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Wigram Gymnasium

BU 2556-001 EQ2

Detailed Engineering Evaluation

Quantitative Report

Version FINAL

29 Springs Road, Hornby

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

Wigram Gymnasium
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Quantitative Report
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29 Springs Road, Hornby

Christchurch City Council

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Date
2/10/12

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Detailed Engineering Evaluation

Quantitative Report - SUMMARY

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Background

Wigram Gymnasium is located at 29 Springs Road, Hornby, Christchurch and has been assessed for its safety during an earthquake. We have assessed the structure of the building to determine the current level of safety it affords during an earthquake, and have compared that level to the legal requirements.

This is a summary of the Quantitative report for the building structure, and is based in general on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 18th January 2012 and available drawings as itemised in Section 5.3.

Building Description

The Wigram Gymnasium is a one (1) storey structure constructed from structural steel and reinforced concrete masonry block walls. The building is approximately 50 m long by 35 m wide and 11 m tall. The overall footprint of the building is approximately 1300 m^2.

Key Damage Observed

Key damage observed included:-

- Minor cracks along the construction joint between the concrete masonry block walls of the external storage area to the north-west and the main building.
- Minor cracks in the long reinforced concrete masonry block wall along the north-east side of the building. These cracks were filled with dirt suggesting that they are not related to the recent seismic activity.

Building Capacity Assessment

Based on the site inspection, available drawings and the results of quantitative assessment, the overall building capacity is rated at 43%NBS. The critical building is the gymnasium which has inadequate roof and wall bracing to transfer the roof lateral load down to the foundations in the longitudinal direction. The building overall is therefore classified as ‘Earthquake Risk’.

Changing and External Storage Rooms are rated over 100% and 50%NBS respectively.

Recommendation

GHD recommend that further work is undertaken in order to develop the scope of the strengthening and repair options. This work should involve:

- Minor repairs are undertaken to fill the cracks identified in the reinforced concrete masonry block walls.
- Developing a strengthening works scheme to increase the seismic capacity of the Wigram Gymnasium to as near as practicable to 100%NBS, and at least 67%NBS. This will need to consider compliance with accessibility and fire requirements.
- The Wigram Gymnasium is classified as ‘Earthquake Risk’ building and therefore is acceptable to occupy in accordance with CCC policy.

1. Background

GHD has been engaged by Christchurch City Council (CCC) to undertake a detailed engineering evaluation of Wigram Gymnasium.

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

2. Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

CERA now requires 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). The Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 has been adopted by CERA for evaluations. 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.

Factors determining the extent of evaluation and strengthening level required 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 2004 are relevant when considering structural requirements:

Section 112 – Alterations

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

Section 115 – Change of Use

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

2.2.1 Section 121 – Dangerous Buildings

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

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

Section 122 – Earthquake Prone Buildings

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

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

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

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

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

2.4 Building Code

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

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

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

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

3. Earthquake Resistance Standards

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

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

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

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

Wigram Gymnasium is located at 29 Springs Road, Hornby, Christchurch and is currently used by Olympia Gymnastics as a gymnastics sports hall, gallery, office space, changing facility and storage room.

The original building which houses the gymnastics hall, changing facilities, office space and internal storage room was constructed in 1985. Sometime later (year unknown), a single storey extension was added on the west of the original building. This now houses the external storage room.

The structure of the gymnastics area of the building consists of steel portal frames with reinforced concrete masonry block walls up to the level of the first bend in the portal frames. A portion of the middle steel portal frames extend towards the south, accommodating the mezzanine viewing and gallery platform. The building has a concrete ground slab and foundations consisting of pad footings under the portal frame columns connected by concrete strip footings which extend under the reinforced concrete masonry block walls.

The single storey changing room area and storage areas to the south and west of the gymnastics area consist of reinforced concrete masonry block walls supporting the timber framed roofing. These areas also have concrete ground slabs and concrete strip footings.

The structure of the external storage room located at the west of the gymnastics area also consists of reinforced concrete block masonry walls supporting the timber framed roofing. No drawings were found for this part of the structure. The building is believed to be supported by strip footings beneath the reinforced concrete masonry block walls.

Key structural details of the building are shown in Figure 2 below.

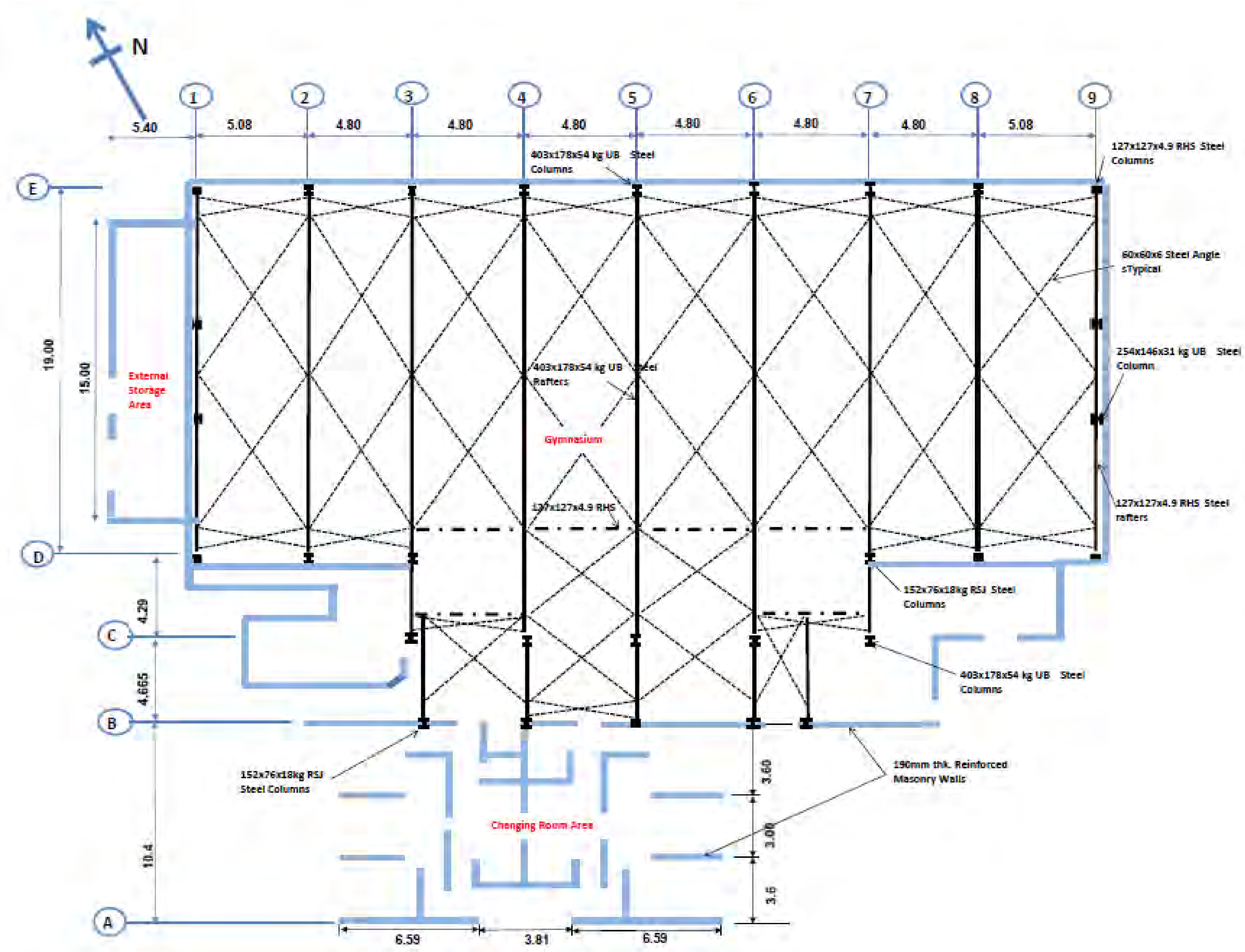


Figure 2 Plan Showing Key Structural Elements

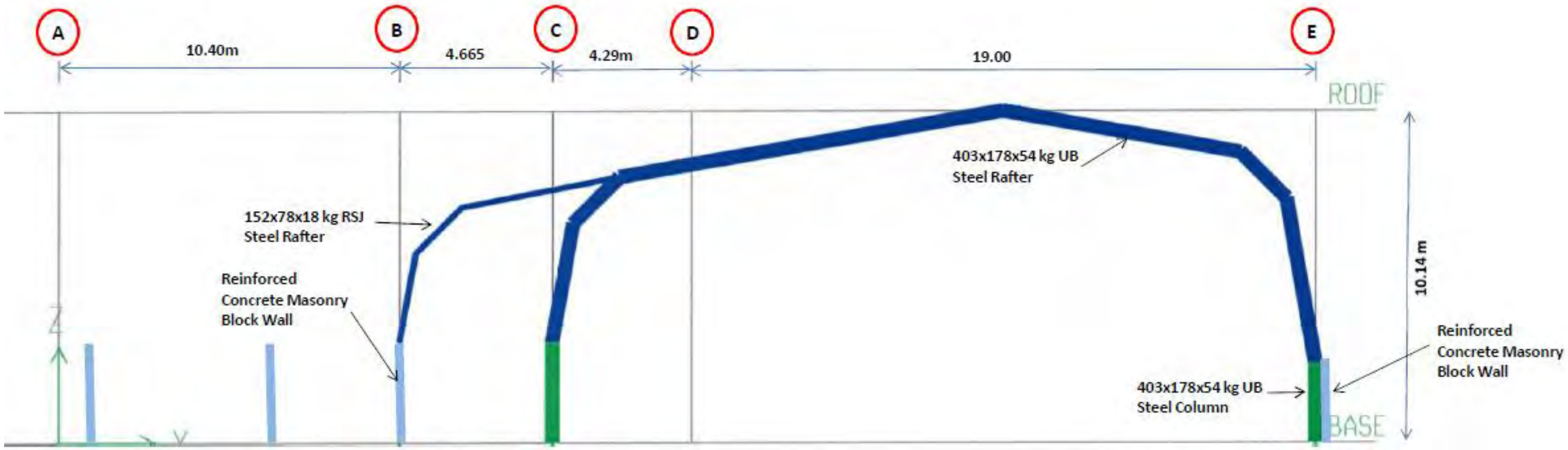


Figure 3 Frame at Grid Line 4

The dimensions of the main gymnastics hall are approximately 45 m long by 20 m wide and 11 m tall. The gallery platform and reinforced concrete masonry changing room areas extend another 15 m to the south of the building resulting in an overall width of approximately 35 m. The overall footprint of the building is approximately 1300 m^2.

4.2 Gravity Load Resisting System

The gravity loads in the structure are carried by a steel portal frame system supporting the gymnastics hall roof section of the building and reinforced concrete masonry blockwork walls in the changing room and storage areas.

The roof structure of the gymnasium area consists of a light steel roof supported by steel purlins. The gravity loads from the roof are transferred through the steel purlins spanning between the portal frames. The loads are then transferred through the portal frames and into the foundations of the building. A reinforced concrete masonry block wall to the height of the first bend of the portal frames is present on all sides of the building. An external view of these walls is shown in Photograph 5. Steel girts span between the portal frames along the walls of the building as can be seen in Photograph 11. Steel angle cross bracing is present between the portal frames at roof level but is not present below this level, as shown in Photograph 16. The mezzanine viewing platform flooring system consists of a suspended timber floor supported by timber framed walls and SHS steel columns.

The gravity loads in the single story concrete masonry changing room and storage areas are resisted by reinforced concrete masonry block walls. The roof structure consists of light steel roofing supported by timber framing.

The foundation for the building based on the available drawings consists of reinforced concrete pads, beams and slabs.

4.3 Lateral Load Resisting System

Lateral forces in the transverse direction of the main building are resisted by the moment resisting portal frames.

Lateral forces in the longitudinal direction of the main building are supposed to be transferred to the foundations of the building through the steel angle cross bracing down to the reinforced concrete masonry block walls and then down to the footings.

However there are two (2) issues of contention:

1. The steel portal frames that span over the gymnastics hall area have steel cross bracing at the roof level spanning between the portal frames as shown in Photograph 10. There is no steel cross bracing below the roof level of the building and as a result, the building relies on the columns of the portal frame and the wall girts to distribute the lateral forces from the bottom of cross bracing to the top of the reinforced concrete masonry block walls.
2. The roof cross bracing is expected to act in tension only and relies on the doubled purlins to provide the compression struts.

Both of these points may be suspect if the connection of the purlins and girts to the portal frame is not satisfactory.

In the changing room areas and the storage areas, lateral loads are resisted by reinforced concrete masonry block walls in both the longitudinal and transverse directions of the building.

5. Assessment

5.1 Site Inspection

An inspection of the building was undertaken on the 18th of January 2012. Both the interior and exterior of the building were inspected. The building was observed to have a green placard in place. Most of the main structural components of the building were able to be viewed due to the exposed nature of the structure. The reinforced concrete masonry block walls are unlined and the steel and timber framing is generally exposed. No inspection of the foundations of the structure was carried out.

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

5.2 Site Measurement

The external storage area building dimensions were measured due to unavailability of the drawings. In addition, rebar scanning using a HILTI Ferroscan was undertaken to determine approximately the rebar diameter and spacing in the reinforced concrete masonry block walls. The results of the scanning are attached in Appendix D.

5.3 Available Structural Drawings

There are available existing structural drawings provided to GHD and are itemised below:

Item #	Title	Sheet No.	Rev No.	Drawing Date
1	Reinforced Concrete – Standard Structural Details and Notes	200/1	-	Oct 1981
2	Masonry – Standard Structural Details and Notes	200/2	-	July 1979
3	Foundation Plan and Details	201	R1	April 1982
4	Foundation Details	202	-	April 1982
5	Blockwork Plan	203	-	April 1982
6	Blockwork Details	204	R2	April 1982
7	Portal and Steel Frame Layout	205	-	April 1982
8	Roof Plan and Steel Frame Layout	206	R1	April 1982
9	Steel Work Details and Sections	207	-	April 1982
10	Steel Work Details and Sections	208	-	April 1982

11	Steel Work Details and Sections	209	-	April 1982
12	Steel Work Details	210	R1	April 1982
13	Steel Work Details	211	R1	April 1982
14	Miscellaneous Steelwork Details	212	-	July 1982

5.4 Analysis and Modelling Methodology

Mathematical Modelling

The three-dimensional frame modelling of the Wigram Gymnasium was undertaken to realistically simulate the effects of the applied loads on the structure under different loading conditions such as normal operation, earthquake and combinations thereof.

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

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 the Etabs Version 9.7.2 structural analysis software, a computer model that incorporates all the properties of the steel portal frame and reinforced concrete masonry structure was prepared.

The Changing Room and External Storage Room were analysed separately using manual calculations and spread sheets.

Loading Conditions

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

Determination of %NBS

Upon determination of the critical loading conditions, each of the structural members that make up the Wigram Gymnasium was checked to determine %NBS of the members indicated as shown in the available drawings. Members demand and capacity ratio was computed and %NBS was calculated accordingly.

Seismic Design

The Wigram Gymnasium structure was checked to the seismic design standards in accordance with the AS/NZ 1170.5:2004, NZBC Clause B1 Structure and New Zealand Society of Earthquake Engineering “Guidelines for Assessment and Improvement of the Structural Performance of Buildings in Earthquakes”.

6. Damage Assessment

6.1 Surrounding Buildings

No damage to surrounding buildings was observed during site inspection.

6.2 Residual Displacements and General Observations

No residual displacements of the structure were noticed during site inspection of the building.

Minor cracks were observed in the reinforced concrete masonry blockwork walls in several areas of the building. On the east face of the building there are minor cracks in the reinforced concrete masonry blockwork walls. These cracks can be seen in Photographs 6 and 7 in Appendix B. These cracks were filled with dirt and as a result it is unlikely that they have occurred as a result of the recent seismic activity. They can more likely be attributed to shrinkage effects.

Cracking was also observed around the construction joint between the main gymnasium hall and the external storage area to the west. The cracking is likely due to relative movement between the two different structures. The reinforced concrete masonry storage area was an extension to the existing gymnastics hall and may have not been tied in structurally to the existing building, resulting in the two structures behaving separately. Details of the cracking in this area can be seen in Photographs 3 and 4.

6.3 Ground Damage

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

7. Structural Analysis

7.1 Seismic Parameters

Earthquake loads were calculated using the criteria specified by New Zealand Code NZS 1170.5:2004.

Site Classification	D
Importance Level	2
Seismic Zone factor (Z)	
(Table 3.3, NZS 1170.5:2004 and NZBC Clause B1 Structure)	0.30 (Christchurch)
Annual Probability of Exceedance	
(Table 3.3, NZS 1170.0:2002)	1/500 (ULS) Importance Level 2
Annual Probability of Exceedance	
(Table 3.3, NZS 1170.0:2002)	1/25 (SLS)
Return Period Factor (Ru)	
(Table 3.5, NZS 1170.5:2004)	1.0 (ULS)
Return Period Factor (Rs)	
(Table 3.5, NZS 1170.5:2004 and NZBC Clause B1 Structure)	0.33 (SLS)
Ductility Factor (μ)	2.00
Performance Factor (Sp) (NZS 3404:1997)	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.

7.2 Structural Ductility Factor

A structural ductility factor of 2.0 has been assumed in both the longitudinal and transverse directions of the building based on the steel portal frame system as indicated on the available drawings. The steel portal frames have been assessed as the limiting structural elements in terms of the ductility of the structure and the ability to dissipate energy during an earthquake. As a result, the structural ductility factor of 2.0 associated with the moment resisting steel portal frame has been used for the purpose of this Detailed Engineering Evaluation Quantitative Assessment.

8. Geotechnical Consideration

The site is bordered by Springs Road to the northwest, with recreational park area to the south and east.

The terrain of the subject site is relatively flat at approximately 22m above mean sea level. It is <1km north of the Heathcote River, approximately 3.2km southwest of the Avon River, and approximately 13km west of the coast (Pegasus Bay) at New Brighton.

8.1 Published Information on Ground Conditions

8.1.1 Published Geology

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

- Dominantly alluvial sand and silt overbank deposits, being Holocene soils of the Yaldhurst Member, sub-group of the Springston formation.

8.1.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that are no boreholes within 200m of the site. Borehole lithographic logs from beyond this distance show predominantly gravel and sandy gravel with varying quantities of clay beneath the ground surface.

8.1.3 EQC Geotechnical Investigations

The Earthquake Commission has not undertaken geotechnical testing in the area of the site.

8.1.4 CERA Land Zoning

Based on the known geology, subsurface investigations, and the absence of liquefaction and ground damage during the Canterbury earthquakes, the Canterbury Earthquake Recovery Authority (CERA) has published areas showing the Green Zone Technical Category in relation to the risk of future liquefaction and how these areas are expected to perform in future earthquakes.

The site is classified as Green, N/A. This indicates that it is a non-residential property in an urban area that has not been given a Technical Category. However, nearby land has been classified as Technical category 1 (TC1) which means that liquefaction is unlikely in a future earthquake event.

8.1.5 Post February Aerial Photography

Aerial photography taken following the 22 February 2011 earthquake (Figure 1) shows no signs of liquefaction outside the building footprint or adjacent to the site and the site inspection commented that there was no noticeable ground damage.

[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.

Figure 4 Post February 2011 Earthquake Aerial Photography[2]

8.1.6 Summary of Ground Conditions

From the information presented above, the ground conditions are likely to comprise of silty clay underlain at shallow depth by gravel and sandy gravel.

8.2 Seismicity

8.2.1 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.

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

Table 2 Summary of Known Active Faults[3][4]

Known Active Fault	Distance from Site (km)	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	125 NW	~8.3	~300 years
Greendale (2010) Fault	14 W	7.1	~15,000 years
Hope Fault	110 N	7.2~7.5	120~200 years
Kelly Fault	110 NW	7.2	~150 years
Porters Pass Fault	58 NW	7.0	~1100 years

Recent earthquakes since 4 September 2010 have identified the presence of a new active fault system / zone 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 and average recurrence intervals are yet to be established.

8.2.2 Ground Shaking Hazard

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.

New Zealand Standard NZS 1170.5:2004 now 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.

8.3 Field Investigations

In order to further understand the ground conditions at the site, one piezocone CPT investigation was conducted at the site on 02 April 2012.

The location of the test is tabulated in Table 2.

Table 2 Coordinates of Investigation Locations

Table 3 Coordinates of Investigation Locations

Investigation	Depth (m bgl)	Easting (NZMG)	Northing (NZMG)
CPTU 001	0.9	2473167	5740044

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

[4] GNS Active Faults Database

The CPTU investigation was undertaken by McMillan Drilling Service on 02 April 2012, typically to a target depth of 20m below ground level. However, refusal was reached at depth of 0.9m due to the presence of dense gravels.

Interpretation of output graphs[5] from the investigation showing Cone Tip Resistance (qc), Friction Ratio (Fr), Inferred Lithology and Inferred Liquefaction Potential are presented in Table 3.

8.4 Ground Conditions Encountered

8.4.1 Summary of CPT-Inferred Lithology

Table 4 Summary of CPT-Inferred Lithology

Depth (m)	Lithology [1]	Cone Tip Resistance q_c (MPa)	Friction Ratio Fr (%)
0 – 0.9	Surface soil	~15.0	1.0 – 2.0
>0.9	Gravel	> 20.0	~0.0

8.5 Interpretation of Ground Conditions

8.5.1 Liquefaction assessment

It is considered that liquefaction at this site is unlikely to occur in future earthquake events. This is based on:

- No signs of liquefaction from post-earthquake aerial photography or during inspection on 18 January 2012
- Ground conditions encountered of dense shallow gravels
- TC1 classification

8.5.2 Slope Failure and/or Rockfall Potential

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

8.5.3 Foundation Recommendations

Following the guidance provided by the Department of Housing and Building6 (DBH) in section 4 for repairing of foundations for TC1 dwellings, the following geotechnical recommendations are provided:

- A site subsoil Class of D, Deep or Soft Soil, should be adopted for the site (in accordance with NZS 1170.5:2004).

[5] McMillans Drilling CPT data plots, Appendix A.

- An allowable bearing Capacity of 100KPa can be used for standard shallow foundation solutions using timber and concrete floors, in accordance with New Zealand Building regulations and NZS 3604.
- If a re-build is deemed necessary a shallow investigation specific to the new building footprint should be undertaken. Shallow ground improvement is not required.

9. Results of the Analysis

The following are the results of structural analysis to Wigram Gymnasium structure.

9.1 Gymnasium

Steel Columns

All steel columns rated above 100%NBS.

Roof Steel Rafters

The rafters in five (5) of the steel portal frames rated lower than 67%NBS with the lowest on grid line 5 being 43%NBS. These are highlighted in red in Figure 5 on page 21.

Gallery Steel Beams

One (1) gallery support steel beam rated below 67%NBS. It is highlighted in red in Figure 6 on page 22.

Roof Steel Braces (Tension Only)

All roof steel angle braces met 100%NBS

Reinforced Concrete Masonry Block Walls

All reinforced concrete masonry block wall panels were found to be above 100% NBS.

Seismic Horizontal Deflection

The computed seismic horizontal defections of the Gymnasium structure are itemised in the table below.

Table 5 Seismic Horizontal Deflection

Level	Seismic in Longitudinal Direction	Seismic in Transverse Direction	Height(H) (m)	Allowable, 2.5%xH (mm)
Roof	98 mm	86 mm	10.15	253

9.2 Changing Room

Reinforced Concrete Masonry Block Wall

All reinforced concrete masonry block wall panels were found to be above 100% NBS.

9.3 External Storage Room

Reinforced Concrete Masonry Block Wall

All reinforced concrete masonry block wall panels were also found to be over 100%NBS.

Seismic Horizontal Deflection

The computed seismic horizontal deflection of the structure in the transverse direction is 1 mm. Similarly, the horizontal deflection of the Gymnasium in the longitudinal direction at roof level of External Storage Room is 10 mm. The two (2) horizontal deflections are then combined as per Appendix 4D.1 of NZSEE which resulted to a value of 10 mm.

Considering the approximate nominal gap of 5 mm between the External Storage Room and the Gymnasium, and the computed combined seismic horizontal deflection of 10 mm, the structure was rated 50% NBS.

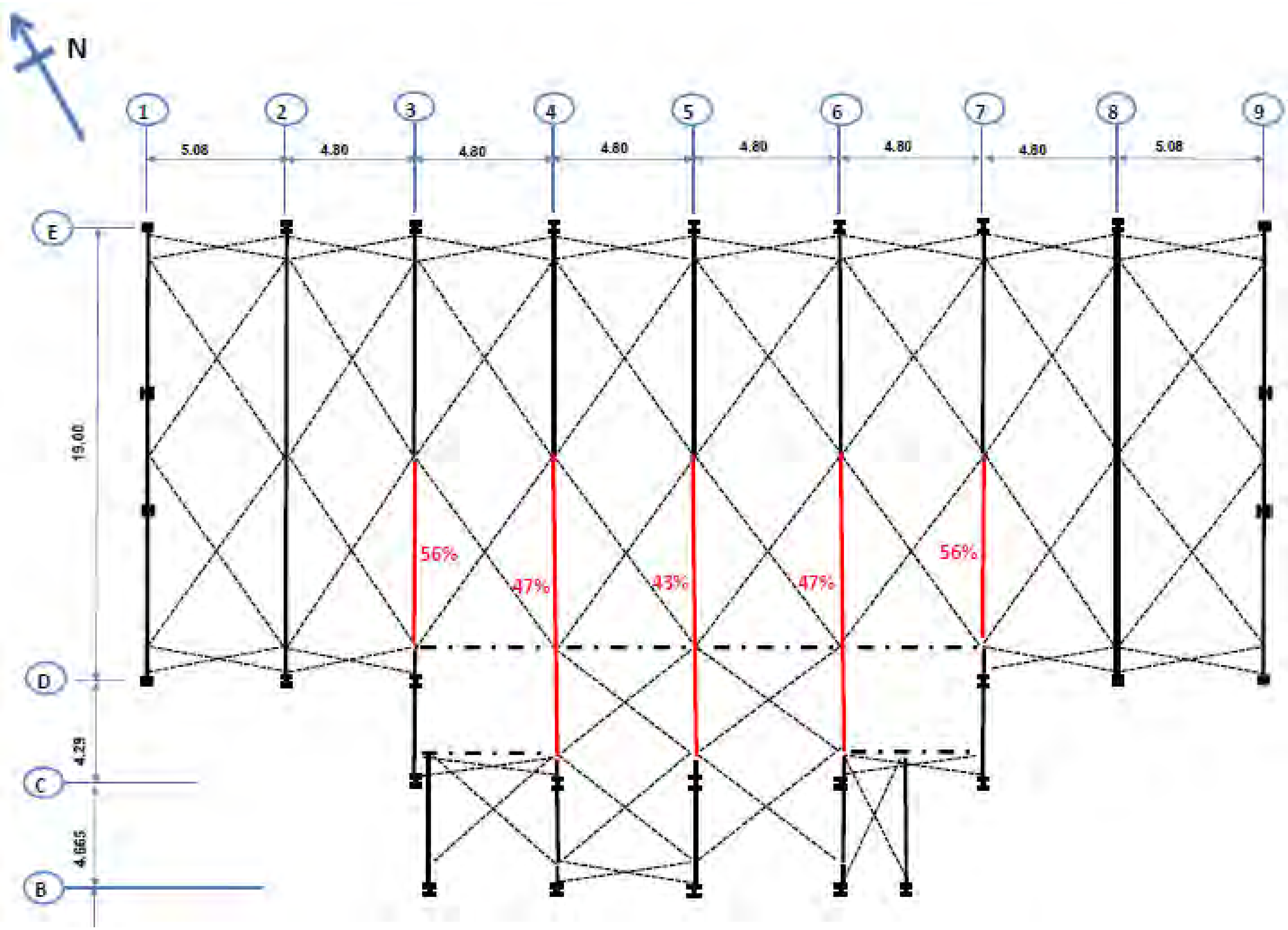


Figure 5 Roof steel rafters rated less than 67%NBS

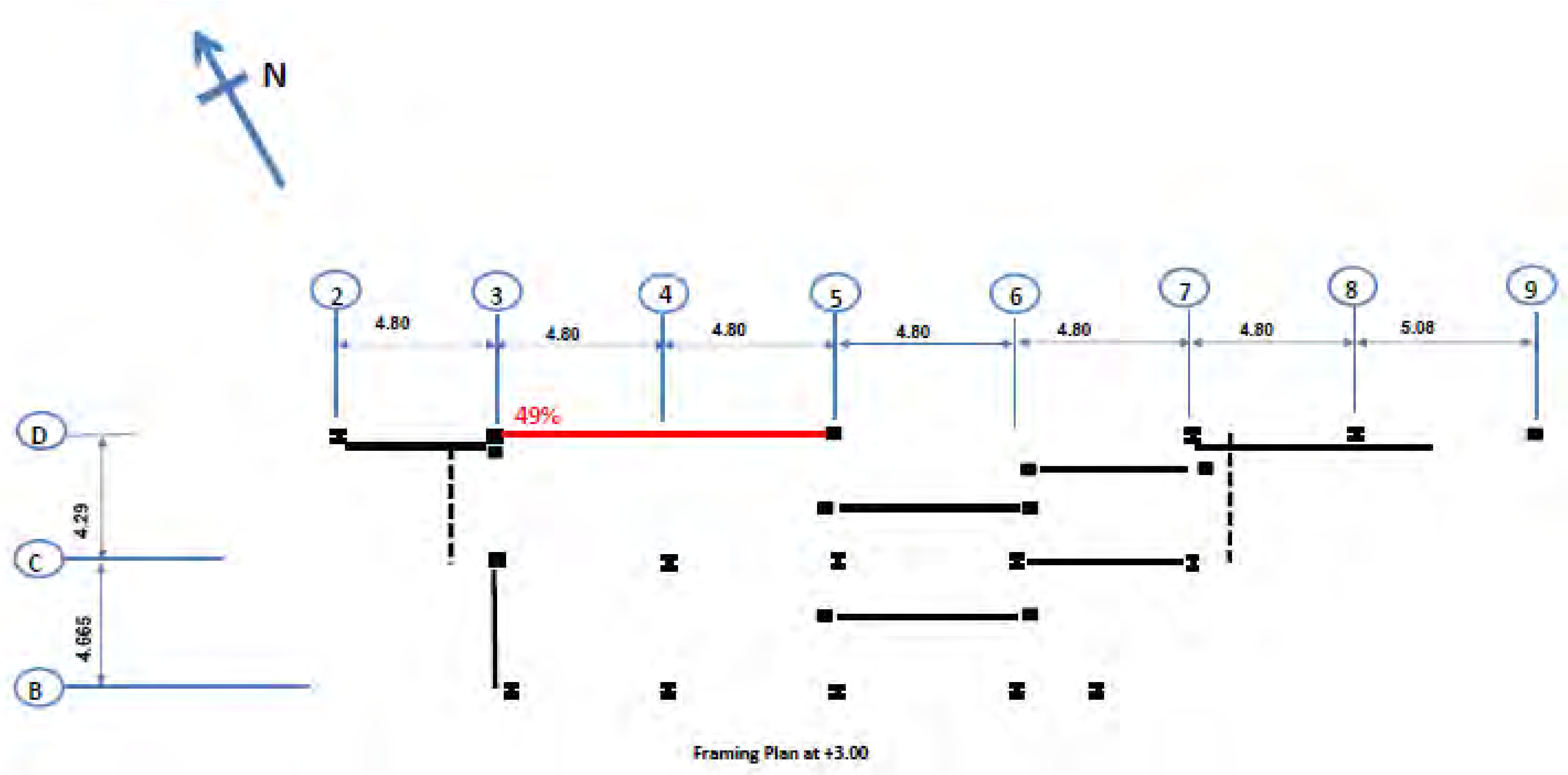


Figure 6 Gallery steel beam rated less than 67%NBS

9.4 Discussion of Results

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

The original building was constructed in 1982 and was likely designed to the loading standard current at the time, NZS 4203:1976. The design loads used in this code are likely to have been less than those required by the current loading standard and the detailing requirements for ductile seismic behaviour that are present in the current codes would not have been considered in the design. 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.

9.5 Occupancy

The building has been assessed as "Earthquake Risk". As a result the building is still acceptable to be occupied.

10. Conclusions

10.1 Building Capacity Assessment

The building overall has been assessed as having a seismic capacity of 43% NBS and is therefore classified as 'Earthquake Risk'.

Gymnasium

The critical structural weakness for this building is the rafters of the steel portal frames which support the steel roof system and transfer the roof lateral load down to the foundations. These steel structural elements rated 43% NBS.

The steel portal frames lacks adequate roof and wall bracing to transfer the roof lateral load down to the foundation. The presence of reinforced concrete masonry walls along the perimeter of the portal frames helps to brace the lateral load resisting system but needs additional roof compression strut and wall bracing to make the building structurally robust.

Changing Room

The building rated above 100%NBS.

External Storage Area

The building also rated above 50%NBS.

Building Horizontal Deflection

The computed seismic horizontal deflection of the Gymnasium roof is 98 mm and 86 mm in the longitudinal and transverse direction respectively. These values are within the requirements of AS/NZS 1170.5:2004.

Pounding Effect

There is an approximately 5 mm seismic gap between the Gymnasium and External Storage Room in the longitudinal direction. In the event of earthquake, each building will produce different period, there is a risk that they will pound each other. The pounding may cause cracks, localised member and connection damage at the possible point or area of impact. It is also possible that the cracks along the construction joint mentioned in the key damage observed may be attributed to some minor pounding.

10.2 Occupancy

The Wigram Gymnasium has been assessed as "Earthquake Risk". As a result the building is still acceptable to be occupied.

11. Recommendations

Recommendation

GHD recommend the following:

- Minor repairs are undertaken to fill the cracks identified in the reinforced concrete masonry block walls.
- A strengthening scheme is developed to increase the seismic capacity of the Wigram Gymnasium to as near as practicable to 100%NBS, and at least 67%NBS. This will need to consider compliance with accessibility and fire requirements.

12. Limitations

12.1 General

This report has been prepared subject to the following limitations:

- Available drawings itemised in Section 5.3 were used in the assessment.
- The roof structure and foundations of the building were unable to be inspected.
- Foundations were not checked.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.

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

12.2 Geotechnical Limitations

The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical 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.

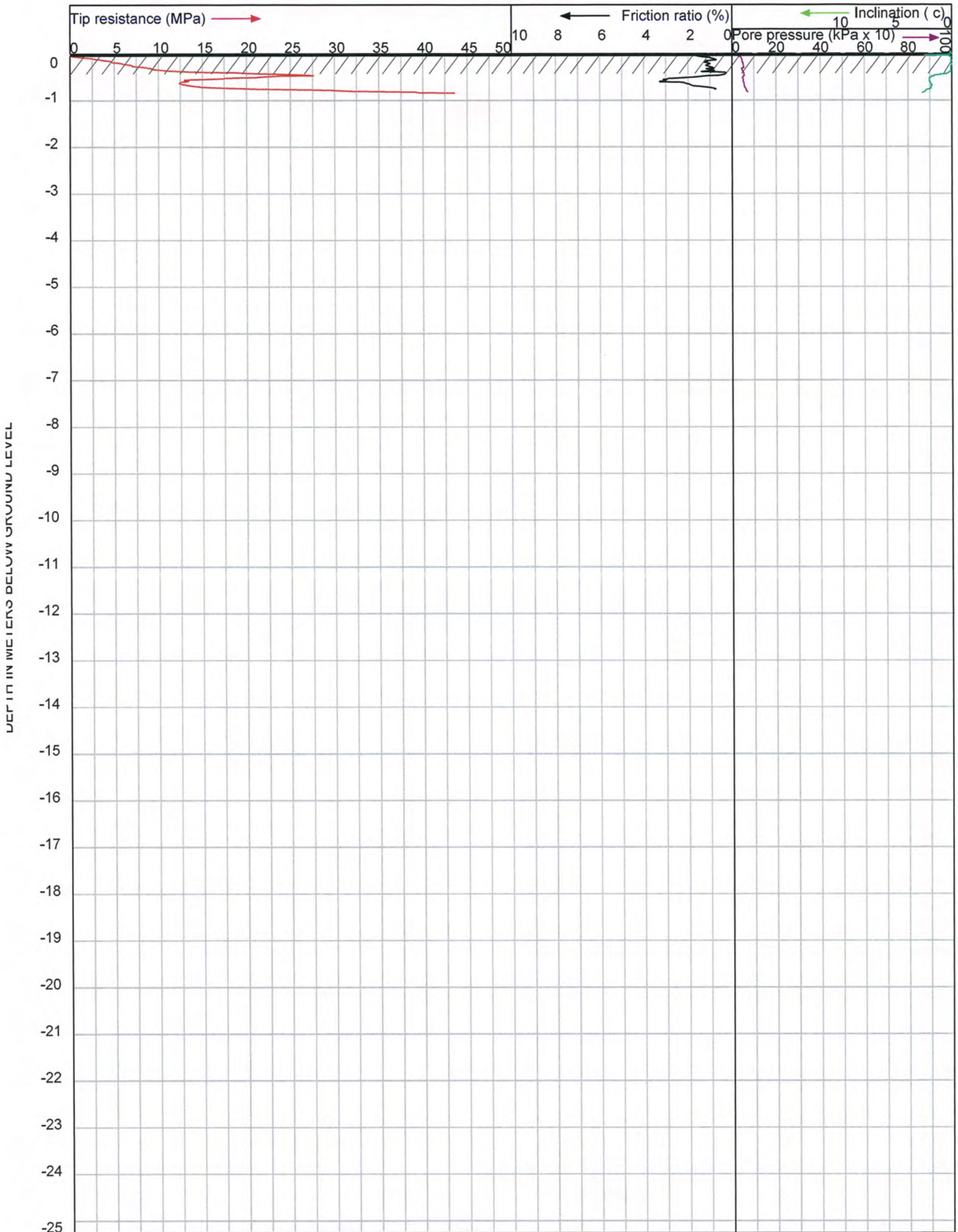
The subsurface and surface earthworks, excavations and foundations should be examined by a suitably qualified and experienced Engineer who shall judge whether the revealed conditions accord with both the assumptions in this report and/or the design of the works. If they do not accord, the Engineer shall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

Geotechnical Investigation Reports and Analysis

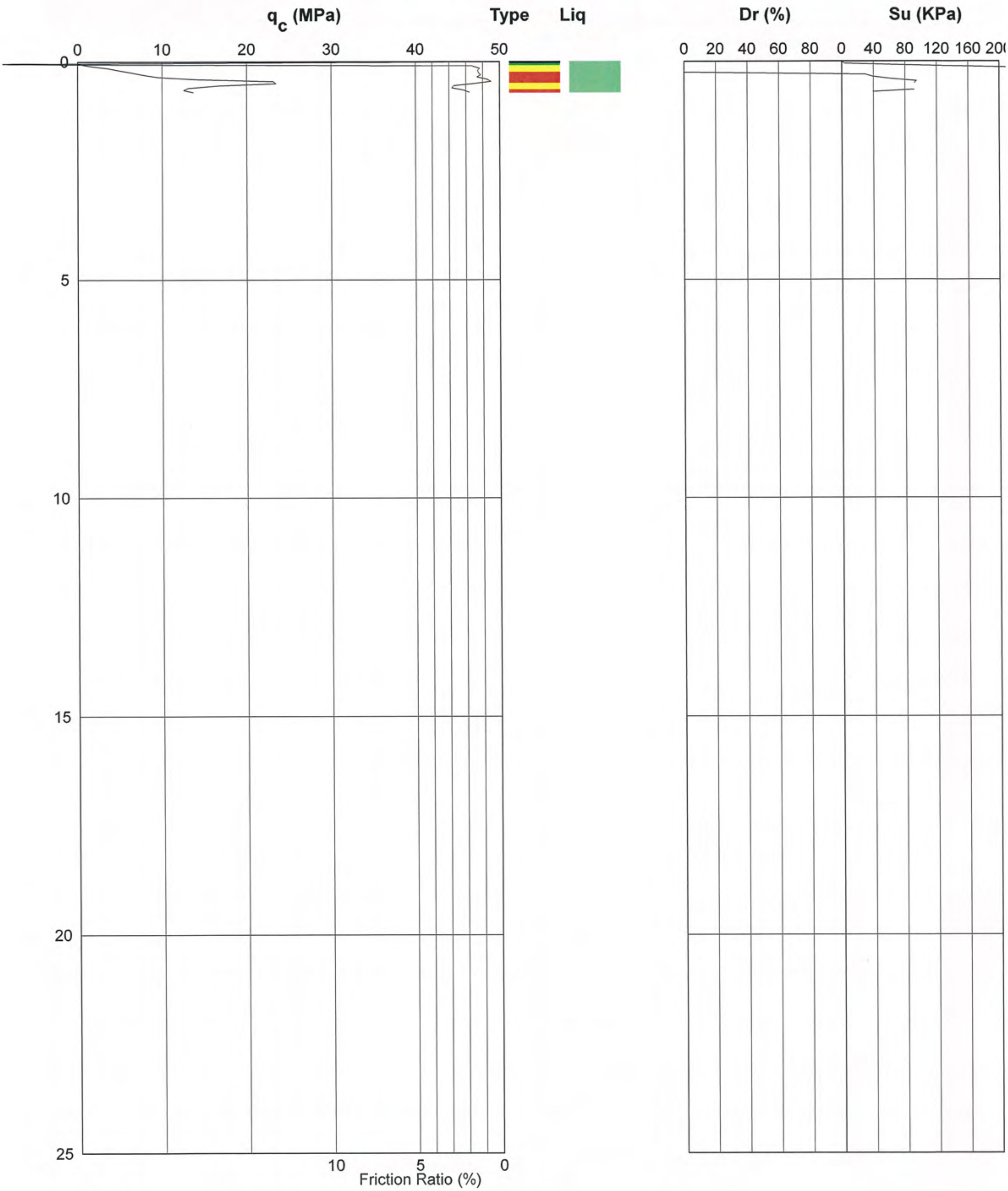


CLIENT : GHD
LOCATION : Christchurch Various (CCC Properties)
DATE : 2-4-2012
OPERATOR : H. Pardoe
REMARK 1 : CPTu23
REMARK 2 : Effective Refusal

JOB # : 10386
TEST # : 23

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:	10386	Date:	2-4-2012
CPT No:	CPTu23	Operator:	H. Pardoe
Project:	GHD	Remark:	Effective Refusal
Location:	Christchurch Various (CCC Properties)		

McMILLAN DRILLING SERVICES

Appendix B
Photographs

Photograph 1 View from Corsair Drive.

Photograph 2 Concrete masonry changing rooms.

Photograph 3 **Cracking between external storage room and main building.**

Photograph 4 **View of connection between external storage room and main building.**

Photograph 5 North-eastern face of the building.

Photograph 6 Cracking in concrete masonry wall.

Photograph 7 **Further cracking in concrete masonry wall.**

Photograph 8 **South-eastern face of building.**

Photograph 9 Portal frame knee joint connection.

Photograph 10 View of internal roof bracing.

Photograph 11 Steel girts between portal frames.

Photograph 12 Portal frame base connection.

Photograph 13 Connection between steel portal frame and infill masonry wall.

Photograph 14 Close-up of steel girts between portal frames.

Photograph 15 Portal frame bracing connections.

Photograph 16 Bracing between portal frames.

Photograph 17 Extended roof area over mezzanine viewing platform.

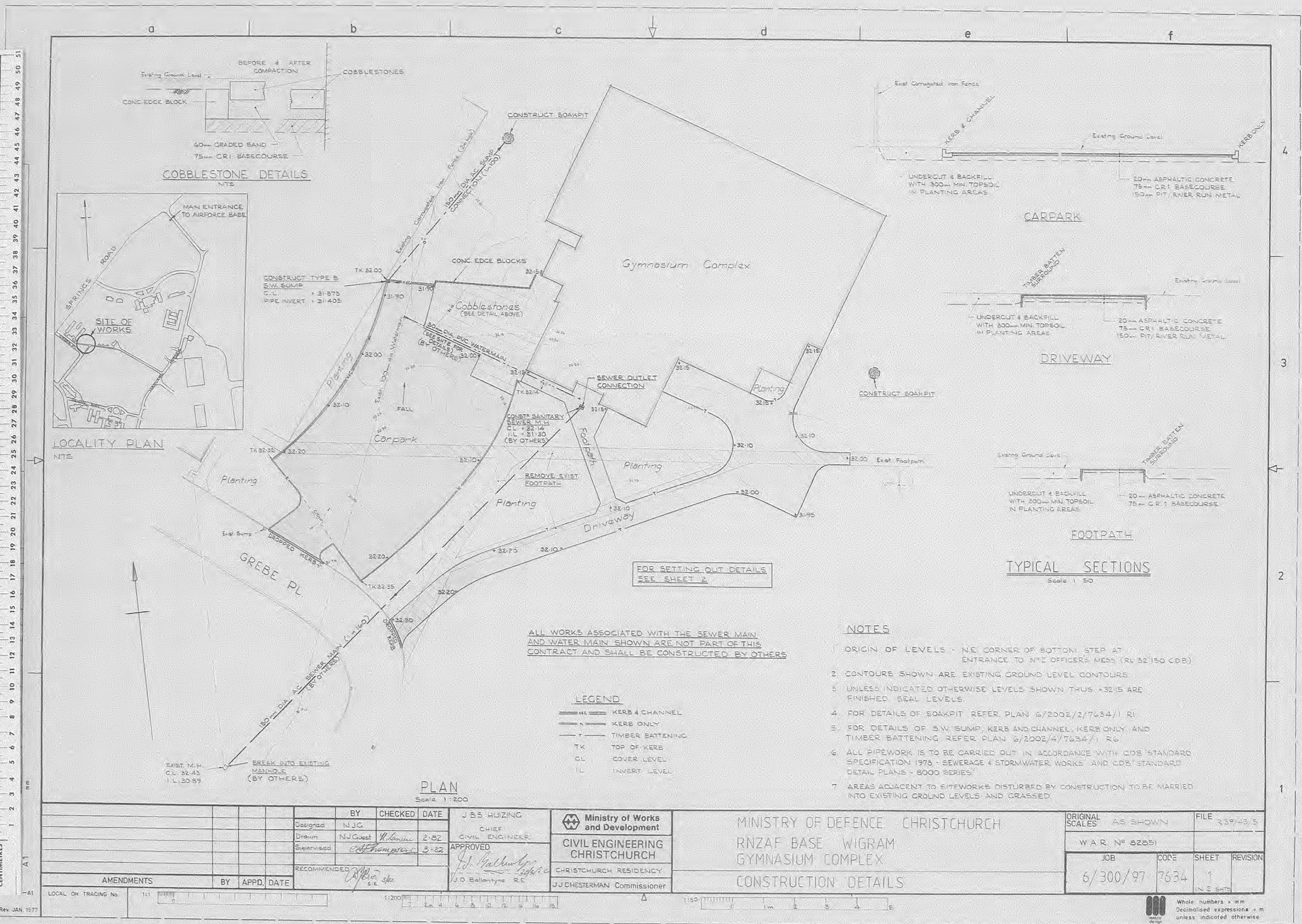
Photograph 18 Connection between steel stairs and concrete masonry wall.

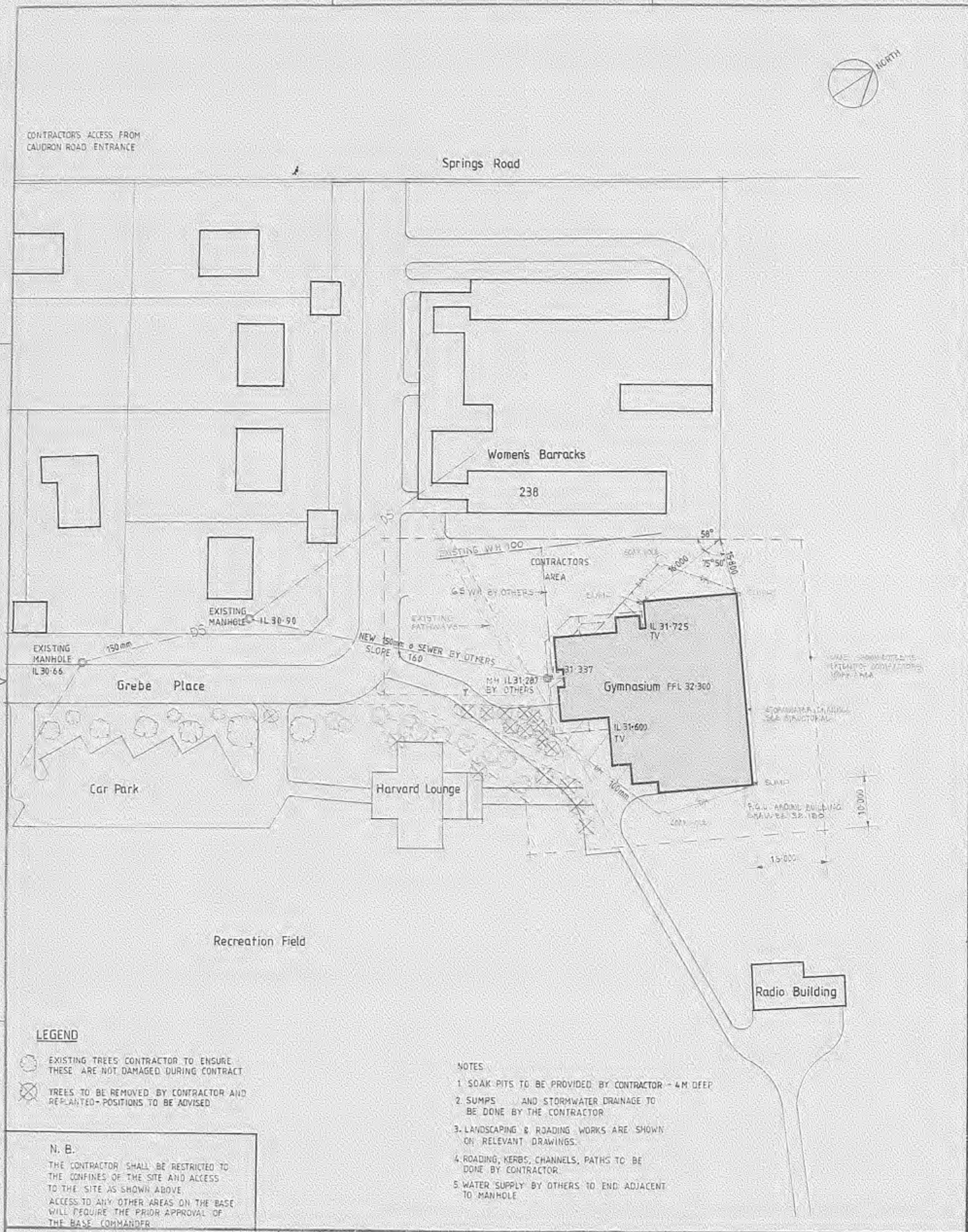
Photograph 19 **Further connection between steel stairs and concrete masonry wall.**

Photograph 20 **Steel RHS posts supporting steel stairs.**

Appendix C

Existing Drawings


COBBLESTONE DETAILS
NTS
BEFORE & AFTER COMPACTION
Existing Ground Level
COBBLESTONES
CONC. EDGE BLOCK
60mm GRADED SAND
75mm CR1 BASECOURSE
LOCALITY PLAN
NTS
MAIN ENTRANCE TO AIRFORCE BASE
SPRINGS ROAD
SITE OF WORKS
CONSTRUCT SOAKPIT
150mm DIA AC SUMP CONNECTION (1:100)
Existing Corrugated Iron Fence
CONSTRUCT TYPE B S.W. SUMP
C.L. = 31·875
PIPE INVERT = 31·405
TK 32.00
CONC. EDGE BLOCKS
Cobblestones
(SEE DETAIL ABOVE)
Gymnasium Complex
50mm DIA. PVC WATERMAIN (SEE SHEET FOR DETAILS) (BY OTHERS)
SEWER OUTLET CONNECTION
CONSTR SANITARY SEWER M.H.
C.L. = 32·14
I.L. = 31·30
(BY OTHERS)
Planting
Carpark
FALL
Footpath
Driveway
REMOVE EXIST FOOTPATH
CONSTRUCT SOAKPIT
Exist Footpath
Exist Sump
DROPPED KERB
GREBE PL
150mm DIA AC SEWER MAIN (1:160) (BY OTHERS)
EXIST. M.H.
C.L. 32·43
I.L. 30·89
BREAK INTO EXISTING MANHOLE (BY OTHERS)
FOR SETTING OUT DETAILS SEE SHEET 2
ALL WORKS ASSOCIATED WITH THE SEWER MAIN AND WATER MAIN SHOWN ARE NOT PART OF THIS CONTRACT AND SHALL BE CONSTRUCTED BY OTHERS
PLAN
Scale 1:200
Exist Corrugated Iron Fence
KERB & CHANNEL
KERB ONLY
Existing Ground Level
UNDERCUT & BACKFILL WITH 300mm MIN. TOPSOIL IN PLANTING AREAS
20mm ASPHALTIC CONCRETE
75mm CR1 BASECOURSE
150mm PIT/RIVER RUN METAL
CARPARK
TIMBER BATTEN SURROUND
DRIVEWAY
20mm ASPHALTIC CONCRETE
75mm CR1 BASECOURSE
FOOTPATH
TYPICAL SECTIONS
Scale 1:50
NOTES
1. ORIGIN OF LEVELS - N.E. CORNER OF BOTTOM STEP AT ENTRANCE TO No 2 OFFICERS MESS (RL 32·150 CDB)
2. CONTOURS SHOWN ARE EXISTING GROUND LEVEL CONTOURS
3. UNLESS INDICATED OTHERWISE LEVELS SHOWN THUS +32·15 ARE FINISHED SEAL LEVELS
4. FOR DETAILS OF SOAKPIT REFER PLAN 6/2002/2/7634/1 R1
5. FOR DETAILS OF S.W. SUMP, KERB AND CHANNEL, KERB ONLY AND TIMBER BATTENING REFER PLAN 6/2002/4/7634/1 R6
6. ALL PIPEWORK IS TO BE CARRIED OUT IN ACCORDANCE WITH CDB STANDARD SPECIFICATION 1978 - SEWERAGE & STORMWATER WORKS AND CDB STANDARD DETAIL PLANS - 8000 SERIES
7. AREAS ADJACENT TO SITEWORKS DISTURBED BY CONSTRUCTION TO BE MARRIED INTO EXISTING GROUND LEVELS AND GRASSED
LEGEND
KERB & CHANNEL
KERB ONLY
TIMBER BATTENING
TK TOP OF KERB
CL COVER LEVEL
IL INVERT LEVEL
AMENDMENTS
BY
APPD.
DATE
BY CHECKED DATE
Designed NJG
Drawn NJ Guest 2·82
Supervised 3·82
RECOMMENDED
J B S HUIZING
CHIEF CIVIL ENGINEER
APPROVED
J O Ballantyne R.E.
Ministry of Works and Development
CIVIL ENGINEERING CHRISTCHURCH
CHRISTCHURCH RESIDENCY
J J CHESTERMAN Commissioner
MINISTRY OF DEFENCE CHRISTCHURCH
RNZAF BASE WIGRAM
GYMNASIUM COMPLEX
CONSTRUCTION DETAILS
ORIGINAL SCALES AS SHOWN
FILE 339/43/5
W.A.R. No 82851
JOB 6/300/97
CODE 7634
SHEET 1 IN 2 SHTS
REVISION
LOCAL OR TRACING No.
Rev. JAN. 1977
Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



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602	AMENITIES BLOCK - HOT AND COLD WATER LAYOUT

	BY	CHECKED	DATE
DESIGNED	GMC		6/81
DRAWN	JAS		11/81
CHECKED			
APPROVED			

AMENDMENTS | BY | APPD. | DATE
R1 Sheet title (?) changed | DHHS

GO MISKIMMIN GOVERNMENT ARCHITECT

R.W. TAYLOR DISTRICT ARCHITECT

Ministry of Works and Development
ARCHITECTURAL CHRISTCHURCH
JJ Chesterman Commissioner

MINISTRY OF DEFENCE - CHRISTCHURCH
RNZAF BASE WIGRAM
GYMNASIUM COMPLEX

SITE PLAN AND INDEX

ORIGINAL SCALES 1:500

FILE 43/9/4

JOB	CODE	SHEET	REVISION
6 / 300 / 97	7601	101	R1

Whole numbers = mm. Decimalised expressions = m Unless indicated otherwise

ORIGINAL SIZE A1

LOCAL OR TRACING No.

Rev. JAN 1977

a | b | c | d | e | f

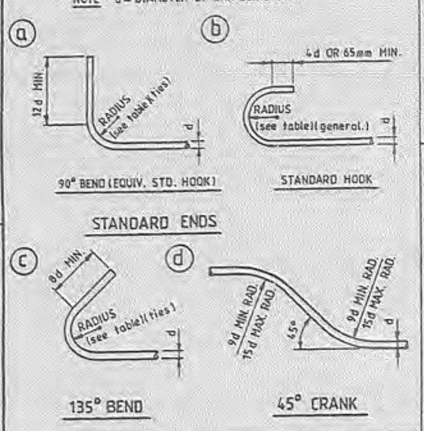
1 STD. BEND RADII

STEEL GRADE	BAR SIZE	GENERAL	TIES * PLAIN BARS	TIES * DEFORMED
275	6 TO 24	2·5d	d	2d
	24 TO 40	3d	—	—

* TIES — EQUAL TO RADIUS OF ENCLOSED BAR BUT NOT LESS THAN THE VALUES GIVEN IN THE TABLE.

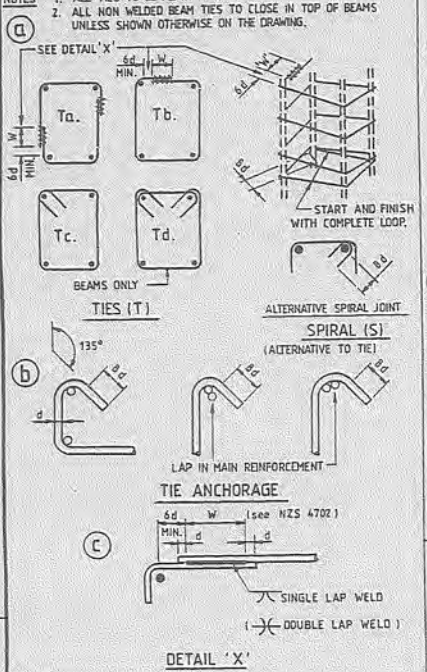
RADIUS OF BENDS (INSIDE FACE)

NOTE d = DIAMETER OF BAR BEING BENT.



2 TIES FOR BEAMS AND COLUMNS

NOTES 1. ALL TIES TO BE PLAIN ROUND BARS.
2. ALL NON WELDED BEAM TIES TO CLOSE IN TOP OF BEAMS UNLESS SHOWN OTHERWISE ON THE DRAWING.

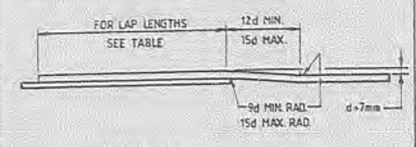


3 LAP AND ANCHORAGE LENGTHS

FOR BARS AT GREATER THAN 100mm CENTRES.

BAR DIAMETER	10	12	16	20	24	28	32
LAP LENGTH ℓ	300	400	700	900	1300	1400	1800

WHERE SPLICES ARE REQUIRED FOR ADJACENT BARS AT LESS THAN 100mm CENTRES, CONSULT STRUCTURAL ENGINEER.



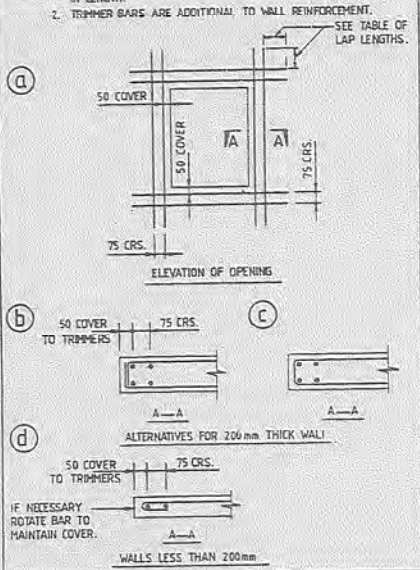
OFFSET LAPS

4 MINIMUM REINFORCEMENT FOR WALLS 200mm THICK OR LESS

(ALL DIMENSIONS IN mm)

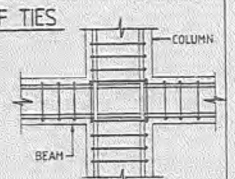
WALL THICKNESS	TRIMMING BARS TO OPENINGS	MINIMUM WALL REINFORCEMENT HORIZONTAL	MINIMUM WALL REINFORCEMENT VERTICAL
200	2-D12-75 E.F.	D10-300 E.F.	D10-450 E.F.
175	2-D16-75 C.	D12-250 C.	D12-400 C.
150	2-D16-75 C.	D12-300 C.	D12-350 C.
100-125	2-D16-75 C.	D10-250 C.	D10-250 C.

NOTES 1. NO TRIMMER BARS AT SIDES OF OPENINGS 300mm OR LESS IN LENGTH.
2. TRIMMER BARS ARE ADDITIONAL TO WALL REINFORCEMENT.

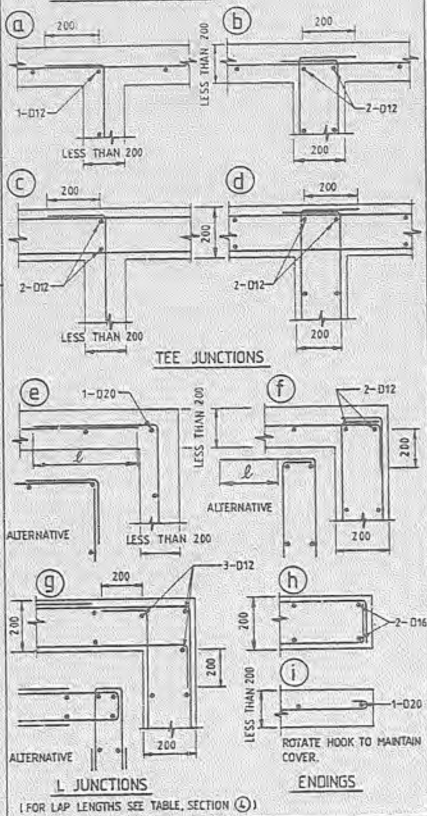


5 POSITIONING OF TIES

NOTES
1. POSITION OF FIRST COLUMN TIE TO BE AGAINST MAIN BEAM REINFORCEMENT.
2. POSITION OF FIRST BEAM TIE TO BE AGAINST MAIN COLUMN REINFORCEMENT.
3. JOINT REINFORCEMENT NOT SHOWN.

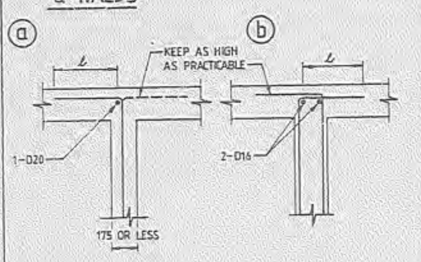


6 JUNCTIONS & ENDINGS OF WALLS 200mm & LESS WITH MINIMUM REINFORCEMENT



(FOR LAP LENGTHS SEE TABLE, SECTION 3)

7 SLAB JUNCTIONS WITH EDGE BEAMS & WALLS



8 COVERS

1. FOR REINFORCEMENT TOLERANCES SEE ARCHITECTURAL STANDARD STEEL REINFORCEMENT SPECIFICATION.

CAST IN SITU

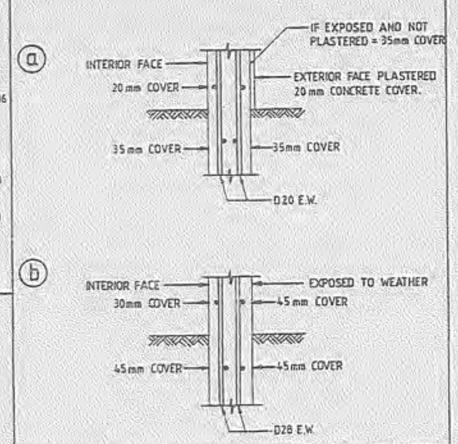
	NOT EXPOSED							EXPOSED						
BAR DIAMETER	40	32	28	24	20	16	10/12	40	32	28	24	20	16	10/12
FOOTINGS				45							45			
COLUMN AND BEAM REINF. (A) PRINCIPAL				40							50			
(B) SECONDARY					25							40		
SLABS, WALLS, AND RIBS	40		30			20			45				35	

PRECAST

	NOT EXPOSED							EXPOSED						
BAR DIAMETER	40	32	28	24	20	16	10/12	40	32	28	24	20	16	10/12
COLUMN AND BEAM REINF. (A) PRINCIPAL				35			30				40			
(B) SECONDARY					20		15						30	
SLABS, WALLS, AND RIBS	35		25			15		40					30	

9 DOUBLE REINFORCED WALL AT GROUND LEVEL

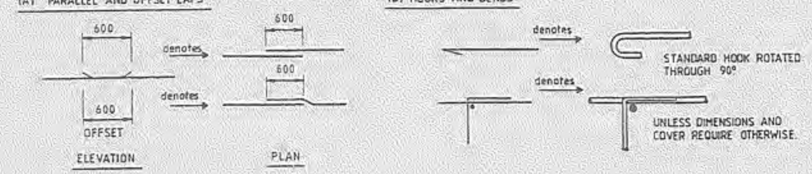
SHOWING RE-ARRANGEMENT OF HORIZONTAL BARS TO OBTAIN EXTRA COVER



10 NOTES

1. DETAILS ON THIS SHEET APPLY ONLY TO REINFORCING BARS OF GRADE 275 MPa TO NZS 3402P.
2. PICTORIAL REPRESENTATION OF REINFORCING BARS ON DRAWINGS.

(A) PARALLEL AND OFFSET LAPS (B) HOOKS AND BENDS



3. STANDARD ABBREVIATIONS

ALT	ALTERNATE	D.P.C.	DAMP PROOF COURSE	N.F.	NEAR FACE
B	BOTTOM	D.H.	DEFORMED HIGH TENSILE BARS	N.L.	NO LAPS
C	CENTRAL	E.F.	EACH FACE	R	PLAIN ROUND BARS
C.J.	CONSTRUCTION JOINT	E.W.	EACH WAY	S.F.L.	STRUCTURAL FLOOR LEVEL
CRS	CENTRES OF BARS	F.F.	FAR FACE	STA.	STARTER
d	NOMINAL BAR DIA. IN mm	F.F.L.	FINISH FLOOR LEVEL	T	TOP
D	DEFORMED BARS	L.A.R.	LAP AT RANDOM	TRM.	TRIMMER
				V.L.	VARYING LENGTHS

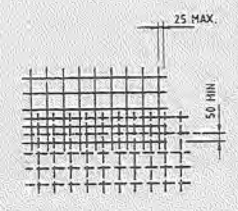
4. REINFORCEMENT NOTATIONS

D12-250 DENOTES 12mm DIA. DEFORMED BARS AT 250mm CENTRES.
R12-250 DENOTES 12mm DIA. PLAIN ROUND BARS AT 250mm CENTRES.

5. CONCRETE MIX NOTATIONS

20mm C30. DENOTES 20mm - MAX. AGGREGATE SIZE.
C - INSITU CONCRETE.
30 - 28 DAY COMPRESSION STRENGTH, MPa.

12mm P35. DENOTES 12mm - MAX. AGGREGATE SIZE.
P - PRECAST CONCRETE.
35 - 28 DAY COMPRESSION STRENGTH, MPa.



6. IN GROUND SUPPORTED SLABS ONLY, WELDED WIRE MESH REINFORCEMENT TO BE LAPPED AS SHOWN ABOVE—
7. SLABS ON GROUND SHALL BE POURED IN ALTERNATE PANELS NOT EXCEEDING 25 SQm OR 7m ON ANY SIDE WITH 14 DAYS BETWEEN ADJACENT PANELS. ALTERNATIVELY SAW 1/4 OF SLAB THICKNESS TO ANY APPROVED PATTERN NOT LATER THAN 36 HOURS AFTER POURING, UNLESS OTHERWISE INSTRUCTED. ALTERNATE WIRES AND/OR BARS TO BE DISCONTINUOUS AT JOINTS AND NO LAPS TO OCCUR AT JOINTS.
8. SLAB TOP REINFORCEMENT SHALL BE SUPPORTED BY HIGH CHAIRS OR OTHER APPROVED METHODS. TOP REINFORCEMENT NOT TO BE SUPPORTED ON PRECAST BLOCKS.
9. MESH REINFORCEMENT IS DESIGNATED ON THE DRAWINGS BY THE PITCHES OF WIRE IN INCHES FOLLOWED BY RESPECTIVE SIZE OF WIRE.
E.G. 665 MESH
PITCH OF WIRE IN INCHES —— SIZE OF WIRES (S.W.G.)
N.B. MESH SIZES ARE DESIGNATED IN IMPERIAL UNITS BECAUSE METRIC SIZES ARE NOT PRODUCED.
10. LAPS WHERE LAPS ARE NOT SHOWN ON THE DRAWINGS, REINFORCEMENT IN WALLS AND SLABS MAY, IF APPROVED, BE LAPPED AT RANDOM IN A STAGGERED PATTERN. BARS LONGER THAN 3m WHERE LENGTH IS CRITICAL FOR ACCURATE PLACING SHOULD INCORPORATE ONE LAP.
11. TIMBER GROUNDS ARE NOT TO BE USED WITHOUT APPROVAL. WHERE USED THEY ARE TO BE AT LEAST 20mm CLEAR OF ANY REINFORCING.
12. ANCHOR BOLTS. FOR STUD WALL PLATES ETC. TO BE 12mm DIA. MINIMUM EMBEDMENT 75mm EXCLUDING UPSTANDS, IF USED. SHOT FIRED FIXINGS ONLY TO BE USED IF APPROVED.
13. DEFORMED BARS. THE DIAMETERS GIVEN FOR DEFORMED BARS ARE NOMINAL ONLY. THE ACTUAL DIAMETER OVER DEFORMATIONS IS APPROXIMATELY 10% GREATER THAN THESE.
14. WELDS TO BE NOT CLOSER THAN 6d TO BENDS IN REINFORCING BARS.

11 GENERAL

1. CHECK ALL DIMENSIONS ON SITE.
2. WHERE ALTERNATIVES ARE SHOWN ON THIS SHEET, THE CONTRACTOR MUST OBTAIN APPROVAL FOR USE OF ONE OF THESE, AND SHALL NOT CHANGE FROM THIS WITHOUT FURTHER APPROVAL.
3. STRUCTURAL DRAWINGS TO BE READ IN CONJUCTION WITH THE DRAWINGS OF OTHER SPECIALISTS (e.g. ARCHITECTS, MECHANICAL, BUILDING SERVICES, ELECTRICAL, ETC.), AND WITH THE CONTRACT SPECIFICATION. THE ARCHITECT MUST BE NOTIFIED OF ANY DISCREPANCY BETWEEN STRUCTURAL AND OTHER CONTRACT DOCUMENTS.
5. METRIC DIMENSIONING USED THROUGHOUT THIS SET OF DRAWINGS. THE FOLLOWING RULES APPLY —
   A. ON DIMENSION LINES ALL LENGTHS OF UNDER ONE METRE ARE GIVEN IN MILLIMETRES. 420
   B. ON DIMENSION LINES ALL LENGTHS OF ONE METRE AND OVER ARE GIVEN IN METRES DECIMALISED TO THREE PLACES. 12.420
   C. ON DIMENSION LINES NO LENGTH SYMBOLS ARE SHOWN EXCEPT —
      1. WHERE WHOLE METRES ARE SHOWN. e.g. 65m
      2. WHERE DECIMALS OF A MILLIMETRE ARE SHOWN. e.g. 24.5mm
   D. DESCRIPTIONS WITH SINGLE MEASUREMENTS HAVE SYMBOLS. e.g. 250mm CENTRES.
   E. DESCRIPTIONS WITH TWO OR MORE MEASUREMENTS HAVE NO SYMBOLS e.g. 900×350 BEAM.
6. WHERE PROPERIETY ITEMS ARE SHOWN ON THE DRAWINGS APPROVED ALTERNATIVES MAY BE USED.

N.B. UNLESS OTHERWISE SPECIFIED OR DETAILED ON THE DRAWINGS, THESE NOTES AND DETAILS SHALL APPLY BUT INCLUSION OF THIS SHEET (200/1) IN THIS CONTRACT SET DOES NOT IMPLY THAT ALL DETAILS OCCUR IN THIS CONTRACT.
DO NOT SCALE OFF DRAWINGS. IF IN DOUBT ASK.

AMENDMENTS	BY	APPD.	DATE
R3 MINOR CORRECTIONS AND AMMENDMENTS			8/82
REDRAWN & UPDATED TO NEW CODE DZ 3101/1 JULY 1981			9/81

	BY	CHECKED	DATE
DRAWN			9/81 10/81
DRG. SUPV'D			
DESIGNED			
REC'M'D			

STRUCTURAL DESIGN OFFICE

J.B.S. HUIZING
CHIEF CIVIL ENGINEER
G.H.F. McKENZIE
CHIEF STRUCTURAL ENGINEER
APPROVED

Ministry of Works and Development
CIVIL ENGINEERING HEAD OFFICE
R.G. NORMAN Commissioner

MINISTRY OF DEFENCE — CHRISTCHURCH.
R.N.Z.A.F. BASE WIGRAM.
GYMNASIUM COMPLEX.

REINFORCED CONCRETE
STANDARD STRUCTURAL DETAILS AND NOTES

ORIGINAL SCALES

FILE P.W. 81/10/1

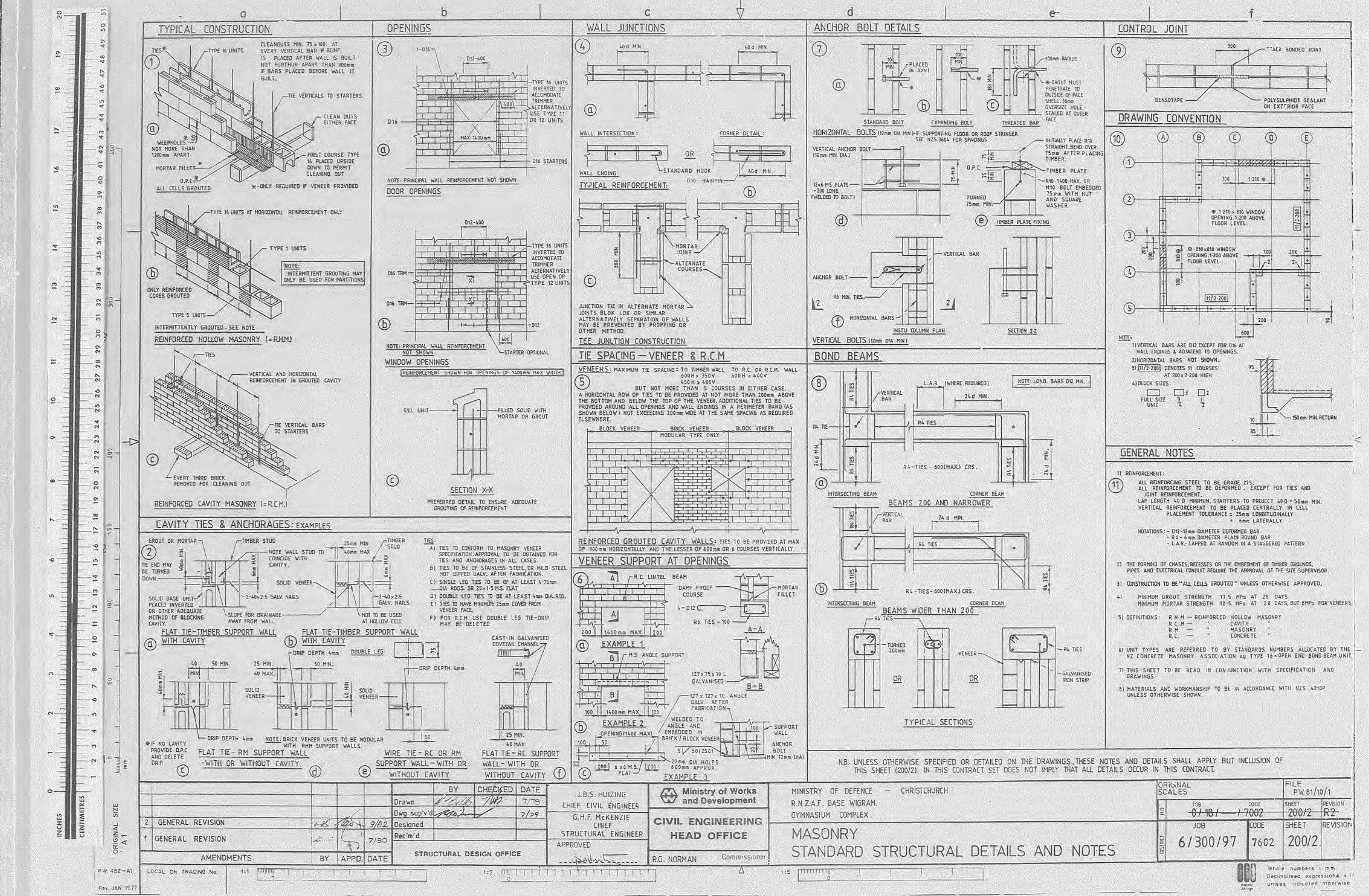
JOB	CODE	SHEET	REVISION
~~0/18/~~	~~7002~~	~~200/1~~	~~R3~~
6/300/97	7602	200/1	

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise

LOCAL OR TRACING No. 1:1 1:2 1:5

P.W. 482-A1
Rev. JAN 1977

ORIGINAL SIZE A1
INCHES CENTIMETRES


TYPICAL CONSTRUCTION
REINFORCED HOLLOW MASONRY (=R.H.M.)
REINFORCED CAVITY MASONRY (=R.C.M.)
OPENINGS
DOOR OPENINGS
WINDOW OPENINGS
SECTION X-X
WALL JUNCTIONS
TYPICAL REINFORCEMENT:
TEE JUNCTION CONSTRUCTION
TIE SPACING — VENEER & R.C.M.
REINFORCED GROUTED CAVITY WALLS:
VENEER SUPPORT AT OPENINGS
ANCHOR BOLT DETAILS
HORIZONTAL BOLTS
VERTICAL BOLTS
BOND BEAMS
BEAMS 200 AND NARROWER
BEAMS WIDER THAN 200
TYPICAL SECTIONS
CONTROL JOINT
DRAWING CONVENTION
CAVITY TIES & ANCHORAGES: EXAMPLES
GENERAL NOTES
1) REINFORCEMENT:
ALL REINFORCING STEEL TO BE GRADE 275.
ALL REINFORCEMENT TO BE DEFORMED, EXCEPT FOR TIES AND JOINT REINFORCEMENT.
LAP LENGTH 40 D MINIMUM. STARTERS TO PROJECT 40 D + 50mm MIN.
VERTICAL REINFORCEMENT TO BE PLACED CENTRALLY IN CELL
PLACEMENT TOLERANCE ± 25mm LONGITUDINALLY
± 6mm LATERALLY
NOTATIONS: - D12-12mm DIAMETER DEFORMED BAR
- R6 - 6mm DIAMETER PLAIN ROUND BAR
- L.A.R.- LAPPED AT RANDOM IN A STAGGERED PATTERN
2) THE FORMING OF CHASES, RECESSES OR THE EMBEDMENT OF TIMBER GROUNDS, PIPES AND ELECTRICAL CONDUIT REQUIRE THE APPROVAL OF THE SITE SUPERVISOR.
3) CONSTRUCTION TO BE "ALL CELLS GROUTED" UNLESS OTHERWISE APPROVED.
4) MINIMUM GROUT STRENGTH 17·5 MPa AT 28 DAYS
MINIMUM MORTAR STRENGTH 12·5 MPa AT 28 DAYS, BUT 8MPa FOR VENEERS.
5) DEFINITIONS: R.H.M — REINFORCED HOLLOW MASONRY
R.C.M — " CAVITY "
R.M. — " MASONRY "
R.C. — " CONCRETE "
6) UNIT TYPES ARE REFERRED TO BY STANDARDS NUMBERS ALLOCATED BY THE NZ CONCRETE MASONRY ASSOCIATION eg TYPE 16 = OPEN END BOND BEAM UNIT.
7) THIS SHEET TO BE READ IN CONJUNCTION WITH SPECIFICATION AND DRAWINGS.
8) MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH NZS 4210P UNLESS OTHERWISE SHOWN.
N.B. UNLESS OTHERWISE SPECIFIED OR DETAILED ON THE DRAWINGS, THESE NOTES AND DETAILS SHALL APPLY BUT INCLUSION OF THIS SHEET (200/2) IN THIS CONTRACT SET DOES NOT IMPLY THAT ALL DETAILS OCCUR IN THIS CONTRACT.
2 GENERAL REVISION 9/82
1 GENERAL REVISION 7/80
AMENDMENTS BY APPD. DATE
Drawn 7/79
Dwg sup'v'd 7/79
Designed
Rec'm'd
STRUCTURAL DESIGN OFFICE
J.B.S. HUIZING
CHIEF CIVIL ENGINEER
G.H.F. McKENZIE
CHIEF
STRUCTURAL ENGINEER
APPROVED
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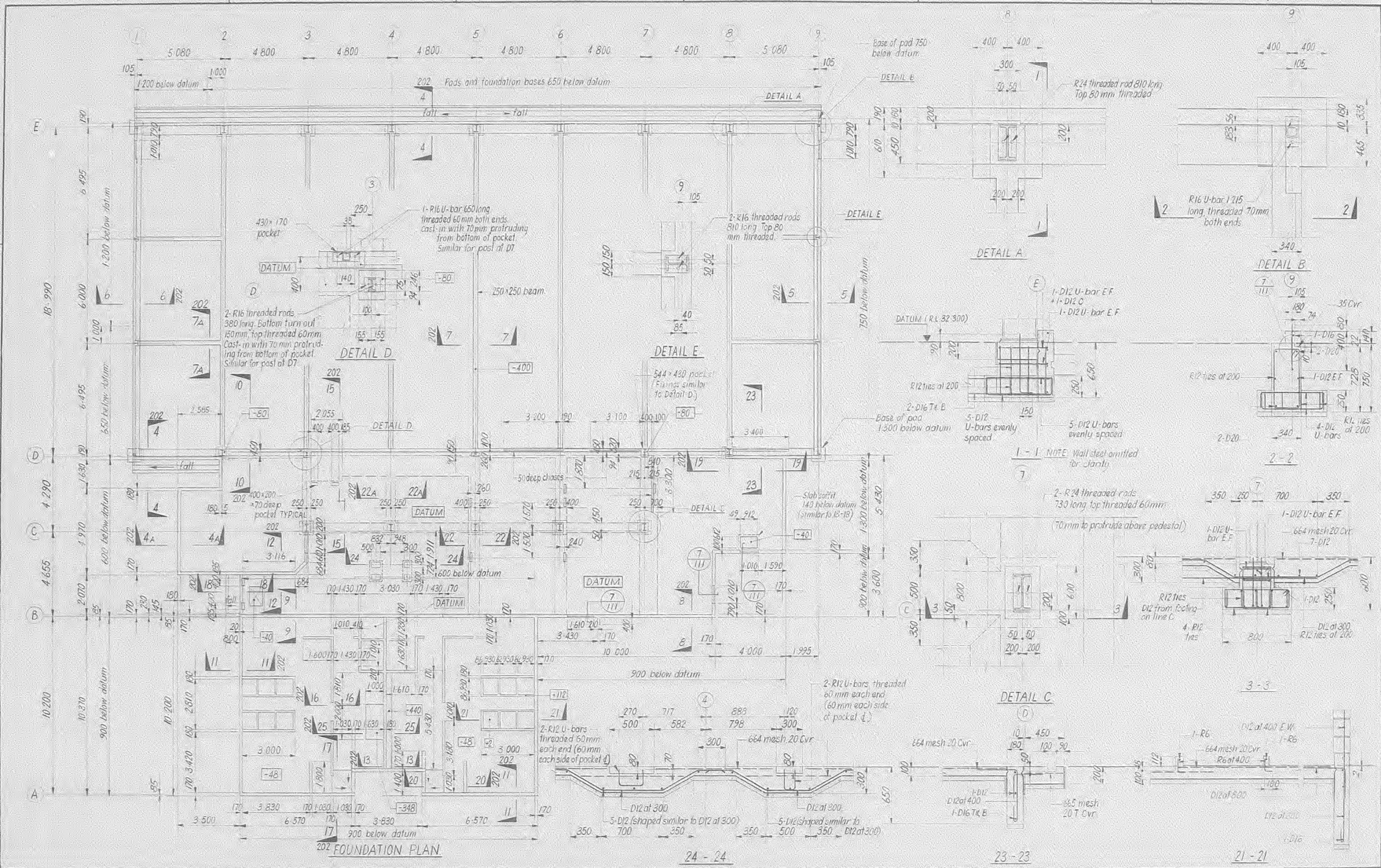
MINISTRY OF DEFENCE - CHRISTCHURCH.
R.N.Z.A.F. BASE WIGRAM.
GYMNASIUM COMPLEX.
MASONRY
STANDARD STRUCTURAL DETAILS AND NOTES
ORIGINAL SCALES
FILE P.W. 81/10/1
JOB 0/18/ CODE 7002 SHEET 200/2 REVISION R2
JOB 6/300/97 CODE 7602 SHEET 200/2.
ORIGINAL SIZE A1
P.W. 482-A1
Rev. JAN 1977
LOCAL OH TRACING No.
Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



	BY	CHECKED	DATE
DRAWN			12/81
SUPERVISED			4.82
DESIGNED			4.22
RECOMMENDED			4.82

AMENDMENTS | BY | APPD. | DATE

J.B.S. HUIZING
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CHIEF STRUCTURAL ENGINEER

APPROVED 4/82
P.R. HARROW D.S.E.

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CIVIL ENGINEERING CHRISTCHURCH
STRUCTURAL DESIGN OFFICE
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MINISTRY OF DEFENCE - CHRISTCHURCH
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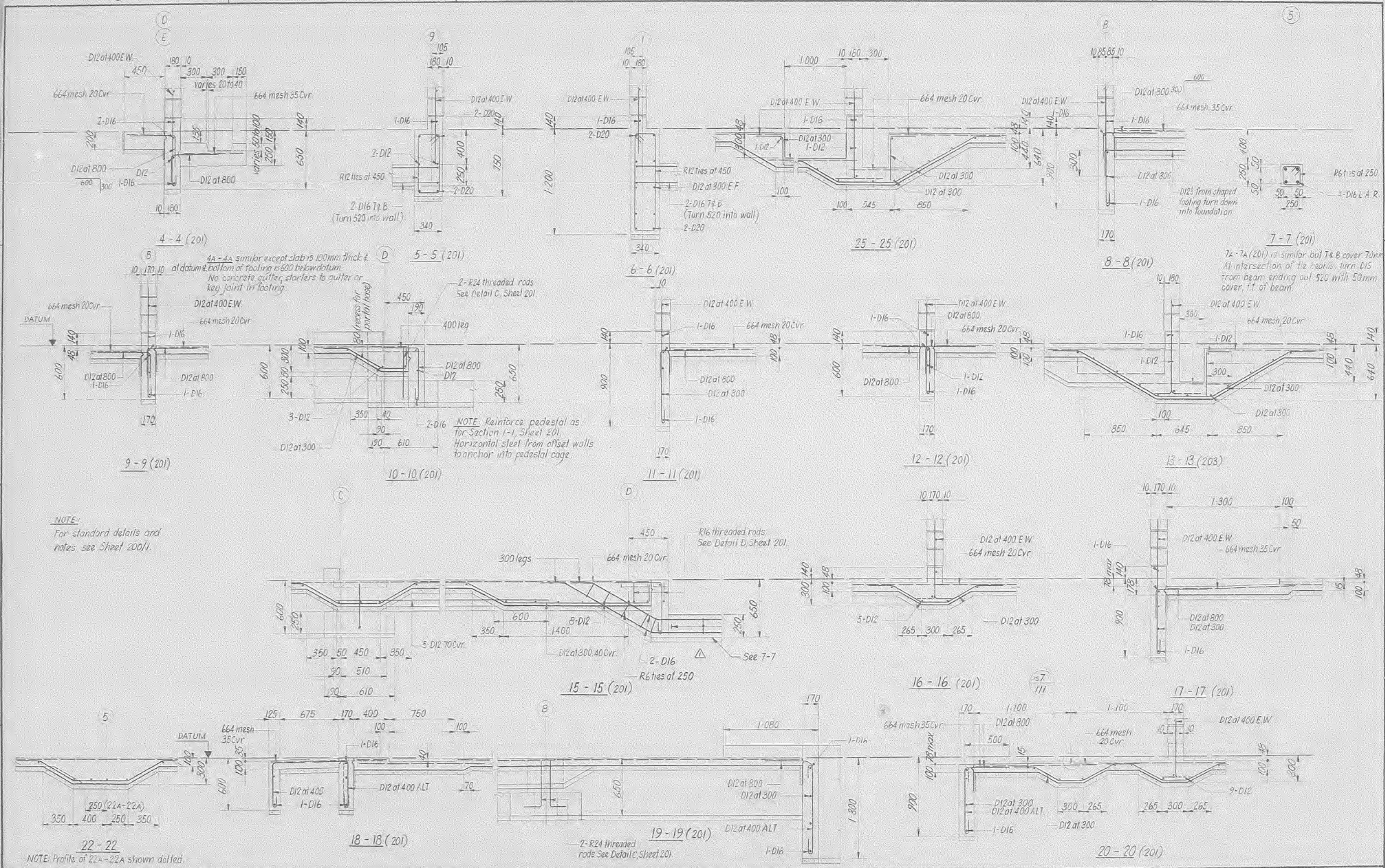
FOUNDATION PLAN & DETAILS.

ORIGINAL SCALES 1:100, 1:20.
FILE 43/9/14.

JOB	CODE	SHEET	REVISION
6/300/97	7602	201.	

Whole numbers = mm. Decimalised expressions = m unless indicated otherwise.

LOCAL OH TRACING No.



△ Tie beam added to 15-15.			10/83.
AMENDMENTS	BY	APPD.	DATE

	BY	CHECKED	DATE
DRAWN.			12/81.
SUPERVISED.			4.82
DESIGNED.			4.82.
RECOMMENDED.			4.82

J.B.S.HUIZING.
CHIEF CIVIL ENGINEER

G.H.F. McKENZIE
CHIEF
STRUCTURAL ENGINEER

APPROVED 4.82
P.R.HARROW D.S.E.

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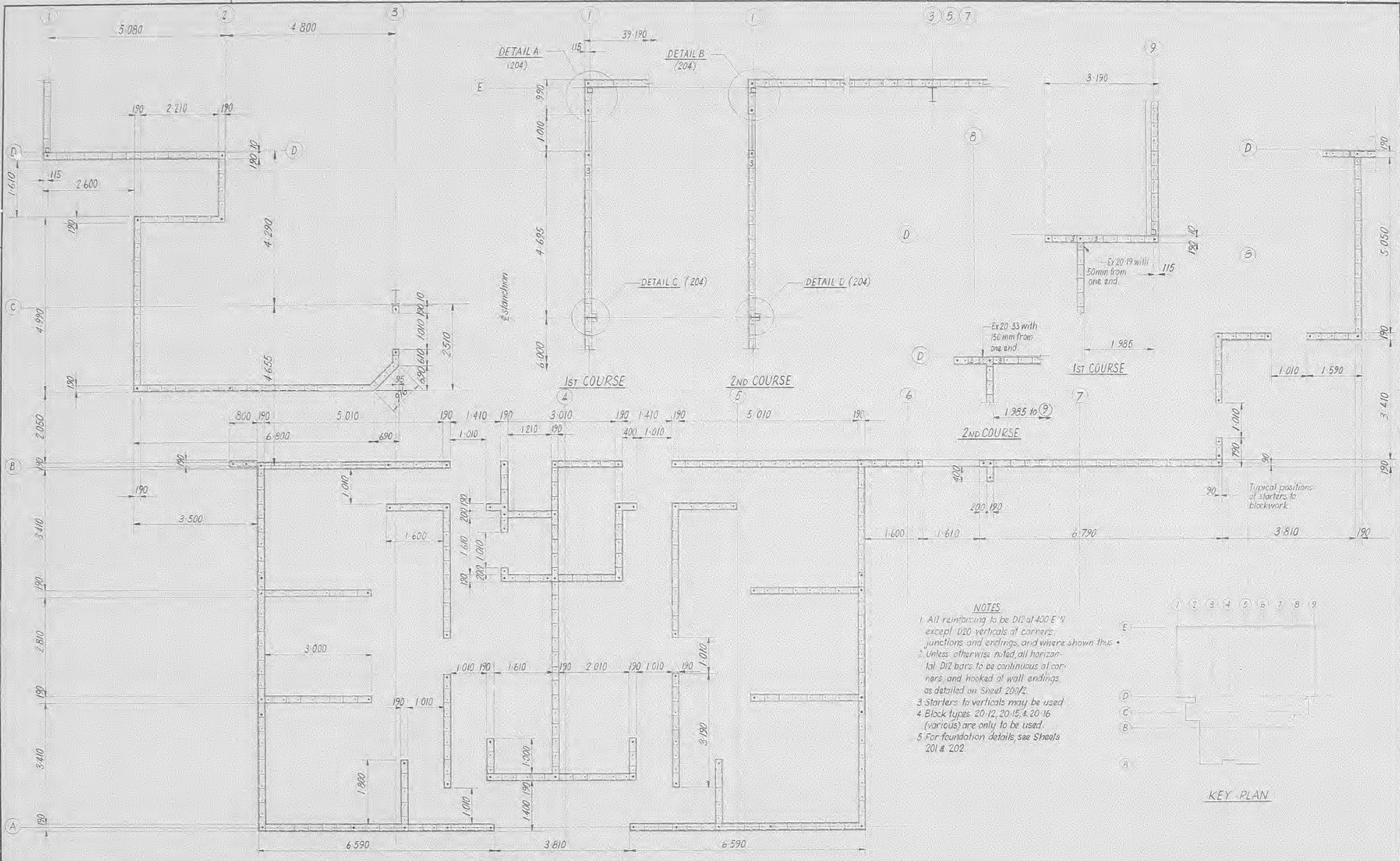
FOUNDATION DETAILS.

ORIGINAL SCALES 1:20
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6 / 300 / 97.	7602.	202.	R1.

R.W. 482-A1
Rev. JAN. 1977
LOCAL OR TRACING No.
1:1 1:2 1:5

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



1ST COURSE BLOCKWORK PLAN.

NOTES

1. All reinforcing to be D12 at 400 E'W except D20 verticals at corners, junctions and endings, and where shown thus •
2. Unless otherwise noted, all horizontal D12 bars to be continuous at corners and hooked at wall endings as detailed on Sheet 200/2.
3. Starters to verticals may be used.
4. Block types 20·12, 20·15, & 20·16 (various) are only to be used.
5. For foundation details, see Sheets 201 & 202.

KEY PLAN

	BY	CHECKED	DATE
DRAWN			12/81
SUPERVISED			4.82
DESIGNED			4.82
RECOMMENDED			4.82

AMENDMENTS | BY | APPD. | DATE

J.B.S. HUIZING. CHIEF CIVIL ENGINEER

G.H.F. McKENZIE CHIEF STRUCTURAL ENGINEER

APPROVED 4/82 P.R. HARROW. D.S.E.

Ministry of Works and Development

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STRUCTURAL DESIGN OFFICE

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R.N.Z.A.F. BASE WIGRAM.
GYMNASIUM COMPLEX.

BLOCKWORK PLAN.

ORIGINAL SCALES 1:50.

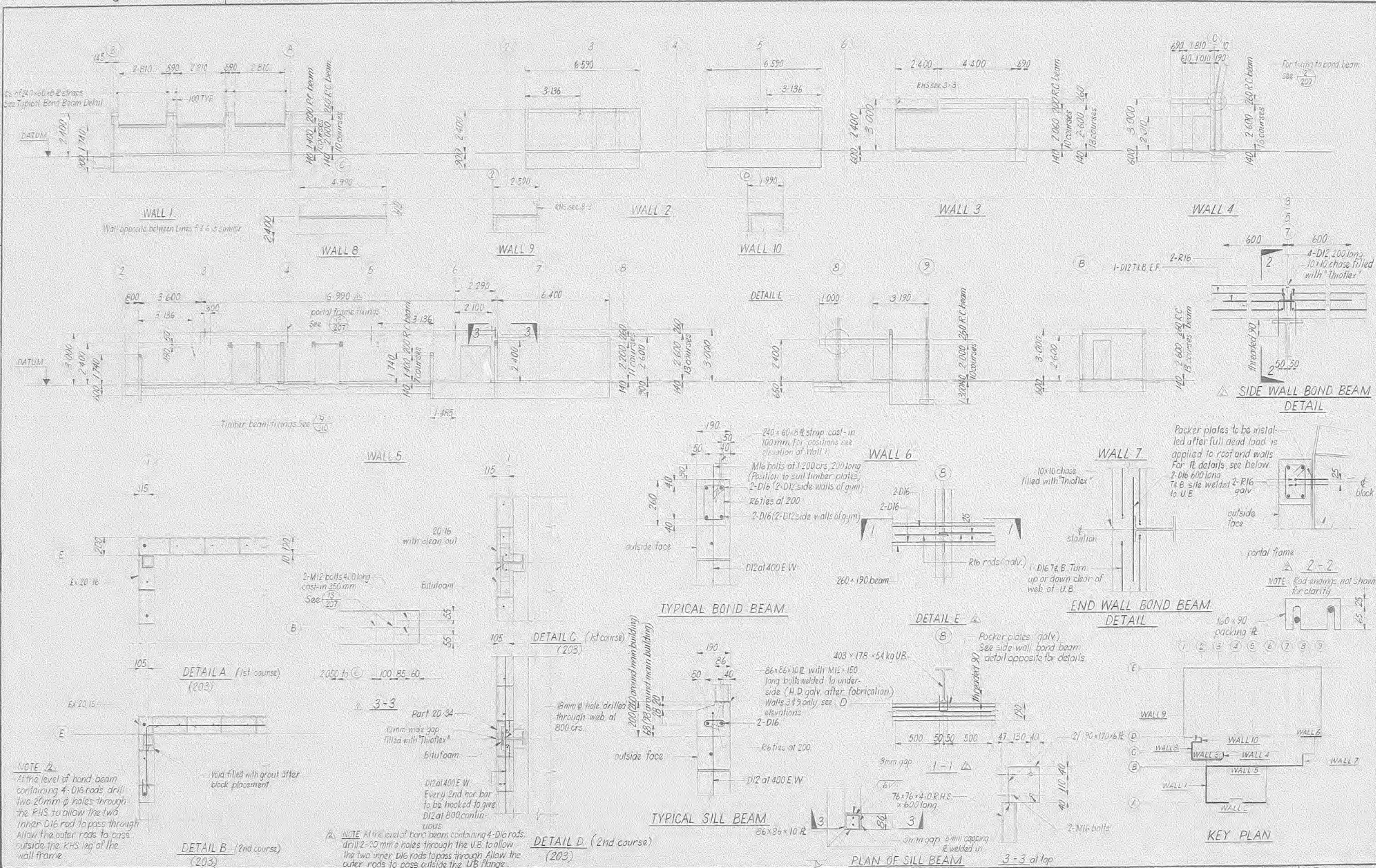
FILE 43/9/14.

JOB	CODE	SHEET	REVISION
6 / 300 / 97.	7602.	203.	

P.W. 482-A1 Rev. JAN. 1977

LOCAL OR TRACING No.

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



3-3 added to sheet			3/84
Side wall bond beam detail & Detail E altered			4/84
Notes on Details B & D added			
AMENDMENTS	BY	APPD.	DATE

	BY	CHECKED	DATE
DRAWN			1/82
SUPERVISED			4-82
DESIGNED			4-82
RECOMMENDED			4-82

J.B.S. HUIZING. CHIEF CIVIL ENGINEER

G.H.F. McKENZIE CHIEF STRUCTURAL ENGINEER

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R.N.Z.A.F. BASE WIGRAM
GYMNASIUM COMPLEX

BLOCKWORK DETAILS.

ORIGINAL SCALES 1:100, 1:20, 1:10.

FILE 43/9/14.

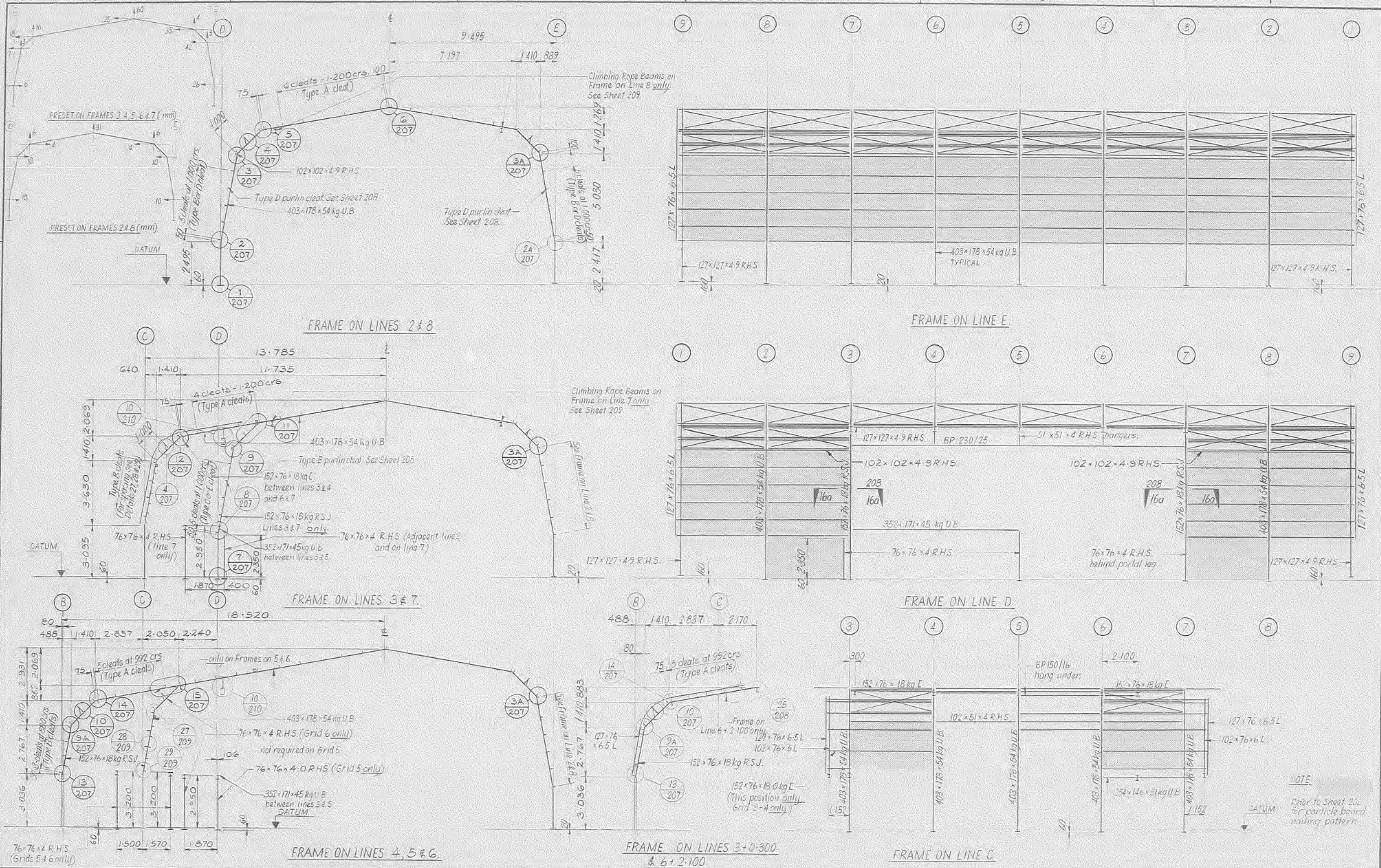
JOB	CODE	SHEET	REVISION
6/300/97.	7602.	204.	R2.

ORIGINAL SIZE A1

P.W. 482–A1 Rev. JAN. 1977

LOCAL OH TRACING No.

Whole numbers = mm. Decimalised expressions = m. Unless indicated otherwise.



	BY	CHECKED	DATE
DRAWN.			12/81
SUPERVISED.			4.82
DESIGNED.			4.82
RECOMMENDED.			4.82

AMENDMENTS | BY | APPD. | DATE

J.B.S. HUIZING
CHIEF CIVIL ENGINEER

G.H.F. McKENZIE
CHIEF STRUCTURAL ENGINEER

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P.R. HARROW D.S.E.

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R.N.Z.A.F. BASE WIGRAM.
GYMNASIUM COMPLEX.

PORTAL & STEEL FRAME LAYOUT.

ORIGINAL SCALES 1:100

FILE 43/9/14.

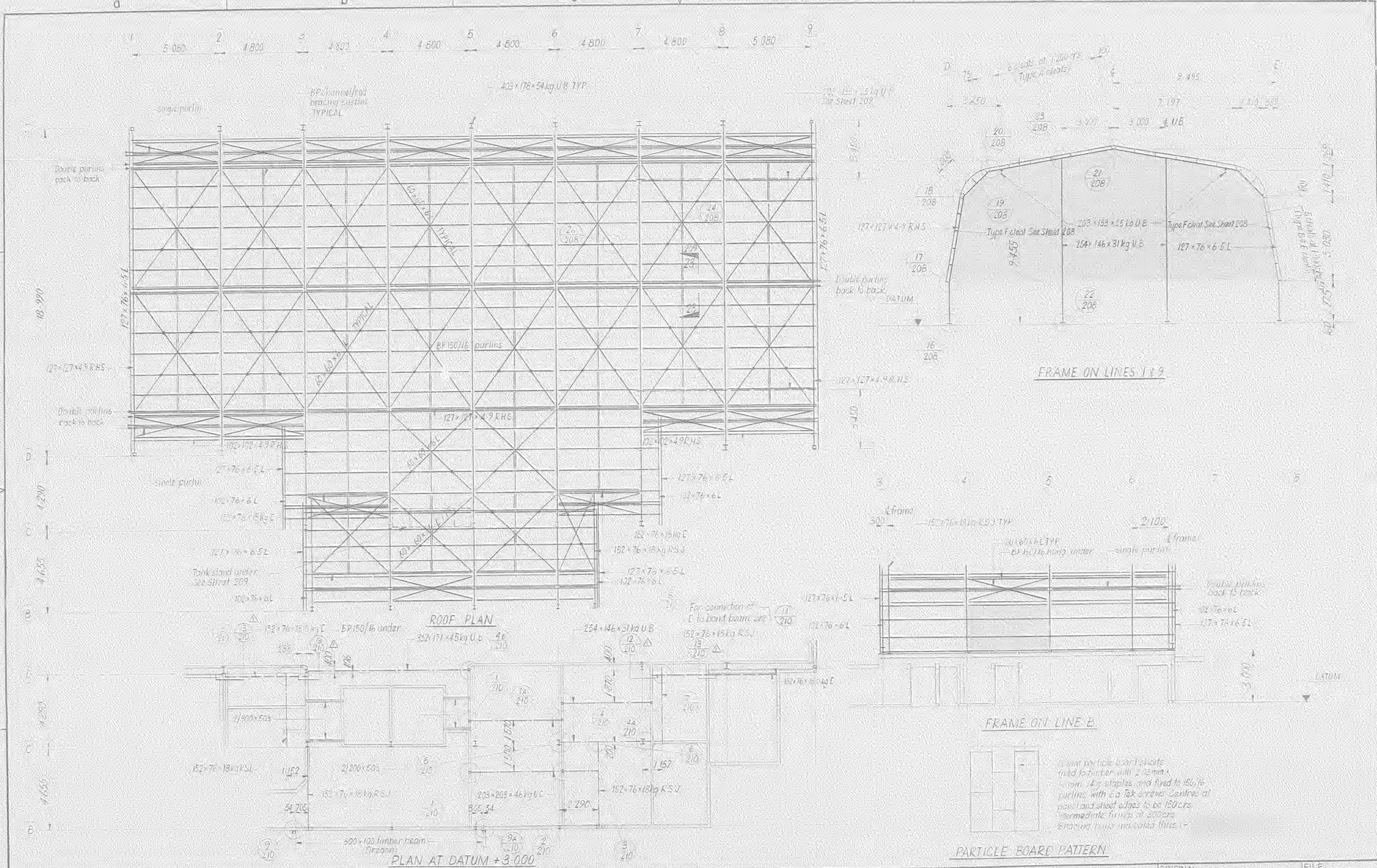
JOB	CODE	SHEET	REVISION
6 / 300 / 97.	7602	205.	

LOCAL OR TRADING No.

ORIGINAL SIZE A1

482-A1 Rev. JAN 1977

Whole numbers = mm. Decimalised expressions = m unless indicated otherwise.



AMENDMENTS	BY	APPD.	DATE
added to Plan at Datum + 3.000			3/84

	BY	CHECKED	DATE
DRAWN			12/81
SUPERVISED			4.82
DESIGNED			4.82
RECOMMENDED			4.82

J.B.S.HUIZING
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APPROVED
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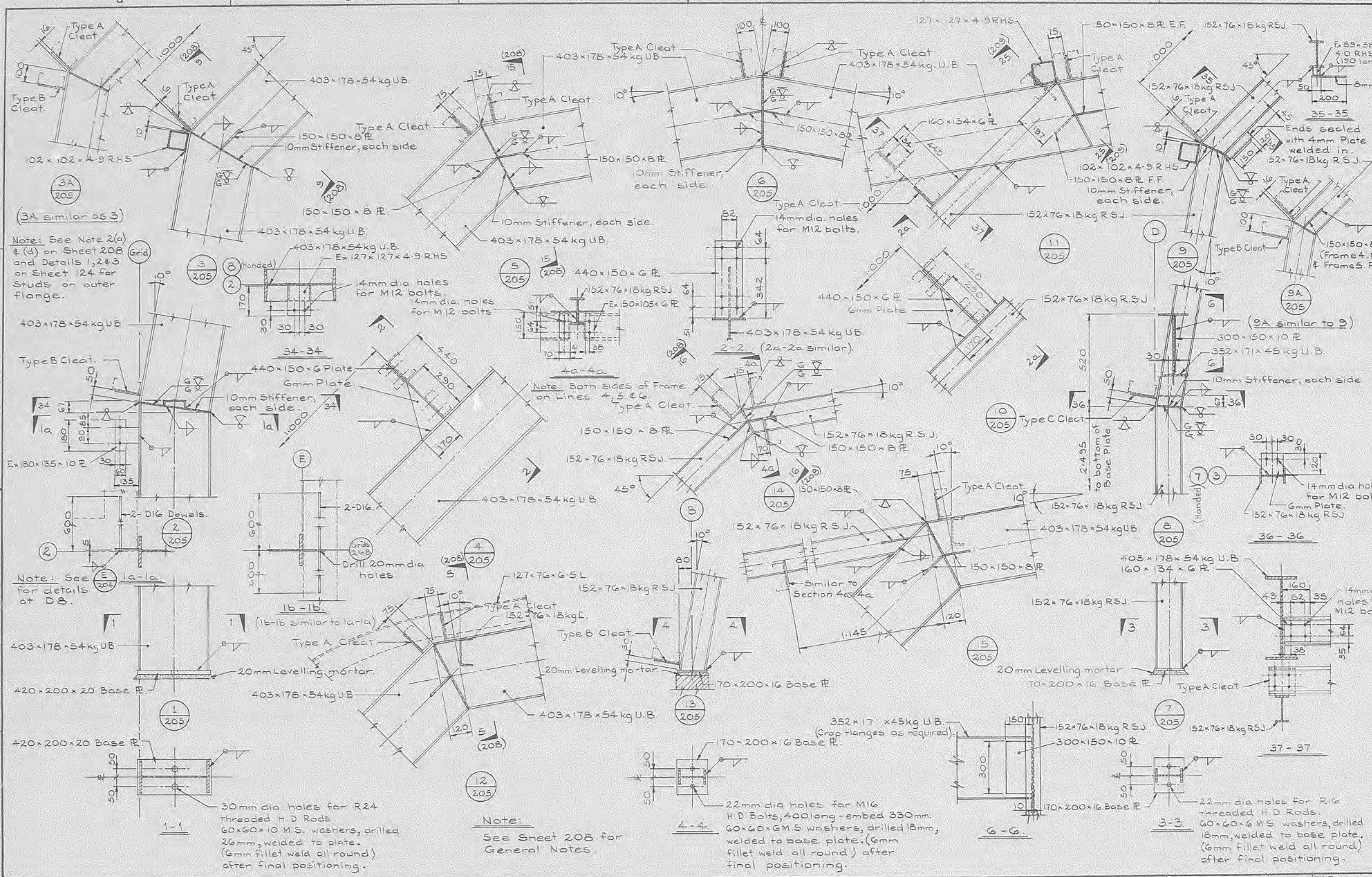
GYMNASIUM COMPLEX

ROOF PLAN & STEEL FRAME LAYOUT.

ORIGINAL SCALES 1:100
FILE 43/9/14.

JOB	CODE	SHEET	REVISION
6/300/97.	7602	206.	R1.

ORIGINAL SIZE A1
P.W. 482-A1 LOCAL OR TRACING No.
Rev. JAN 1977



			BY	CHECKED	DATE
		DRAWN			3.82
		DWG SUP.			4.82
		DESIGNED			4.82
		REC'M'D			4.82
AMENDMENTS	BY	APPD. DATE			

LOCAL OR TRACING No.

J.B.S. HUIZING, CHIEF CIVIL ENGINEER

G.H.F. McKENZIE, CHIEF STRUCTURAL ENGINEER

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R.N.Z.A.F. BASE WIGRAM
GYMNASIUM COMPLEX.

STEELWORK DETAILS AND SECTIONS.

ORIGINAL SCALES 1:10

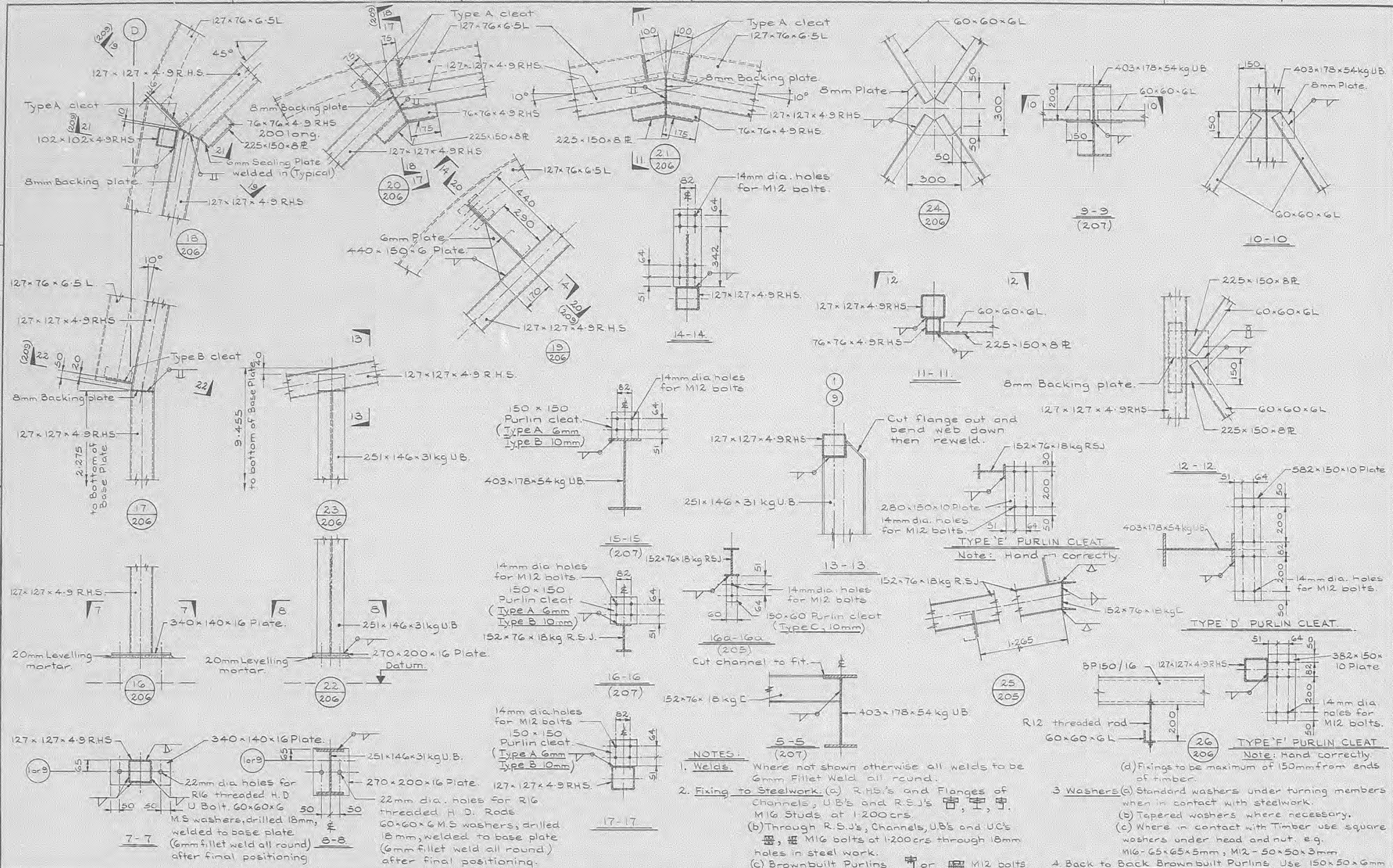
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6/300/97	7602	207	

Whole numbers = mm. Decimalised expressions = m unless indicated otherwise.

ORIGINAL SIZE A1

482-A1 Rev. JAN. 1977



NOTES:

1. Welds. Where not shown otherwise all welds to be 6mm Fillet Weld all round.
2. Fixing to Steelwork. (a) R.H.S.'s and Flanges of Channels, U.B's and R.S.J's, M16 Studs at 1·200 crs.
   (b) Through R.S.J's, Channels, U.B's and U.C's, M16 bolts at 1·200 crs through 18mm holes in steel work.
   (c) Brownbuilt Purlins or M12 bolts at 1·200 crs through 14mm holes in steelwork.
   (d) Fixings to be maximum of 150mm from ends of timber.
3. Washers (a) Standard washers under turning members when in contact with steelwork.
   (b) Tapered washers where necessary.
   (c) Where in contact with Timber use square washers under head and nut. e.g. M16 - 65×65×5mm ; M12 - 50×50×3mm
4. Back to Back Brownbuilt Purlins Use 150×50×6mm M.S. Spacers midspan.

	BY	CHECKED	DATE
DRAWN			3.82
DWG. SUP			4.82
DESIGNED			4.82
REC'M'D			4.82

AMENDMENTS		BY	APPD.	DATE

J.B.S. HUIZING
CHIEF CIVIL ENGINEER

G.H.F. McKENZIE
CHIEF
STRUCTURAL ENGINEER

APPROVED: P.R. HARROW D.S.E. 14.82

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MINISTRY OF DEFENCE — CHRISTCHURCH.
R.N.Z.A.F. BASE WIGRAM
GYMNASIUM COMPLEX.

STEELWORK DETAILS AND SECTIONS.

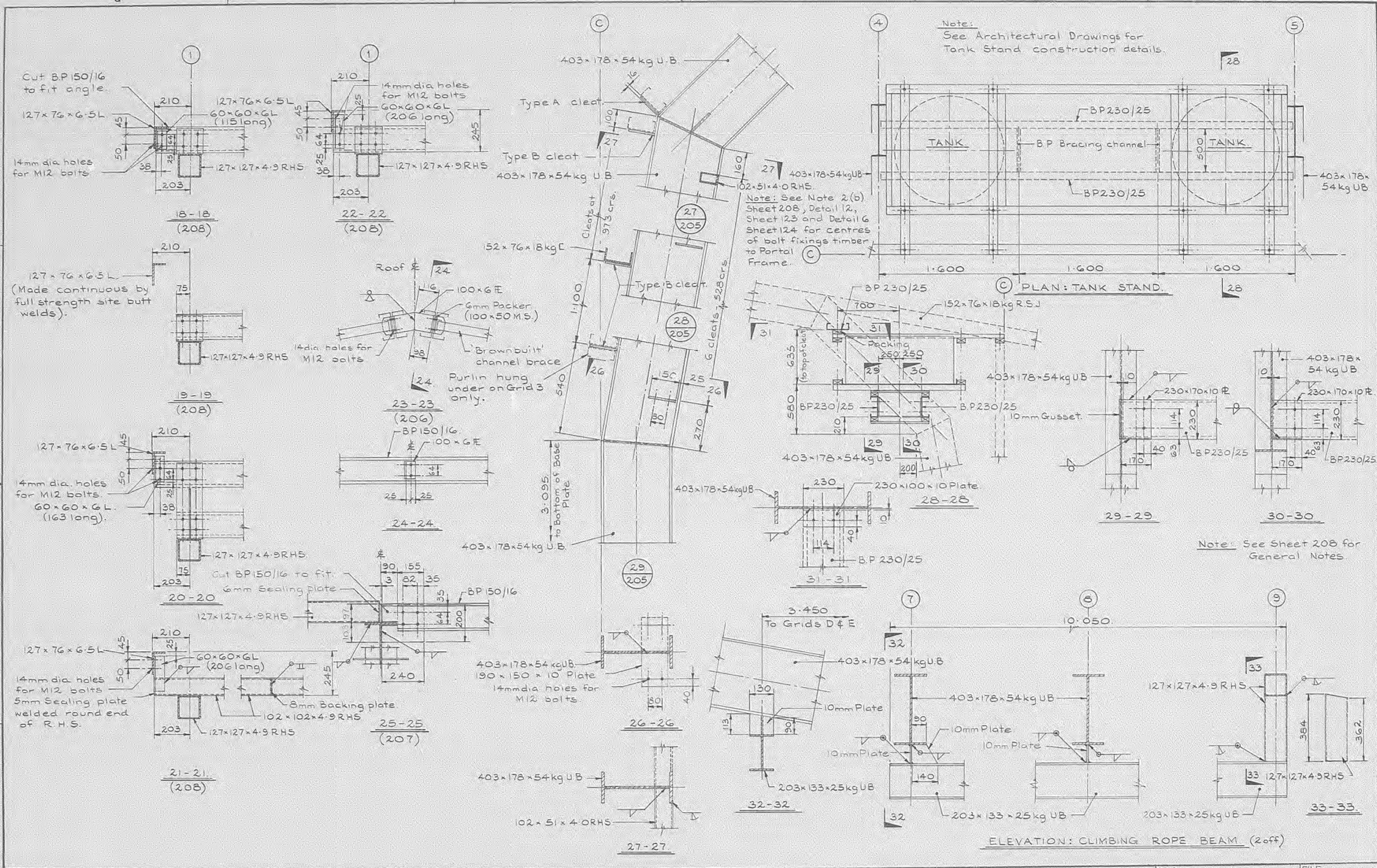
ORIGINAL SCALES 1:10.

FILE 43/9/14

JOB	CODE	SHEET	REVISION
6/300/97	7602	208	

P.W. 482—A1
Rev. JAN. 1977
LOCAL OR TRACING No.
1:1 1:2 1:5

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



AMENDMENTS	BY	APPD.	DATE

	BY	CHECKED	DATE
DRAWN			3.82
DWG. SUP.			4.82
DESIGNED			4.82
REC'M'D			4.82

J. B. S. HUIZING
CHIEF CIVIL ENGINEER

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CHIEF STRUCTURAL ENGINEER

APPROVED: P.R. HARROW D.S.E. 1/4/82

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GYMNASIUM COMPLEX

STEELWORK DETAILS AND SECTIONS.

ORIGINAL SCALES 1:10, 1:20.

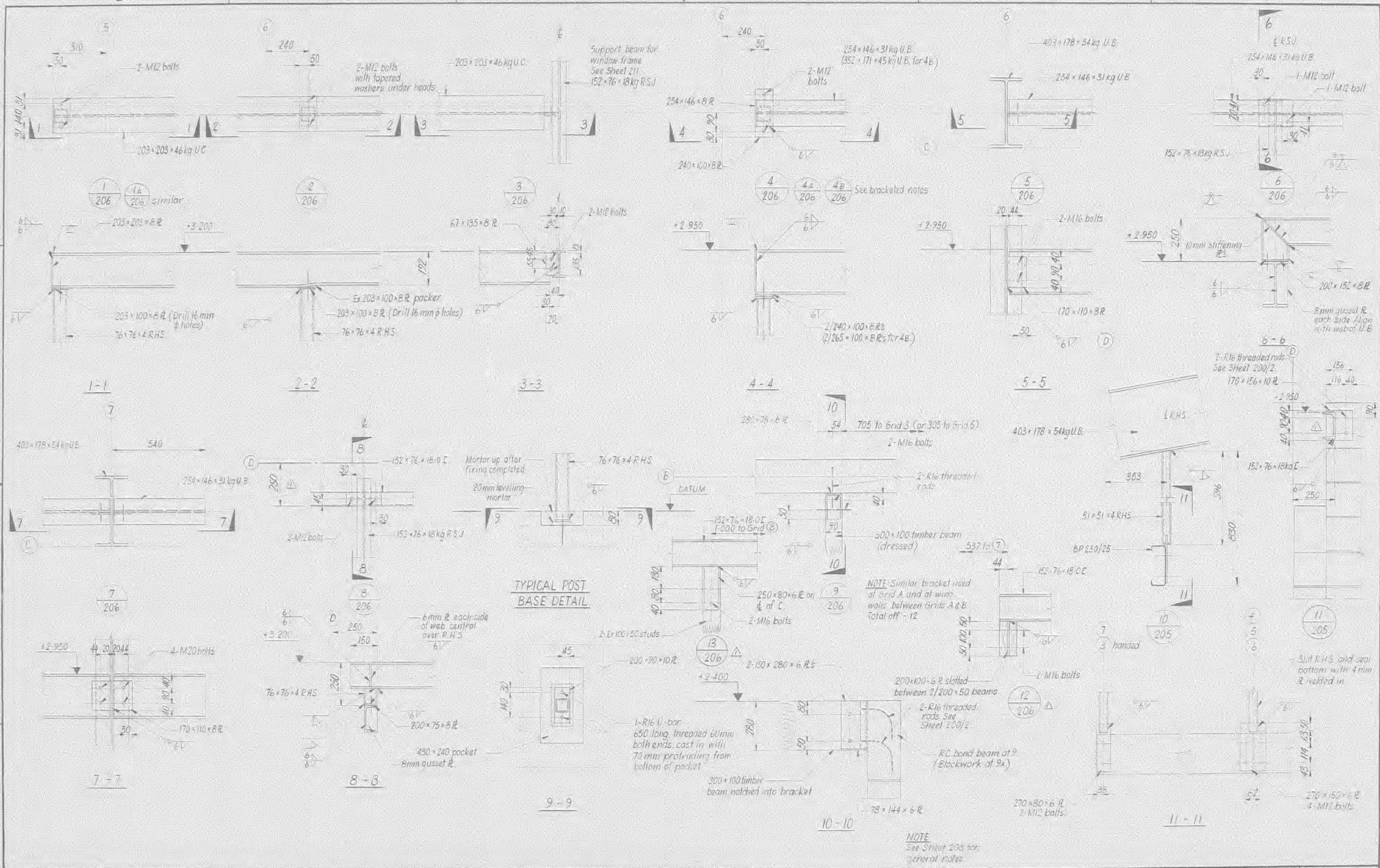
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6 / 300 / 97	7602	209	

P.W. 482-A1 Rev. JAN. 1977

LOCAL OR TRACING No.

Whole numbers = mm. Decimalised expressions = m unless indicated otherwise



Amendments	By	Appd.	Date
added to sheet, altered			3/84

	BY	CHECKED	DATE
DRAWN			3/82
SUPERVISED			4.82
DESIGNED			4.82
RECOMMENDED			

J.B.S. HUIZING
CHIEF CIVIL ENGINEER

G.H.F. McKENZIE
CHIEF STRUCTURAL ENGINEER

APPROVED
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MINISTRY OF DEFENCE – CHRISTCHURCH
R.N.Z.A.F. BASE WIGRAM
GYMNASIUM COMPLEX

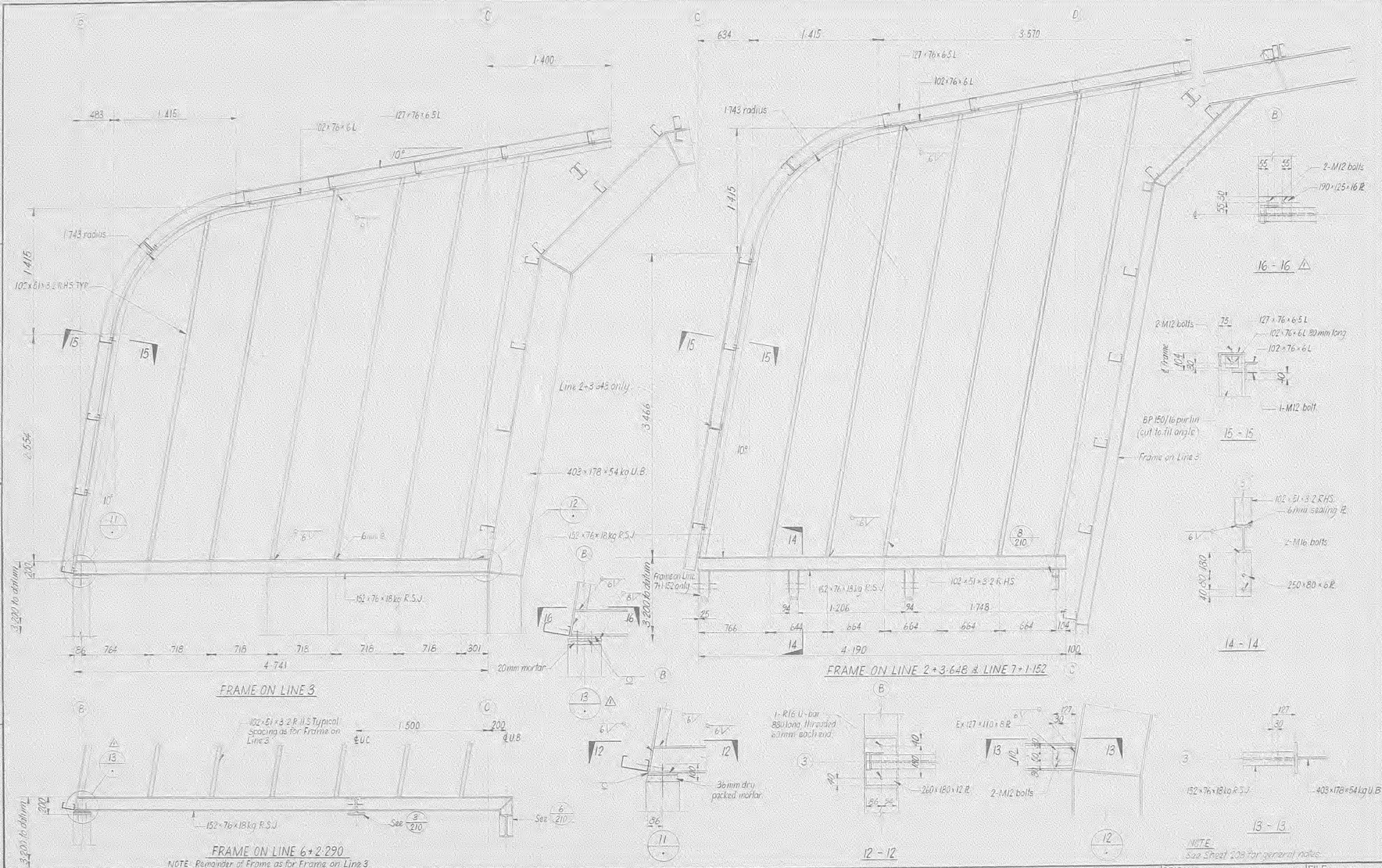
STEELWORK DETAILS

ORIGINAL SCALES 1:10
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6/300/97.	7602.	210.	R1.

ORIGINAL SIZE A1
P.W. 482-A1 Rev. JAN 1977
LOCAL OR TRACING No.

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise



⚠ added to sheet			3/84
AMENDMENTS	BY	APPD.	DATE

	BY	CHECKED	DATE
DRAWN			3/82
SUPERVISED			4.82
DESIGNED			4.82
RECOMMENDED			4.82

J.B.S. HUIZING.
CHIEF CIVIL ENGINEER

G.H.F. McKENZIE
CHIEF
STRUCTURAL ENGINEER

APPROVED
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R.N.Z.A.F BASE WIGRAM
GYMNASIUM COMPLEX

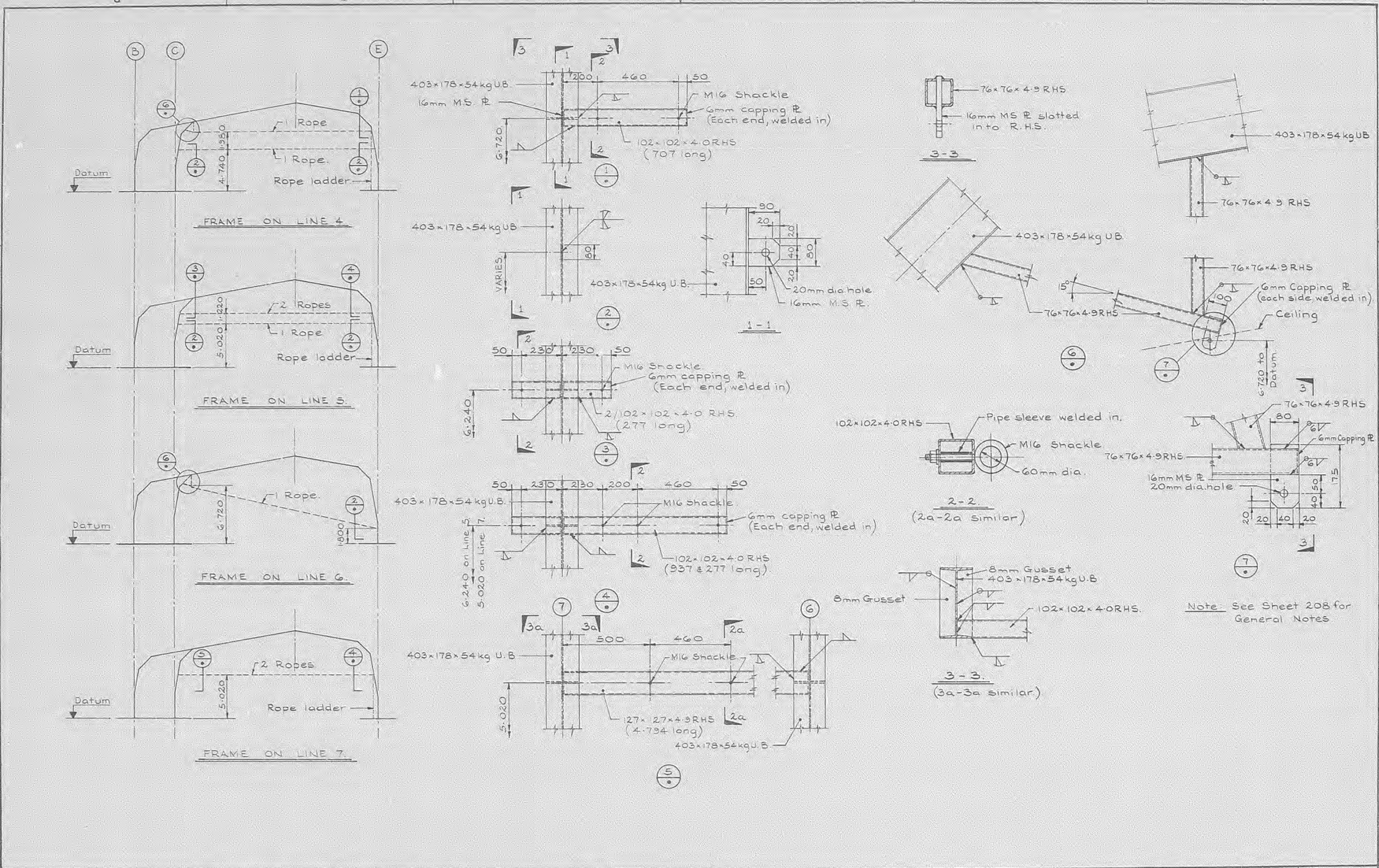
STEELWORK DETAILS.

ORIGINAL SCALES 1:20, 1:10.
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6/300/97.	7602.	211.	R1.

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise

ORIGINAL SIZE A1
PW 482-A1
Rev. JAN 1977
LOCAL OR TRACING No.
MICROFILM



	BY	CHECKED	DATE
DRAWN			7.82
DWG. SUP.			7.82
DESIGNED			7.82
REC'M'D.			7.82

AMENDMENTS | BY | APPD. | DATE

J.B.S. HUIZING
CHIEF CIVIL ENGINEER
G.H.F. McKENZIE
CHIEF STRUCTURAL ENGINEER
APPROVED: P.R. HARROW D.S.E. 14.7.82

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CIVIL ENGINEERING CHRISTCHURCH
STRUCTURAL DESIGN OFFICE
J.J. CHESTERMAN Commissioner

MINISTRY OF DEFENCE - CHRISTCHURCH
R.N.Z.A.F. BASE WIGRAM
GYMNASIUM COMPLEX.

MISCELLANEOUS STEELWORK DETAILS

ORIGINAL SCALES 1:5, 1:10, 1:200
FILE 43/9/14

JOB	CODE	SHEET	REVISION
6/300/97	7602	212	

LOCAL OR TRACING No.

Whole numbers = mm
Decimalised expressions = m
unless indicated otherwise

Appendix D

Rebar Scanning Results

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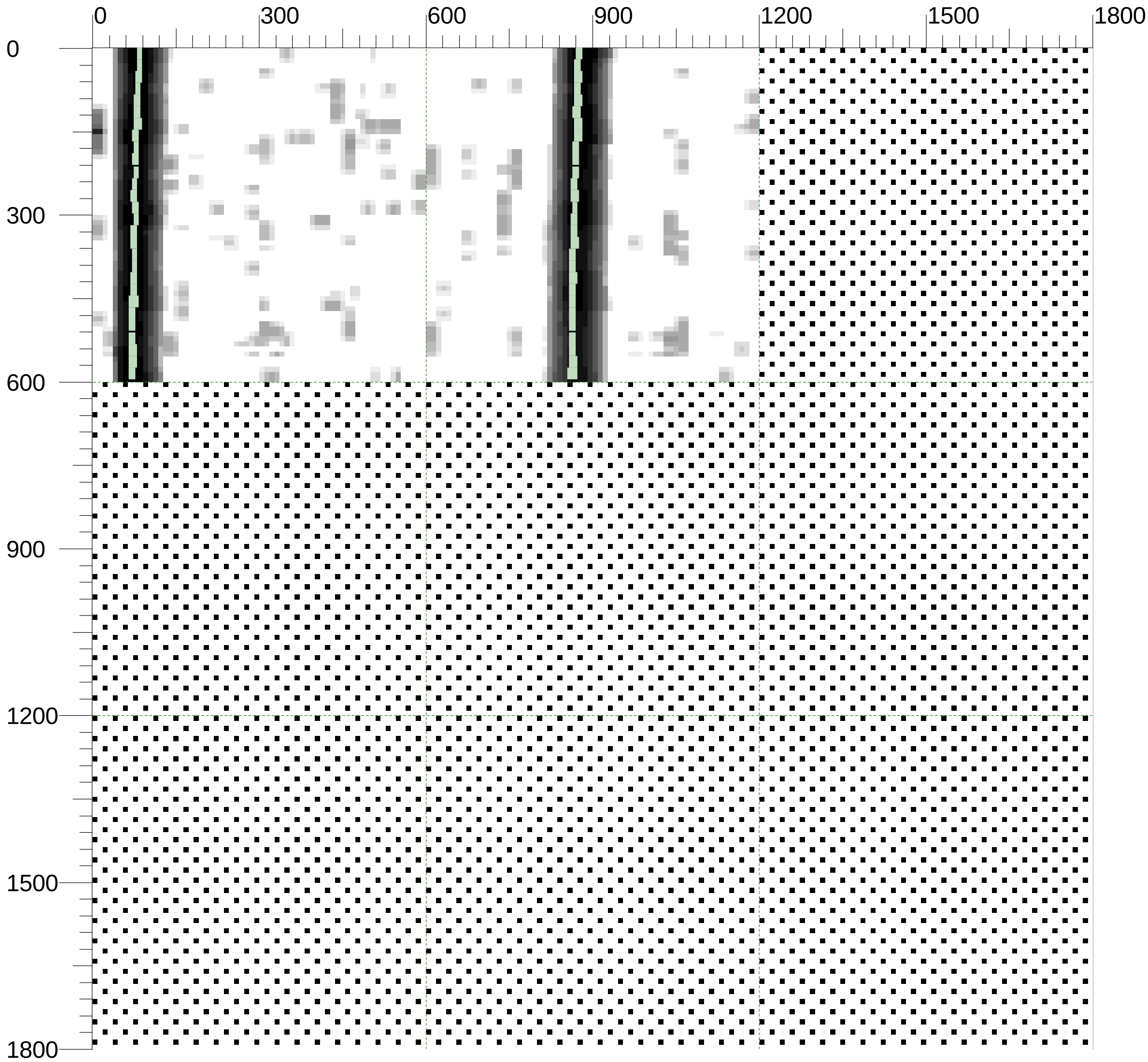
Date / Time: 2012-07-09 09:54:01 SSN: 31311003 [mm]



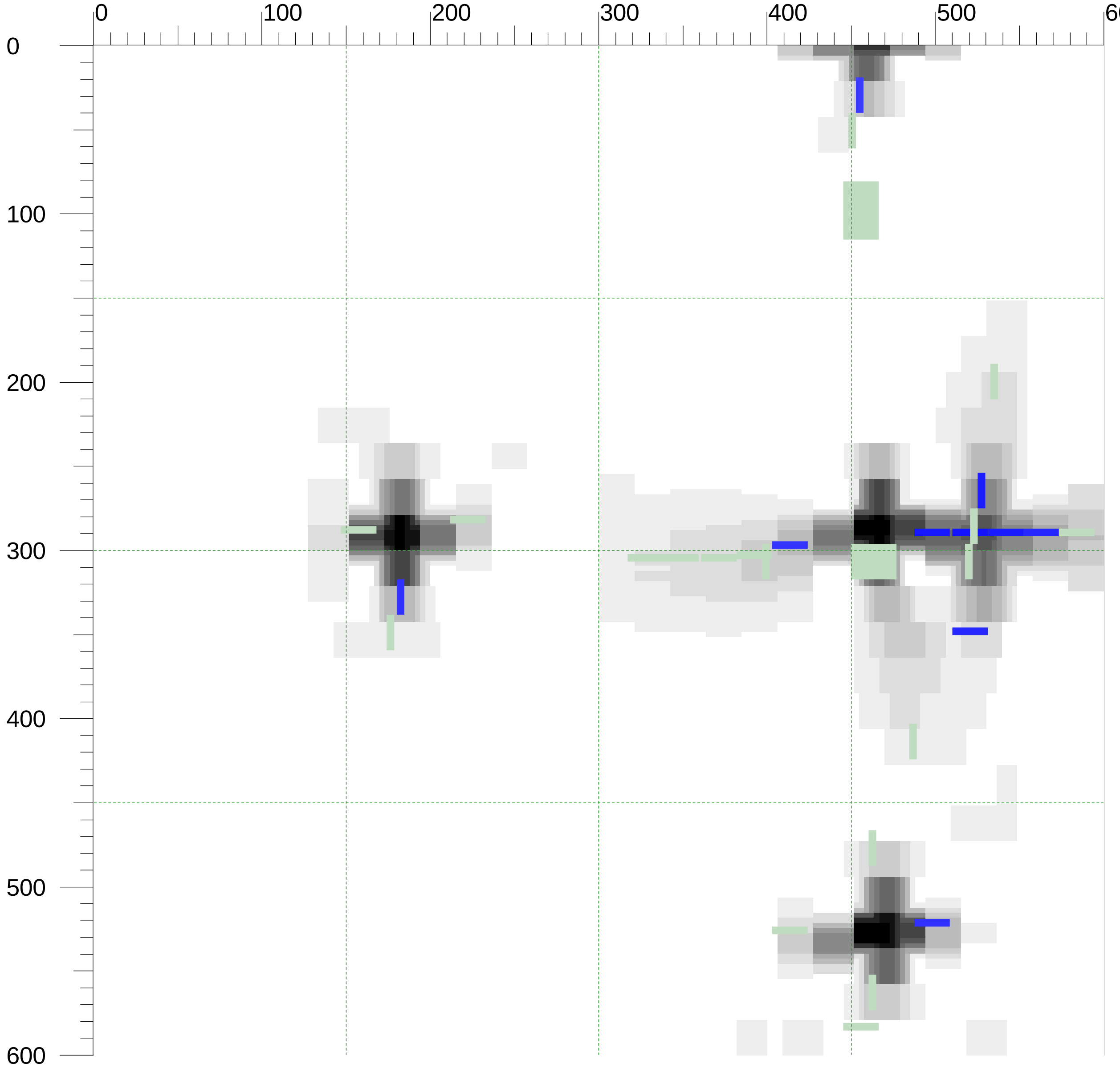
Customer: ---

Location: --- Operator: ---

Comment:

Imagescan: FS000431.XFF

Date / Time: 2012-07-09 09:58:30 SSN: 31311003 [mm]



Customer: ---

Location: --- Operator: ---

Comment:

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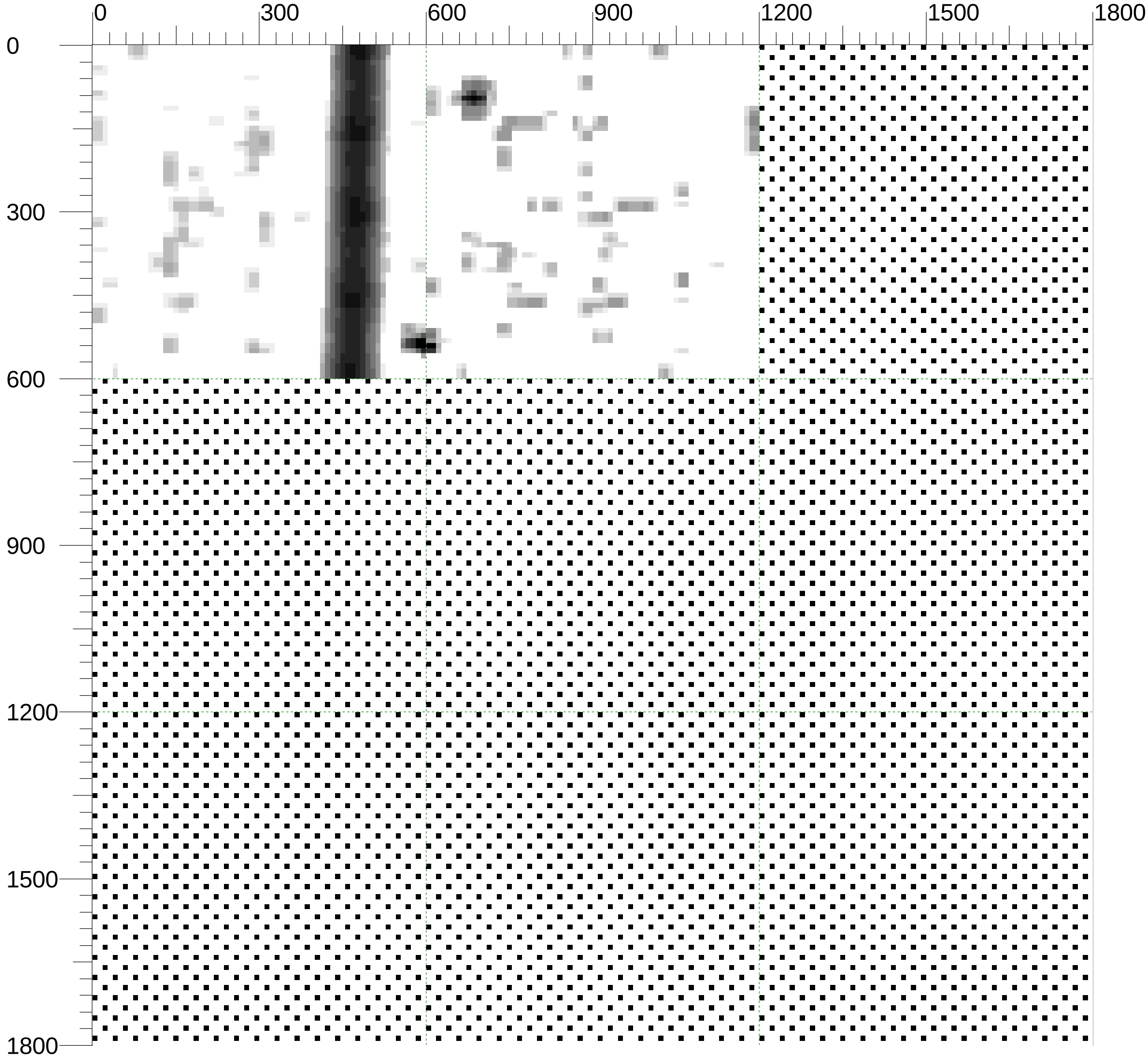
Date / Time: 2012-07-09 10:01:15 SSN: 31311003 [mm]



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Location: --- Operator: ---

Comment:

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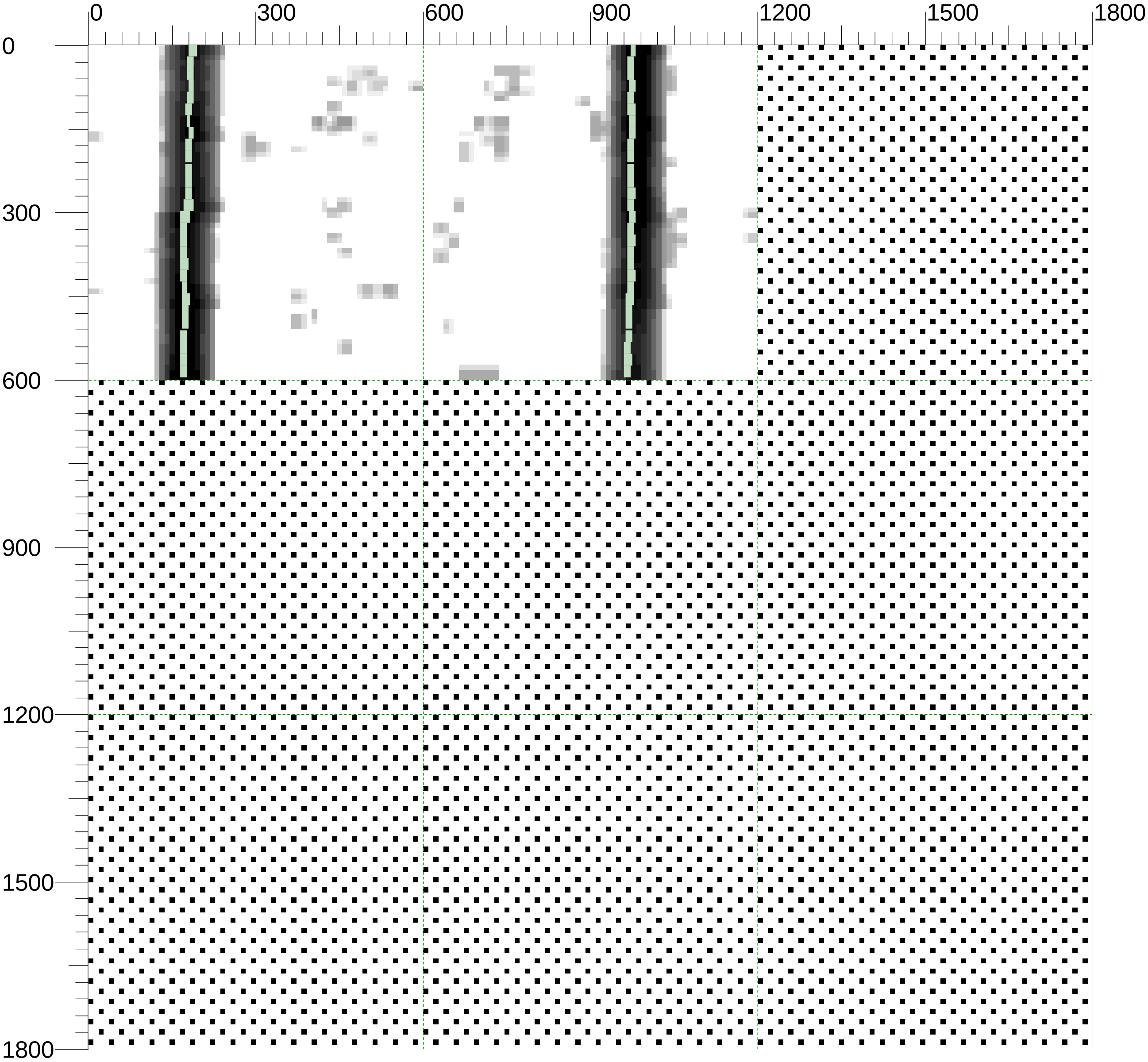
Date / Time: 2012-07-09 10:06:09 SSN: 31311003 [mm]



Customer: ---

Location: --- Operator: ---

Comment:

Appendix E

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Wigram Gymnasium			Reviewer:	Stephen Lee
	Unit	No:	Street	CPEng No:	1006840
Building Address:		29	Springs Road	Company:	GHD
Legal Description:				Company project number:	51/30596/23
				Company phone number:	04 472 0799
	Degrees	Min	Sec		
GPS south:				Date of submission:	
GPS east:				Inspection Date:	18/1/12
				Revision:	0
Building Unique Identifier (CCC):				Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	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):	11.00		height from ground to level of uppermost seismic mass (for IEP only) (m):	11
Floor footprint area (approx):				
Age of Building (years):	26		Date of design:	1976-1992
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	other (specify)		Brief strengthening description:	
Use (upper floors):	other (specify)			
Use notes (if required):	Recreation Gymnasium			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	frame system		
Roof:	steel 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:	welded and bolted steel moment frame		**Note: Define along and across in detailed report!**	note typical bay length (m)	
Ductility assumed, μ:	2.00				
Period along:	0.85	0.85	from parameters in sheet	estimate or calculation?	calculated
Total deflection (ULS) (mm):				estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				estimate or calculation?	
Lateral system across:	welded and bolted steel moment frame			note typical bay length (m)	
Ductility assumed, μ:	2.00				
Period across:	0.85	0.00		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:	steel	describe supports	
Wall cladding:	profiled metal	describe	
Roof Cladding:	Metal	describe	
Glazing:	aluminium frames		
Ceilings:	none		
Services(list):			

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site:
(refer DEE Table 4-2)

Site performance:	No ground damage observed.	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 (summary):	Less than 5% damage if at all.
Across	Damage ratio:	0%
	Describe (summary):	Less than 5% damage if at all.
Diaphragms	Damage?:	no
CSWs:	Damage?:	no
Pounding:	Damage?:	no
Non-structural:	Damage?:	yes

Describe how damage ratio arrived at:

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

Describe:

Describe:

Describe:

Describe:

Recommendations

Level of repair/strengthening required:	significant structural and strengthening	Describe:
Building Consent required:	no	Describe:
Interim occupancy recommendations:	full occupancy	Describe:

Along	Assessed %NBS before:	43%	##### %NBS from IEP below
	Assessed %NBS after:	43%	
Across	Assessed %NBS before:	43%	##### %NBS from IEP below
	Assessed %NBS after:	43%	

If IEP not used, please detail assessment methodology:

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): 1976-1992

h_n from above: 11m

Seismic Zone, if designed between 1965 and 1992:

not required for this age of building

not required for this age of building

	along	across
Period (from above):	0.85	0.85
(%NBS)nom from Fig 3.3:		

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

Note 2: for RC buildings designed between 1976-1984, use 1.2

Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)

	along	across
Final (%NBS)$_{nom}$:	**0%**	**0%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6:

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	#DIV/0!	#DIV/0!

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:	
Z_{1992}, from NZS4203:1992	
Hazard scaling factor, **Factor B:**	#DIV/0!

2.4 Return Period Scaling Factor

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

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)		
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

Sp:		
Structural Performance Scaling Factor **Factor E**:	#DIV/0!	#DIV/0!

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E

$\%NBS_b$:	**#DIV/0!**	**#DIV/0!**

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:	severe	0.4
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	insignificant	1

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

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum		
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

3.7. Overall Performance Achievement ratio (PAR)	**0.00**	**0.00**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)		**#DIV/0!**

GHD

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Document Status

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		Name	Signature	Name	Signature	Date
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