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Burwood Park North – Toilets
PRK 0724 BLDG 001

Detailed Engineering Evaluation
Qualitative Report
Version Final

75 New Brighton Road, Burwood

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

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75 New Brighton Road, Burwood

Christchurch City Council

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Date
15 May 2013

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Burwood Park North – Toilets

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Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version Final

75 New Brighton Road, Burwood

Background

This is a summary of the Qualitative report for the ground floor public toilets in the pavilion building at Burwood Park North, and is based in part on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 and visual inspections of the toilet portion of the building only on 27th August 2012.

Building Description

The toilets are located in the pavilion building in Burwood Park North at 75 New Brighton Road, Burwood. The original pavilion building was constructed pre-1981 with significant alterations and additions to the building in 2004. Extensions to the building were added to the south, east and west. The pavilion/toilet building is two storeys with the ground floor being used for changing rooms, public toilets and sporting equipment storage. The first floor of the building is used as a function room with kitchen and toilets.

The general construction of the building is concrete masonry walls to the ground floor and timber framed walls to the upper floor. The roof consists of lightweight metal cladding fixed to timber roof sarking on timber roof trusses. Roof trusses are supported by steel beams spanning transversely across the pavilion. The steel beams are supported by steel square hollow section posts at each end. The first floor consists of reinforced and prestressed concrete slabs supported by external and internal concrete masonry lower walls. The ground floor is on-grade concrete floor slabs. Foundations are strip footings under all walls and pads under all steel posts.

Key Damage Observed

Key damage to the toilets observed includes:-

- Cracking to concrete masonry walls to the ground floor toilet amenities.

Critical Structural Weaknesses

The following potential critical structural weaknesses have been identified in the whole pavilion structure.

- Liquefaction Potential (30% reduction)
- Damage (5% reduction)

(Resulting in 43% NBS)

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the original capacity of the building has been assessed to be in the order of 45% NBS and post-earthquake capacity in the order of 43% NBS. The buildings post-earthquake capacity excluding critical structural weaknesses is in the order of 64% NBS.

The pavilion building has been assessed to have a seismic capacity in the order of 43% NBS and is therefore considered to be an Earthquake Risk building.

Recommendations

The recent seismic activity in Christchurch has caused minor visible damage to the building. As the building has suffered damage that could potentially compromise the load resisting capacity of the existing structural system and has achieved less than 67% NBS following an initial IEP assessment of the building, GHD Limited recommends that a detailed quantitative assessment be performed.

As the building has been classified as not being potentially Earthquake Prone and there are no immediate collapse hazards, general access to the building is permitted.

1. Background

GHD Limited has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the toilets in the pavilion building at Burwood Park North.

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

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential critical structural weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. Construction drawings were made available, and these have been considered in our evaluation of the building. The building description is based on a review of the drawings and our visual inspections.

2. Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

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

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

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

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

2.2 Building Act

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

Section 112 – Alterations

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

Section 115 – Change of Use

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

2.2.1 Section 121 – Dangerous Buildings

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

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

Section 122 – Earthquake Prone Buildings

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

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

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

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

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

2.4 Building Code

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

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

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

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

3. Earthquake Resistance Standards

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

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

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

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

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

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

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

Table 1 %NBS compared to relative risk of failure

4. Building Description

4.1 General

The pavilion building is located at 75 New Brighton Road, Burwood. The original Pavilion was constructed pre-1981 with significant alterations and additions to it in 2004. Extensions to the building were added to the south, east and west. The pavilion/toilet building is two storeys with the ground floor being used for changing rooms, public toilet and sporting equipment storage. The first floor of the building is used for office space and a function room.

From the drawings, the general construction of the building is concrete masonry walls to the ground floor and timber framed walls to the upper floor. The roof consists of lightweight metal cladding fixed to 15mm thick timber roof sarking on 200mm x 75mm timber roof trusses. Roof trusses are supported by 360mm UBs and 300mm x 90mm parallel flange channel steel beams spanning transversely across the pavilion. The steel beams are supported by 102mm steel square hollow section posts at each end. The upper floor timber framed walls are lined internally with 13mm thick plasterboard cladding and externally with treated timber weatherboard. The first floor consists of one way spanning, mesh reinforced pre-stressed concrete slabs and supported by external and internal concrete masonry lower walls. The ground floor is on-grade concrete floor slabs. Foundations are strip footings under all walls and pads under all steel posts.

The pavilion building is approximately 35m in length and 11m wide. The toilet portion of the building is 3m across by 6.2m along. Plan area of the ground floor toilets is approximately $17m^2$. The height of the toilet block including the upper timber framed portion of the pavilion is approximately 5.5m. The nearest building to the pavilion is the bowling club pavilion approximately 150m south-west. The nearest waterway is the Avon River, approximately 850m to the east. The site is flat with no variations in ground level.

4.2 Gravity Load Resisting System

Gravity loads are transferred from the pavilion roof cladding through to the timber roof sarking to the timber roof trusses of the pitched roofs and to the timber rafters for the flat roofs. Loads are then transferred down through the trusses and into the supporting steel beams. The steel beams span between steel posts which transfer the loads down to the concrete first floor. Roof loads transferred from the flat roof rafters are transferred to supporting timber beams and to the timber framed external walls. These loads are then transferred down through the walls to the concrete first floor. All internal loads are transferred through the reinforced pre-stressed concrete floor slabs and to the supporting concrete masonry lower level walls. Loads are transferred through the masonry walls to the concrete strip foundations and into the ground below.

4.3 Lateral Load Resisting System

Lateral load resistance systems to the pavilion in both the along and across directions are similar. Timber sarking provides minimal bracing to the roof structure. Further bracing to the roof is provided by plasterboard ceilings fixed to the underside of the trusses in places. Wall bracing to the first floor is provided by the timber framed external and internal walls and by a number of steel portal frames. The reinforced concrete first floor slabs act as a rigid diaphragm providing lateral restraint to the structure.

Lateral load resistance on the ground floor is provided by the internal and external reinforced concrete masonry walls in both directions.

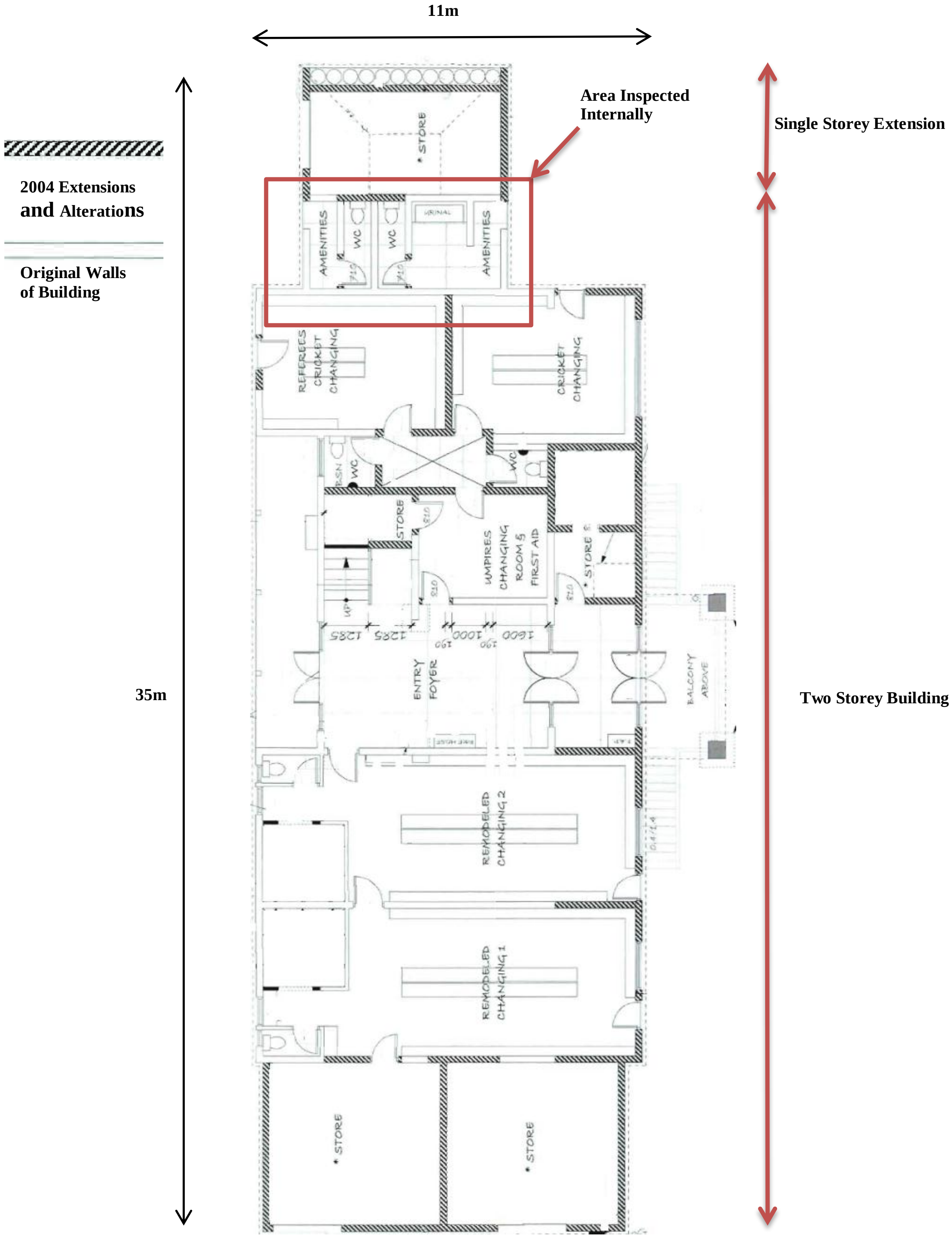


Figure 2 Plan of the Ground Floor Showing Key Structural Elements with Toilets Highlighted

5. Assessment

An inspection of the building was undertaken on the 27th of August 2012. Both the interior and exterior of the toilet amenities of the building were inspected. The remainder of the building was not inspected.

The inspection consisted of examining the toilet structure, internally and externally, to determine the structural systems and likely behaviour of the building during an earthquake. Visual inspection of the exterior of the remainder of the pavilion was also carried out. The site was assessed for damage, including examination of the ground conditions, checking for damage in areas where damage would be expected for the type of structure and noting general damage observed throughout the building in both structural and non-structural elements.

The %NBS score determined for the pavilion has been based on the IEP procedure described by the NZSEE and based on the information obtained from visual observation of the building and plan drawings of the building.

6. Damage Assessment

6.1 Surrounding Buildings

The pavilion building is located in a park reserve with sporting facilities all around. East Christchurch Shirley Cricket Club and Shirley Rugby Football Club operate out of the building. Visible damage to the exterior of the pavilion was limited to cracking along mortar lines of the concrete masonry walls.

6.2 Residual Displacements and General Observations

No residual displacements of the toilet amenities structure were noticed during our inspection of that part of the building.

Cracking was noted along the mortar lines of the building in several locations. A strength reduction of 5% has been applied to the building as a result of this.

6.3 Ground Damage

Post-earthquake aerial photography of the site indicates that liquefaction has occurred on site. There was no indication of site settlement. Although liquefaction had occurred at the site, no evidence of liquefaction remained. No damage was noted to paving in the area.

7. Critical Structural Weakness

7.1 Short Columns

No short columns are present in the structure.

7.2 Lift Shaft

The building does not contain a lift shaft.

7.3 Roof

Roof elements of the pavilion were not able to be inspected as a result of the lack of access to the majority of the building. The ceiling of the toilets is suspended concrete slab which acts as a diaphragm.

7.4 Staircases

The pavilion staircases are steel. The toilet portion of the building does not contain a staircase.

7.5 Site Characteristics

Following the geotechnical appraisal it was found that the site has a moderate to high potential for liquefaction. For the purposes of the IEP assessment of the building and the determination of the %NBS score, the effects of soil liquefaction on the performance of the building has been assessed as a 'significant' site characteristic in accordance with the NZSEE guidelines.

8. Geotechnical Consideration

Introduction

This desktop geotechnical study outlines the ground conditions, as indicated from sources quoted within, for inclusion in the subject structure's DEE Qualitative Assessment.

This report is specific to Detailed Engineering Evaluations. The site is within Burwood Park, and is owned by the Christchurch City Council.

8.1.1 Site Description

The site is situated in the suburb of Burwood, northeast of Christchurch City centre. The site is relatively flat at approximately 10m above mean sea level. It is approximately 900m west of Avon River, 4.5km east of the Main North Line Railway, and 5km west of the coast (Pegasus Bay).

8.1.2 Published Information on Ground Conditions

8.1.2.1 Published Geology

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

- Marine deposits of Christchurch Formation, dominantly sand of fixed and semi-fixed dunes and beaches, Holocene in age.

Due to the low-lying location of the site, shallow ground water table is anticipated.

8.1.2.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that there are four boreholes located within 200m of the site. The information in the boreholes are summarised in the table below (see Table 2).

These indicate that the area is underlain by layers of sand and clay with varying amount of gravel and peat.

Table 2 ECan Borehole Summary

Bore Name	Log Depth	Groundwater	Distance & Direction from Site
M35-1892	81.69m	1.9m bgl	155m W
M35-2092	116.1 m	1.8m bgl	175m NW
M35-2110	119.2 m	1.8m bgl	175m NW
M35-2113	81.1 m	2.1m bgl	60m W

It should be noted that the boreholes were sunk for groundwater extraction and not for geotechnical purposes. Therefore, the amount of material recovered and available for interpretation and recording will

[1] Forsyth, P. J., Barrell, D. J. A., & Jongens, R. (2008): *Geology of the Christchurch Urban Area*. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 16. IGNS Limited: Lower Hutt.

have been variable at best and may not be representative. The logs have been written by the well driller and not a geotechnical professional or to a standard. In addition strength data is not recorded.

8.1.2.3 EQC Geotechnical Investigations

The Earthquake Commission has undertaken geotechnical testing in the area of the site. Information pertaining to this investigation is included in the Tonkin & Taylor Report for Dallington Upper[2]. One investigation point was undertaken within 200m of the site, as summarised below in Table 3.

Table 3 EQC Geotechnical Investigation Summary Table

Bore Name	Orientation from Site	Depth (m bgl)	Log Summary
CPT-BUR-20	200m SE	0-2	Sand to silty sand Silty sand to sandy silt Sand to silty sand (GWL 2m bgl)

Initial observations of the CPT results indicate that the soil in that location is Sand with intermediate layers of Sand mixtures.

8.1.2.4 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 in expected to perform in future earthquakes.

The site is within an area classified as “Not Applicable” as it is a non-residential property. However, adjacent properties to the north, west, and south are classified as Green Zone TC2 (yellow) indicating that minor to moderate land damage from liquefaction is possible in future significant earthquakes. It should be noted that the land to the east of Burwood Park is within the Red Zone.

8.1.2.5 Post February Aerial Photography

Aerial photograph taken following the 22 February 2011 earthquake shows signs of severe liquefaction at road corridors near the site, as shown in Figure 3**.**

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

Figure 3 Post February 2011 Earthquake Aerial Photography[3]

8.1.2.6 Summary of Ground Conditions

From the information presented above, the ground conditions underlying the site are anticipated to comprise multiple strata of sand and clay with varying amounts of gravel and peat.

8.1.3 Seismicity

8.1.3.1 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.

Table 4 Summary of Known Active Faults[4,5]

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 (2010) Fault	25 km	W	7.1	~15,000 years
Hope Fault	105 km	NW	7.2~7.5	120~200 years

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

[4] 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, June 2002, pp. 1878-1903.

[5] GNS Active Faults Database, http://maps.gns.cri.nz/website/af/viewer

Kelly Fault	105 km	NW	7.2	150 years
Porter Pass Fault	65 km	NW	7.0	1100 years

The recent earthquakes since 4 September 2010 have identified the presence of a previously unmapped active fault system underneath the Canterbury Plains, including Christchurch City, and the Port Hills. Research and published information on this system is in development and not generally available. Average recurrence intervals are yet to be estimated.

8.1.3.2 Ground Shaking Hazard

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

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

8.1.4 Slope Failure and/or Rockfall Potential

Given the site's location in Burwood, global slope instability is considered negligible. However, any localised retaining structures or embankments should be further investigated to determine the site-specific slope instability potential.

8.1.5 Liquefaction Potential

The site is considered to be moderately to highly susceptible to liquefaction, due to the following reasons:

- Signs of moderate to high liquefaction at road corridors near the site (evidence from the post-earthquake aerial photograph);
- Anticipated presence of sand layers beneath the site; and,
- Anticipated shallow ground water table.

Due to the limited subsoil information, further investigation is recommended to better determine subsoil conditions. From this, a more comprehensive liquefaction assessment could be undertaken.

8.1.6 Conclusions & Recommendations

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

The site appears to be situated on marine deposits. Associated with this the site also has a moderate to high liquefaction potential, in particular where sands and/or silts are present.

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

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that intrusive investigation be conducted.

9. Survey

No level or verticality surveys have been undertaken for this building at this stage as indicated by Christchurch City Council guidelines.

10. Initial Capacity Assessment

10.1 % NBS Assessment

The pavilion building's seismic capacity has been assessed using the Initial Evaluation Procedure based on the information available. The buildings capacity excluding critical structural weaknesses and the capacity of any identified weaknesses are expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 5. These capacities are subject to confirmation by a detailed quantitative analysis.

Item	%NBS
Building excluding CSW's	64
Liquefaction Potential (30% reduction)	45
Damage to masonry (5% reduction)	43

Table 5 Indicative Building and Critical Structural Weaknesses Capacities based on the NZSEE Initial Evaluation Procedure

Following an IEP assessment, the pavilion building has been assessed as achieving 45% New Building Standard (NBS). Under the New Zealand Society for Earthquake Engineering (NZSEE) guidelines the building is considered to be Earthquake Risk as it achieves greater than 33% and less than 67% NBS. This score has been adjusted for damage to the structure as it is likely to adversely affect the load carrying capacity of the structural systems.

10.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS 1170.5:2004 and the NZBC clause B1 for this building are:

- Site soil class: D/E, NZS 1170.5:2004, Clause 3.1.3, Soft Soil
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- Return period factor R_u = 1.0, NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.

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

10.3 Expected Structural Ductility Factor

A structural ductility factor of 1.25 has been assumed based on the structural system observed and the date of construction.

10.4 Discussion of Results

The results obtained from the initial IEP assessment are consistent with those expected for a building of this age and construction type. Although the original building construction date is unknown, during the design of the alterations, in 2004, a detailed analysis and design would have been carried out to determine the loading on the building and was likely designed to the loading standard current at the time, i.e. NZS 4203:1992. The design loads used in this standard are likely to have been less than those required by the current loading standard. When combined with the increase in the hazard factor for Christchurch to 0.3, it would be expected that the building would not achieve 100% NBS.

10.5 Occupancy

The pavilion building does not pose an immediate risk to users and occupants as no immediate collapse hazards have been identified. As building has been assessed as not being Earthquake Prone and there are no immediate collapse hazards, general access to the building is permitted.

11. Initial Conclusions

The pavilion building has been assessed by the IEP to have a seismic capacity in the order of 43% NBS and is therefore potentially Earthquake Risk.

This building is not considered to pose an immediate risk to occupants as no immediate collapse hazards have been identified. As the building has not been classified as being potentially Earthquake Prone and there are no immediate collapse hazards, general access to the building is permitted.

The NZSEE guidelines recommend quantitative analysis and potential strengthening for structures assessed to be less than 67% NBS. GHD Limited considers that further assessment and strengthening design should be undertaken for this building.

12. Recommendations

It is recommended that the current placard status of the building of green remains as is.

The recent seismic activity in Christchurch has caused visible damage to portions of the building. As the building has achieved between 33% and 67% NBS following an initial IEP assessment of the building, GHD Limited recommends that a detailed quantitative assessment of the building's %NBS be carried out and possible strengthening options be explored.

As the building has not been classified as being potentially Earthquake Prone and there are no immediate collapse hazards, general access to the building is permitted.

13. Limitations

13.1 General

This report has been prepared subject to the following limitations:

- No intrusive structural investigations have been undertaken.
- No intrusive geotechnical investigations have been undertaken.
- Inspection of the function room, kitchen, upper floor toilets, changing rooms and storage was not undertaken as internal access was not permitted.
- Visual inspections of the roof space were not undertaken.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- No calculations, other than those included as part of the IEP in the CERA Building Evaluation Report, have been undertaken. No modelling of the building for structural analysis purposes has been performed.

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.

13.2 Geotechnical Limitations

This report presents the results of a geotechnical appraisal prepared for the purpose of this commission, and prepared solely for the use of Christchurch City Council and their advisors. 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.

The advice tendered in this report is based on a visual geotechnical appraisal. No subsurface investigations have been conducted. An assessment of the topographical land features have been made based on this information. It is emphasised that Geotechnical conditions may vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels can change in a limited distance or time. In evaluation of this report cognisance should be taken of the limitations of this type of investigation.

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

Appendix A

Photographs

Photograph 1 North elevation.

Photograph 2 Southern elevation.

Photograph 3 Toilet and gas storage portions of the eastern end of the building.

Photograph 4 Women's/disabled toilet on north eastern side of building.

Photograph 5 Cracking to masonry walls at entrance to men's toilet.

Photograph 6 Vertical cracking to internal masonry cubicle wall.

Photograph 7 Concrete panel capping the cubicle walls in men's toilet.

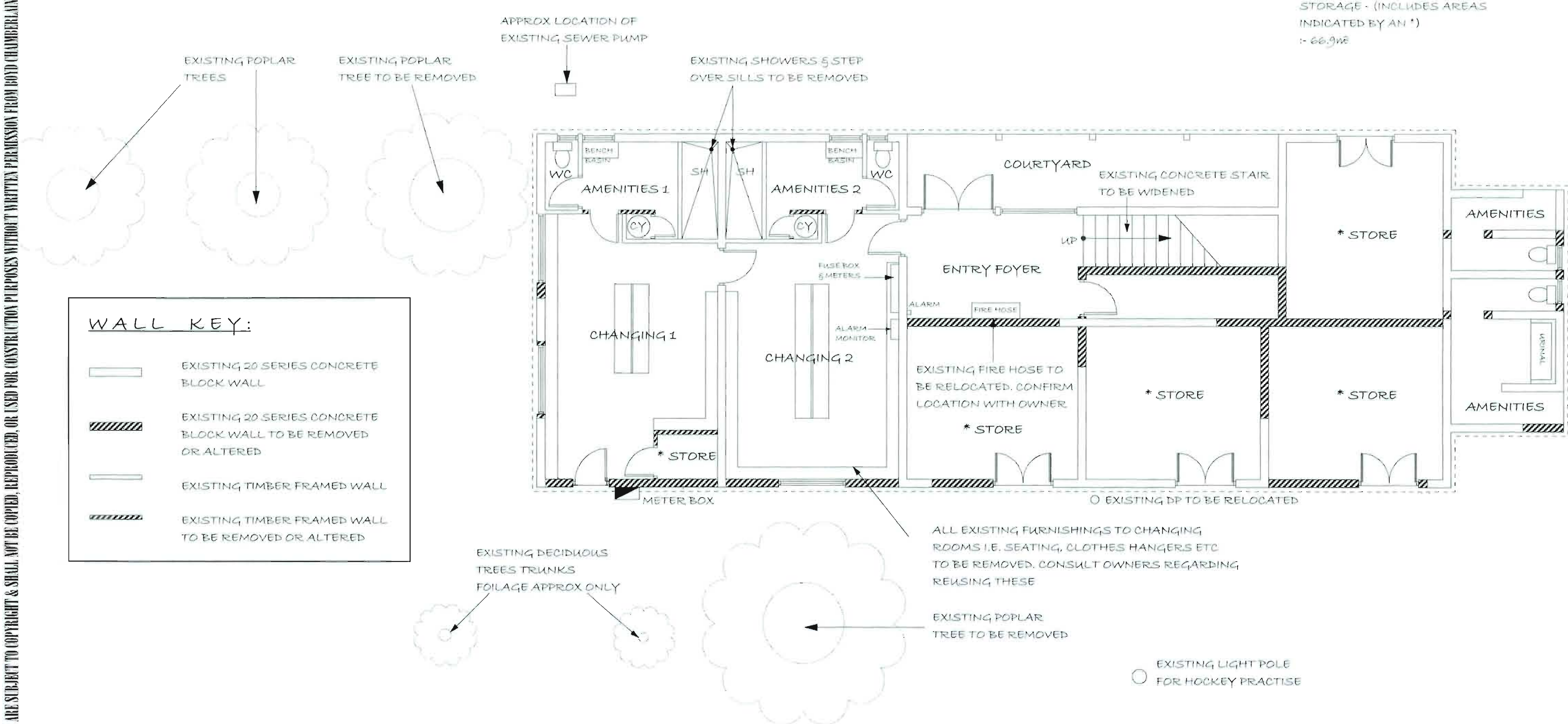
Photograph 8 Cracking to flexible seal.

Appendix B

Existing Drawings

STORAGE:

EXISTING GROUND FLOOR STORAGE - (INCLUDES AREAS INDICATED BY AN *)
:- 66.9m²



Boyd Chamberlain
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Email: bcdraughting@paradise.net.nz Po Box 13451 Chch

DRAWING TITLE :

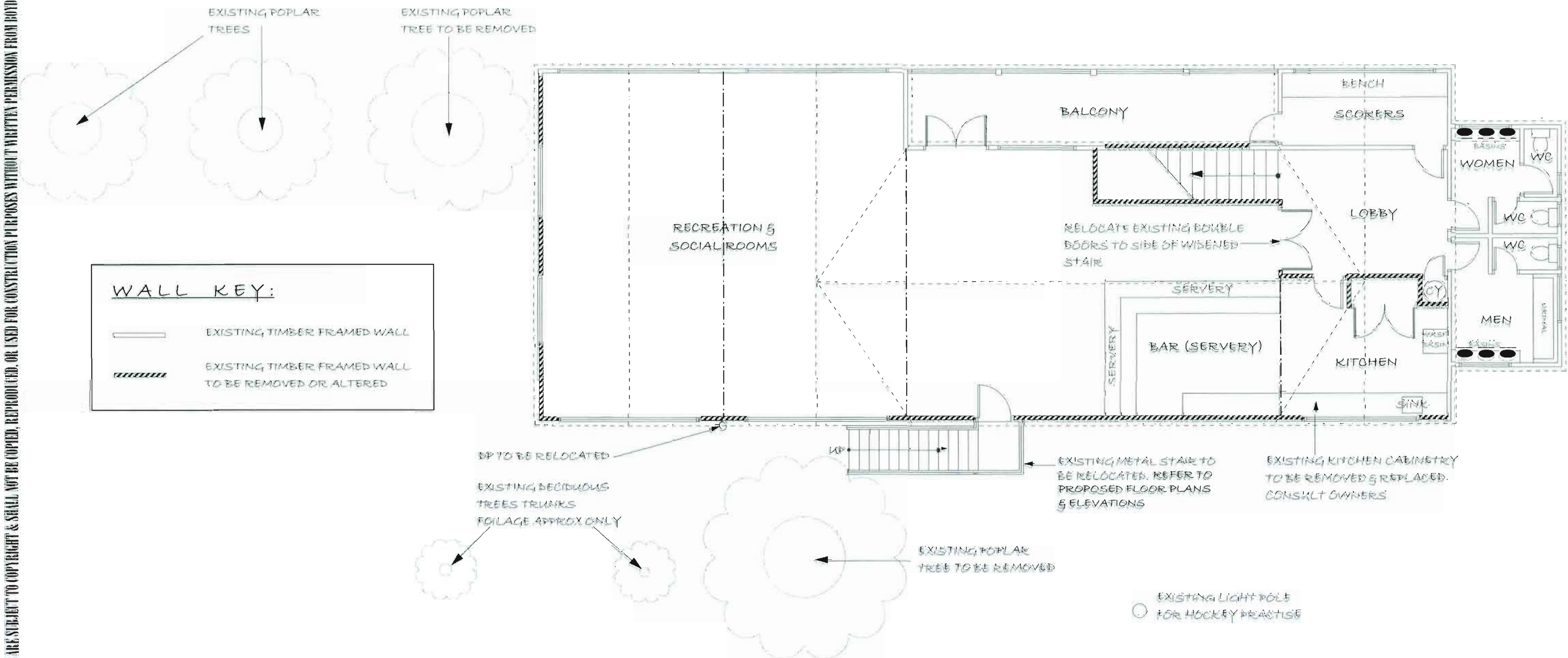
PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

NOTE:
ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED BEFORE ANY CONSTRUCTION COMMENCES. ALL WORK TO COMPLY WITH THE NZ BUILDING CODE & NZS 3604:1999

DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD JOB No. 02C/IE
SHEET TITLE :	EXISTING GROUND FLOOR PLAN

SHEET No: 3 OF: 23 REV: C

All building work shall comply with the New Zealand Building Code notwithstanding any discrepancies which may ... the drawings and specifications.



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DATE:	1/12/03		SHEET No.
SCALES:	1 : 100		4
DRAWN:	BCAD	JOB No. 02C115	
SHEET TITLE:	EXISTING FIRST FLOOR PLAN		OF: 23 REV: C

WALL KEY:

- EXISTING GROUND FLOOR WALLS
- PROPOSED 20 SERIES CONCRETE BLOCK. CONFIRM HEIGHT. i.e. WINDOW FILL
- PROPOSED TIMBER FRAMED WALL

REFERENCE KEY:

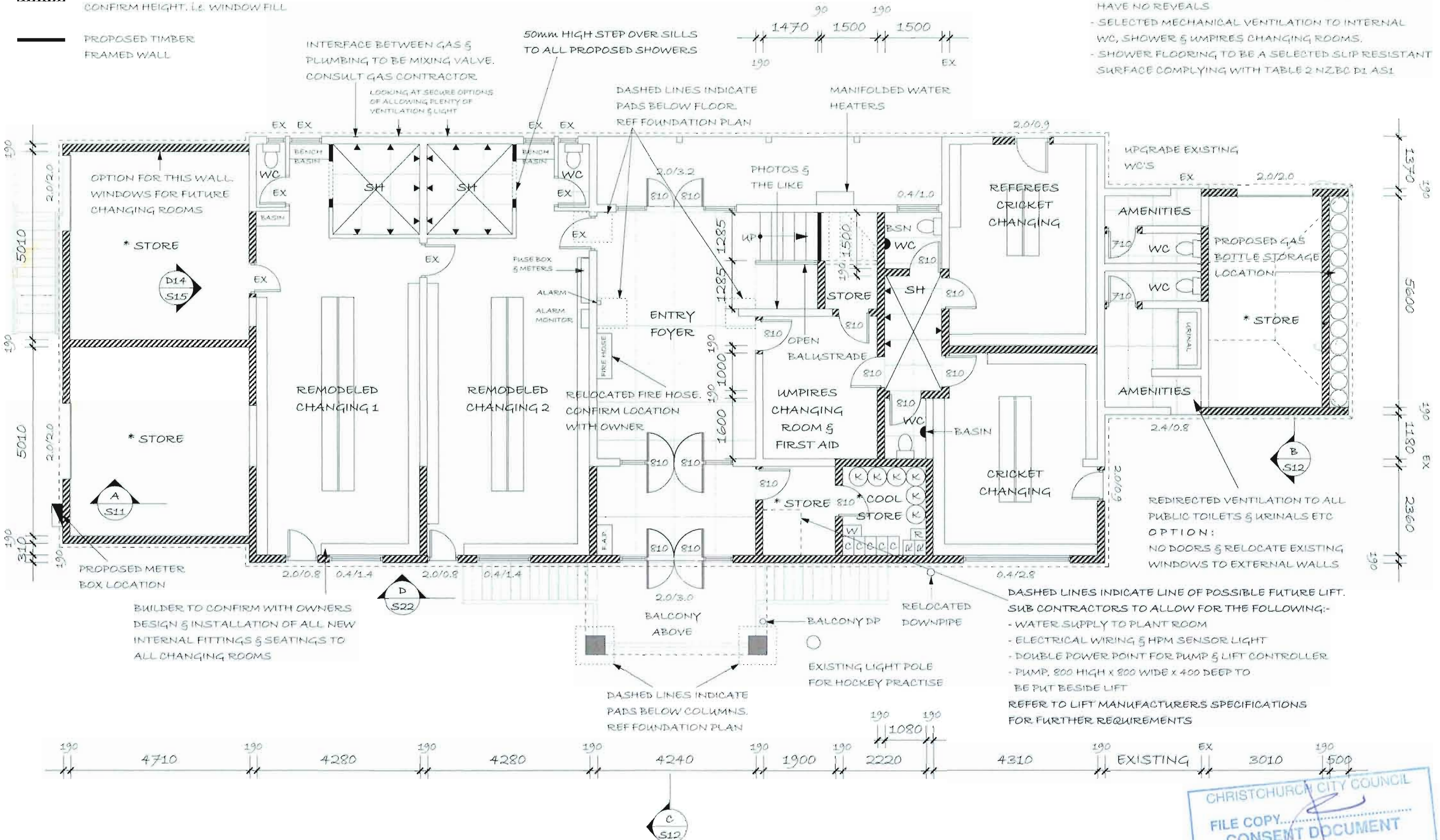
D10 / S10 — DETAIL No / SHEET No.

COOL STORE REQUIREMENTS:

- 12 KEGS STORED 2 HIGH. 700 HIGH. 500Ø
- 20 CRATES STORED 5 HIGH. 500 x 300 x 350 HIGH
- 2 BOXES OF WINE STORED 5 HIGH. 500 x 300 x 350 HIGH
- 8 BOXES OF RTD'S STORED 7 - 8 HIGH. 400 x 300 x 250 HIGH

NOTES:

- PROPOSED GROUND FLOOR STORAGE (INCLUDES AREAS INDICATED BY AN *) - 78.2m²
- ALL FLOOR COVERINGS DRAWN ARE INDICATIVE ONLY
- EX = EXISTING WINDOW OR DOOR
- ALL NEW DOORS TO PROPOSED CHANGING ROOMS TO HAVE NO REVEALS
- SELECTED MECHANICAL VENTILATION TO INTERNAL WC, SHOWER & UMPIRES CHANGING ROOMS.
- SHOWER FLOORING TO BE A SELECTED SLIP RESISTANT SURFACE COMPLYING WITH TABLE 2 NZBC D1 AS1



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DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD — JOB No: 02C/IE
SHEET TITLE:	PROPOSED GROUND FLOOR PLAN
SHEET No:	5
OF:	23
REV:	C

WALL KEY:

- EXISTING TIMBER FRAMED WALL
- PROPOSED TIMBER FRAMED WALL

REFERENCE KEY:

D10 / S10 — DETAIL No. / SHEET No.

POTENTIAL AREA REQUIREMENTS:

100 PEOPLE @ 2 PER m2 - BAR STANDING/LEANING
30 PEOPLE @ 1.7 PER m2 - DANCING
70 PEOPLE @ 1 PER m2 - BAR SITTING

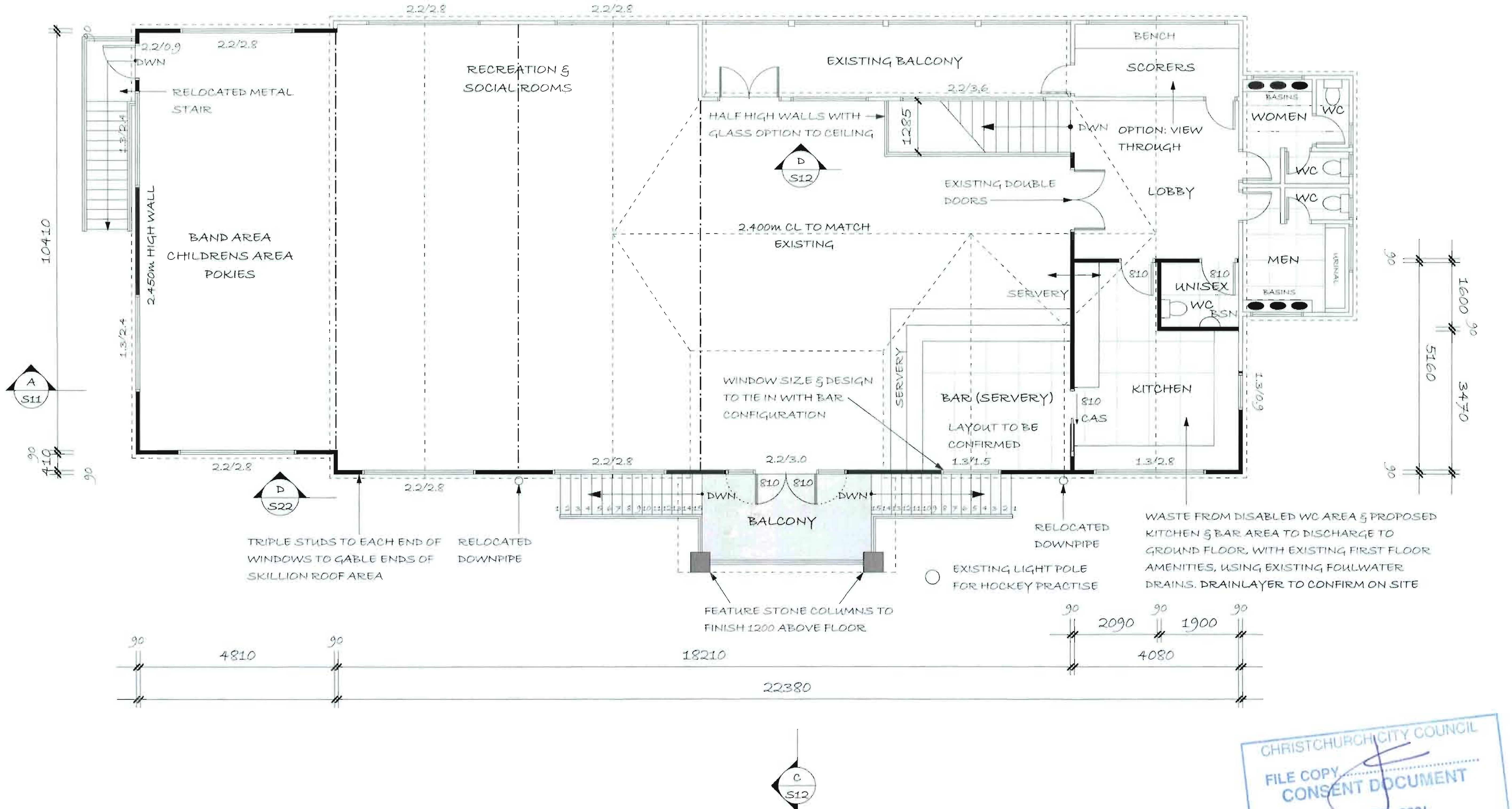
170 PEOPLE @ 0.8 PER m2 - DINING

NOTES:

EXTERNAL DRAINAGE LINES FROM FIRST FLOOR SERVICES TO BE HIDDEN

ALL FLOOR COVERINGS DRAWN ARE INDICATIVE ONLY

REFER TO KITCHEN DESIGNERS DRAWINGS & SPECIFICATIONS FOR KITCHEN & BAR LAYOUT



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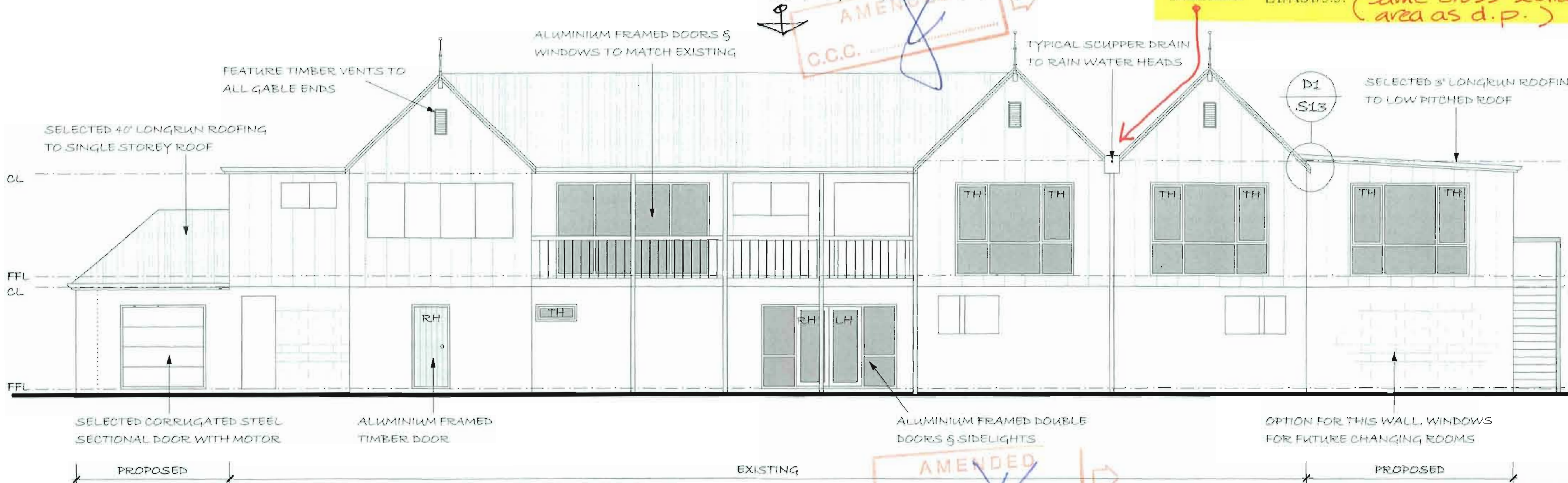
DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD — JOB No: 02C/E
SHEET TITLE:	PROPOSED FIRST FLOOR PLAN
SHEET No:	6
OF:	23
REV:	C

CHRISTCHURCH CITY COUNCIL ENVIRONMENT — **INTERNAL GUTTERS** shall have overflows complying with NZBC E1/AS1/5.5. (same cross-sectional area as d.p.)

PROPOSED NORTH ELEVATION



AMENDED C.C.C.

CHRISTCHURCH CITY COUNCIL ENVIRONMENT — **SAFETY GLASS** shall comply with NZBC F2/AS1.

PROPOSED SOUTH ELEVATION

CHRISTCHURCH CITY COUNCIL
FILE COPY
CONSENT DOCUMENT
08 APR 2004
All building work shall comply with the New Zealand Building Code notwithstanding any inconsistencies which may occur in the drawings and specifications.

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DRAWING TITLE:
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DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD JOB No. 02C/JE
SHEET TITLE:	PROPOSED ELEVATIONS
SHEET No:	9
OF:	23
REV:	C

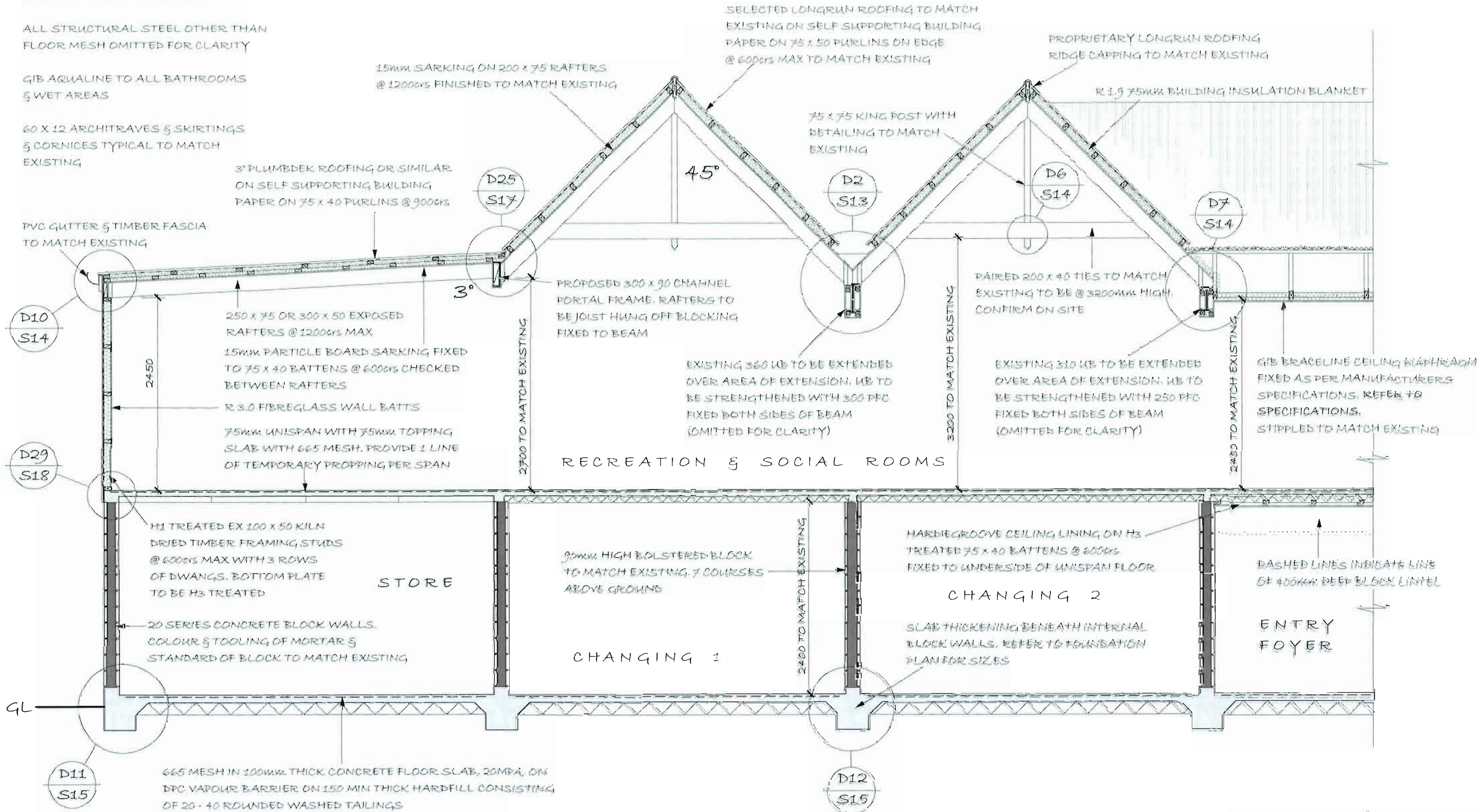
NOTES:

LINTEL HEIGHTS TO BOTH GROUND & FIRST FLOOR TO MATCH EXISTING BUILDER TO CONFIRM ON SITE

ALL STRUCTURAL STEEL OTHER THAN FLOOR MESH OMITTED FOR CLARITY

GIB AQUALINE TO ALL BATHROOMS & WET AREAS

60 X 12 ARCHITRAVES & SKIRTINGS & CORNICES TYPICAL TO MATCH EXISTING



A S5,6

PART CROSS SECTION A - A

SCALE 1 : 50

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DRAWING TITLE:

PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

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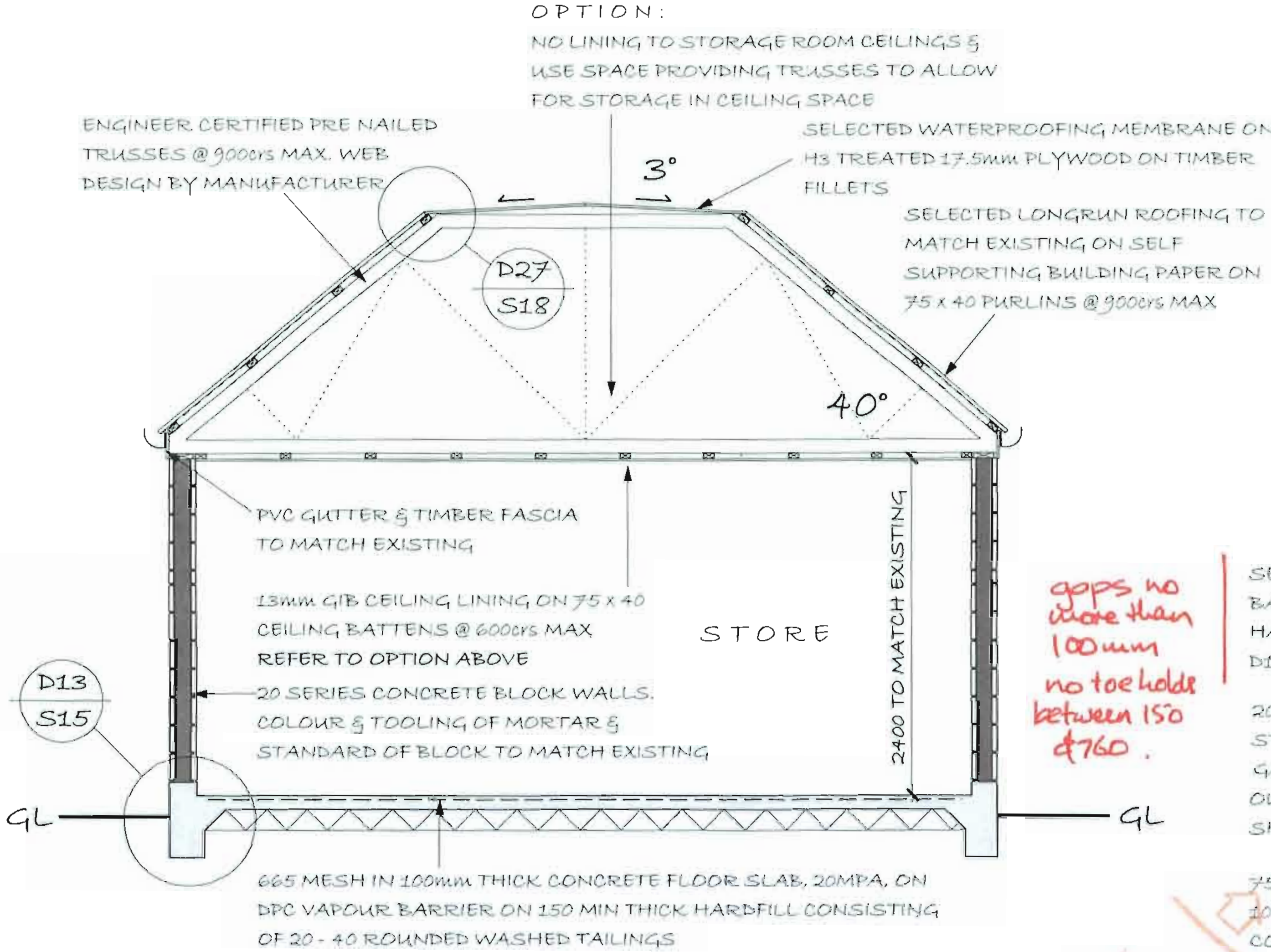
DATE:	1/12/03		SHEET No: 11
SCALES:	1 : 50		
DRAWN:	BCAD	JOB No: 05C/4E	
SHEET TITLE:	CROSS SECTION		OF: 23 REV: C

NOTES:

LINTEL HEIGHTS TO BOTH GROUND & FIRST FLOOR TO MATCH EXISTING. BUILDER TO CONFIRM ON SITE

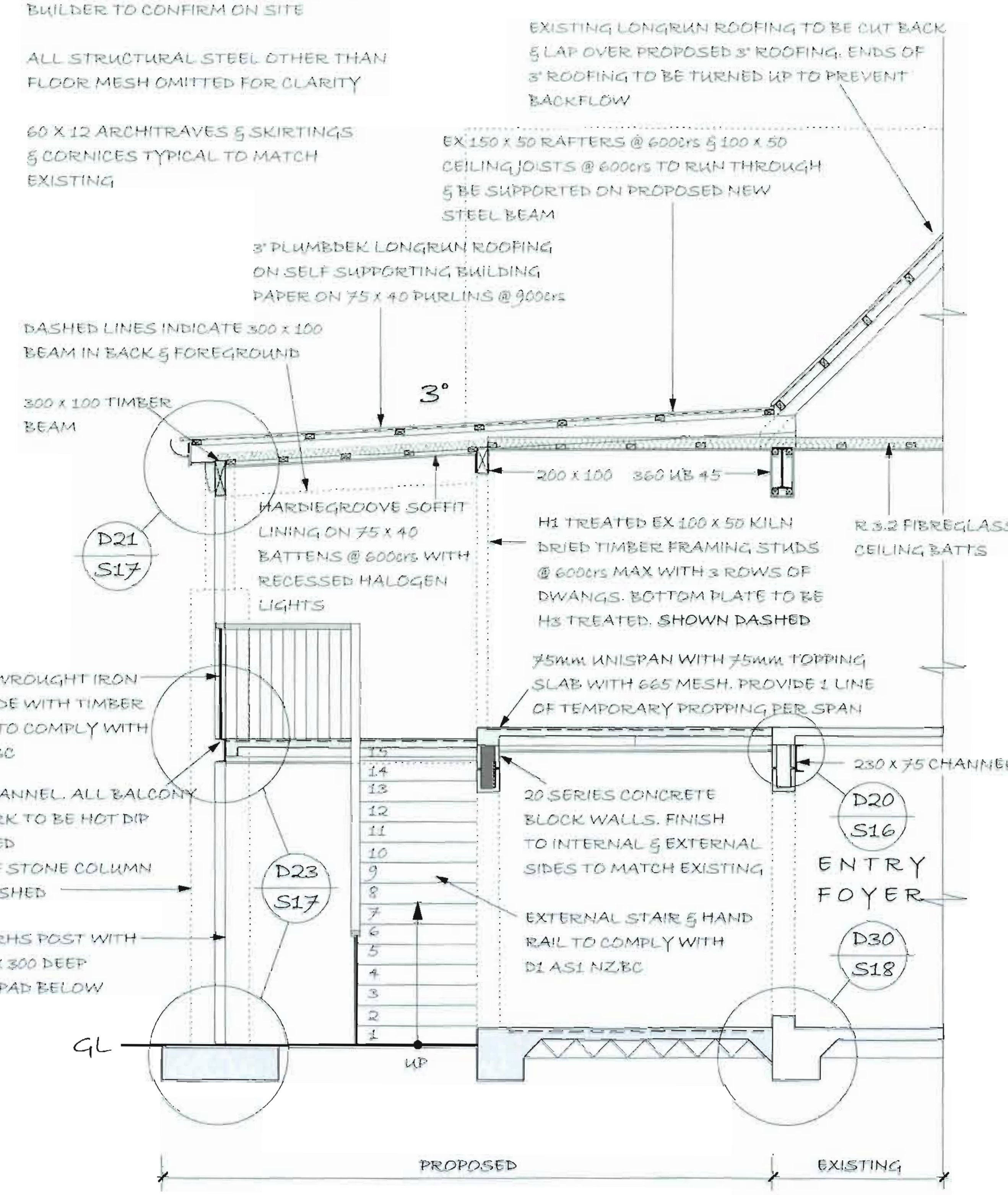
ALL STRUCTURAL STEEL OTHER THAN FLOOR MESH OMITTED FOR CLARITY

60 X 12 ARCHITRAVES & SKIRTINGS & CORNICES TYPICAL TO MATCH EXISTING



B
S5
CROSS SECTION B - B
SCALE 1 : 50

gaps no more than 100mm
no toe holds between 150 & 760.



C
S5,6
PART CROSS SECTION C - C
SCALE 1 : 50

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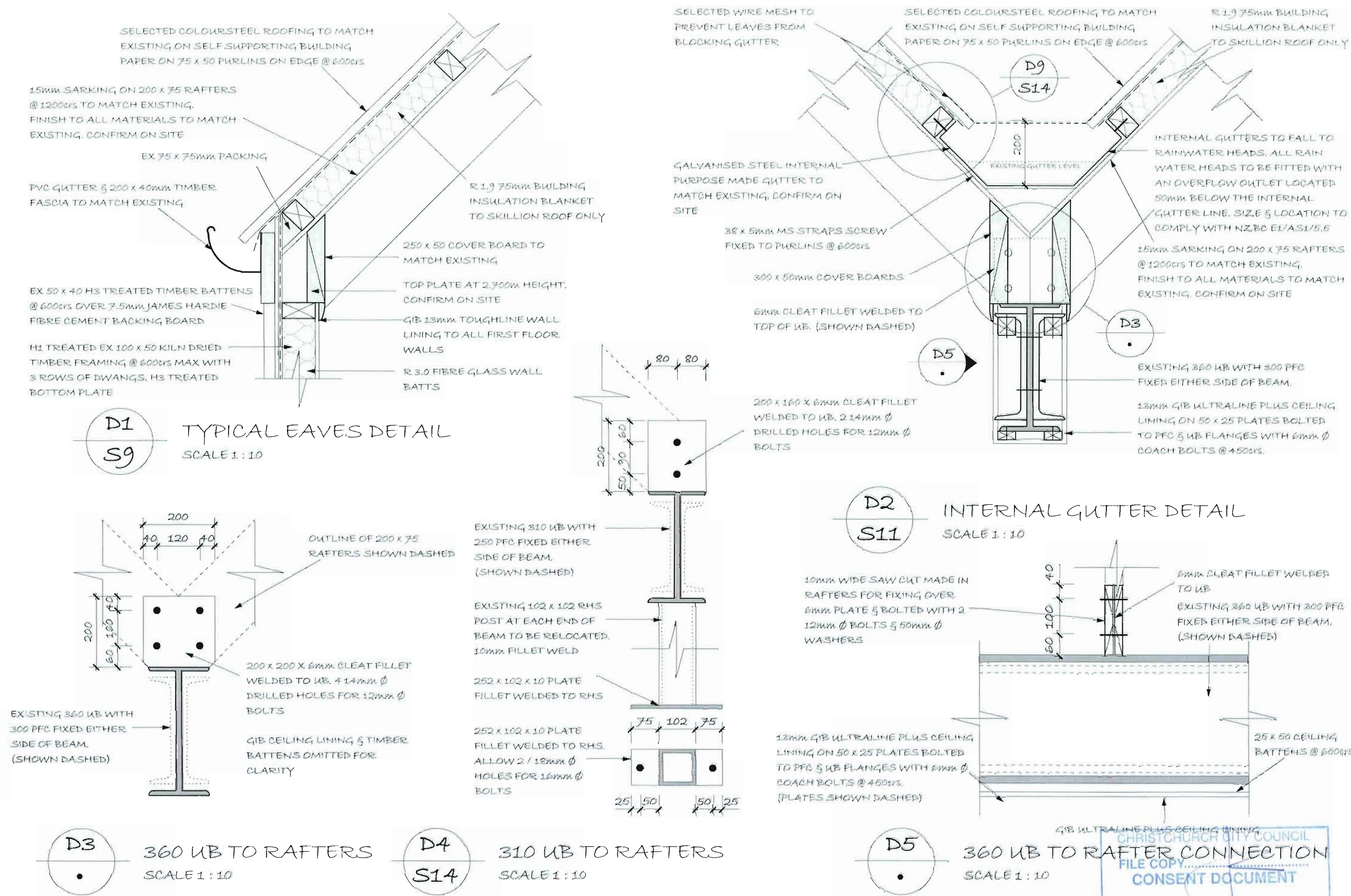
DATE:	1/12/03		SHEET No:
SCALES:	1 : 50		12
DRAWN:	BCAD	JOB No 02C/TE	
SHEET TITLE:	CROSS SECTIONS		OF: 23 REV: C



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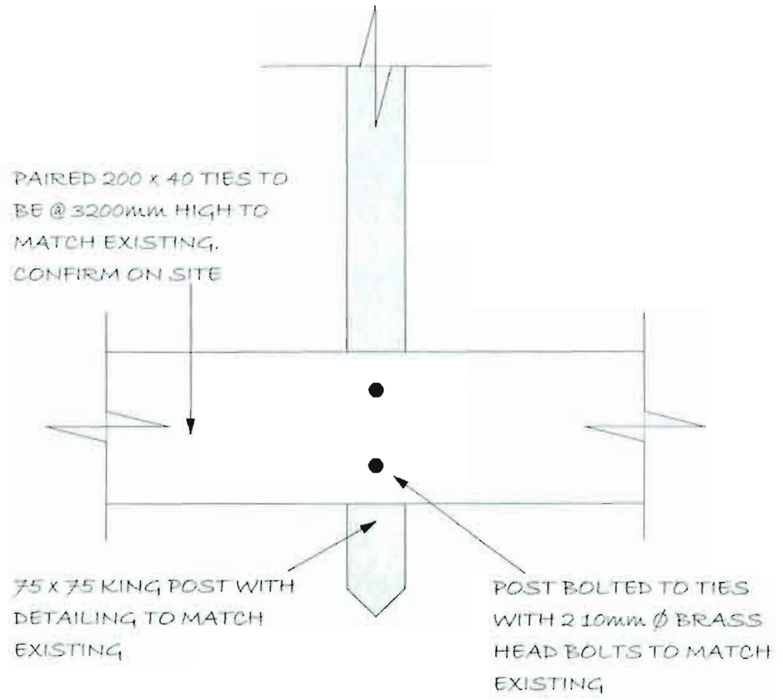
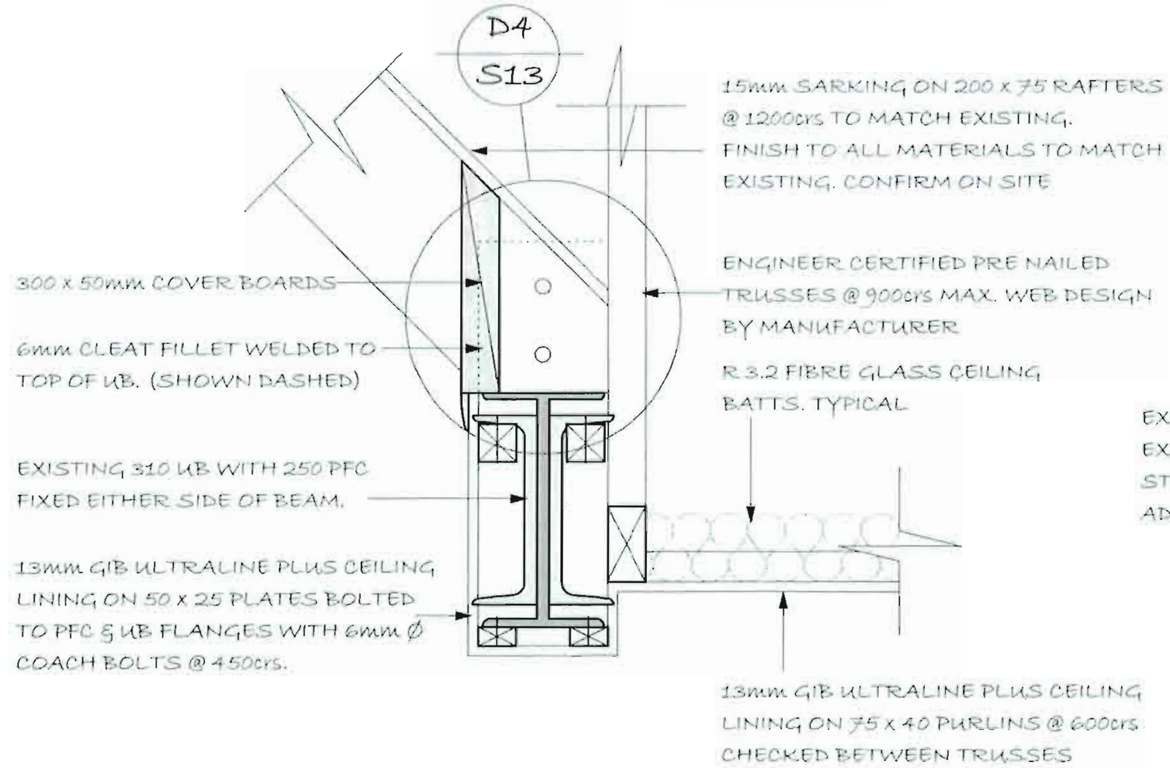
DATE:	1/12/03		SHEET No:
SCALES:	1 : 10		
DRAWN:	BCAD	JOB No: 02C/1E	13
SHEET TITLE:	STRUCTURAL DETAILS		OF 23 REV. C



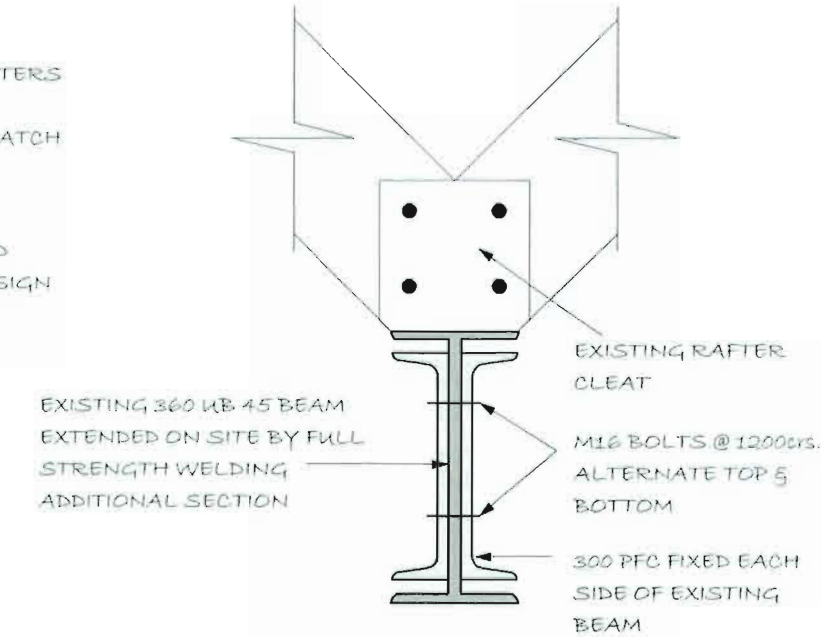
D6 / S11 COLLAR TIE FIXINGS TO POST TO EXPOSED RAFTER AREA

SCALE 1 : 10



D7 / S11 310 UB TO TRUSSES

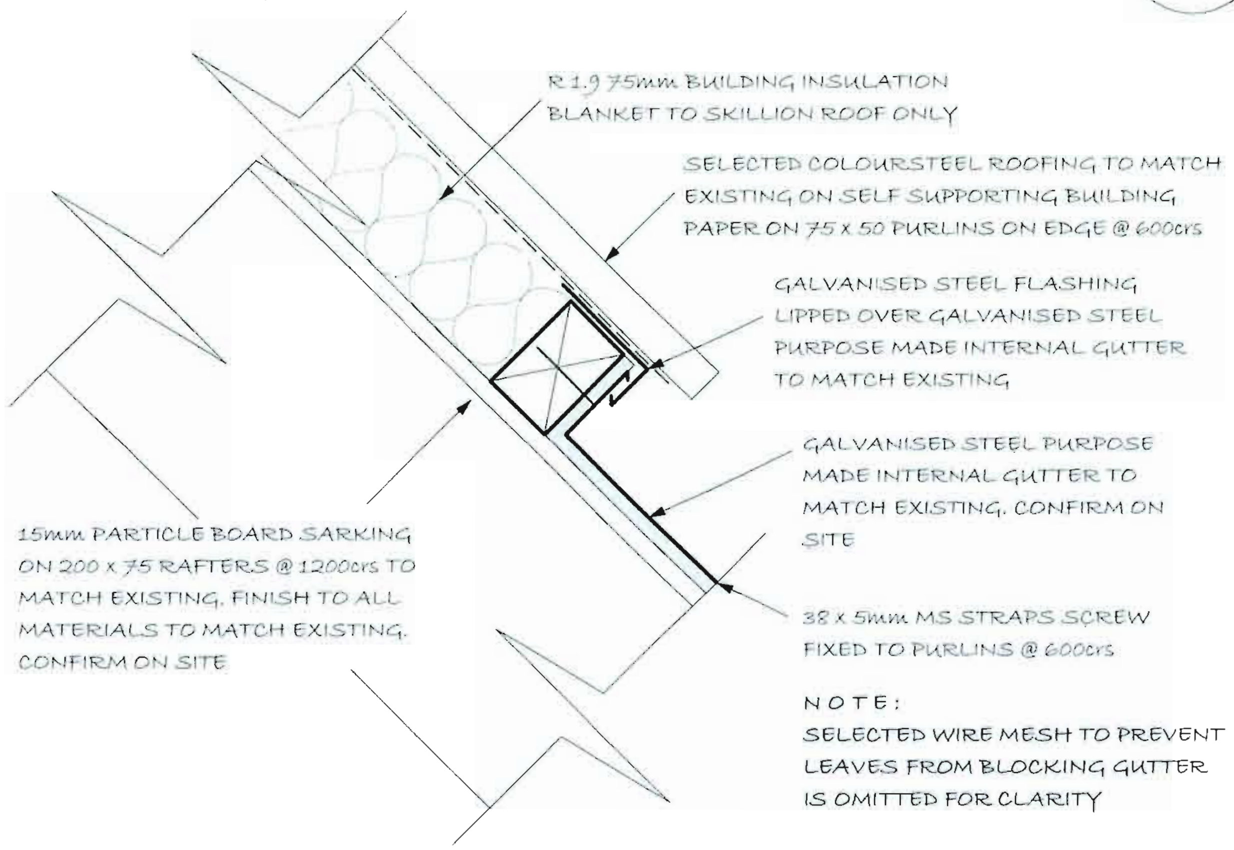
SCALE 1 : 10



NOTES : - ALL LININGS OMITTED FOR CLARITY
- USE 250 PFC'S ON EXISTING 310 UB

D8 / S21 EXISTING ROOF BEAM STRENGTHENING

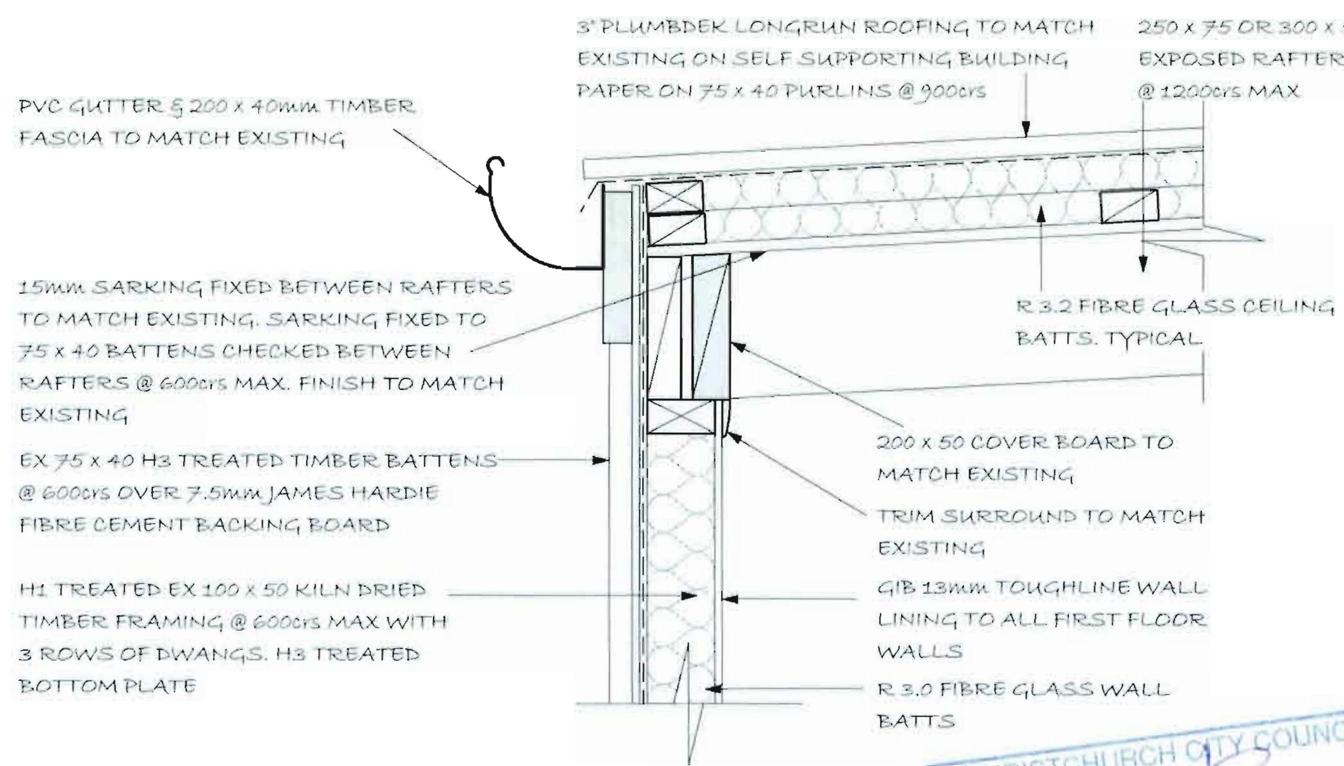
SCALE 1 : 10



NOTE:
SELECTED WIRE MESH TO PREVENT LEAVES FROM BLOCKING GUTTER IS OMITTED FOR CLARITY

D9 / S13 INTERNAL GUTTER DETAIL

SCALE 1 : 5



D10 / S11 3° PITCHED ROOF EAVE DETAIL

SCALE 1 : 10

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DRAWING TITLE :
PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

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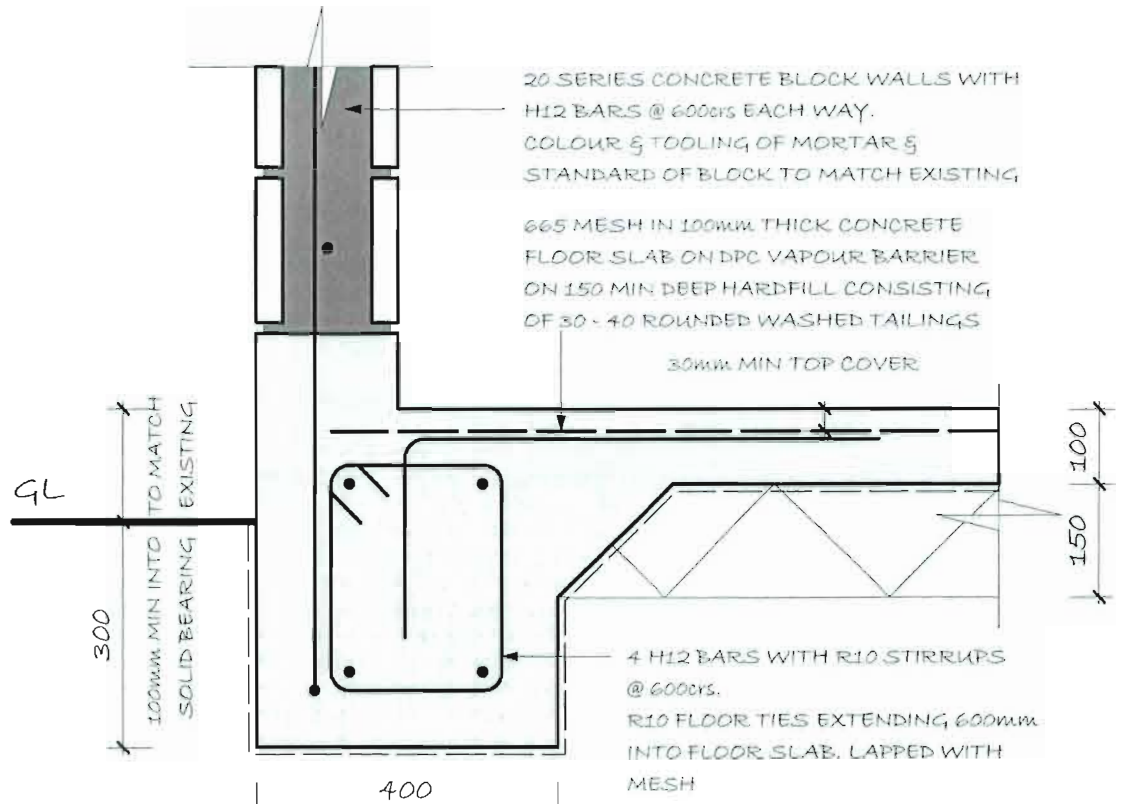
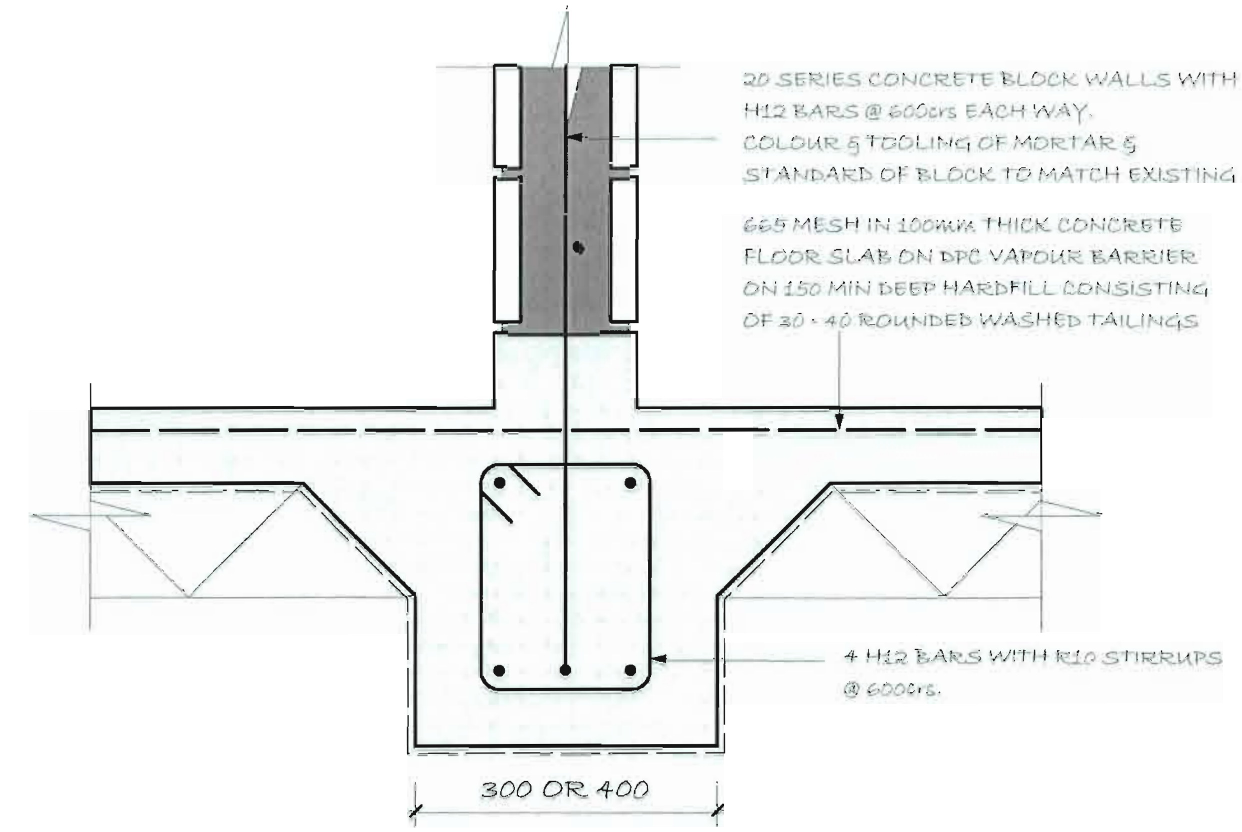
DATE:	1/12/03
SCALES:	1 : 10 ; 1 : 5
DRAWN:	BCAD JOB No 02C/IE
SHEET TITLE :	STRUCTURAL DETAILS

SHEET No: 14 OF: 23 REV: C



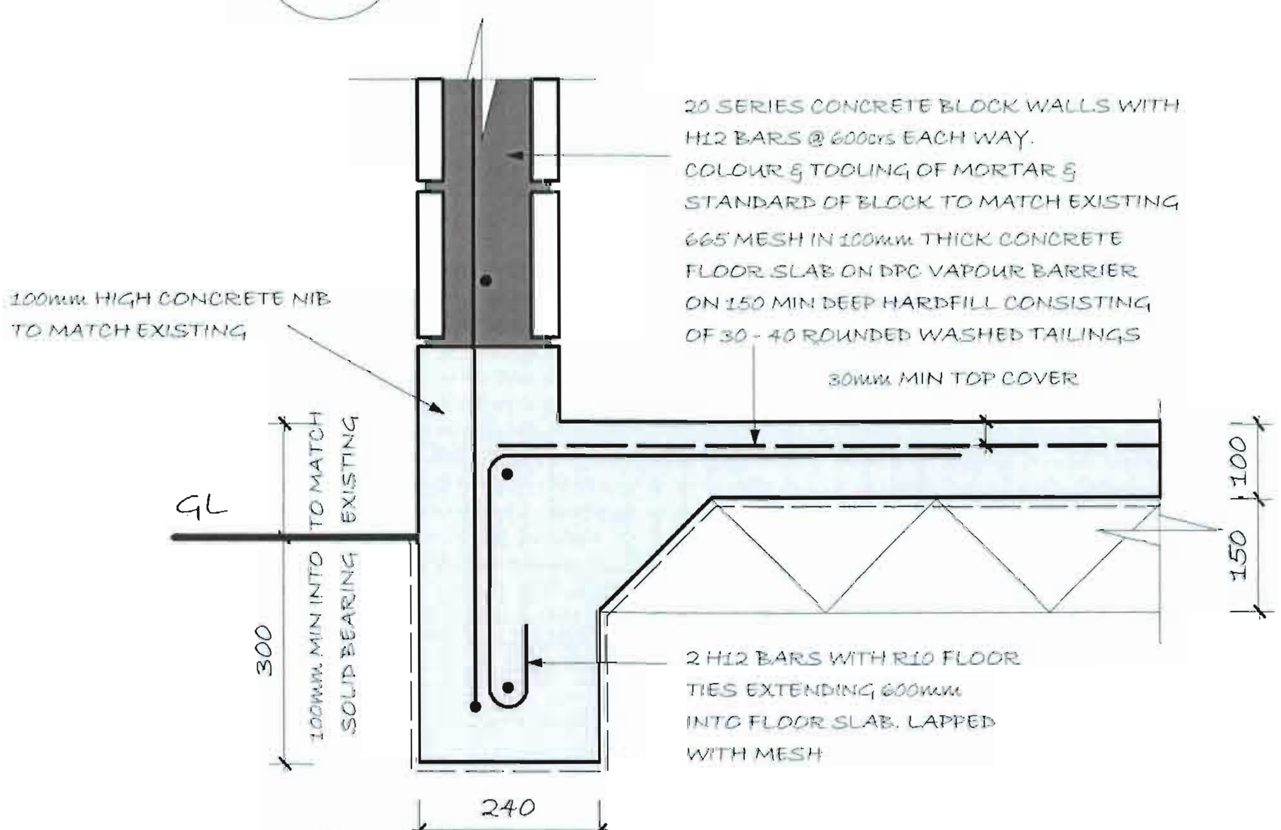
D11 / S11 TYPICAL FOUNDATION

SCALE 1 : 10



D12 / S11 SLAB THICKENING BENEATH INTERNAL CONCRETE BLOCK WALLS

SCALE 1 : 10

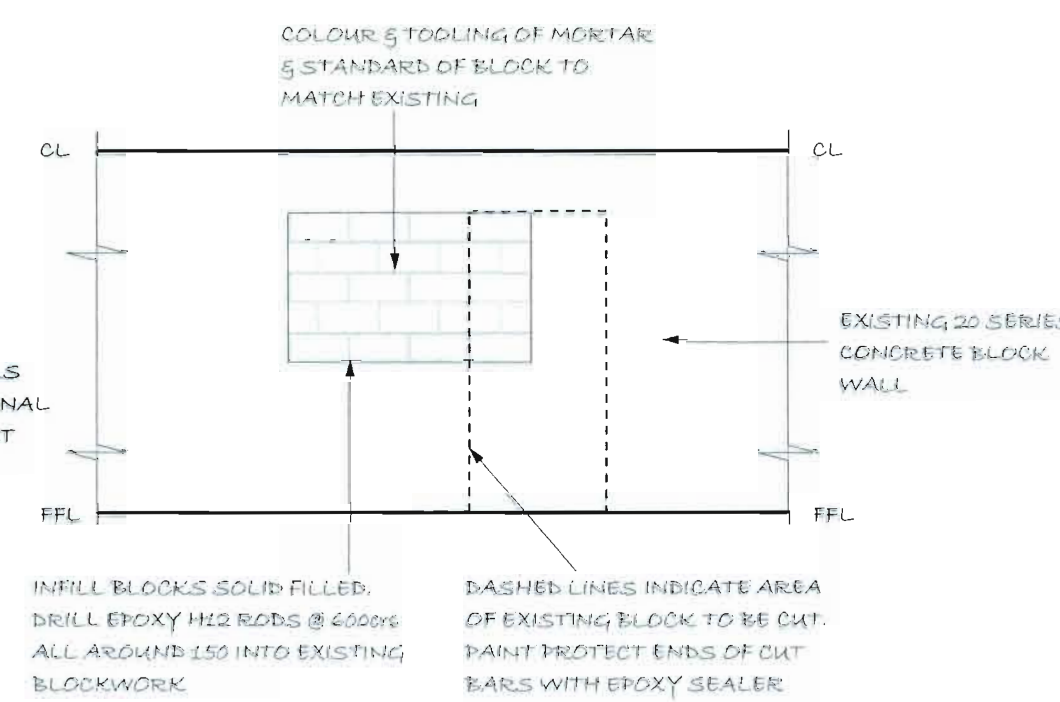


D13 / S12 SINGLE STOREY FOUNDATION

SCALE 1 : 10

FOR EXPOSED BLOCK ENDS BLOCK LAYER TO USE 20.14 BLOCKS. FOR BOND BEAM COURSES CUT INTERNAL WEB FOR A DEPTH OF 100mm & REMOVE WASTE

EXTERIOR OF CONCRETE BLOCK WALLS TO BE SEALED WITH SELECTED EXTERNAL WATER PROOFING SEALANT. CONSULT OWNERS FOR SPECIFICATIONS



D14 / S5 TYPICAL INFILL/CUT BLOCK DETAIL

SCALE 1 : 50

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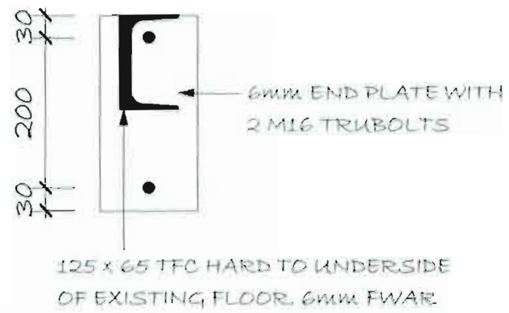
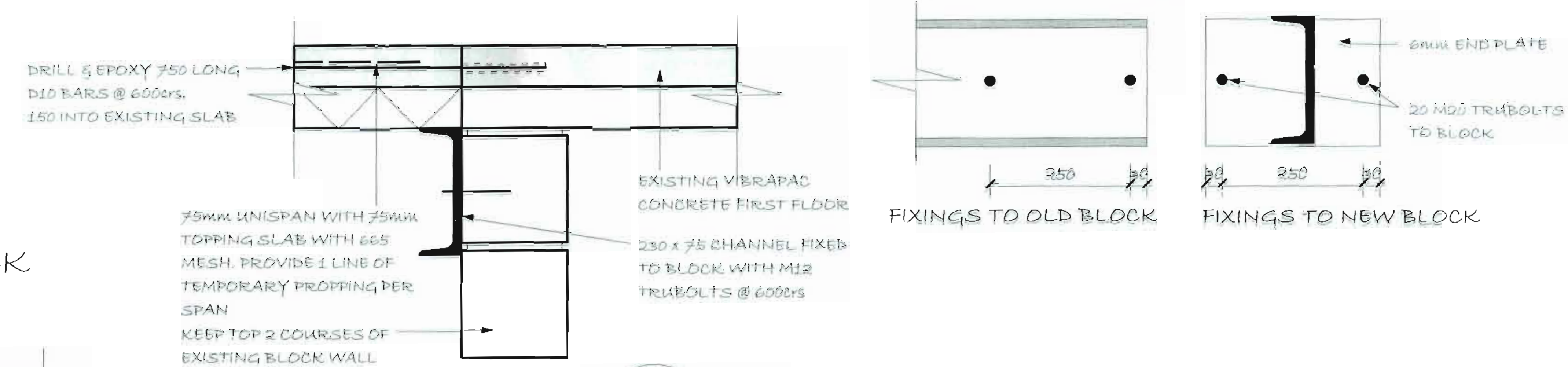
SCALES:	1 : 50 ; 1 : 10
DRAWN:	BCAD — JOB No 02C/IE
SHEET TITLE:	STRUCTURAL DETAILS

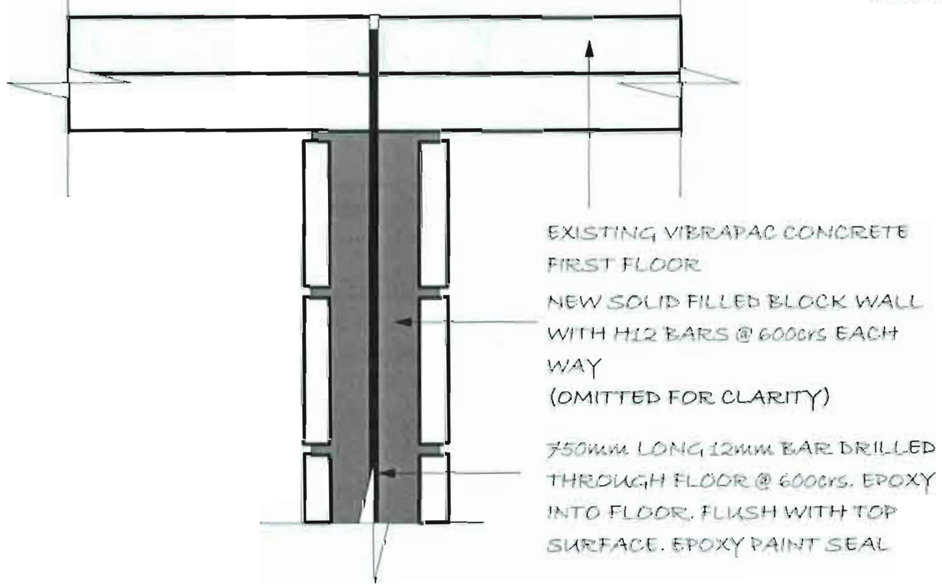
SHEET No: 15 OF: 23 REV: C



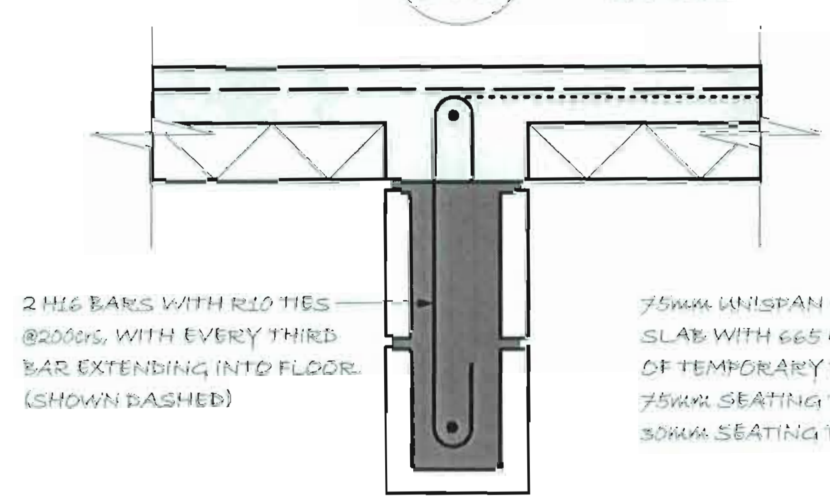
D15 / S20 125 TFC TO BLOCK
SCALE 1 : 10



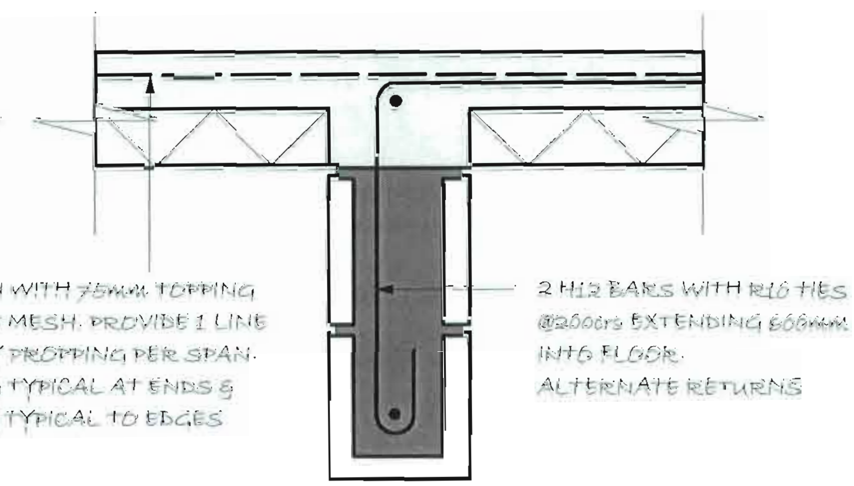
D16 / S20 230 x 75 CHANNEL CONNECTION DETAILS
SCALE 1 : 10



D17 / S20 EXISTING FLOOR TO NEW BLOCK WALL
SCALE 1 : 10



D18 / S20 TYPICAL BLOCK LINTEL
SCALE 1 : 10



D19 / S20 ENTRY DOOR LINTEL
SCALE 1 : 10

D20 / S20 & D20 / S12 ENTRY FOYER 230 x 75 CHANNEL CONNECTION DETAILS
SCALE 1 : 10

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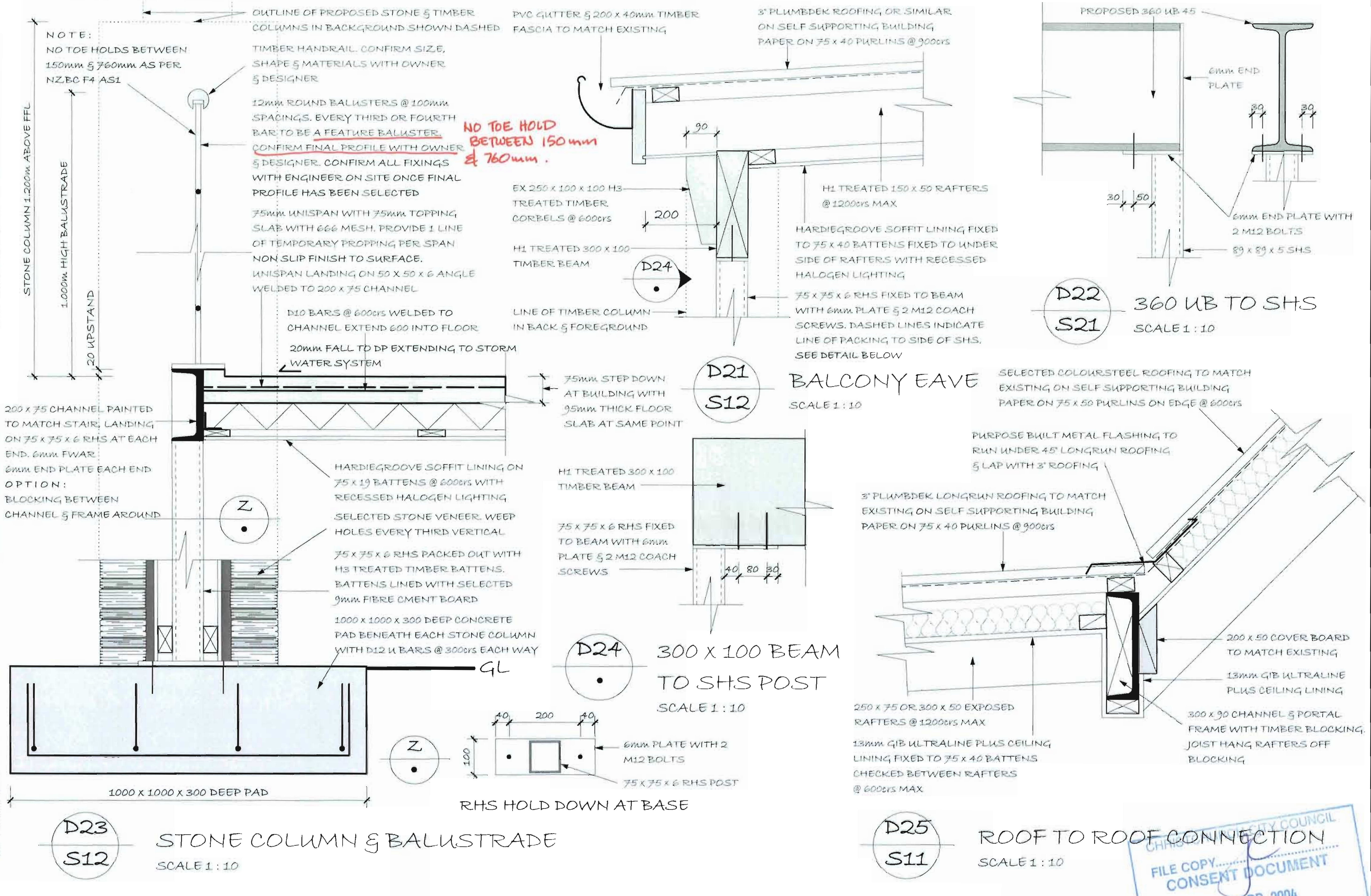
DRAWN:	BCAD JOB No 02C/IE
SHEET TITLE:	STRUCTURAL DETAILS
SHEET No:	16 of 23
REV:	C



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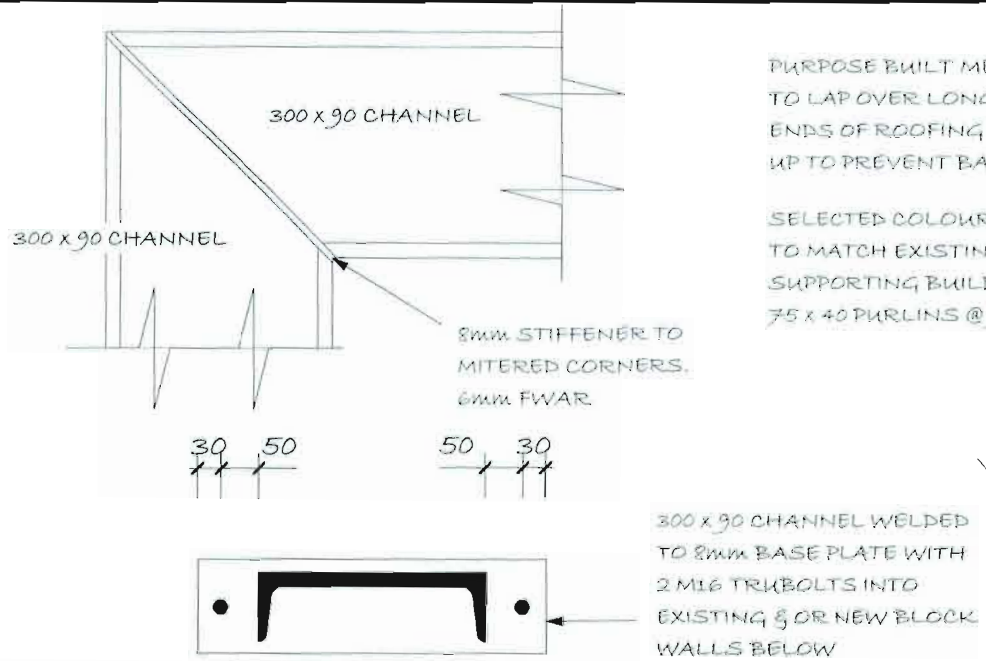
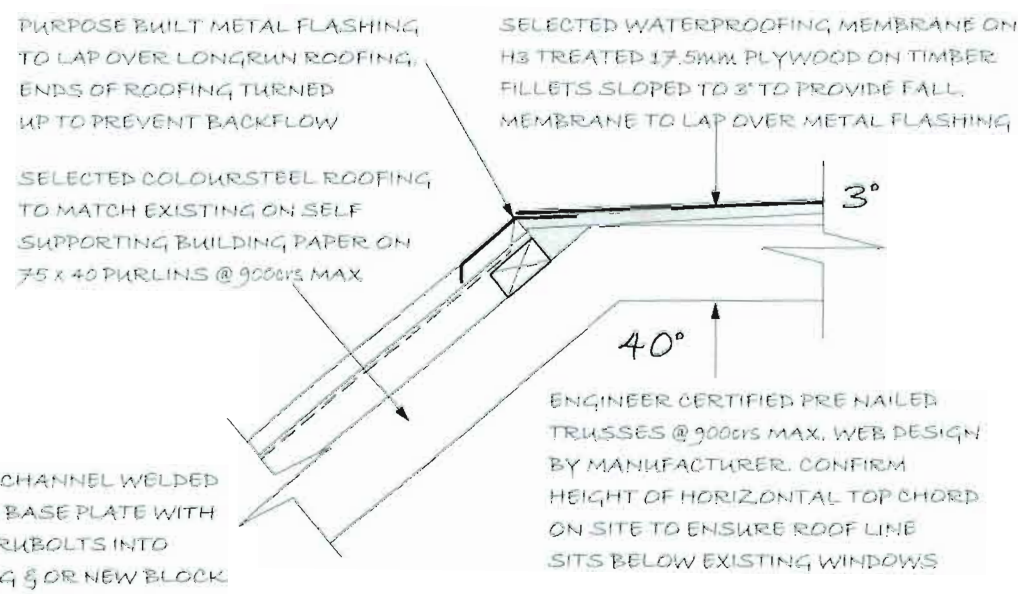
DRAWN:	BCAD JOB No: 02C/15
SHEET TITLE:	STRUCTURAL DETAILS

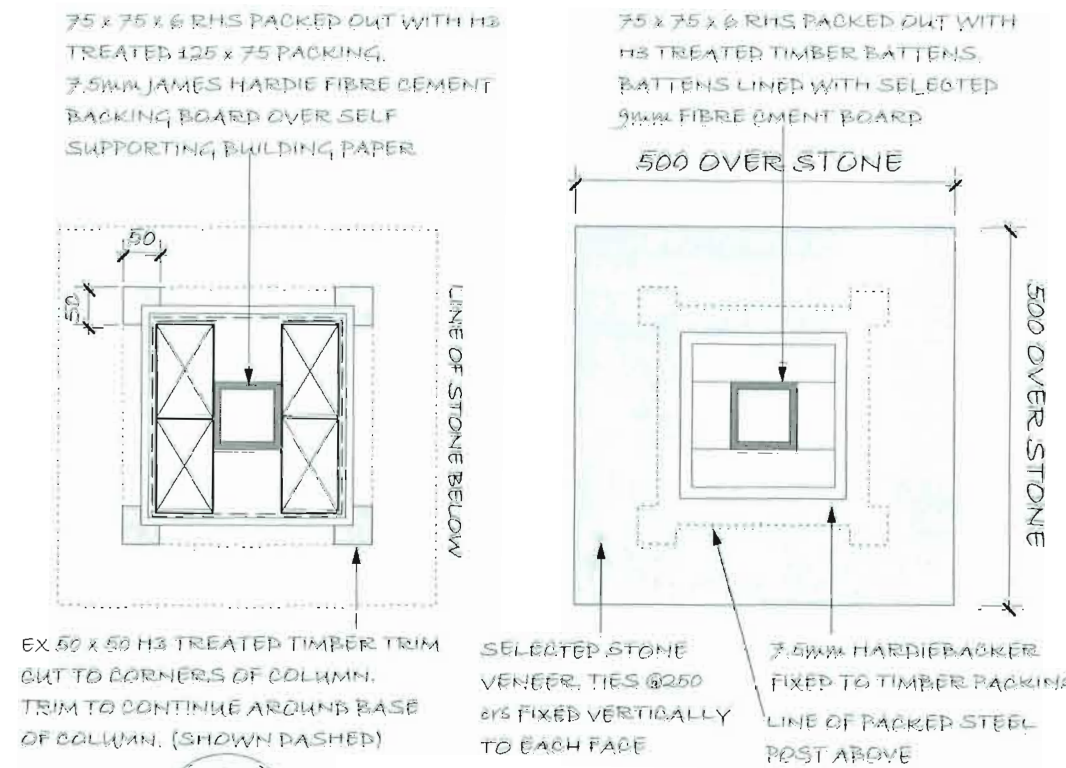
SHEET No: 17 OF: 23 REV: C



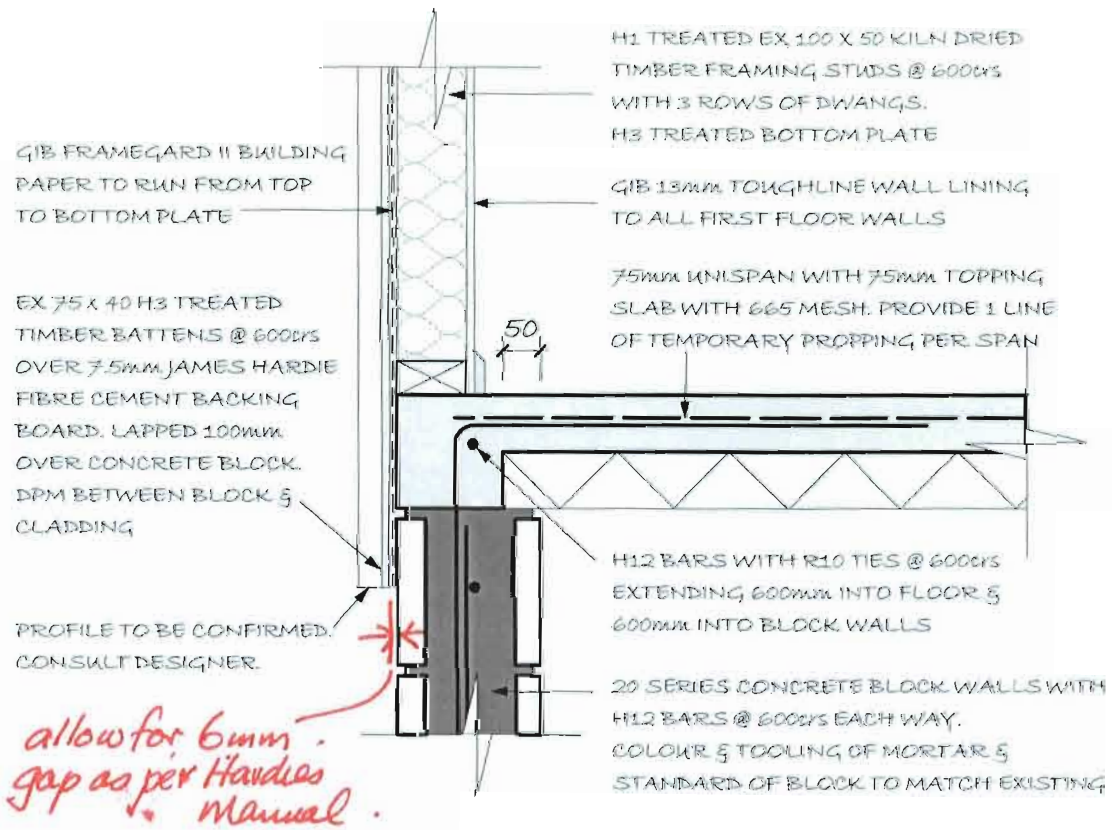
D26 / S21 300 X 90 PORTAL FRAME
SCALE 1 : 10



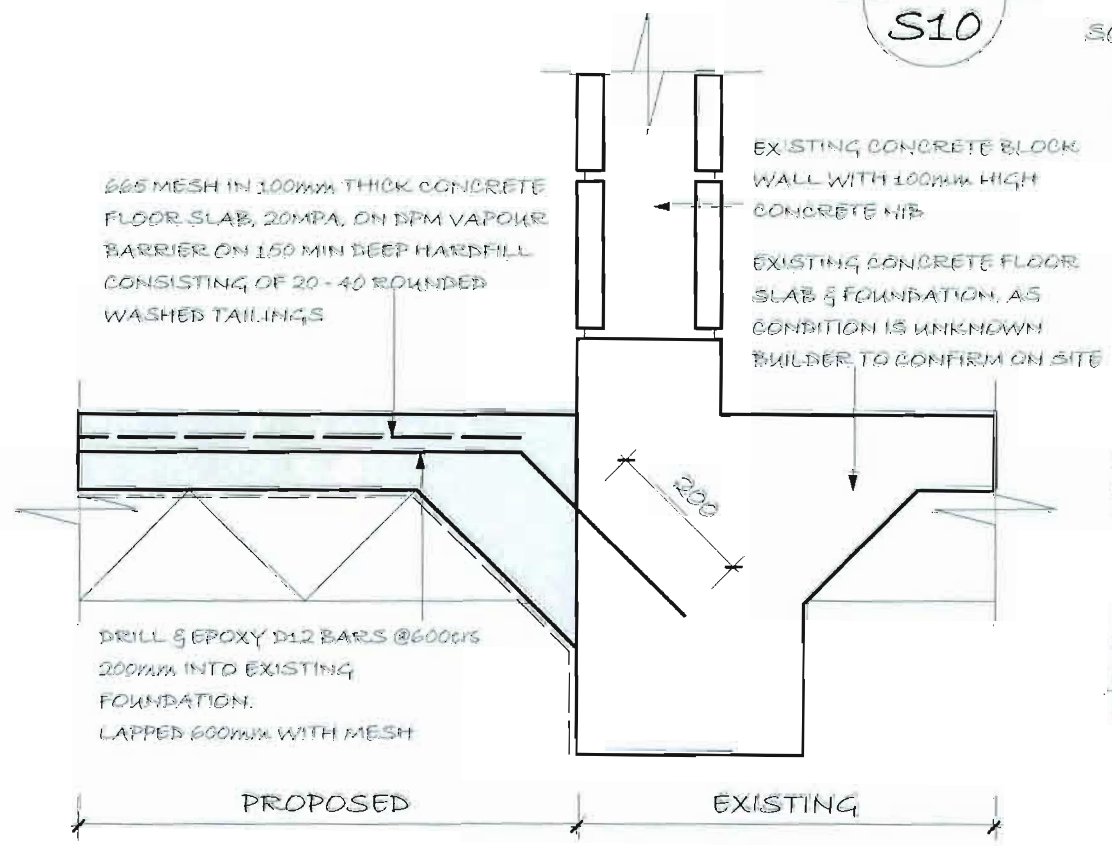
D27 / S12 40° ROOF TO 3° ROOF CONNECTION
SCALE 1 : 10



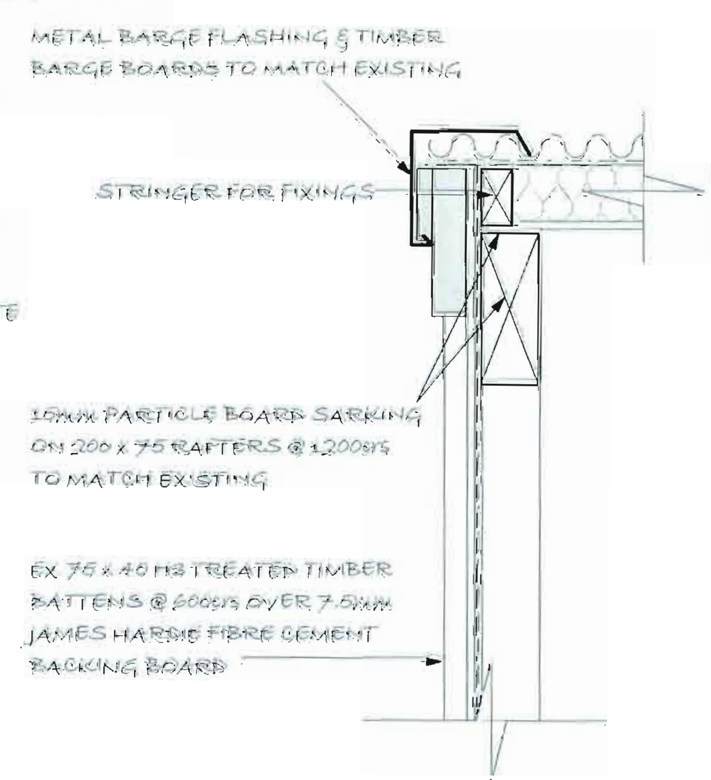
D28 / S10 COLUMN DETAILS
SCALE 1 : 10



D29 / S11 EXTERNAL CLADDING CONNECTION
SCALE 1 : 10



D30 / S12 EXISTING FOUNDATION TO PROPOSED FOUNDATION
SCALE 1 : 10



D31 / S10 TYPICAL BARGE DETAIL
SCALE 1 : 10

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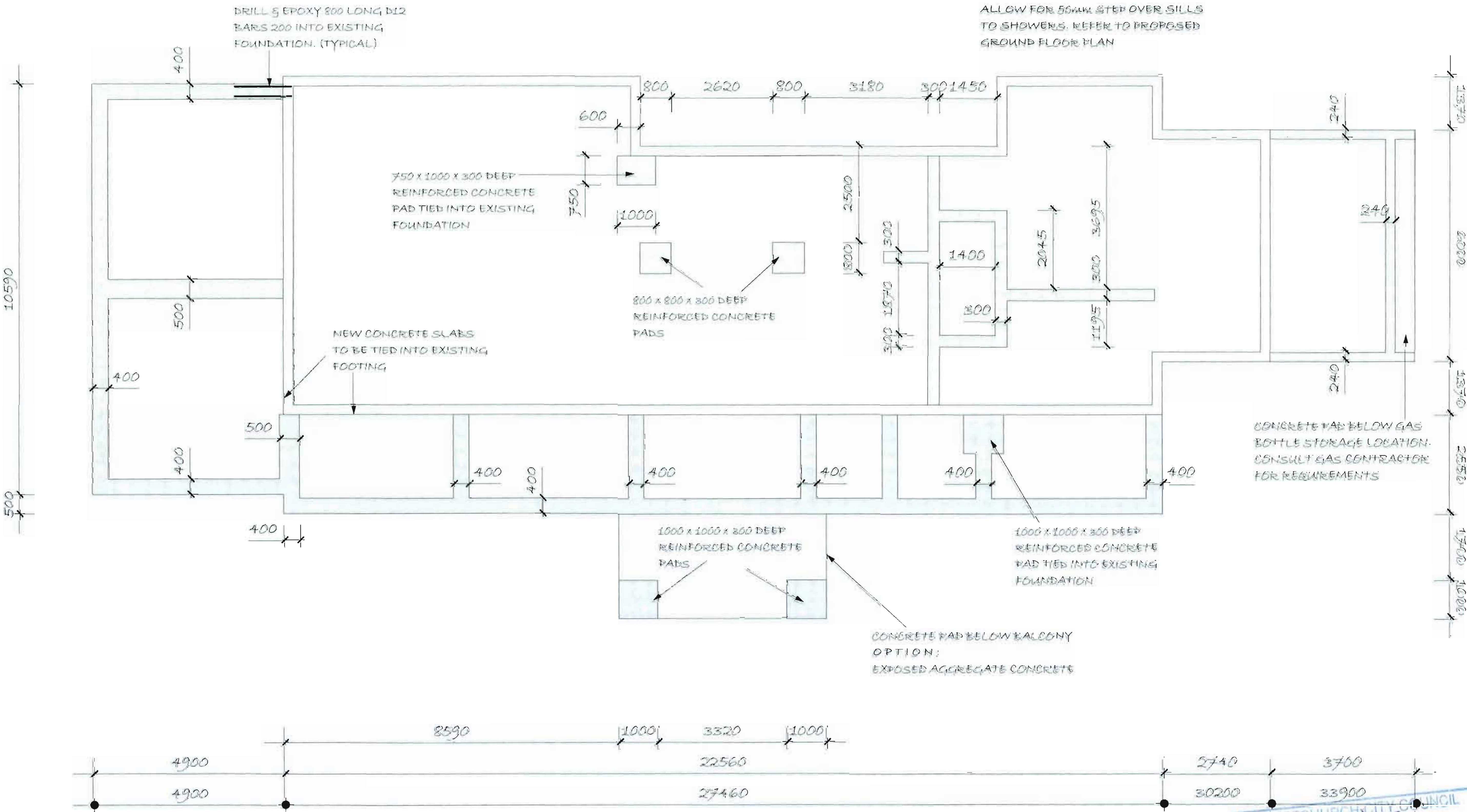
DATE:	1/12/03
SCALES:	1 : 10
DRAWN:	BCAD JOB No 02C/IE
SHEET TITLE:	STRUCTURAL DETAILS

SHEET No: 18 OF: 23 REV: C

NOTES:

ALL REINFORCED CONCRETE PADS TO HAVE D12 H BARS @ 300crs EACH WAY

ALLOW FOR 50mm STEP OVER SILLS TO SHOWERS. REFER TO PROPOSED GROUND FLOOR PLAN



Boyd Chamberlain
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Email: bcdraughting@paradise.net.nz Po Box 13451 Chch

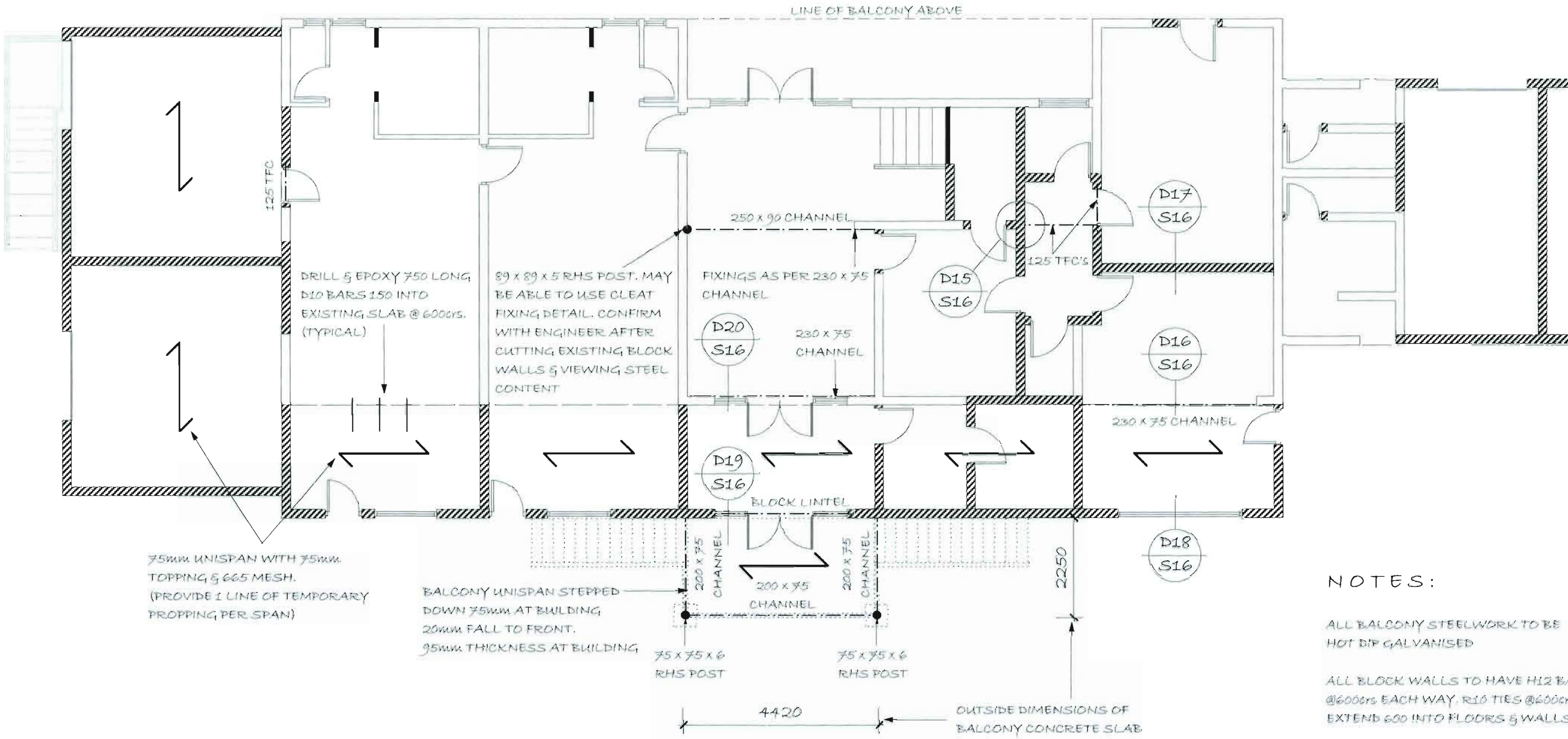
DRAWING TITLE:

PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

NOTE:
ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED BEFORE ANY CONSTRUCTION COMMENCES. ALL WORK TO COMPLY WITH THE NZ BUILDING CODE & NZS 3604:1999

DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD JOB No. 02C/IF
SHEET TITLE:	FOUNDATION PLAN

SHEET No: 19 OF 23 REV: C



NOTES:

ALL BALCONY STEELWORK TO BE HOT DIP GALVANISED

ALL BLOCK WALLS TO HAVE H12 BARS @600crs EACH WAY. R10 TIES @600crs TO EXTEND 600 INTO FLOORS & WALLS

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DRAWING TITLE:
PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

NOTE:
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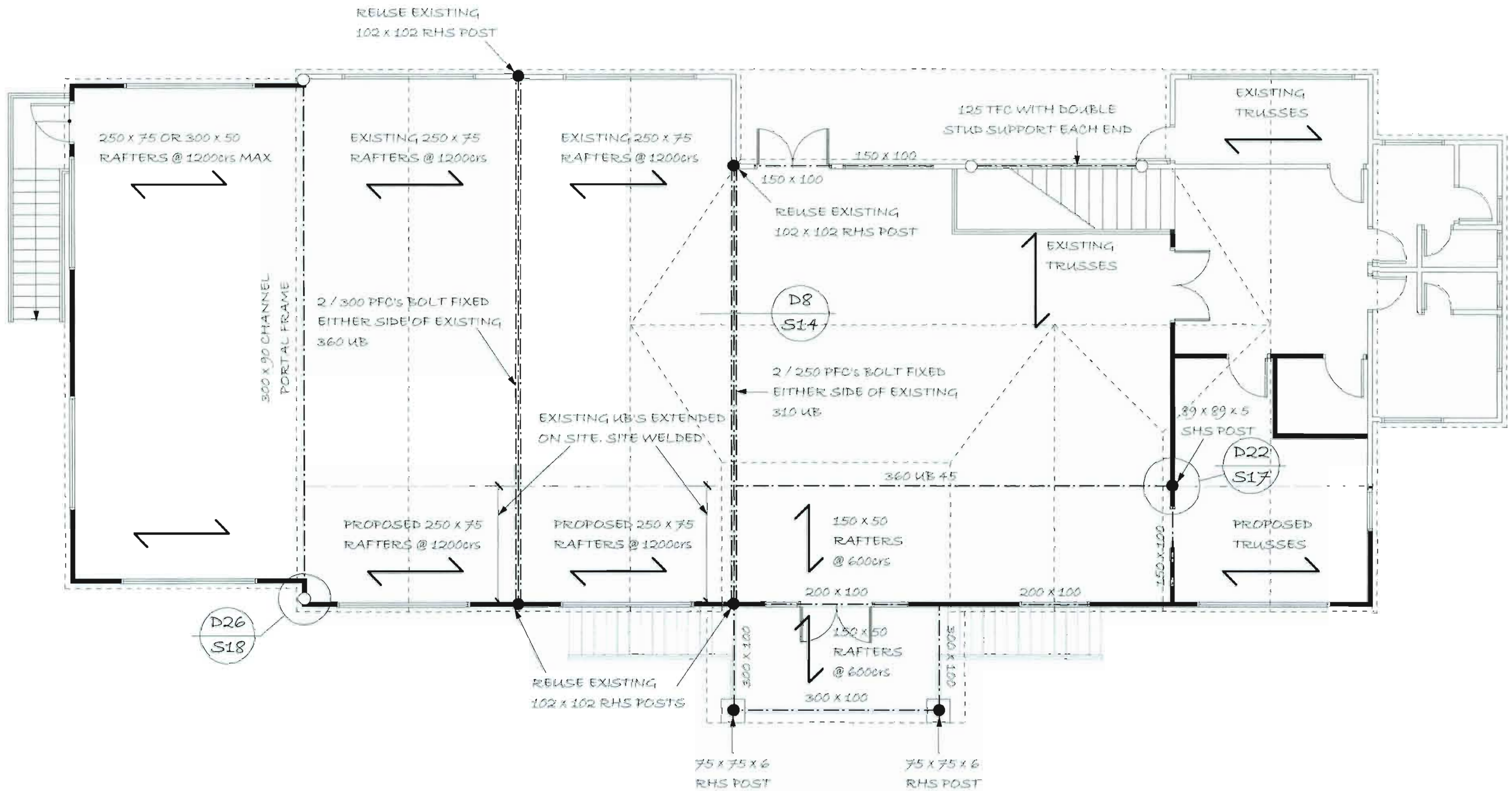
DATE:	1/12/03
SCALES:	1 : 100
DRAWN:	BCAD JOB No 02C/IE
SHEET TITLE:	MIDFLOOR & BEAM LAYOUT
SHEET No:	20 OF 23 REV: C



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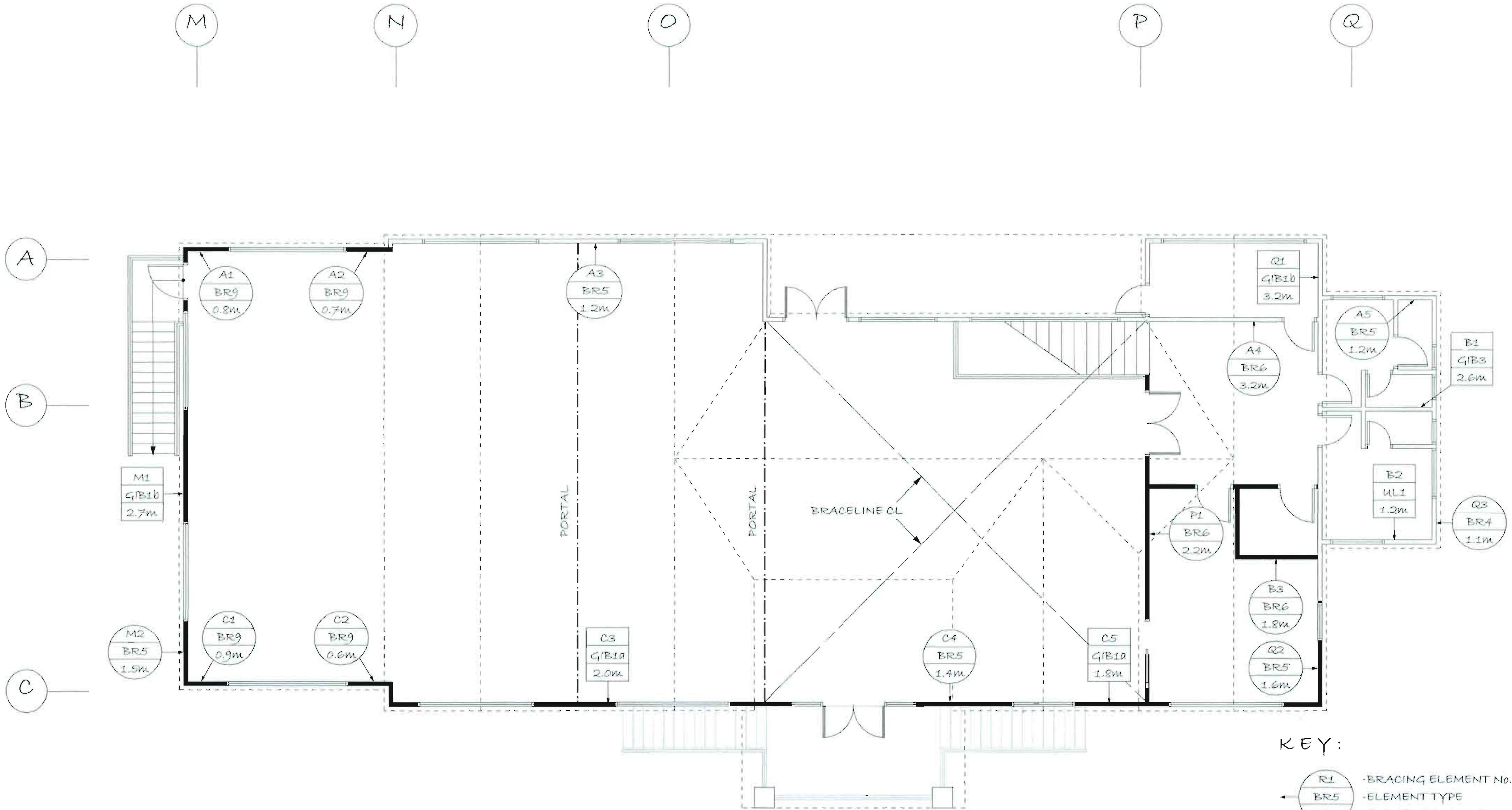
DRAWING TITLE :

PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

NOTE:
ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED BEFORE ANY CONSTRUCTION COMMENCES. ALL WORK TO COMPLY WITH THE NZ BUILDING CODE & NZS 3604:1999

DATE:	1/12/03	
SCALES:	1 : 100	
DRAWN:	BCAD	JOB No: 02C/IE
SHEET TITLE:	ROOF FRAMING & BEAM LAYOUT	

SHEET No: 21
OF: 23 REV: C



KEY:

R1 -BRACING ELEMENT No.
BR5 -ELEMENT TYPE
1.2m -ELEMENT PLAN LENGTH

NOTES:
FOR BRACING KEY REFER TO SPECIFICATION

ALL BRACING HAS BEEN CALCULATED BY ENGINEER

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DRAWING TITLE :
PROPOSED ALTERATION TO THE EAST SHIRLEY CRICKET CLUBROOMS BURWOOD PARK CHCH

NOTE:
ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED BEFORE ANY CONSTRUCTION COMMENCES. ALL WORK TO COMPLY WITH THE NZ BUILDING CODE & NZS 3604:1999

DATE:	1/12/03	SHEET No: 23
SCALES:	1 : 100	
DRAWN:	BCAD JOB No 02C/1E	
SHEET TITLE :	FIRST FLOOR BRACING PLAN	OF: 23 REV: C

Appendix C

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Burwood Park North - Pavilion (Ground Floor Toilets)			Reviewer:	David Lee
	Unit	No:	Street	CPEng No:	112052
Building Address:	1	75	New Brighton Road	Company:	GHD Limited
Legal Description:	Pt Lot 2 DP 8140			Company project number:	513090245
				Company phone number:	(03) 378 0900
	Degrees	Min	Sec		
GPS south:	43	30	18.62	Date of submission:	15/05/2013
GPS east:	172	40	19.13	Inspection Date:	31/08/2012
				Revision:	Final
Building Unique Identifier (CCC):	PRK 0724 BLDG 001			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	0
Soil type:	silty sand	Soil Profile (if available):	
Site Class (to NZS1170.5):	E		
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):	5.00

Building

No. of storeys above ground:	2	single storey = 1	Ground floor elevation (Absolute) (m):	5.00
Ground floor split?	no		Ground floor elevation above ground (m):	0.00
Storeys below ground	0			
Foundation type:	mat slab		if Foundation type is other, describe:	
Building height (m):	7.50		height from ground to level of uppermost seismic mass (for IEP only) (m):	
Floor footprint area (approx):	375			
Age of Building (years):	31		Date of design:	1992-2004
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	other (specify)		Brief strengthening description:	
Use (upper floors):	commercial			
Use notes (if required):	Changing rooms/toilets			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	steel non-composite	beam and connector type	
Columns:	structural steel	typical dimensions (mm x mm)	
Walls:	partially filled concrete masonry	thickness (mm)	

Lateral load resisting structure

Lateral system along:	partially 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:	0.10	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	partially filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.10	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

<u>Separations:</u>

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

<u>Non-structural elements</u>

Stairs:	steel	describe supports	
Wall cladding:	other light	describe	
Roof Cladding:	Metal	describe	
Glazing:	aluminium frames		
Ceilings:			
Services(list):			

Available documentation

Architectural		original designer name/date	
Structural		original designer name/date	
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

<u>Site:</u>
(refer DEE Table 4-2)

Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	0-2 m³/100m²	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):	

<u>Building:</u>

	Current Placard Status:	green		
Along	Damage ratio:	5%	Describe how damage ratio arrived at:	
	Describe (summary):	Cracking to masonry toilet walls		
Across	Damage ratio:	5%		
	Describe (summary):	Cracking to masonry toilet walls		

$$Damage\_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$$

Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:	minor structural		Describe:	
	Building Consent required:			Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before e'quakes:	45%	45% %NBS from IEP below	If IEP not used, please detail assessment methodology:	
	Assessed %NBS after e'quakes:	43%			
Across	Assessed %NBS before e'quakes:	45%	45% %NBS from IEP below		
	Assessed %NBS after e'quakes:	43%			

IEP **Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.**

Period of design of building (from above): 1992-2004

h_n from above: m

Seismic Zone, if designed between 1965 and 1992:

not required for this age of building

Design Soil type from NZS4203:1992, cl 4.6.2.2:

	along	across
Period (from above):	0.1	0.1
(%NBS)nom from Fig 3.3:	22.3%	22.3%

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0	1.00
Note 2: for RC buildings designed between 1976-1984, use 1.2	1.0
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)	1.0

	along	across
Final $(\%NBS)_{nom}$:	**22%**	**22%**

2.2 Near Fault Scaling Factor

	along	across
Near Fault scaling factor, from NZS1170.5, cl 3.1.6:		1.00
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:	0.30
Z_{1992}, from NZS4203:1992	0.8
Hazard scaling factor, **Factor B:**	2.666666667

2.4 Return Period Scaling Factor

Building Importance level (from above):	2
Return Period Scaling factor from Table 3.1, **Factor C**:	1.00

		along	across
2.5 Ductility Scaling Factor	Assessed ductility (less than max in Table 3.2)	1.25	1.25
	Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:	1.00	1.00
	Ductiity Scaling Factor, **Factor D**:	1.00	1.00
2.6 Structural Performance Scaling Factor:	Sp:	0.925	0.925
	Structural Performance Scaling Factor **Factor E**:	1.081081081	1.081081081
2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E	**$\%NBS_b$:**	**64%**	**64%**

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A:	insignificant	1
3.2. Vertical irregularity, Factor B:	insignificant	1
3.3. Short columns, Factor C:	insignificant	1
3.4. Pounding potential — Pounding effect D1, from Table to right		1.0
Height Difference effect D2, from Table to right		1.0
Therefore, Factor D:		1
3.5. Site Characteristics	significant	0.7

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

		Along	Across
3.6. Other factors, Factor F	For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum	1.0	1.0
	Rationale for choice of F factor, if not 1		

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)
List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

		Along	Across
3.7. Overall Performance Achievement ratio (PAR)		**0.70**	**0.70**
4.3 PAR x (%NBS)b:	PAR x Baselline %NBS:	**45%**	**45%**
4.4 Percentage New Building Standard (%NBS), (before)			**45%**

Official Use only:

Accepted By

Date:

GHD

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Final	Peter O'Brien	David Lee		Nick Waddington		15/05/13