City Care Milton Street Depot
Plant Maintenance Workshop, Part 1 & 2
Detailed Engineering Evaluation
BU 1141-002 EQ2
Quantitative Report

Prepared for Christchurch City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

14 June 2013

Revision History

Revision Nº	Prepared By	Description	Date
A	George El Haddad	Draft for CCC review	1 March 2013
B	Laura Chen	Final	14 June 2013

Document Acceptance

Action	Name	Signed	Date
Prepared by	George El Haddad		14 June 2013
Reviewed by	Nicholas Charman		14 June 2013
Approved by	David Whittaker		14 June 2013
on behalf of	Beca Carter Hollings & Ferner Ltd		

City Care Milton Street Depot – Plant Maintenance Workshop, Part 1 & 2 BU 1141-002 EQ2

Detailed Engineering Evaluation
Quantitative Report – SUMMARY
Version 1

Address
245 Milton Street
Sydenham
Christchurch

Background

This is a summary of the Quantitative Assessment report for the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

Separate Qualitative Reports for the Plant Maintenance Workshop Part 1 and Part 2 were issued to CCC on 4 September 2012

The Plant Maintenance Workshop Part 1 and 2 (Plant Maintenance Workshop) is located at the City Care Milton St Depot at 245 Milton Street, Sydenham, Christchurch. It is part of the same building which also encompasses the Tyre Bay (BU 1141-011 EQ2) and primarily consists of steel portal frames with precast concrete shear walls. The structural drawings available indicate the Plant Maintenance Workshop was designed in 1979. Calculations have been undertaken as part of the Quantitative Assessment.

Key Damage Observed

Visual inspection on 8 February 2012 indicates the building has suffered minor damage. Key damage observed includes:

- Minor cracking to concrete encasement of steel columns.
- Cracking along vertical joint between concrete wall and internal timber framed wall.
- Horizontal cracking to concrete shear walls.
- Cracking of the sealant in the vertical movement joints between concrete panels.
- Cracking in masonry block wall mortar joints in the oxygen storage area.

Critical Structural Weaknesses (CSW)

The following Critical Structural Weaknesses have been identified:

- Site characteristics due to liquefaction occurring on the Milton St site.

Indicative Building Strength (from Detailed Assessment)

The building has been assessed to have a seismic capacity in the order of 35%NBS, using the New Zealand Society for Earthquake Engineering (NZSEE) Detailed Assessment guideline 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. The Plant Maintenance Workshop is therefore classified as Earthquake Risk and Seismic Grade C.

The structural damage observed is predominantly minor and the seismic capacity is not considered to have materially diminished from its pre-earthquake level.

Our assessment has identified the structural components that have governed/limited the building's seismic performance, and their potential failure mechanisms, are as follows:

- Overturning capacity of the precast shear walls and foundation achieves 35%NBS under longitudinal (in-plane) loading.
- RHS door header (tie member) connections under longitudinal (in-plane) loading achieve 36%NBS.
- Eaves channel (tie member) connections under longitudinal (in-plane) loading achieve 38%NBS.
- Precast panel connections to the portal frames achieve 46%NBS under longitudinal (in-plane) loading.

Recommendations

In order that the owner can make an informed decision about the on-going use and occupancy of their building the following information is presented in line with the Department of Building and Housing document 'Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch', June 2012.

The building is considered to be earthquake risk, having an assessed capacity of between 34% and 67% NBS. The risk of collapse of an earthquake risk building is considered to be 5 to 10 times greater than that of an equivalent new building.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would reduce its ability to resist further loads and therefore no restrictions on use or occupancy are recommended.

It is recommended that:

- A level survey could be carried out to determine the extent of settlement of the building for insurance purposes.
- According to the recent CCC Instructions to Engineers document (16 October 2012), Council's insurance provides for repairing damaged elements to a condition substantially as new. We suggest you consult further with your insurance advisor.

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Appendices

1 Background

Beca Carter Hollings & Ferner Ltd (Beca) has been engaged by Christchurch City Council (CCC) to undertake a Quantitative Detailed Engineering Evaluation (DEE) of the Plant Maintenance Workshop building located at 245 Milton Street, Sydenham, Christchurch.

This report is a Quantitative Assessment of the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

A quantitative assessment involves analytical calculations of the building's strength and may involve material testing, geotechnical testing and intrusive investigation. The qualitative assessment previously carried out involved inspections of the building, a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available and an assessment of the level of seismic capacity against current code using the Initial Evaluation Procedure (IEP).

The purpose of these assessments is to determine the likely building performance and damage patterns, to identify any potential Critical Structural Weaknesses (CSW) or collapse hazards, and to make an assessment of the likely building strength in terms of percentage of New Building Standard (%NBS).

A full set of structural drawings was made available and has been used in our assessment of the building. The building description below is based on a review of the drawings and our visual inspections.

The format and content of this report follows a template provided by CCC, which is based on the EAG document.

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 understood that CERA is adopting the Detailed Engineering Evaluation Procedure document (draft) issued by the Engineering Advisory Group on 19 July 2011, which sets out a methodology for both qualitative and quantitative assessments. We understand this report will be used in response to CERA Section 51.

The qualitative assessment includes a thorough visual inspection of the building coupled with a desktop review of available documentation such as drawings, specifications and IEP's. The quantitative assessment involves analytical calculation of the building's 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 that was assigned during the state of emergency following the 22 February 2011 earthquake
- The age and structural type of the building
- Consideration of any Critical Structural Weaknesses
- The extent of any earthquake damage

2.2 Building Act

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

Section 112 – Alterations

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

Section 115 – Change of Use

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

Section 121 – Dangerous Buildings

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

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- There is a risk that 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.

It is understood 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.

On 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

a. Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)

b. 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 Ultimate Limit State 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).

No consideration has been given at this stage to checking the level of compliance against the increased Serviceability Limit State requirements.

The likely ultimate capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a building's capacity based on a comparison of loading codes from when the building was designed 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 3.1 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 3.1: NZSEE Risk Classifications Extracted from Table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 3.1 below 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. on average 0.2% in any year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Table 3.1: %NBS Compared to Relative Risk of Failure

Building Grade	Percentage of New Building Standard (*%NBS*)	Approx. Risk Relative to a New Building
A+	>100	<1
A	80-100	1-2 times
B	67-80	2-5 times
C	33-67	5-10 times
D	20-33	10-25 times
E	<20	>25 times

4 Building Description

4.1 General

Summary information about the building is given in the following table. The Plant Maintenance Workshop is part of the same structure which contains the Tyre Bay.

Table 4.1: Building Summary Information

Item	Details	Comment
Building name	City Care Milton Street Depot – Plant Maintenance Workshop,	
Street Address	245 Milton Street Sydenham Christchurch	
Age	Designed in 1979	From drawings available
Description	Single storey garage facility	
Building Footprint / Floor Area	Approx. 100m x 15m, 1500m^2 internally	Excluding Tyre Bay area
No. of storeys / basements	1 storey/no basement	2 storey office area at centre of building
Occupancy / use	Workshop and offices	Importance Level 2
Construction	Steel portal frame with glazed infills and concrete walls. Concrete frame in office area. A timber framed extension at the entrance to the two storey office area was designed in 1995.	The timber extension is tied into the concrete frame of the office area.
Gravity load resisting system	Timber framed roof supported by steel portal frames. Concrete ground to mezzanine floor structure in two-storey office.	
Seismic load resisting system	The transverse lateral load resisting system comprises steel portal frames. The longitudinal lateral load resisting system	The drawings indicate rod bracing on both the north and south elevations of the building, however site

Item	Details	Comment
	comprises of a plywood roof diaphragm which transfers the load through struts/ties at the eaves level into the precast panel shear walls at each end of the building (Tyre Bay and Plant Maintenance Workshop). In the two storey office area, the lateral load resisting system is reinforced concrete frames in both directions (ground to mezzanine), with transverse portal frames from mezzanine floor level and tied into the primary longitudinal load resisting system at door header level. Lateral loads from the timber framed extension are resisted by the concrete frames of the office area.	observations suggest the northern bracing was not installed. This Quantitative Assessment did not include the northern bracing. The south elevation structures of both the Tyre Bay and Plant Maintenance Workshop have been considered as a single continuous lateral load resisting system for longitudinal loading including precast panels, RHS door header and channel eaves members.
Foundation system	Reinforced concrete slab with concrete pads and tie beams.	
Stair system	Timber stairs up to Fleet Services office.	
Other notable features	None	
External works		
Construction information	Structural drawings by City Engineer's Department and Architectural drawings by City Architectural Division both dated 1979.	
Likely design standard	NZS 4203:1976	Inferred from age of building
Heritage status	No heritage status	
Other	Masonry block walls in oxygen storage area	

4.2 Structural 'Hot-spots'

Areas in which damage may be expected to occur from earthquake shaking are outlined below;

- Cracking of the office concrete frames.
- Cracking of the precast panels.
- Damage to the roof diaphragm between the portal frame structures and the concrete frame office area due to the different behaviour of the different structures.
- Damage at panel connections and panel interfaces.

5 Site Investigations

5.1 Previous Assessments

It is understood that Opus International Consultants undertook rapid assessments of the buildings on the Milton St Depot site. These reports were not available for review.

Visual inspections as part of the Level 4 assessment were undertaken on 8 February 2012. A qualitative report was issued to CCC on 4 September 2012.

5.2 Level 5 Intrusive Investigations

Intrusive Investigations were carried out on the roof structure on 9 October 2012 to confirm the presence of a plywood roof diaphragm.

6 Damage Assessment

6.1 Damage Summary

The table below provides a summary of damage that we observed on our inspection visit. Refer to Appendix A for photographs of the observed damage. The damage described in this report is for the Plant Maintenance Workshop only.

Table 6.1: Damage Summary

Damage type	Unknown	Minor	Moderate	Major	Comment
settlement of foundations	ü				None observed during visual inspection. Level survey may be required to confirm.
tilt of building	ü				None observed during visual inspection. Verticality survey may be required to confirm.
liquefaction		ü			None observed during visual inspection. Contacts on site stated it had occurred in areas throughout the site. The aerial reconnaissance on 24 Feb 2011 indicates the extent was minor.
settlement of external ground					None observed during visual inspection.
lateral spread / ground cracks					None observed during visual inspection.
Frame		ü			Minor cracking of column concrete encasement was observed.
concrete walls		ü			Minor cracking of the concrete shear walls was observed. Minor separation along movement joints between concrete panels was observed.
cracking to concrete floors		ü			Cracks in floor slabs were observed.
Bracing	ü				No damage to the vertical steel cross bracing was observed.

Damage type	Unknown	Minor	Moderate	Major	Comment
					Only a small area of the roof diaphragm was able to be inspected during the intrusive investigation. No damage to this area was observed.
Precast flooring seating	ü				Ceiling lining prevented visual inspection of precast floor seating (mezzanine level of office structure). Drawings indicate 55mm seating which is in accordance with NZS 3101:2006
Stairs					No damage observed during visual inspection
cladding /envelope		ü			Cracking to precast concrete wall panels observed as described above
Internal fit out		ü			Minor plasterboard cracking observed.
building services	ü				No inspection of services. No obvious damage was observed.
Adjacent building					The Plant Maintenance Workshop and the Tyre Bay have been considered as one building.

6.2 Surrounding Buildings

The Tyre Bay (BU 1141-011 EQ2) is part of the same structure as the Plant Maintenance Workshop.

6.3 Residual Displacements and General Observations

No evidence of permanent settlement or displacements was observed during our visual inspection, however a global settlement survey may reveal movement that could be described as damage under insurance entitlement.

6.4 Implication of Damage

Based on our visual inspection, the structure appears to have only suffered minor damage and therefore we believe the structural capacity has not materially diminished.

7 Generic Issues

The generic issues referred to in Appendix A of the EAG guideline document have been assessed and are not considered applicable to the Plant Maintenance Workshop.

8 Geotechnical Consideration

No geotechnical information was available for this site. During the inspection, any damage to the surrounding pavement was noted and any affect to the structure was considered.

9 Survey

No level or verticality surveys were carried out as there was no evidence of settlement or displacement observed during the inspection. CCC may wish to undertake a level survey as part of insurance entitlement considerations.

10 Detailed Seismic Capacity Assessment

10.1 Assessment Methodology

The building has had its seismic capacity assessed using the Forced-based Detailed Assessment Procedures in the NZSEE 2006 AISPBE guidelines, based on the drawings and intrusive investigations.

The structure has suffered minor damage. The post-damage capacity is considered to be the same as the original capacity.

The concrete framed structure of the office area was assessed separately to the rest of the structure. The precast concrete panels of the Tyre Bay and Plant Maintenance Workshop, plus associated steel tie members, have been assumed to contribute to the overall longitudinal lateral load resisting system of both structures i.e. they have been considered as one structure when assessing the seismic capacity of the building.

10.2 Assumptions

The following assumptions were used in our quantitative assessment:

- Reinforcing steel yield strength f_y = 275 MPa (as noted on the drawings)
- Concrete compressive strength f_c' = 25 MPa (as noted on the drawings)
- Structural steel yield strength f_y = 250 MPa
- Soil ultimate bearing strength q_u = 300 kPa

10.3 Critical Structural Weaknesses

The following Critical Structural Weakness has been identified:

- Site characteristics due to liquefaction occurring on the Milton St site

The site characteristics have been identified as a potential CSW in our earlier qualitative report. We note that liquefaction is still considered a potential CSW however has not been considered in this quantitative assessment as we believe it will not have a direct impact on the structure's ability to resist further loads or cause global failure of the structure.

10.4 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 – NZS 1170.5:2004, Clause 3.1.3, Soft Soil
- Site hazard factor, Z = 0.3 – NZBC, Clause B1 Structure, Amendment 11 effective from 19 May 2011
- Return period factor Ru = 1 – NZS 1170.5:2004, Table 3.5, Importance Level 2 structure with a 50 year design life.
- Near fault factor N(T,D) = 1 – NZS 1170.5:2004, Clause 3.1.6, Distance more than 20 km from fault line.

10.5 Results of Seismic Assessment

The results of our quantitative assessment indicate the building has a seismic capacity in the order of 35%NBS. This is similar to the IEP assessment of 36%NBS in the previous Qualitative Report. Table 10.1 presents the evaluated seismic capacity in terms of %NBS of the individual structural systems in each building direction.

Table 10.1: Summary of Seismic Assessment of Structural Systems

Item	Loading Direction	Ductility, μ	Seismic Capacity	Notes
Overall %NBS adopted from DEE	**Longitudinal**		**35%NBS**	**Governed by precast shear wall overturning.**
Portal frames	Transverse	1.25	>100%NBS	
Precast panel, in-plane capacity	Longitudinal	1.25	>100%NBS	
Foundations	Longitudinal	1.25	35%NBS	Resistance to overturning of precast panels. Based on combined Tyre Bay and Plant Maintenance Workshop longitudinal load resisting system adopted.
Precast panel, out-of-plane flexural capacity	Both	3	92%NBS	Precast panels have been analysed as a part.
Precast panel connections	Longitudinal	1.25	46%NBS	Shear capacity under In-plane loading.
RHS door header beam	Longitudinal	1.25	36%NBS	Pull out of connection to the precast panels.
Channel eaves beam	Longitudinal	1.0	38%NBS	Shear capacity of connection to precast panels.
Mezzanine office reinforced concrete frames	Transverse	3	85%NBS	Capacity governed by columns (flexure).
Mezzanine office reinforced concrete frames	Longitudinal	3	70%NBS	Capacity governed by beams (flexure).

Note: Ductility factors are in accordance with values recommended in the NZSEE 2006 AISPBE guidelines.

10.6 Discussion of results

The key findings of the assessment are as follows:

- Overturning capacity of the precast shear walls and foundation achieves 35%NBS under longitudinal (in-plane) loading.
- RHS door header (tie member) connections under longitudinal (in-plane) loading achieve 36%NBS.
- Eaves channel (tie member) connections under longitudinal (in-plane) loading achieve 38%NBS.
- Precast panel connections to the portal frames achieve 46%NBS under longitudinal (in-plane) loading.

Based on the results of our Quantitative Assessment, the Plant Maintenance Workshop is considered Earthquake Risk and Seismic Grade C as the seismic capacity was assessed to be between 34%NBS and 67%NBS.

11 Recommendations

11.1 Occupancy

In order that the owner can make an informed decision about the on-going use and occupancy of their building the following information is presented in line with the Department of Building and Housing document 'Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch', June 2012.

The building is considered to be earthquake risk, having an assessed capacity of between 34% and 67%NBS. The risk of collapse of an earthquake risk building is considered to be 5 to 10 times greater than that of an equivalent new building.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would reduce its ability to resist further loads and therefore no restrictions on use or occupancy are recommended.

11.2 Further Investigations, Survey or Geotechnical Work

A settlement survey could be carried out to determine the extent of settlement of the building for insurance purposes.

11.3 Damage Reinstatement

According to the recent CCC Instructions to Engineers document (16 October 2012), Council's insurance provides for repairing damaged elements to a condition substantially as new. We suggest you consult further with your insurance advisor.

12 Design Features Report

Repairs will be required to reinstate the existing structural system. A repair methodology has not been prepared at this stage. No new load paths are expected as a result of the repairs required.

13 Limitations

The following limitations apply to this engagement:

- Beca and its employees and agents are not able to give any warranty or guarantee that all defects, damage, conditions or qualities have been identified.
- Inspections are primarily limited to visible structural components. Appropriate locations for invasive inspection, if required, will be based on damage patterns observed in visible elements, and review of the construction drawings and structural system. As such, there will be concealed structural elements that will not be directly inspected.
- The inspections are limited to building structural components only.
- Inspection of building services, pipework, pavement, and fire safety systems is excluded from the scope of this report.
- Inspection of the glazing system, linings, carpets, claddings, finishes, suspended ceilings, partitions, tenant fit-out, or the general water tightness envelope is excluded from the scope of this report.
- The assessment of the lateral load capacity of the building is limited by the completeness and accuracy of the drawings provided. Assumptions have been made in respect of the geotechnical conditions at the site and any aspects or material properties not clear on the drawings. Where these assumptions are considered material to the outcome further investigations may be recommended. It is noted the assessment has not been exhaustive, our analysis and calculations have focused on representative areas only to determine the level of provision made. At this stage we have not undertaken any checks of the gravity system, wind load capacity, or foundations.
- The information in this report provides a snapshot of building damage at the time the detailed inspection was carried out. Additional inspections required as a result of significant aftershocks are outside the scope of this work.

This report is of defined scope and is for reliance by CCC only, and only for this commission. Beca should be consulted where any question regarding the interpretation or completeness of our inspection or reporting arises.

Appendix A

Photographs

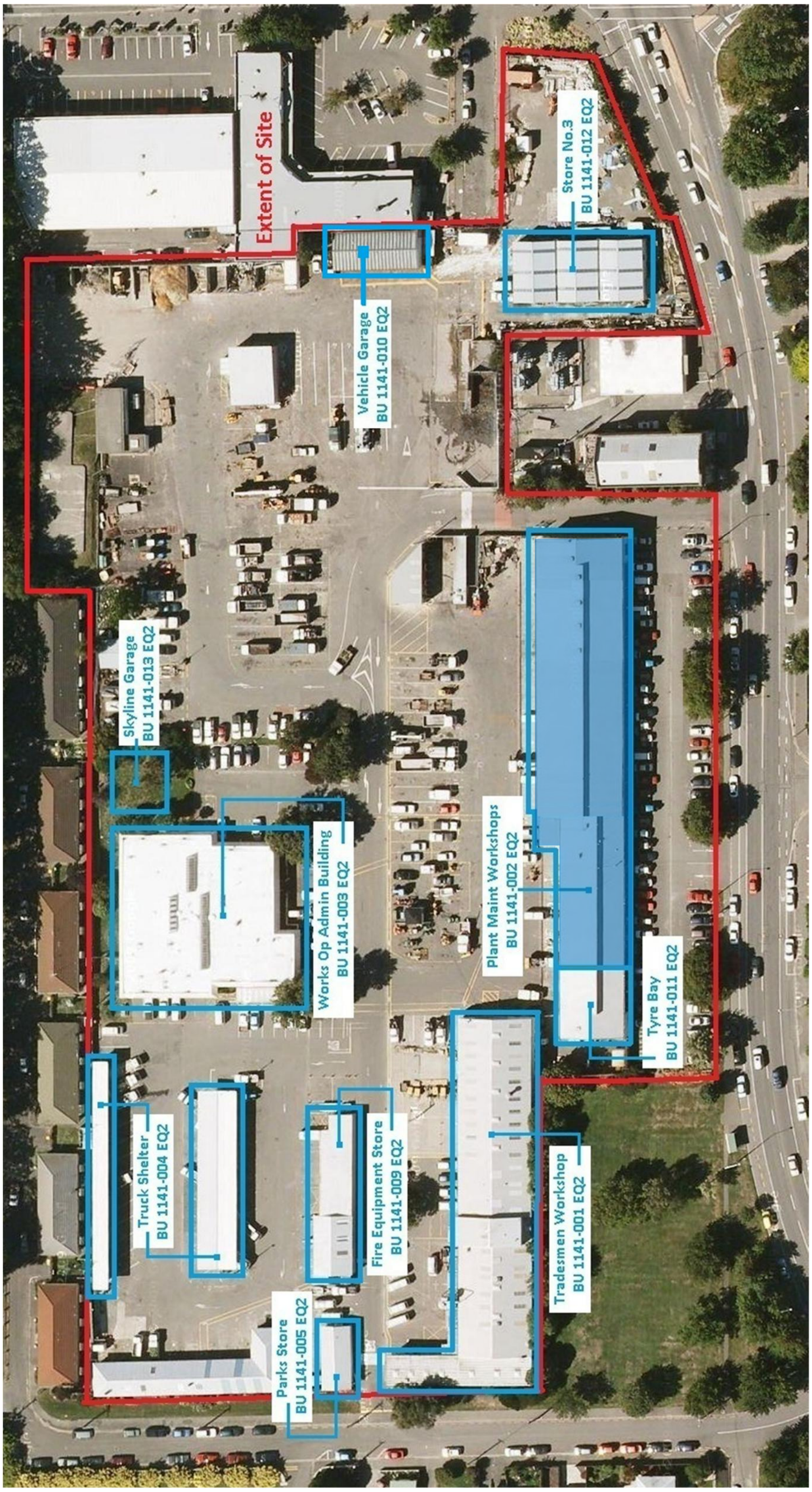


Figure 1A: Site Layout (North is to the left of page)

Photo 1: External view of Plant Maintenance Workshop

Photo 2: External view of Plant Maintenance Workshop

Photo 3: External view of Plant Maintenance Workshop

Photo 4: Internal view of Plant Maintenance Workshop.

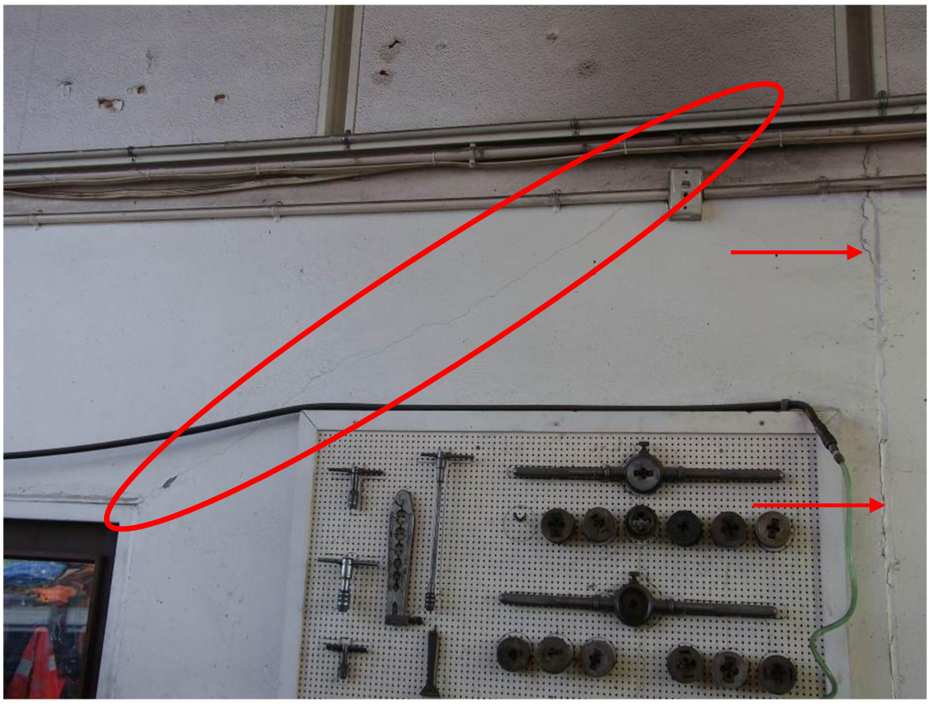


Photo 5: Typical cracking to concrete shear walls.

Description of Damage: Cracking to concrete shear walls and movement joints, with some spalling at movement joint.

Photo 6: Typical slab cracking

Description of Damage: Cracking to concrete slab at Fleet Services entrance.

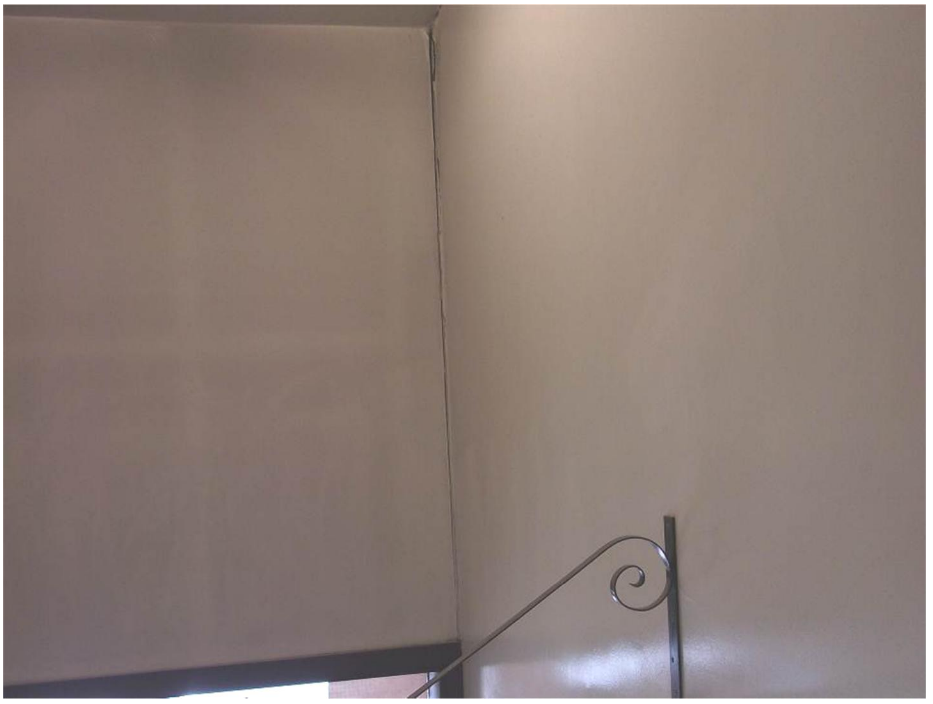


Photo 7: Movement between concrete wall and timber wall.

Description of Damage: Damage from movement between concrete wall and timber wall.

Photo 8: Typical cracking to concrete encasement of column.

Description of Damage: Cracking to column concrete encasement.

Photo 9: Typical cracking to concrete shear walls at corners of building.

Description of Damage: Cracking to concrete shear walls.

Photo 10: Typical cracking to concrete shear walls at corners of building

Description of Damage: Shear crack in concrete shear wall.

Photo 11: Typical cracking along movement joints

Description of Damage: Cracking to vertical movement joints.

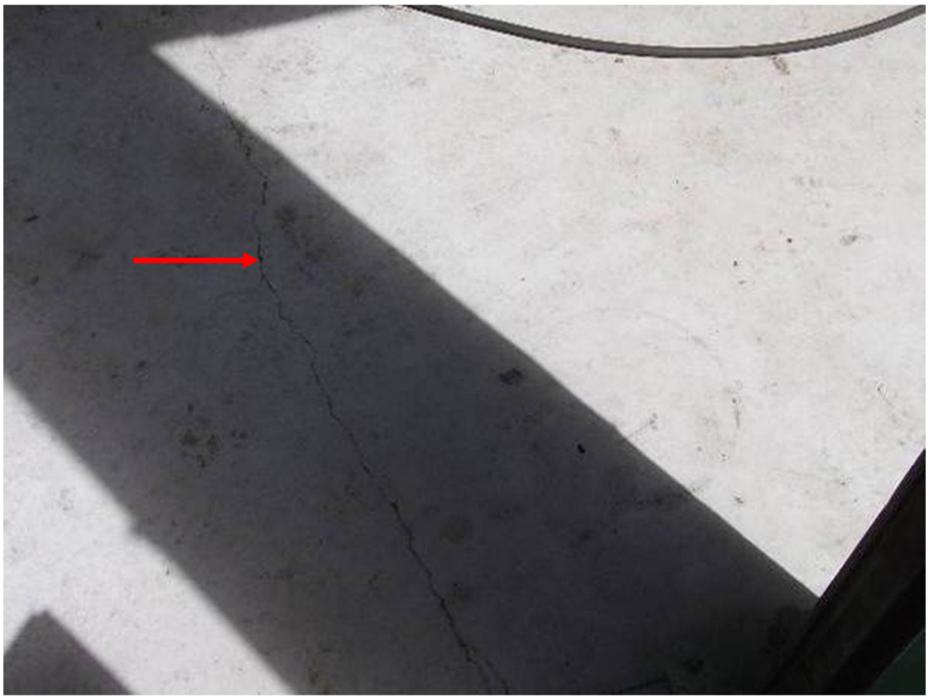


Photo 12: Typical slab cracking

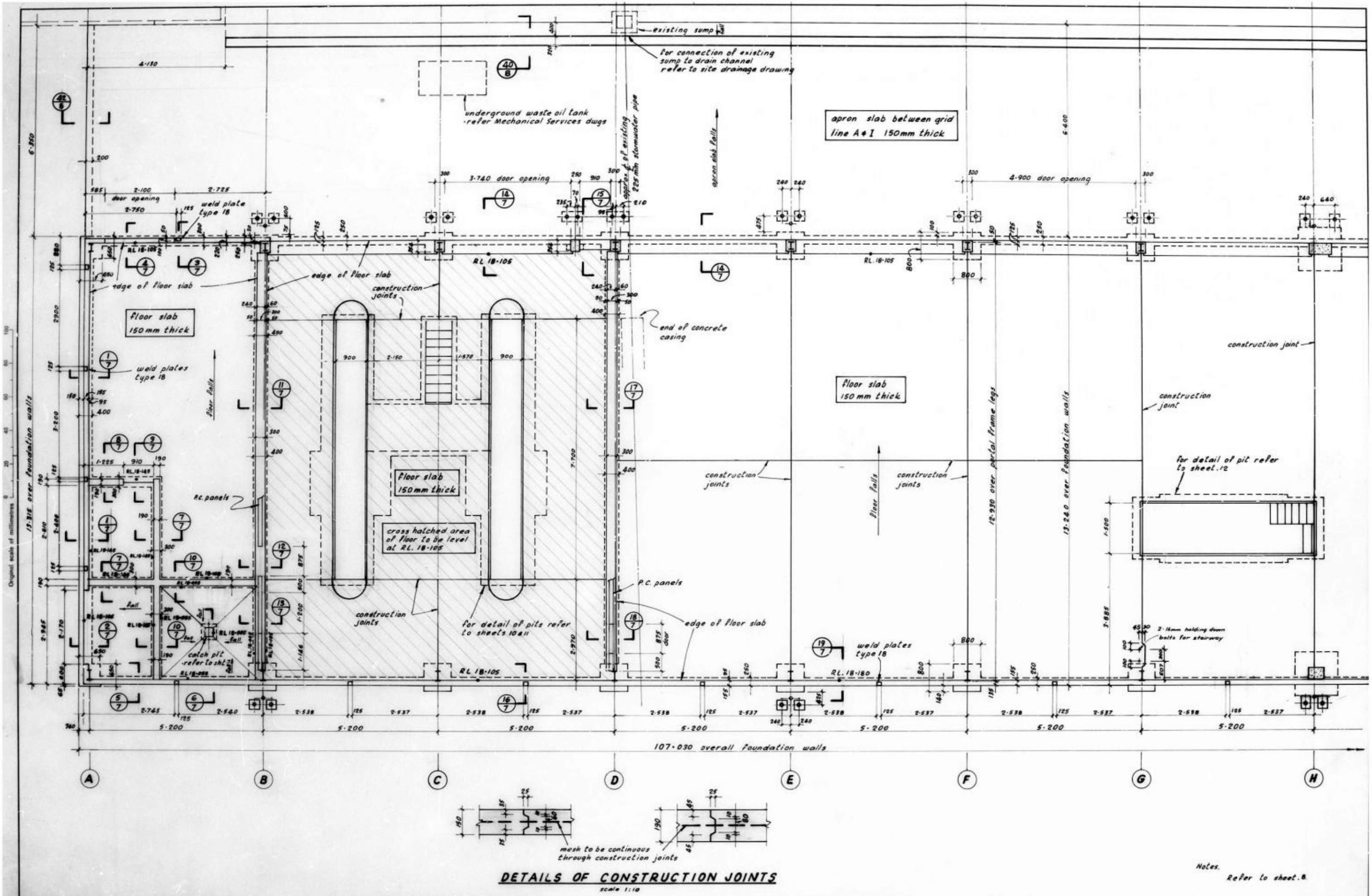
Description of Damage: Cracking to concrete slab.

Photo 13: Cracking to oxygen tank storage blockwork

Description of Damage: Cracking to blockwork mortar.

Appendix B

Existing Drawings



DETAILS OF CONSTRUCTION JOINTS

scale 1:10

Notes.

Refer to sheet. 8

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

	Amendments	Initials	Date
A	Stairway bolts added	PRM	10/79

Designed	P. Rosie 11/78
Drawn	A.L. Bambridge 11/78
Traced	
Dwg. Chk.	P. Rosie 5/79
Des. Chk.	
Indexed	A.E.B. 6/79

Approved: Design Engineer 13.6.79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

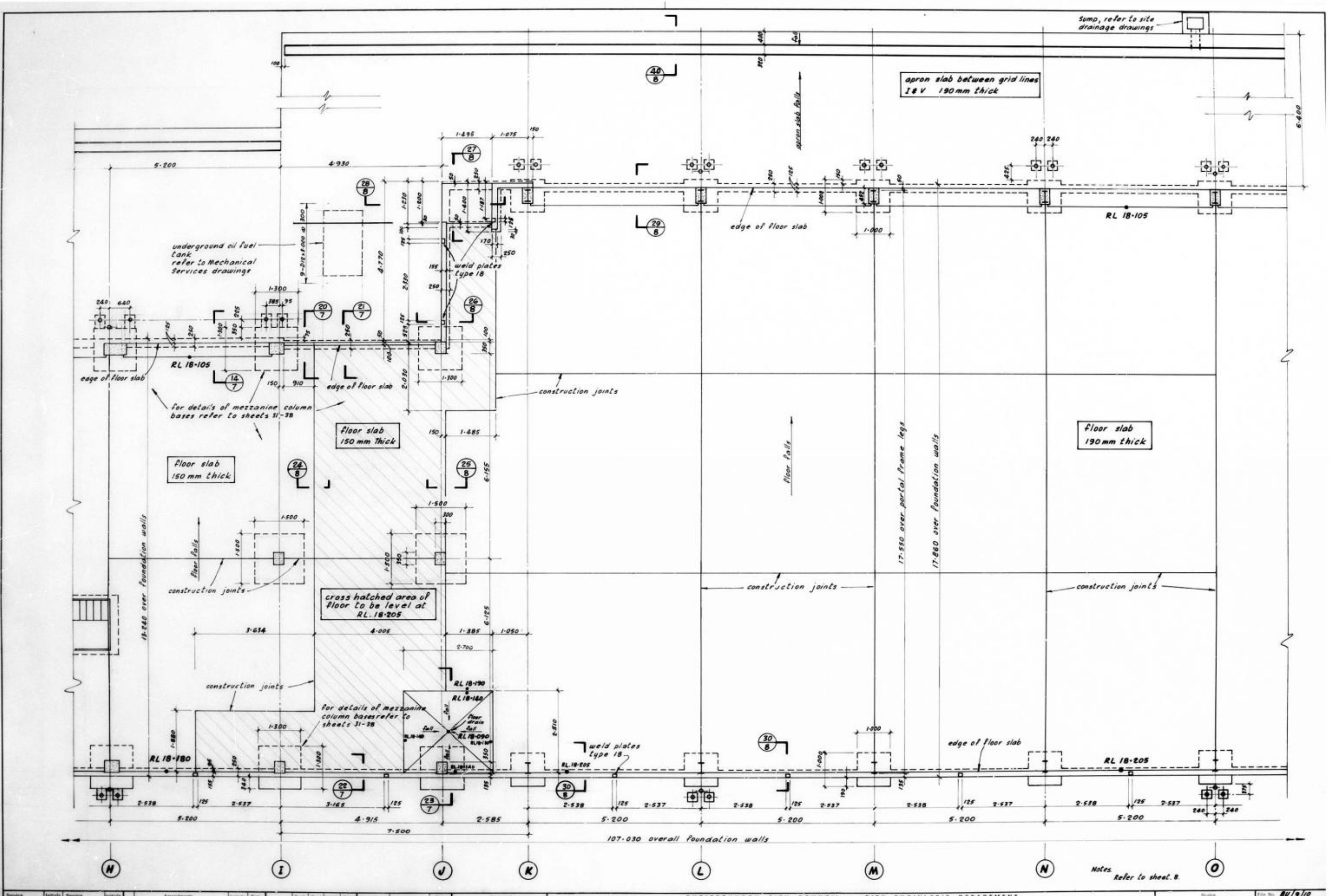
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - PART FOUNDATION PLAN - GRID LINES A - H -

Scales: 1:50, 1:10

File No. 8U/9/10 Issue A

D.2278

Sheet 1 of 49



Notes. Refer to sheet. 8.

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

Amendments	Initials	Date

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

		Date
Designed	P. Rosie	11/78
Drawn	A.C. Bawbridge	12/78
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B	6/79

Approved: Design Engineer, Date 13·6·79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - PART FOUNDATION PLAN - GRID LINES H - O -

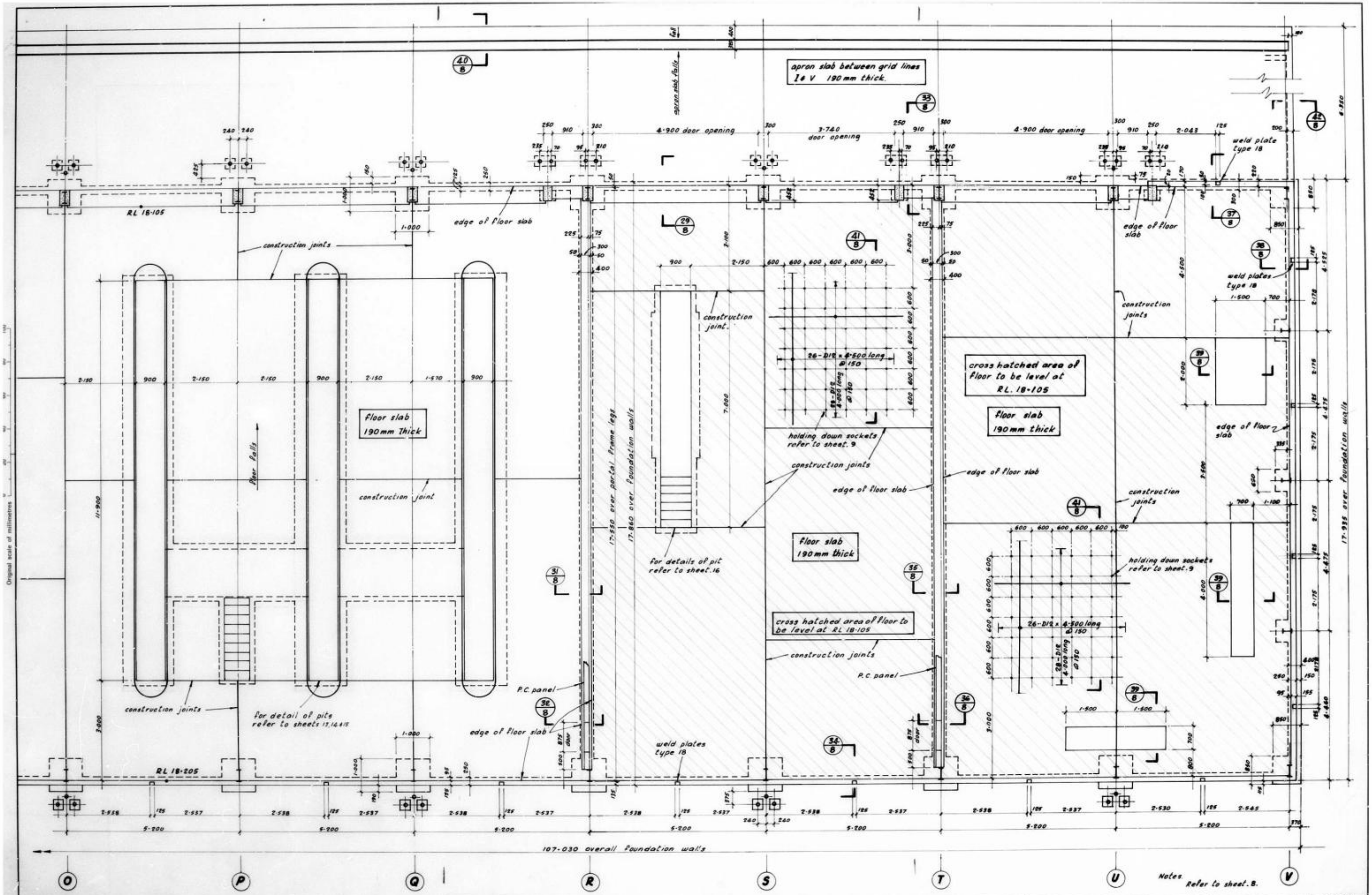
Scales: 1 : 50

File No. 8U/9/10

Issue

D. 2278

Sheet 2 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
PART FOUNDATION PLAN - GRID LINES O - V -

Designed	P. Rosie	11/78
Drawn	A.E. Bainbridge	12/78
Traced		
Desg. Chk.	P. Rosie	5/79
Cze. Chk.		
Indexed	A.E.B.	6/79

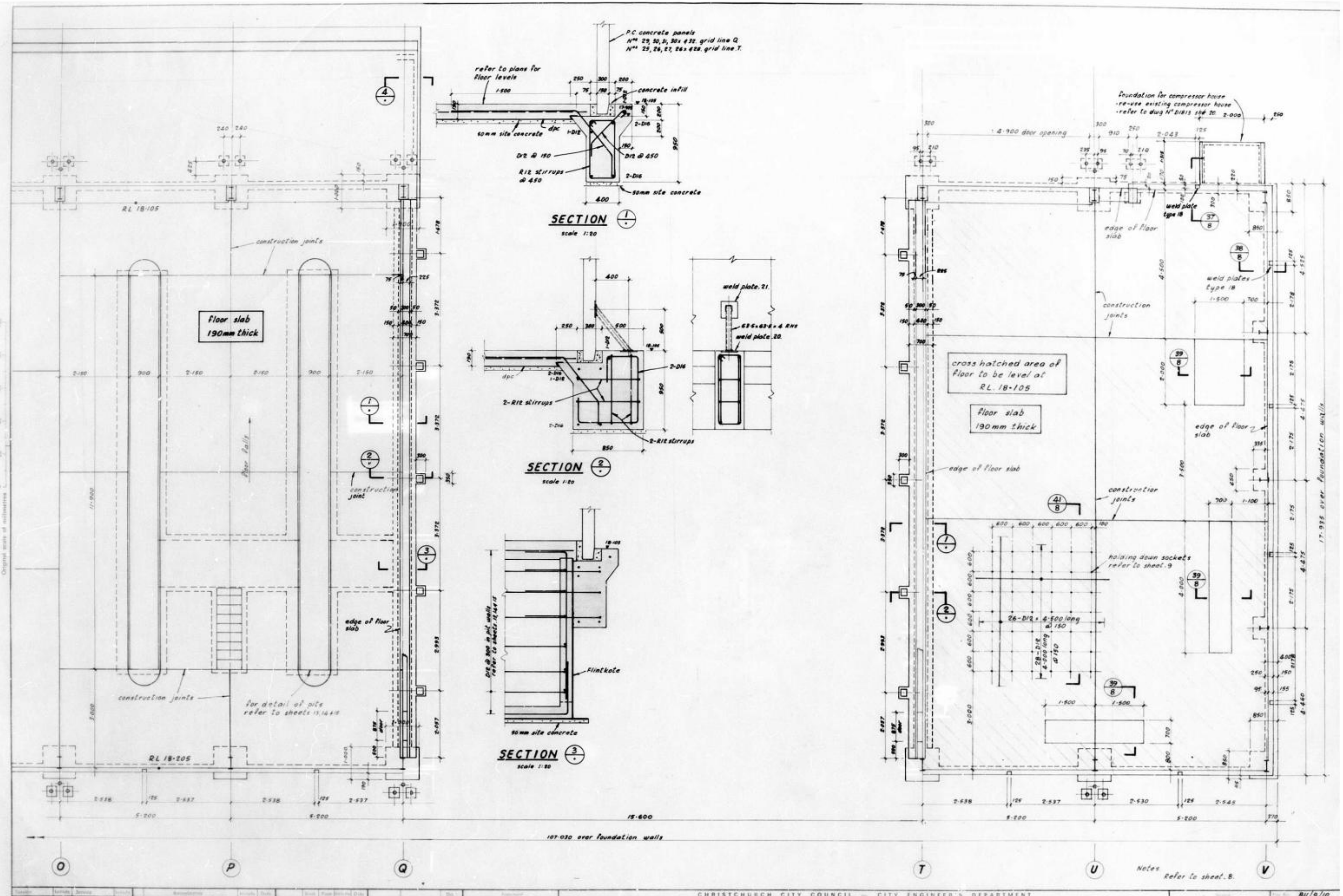
Approved: Design Engineer 13.6.79 — for City Engineer

Scales: 1:50

File No. 8U/9/10

D. 2278

Sheet 3 of 49



Notes
Refer to sheet. 8.

A 3 bays of the building deleted between grid lines Q & T — A.E.B 12/79
B Weld plate 19 changed to 21 — A.E.B 2/80

Drawn P. Rosie 1/78
A.E. Bainbridge 7/78
P. Rosie 5/79
A.E.B 6/79
Design Engineer 13.6.79

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - PART FOUNDATION PLAN - GRID LINES O-V —

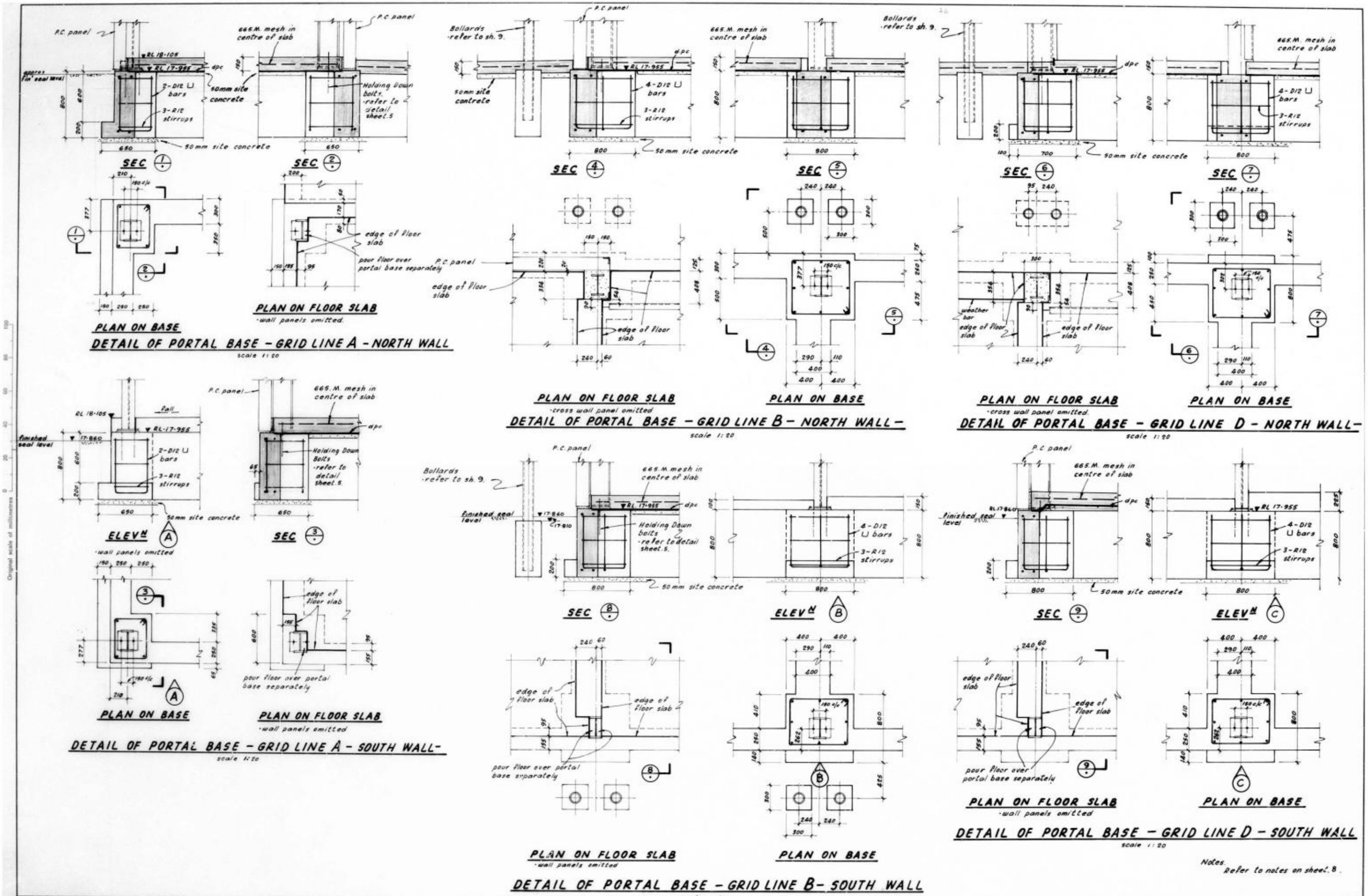
1:50

BU/9/10

A B

D. 2278

3 / 43



Notes.
Refer to notes on sheet. 8.

Designed	P. Rosie 11/76
Drawn	A.E. Bainbridge 12/78
Dsg. Chk.	P. Rosie 5/79
Approved	Design Engineer 13.6.79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

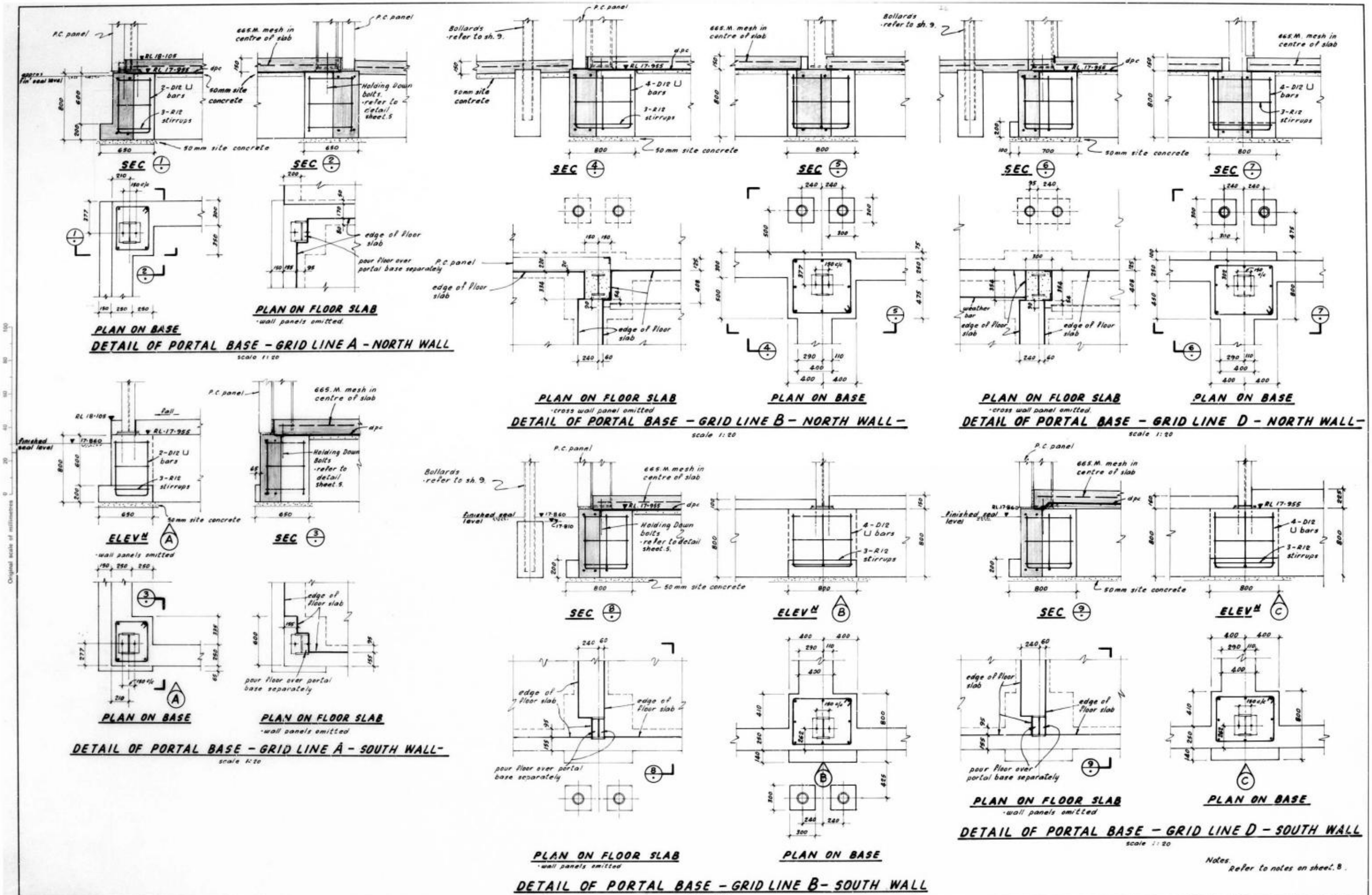
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL BASES - GRID LINES A, B & D -

Scale 1:20

File No. 8U/9/10

D.2278

Sheet 4 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

Designed	P. Rosie	11/78
Drawn	A.E. Bombridge	12/78
Dwg. Chk.	P. Rosie	5/79
(Index)	A.E.B.	6/79

Approved: Design Engineer 13.6.79; City Engineer

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -

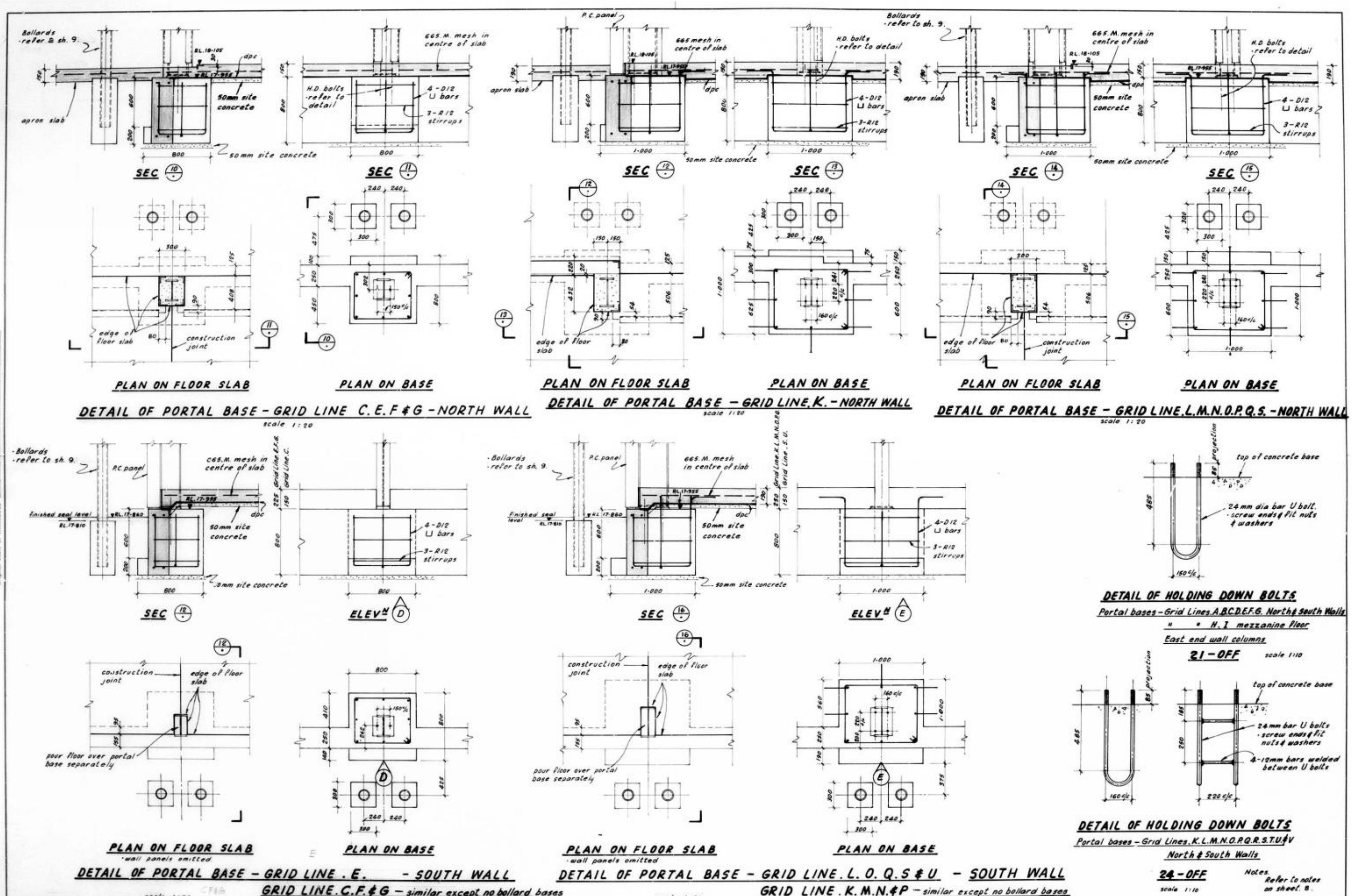
DETAILS OF PORTAL BASES - GRID LINES A, B & D -

Scale 1:20

File No. 84/9/10

D.2278

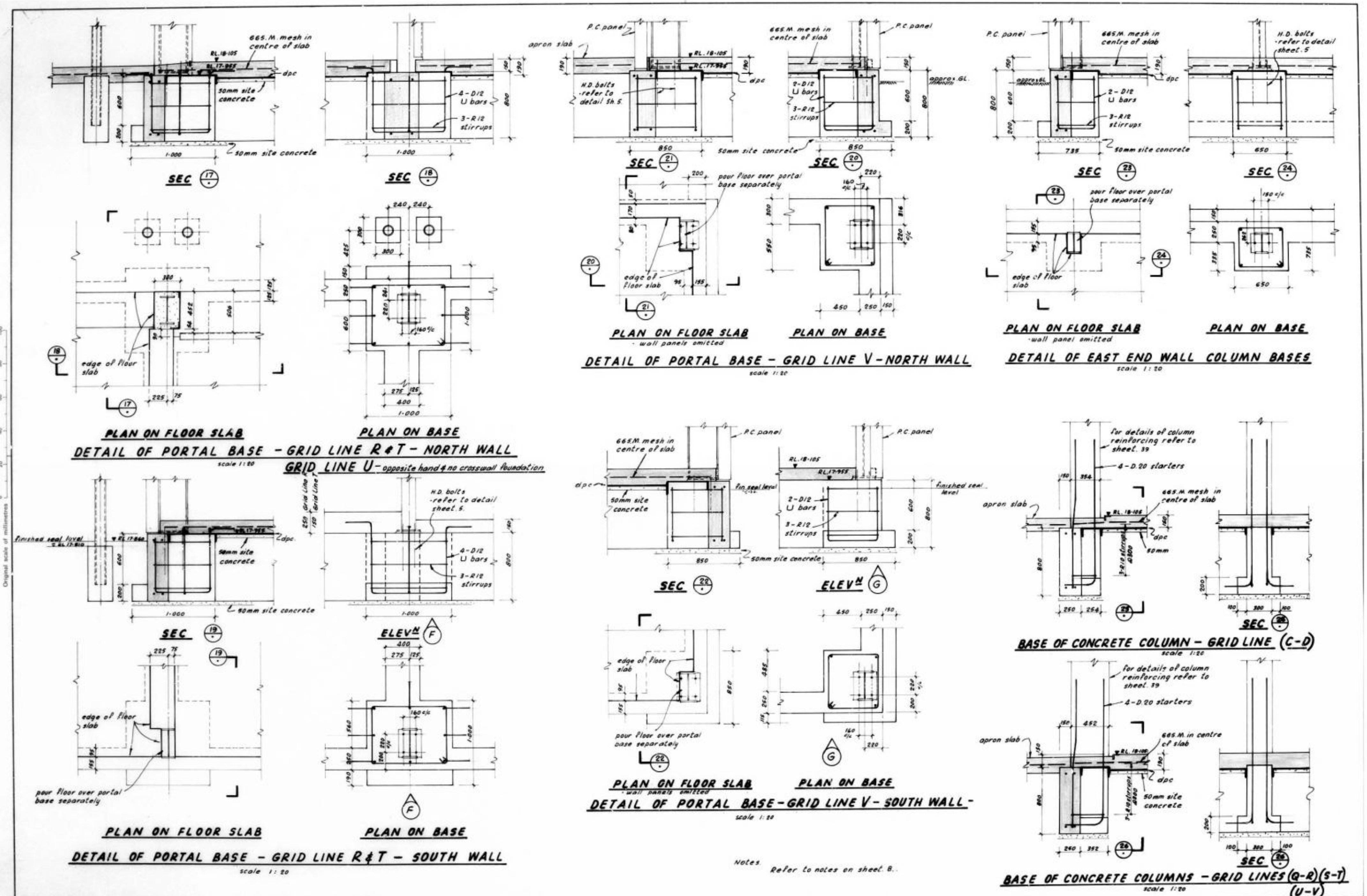
Sheet 4 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL BASES - GRID LINES C.E.F.G.K.L.M.N.O.P.Q.S & U -

Designed	P. Rosie 12/78
Drawn	A.E. Bainbridge 1/79
Desg. Chk.	P. Rosie 5/79
Inked	A.E.B 6/79
Design Engineer	13.6.79
City Engineer	
Scale	1:10, 1:20
File No.	8U/9/10
Drawing	D.2278
Sheet	5 of 49



Notes.
Refer to notes on sheet. 8.

Designed	P. Rosie	11/78
Drawn	K.E. Bainbridge	1/79
Dsg. Ch.	P. Rosie	5/79
Indexed	A.E.B.	6/79

Design Engineer 13.6.79

City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

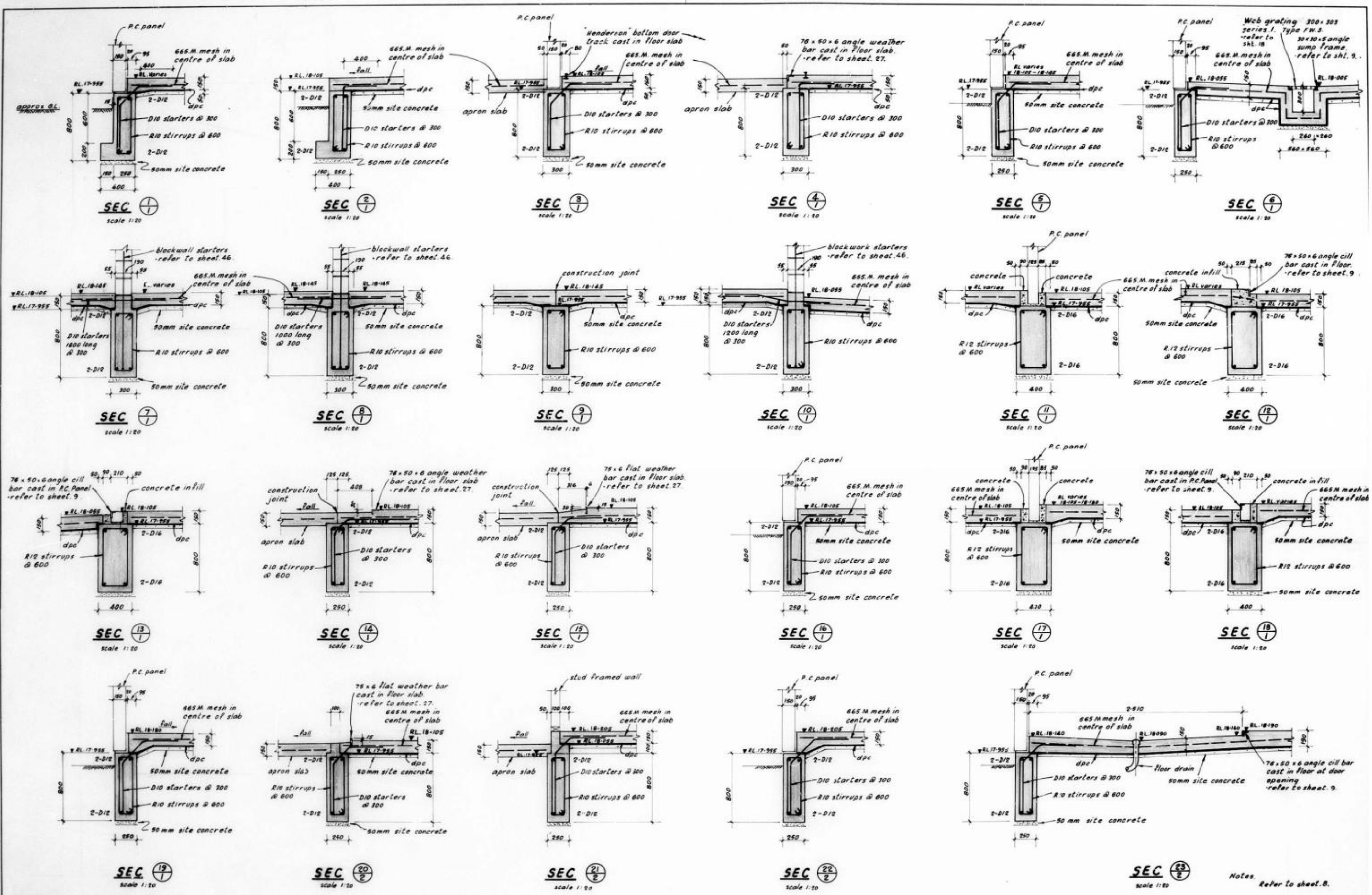
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL BASES - GRID LINES R, T. U & V - EAST WALL COLS -

Scale 1:20

File No. 2U/9/10

D.2278

Sheet 6 of 49



Notes. Refer to sheet. 8.

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

		Date
Designed	P. Rosie	11/78
Drawn	A.E. Bambridge	1/79
Traced		
Des. Chk.	P. Rosie	5/79
Drn. Chk.		
Indexed	A.E.B	6/79

Approved: Design Engineer 13.6.79 — for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - FOUNDATION SECTIONS

Scales: 1:20

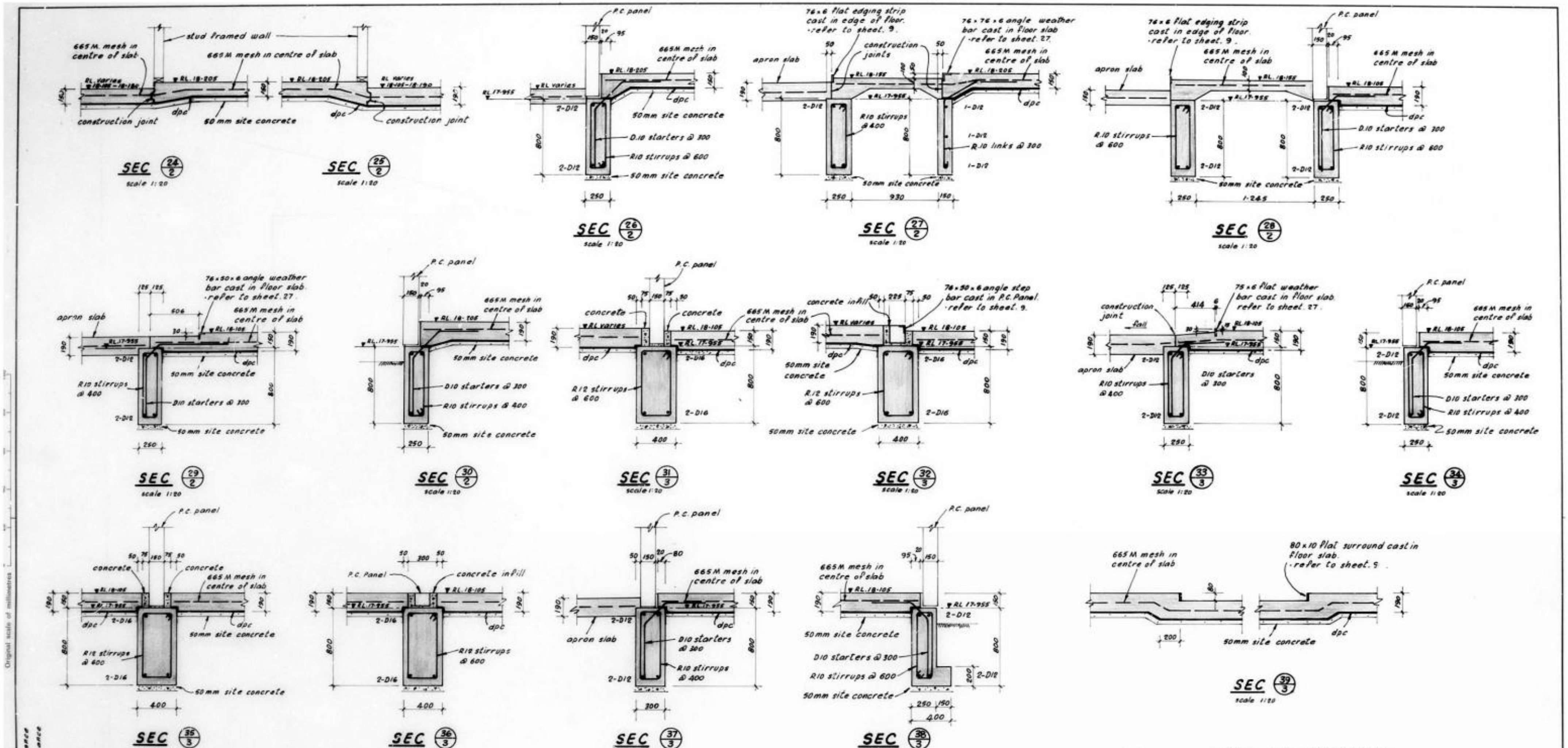
File No. 84/9/10

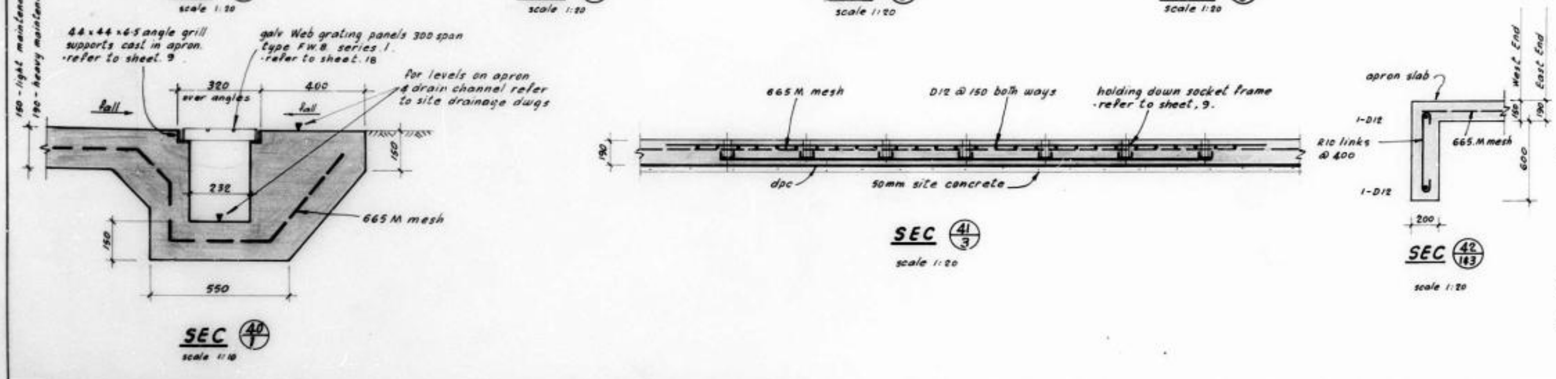
D.2278

Sheet 7 of 49

Original scale of millimetres 0 20 40 60 80 100

centimetres 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30





NOTES FOR FOUNDATIONS

1. Concrete
   - (a) Concrete strength shall be -:
     - f'c = 10 MPa - site concrete
     - f'c = 25 MPa - Foundation beams
     - f'c = 35 MPa - Floor & Apron slabs
   - (b) Cover to foundation beam stirrups 50mm mesh centrally placed.
2. Reinforcing
   - (a) All bars except stirrups & links to be deformed Grade 275
   - (b) Stirrups & links to be plain round Grade 275
   - (c) Reinforcing to be continuous throughout. Unless shown otherwise laps shall be -:
     - 10mm = 350 mm
     - 12mm = 400 mm
     - 16mm = 550 mm
     - Mesh = 300 mm
3. Refer to Architects & Mechanical Services drawings for details of all bolts, chases, pipes, conduits etc to be cast into or formed in concrete
4. Excavate & backfill with compacted pitrun hardfill down to the gravel sub-base (approx RL. 16·000) beneath all portal & mezzanine column bases

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - FOUNDATION SECTIONS

Designed	P. Rosie	11/78
Drawn	A.E. Bainbridge	2/79
Dsg. Chk.	P. Rosie	5/79
Issued	AEB	6/79

Approved: Design Engineer 13.6.79; B.D. [illegible] for City Engineer

Scales: 1:10, 1:20

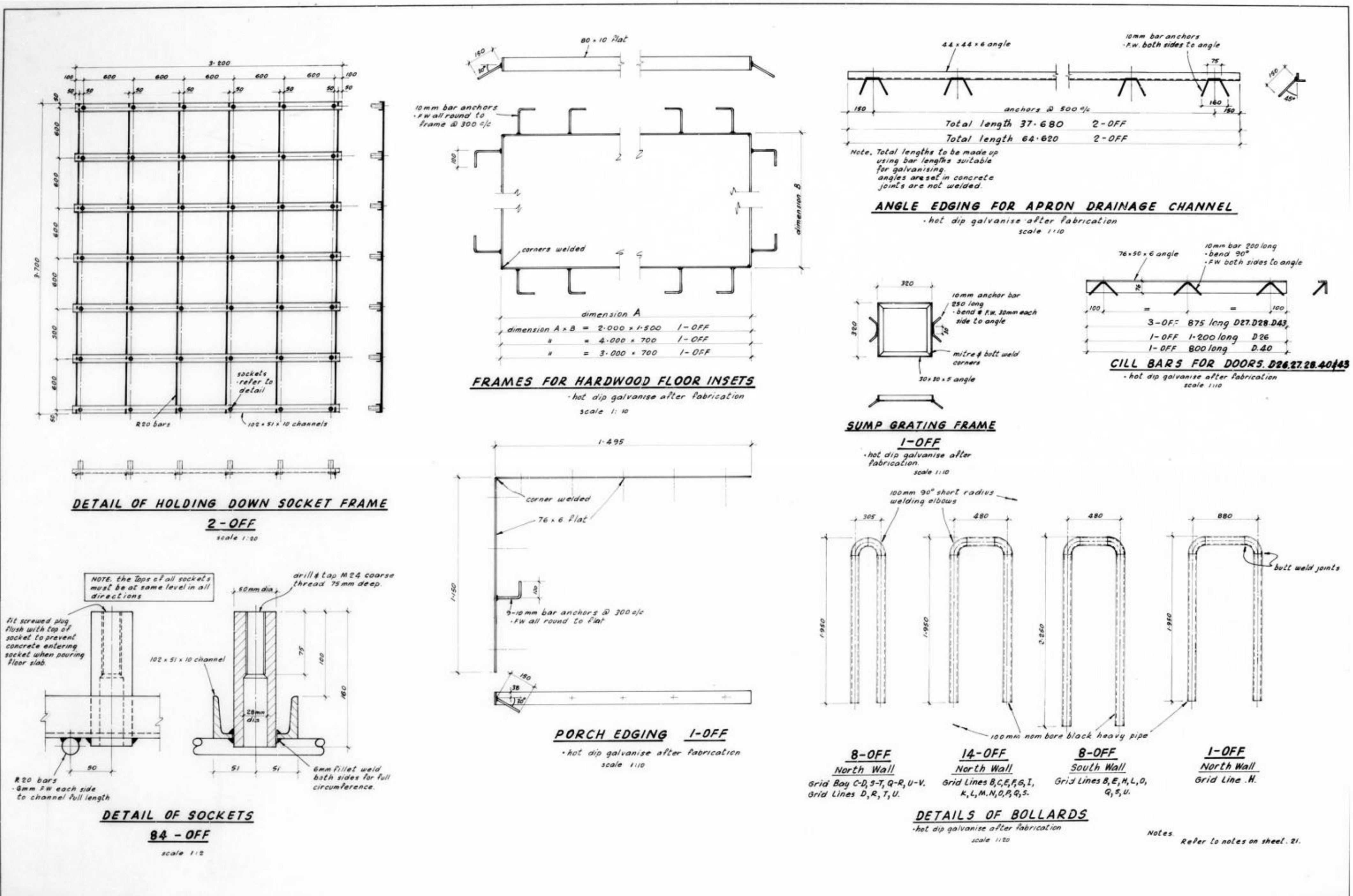
File No. 8U/9/10

D.2278

Sheet 8 of 49

Original scale of millimetres

centimetres



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT – PLANT MAINTENANCE – STAGE 2 – JOHNSON ST –
DETAILS OF STEELWORK CAST IN FLOORS & APRONS

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

		Date
Designed	P. Rosie	12/78
Drawn	A.E. Bainbridge	2/79
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Passed	A.E.B.	6/79

Approved: Design Engineer — Date 18.6.79

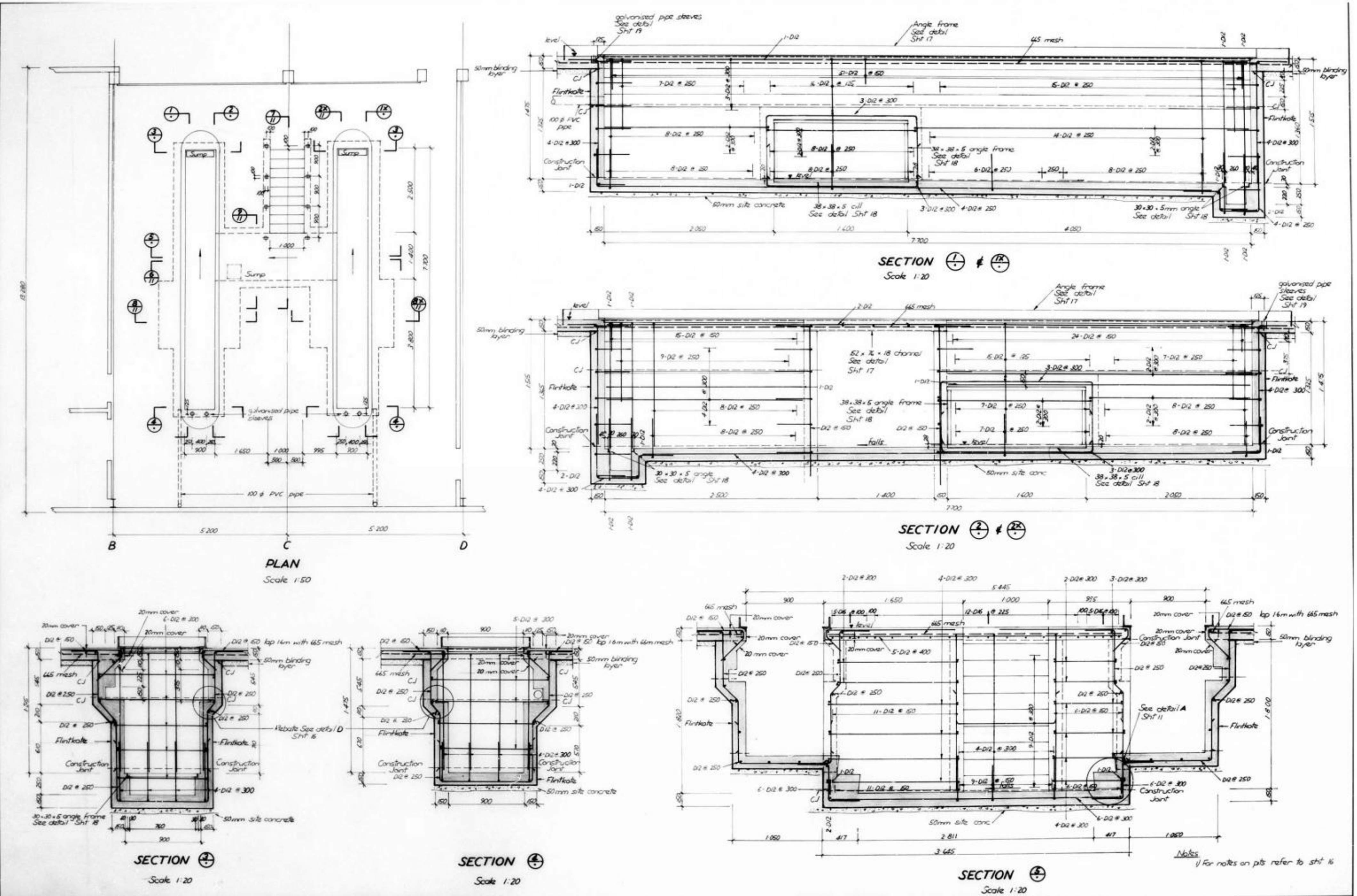
City Engineer

Scales: 1:2 1:10 1:20

File No. 8U/9/10

D.2278

Sheet 9 of 49



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

		Date
Designed	P Rosie	12/78
Drawn	AJF	2/79
Traced	-"-	-"-
Des. Chk.	P Rosie	5/79
Dwn. Chk.		
Indexed	A.E.B	6/79

Approved: Design Engineer 13.6.79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

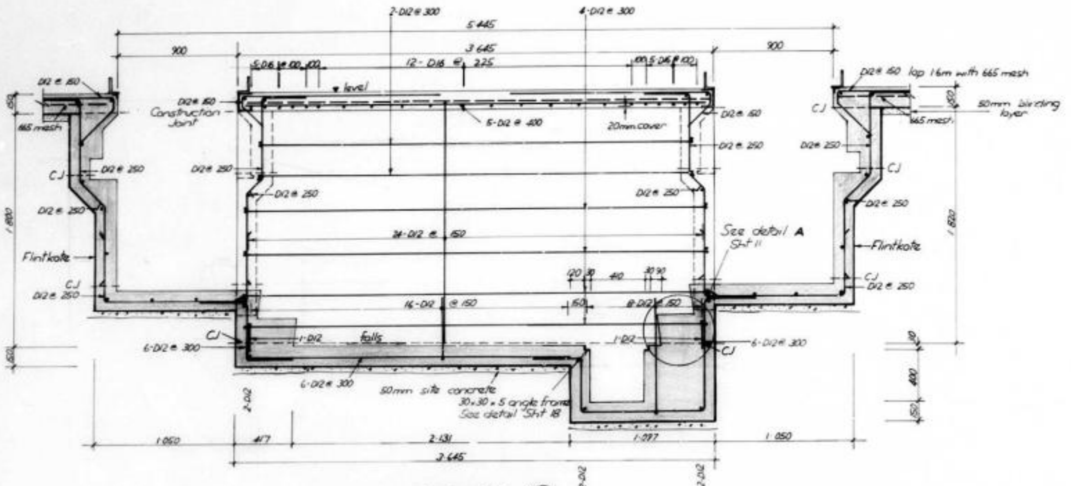
PITS - LUBRICATION BAY

Scale 1:20 1:50

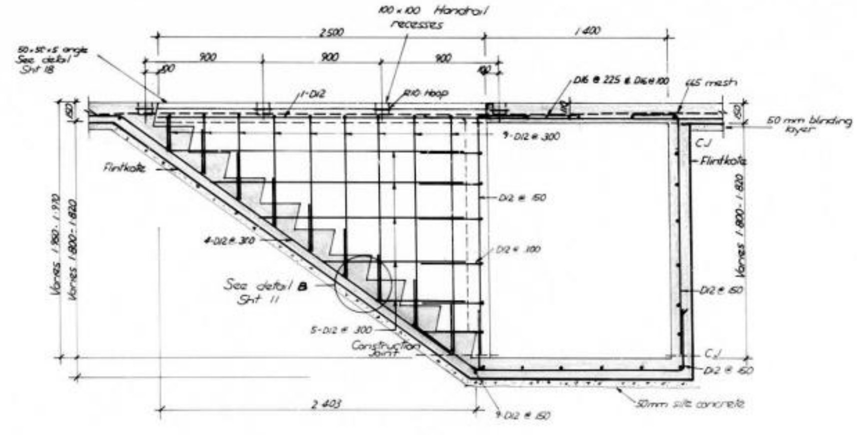
File No. BU/9/10

D2278

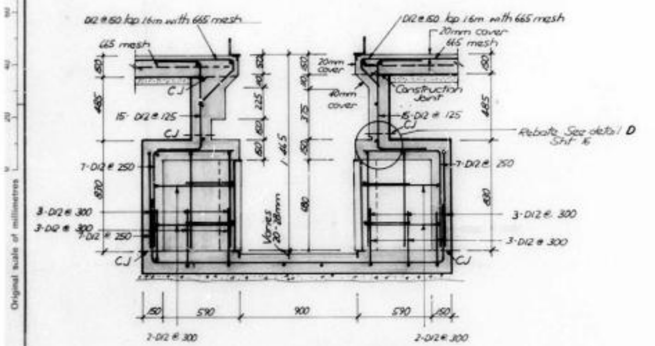
Sheet 10 of 49



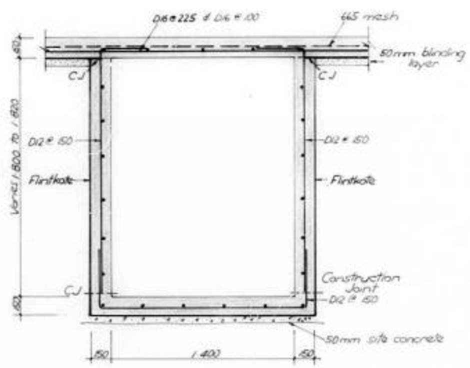
SECTION 6/10
Scale 1:20



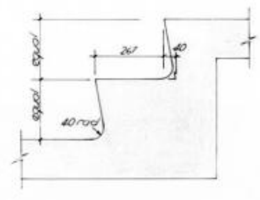
SECTION 7/10
Scale 1:20



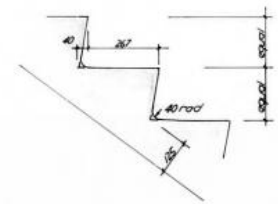
SECTION 8/10 & 8A/10
Scale 1:20



SECTION 9/10
Scale 1:20



DETAIL A
Scale 1:10



DETAIL B
Scale 1:10

Notes
1) For notes on pits refer to sht 16

Designed	P Rosie	12/78
Drawn	AJF	2/79
Traced	"	"
Desg. Chk.	P Rosie	5/79
Dwn. Chk.		
Indexed	A.E.B	6/79

Approved: Design Engineer 12.6.79; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

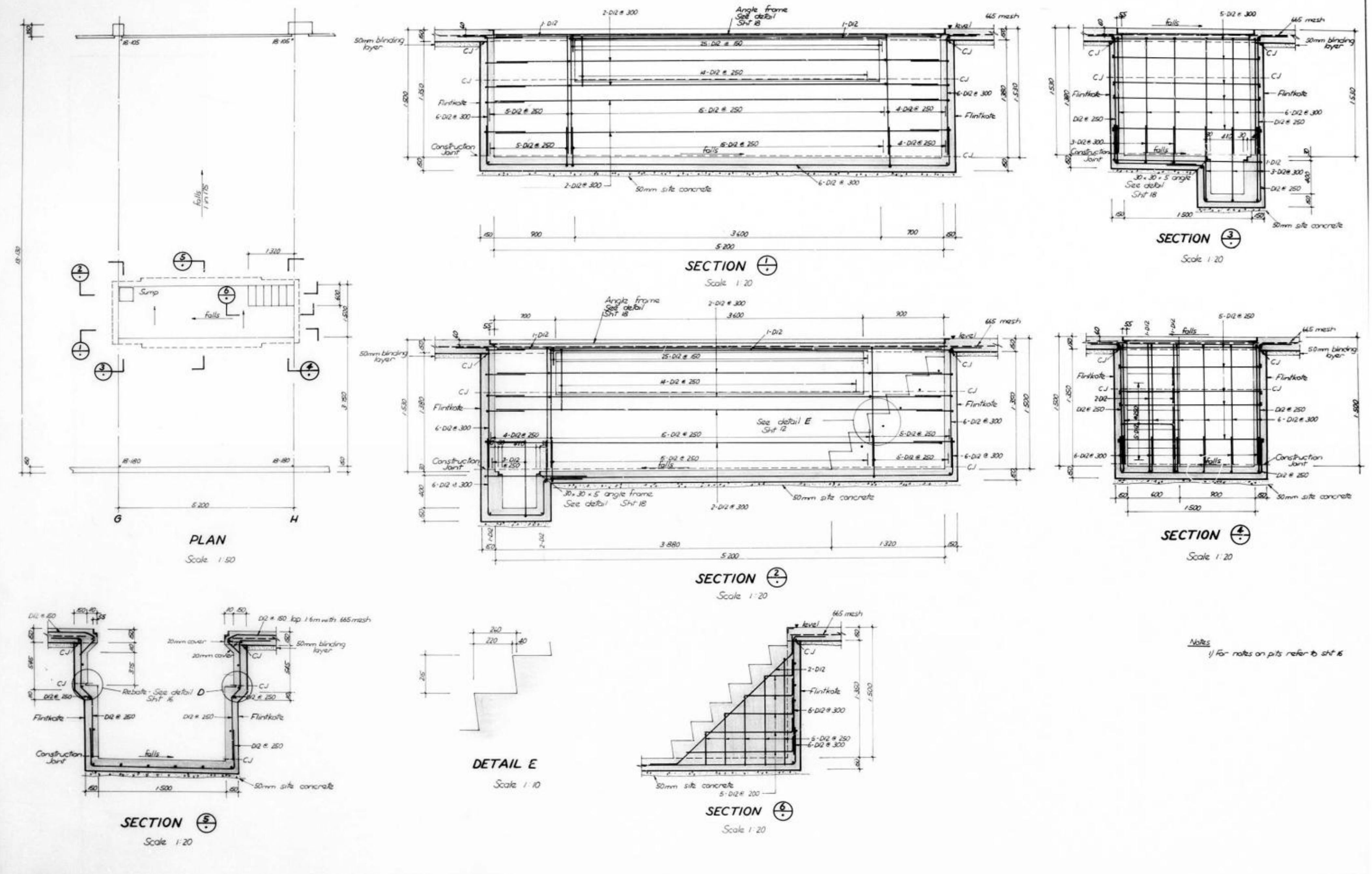
PITS - LUBRICATION BAY

Scales: 1:10, 1:20

File No. BU/9/10

D2278

Sheet 11 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

PIT - LIGHT MAINTENANCE WORKSHOP

Designed	P Rose	12/78	
Drawn	AJF	2/79	
Traced	"	"	
Des. Chk	P Rose	5/79	
Des. Chk			
Indexed	A.E.B	6/79	

Design Engineer

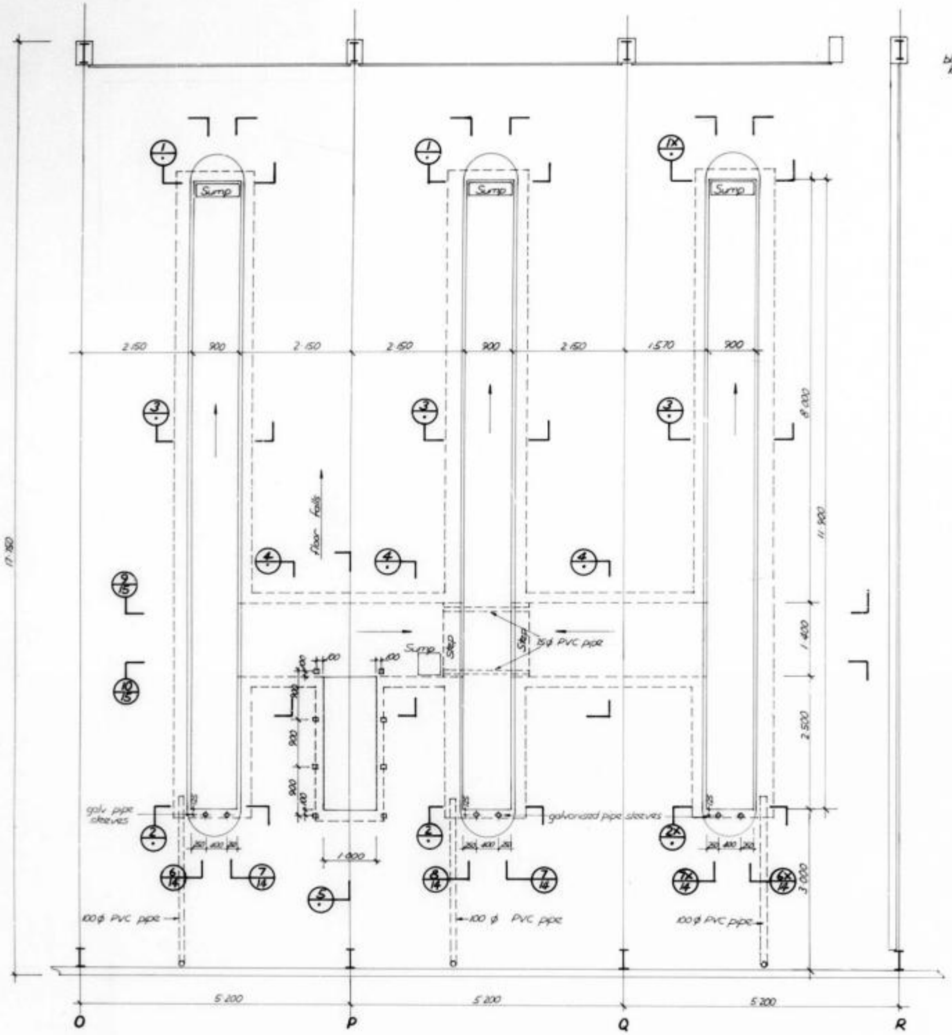
for City Engineer

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

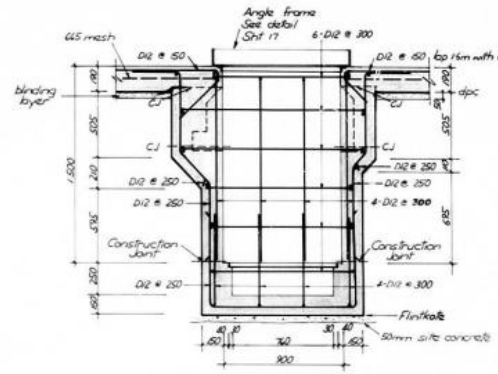
File No. 3U/9/10

D2278

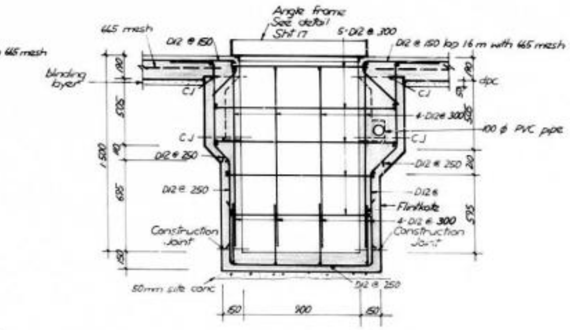
Sheet 12 of 49



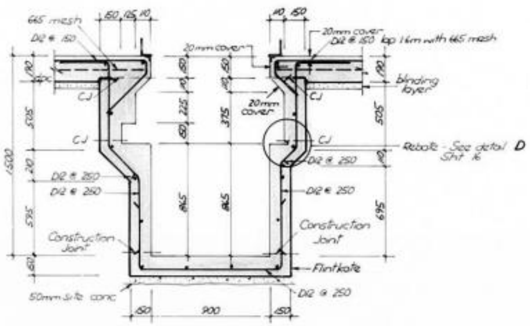
PLAN
Scale 1:50



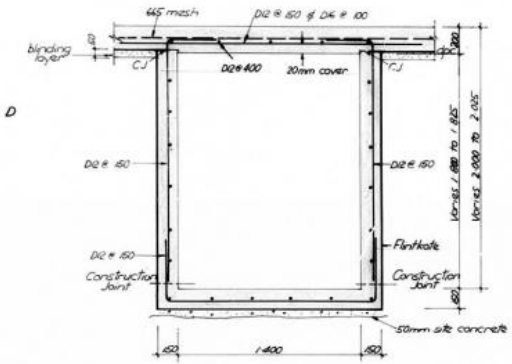
SECTION 1 & 1X
Scale 1:20



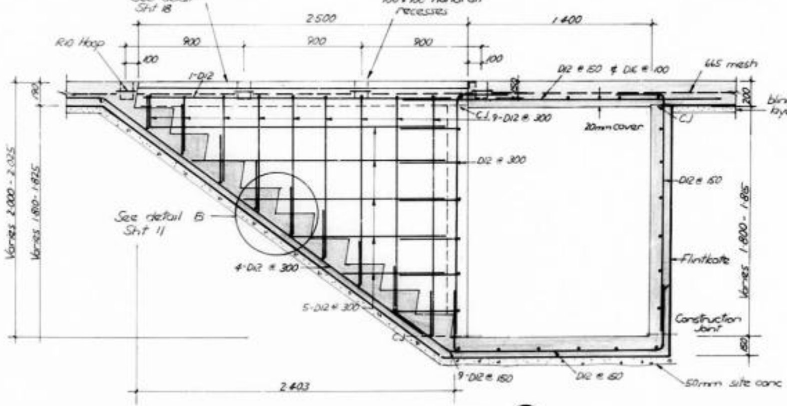
SECTION 2 & 2X
Scale 1:20



SECTION 3
Scale 1:20



SECTION 4
Scale 1:20



SECTION 5
Scale 1:20

Notes
1) For notes on pits refer to sht 16

Drawn	P Rosie	12/78
Drawn	AJF	2/79
Des. Chk.	P Rosie	6/79
Indexed	AEB	6/79

Design Engineer 13.6.79

City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

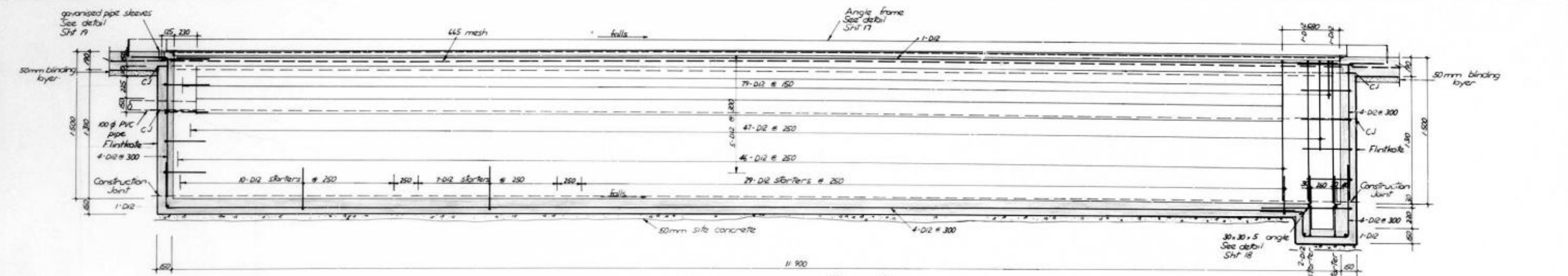
PITS - HEAVY MAINTENANCE WORKSHOP

Scales 1:20 1:50

File No. BU/9/10

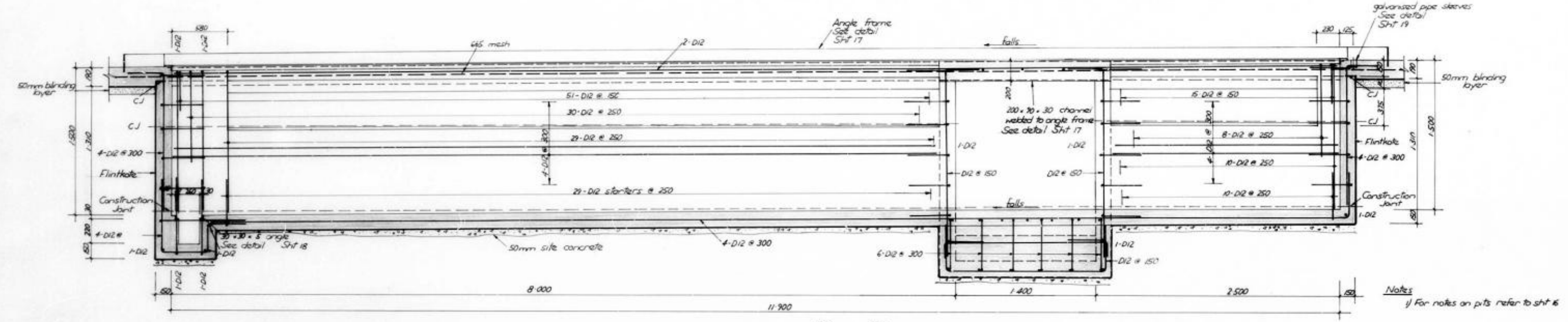
D2278

Sheet 8 of 49



SECTION 6/13 & 6A/13

Scale 1:20

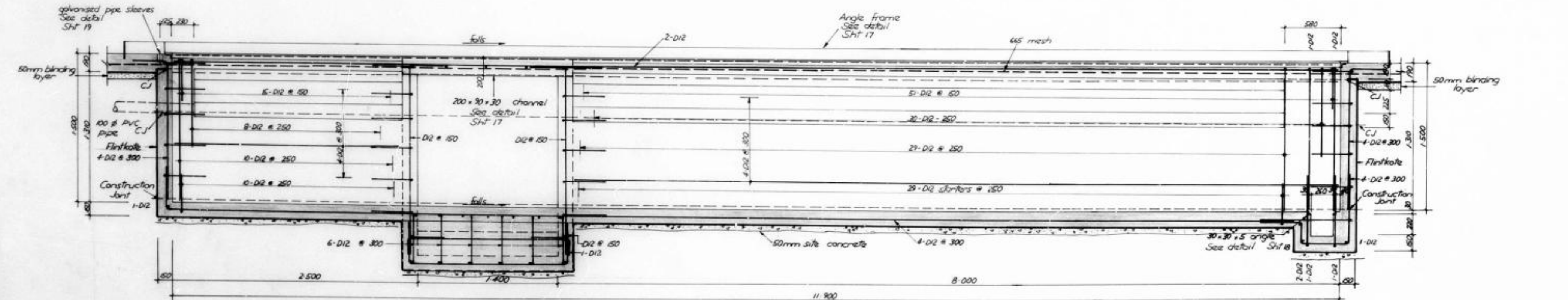


Notes

1) For notes on pits refer to sht 16

SECTION 7/13 & 7A/13

Scale 1:20



SECTION 8/13

Scale 1:20

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
PITS - HEAVY MAINTENANCE WORKSHOP

Designed	P Rosie	12/78
Drawn	AJF	2/79
Traced	"	2/79
Des. Chk.	P Rosie	5/79
Indexed	AEB	6/79

Approved: Design Engineer — Date 11.6.79; City Engineer

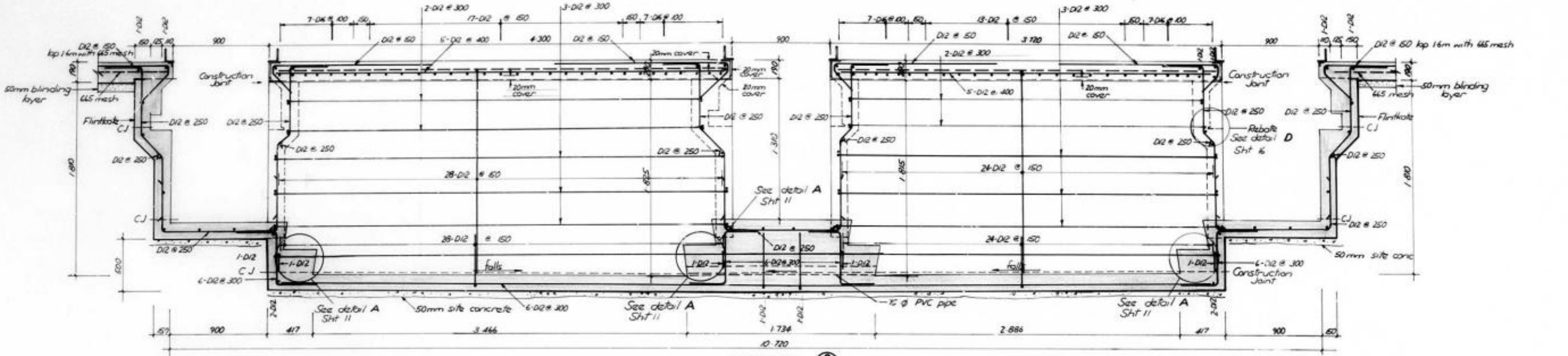
Scale: 1:20

File No. BU/9/10

D2278

Sheet 14 of 49

Original scale of millimetres



SECTION 9/13
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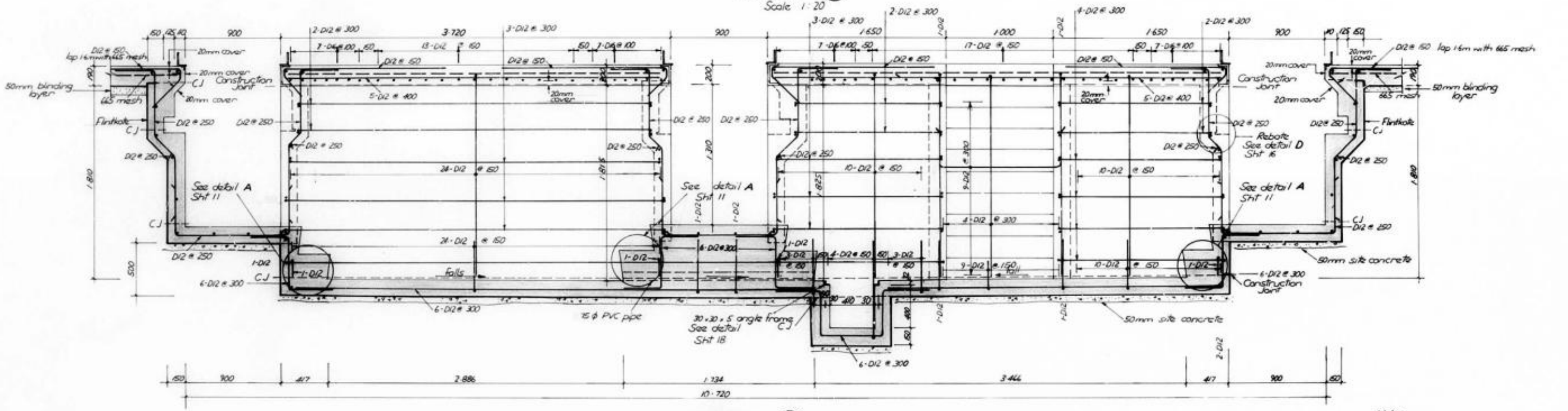


SECTION 10/13
Scale 1:20

Notes
1) For notes on pits refer to sht 16

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

PITS - HEAVY MAINTENANCE WORKSHOP

Designed	P. Rosie	12/78	
Drawn	AJF	2/79	
Traced	"	"	
Dwg. Chk.	P. Rosie	5/79	
Des. Chk.			
Indexed	A.E.B	6/79	

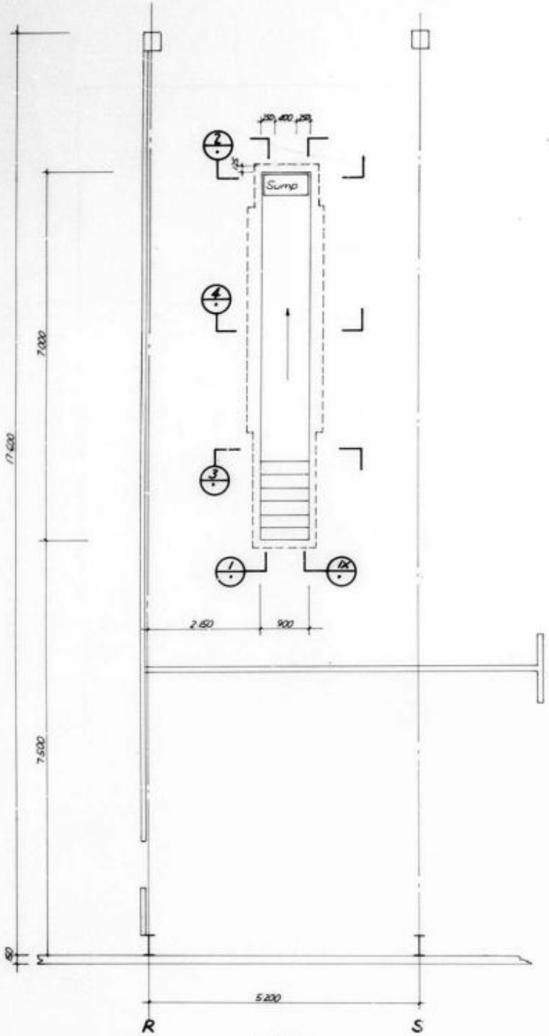
Approved: Design Engineer 12.6.79; for City Engineer

Scales: 1:20

File No. BU/9/10

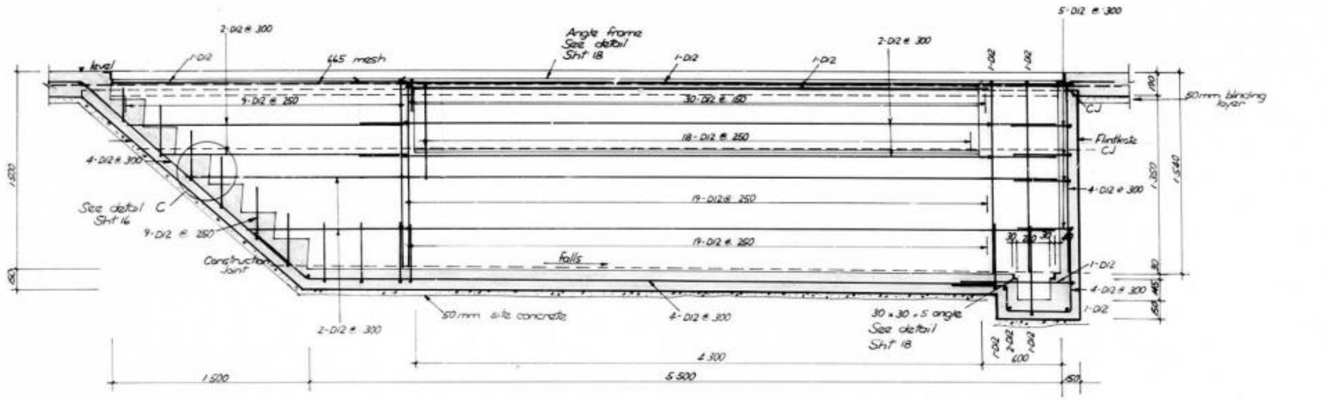
D2278

Sheet 6 of 49



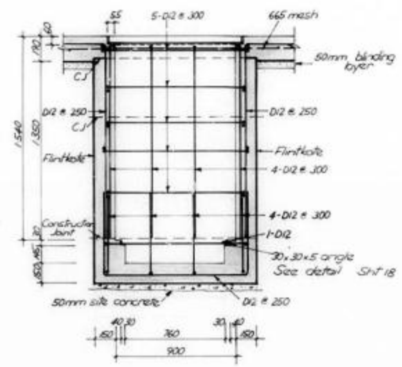
PLAN

Scale 1:50

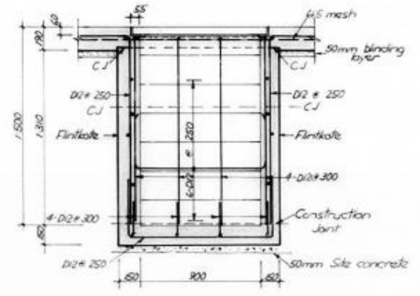


SECTION 1 1X

Scale 1:20

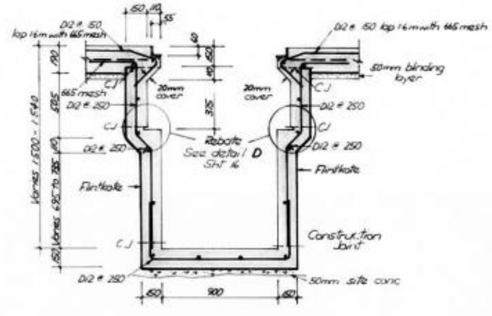


SECTION 2



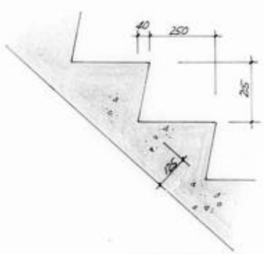
SECTION 3

Scale 1:20



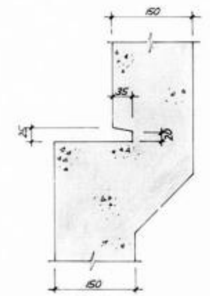
SECTION 4

Scale 1:20



DETAIL C

Scale 1:10



DETAIL D

Scale 1:10

NOTES FOR PITS

1) Concrete
Strength f'c = 25 MPa

2) Reinforcing
(a) All bars to be deformed Grade 275
(b) Reinforcing to be continuous throughout
(c) Cover - All reinforcing to be in centre of walls & floor slabs except where shown otherwise

Laps shall be
12mm = 400 mm
16mm = 550 mm

3) Refer to Architects & Mechanical Services drawings for all pipes, conduits, bolts etc to be cast into concrete

4) Site Concrete
A 50mm layer of site concrete shall extend 300mm beyond the base of all pits, underpasses and stairways

5) Tanking
All pits shall be fully tanked with Flintkote and fibreglass according to the Specification

Designed	P Rosie	12/78
Drawn	AJF	2/79
Traced	"	3/79
Dwg. Chk	P Rosie	5/79
Indexed	REB	6/79

Approved: Design Engineer 13.6.79; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

PITS - FITTING AND TURNING WORKSHOP

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

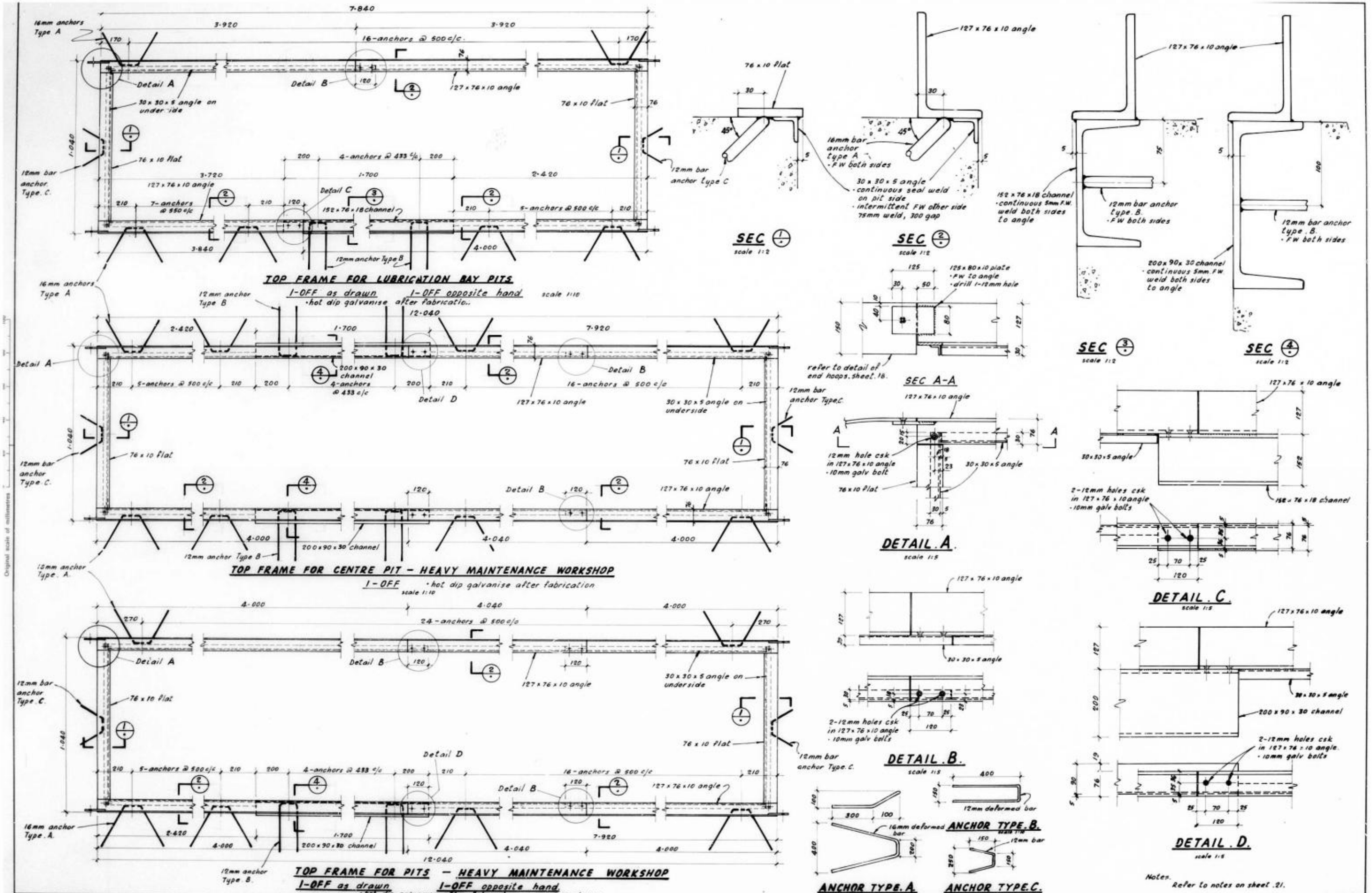
File No. 311/9/10

D2278

Sheet 16 of 49

Original scale of millimetres

centimetres



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

		Date
Designed	P. Rosie	3/79
Drawn	A.E. Bambridge	3/79
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B.	6/79

Approved: Design Engineer 13.6.79; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF TOP FRAMES FOR LUBE BAY & HEAVY MAINT^CE WKSP PITS

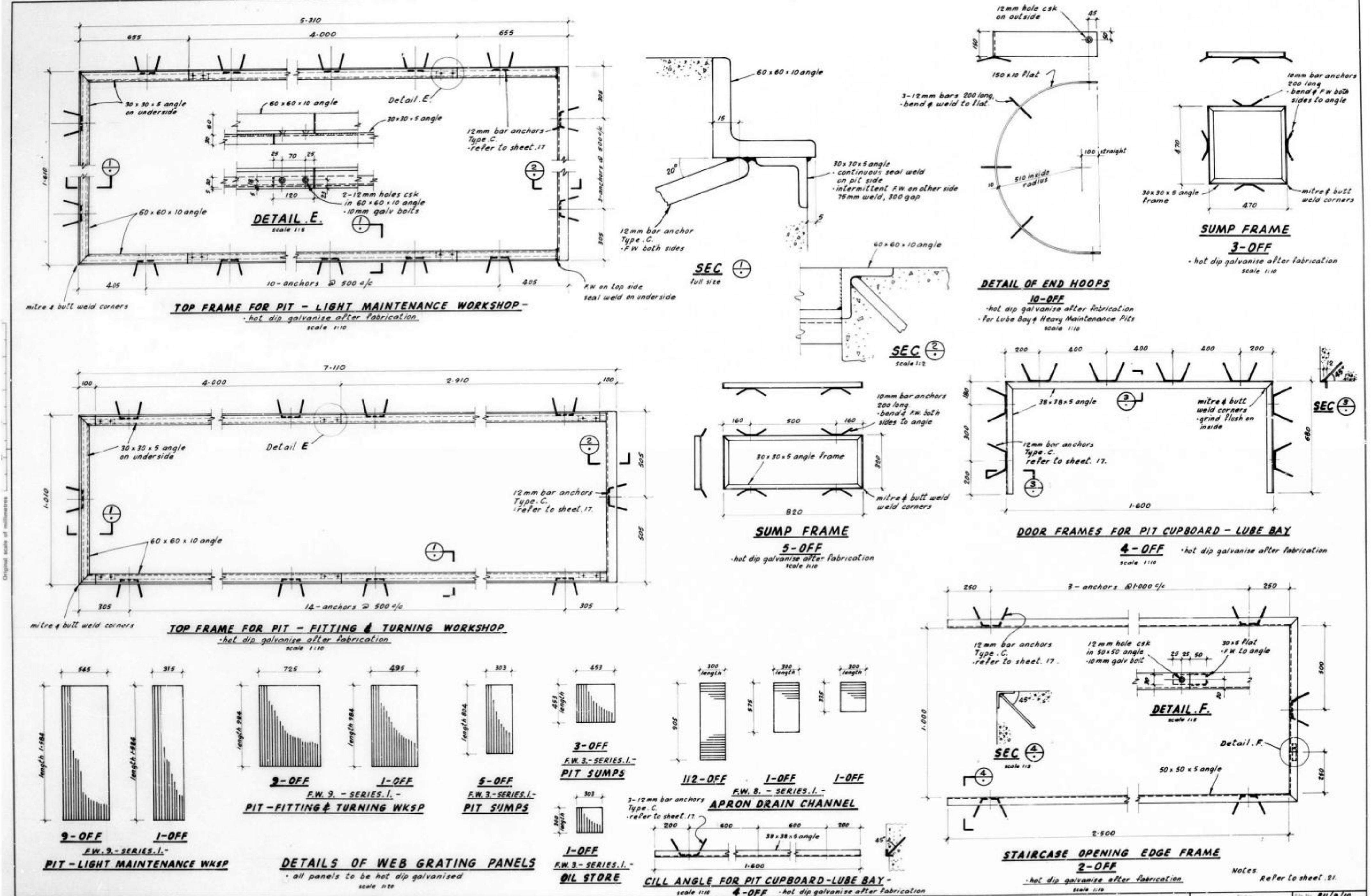
Scales: 1:2, 1:5, 1:10

File No. 8U/9/10

D.2278

Sheet 17 of 49

Original scale of millimetres



Notes. Refer to sheet. 21.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

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

		Date
Designed	P. Rosie	3/79
Drawn	A.C. Bainbridge	3/79
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.R.B.	6/79

Approved: Design Engineer 18.6.79; for City Engineer

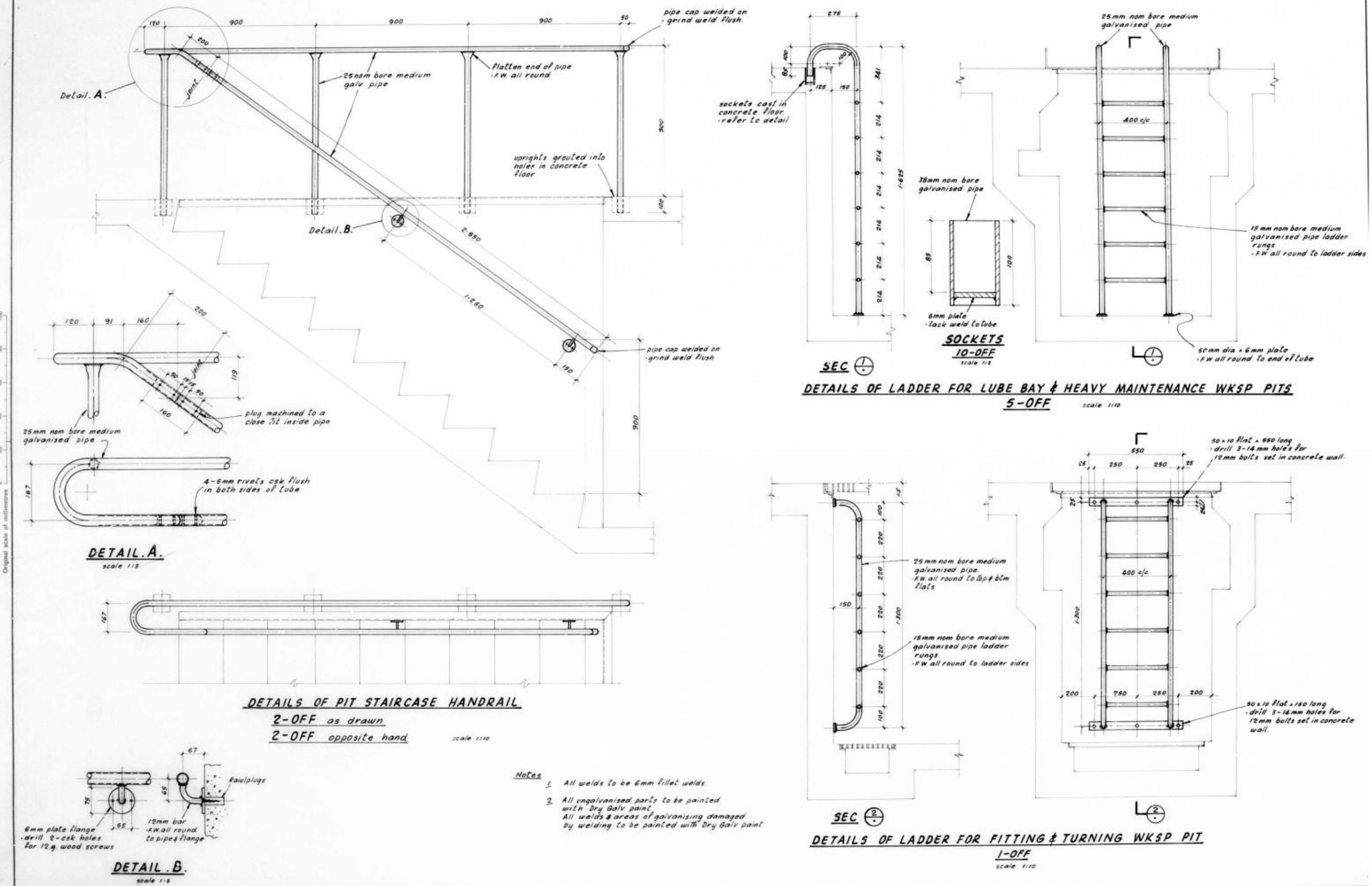
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PIT TOP FRAMES, WEB GRATING PANELS, END HOOPS ETC

Scales: 1:10, 1:20

File No. BU/9/10

D.2278

Sheet 18 of 49



Notes

1. All welds to be 6mm fillet welds.
2. All ungalvanised parts to be painted with Dry Galv paint. All welds & areas of galvanising damaged by welding to be painted with Dry Galv paint.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

Designed	A.E. Bambridge 3/79
Drawn	A.E. Bambridge 3/79
Dwg. Chk.	P. Rosie 5/79
Indexed	AEB 6/79

Design Engineer 11.6.79

for City Engineer

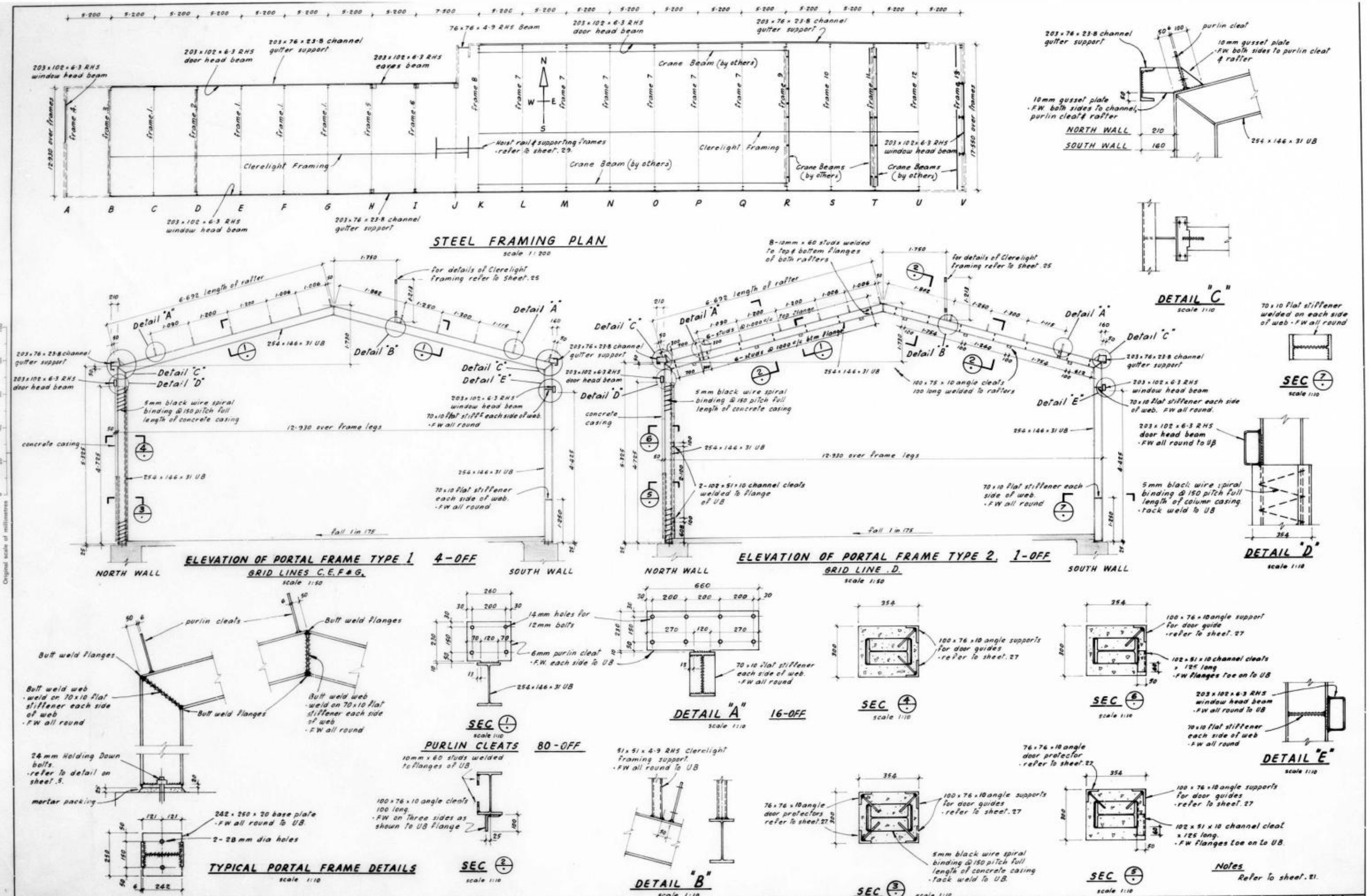
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF STAIRCASE HANDRAIL & LADDERS FOR PITS

Scales: 1:10, 1:5, 1:2

File No. 84/9/10

D.2278

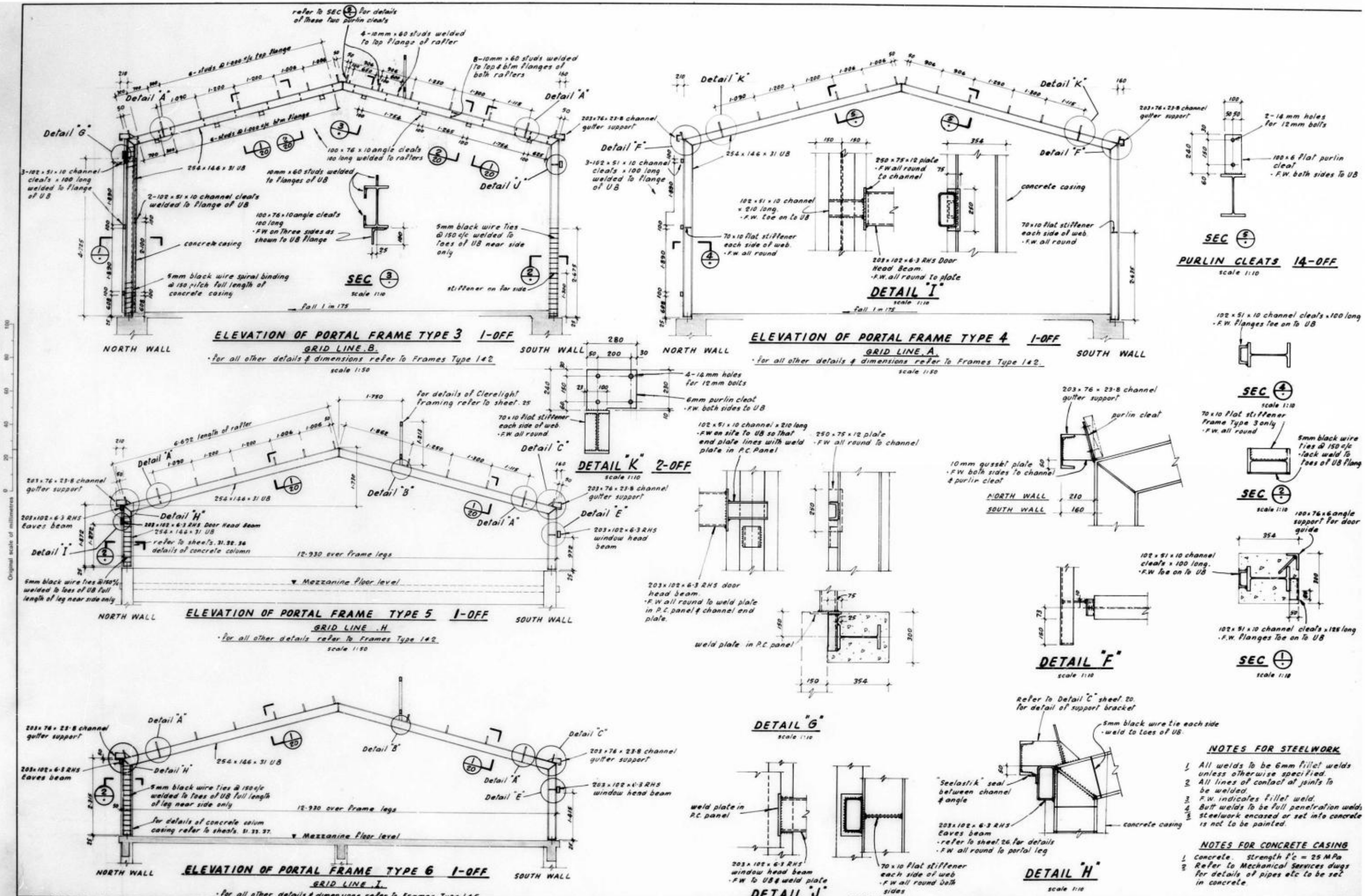
Sheet 19 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF PORTAL FRAMES 1 & 2 - STEEL FRAMING PLAN -

Designed	P Rosie 9/78
Drawn	A.E. Bainbridge 9/78
Des. Chk.	P Rosie 5/79
Indexed	A.C.B. 6/79
Design Engineer	12.6.79
Scale	1:10, 1:50
File No.	8U/9/10
Drawing No.	D.2278
Sheet	20 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL FRAMES 3, 4, 5 & 6

Designed	P. Rosie 9/78
Drawn	A.C. Bambridge 9/78
Dwg. Chk.	P. Rosie 5/79
Indexed	A.E.B 6/79

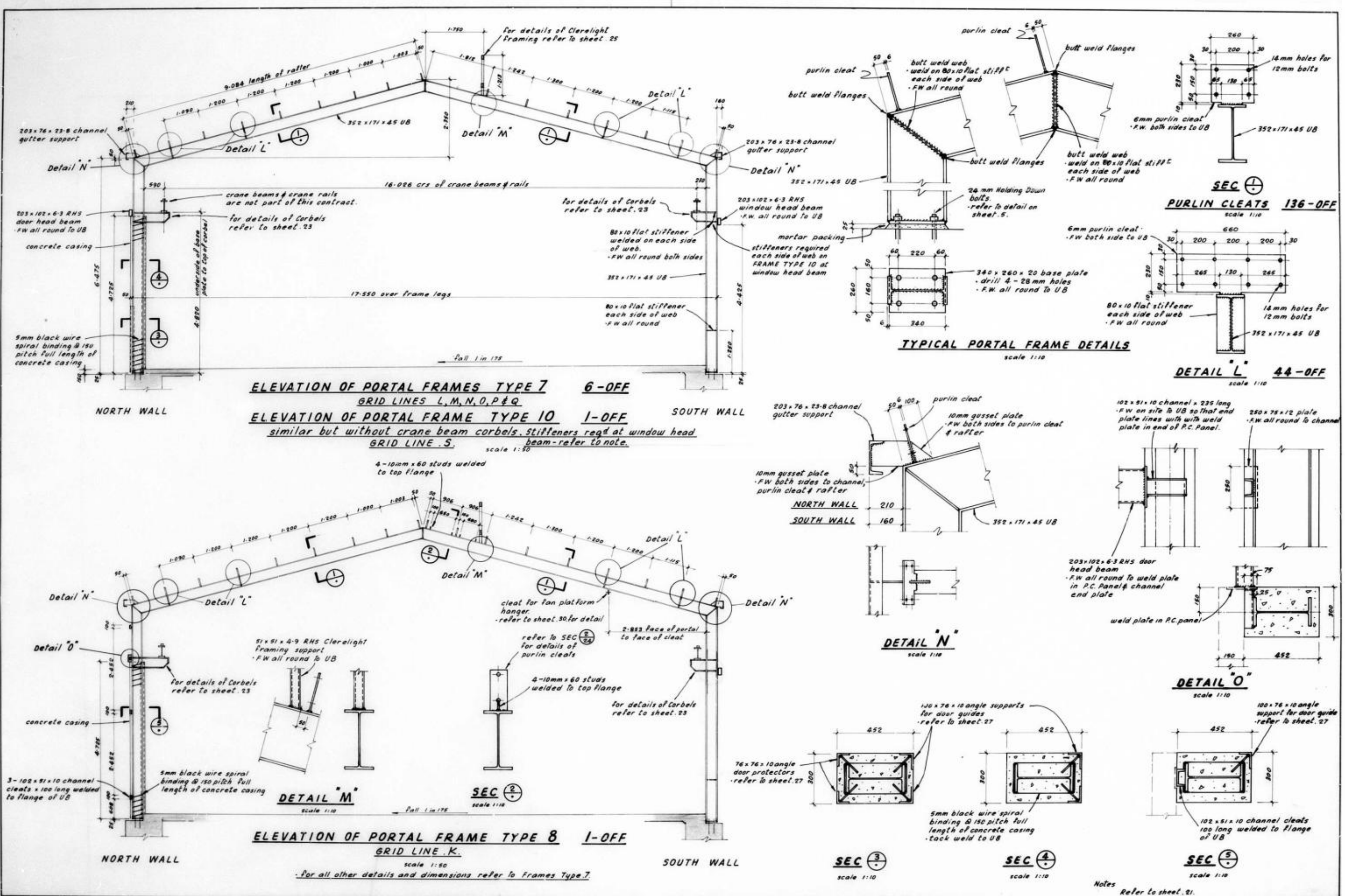
Design Engineer
City Engineer

Scales 1:10, 1:50

File No. 8U/9/10

D.2278

Sheet 21 of 49



Designed	P. Rosie	10/78
Drawn	A.E. Rainbridge	10/78
Traced		
Des. Chk.	P. Rosie	5/79
Drg. Chk.		
Indexed	A.E.B.	6/79

Design Engineer 13.6.79

City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

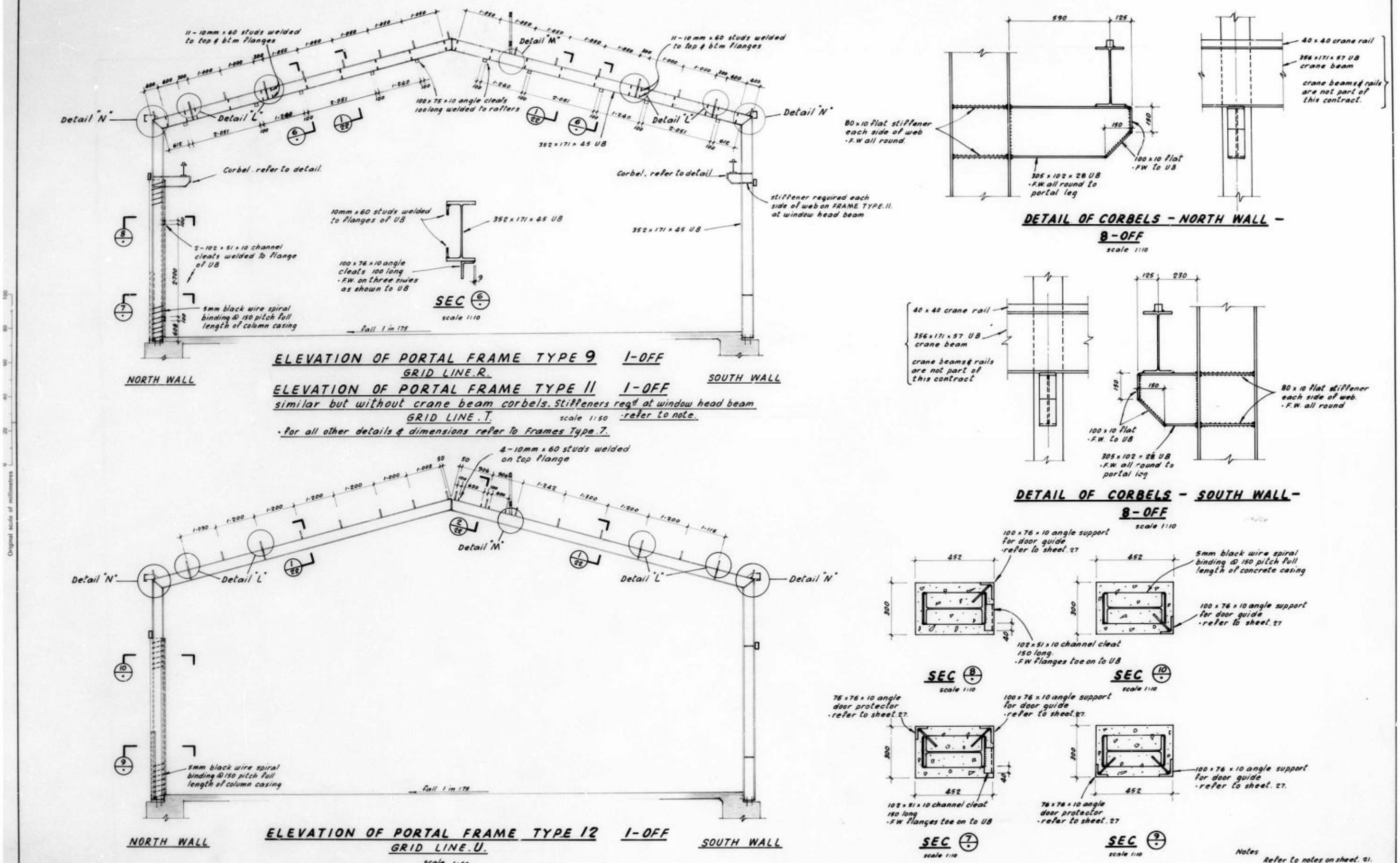
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF PORTAL FRAMES TYPES 7, 8 & 10

Scales 1:10 1:50

File No. 84/9/10

D2278

Sheet 22 of 47



DETAIL OF CORBELS - NORTH WALL - 8-OFF

scale 1:10

DETAIL OF CORBELS - SOUTH WALL - 8-OFF

scale 1:10

ELEVATION OF PORTAL FRAME TYPE 9 1-OFF

GRID LINE.R.

ELEVATION OF PORTAL FRAME TYPE 11 1-OFF

similar but without crane beam corbels. Stiffeners reqd at window head beam -refer to note.

GRID LINE.T. scale 1:50

·For all other details & dimensions refer to Frames Type.7.

ELEVATION OF PORTAL FRAME TYPE 12 1-OFF

GRID LINE.U.

scale 1:50

·For all other details & dimensions refer to Frames Type.7.

Notes
Refer to notes on sheet. 21.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL FRAMES TYPES 9, 11 & 12

Designed	P. Rosie	10/78	
Drawn	A.E. Bainbridge	10/78	
Traced			
Dwg. Chk.	P. Rosie	5/79	
Des. Chk.			
Indexed	AEB	6/79	

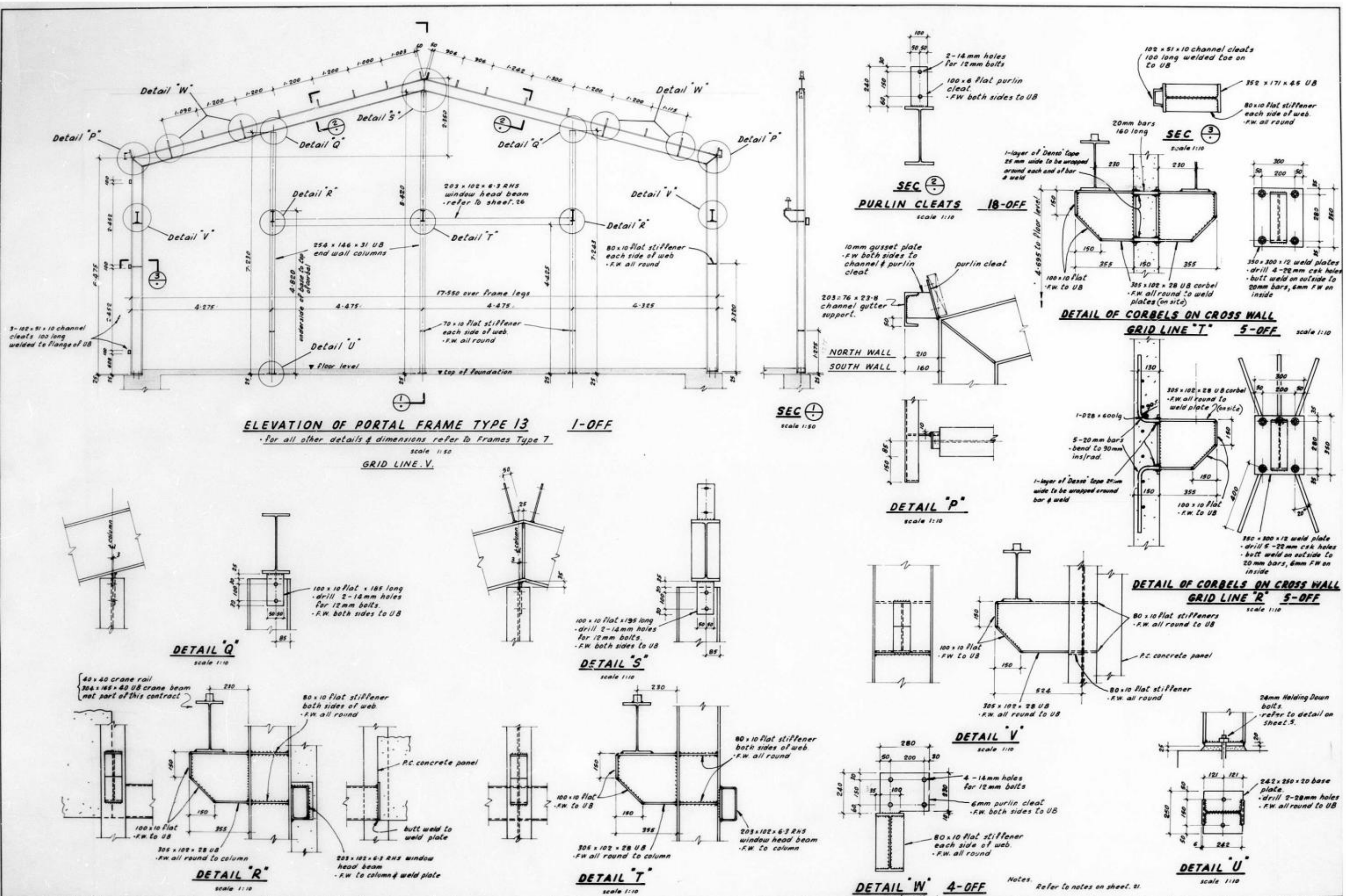
Design Engineer 13.6.79
for City Engineer

Scales 1:10, 1:50

File No. 8H/9/10

D.2278

Sheet 23 of 49



Notes. Refer to notes on sheet. 21.

Service	Initials	Service	Initials		Amendments	Initials	Date
H.P. Water		Lands & Survey		A	Denso tape added to corbel weld plate anchor bars	A.E.B.	1/80
Sewer		Planning					
S.W. Drainage							
Gas							
Cables (M.E.D.)							
(P.O.)							

		Date
Designed	P. Rosie	11/78
Drawn	A.C. Bainbridge	11/78
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B.	6/79

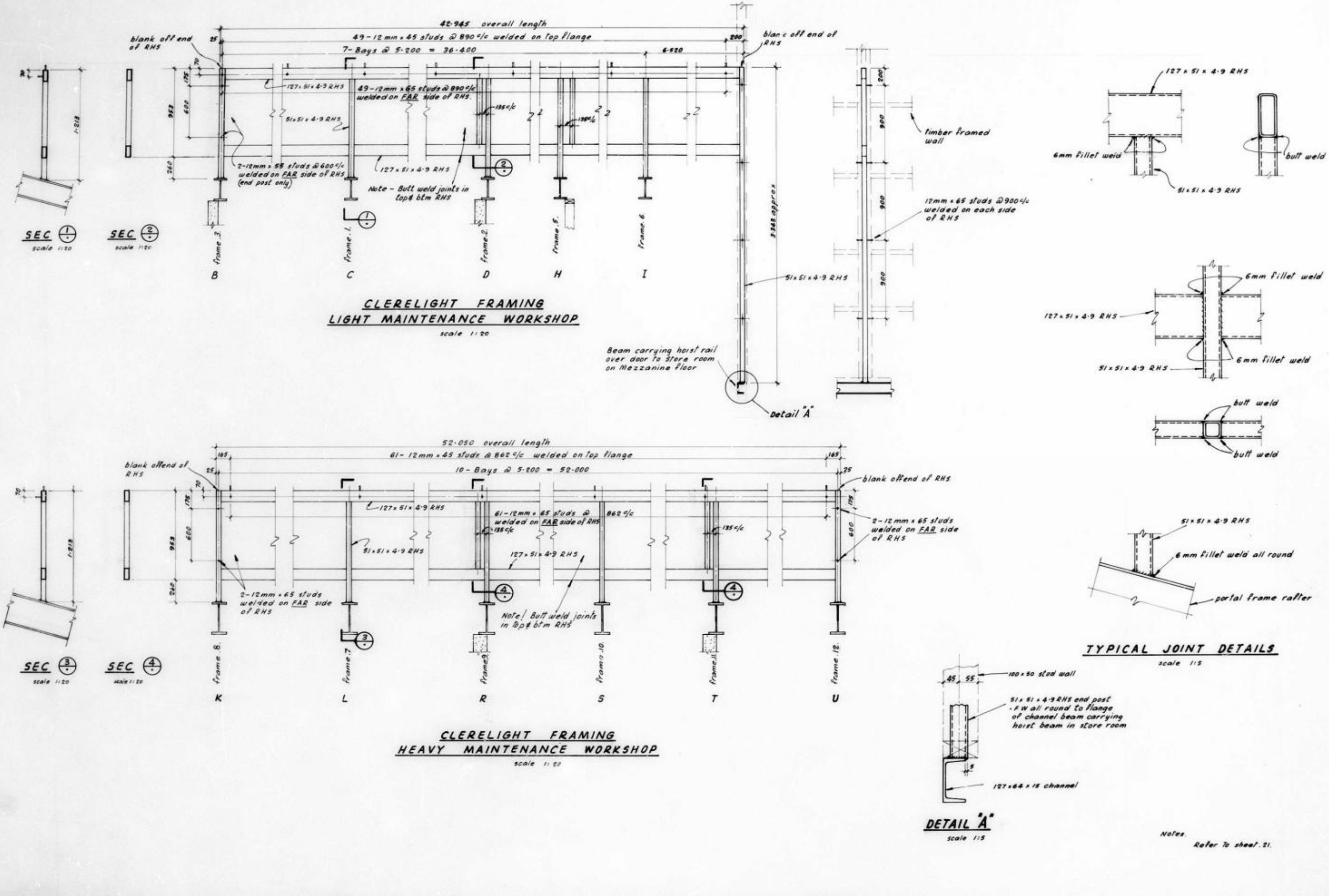
Approved: Design Engineer 13.6.79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF PORTAL FRAME 13 - CORBELS ON GRID LINES "R" & "T"

Scale: 1:10, 1:50

File No. 8U/9/10
Issue A
D.2278
Sheet 24 of 45



Notes.

Refer to sheet. 21.

Service	Initials	Service	Initials	Amendments	Initials	Date		Book	Page	Initials	Date			Date	Approved
H.P. Water		Lands & Survey					Surveyed					Designed	P. Rosie	9/78	Design Engineer 13.6.79
Sewer		Planning					Levelled					Drawn	A.E. Bambridge	9/78	
S.W. Drainage							E.fe.					Traced			
Gas							Compiled from					Dwg. Chk.	P. Rosie	9/79	City Engineer
Cables (M.E.D.)												Dsn. Chk.			
(P.O.)												Indexed	AEB	6/79	

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF CLERELIGHT FRAMING

Scales 1:5, 1:20

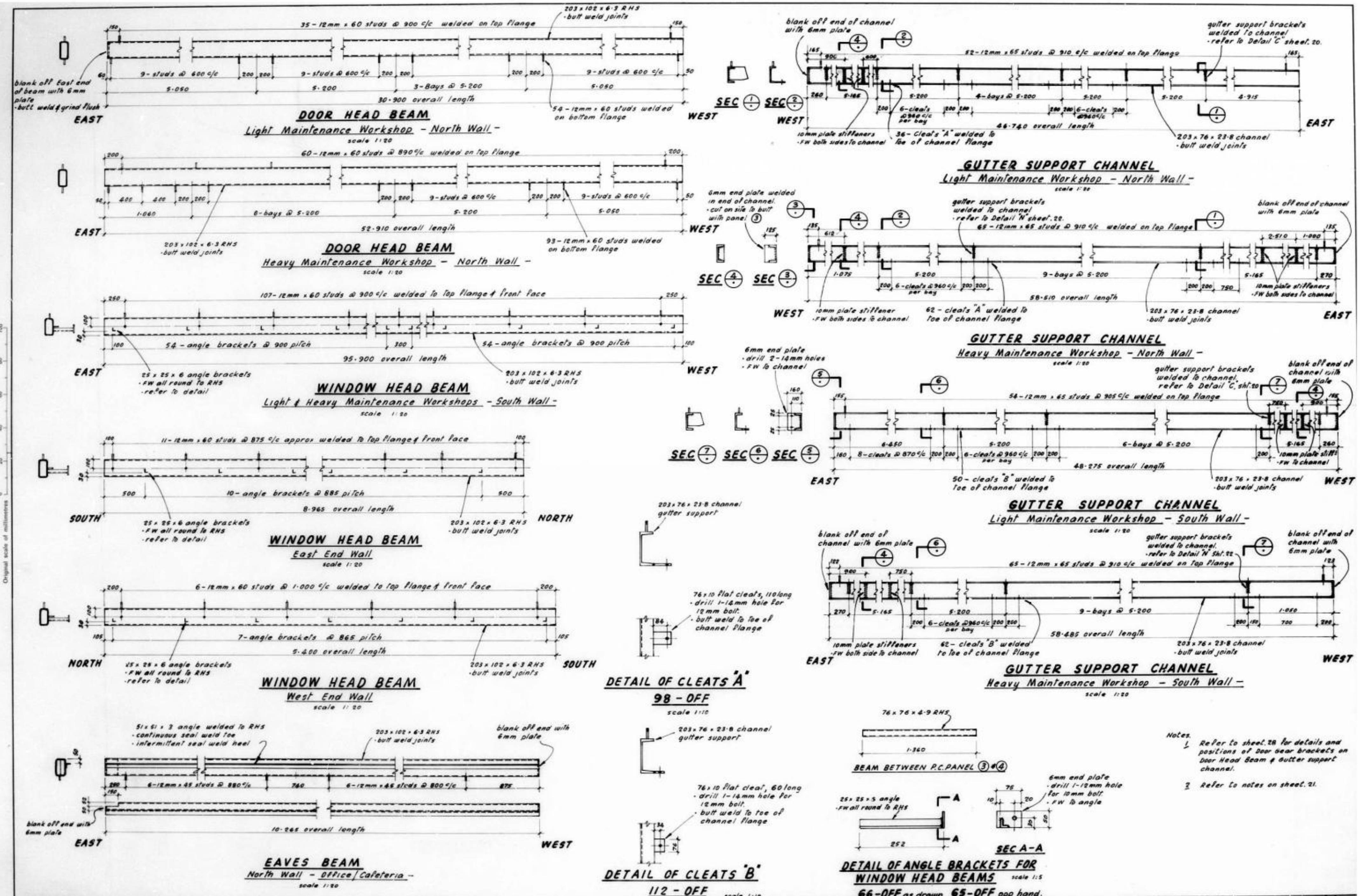
File No. 8U/9/10

D. 2278

Sheet 25 of 49

centimetres

Original scale of millimetres



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF DOOR & WINDOW HEAD BEAMS, GUTTER SUPPORTS ETC.

Designed	P. Rosie	9/78
Drawn	A.E. Bainbridge	10/78
Dwg. Chk.	P. Rosie	5/79
Indexed	A.L.B.	6/79

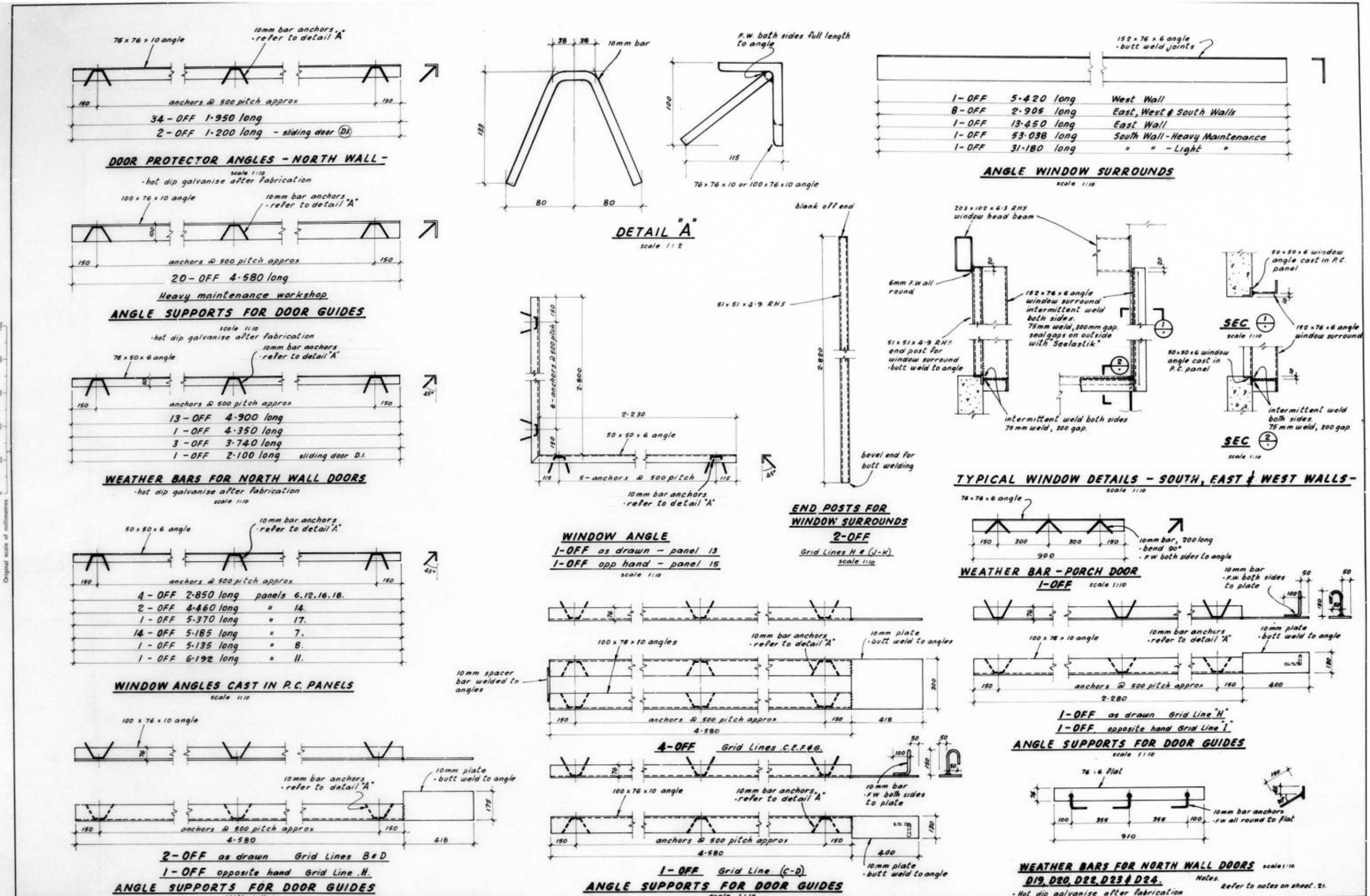
Approved: Design Engineer 13·6·79; for City Engineer

Scales: 1:10, 1:20, 1:5

File No. BU/9/10

D.2278

Sheet 26 of 40



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF DOOR & WINDOW ANGLES

Designed	P. Rosie	11/78
Drawn	A.C. Bambridge	11/78
Dwg. Chk	P. Rosie	
Released	AEB	6/79

Design Engineer

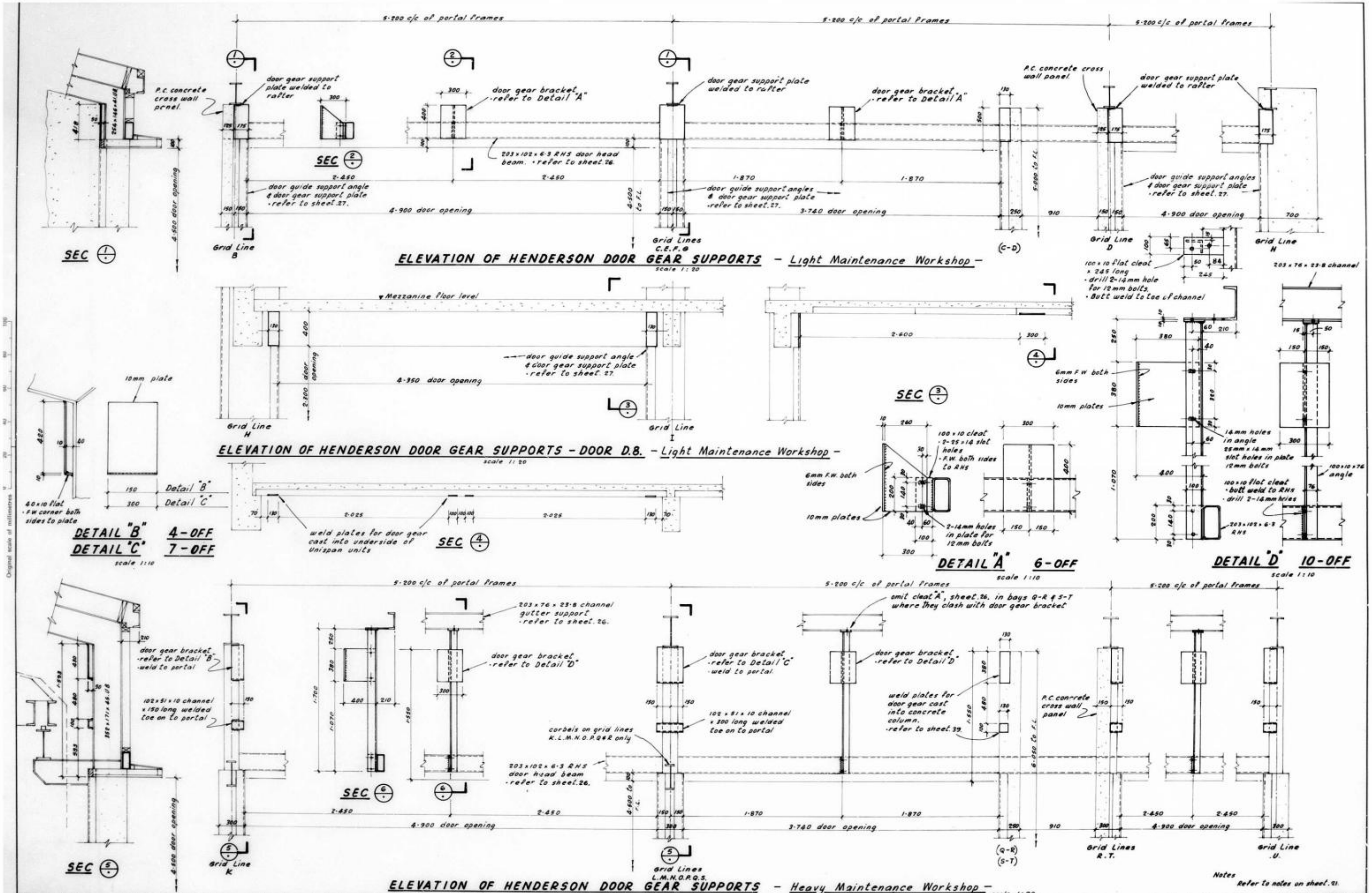
City Engineer

Scales: 1:2, 1:10

File No. 84/9/10

D.2278

Sheet 27 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF SUPPORT BRACKETS FOR HENDERSON PANORAMIC DOOR GEAR

Designed	P. Rosie	11/78
Drawn	A.E. Bambridge	11/78
Traced		
Dsg. Chk.	P. Rosie	5/79
Dm. Chk.		
Indexed	A.E.B.	6/79

Approved 13.6.79

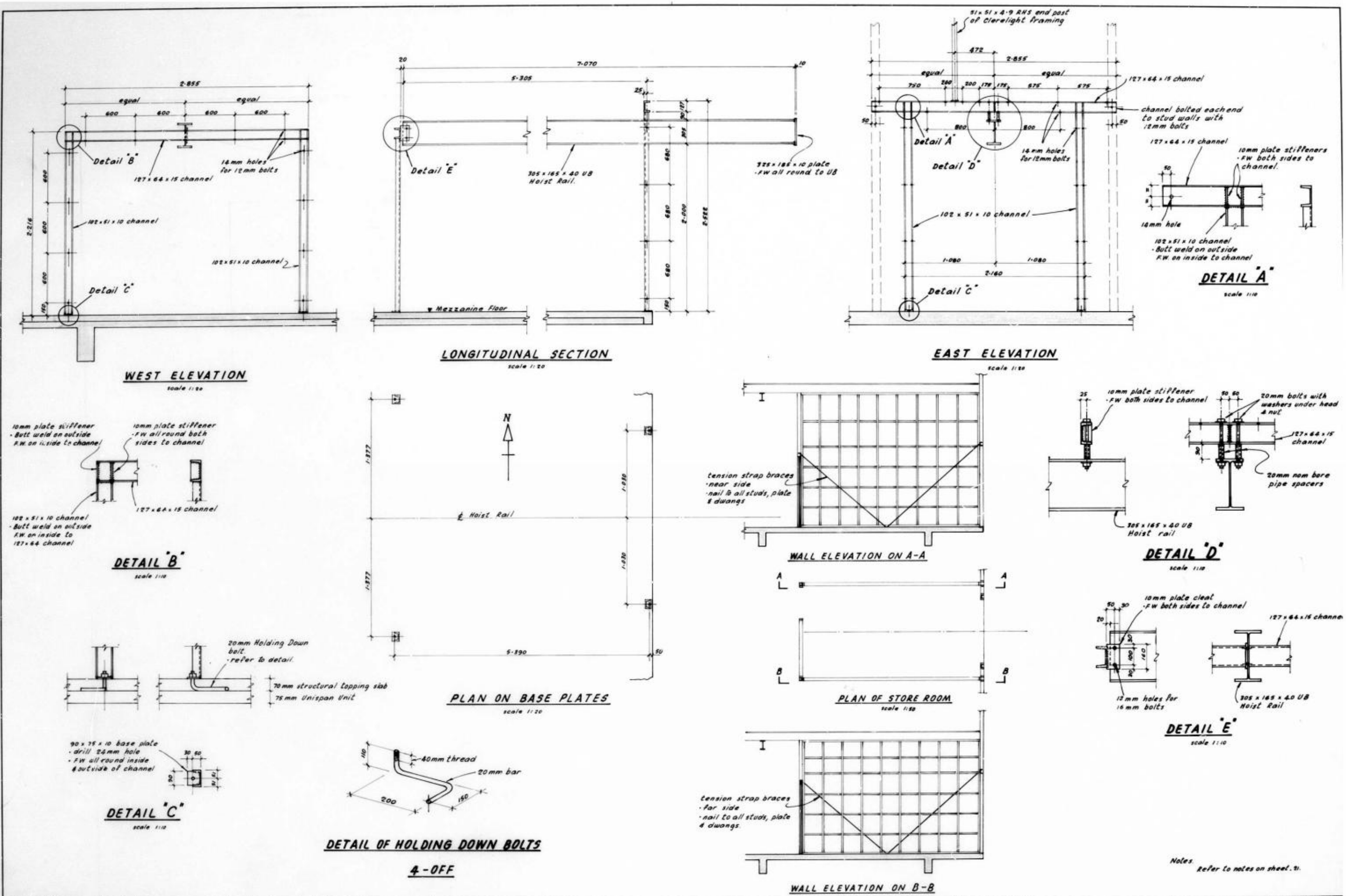
City Engineer

Scales 1:10 1:20

File No. BU/9/10

D.2278

Sheet 28 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST-
DETAILS OF HOIST RAIL IN STORE ROOM - MEZZANINE FLOOR -

Amendments	Initials	Date
A Details D&E Dimensions	PRM	10/79

		Date
Designed	P. Rosie	10/78
Drawn	A.E. Bainbridge	11/78
Dwg. Chk.	P. Rosie	5/79
Indexed	AEB	6/79

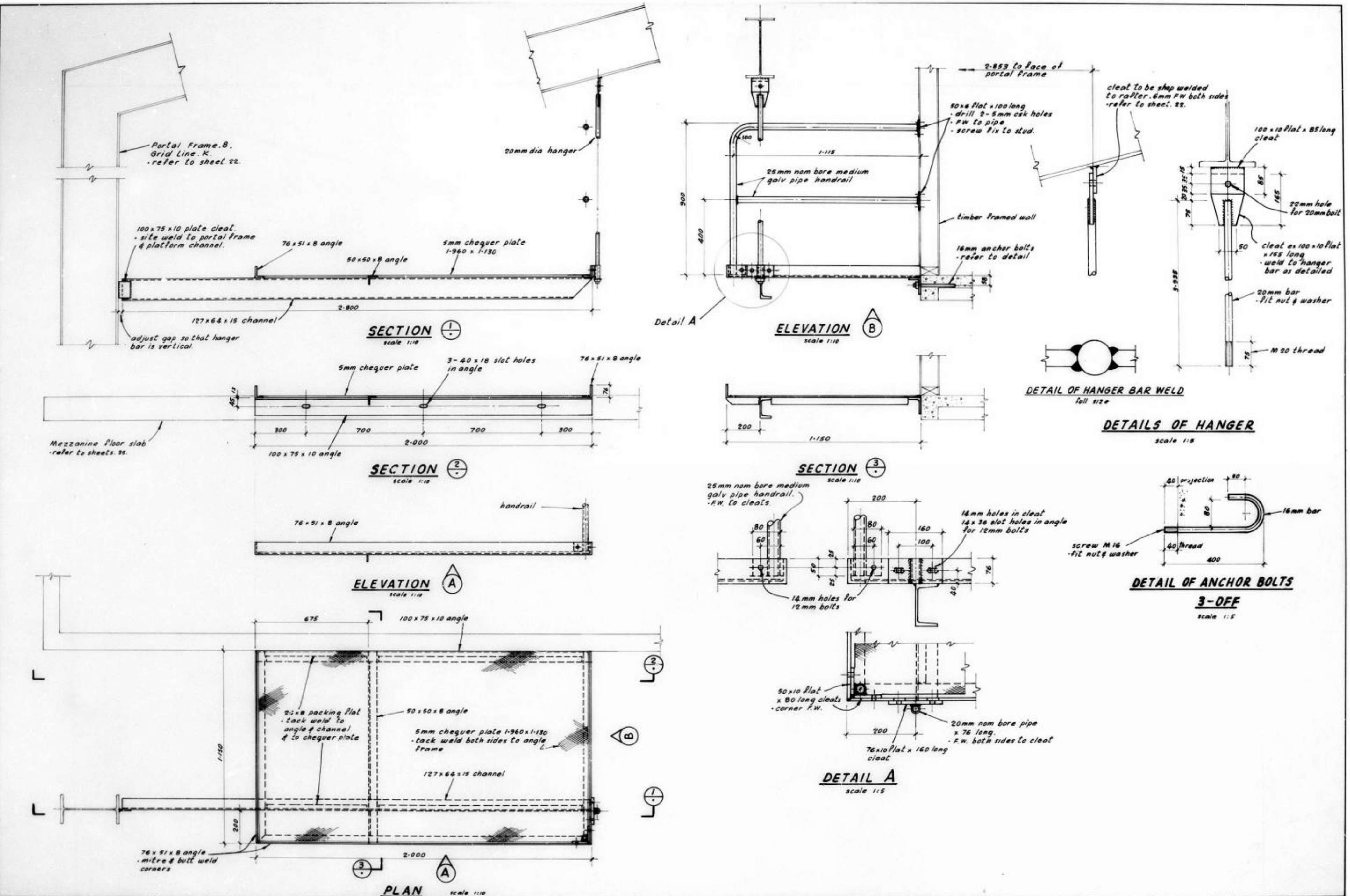
Approved: Design Engineer; City Engineer

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

File No. BU/9/10
Issue A

D.2278

Sheet 29 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - DETAILS OF PLATFORM FOR EXHAUST EXTRACTION FAN

Designed	P. Rosie	3/79
Drawn	A.E. Bainbridge	3/79
Traced		
Des. Chk.	P. Rosie	5/79
Drs. Chk.		
Indexed	AEB	6/79

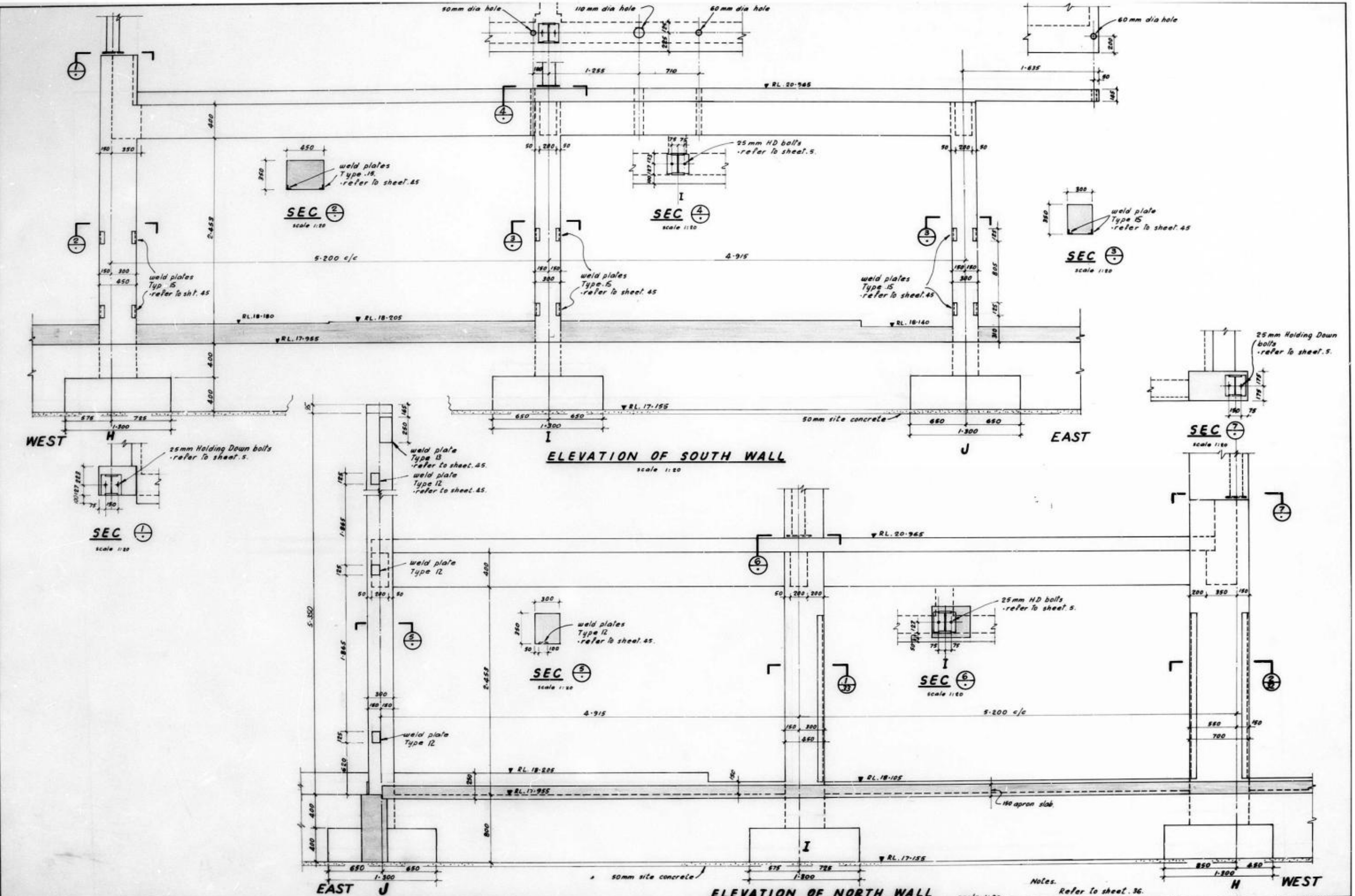
Approved: Design Engineer 13.6.79; for City Engineer

Scales: 1:5, 1:10

File No. 88/9/10

D.2278

Sheet 30 of 49



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

	Date
Designed P. Rosie	9/78
Drawn A.E. Bambridge	9/78
Traced	
Dwg. Chk. P. Rosie	5/79
Des. Chk.	
Indexed AEB	6/79

Approved: Design Engineer — City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

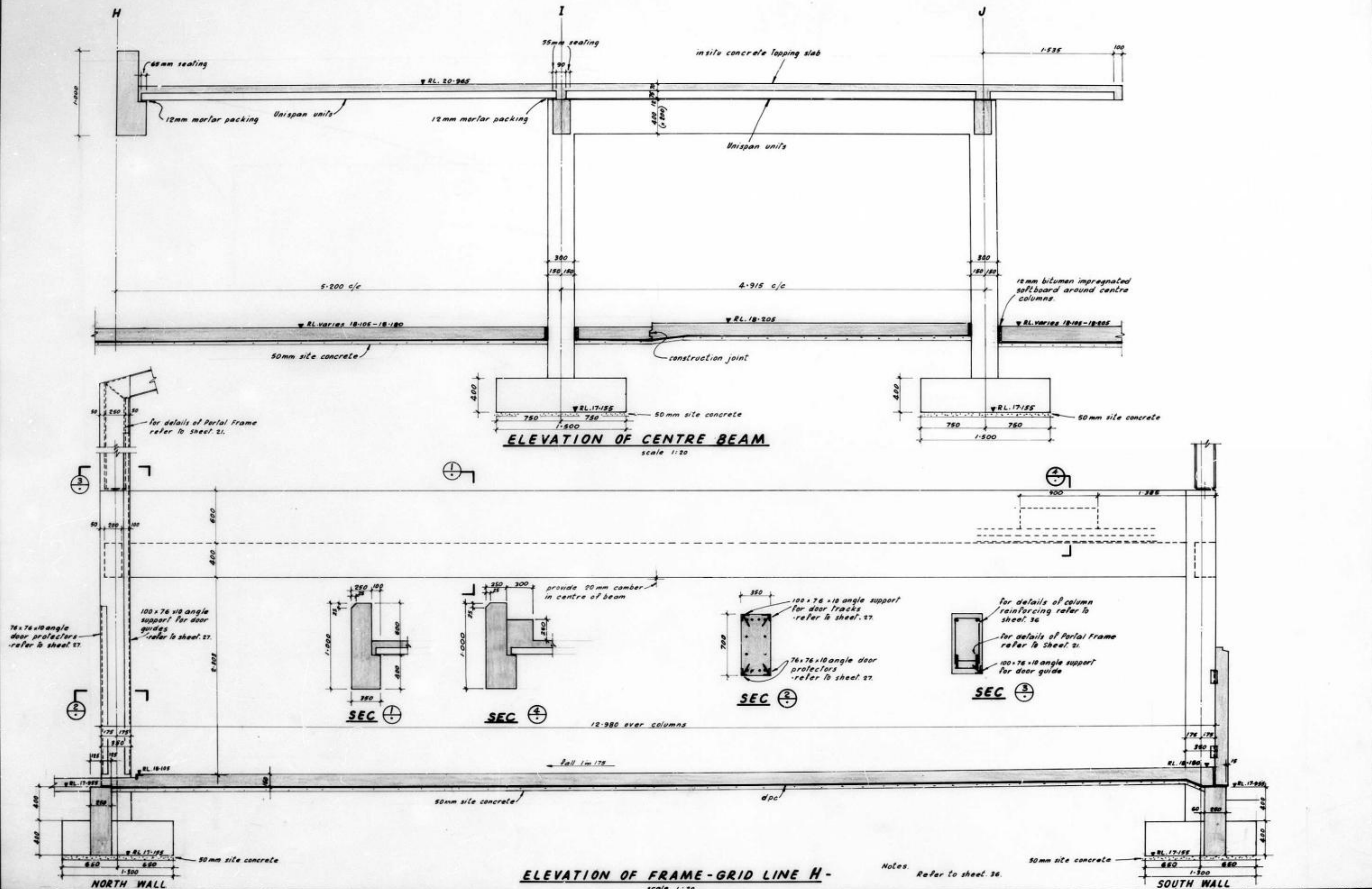
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - MEZZANINE FLOOR - NORTH & SOUTH WALL BEAMS - GEOMETRIC DETAILS

Scales: 1:20

File No. 8U/9/10

D.2278

Sheet 31 of 49



ELEVATION OF CENTRE BEAM

scale 1:20

ELEVATION OF FRAME - GRID LINE H -

scale 1:20

Notes. Refer to sheet. 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - MEZZANINE FLOOR - CENTRE BEAM & FRAME "H" - GEOMETRIC DETAILS -

Designed	P. Rosie	9/78
Drawn	A.C. Bainbridge	9/78
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B.	6/79

Amendments: A — Beam chamfered - Sec 4 added — P.R.H. — 10/79

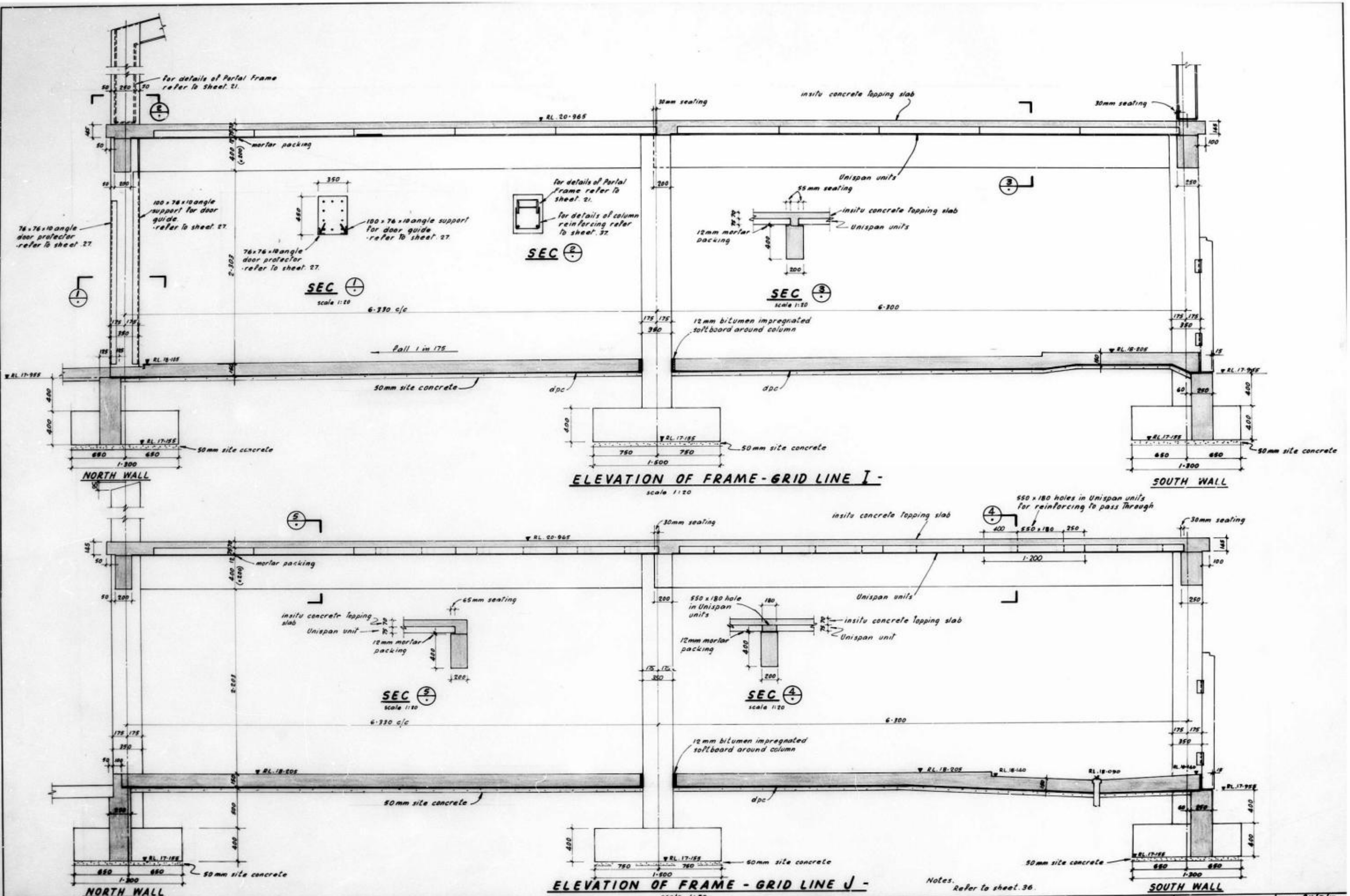
Approved: Design Engineer; City Engineer

Scales: 1:20

File No. 8U/9/10 · Issue A

D2278

Sheet 32 of 49



Notes.
Refer to sheet. 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - MEZZANINE FLOOR - FRAMES GRID LINES I & J - GEOMETRIC DETAILS

Designed	P. Rosie 9/78
Drawn	A.C. Bainbridge 9/78
Traced	
Des. Chk.	P. Rosie 5/79
Dwg. Chk.	
Indexed	A.Z.B. 6/79

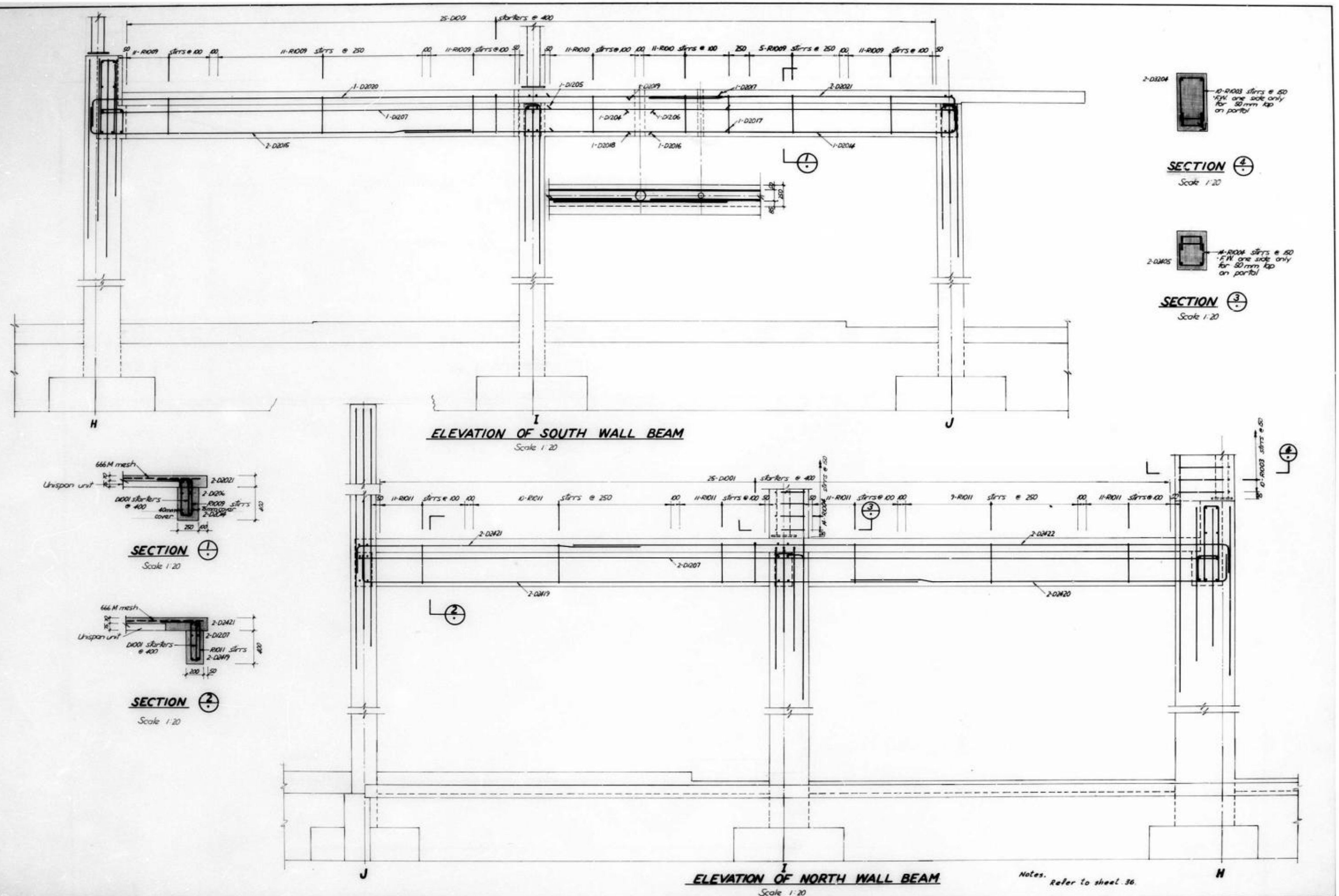
Approved: Design Engineer 13.6.79; City Engineer

Scales: 1:20

File No. 84/9/10

D.2278

Sheet 33 of 49



Notes. Refer to sheet 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

MEZZANINE FLOOR - NORTH & SOUTH WALL BEAMS - REINFORCING

	Name	Date
Designed	P. Rosie	9/78
Drawn	AJF	9/78
Traced	"	"
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	AEB	6/79

Approved: Design Engineer 13.6.79; City Engineer

Scale 1:20

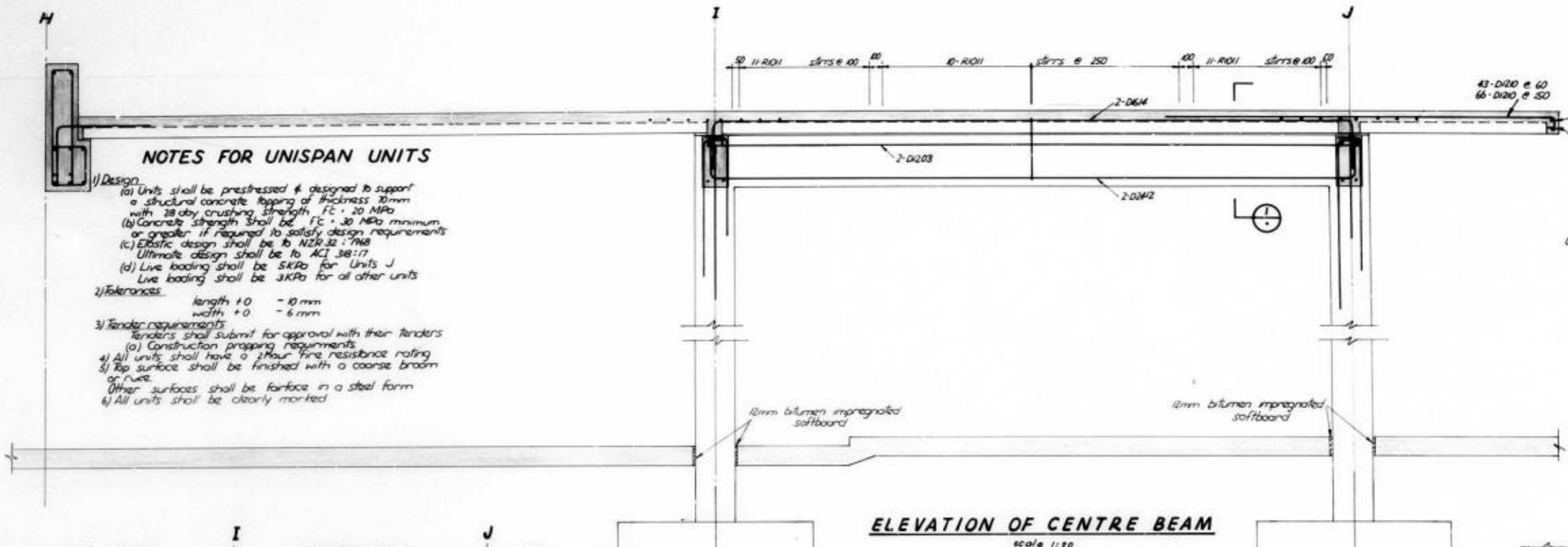
File No. 84/9/10

D2278

Sheet 34 of 49

Original scale of millimetres

centimetres



ELEVATION OF CENTRE BEAM

scale 1:20

NOTES FOR UNISPAN UNITS

1) Design

(a) Units shall be prestressed & designed to support a structural concrete topping of thickness 70mm with 28 day crushing strength $f'c = 20$ MPa

(b) Concrete strength shall be $f'c = 30$ MPa minimum or greater if required to satisfy design requirements

(c) Elastic design shall be to NZR 32 : 1968. Ultimate design shall be to ACI 318 : 17

(d) Live loading shall be 5KPa for Units J. Live loading shall be 3KPa for all other units

2) Tolerances

length +0 −10 mm
width +0 −6 mm

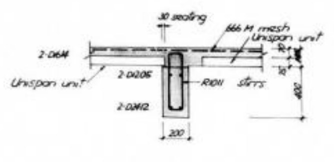
3) Tender requirements

Tenders shall submit for approval with their Tenders
(a) Construction propping requirments

4) All units shall have a 2Hour fire resistance rating

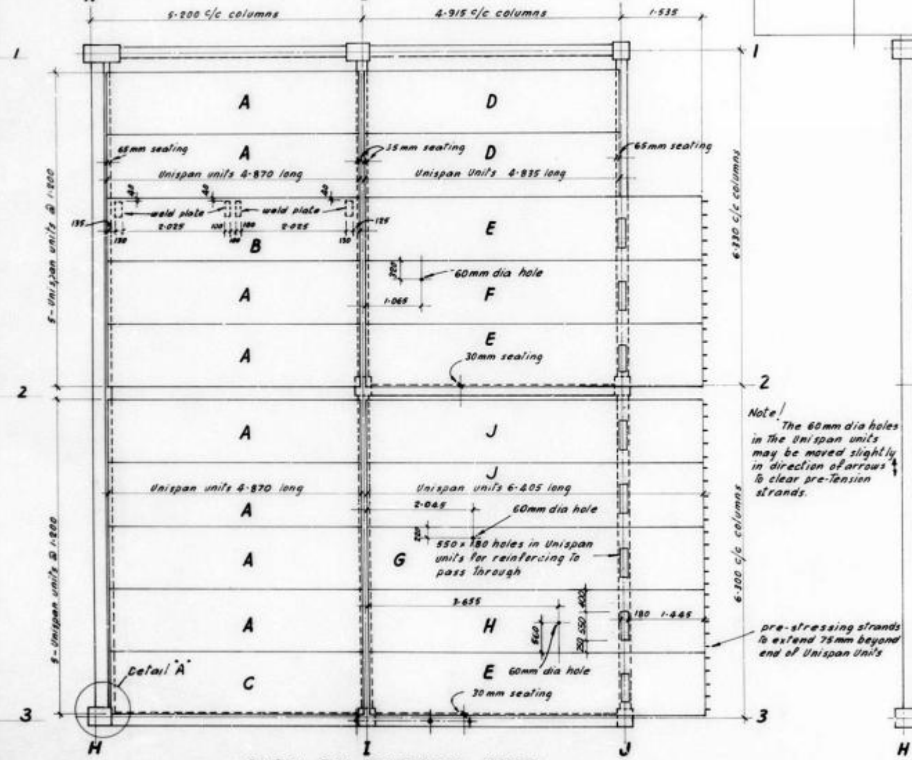
5) Top surface shall be finished with a coarse broom or rake.
Other surfaces shall be fairface in a steel form

6) All units shall be clearly marked



SECTION

Scale 1:20

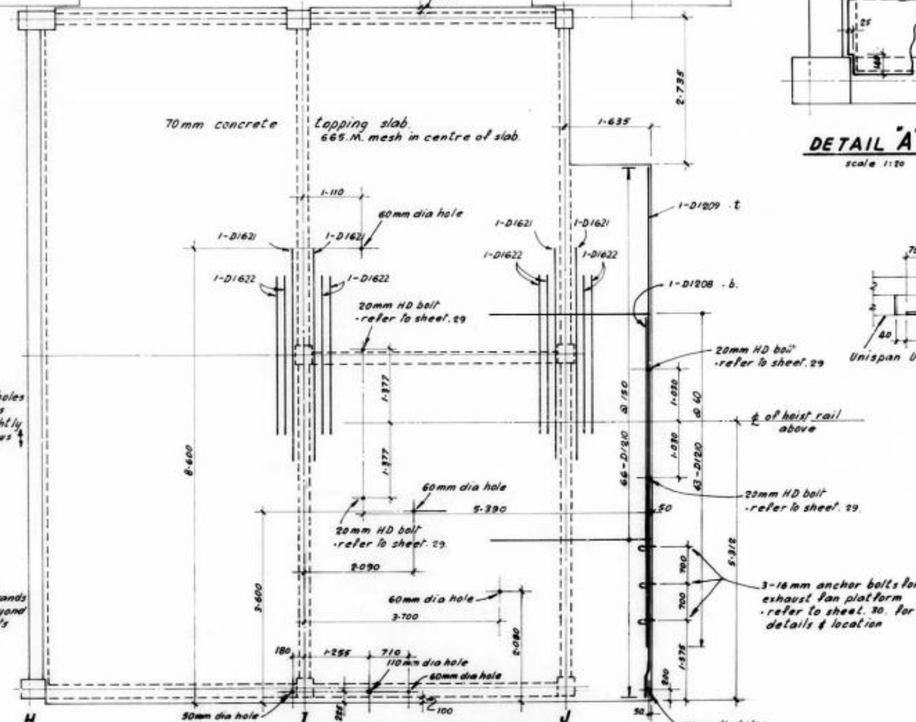


Note /
The 60mm dia holes in the Unispan units may be moved slightly in direction of arrows to clear pre-Tension strands.

pre-stressing strands to extend 75mm beyond end of Unispan Units

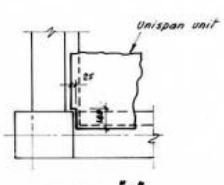
PLAN ON UNISPAN UNITS

scale 1:50



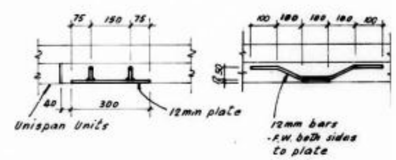
PLAN ON CONCRETE TOPPING SLAB

scale 1:50



DETAIL "A"

scale 1:20



DETAIL OF WELD PLATES

2-OFF 100 mm wide
2-OFF 130 mm wide

scale 1:10

Notes. Refer to sheet. 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
MEZZANINE FLOOR - CENTRE BEAM & FLOOR SLAB - REINFORCING

Designed	P Rose	9/78
Drawn	AJF	9/78
Traced	"	"
Dsg. Chk.	P Rose	5/79
Det. Chk.		
Indexed	AEB	6/79

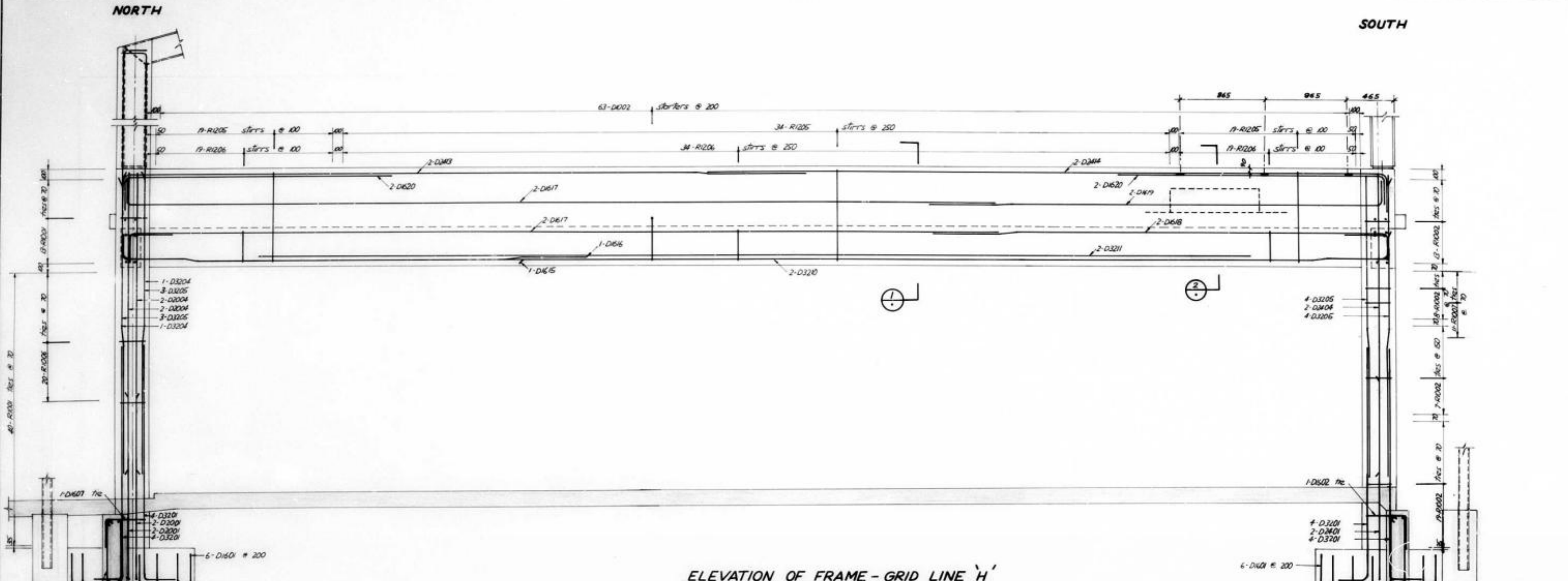
Approved: Design Engineer 13.6.79; City Engineer

Scale: 1:20

File No. 80/9/10

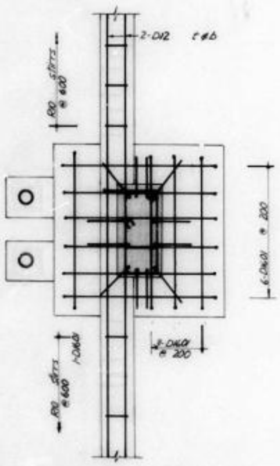
D2278

Sheet 36 of 49



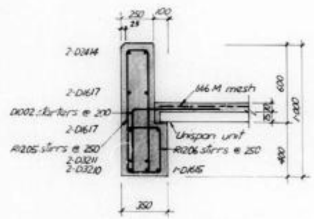
ELEVATION OF FRAME - GRID LINE 'H'

Scale 1:20



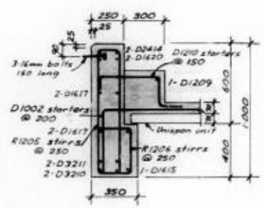
PLAN OF FOOTING H1

Scale 1:20



SECTION 1

Scale 1:20



SECTION 2

Scale 1:20

NOTES FOR MEZZANINE FLOOR

1 Concrete

(a) Concrete strength shall be -:

$f'c$ = 10 MPa - Site concrete
$f'c$ = 30 MPa - Columns & Beams
Structural topping to Unispan units
$f'c$ = 25 MPa - Concrete casing to Portal Frame legs

2 Reinforcing

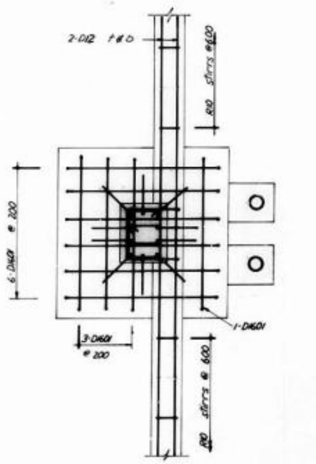
(a) Refer to bending schedule for bar lengths
R = plain round bar Grade 275
D = deformed bar Grade 275
First two numbers of bar mark number denote size of bar in mm.

(b) Cover to stirrups shall be 40mm unless shown otherwise.

(c) Reinforcing to be continuous throughout unless scheduled otherwise
Laps not scheduled shall be -:

10mm = 400
12mm = 500
16mm = 650
20mm = 800
24mm = 1000
Mesh = 300

3 Refer to Architects & Mechanical Services drawings for details of bolts, chases, pipes, conduits etc to be cast into or formed in concrete.



PLAN OF FOOTING H3

Scale 1:20

Amendments	Initials	Date
A Section 2 added	PRM	10/79

		Date
Designed	P Rosie	9/78
Drawn	AJF	9/78
Dwg. Chk.	P Rosie	5/79
Indexed	AEB	6/79

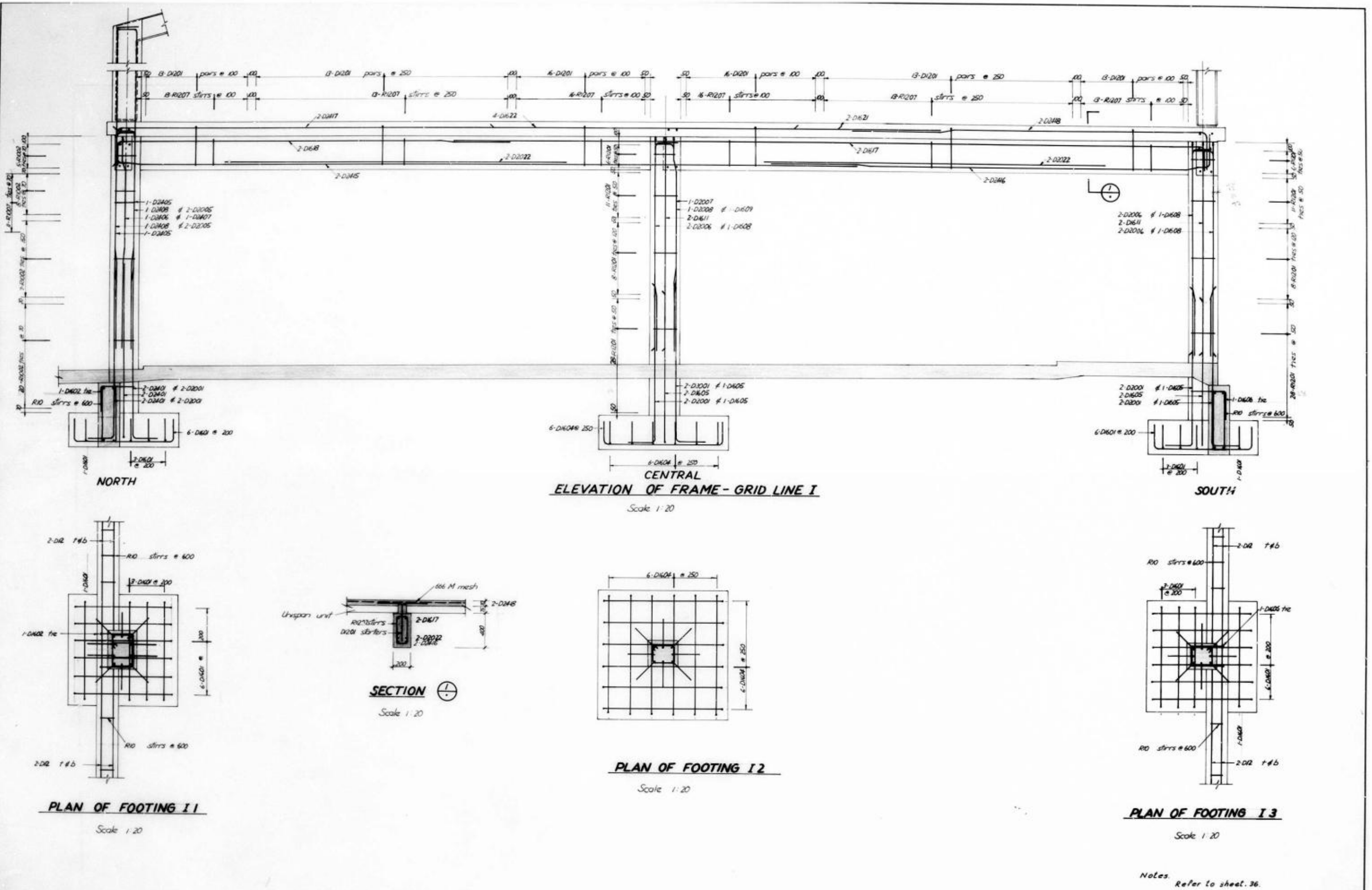
Approved: Design Engineer 12.6.79; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
MEZZANINE FLOOR - FRAME GRID LINE H - REINFORCING

Scales 1:20

File No. 8U/9/10
Issue A
D2278
Sheet 36 of 49



ELEVATION OF FRAME - GRID LINE I

Scale 1:20

Notes. Refer to sheet. 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
MEZZANINE FLOOR - FRAME GRID LINE I - REINFORCING

Designed	P Rosie	9/78
Drawn	A/F	10/78
Traced	-	-
Des. Chk.	P Rosie	5/79
Dwn. Chk.		
Indexed	A.F.B.	6/79

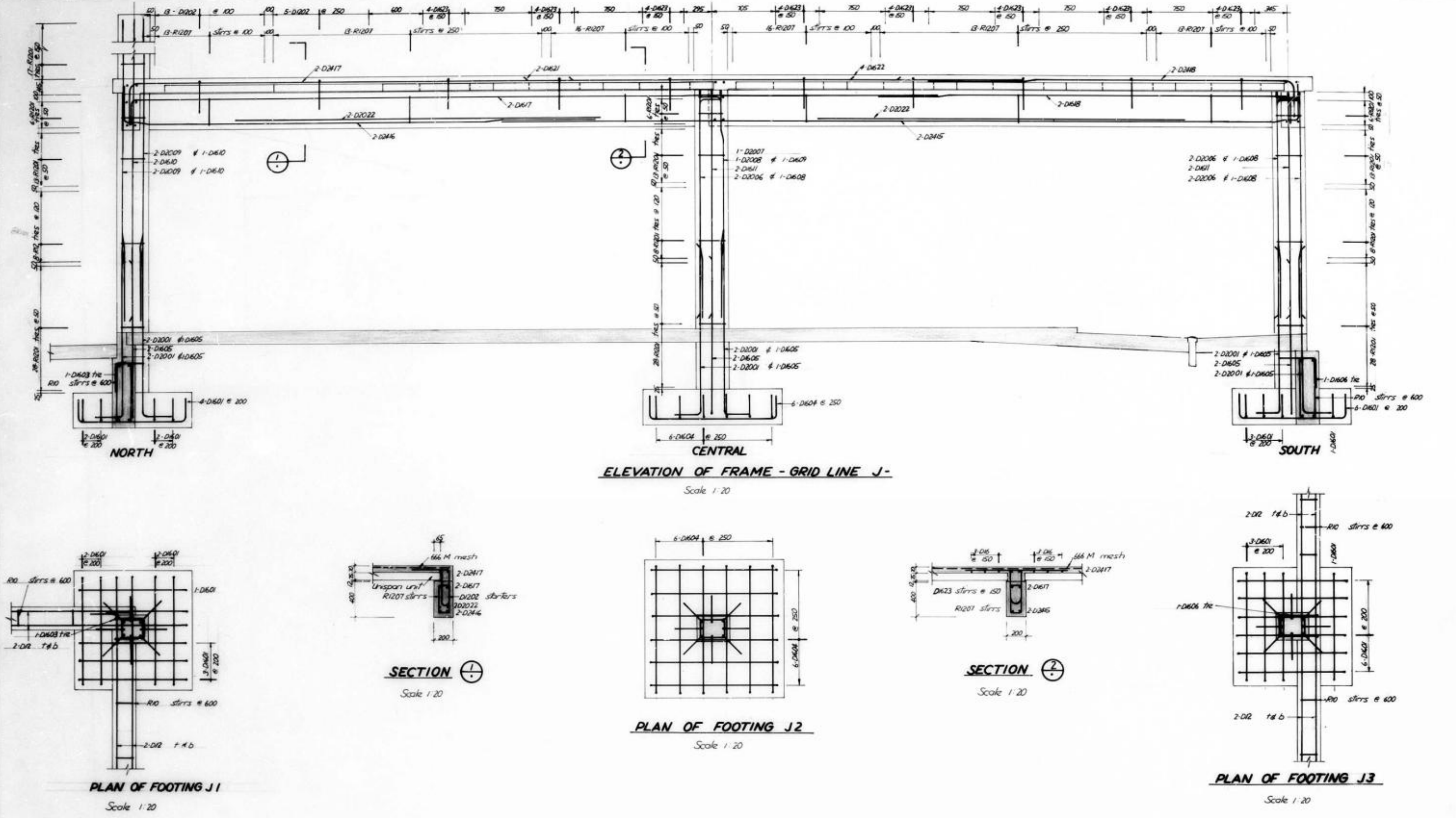
Approved: Design Engineer; for City Engineer

Scales: 1:20

File No. 84/9/10

D.2278

Sheet 37 of 49



Notes.
- Refer to sheet. 36.

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
MEZZANINE FLOOR - FRAME GRID LINE J - REINFORCING

		Date
Designed	P. Rosie	9/78
Drawn	A.J.F.	10/78
Traced	"	
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B.	6/79

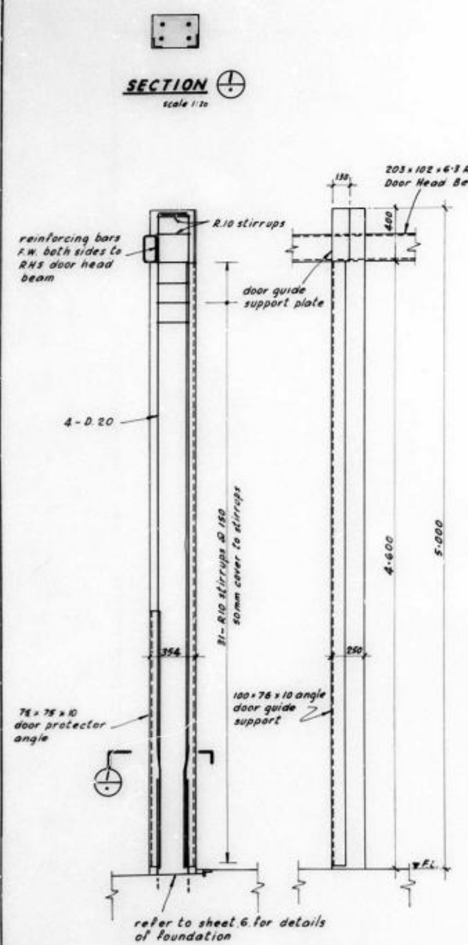
Approved: Design Engineer, 17.6.79 (Date); B. D. [illegible] for City Engineer

Scales: 1:20

File No. 84/9/10

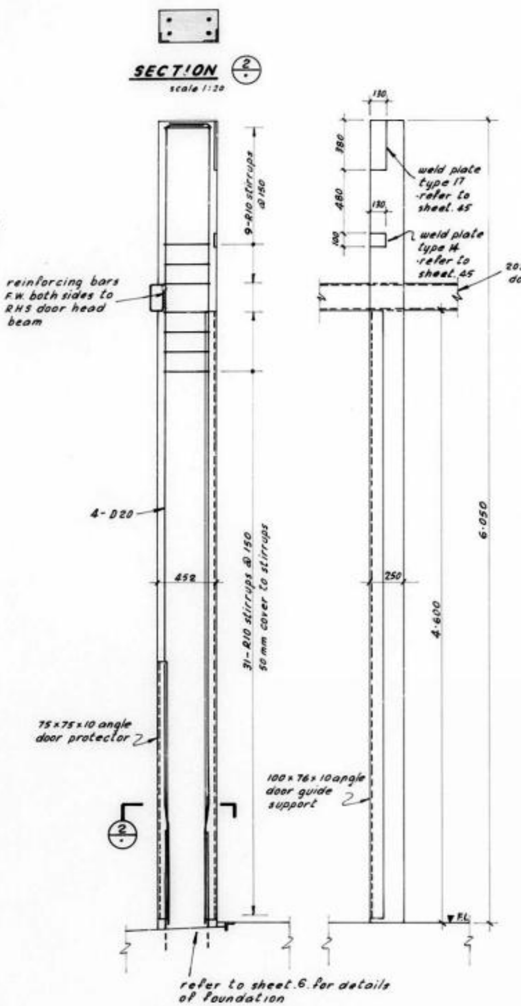
D2278

Sheet 38 of 49



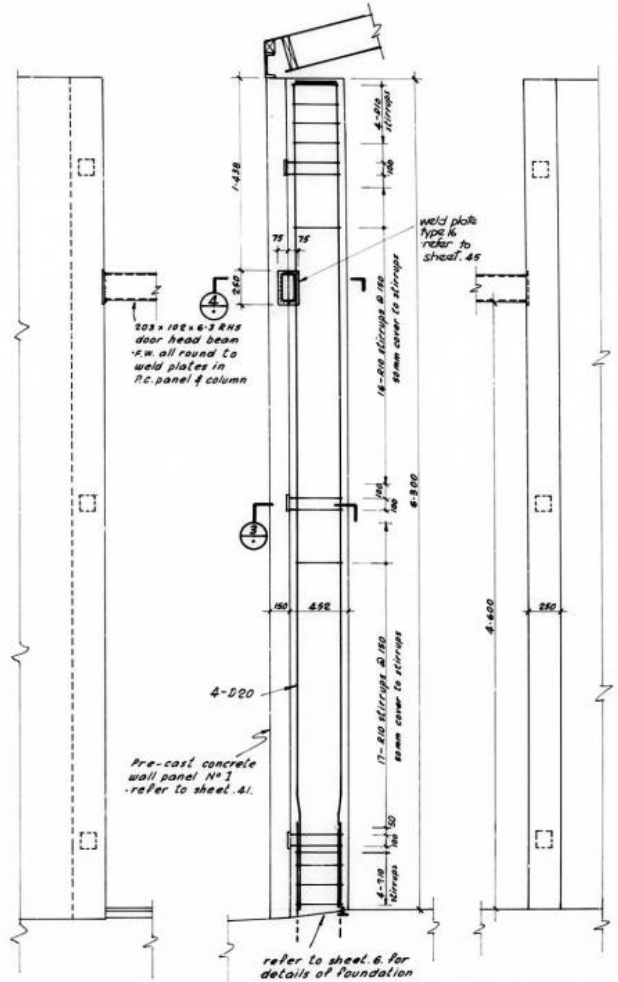
DETAILS OF CONCRETE COLUMN AT DOOR OPENING - GRID LINE (C-D)

scale 1:20



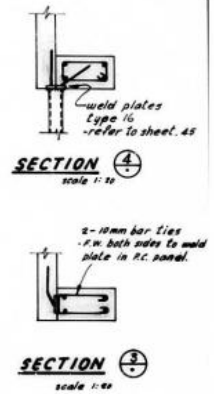
DETAILS OF CONCRETE COLUMN AT DOOR OPENING - GRID LINE (Q-R) & (S-T)

scale 1:20



DETAIL OF CONCRETE COLUMN AT DOOR OPENING - GRID LINE (U-V)

scale 1:20



NOTES FOR CONCRETE COLUMNS

1 Concrete
strength f'c = 25 MPa

2 Reinforcing
(a) All bars except stirrups shall be deformed Grade 275
(b) Stirrups shall be plain round Grade 275
(c) Reinforcing shall be continuous throughout
Laps shall be
20mm = 650
(c) Cover to stirrups 50mm

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

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

		Date
Designed	P. Rosie	11/78
Drawn	A.E. Bambridge	11/78
Traced		
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.B	6/79

Approved: Design Engineer, Date 13.6.79; A. D. Forbes, for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

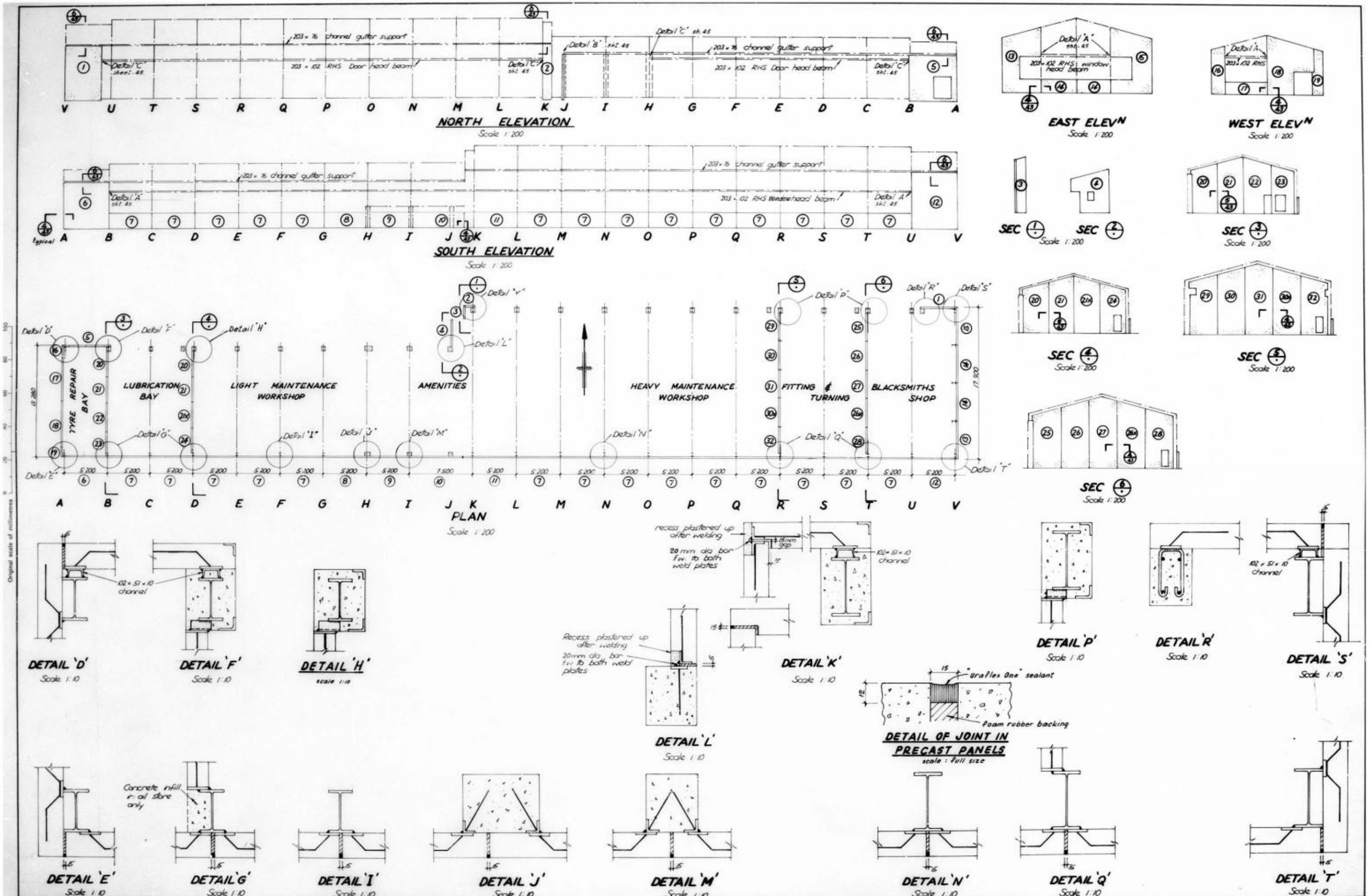
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF CONCRETE COLUMNS AT DOOR OPENINGS - NORTH WALL -

Scales: 1:20

File No. 8U/9/10

D.2278

Sheet 39 of 49



CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
P.C. WALL PANELS - PLAN . ELEVATIONS & JOINT DETAILS

Designed	P. Rosie	9/78	
Drawn	AJF	11/78	
Traced	"	"	
Dsn. Chk.	P. Rosie	5/79	
Indexed	AEB	6/79	

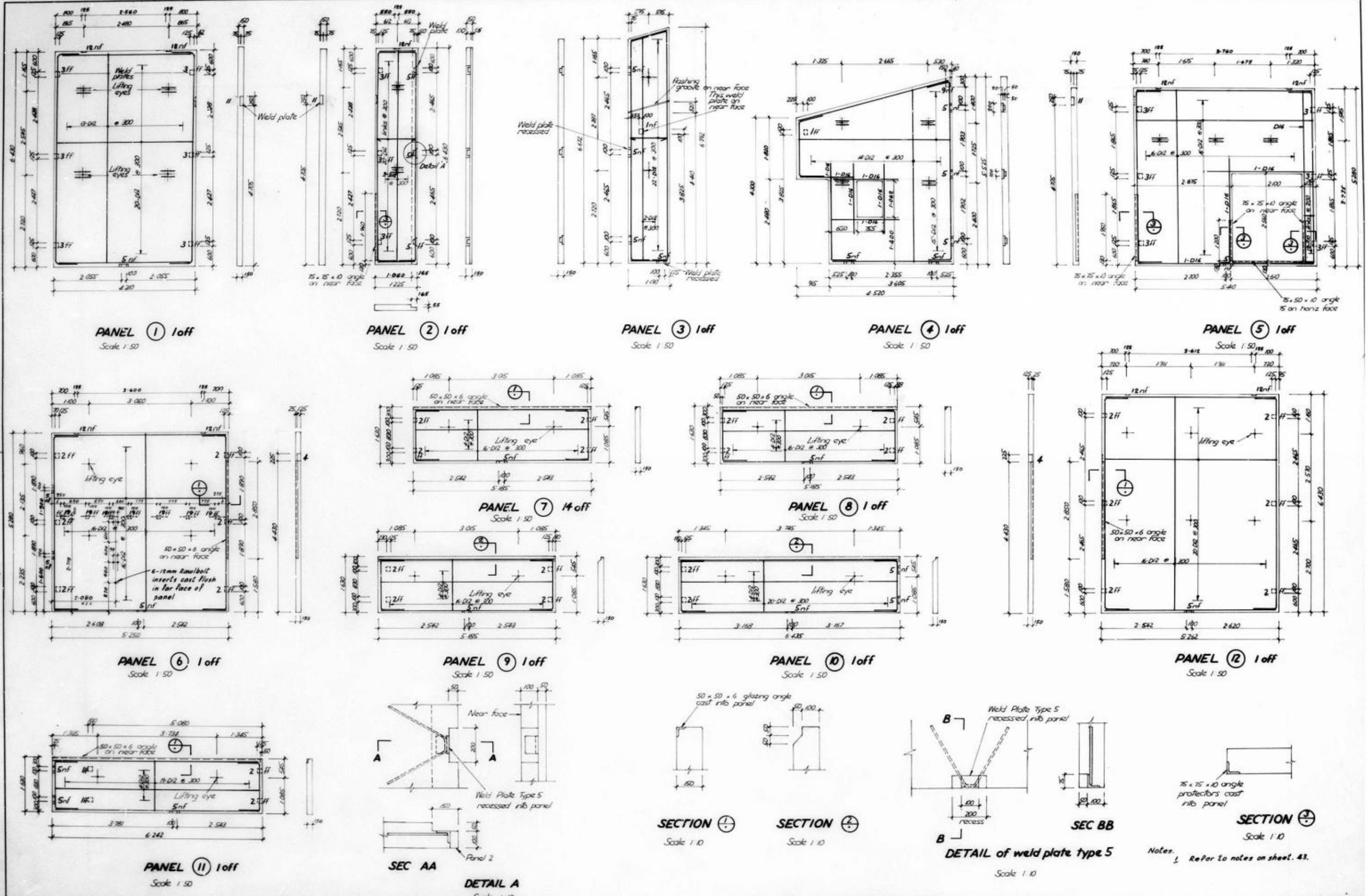
Approved: Design Engineer, 17.6.79; for City Engineer

Scales: 1:10, 1:200

File No. 80/9/10

D2278

Sheet 40 of 49



Notes.
1. Refer to notes on sheet. 43.

Amendments	Initials	Date
A weld plate 19 on panel 4 & reinforcing on panels 4 & 5	P.R.M.	10/79

Designed	P Rosie	10/78
Drawn	AJF	10/78
Dwg. Chk.	P Rosie	5/79
Indexed	AEB	6/79

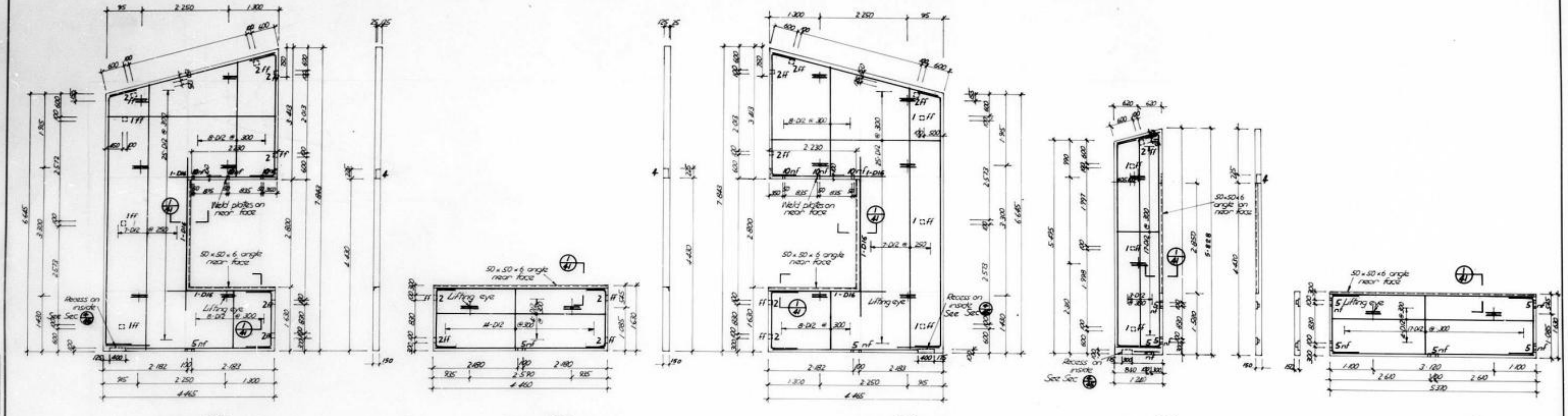
Approved: Design Engineer 12.6.79; City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
PRECAST CONCRETE WALL PANELS - ELEVATIONS - 1 - 12

Scales: 1:10, 1:50

File No. BU/9/10
Issue A
D2278
Sheet 41 of 49



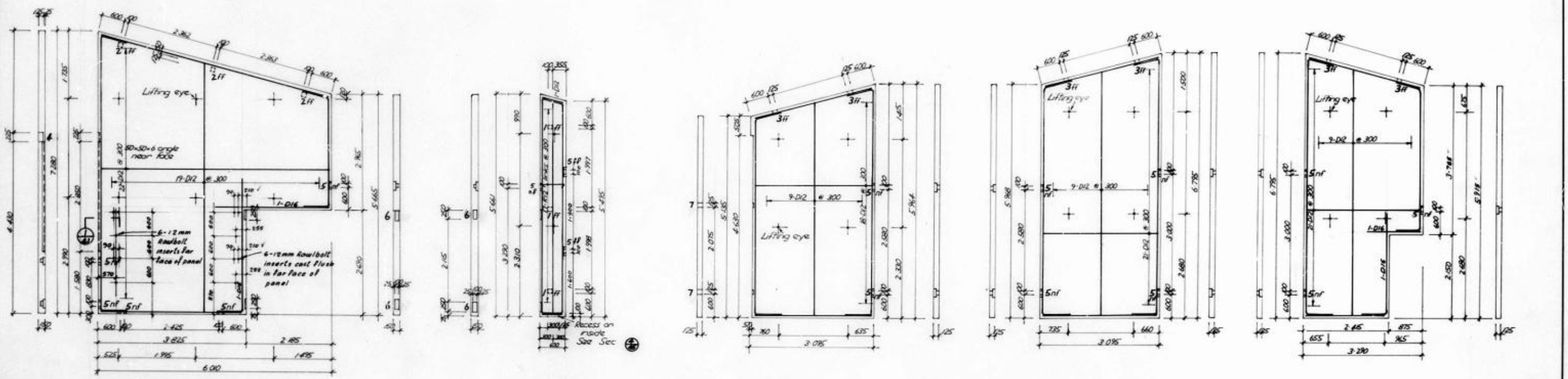
PANEL (13) 1 off
Scale 1:50

PANEL (14) 2 off
Scale 1:50

PANEL (15) 1 off
Scale 1:50

PANEL (16) 1 off
Scale 1:50

PANEL (17) 1 off
Scale 1:50



PANEL (18) 1 off
Scale 1:50

PANEL (19) 1 off
Scale 1:50

PANEL (20) 2 off
Scale 1:50

PANEL (21) 2 off
PANEL (21A) opp hand 1 off

PANEL (22) 1 off
Scale 1:50

Notes
1) Refer to notes on sht 43

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

	Amendments	Initials	Date
A	Reinforcing on panels 13,15,18 & 22	P.R.M.	10/79
B	Panel 22 dimensions corrected	A.E.B.	3/80

		Date
Designed	P Rosie	9/78
Drawn	AJF	11/78
Traced	-"-	-"-
Dwg. Chk	P. Rosie	5/79
Des. Chk		
Indexed	A.E.B.	6/79

Approved: Design Engineer 13.6.79; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
PRECAST CONCRETE WALL PANELS - ELEVATIONS - 13 - 22

Scale 1:50

File No. 8U/9/10
Issue A B

D2278

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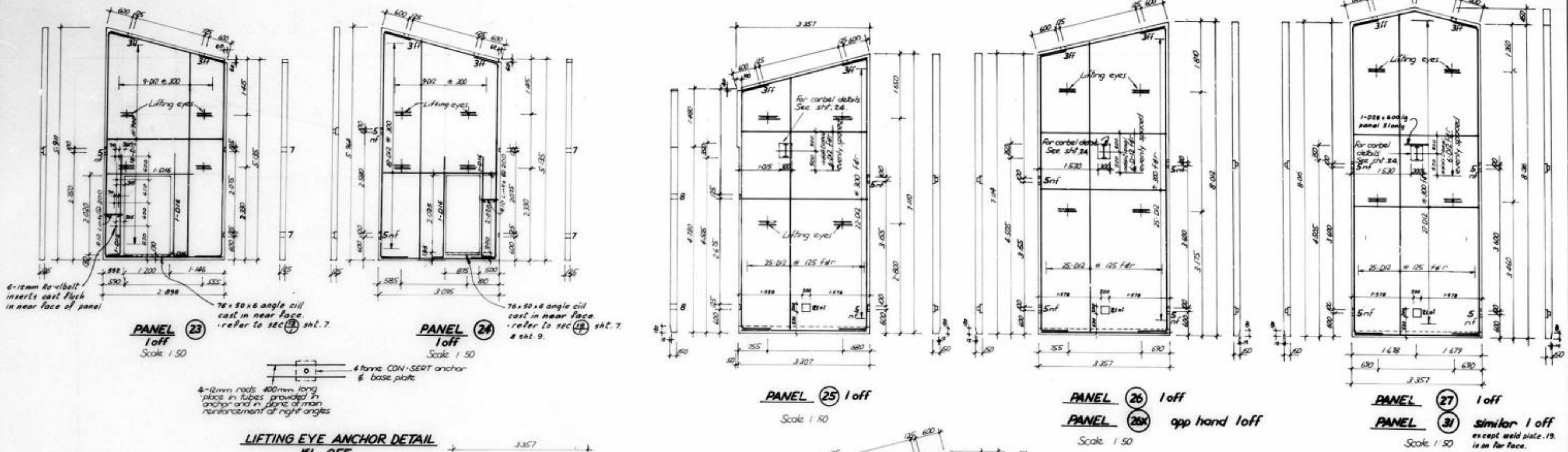

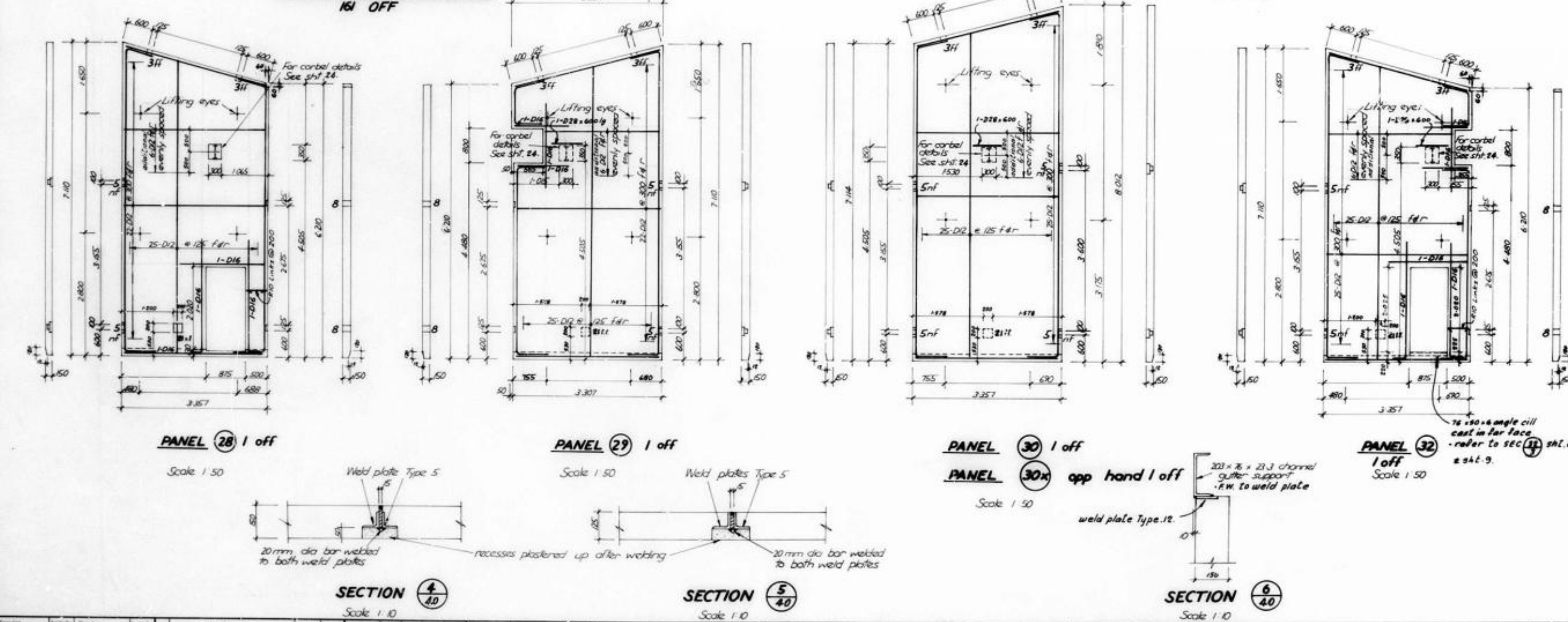

NOTES FOR PC PANELS

1) Concrete
   (a) Concrete strength f'c = 20 MPa before lifting of panels commences. f'c = 30 MPa after 28 days

2) Reinforcing
   (a) All reinforcing rods to be deformed Grade 275
   (b) All steel to be placed centrally in panel, except for panels 25-32
   (c) Cover of panel edges to be 25mm min. Cover front & rear faces panels 25-32 to be 20mm
   (d) All trimmer bars to be D.12 unless shown otherwise

3) General
   (a) Tolerances: length + 00mm - 6mm; height ± 10mm; thickness ± 3mm
   (b) Refer to Architect's drawings for fixing details, timber work etc to wall panels
   (c) Rebates are on far face of panels except where otherwise shown
   (d) For details on angles cast in panels refer to Shts 9 & 27

4) Weld plates
   (a) Weld plates indicated on panel elevations thus □ 2nf □ 2ff
   nf denotes near face
   ff denotes far face
   (b) Refer to shts 44 & 45 for details of weld plates
   (c) Wrap all edges of weld plates in "Densotape" or similar material to allow expansion of plates without spalling of adjacent concrete

5) Lifting Eyes
   (a) All lifting eyes to be 4 tonne Con-Sert type
   (b) Positions & number of lifting eyes for each panel to be as shown
   (c) All lifting eyes are on near face of panel
   (d) For details of extra reinforcing at all lifting eyes refer to detail this sheet.

6. Mesh
   At all weld plate centrally place a layer of 665.M. mesh 1·060 x 500.

Amendments	Initials	Date
A Reinforcing on panels 25,26,28,29,32	PRM	10/79
B Weld plates 19 & chamfer added to panels 25-32 inc	A.E.B	12/79
C Weld plate 19 now weld plates 21	AEB	2/80
D Panel 25 dimensions altered	AEB	2/80

Designed	P Rosie	10/78
Drawn	AJF	11/78
Traced	-"-	-"-
Desg. Chk.	P. Rosie	5/79
Indexed	A.E.B	6/79

Approved: Design Engineer 13.6.79; B. D. Hobbs for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
PRECAST CONCRETE WALL PANELS - ELEVATIONS - 23 - 32

Scales: 1:10, 1:50

File No. 8U/9/10

Issues: A B C D

D2278

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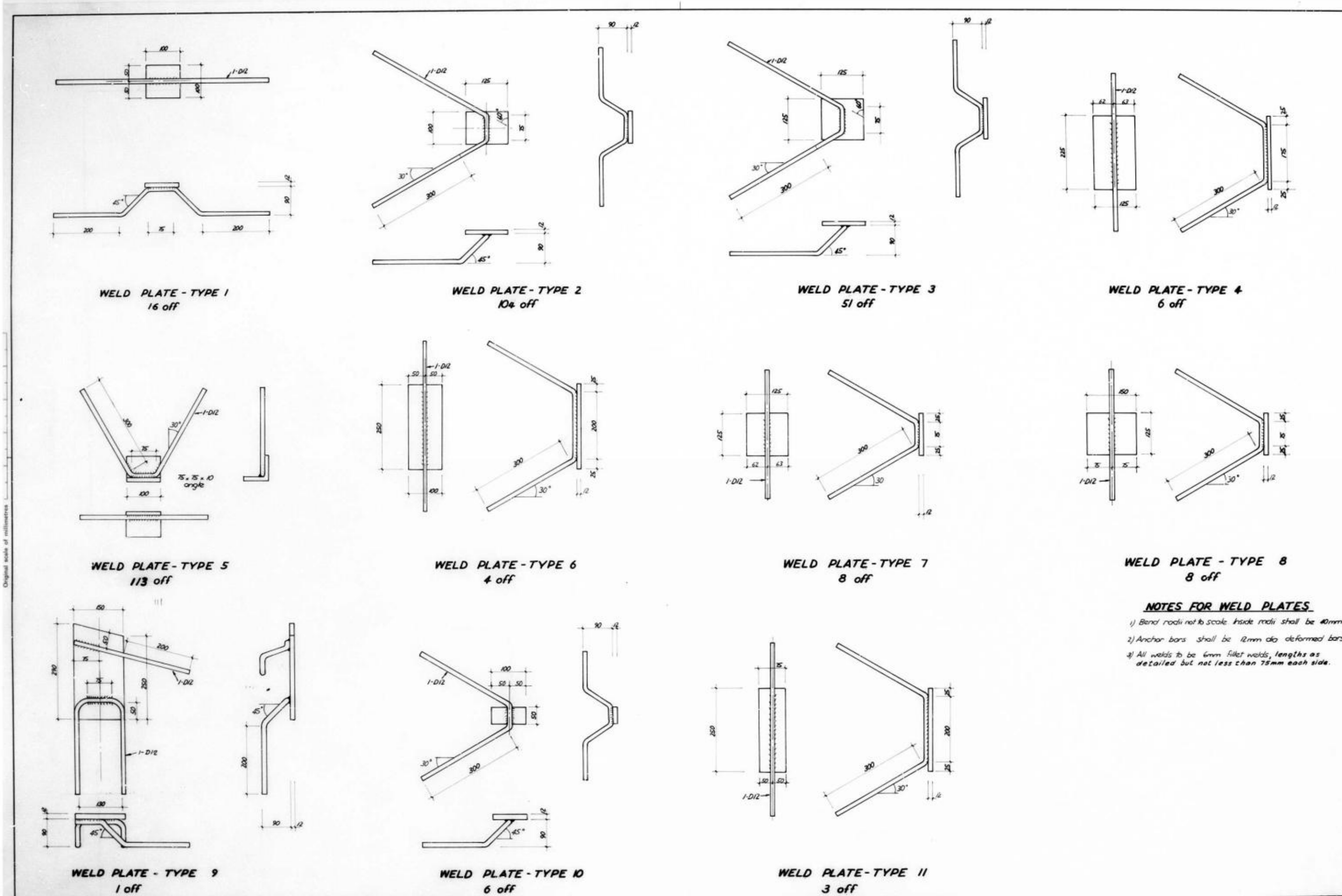

NOTES FOR WELD PLATES

1) Bend radii not to scale. Inside radii shall be 40mm
2) Anchor bars shall be 12mm dia deformed bars
3) All welds to be 6mm fillet welds, lengths as detailed but not less than 75mm each side.

Amendments	Initials	Date
A No of Type 1 weld plates reduced	PRM	10/79

		Date
Designed	P. Rosie	10/78
Drawn	AJF	11/78
Traced	"	"
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	AEB	6/79

Approved: Design Engineer; for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST

DETAILS OF WELD PLATES

Scales: 1:5

File No. BU/9/10

Issue A

D2278

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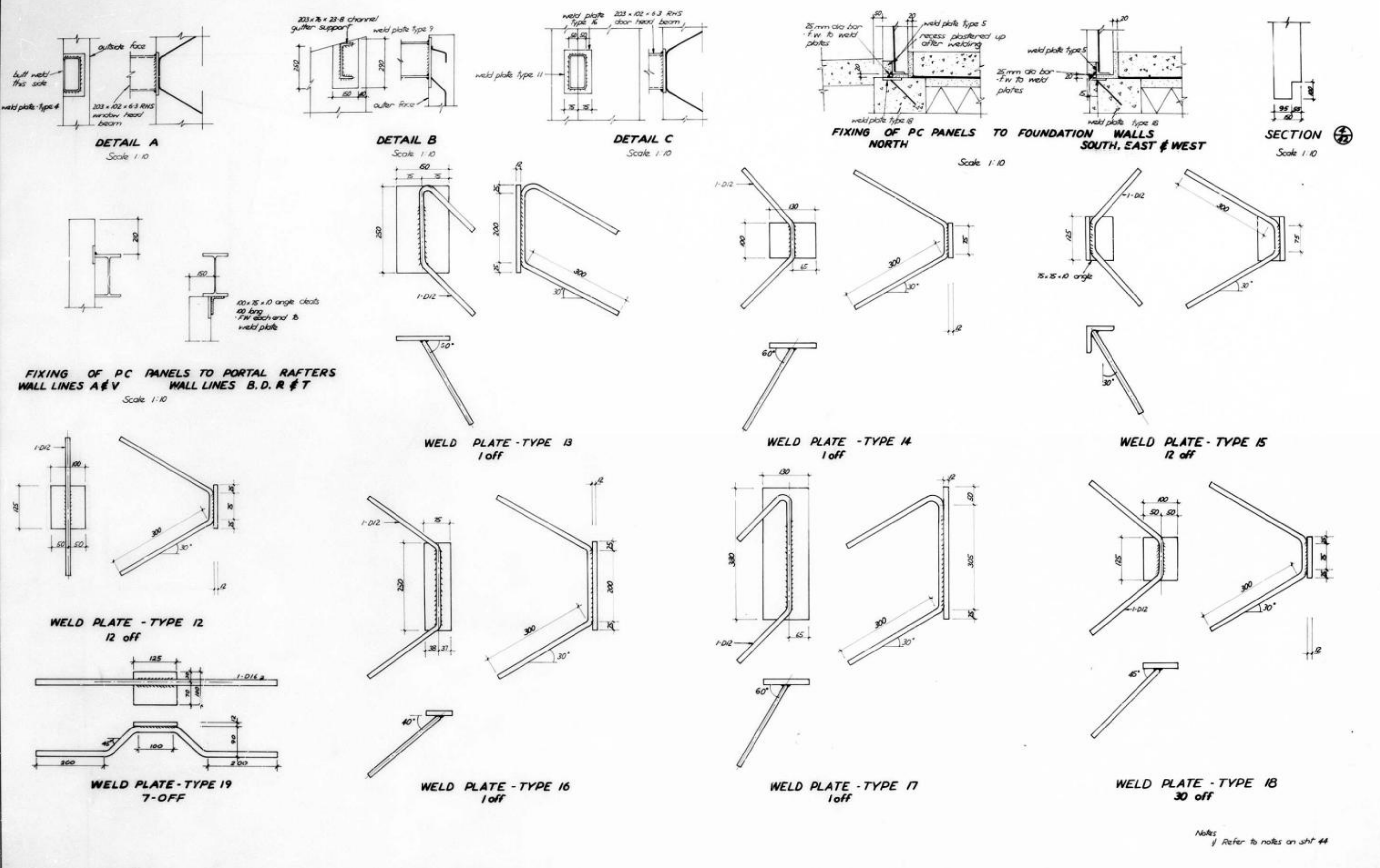


Notes
1/ Refer to notes on sht 44

Amendments	Initials	Date
A Weld Plate Type 19 added	PRM	10/79

		Date
Designed	P Rosie	9/78
Drawn	AJF	11/78
Traced	-	-
Dwg. Chk.	P. Rosie	5/79
Des. Chk.		
Indexed	A.E.S	6/79

Approved: Design Engineer 13.6.79; B. D. Hales for City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

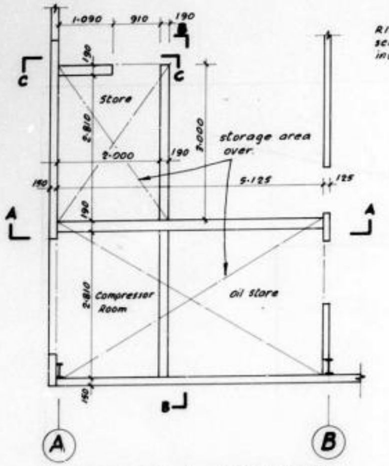
NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST
PANEL FIXING & WELD PLATE DETAILS

Scales 1:10, 1:5

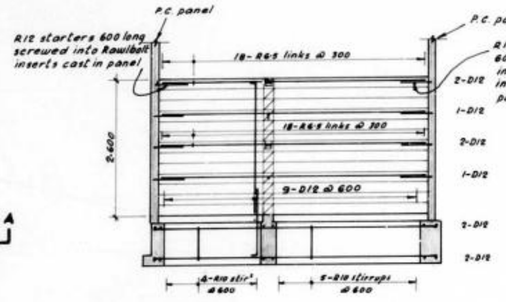
File No. 84/9/10 · Issue A

D2278

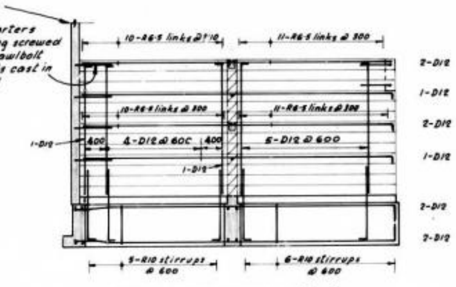
Sheet 45 of 49



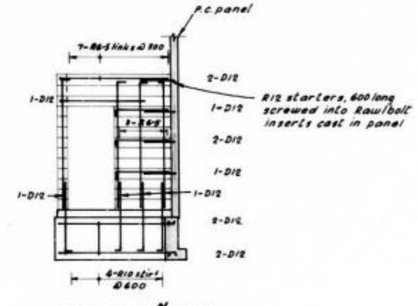
FLOOR PLAN - S.W.CORNER
scale 1:50



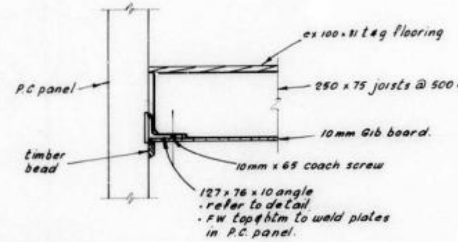
WALL ELEVATION A-A
scale 1:50



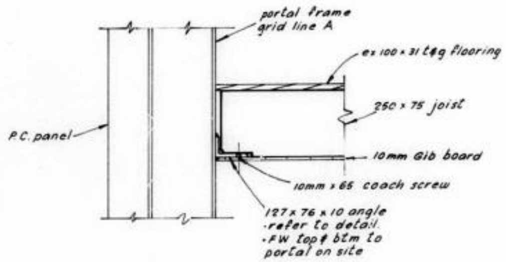
WALL ELEVATION B-B
scale 1:50



WALL ELEV^N C-C
scale 1:50

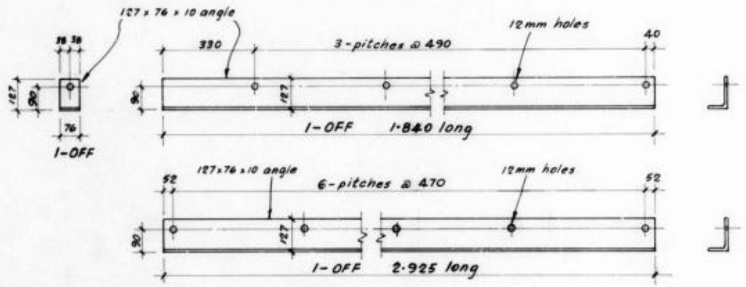


CONNECTION OF TIMBER STORAGE FLOOR TO SOUTH WALL
scale 1:10



CONNECTION OF TIMBER STORAGE FLOOR TO PORTAL FRAME - GRID LINE A
scale 1:10

· For all other storage floor details refer to Architects drawings.



DETAILS OF SUPPORT ANGLES FOR FLOOR JOISTS
scale 1:10

Notes

1. Foundations Refer to notes on sheet. 8.
2. Blockwork
   (a) All blocks to be Series 20.
   (b) All block cores to be filled with grout. $f'_c = 20$ MPa
3. Reinforcing
   (a) All bars except links and screwed starters to be deformed Grade 275
   (b) Links and screwed starters to be plain round Grade 275
   (c) All lapped splices in blockwork including bond beams shall be 40 diameters minimum.
   (d) Details
      (i) 90° bend in vertical bars
      (ii) 90° downward bend in horizontal bars
      (iii) 90° horizontal bend in horizontal bars
   (e) Notation
      (i) represents 90° bend in reinforcing
      (ii) hook as in (i) and (ii) above
      (iii) D = deformed bar R = plain bar

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST - BLOCKWALL ELEVATIONS - STORAGE FLOOR DETAILS -

Designed	P. Rosie	2/79
Drawn	A.E. Bainbridge	2/79
Dwg. Chk.	P. Rosie	5/79
Approved	Design Engineer	
	City Engineer	

Scales 1:10, 1:50

File No. 84/9/10

D.2278

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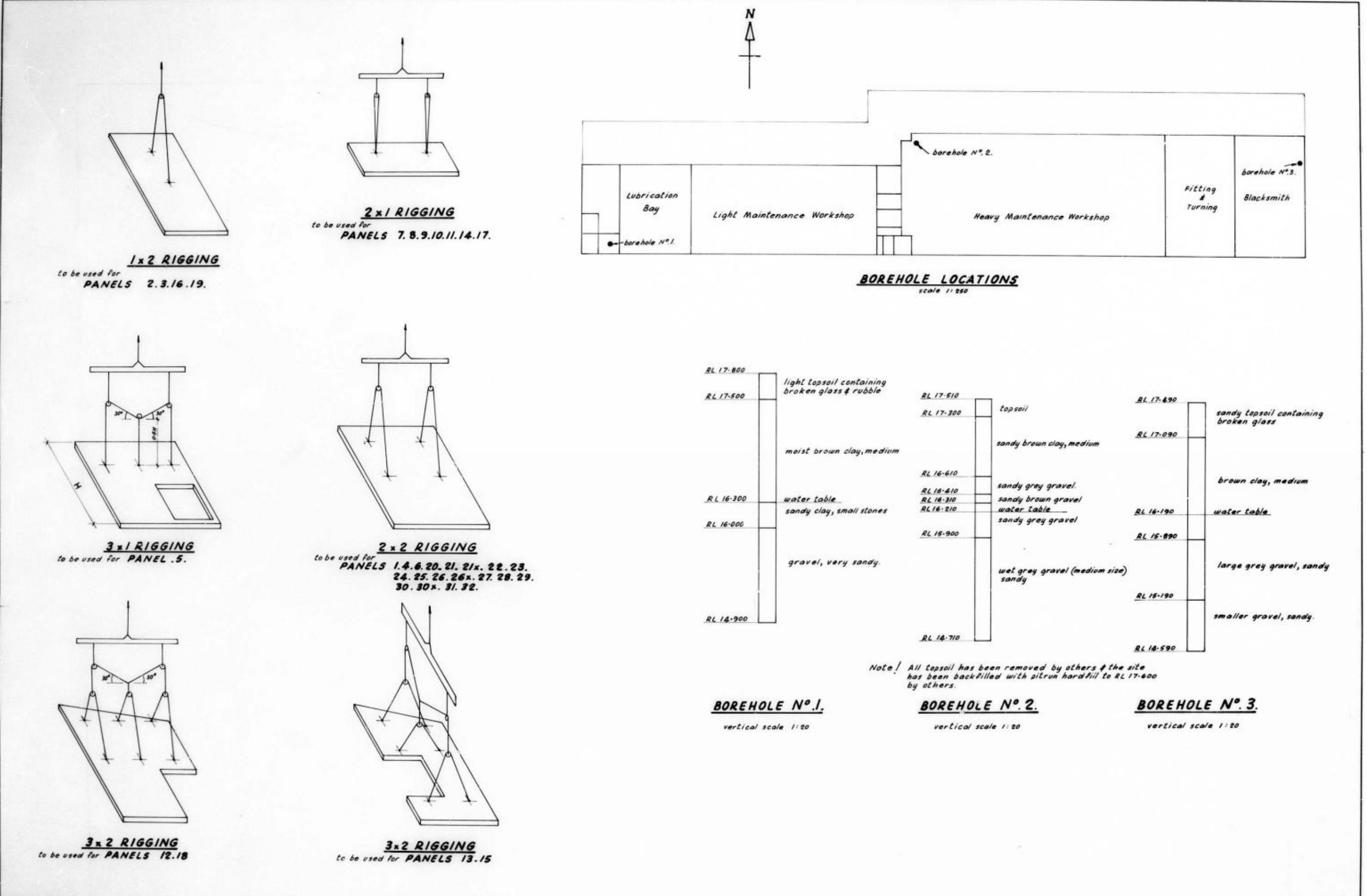

Service	Initials	Service	Initials	Amendments	Initials	Date
H.P. Water		Lands & Survey				
Sewer		Planning				
S.W. Drainage						
Gas						
Cables (M.E.D.)						
(P.O.)						

		Date
Designed	P. Rosie	5/79
Drawn	A.C. Bambridge	5/79
Traced		
Des. Chk.	P. Rosie	5/79
Dwn. Chk.		
Indexed	AEB	6/79

Approved: Design Engineer 13.6.79
City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
LIFTING OF PRE-CAST CONCRETE PANELS — BOREHOLE DETAILS —

Scales: N.T.S / 1:250 / 1:20

File No. 84/9/10

D.2278

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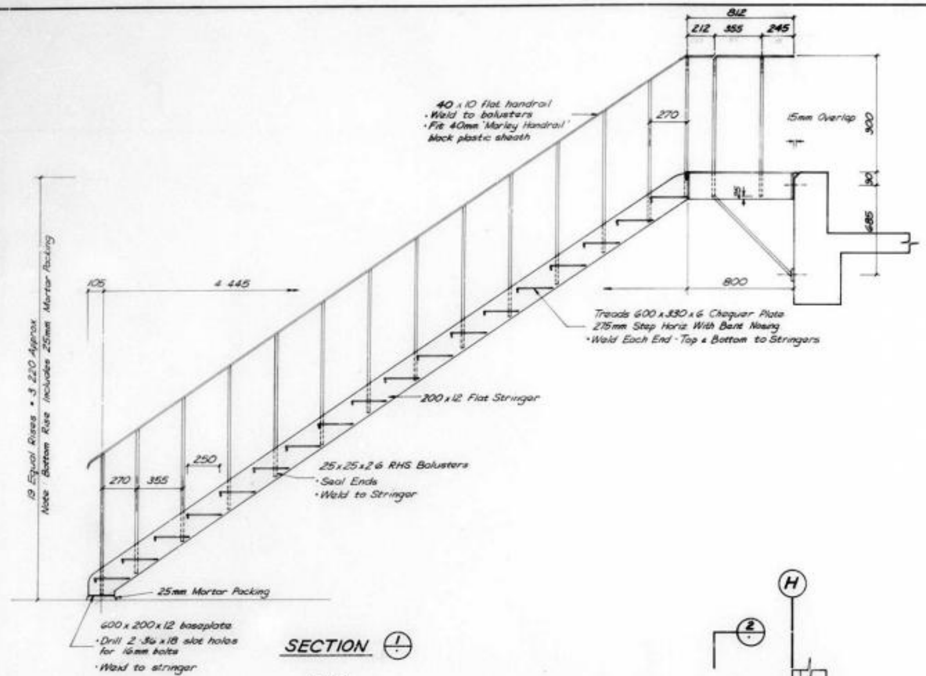
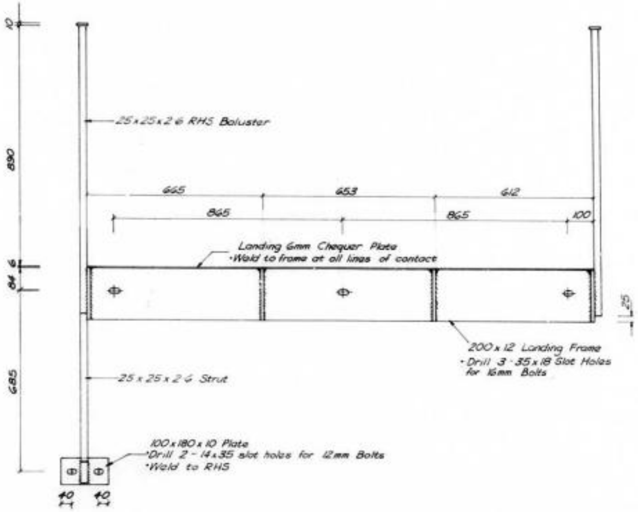


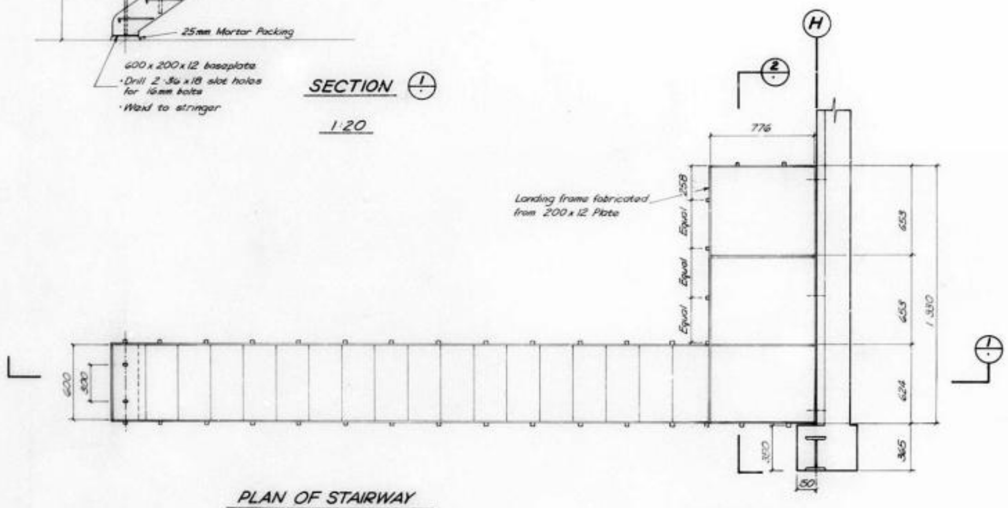
SECTION 1

1:20



SECTION 2

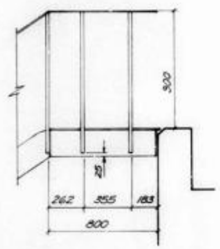
1:10



PLAN OF STAIRWAY

(landing deck & handrail not shown)

1:20



SOUTH BALUSTRADE ON LANDING 1:20

NOTES

1· Refer to Sheet 21

2· For Location of Stairway and details of Timber Panels Fixed to Balustrades - Refer to Architects Drawings

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

Amendments	Initials	Date

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

		Date
Designed	P Rosic	9·79
Drawn	P.R. - M.R.	9·79
Traced	M.Russell	9·79
Desg. Chk.	P Rosic	9·79
Des. Chk.		
Indexed	A.E.B.	6/79

Approved: [signature] 8·10·79 Date

City Engineer

CHRISTCHURCH CITY COUNCIL — CITY ENGINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - JOHNSON STREET
STAGE 2 - STEELWORK - MEZZANINE STAIRWAY

Scales: 1:10, 1:20

File No. BU/9/10

Issue

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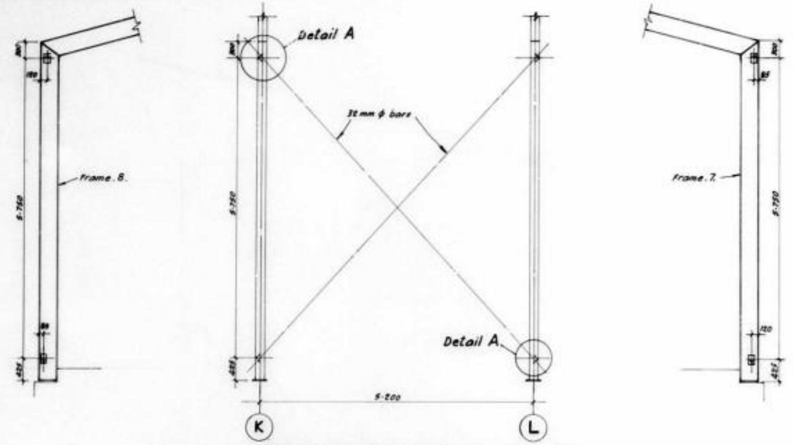
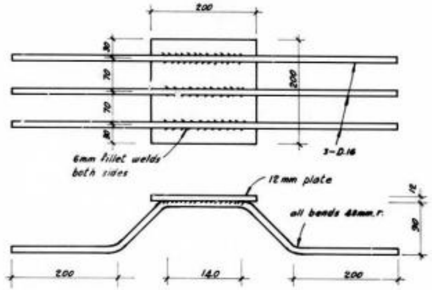
Original scale of millimetres 0 20 40 60 80 100

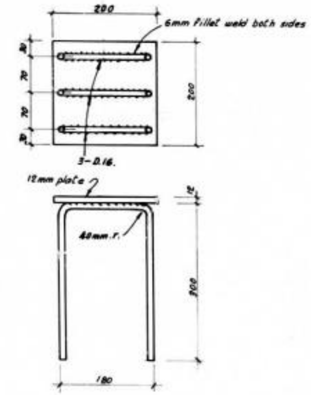
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29



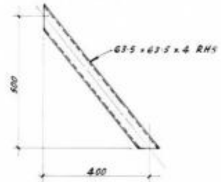
ELEVATION OF DIAGONAL BRACING
NORTH WALL
South wall similar
scale 1:50



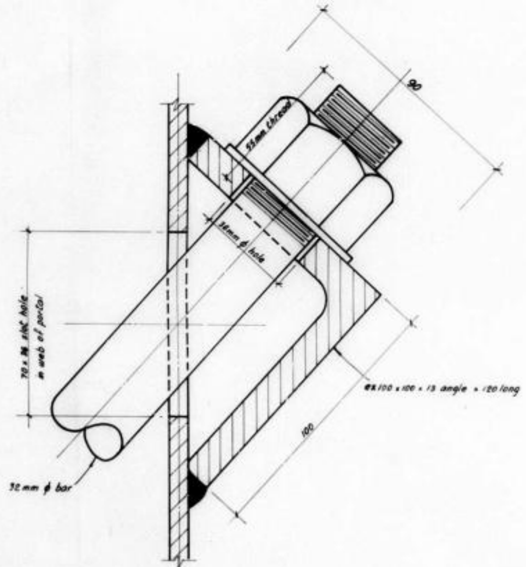
WELD PLATE - TYPE.21.-
10-OFF
scale 1:5



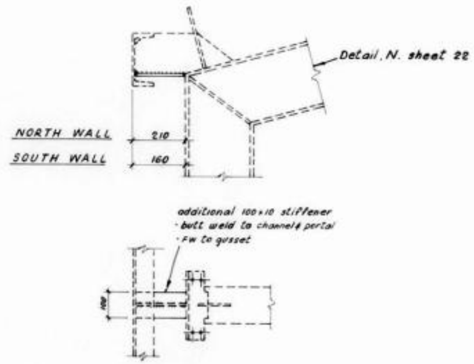
WELD PLATE - TYPE.20.-
10-OFF
scale 1:5



PANEL SUPPORTS
10-OFF
scale 1:10



DETAIL. A.
scale - full size.



ADDITIONAL STIFFENER TO DETAIL. N.
GRID LINES K & L ONLY
scale 1:10

Notes.
Refer to sheets 43 & 44

Service	Initials	Service	Initials		Amendments	Initials	Date
H.P. Water		Lands & Survey		A	Weld plate Type 19 now Type 21	A.E.B.	2/80
Sewer		Planning					
S.W. Drainage							
Gas							
Cables (M.E.D.)							
(P.O.)							

		Date
Designed	P. Rosie	12/79
Drawn	A.E. Bambridge	12/79
Traced		
Dwg. Chk.	P. Rosie	12/79
Des. Chk.		
Indexed	A.E.B.	1/80

Surveyed | Levelled | B.M. | Compiled from

Approved | Date | City Engineer

CHRISTCHURCH CITY COUNCIL — CITY E GINEER'S DEPARTMENT

NEW CENTRAL DEPOT - PLANT MAINTENANCE - STAGE 2 - JOHNSON ST -
DETAILS OF DIAGONAL BRACING ETC

Scales: 1:50, 1:5, 1:10

File No. BU/9/10
Issue A
D.2278
Sheet 49 of 49

Appendix C

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data V1.11

Location

Field	Value	Field	Value
Building Name:	Milton St Depot - Plant Maintenance Workshop	Reviewer:	David Whittaker
	Unit / No: / Street	CPEng No:	123089
Building Address:	245 Milton Street	Company:	Beca
Legal Description:		Company project number:	5323355
		Company phone number:	03 3663521
	Degrees / Min / Sec		
GPS south:		Date of submission:	
GPS east:		Inspection Date:	1/02/2012
		Revision:	
Building Unique Identifier (CCC):	BU 1411-002 EQ2	Is there a full report with this summary?	yes

Site

Field	Value	Field	Value
Site slope:	flat	Max retaining height (m):	0
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

Field	Value	Note	Field	Value
No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	0.00
Storeys below ground	0			
Foundation type:	other (describe)		if Foundation type is other, describe:	Shallow foundations assumed
Building height (m):	5.00		height from ground to level of uppermost seismic mass (for IEP only) (m):	4.5
Floor footprint area (approx):	545			
Age of Building (years):	32		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:	N/A
Use (upper floors):	commercial			
Use notes (if required):	Workshop and offices upstairs			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Field	Value	Field	Value
Gravity System:	frame system		
Roof:	steel framed	rafter type, purlin type and cladding	steel portal, timber purlins and profiled metal
Floors:	timber	joist depth and spacing (mm)	
Beams:	steel non-composite	beam and connector type	structural steel, welded
Columns:	structural steel	typical dimensions (mm x mm)	with concrete encasement on one side
Walls:	non-load bearing	0	

Lateral load resisting structure

Note: Define along and across in detailed report!

Field	Value		Field	Value
Lateral system along:	other (note)		describe system	Precast panels and steel cross bracing, with concrete frame mezzanine.
Ductility assumed, μ:	1.25			
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	other (note)		describe system	steel portal frames with concrete frame mezzanine
Ductility assumed, μ:	3.00			for governing concrete frame, 1.25 for portals
Period across:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

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

Non-structural elements

Field	Value	Field	Value
Stairs:	timber	describe supports	concrete wall adjacent
Wall cladding:	exposed structure	describe	concrete walls and glazing
Roof Cladding:	Metal	describe	corrugated iron
Glazing:	aluminium frames		
Ceilings:	light tiles		
Services(list):	lighting, roller door mechanical		

Available documentation

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

Damage

Site:
(refer DEE Table 4-2)

Field	Value	Field	Value
Site performance:	slight	Describe damage:	some liquefaction and pavement cracking
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	0-2 m²/100m³	notes (if applicable):	estimated from 24th Feb aerial photo
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	0-20mm/20m	notes (if applicable):	cracking to pavement observed
Damage to area:	slight	notes (if applicable):	

Building:

	Field	Value	Field	Value
	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	roof diaphragm not able to be seen
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	N/A
Non-structural:	Damage?:	no	Describe:	

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

Recommendations

	Field	Value		Field	Value
	Level of repair/strengthening required:	minor structural		Describe:	concrete wall crack repair
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:	35%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Forced-based quantitative assessment
	Assessed %NBS after:	35%			
Across	Assessed %NBS before:	70%	##### %NBS from IEP below		
	Assessed %NBS after:	70%			

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: 4.5m

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):	0.4	0.4
(%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):
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:

	along	across
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

	along	across
%NBS$_b$:	**#DIV/0!**	**#DIV/0!**

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

3.1. Plan Irregularity, factor A: 1

3.2. Vertical irregularity, Factor B: 1

3.3. Short columns, Factor C: 1

3.4. Pounding potential

Pounding effect D1, from Table to right
Height Difference effect D2, from Table to right

Therefore, Factor D: 0

3.5. Site Characteristics 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

	along	across
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!**

Official Use only:

Accepted By
Date:

Appendix D

Previous Reports and Assessments

city care

Project SHEET D

Description BU 1141-001 REQ2

Job No/File Ref

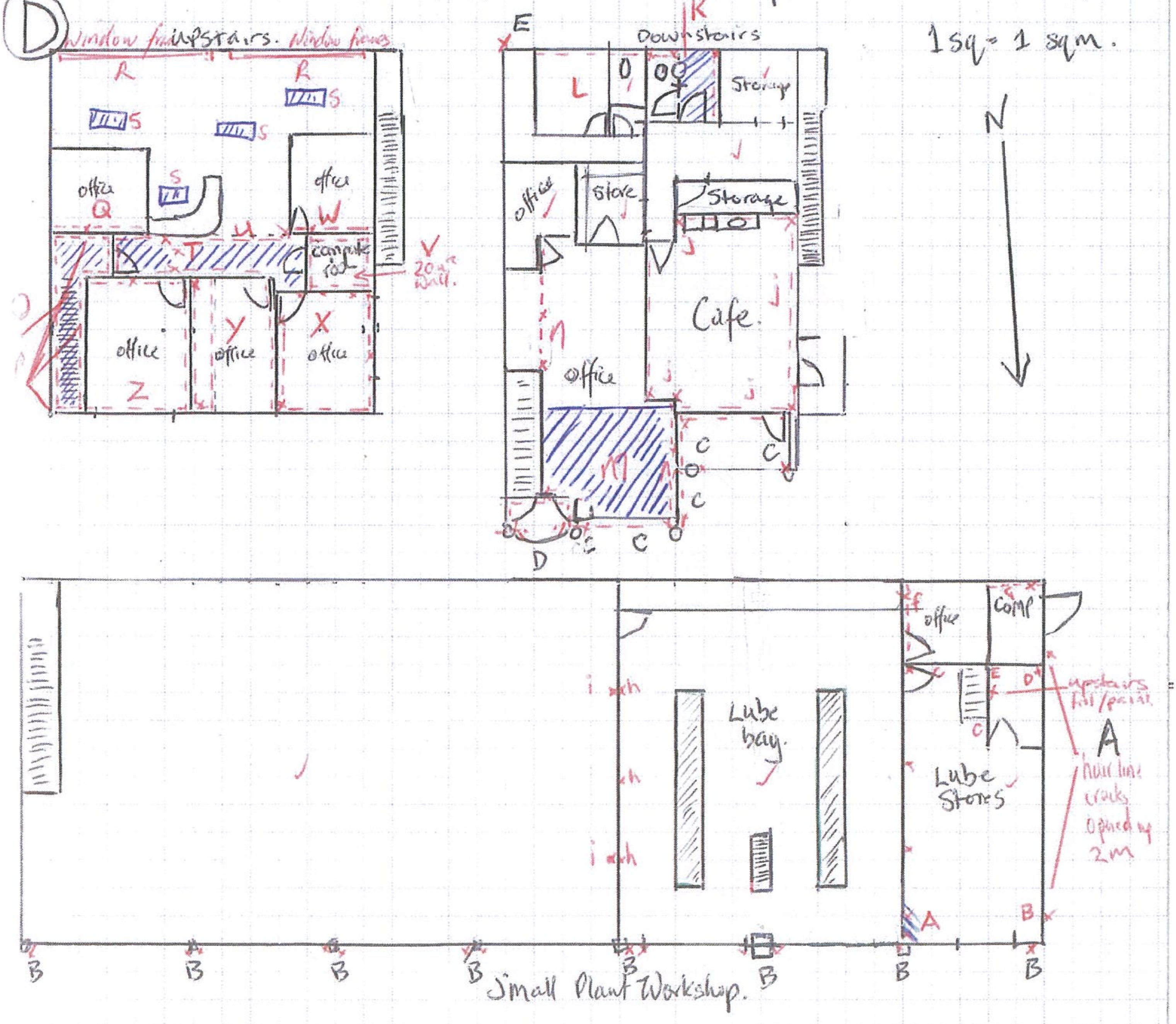
Prepared by

Date / /

Sheet No of

Site Instruction: ☐ Memo: ☐ Meeting: ☐ File Note: ☐ Variation / Detail: ☐

Fleet Services Workshops. 4.5



Approved Client Contractor

Date / / Date / /

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