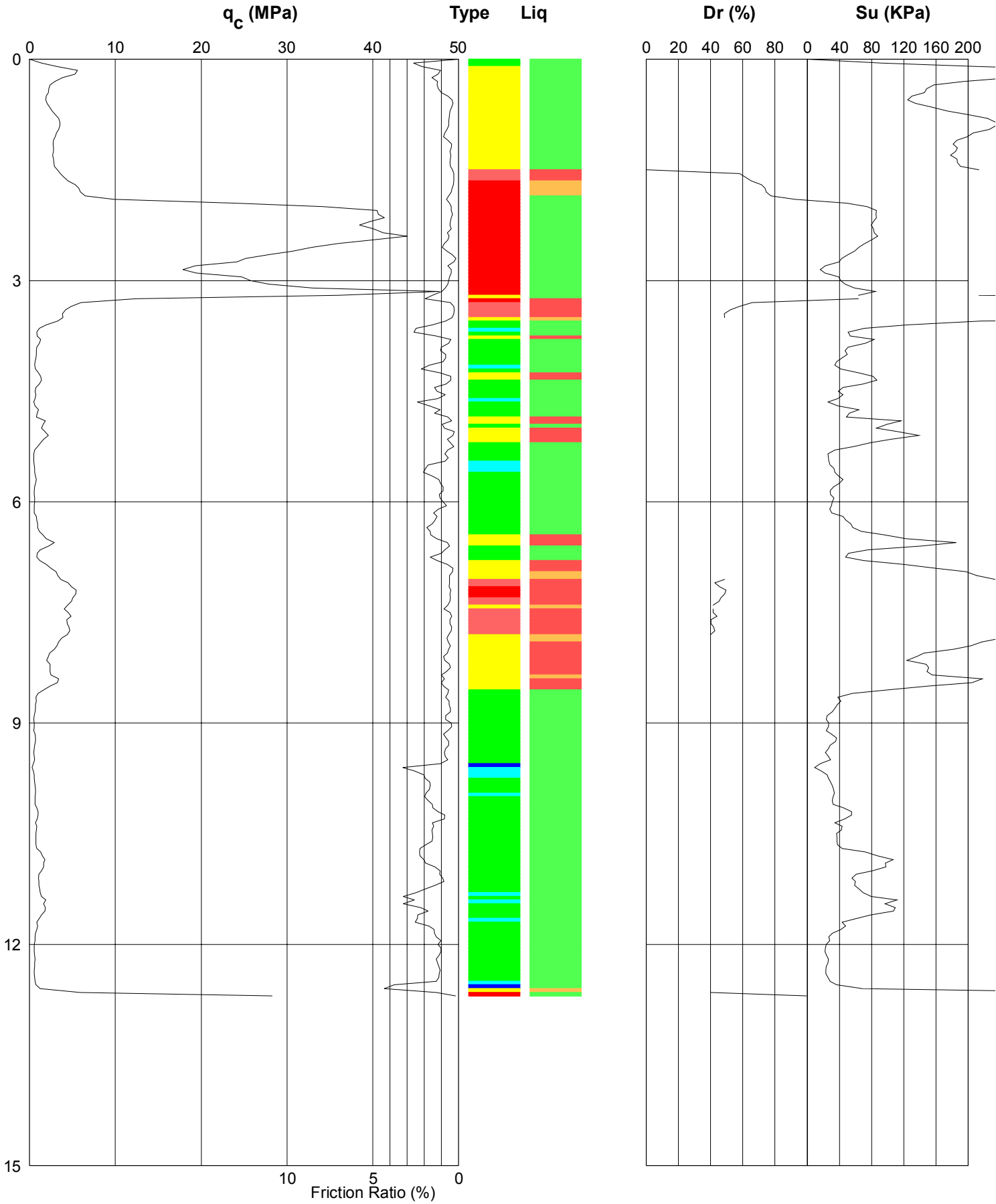


CLIENT : GHD NZ Ltd
LOCATION : 85 Poulson Street, Christchurch
DATE : 1-11-2012
OPERATOR : S.Cardona
REMARK 1 : CPT001
REMARK 2 : Effective Refusal

JOB # : 11259
TEST # : 1
CONE TYPE/SERIAL #: I-CFXY-10 / 080238T

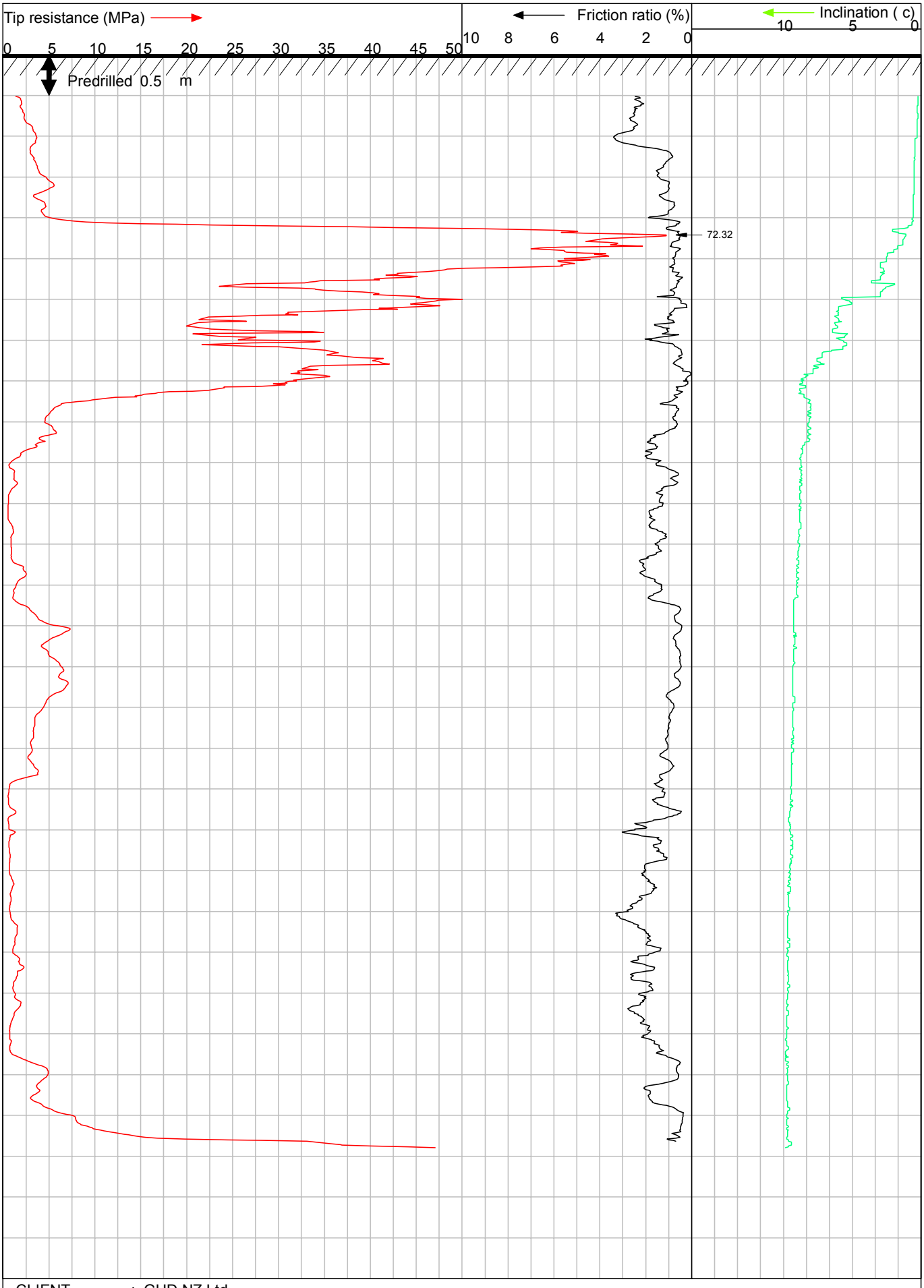
McMILLAN DRILLING SERVICES
120 High St Southbridge CANTERBURY NZ
Ph +64 3 324 2571 Fax +64 3 324 2431
www.drilling.co.nz

PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	11259	Date:	1-11-2012
CPT No:	CPT001	Operator:	S.Cardona
Project:	GHD NZ Ltd	Remark:	Effective Refusal
Location:	85 Poulson Street, Christchurch		

McMILLAN DRILLING SERVICES

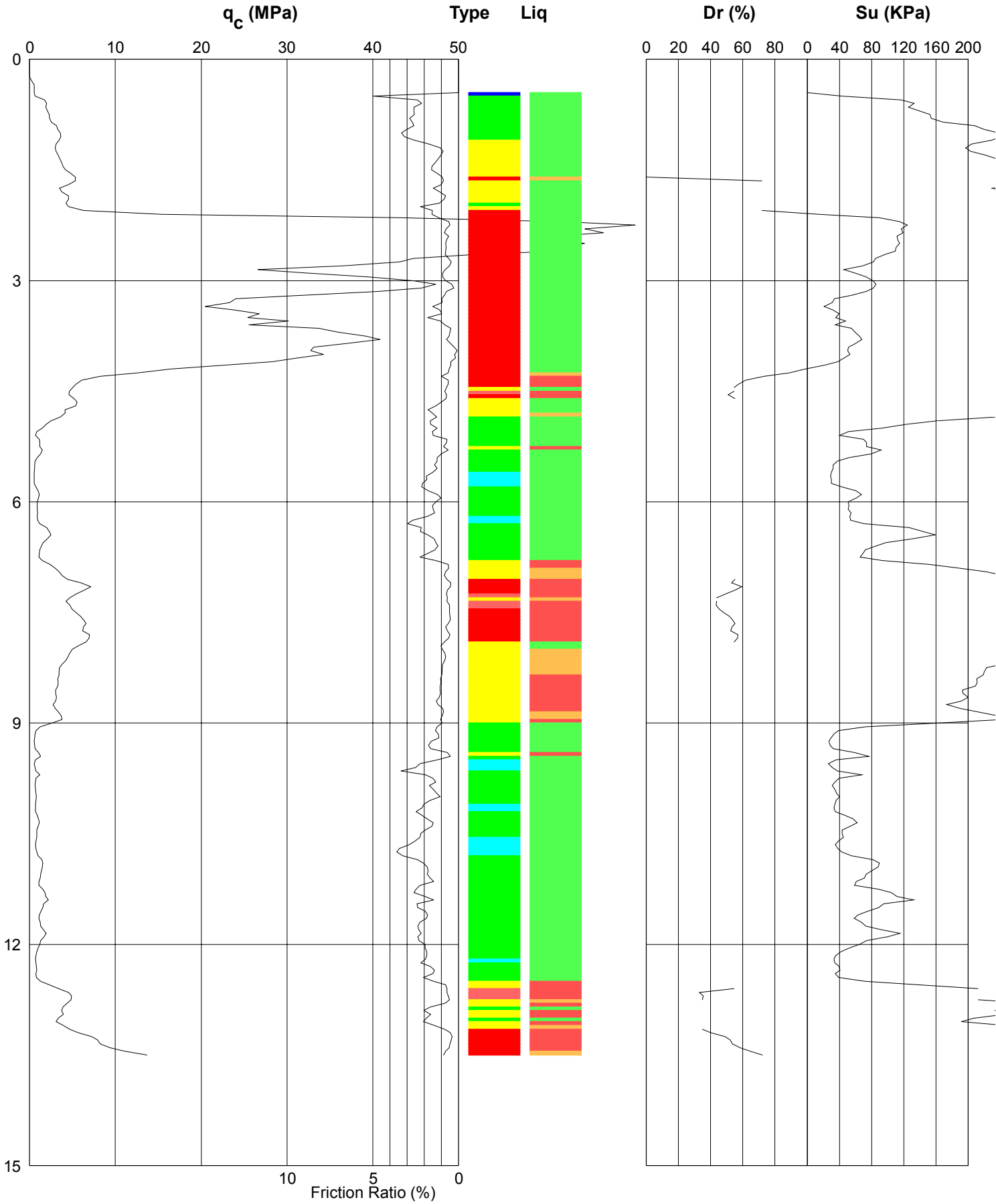


CLIENT : GHD NZ Ltd
LOCATION : 85 Poulson Street, Christchurch
DATE : 1-11-2012
OPERATOR : S.Cardona
REMARK 1 : CPT002
REMARK 2 : Effective Refusal

JOB # : 11259
TEST # : 2
CONE TYPE/SERIAL #: I-CFXY-10 / 080238T

McMILLAN DRILLING SERVICES
120 High St Southbridge CANTERBURY NZ
Ph +64 3 324 2571 Fax +64 3 324 2431
www.drilling.co.nz

PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	11259	Date:	1-11-2012
CPT No:	CPT002	Operator:	S.Cardona
Project:	GHD NZ Ltd	Remark:	Effective Refusal
Location:	85 Poulson Street, Christchurch		

McMILLAN DRILLING SERVICES

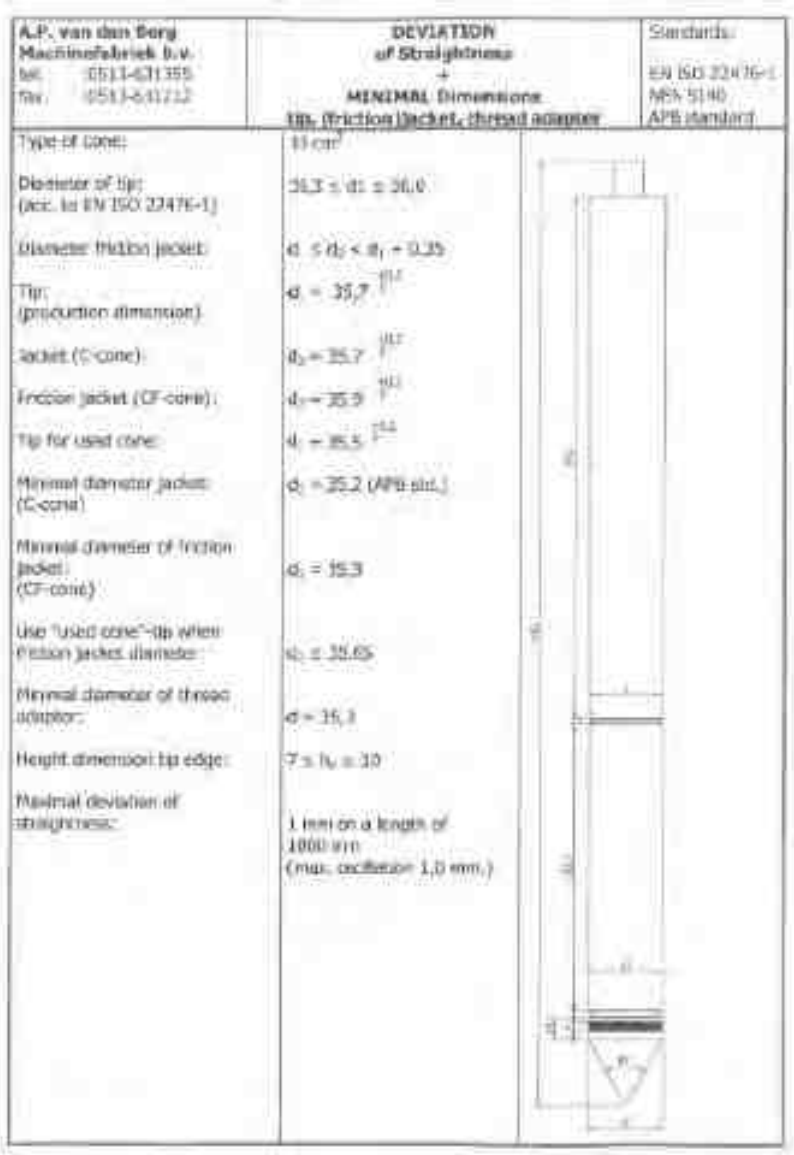
CPT CALIBRATION AND TECHNICAL NOTES

These notes describe the technical specifications and associated calibration references pertaining to the following cone types:

- ELCI-10CFXY measuring cone resistance, sleeve friction and inclination (standard cone);
- ELCI-CFXYP20-10 measuring cone resistance, sleeve friction, inclination and pore pressure (piezo cone).

Dimensions

Dimensional specifications for both cone types are detailed below. All tolerances are routinely checked prior to testing and measurements taken are manually recorded on CPT field sheets. All field sheets are kept on file and available on request.



A.P. van den Berg Machinefabriek b.v. tel: 0513-631355 fax: 0513-631712	DEVIATION of Straightness + MINIMAL Dimensions tip, (friction)jacket, thread adapter	Standards: EN ISO 22476-1 NEN 5140 API5 standard
Type of cone:	10 cm²	
Diameter of tip: (acc. to EN ISO 22476-1)	35,3 ≤ d1 ≤ 36,0	
Diameter friction jacket:	$d_1 \leq d_2 < d_1 + 0,35$	
Tip: (production dimension)	$d_1 = 35,7^{+0,3}$	
Jacket (C-cone):	$d_2 = 35,7^{+0,3}$	
Friction jacket (CF-cone):	$d_2 = 35,9^{+0,1}$	
Tip for used cone:	$d_1 = 35,5^{+0,5}$	
Minimal diameter jacket: (C-cone)	$d_2 = 35,2$ (API5 std.)	
Minimal diameter of friction jacket: (CF-cone)	$d_2 = 35,3$	
Use "used cone"-tip when friction jacket diameter:	$d_2 \leq 35,65$	
Minimal diameter of thread adaptor:	$d = 35,3$	
Height dimension tip edge:	$7 \leq h_1 \leq 10$	
Maximal deviation of straightness:	1 mm on a length of 1000 mm (max. oscillation 1,0 mm.)	

Cone surface ratio



CPT CALIBRATION AND TECHNICAL NOTES (cont.)

Calibration

Each cone has a unique identification number that is electronically recorded and reported for each CPT test. The identification number enables the operator to compare 'zero-load offsets' to manufacturer calibrated zero-load offsets.

The recommended maximum zero-load offset for each sensor is determined as ± 10% of the maximum measuring range although the more conservative trigger point adopted by McMillan Drilling Services is ± 10% of the nominal range.

In addition to maximum zero-load offsets, McMillan Drilling Services also limits the difference in zero load offset before and after the test as ± 1% of the maximum measuring range. See table below:

	Tip (MPa)	Friction (MPa)	Pore Pressure (MPa)
Maximum Measuring Range:	150	1.50	3.00
Nominal Measuring Range:	100	1.00	2.00
Max. 'zero-load offset':	10	0.10	0.20
Max 'before and after test':	1.5	0.015	0.03

Note: The zero offsets are electronically recorded and reported for each test in the same units as that of each sensor.

TEST CERTIFICATE
Icone (all versions)

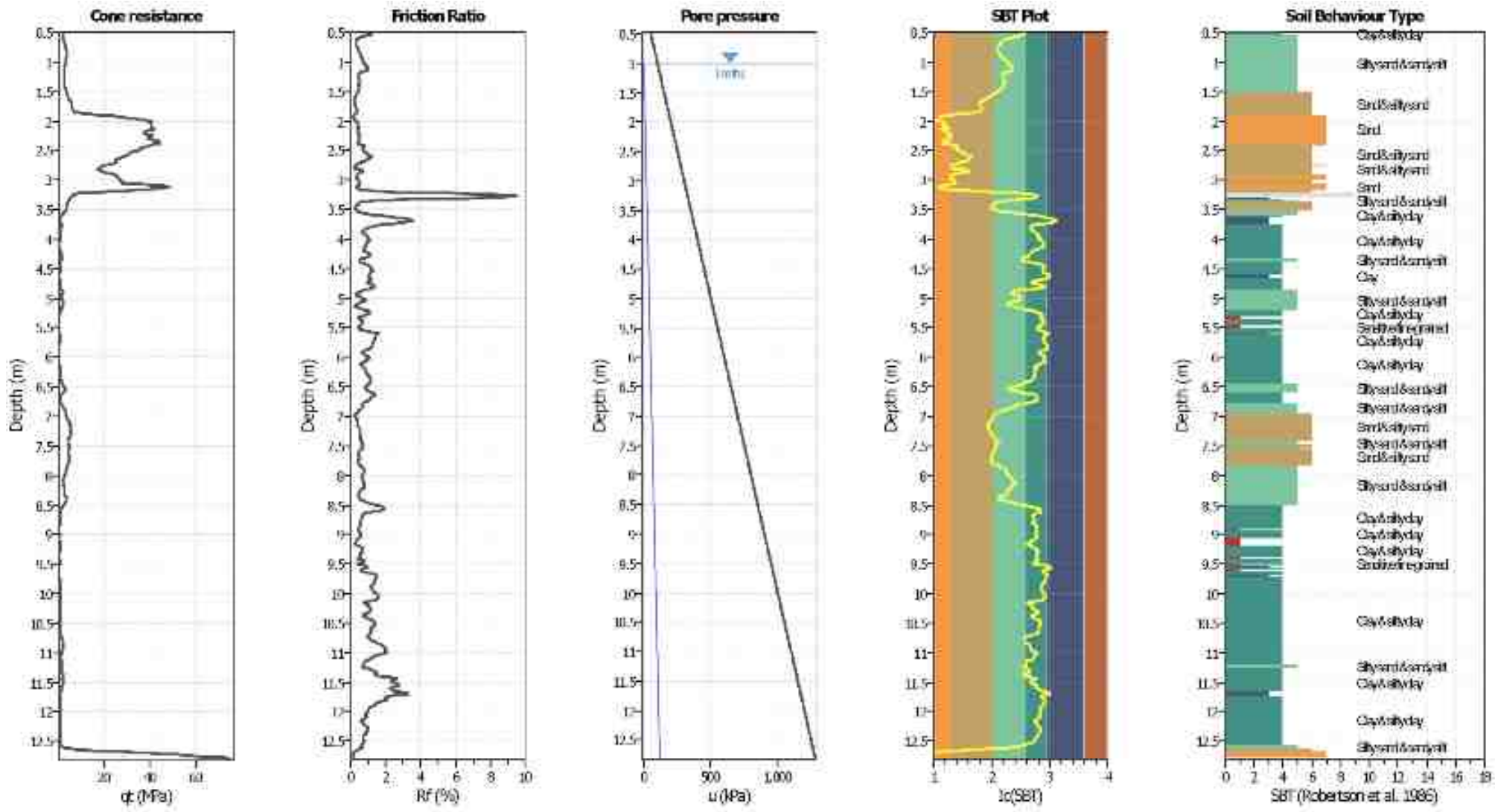
Supplier:	A.P. v.d. Berg Machinefabriek, Heerenveen The Netherlands
Production-order:	55346.001
Client:	Mc Millan
Cone-type:	ELCI 10 CFXY
Cone-number:	080238

To test / To check item	**Required value**	**Checked value**
Isolation-resistance	>0.5 G-Ohm	O.K. Gohm
Straightness	S=<0,2 mm	O.K. mm
Zero-Value Tip	Good	-2,74 MPa
Zero-Value Local Friction	Good	-0,043 MPa
Zero-Value Pore Pressure	Good	n.v.t. kPa
Zero-Value Inclination X Zero-Value Inclination Y	-2° < X <+2° -2° < Y <+2°	-0,1 ° 0,0 °
Measurements Tip resistance OK?	Yes	0-50 MPa
Influence of Tip on Local Friction? (Tip: 100 kN; Mantle free?)	No influence	O.K.
Measurements Local Friction OK?	Yes	0-0,607 MPa
Measurements Pore Pressure OK?	Yes	n.v.t. kPa
Measurements Inclination OK?	Yes	-24-0-24
Cone recognition on disconnecting and connecting Icone again?	Yes	O.K.
Software version 1.7 installed? Check at opening screen	Yes	O.K.
Thresholds for rapid exit set to maximum	Yes	O.K.

Remarks:

Calibrated by: C.J. Wandijn	Date: 22-11-'11	Sign.:	
Final check: J.E. Terhaag	Date: 22-11-'11	Sign.:	

CPT basic interpretation plots



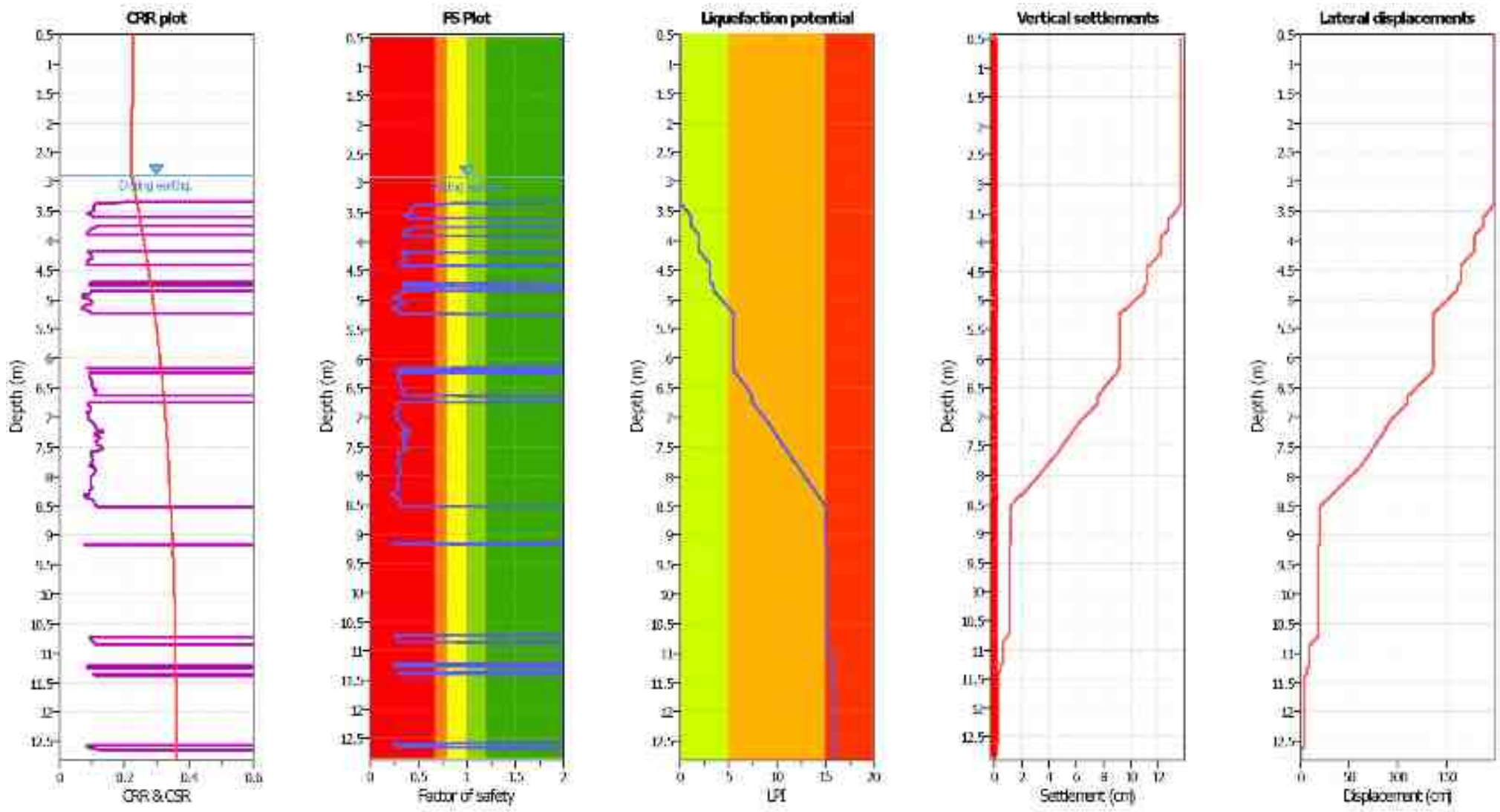
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.35	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

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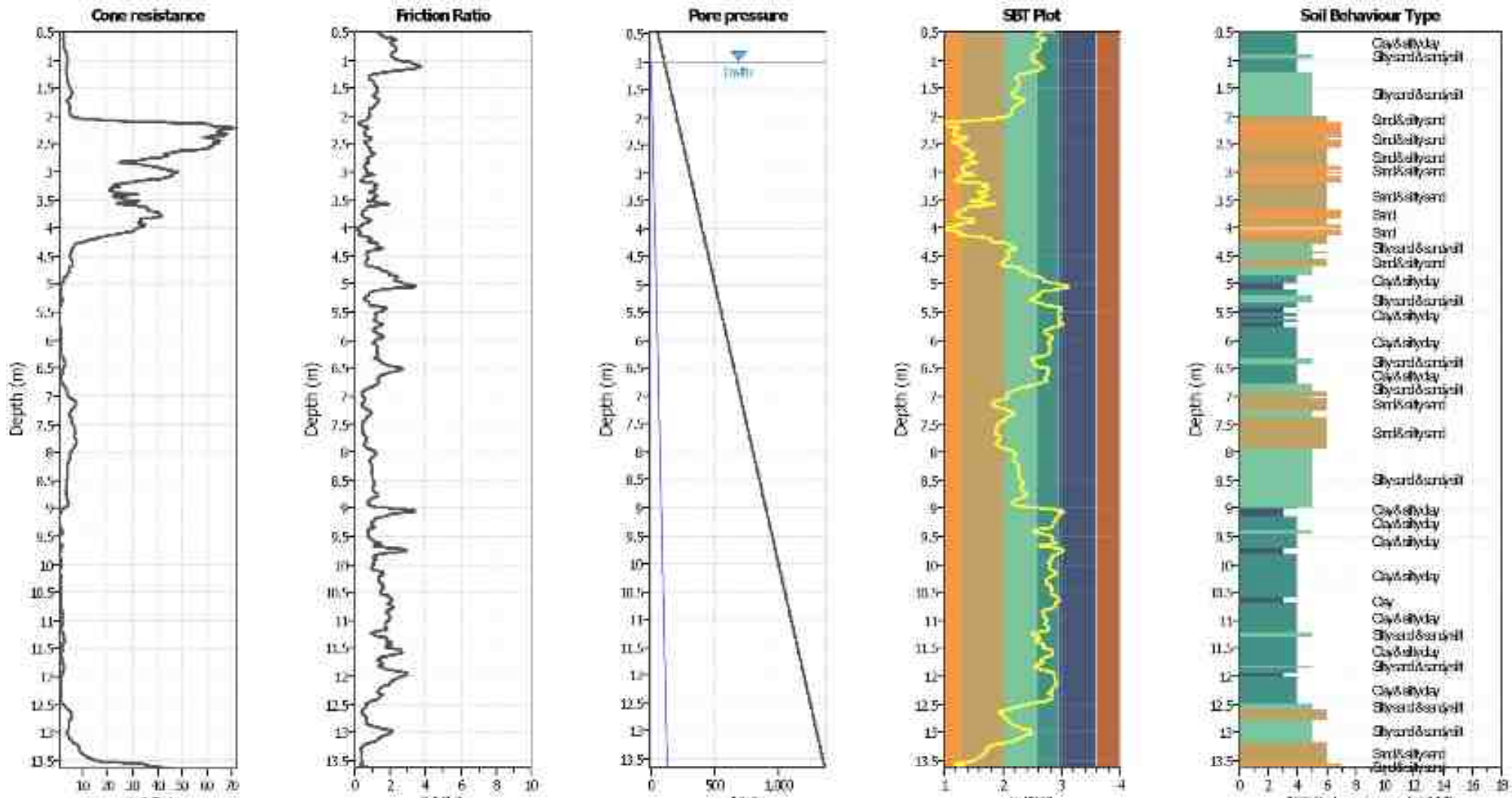
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



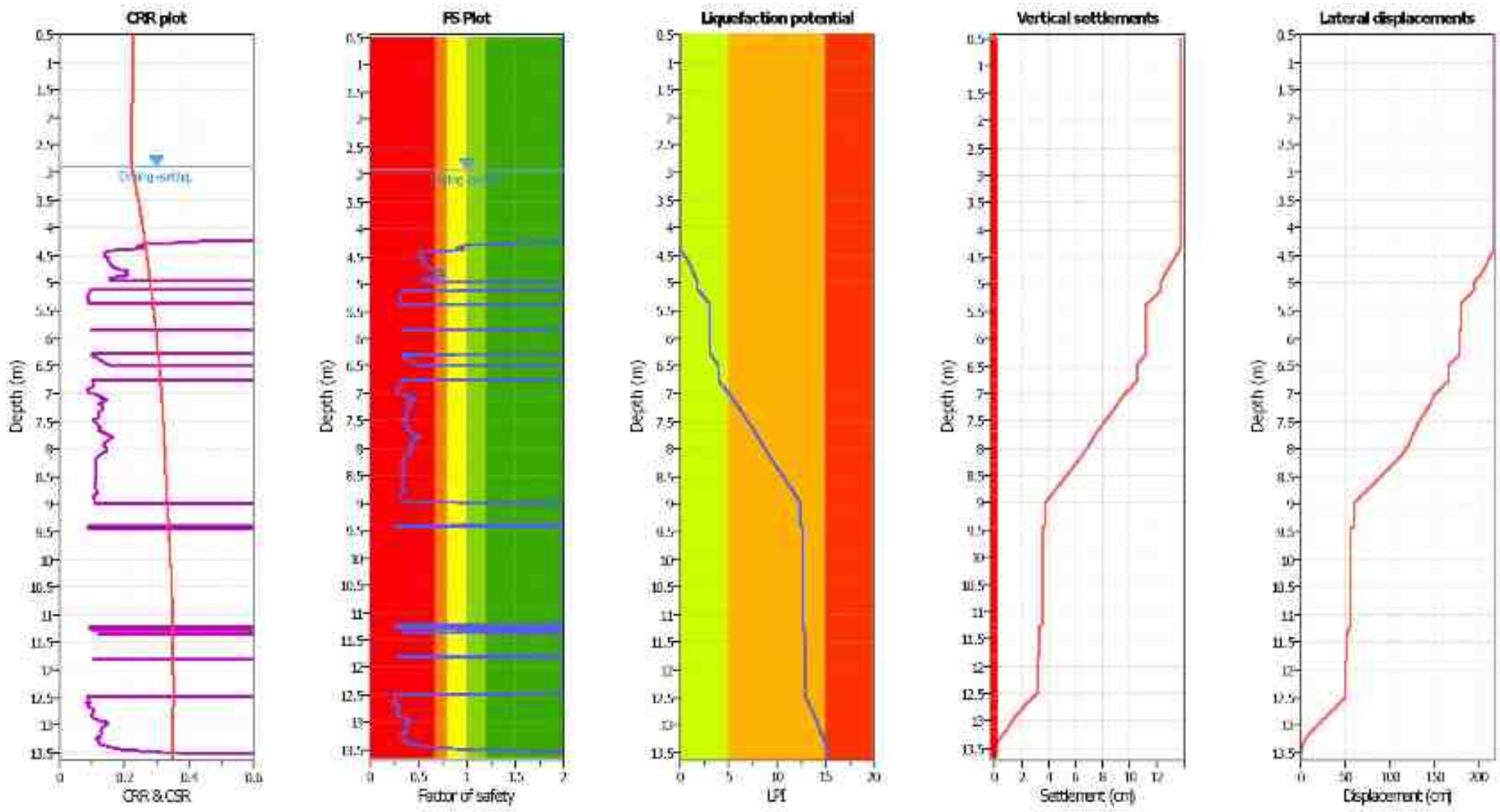
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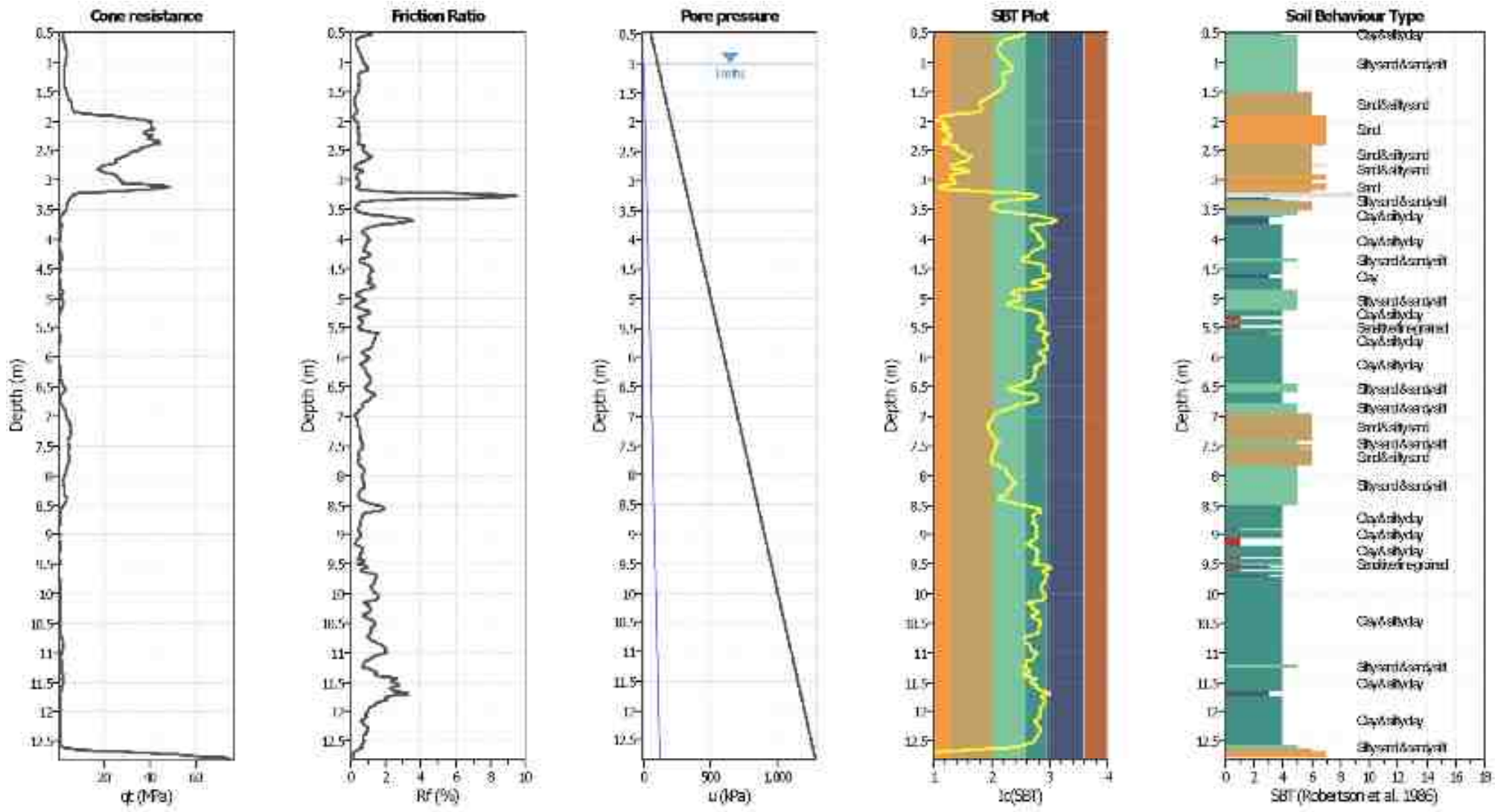
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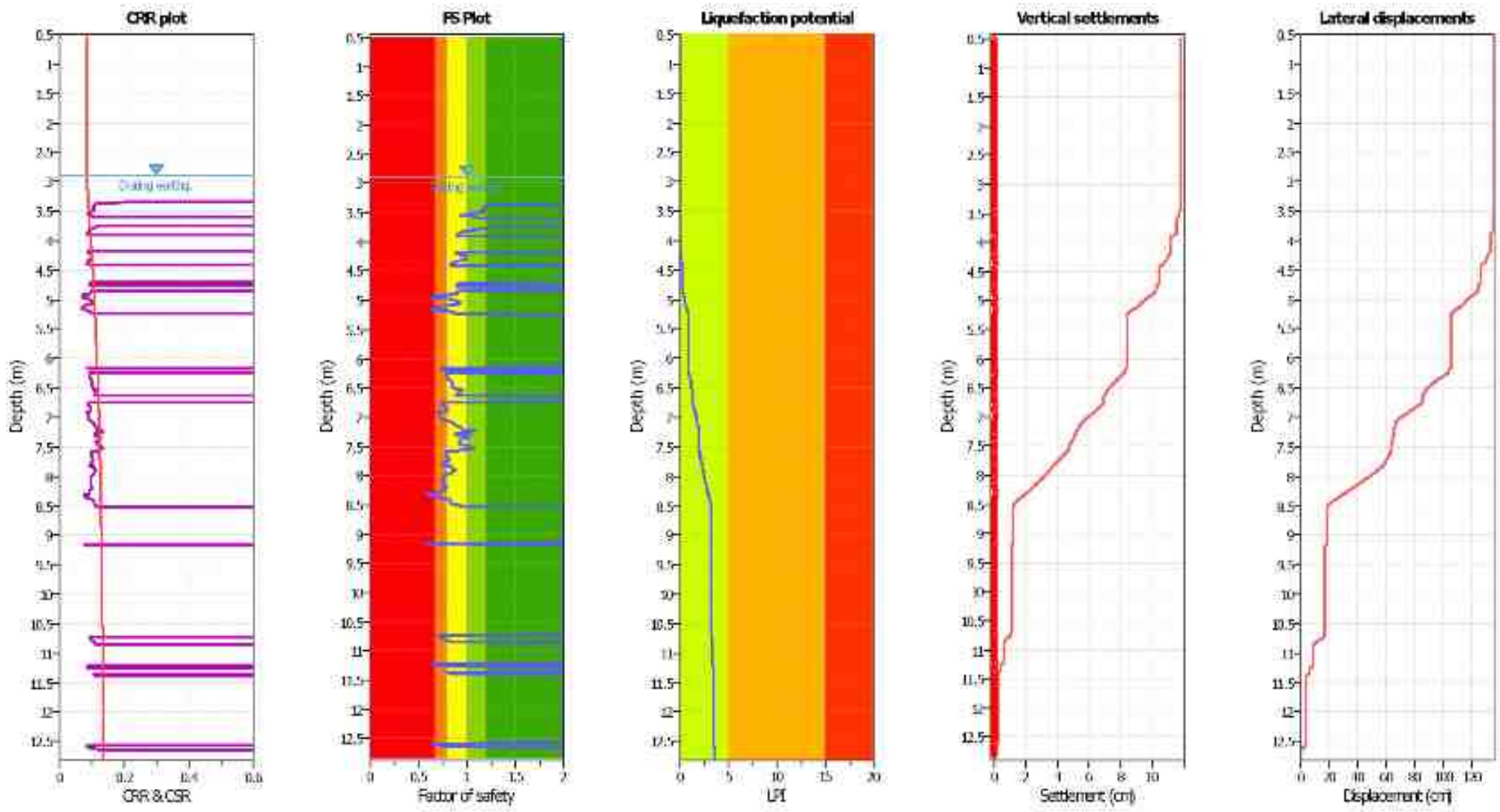
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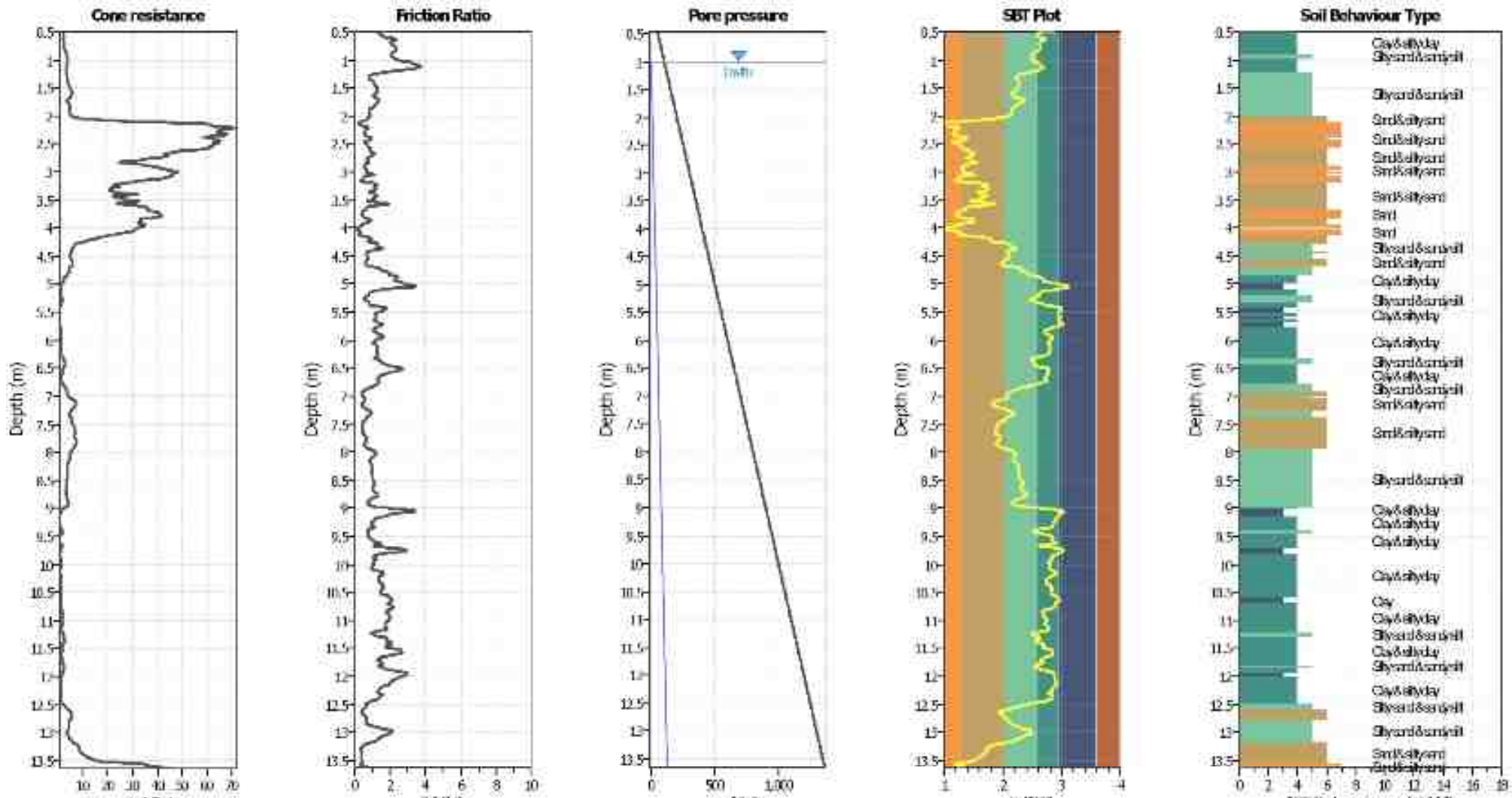
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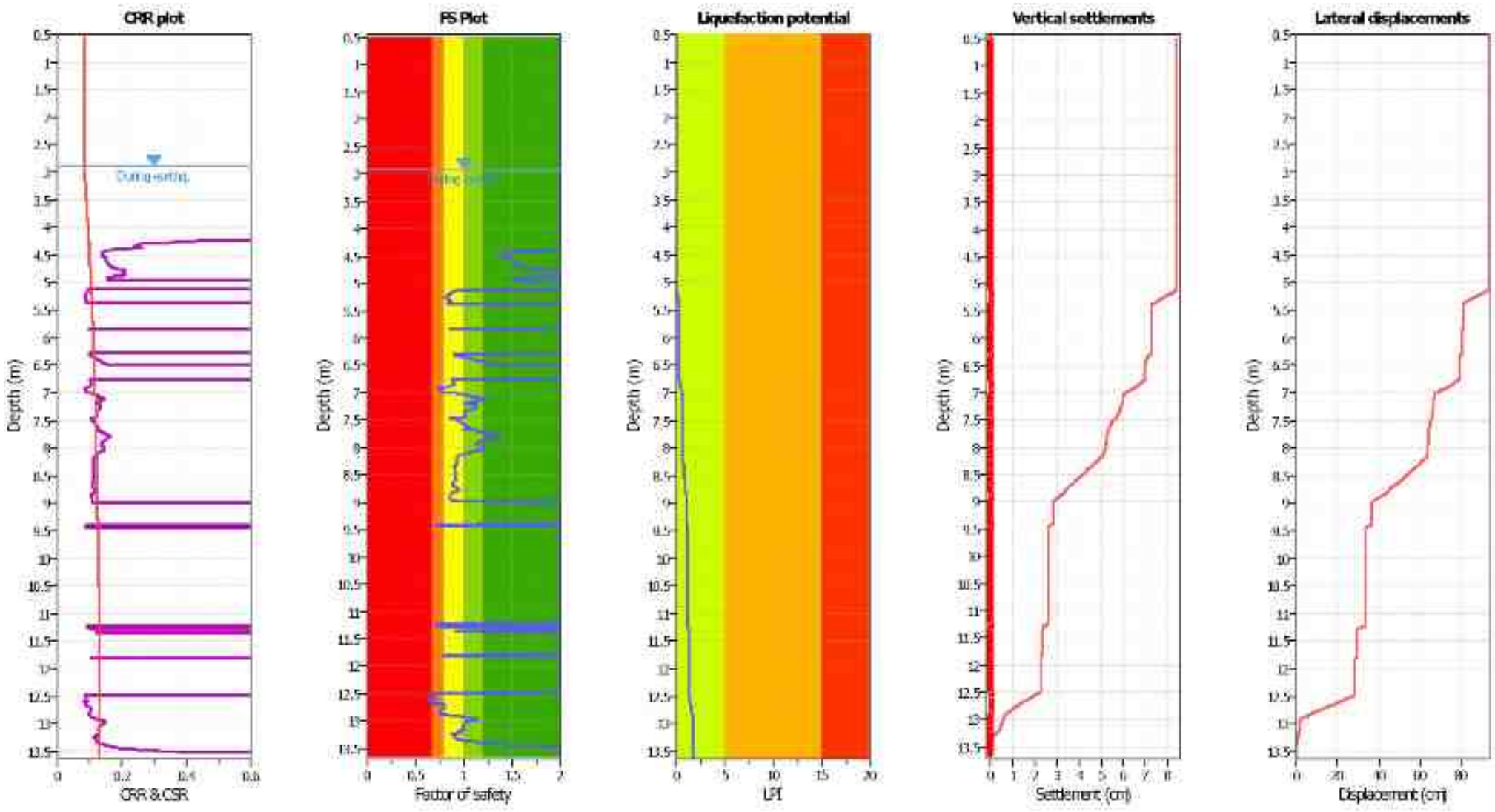
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