AGENDA

RĀRANGI TAKE

NOTICE OF AN ORDINARY MEETING OF

COUNCIL

to be held on **Thursday, 26 November 2020** commencing at **1.00pm** in the Council Chambers, 36 Weld Street, Hokitika and via Zoom

Chairperson: His Worship the Mayor
Members: Cr Carruthers (Deputy)
Cr Davidson
Cr Hart
Cr Hartshorne
Cr Kennedy
Cr Keogan
Cr Martin
Cr Neale
Kw Tumahai
Kw Madgwick

In accordance with clause 25B of Schedule 7 of the Local Government Act 2002, members may attend the meeting by audio or audiovisual link.

Council Vision:

We work with the people of Westland to grow and protect our communities, our economy and our unique natural environment.

Purpose:

The Council is required to give effect to the purpose of local government as prescribed by section 10 of the Local Government Act 2002. That purpose is:

(a) To enable democratic local decision-making and action by, and on behalf of, communities; and

(b) To promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.

1. KARAKIA TĪMATANGA
OPENING KARAKIA

2. NGĀ WHAKAPAAHA
APOLOGIES

3. WHAKAPUAKITANGA WHAIPĀNGA
DECLARATIONS OF INTEREST

Members need to stand aside from decision-making when a conflict arises between their role as a Member of the Council and any private or other external interest they might have. This note is provided as a reminder to Members to review the matters on the agenda and assess and identify where they may have a pecuniary or other conflict of interest, or where there may be a perception of a conflict of interest.

If a member feels they do have a conflict of interest, they should publicly declare that at the start of the meeting or of the relevant item of business and refrain from participating in the discussion or voting on that item. If a member thinks they may have a conflict of interest, they can seek advice from the Chief Executive or the Group Manager: Corporate Services (preferably before the meeting). It is noted that while members can seek advice the final decision as to whether a conflict exists rests with the member.

4. NGĀ TAKE WHAWHATI TATA KĀORE I TE RĀRANGI TAKE
URGENT ITEMS NOT ON THE AGENDA

Section 46A of the Local Government Official Information and Meetings Act 1987 states:

(7) An item that is not on the agenda for a meeting may be dealt with at the meeting if –
(a) the local authority by resolution so decides, and
(b) the presiding member explains at the meeting at a time when it is open to the public, -
(i) the reason why the item is not on the agenda; and
(ii) the reason why the discussion of the item cannot be delayed until a subsequent meeting.
(7A) Where an item is not on the agenda for a meeting, -
(a) that item may be discussed at the meeting if –
(i) that item is a minor matter relating to the general business of the local authority; and
(ii) the presiding member explains at the beginning of the meeting, at a time when it is open to the

public, that the item will be discussed at the meeting; but
(b) No resolution, decision, or recommendation may be made in respect of that item except to refer that item to a subsequent meeting of the local authority for further discussion.

5. NGĀ MENETI O TE HUI KAUNIHERA
MINUTES OF MEETINGS

Minutes circulated separately via Microsoft Teams.

- **Ordinary Council Meeting Minutes - 22 October 2020**
- **Extraordinary Council Meeting Minutes – 2 November 2020**

6. ACTION LIST (Pages 5 - 7)

7. NGĀ TĀPAETANGA
PRESENTATIONS

- **Westland District Revaluation 2020**
  Gail Smits & Jeremy Clayton, Quotable Value (QV)

- **Westland Holdings Limited - Council Update November 2020**
  Joanne Conroy, Chair, Westland Holdings Limited

- **Westland Holdings Limited – Pensioner Housing Update Report** (Pages 8 - 57)
  Joanne Conroy, Chair, Westland Holdings Limited

8. PŪRONGO KAIMAHI
STAFF REPORTS

- **Financial Performance: October 2020** (Pages 58 - 71)
  Lesley Crichton, Group Manager: Corporate Services

- **Approval of Marks Road Local Purpose Reserve Fund – Community Portion** (Pages 72 - 74)
  Sarah Brown, Community Development Advisor

- **Approval of Marks Road Local Purpose Reserve Fund – Civil Defence Portion** (Pages 75 - 77)
  Sarah Brown, Community Development Advisor

- **Detailed Seismic Assessment – Westland District Council Offices, 36 Weld Street, Hokitika**
  (Pages 78 - 260)
  Louis Sparks, Group Manager: District Assets

9. KA MATATAPU TE WHAKATAUNGA I TE TŪMATANUI
RESOLUTION TO GO INTO PUBLIC EXCLUDED

(to consider and adopt confidential items)

Resolutions to exclude the public: Section 48, Local Government Official Information and Meetings Act 1987.

The general subject of the matters to be considered while the public are excluded, the reason for passing this resolution in relation to each matter and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of the resolution are as follows:

Item No.	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
1.	Confidential Minutes – 22 October 2020	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason or withholding exists. Section 48(1)(a)
3.	Contiguous Rating Adverse Possession	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason or withholding exists. Section 48(1)(a)

This resolution is made in reliance on sections 48(1)(a) and (d) of the Local Government Official Information and Meetings Act 1987 and the particular interests or interests protected by section 7 of that Act, which would be prejudiced by the holding of the relevant part of the proceedings of the meeting in public are as follows:

Item No.	Interest
1,3	Protect the privacy of natural persons, including that of deceased natural persons. (Section 7(2)(a)).
1	Protect information where the making available of the information: (ii) would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information (Section 7 (2)(b)(ii)).
1	Protect information which is subject to an obligation of confidence or which any person has been or could be compelled to provide under the authority of any enactment, where the making available of the information: (i) would be likely to prejudice the supply of similar information, or information from the same source, and it is in the public interest that such information should continue to be supplied (Section 7(2)(c)(i)).
1	Enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities (Section 7(2)(h)).
1	Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations). (Section 7(2)(i)).
1,3	Maintain legal professional privilege (Schedule 7(2)(g)).

DATE OF NEXT ORDINARY COUNCIL MEETING – 10 DECEMBER 2020
COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

Council Meetings - Action List

Date of Meeting	Item	Action	Completion Date/Target Date	Officer	Status
28.06.18	Kaniere School Students – Cycle trail	Council staff to get back to the Kaniere School Students regarding the proposal.	Oct 2020	DA	The signs for this crossing are currently in Transit and expected to be delivered within the next week and works to commence within 2 weeks On the location of the crossing itself, this has been specifically situated to provide the correct level of advanced warning while also achieving optimum advanced sign visibility to all motorists. Relocation of this crossing closer to the bridge intersection would compromise the effectiveness and safety of this setup. The crossing has been primarily provided for school children both on foot and on bikes.
04.04.19	Speed Limits	Extension of some limits and open conversation with road users on suitable speed limits.	Oct 2020	DA	Public consultation has been completed. DA staff are completing a report for Dec council meeting for endorsement.
18.04.19	Transfer of Pensioner Housing to Destination Westland	Strategy Document to be developed with a working group.	May 2020	CE	Reported to the Economic development Committee on the 29th Oct. Report to council to confirm direction due for November council meeting.
22.08.19	Fox Landfill	Council support staff in progressing their investigations into the engineering methodology, financial implications and funding mechanisms of the long-term options.	Sept 2020	GM DA	The PGF Funding application is supporting the relocation of the landfill material to Butlers Landfill plus funding to do a final sweep of Fox River for any visible remaining material has been successful. Glacier Guides has been contracted to complete the river clean up and completed 80% of the river area cleanup

Date of Meeting	**Item**	**Action**	**Completion Date/Target Date**	**Officer**	**Status**
					Consent applications for Butlers Cell construction and Fox landfill works are in progress. Landfill excavation works and material transfer tender: • Tender issued 16th November 2020 • Tenders Closes Mid Day 7th December 2020 • Tender award 16th December 2020: • Mobilisation and enabling works in 2-week period prior to Christmas • Contract Physical work to start on the 11th January 2021 and a 12 weeks works programme proposed.
28.11.19	Iwi representation around the Council table	Mayor to write to the Minister of Local Government seeking advice.	In progress	Mayor & CE	Response received from DIA. Further discussions to be completed on next steps.
27.08.20	Kaniere School Students – Cycle trail	Plan to be sent to Council. **24.09.20** – After discussion, Council requested the CE to review the plan to ensure all aspects/concerns raised have been covered.	Sept 2020	CE	Plans made available to council. Location of the crossing has been confirmed by district assets as the safest location.
22.10.20	Hokitika Waste Water Treatment Plant	Provide monthly updates to Council	On going	CE & LS	3 Waters Stimulus Funding Delivery Plan conditionally approved for the Hokitika WWTP feasibility work. More detailed milestones and costs to be submitted for approval. Stantec has been appointed to prepare a cost proposal and commence with the stakeholder engagement process.

Date of Meeting	Item	Action	Completion Date/Target Date	Officer	Status
22.10.20	Site Visit: Kaniere Cycle-way and link locations	Councilor site visit to be organized	Date to be set.	CE	Date set for the 19th November

Report to Council

DATE: 26 November 2020

TO: Mayor and Councillors

FROM: Joanne Conroy - Consultant

Pensioner Housing Strategy

1. Summary

1.1. The purpose of this report is to consider adoption of the attached draft Pensioner Housing Strategy.

1.2. This issue arises from the desire of Westland District Council and Destination Westland Limited to have a strategy to support the current and future management of pensioner housing in the District.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in May 2018, which are set out in the Long-Term Plan 2018-28. Refer page 2 of the agenda.

1.4. This report concludes by recommending that:

1.4.1 That the report be received.

1.4.2 That the option to transfer the pensioner housing asset and the balance of the associated depreciation reserve to Destination Westland Limited be consulted through the long-term plan consultation and engagement process.

1.4.3 That Council adopt the draft Pensioner Housing Strategy as attached.

2. Background

2.1. The reason the report has come before the Council is to give Council and Destination Westland Limited a guiding strategy when considering the best way to manage pensioner housing both now and into the future. Council sought proposals from a number of consultants to draft a strategy. Joanne Conroy was the successful consultant, and the strategy is attached for Council's consideration.

2.2. Council contracts Destination Westland Limited (DWL) to manage its Pensioner Housing portfolio, with Council retaining ownership. Destination Westland owns the Tudor Street property.
The scope of the strategy considered the following issues:

2.2.1 Is the current housing stock adequate both in number and design? If not, what can be done to improve it.

2.2.2 What should the assessment criteria be for eligibility for elderly housing with DWL?

2.2.3 Financial analysis – should rental income cover costs or should housing be subsidised? What level of rent is affordable for tenants?

2.2.4 If further units are required, what should they look like and where should they be?

2.2.5 How would any future developments be funded?

2.2.6 Are there any partnership options that could be explored?

2.2.7 Who should own the portfolio assets?

2.3 The Economic Development Committee considered the Draft Pensioner Housing Strategy at its meeting on 29 October 2020 and sought a number of changes to the original draft as follows:

Issue	Discussion	Outcome
Applicants should be allowed a reasonable level of assets	Even if a person has some money in the Bank, it may not be enough to provide good, safe housing.	Asset level increased to $100,000 for a single person and $150,000 for a couple in the eligibility criteria
Applicants should be allowed some income	Many pensioners will continue to work or may have assets that provided a minimal income.	Asset value increased to $50,000 per annum for a single person and $85,000 per annum for a couple
Rather than being established in the Westland, maybe they should have an association	That would enable people to come to live in retirement to be with family or friends	Amended to say applicants must have an association with Westland.
Any rental increases need to be over a longer period of time to ensure current tenants are not put under too much financial stress	Increases up to the point at which tenants are eligible for a rent subsidy will be paid from current income, usually a benefit.	Rents to increase over four years and be managed carefully to ensure tenants are receiving accommodation supplement if they are eligible.
As well as new developments, repurposing appropriate property should be considered	It may be quicker and cheaper to repurpose motels for example rather than build.	Repurposing included as an option.

2.4 The Committee discussed the transfer of the assets to DWL and was supportive of that proposal noting that the depreciation reserve should be used to upgrade the units in as soon as practical and that any unspent reserve should be transferred to DWL to continue upgrade work.

2.5 The Committee passed the following resolution (unconfirmed):

Moved Cr Keogan seconded Cr Davidson and ***Resolved*** *that*

2.5.1 The draft report from Joanne Conroy be received.

2.5.2 The Economic Development Committee support the transfer of the pensioner housing and the deprecation fund to Destination Westland.

2.5.3 As part of a report to Council, Joanne Conroy to investigate current opportunities of housing versus new builds for pensioner housing.

2.5.4 Consultation on the transfer to Destination Westland to take place through the LTP.

2.5.5 Some maintenance to take place to bring the current stock to a certain standard before transferring to Destination Westland. Operational maintenance is a cost to DWL whereas capital maintenance is currently funded by Council from depreciation reserves, it should be noted that if Capital maintenance is carried out before any transfer, this would reduce the reserves available to be transferred to DWL if the consultation on the transfer was recommended.

2.6 The Board of Destination Westland (excluding Joanne Conroy) also considered the draft strategy and will view the updated version attached, which they will consider at their meeting of 25 November 2020.

3. Current Situation

3.1 The draft strategy is attached as appendix 1. It contains the following recommended actions if it is adopted:

3.2 Introduce eligibility criteria.
Applicants must:

3.2.1 Be aged over 65 years. Applications will be accepted from applicants over 60 if they have special circumstances.
3.2.2 Be a New Zealand resident.
3.2.3 Be retired from full-time work.
3.2.4 Have assets of less than $100,000 for a single person and %150,000 for a couple, This includes the value of any major asset sold within 5 years of applying, and any asset held in the name of a Trust where the applicant is a beneficiary or settler.
3.2.5 Be capable of living independently.
3.2.6 Have an income of less than $50,000 per annum for a single applicant and $85,000 for a couple.
3.2.7 Have an association with Westland.
3.2.8 DWL to seek confirmation from waiting list that they meet the new criteria and include the criteria in application forms and have future applicants confirm in writing that they meet them.

3.3 Increase rents to market.

3.3.1 Gradually increase rents for current tenants of all units, except to 80% of market for Revell Street.
3.3.2 New tenants to commence at market rent.
3.3.3 Include education for current and future tenants about rent subsidies. Include a brochure and/or application form with their review or application documentation. Ensure employees fully understand how the subsidy works.

3.4 Transfer Assets to DWL
WDC to consult through the long term plan process on the transfer of the housing assets and associated depreciation reserve to DWL. The depreciation reserve could be used to carryout any capital maintenance before any transfer was carried out.

3.5 Upgrade Heating and ventilation
All units to have heat pumps, bathroom and kitchen ventilation and adequate ceiling insulation before the end of the 2020-2021 financial year. Seek approval from Council to amend expenditure of the capital funds allocated for this year to ensure all units have heat pumps and ventilation and are upgraded as much as possible. If funds allow, install double glazing into the Ross units first. If the depreciation reserve is transferred, it may facilitate double glazing in all units (except for Revell Street). However it should be noted that there may not be enough reserves to carryout all the capital works required, if the assets are then transferred this would become the responsibility of DWL.

3.6 Increase maintenance on existing units
As rents are increase, additional funds could be used to increase maintenance of the existing portfolio. Long term maintenance plans should be put in place so that priorities can be identified and implemented, and funds accumulated for high cost items over time.

3.7 Develop new units
DWL to fully investigate and implement a new housing development or repurposing property in or near the CBD.

- Development must at least break even, preferably with funding from LGFA.
- Include at least nine units.
- Most units to have a car port.

Once complete, the Revell Street tenants to transfer into these or other units, with any balance to be filled from the waiting list.

3.8 Sell excess land and source other funding options:
Revell Street site to be sold as a development block with proceeds reducing the overall debt for the project.

DWL to source other property holdings to identify redundant sites that could be sold to fund future housing developments.

DWL to continue to seek Government funding for housing developments.

3.9 DWL to further investigate partnership opportunities with Iwi
As the number of Maori in our communities' increases, it might be beneficial to have units specifically tagged for Kaumatua. For any future developments, detailed conversations should take place with Iwi to establish a way to achieve this.

3.10 Undertake further consultation in small communities to determine demand
Despite residents not choosing to participate in the survey, there is still anecdotal evidence that there is demand for pensioner housing in some of the smaller towns. DWL to liaise with the community associations to determine the extent of that demand, and if needed, how it can best be addressed.

3.11 Relationships with Social Agencies
DWL to continue to develop relationships with social agencies dealing with elder residents and community housing. This will ensure good sharing of information and the ability of all parties to deliver the best outcomes to customers.

3.12 Council to advocate and/or facilitate Retirement Village development
Council or its appointee to approach Retirement Village providers and advocate for the development of that style of housing in Hokitika. Council could attract development through re-zoning part of the old racecourse site and then leasing or selling it to an appropriate party.

Another option is to covenant some of the land at the racecourse for occupation by elderly residents so that a village-like neighbourhood is created without the need for external investment.

3.13 Council to consider drafting a strategy for "Age Friendliness"

4. Options

4.1 Option 1: Adopt the Pensioner Housing Strategy:

4.1.1 Adopt the Pensioner Housing Strategy as attached; or
4.1.2 Seek amendments to the strategy and adopt it subject to those changes; or
4.1.3 Not adopt the Pensioner Housing Strategy and the status quo to remain.

4.2 Option 2: Transfer of Pensioner Housing assets and associated depreciation fund to Destination Westland Limited:

4.2.1 Approve transfer of the assets and depreciation fund to Destination Westland Limited in principle and undertake consultation on the matter through the long-term plan process.
4.2.2 Not to approve the transfer.

5. Risk Analysis

5.1 Risk has been considered and the following risks have been identified:
Current tenants will be stressed and/or disadvantaged by proposed rent increases. This can be mitigated through good correspondence and education and ensuring the increases are gradual.

6 Health and Safety

6.1 Health and Safety has been considered and no items have been identified.

7 Significance and Engagement

7.1 The level of significance has been assessed as high because the pensioner housing assets are a strategic asset in councils significance and engagement policy. There will also be a lot of interest in the topic in the community.

7.2 Public consultation is necessary as under Local Government Act 2002 a change in ownership or control of a strategic asset must be provided for in a long term plan with associated consultation.

8 Assessment of Options (including Financial Considerations)

8.1 **Option 1:** Adopt the Pensioner Housing Strategy:

8.1.1 Adopt the Pensioner Housing Strategy as attached:

Advantages:

Will give Council and DWL guidance on management of pensioner housing now and into the future.

Disadvantages:

None identified.

8.1.2 Seek amendments to the strategy and adopt it subject to those changes:

Advantages:

Council may wish to propose changes to the strategy before adoption to ensure the contents meet with Council's policies and the community's needs.

Disadvantages:

None identified.

8.1.3 Not adopt the Pensioner Housing Strategy and the status quo to remain:

Advantages:

None Identified.

Disadvantages:

Council and DWL will not have a guiding document to help decisions regarding the current and future management of the housing portfolio.

8.2 **Option 2:** Transfer of Pensioner Housing assets and associated depreciation fund to Destination Westland Limited:

8.2.1 Approve transfer of the assets and depreciation fund to DWL in principle and undertake consultation on the matter through the long-term plan process.

Advantages:

Council will no longer have to contribute funds to the management of the portfolio, nor depreciation and upgrades, thus reducing rates.

Will improve DWL's balance sheet making investment in future housing more feasible.

Will enable DWL to decommission older units and use the land to either redevelop or sell to fund developments elsewhere.

Disadvantages:

Will reduce Council's balance sheet (value is less than 1%).

8.2.2 Not to approve the transfer.

Advantages:

Council's balance sheet will not be reduced.

Disadvantages:

Council will have to continue to contribute funds to the management of the portfolio in the form of a management fee, and funding of depreciation for capital expenditure, from rates.
DWL's balance sheet will remain as is making investment in future housing more difficult.
DWL will not be able to decommission older units and use the land to either redevelop or sell to fund developments elsewhere.

9 Preferred Option(s) and Reasons

9.1 Adopt the Pensioner Housing Strategy
The preferred option is Option 1.

9.1.1 The reason that Option 1 has been identified as the preferred option is that it provides a guiding document for the current and future management of the pensioner housing as intended by commissioning the strategy.

9.2 Transfer of Pensioner Housing assets and associated depreciation fund to Destination Westland Limited:
The preferred option is Option 1.

9.2.1 The reason that Option 1 has been identified as the preferred option is that it reduces the need for pensioner housing to be partly funded by rates and gives DWL better ability to fund future developments.

10 Recommendation(s)

A) That Council receive the report.

B) That Council approve the option to transfer the pensioner housing asset and the balance of the associated depreciation reserve to Destination Westland Limited is consulted through the long-term plan consultation and engagement process.

C) That Council adopt the draft Pensioner Housing Strategy as attached.

Joanne Conroy
Consultant

Appendix 1: Draft Pensioner Housing Strategy.

Joanne Conroy – Property Consultant

Pensioner Housing Analysis and Strategy

Prepared for:

Destination Westland Limited and Westland District Council

Prepared by:

Joanne Conroy – Property Consultant

Date: 21 October 2020

Table of Contents

Executive Summary

Older residents contribute to our communities with their wisdom and experience. They often volunteer and are strong supporters of charities. They fulfil and important role in strengthening families and social networks. "Every person should be allowed to age in security and with dignity and be in a position to contribute to society in the most meaningful way. Such an environment is at the root of stable, safe and just societies where all members, including vulnerable ones, enjoy equality of opportunities."[1]

Population predictions show that although the population in Westland is likely to remain static, the percentage of older residents will increase steadily over the coming years. Coupled with a reduction in home ownership, the demand for supported housing for our elderly residents will continue to increase.

Central Government does not provide housing specifically for elderly, rather allocating on the basis of need. However, for those with limited means, there are limited options. It is recommended Council, via Destination Westland, continue to provide pensioner housing and attempt to increase the number and quality of units.

The results from the survey undertaken to inform the strategy show that the priorities for current and prospective tenants are warmth, location and cost in that order. They don't want furnished units and most don't want gardens. There is a desire for more two-bedroomed options.

Where financial difficulties exist, some form of subsidy is needed. Offering rents at below market means that other ratepayers subsidise pensioner housing, regardless of their own situation. For tenants with limited means, an accommodation supplement is available from government agencies. This report concludes that Central Government should support elderly housing rents, not Local Government. The impact of rental increases can be lessened by implementing market rent over several years and a strong education programme so that residents are familiar with the financial assistance available to them

The introduction of eligibility criteria for future tenants is recommended to reduce demand and to ensure units are available for those most in need ahead of those with adequate assets and income. However, the level of assets and income does not need to be too low if market rent is charged.

Transferring ownership of the portfolio to Destination Westland will have little impact on Council's balance sheet and will reduce rates. This can only be beneficial for Destination Westland if the depreciation reserve is also transferred to facilitate some of the deferred maintenance required on the units. Ownership would strengthen Destination Westland's balance sheet and allow land to be sold as the older units are decommissioned.

The Revell Street units are becoming obsolete. It is recommended that a small development or repurposing be undertaken as soon as practical so that the tenants in Revell Street can be relocated to a new facility. The land can then be sold, and the proceeds put towards the cost of the new units. Such a development is only feasible with the contribution of land sales and very low interest loans. These loans are likely only available through the Local Government Funding Authority.Longer term, the development of units on a portion of the racecourse land is recommended if such a development is financially feasible. For those who are financially stable, retirement villages provide an excellent housing option and encouraging developers to

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[1] United Nations Economic Commission for Europe, Policy brief on "integration and participation of older persons in society" 2009. Website: https://www.unece.org/fileadmin/DAM/pau/_docs/age/2009/Policy_briefs/4-Policybrief_Participation_Eng.pdf

establish villages in Hokitika would be beneficial. It is recommended that Council set aside land at the racecourse to sell or lease for a retirement village.

Other recommendations include further investigation of partnerships with Iwi, determining demand for elderly housing in the smaller towns, and Council considering an “age-friendly” strategy.

Units at Revell Street

Introduction

It is important to retain elderly residents in our communities. They have life experience and resilience that they can pass on to others. They are an integral part of any family unit. Older citizens often fill volunteer roles and contribute more to charity than younger residents. If suitable housing options are not available, we will continue to lose these valuable members of our communities to the metropolitan centres.

Destination Westland Limited (DWL) is a Council Controlled Organisation (CCO) that is wholly owned by Westland Holdings Limited (WHL). WHL is wholly owned by Westland District Council (WDC).

WDC has contracted management of its pensioner housing portfolio to DWL. That includes management and maintenance of the current housing stock, tenanting, collecting rents, and the development of future housing if appropriate. WDC pays DWL a management fee for this contract and currently retains ownership of the majority of the housing stock. DWL pays for regular repairs and maintenance from the rental income received, and WDC pays for capital upgrades.

WDC owns most of the pensioner units, with the Tudor Street facility being owned by DWL.

Strategy Purpose

Housing is a key area through which social and economic well-being is influenced. Successful housing outcomes are as important to community well-being as the access to services and facilities. This strategy aims to provide direction for the future role of Destination Westland Limited and the Westland District Council in the provision of pensioner housing.

Demand for the current 56 pensioner housing units is increasing and there are few other options for Westland’s aging population. In the absence of any private or central government development of appropriate housing for seniors, provision by Council or its CCO’s is the only option to avoid local people having to move from the area to find housing.

The key issues for DWL and WDC to consider are as follows:

1. Is the current housing stock adequate both in number and design? If not, what can be done to improve it.
2. What should the assessment criteria be for eligibility for elderly housing with DWL?
3. Financial analysis – should rental income cover costs or should housing be subsidised? What level of rent is affordable for tenants?
4. If further units are required, what should they look like and where should they be?
5. How would any future developments be funded?
6. Are there any partnership options that could be explored?
7. Who should own the portfolio assets?

Strategy Aims

The aims of the strategy are to:

1. Provide direction for DWL regarding management of its current housing stock.
2. Provide options for future pensioner housing developments including style, location and funding.
3. Provide an understanding of other housing service providers and funding sources.
4. Inform DWL and WDC about the best ownership model for the portfolio.
5. Highlight any partnerships or advocacy for other types of elderly housing.

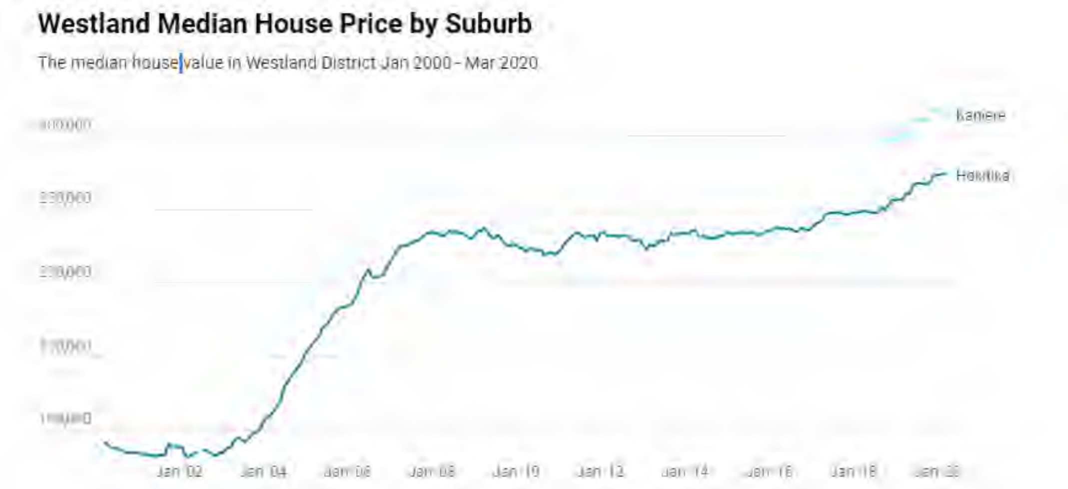
Units at Sewell Street

The Housing Environment

Home ownership and the rental market

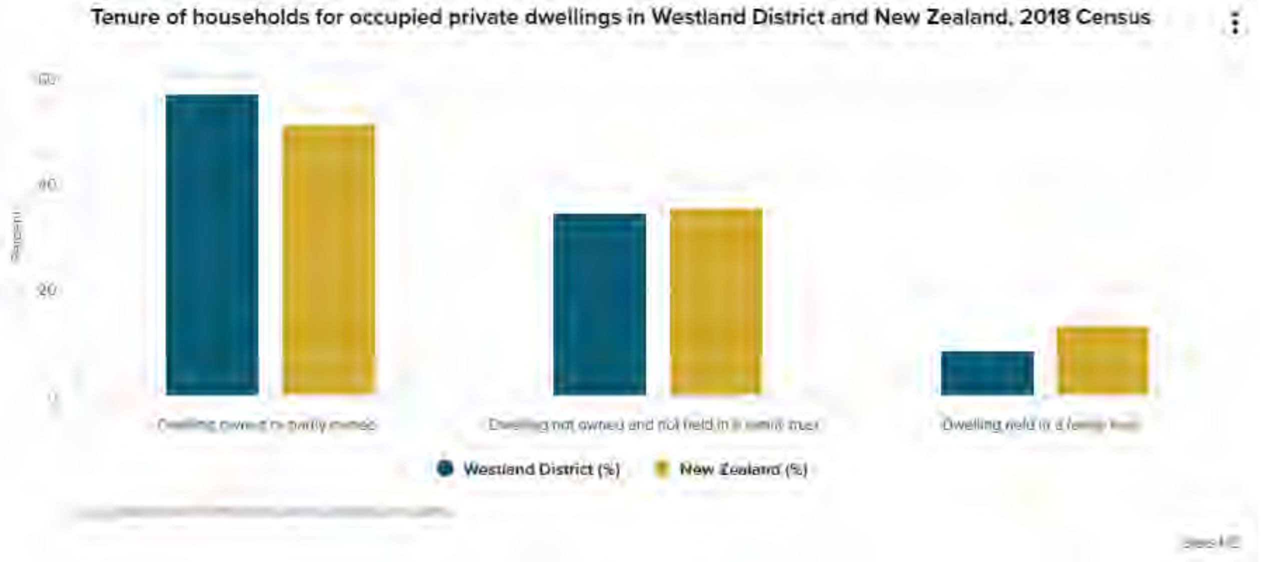
Throughout New Zealand, house prices are increasing. The mean house price in January 2020 in Hokitika was $274,700. Over the previous 12 months, prices in Hokitika increased 7.07%. Housing is still relatively affordable in Westland, but prices are increasing.

Figure 1 Westland Median House Price by Suburb 2000 – 2020[2]



New Zealand has traditionally had high home ownership rates, and that remains true for Hokitika and Westland with home ownership in 2018 at nearly 60% compared to around 50% for all of New Zealand. Home ownership is particularly high in the over 60's but reducing overall throughout New Zealand.

Figure 2 Tenure of housing in Westland – 2018 Census[3]



For people not owning their own homes, housing is challenging on the West Coast and particularly in Hokitika. According to Melina Theurillat of Property Brokers, the rental market is very tight in and around Hokitika with no more than 2-3 properties available for rent at any time. She estimates the market rent for a one-bedroom flat at around $250-$275 per week and currently rising due to the increasing demand. Most rental enquiries are from employees of Westland Milk Co although she does have enquiries from older residents.

She advised that rentals in the smaller towns are harder to fill, for example a house in Harihari can take as long as six months to fill.

State Housing

There are 41 Public Housing tenancies in Westland and a further 24 applicants on the Housing Register. Housing New Zealand does not hold houses specifically for older residents, prioritising by need and eligibility. Accommodation supplements are provided to 12,610 people throughout West Coast/Tasman District.

The Social Housing Reform Act (2013) provides a national framework for the provision for social housing via Housing New Zealand (Kainga Ora), community housing providers and Social Housing providers. The act is primarily administered by the Ministry of Social Development (MSD). Their plan promotes a "well-targeted and integrated support system" to ensure housing for the right people, in the right place for the right length of time at the right cost. The focus is strongly on metropolitan New Zealand and less on regional towns or rural areas.

Figure 3 MSD Social Housing Purchasing Strategy[4]

Neither MSD or Housing and Development (HUD) propose additional provision of public housing by Central Government in Westland. Rather, they support the establishment of the Income Related Rent Subsidies (IRRS) that can be paid to registered Community Housing Providers (CHP) and Kainga Ora. The subsidy is not available to Councils (although that may be reviewed in future). The IRRS is controlled by MSD.

For approved tenants, weekly rental is set at 25% of their income and the balance to market rent is paid by MSD as IRRS, to a maximum rent set by MSD. For Westland that maximum rent amount is $250 for one bedroom and $300 for two bedrooms.

MSD's Purchasing Intentions Report 2016 states that "an increasing proportion of social housing places will be provided by community housing providers" and notes that Kainga Ora focus will be to provide increased housing in metropolitan centres. The report notes the intention of MSD to reduce the number of IRRS places available in 3 and 4 bedroom properties in Westland District, and to maintain the number of 1 and 2 bedrooms properties.

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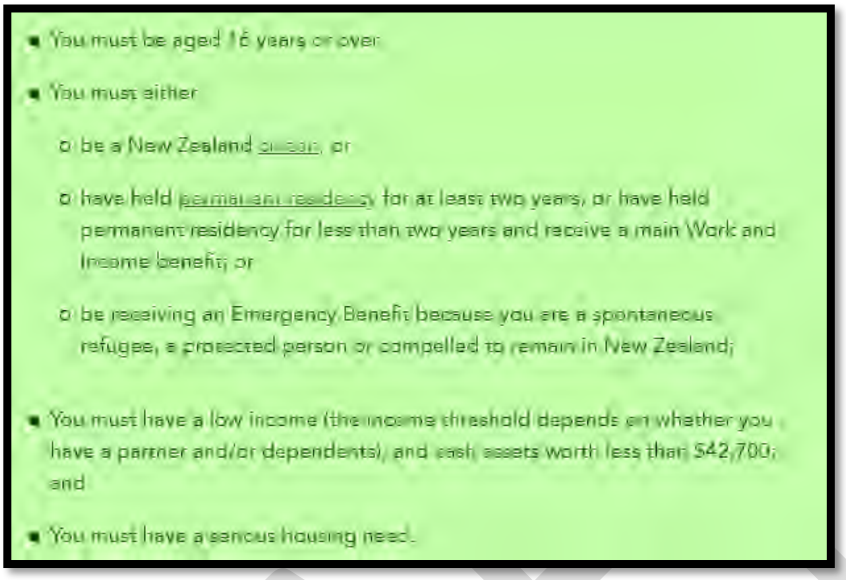
[2] OPES Partners, West Coast Property Market, Website: https://www.opespartners.co.nz/property-markets/west-coast

[3] Statistics NZ Website: https://www.stats.govt.nz/tools/2018-census-place-summaries/westland-district

[4] Ministry of Social Development, Social Housing Purchasing Strategy of Income Related Rent Subsidies, 2016, Website: https://www.msd.govt.nz/documents/about-msd-and-our-work/work-programmes/housing/2016/purchasing-strategy-final.pdf

To be eligible for social housing, clients must meet the following criteria:

Figure 4 Eligibility Criteria for Social Housing[5]



- You must be aged 16 years or over
- You must either
  - be a New Zealand citizen, or
  - have held permanent residency for at least two years, or have held permanent residency for less than two years and receive a main Work and Income benefit; or
  - be receiving an Emergency Benefit because you are a spontaneous refugee, a protected person or compelled to remain in New Zealand;
- You must have a low income (the income threshold depends on whether you have a partner and/or dependents), and cash assets worth less than $42,700; and
- You must have a serious housing need.

We understand that generally only around 20% of pensioners are eligible for IRRS.

People with low income and assets able to apply for an accommodation supplement from Work and Income New Zealand. The supplement amount varies depending on the location and rent paid.

Hokitika is categorised as "area 3" which means the maximum supplement payable for a single person living alone is $80 per week. Elsewhere in Westland the maximum is $70 per week. People with assets below $8,100 for a single person or $16,200 for a couple. Those being paid national superannuation only would be eligible, with the amount depending on the level of rent paid. For example, no supplement would be payable for rents below $150 per week, and the maximum would be paid for rents of around $350 per week.

Provision of Elderly Housing by Councils

Around 60 Local Authorities in New Zealand provide some form of public housing, although an increasing number are transferring their housing stock to community housing providers. In New Zealand in 2017 there were 11,800 social units let by Councils, 62,500 by Kainga Ora and 8000 with NGO's.

Most Councils charge below market rental and do not adequately allow for depreciation. Generally, ratepayers contribute towards pensioner housing for operating costs, capital costs or both. Most Council's apply some type of eligibility criteria so that only clients with low income and assets are eligible for Council housing.

Westland District pensioner housing is available for everyone regardless of their financial situation. It means that a person can choose to sell their family home and invest or divest the funds, then live in housing subsidised by other residents.

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[5] Citizen's Advice Bureau, "Who is eligible for Government-subsidised housing" Website: https://www.cab.org.nz/article/KB00001394

Community Housing Providers

Not for profit community housing providers (CHP) are becoming more common. They are strictly regulated with rigid criteria to become a CHP, then ongoing monitoring. The regulations result in best practise and a strong focus on tenant outcomes.

The Director of Community Housing Aotearoa, Scott Figenshow believes that CHP's are most appropriate where there is an economy of scale, and where most households would be eligible for IRRS. For smaller portfolios, for example less that around 100 units, he suggests partnering with an approved CHP, particularly to begin with. The criteria to attain and retain CHP status is quite rigorous for small providers.

Kainga Ora record five CHP's in the West Coast Tasman District providing 45 houses in total. The CHP's are:

- The Salvation Army New Zealand Trust
- The Nelson Tasman Housing Trust
- Christchurch Methodist Central Mission
- Habitat for Humanity NZ Ltd

These organisations are not currently operating in Westland.

Retirement Villages

Retirement Villages are increasingly popular in New Zealand, especially in the larger towns and most particularly in the North Island. They can be developed and operated by non-profit entities, but most are run by for-profit Companies such as Ryman, Metlifecare and Summerset.

The spread throughout New Zealand is shown below:

Figure 5 Location of Retirement Villages in New Zealand[6]

Most retirement villages offer a "licence to occupy" (LTO) for an independent dwelling. There is an upfront cost to "purchase" an LTO, then weekly or monthly fees to cover costs including grounds maintenance, rates, insurance, activities, common areas etc. Deferred maintenance costs accrue during occupation and are deducted from the sale of the LTO when the retiree departs. Most are around 25-30% of the value of the LTO. Most operators retain any capital gains that might be realised from on-selling the LTO.

This style of accommodation is attractive to relatively fit and healthy retirees who can fund the LTO through the sale of the family home. Often, a rest home is located on site for residents to progress into as their health deteriorates.

Residents in retirement villages tend to be aged 75 plus years. Based on population growth statistics, there will be up to 12% increased demand for retirement villages for this age group. This suggests potential demand on the West Coast for around two new villages over the next 10 years (assumptions based on Jones Lang LaSalle, 2014).

Unfortunately, there are currently no retirement villages on the West Coast, and residents wanting that style of accommodation will have to leave the area.

Abbeyfield

Abbeyfield is a charitable trust that operate a unique style of elderly housing. Each resident has their own ensuited bedroom and they are expected to be reasonable independent, not requiring assisting with dressing, showering, medication etc. Residents are provided with two cooked meals each day in a central dining area.

Figure 6 Location of Abbeyfield Villages[7]

There is no capital cost and places are allocated on the basis of need and suitability. Preference is given to those with no or few assets. The assessment criteria are as follows:

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[6] Retirement Village Association Membership Villages, Website: https://www.google.com/maps/d/viewer?mid=1DlYy30XmppPFl0tFR7fZCLdk4Is&ll=-41.055613912701745%2C173.03205049999997&z=6

[7] Abbeyfield, Website: https://www.abbeyfield.co.nz/find-a-house/

- Aged 65 and over.
- Generally mobile.
- Enjoy reasonable health.
- Are clear mentally.
- Able to care for yourself independently.
- Can maintain your own medication routines.
- Can live flexibly with others, sharing meals and common living areas.
- Ideally have ties to the community where the house is located.

Abbeyfield are currently working to build a new house in Greymouth. It would cater for 12 residents and Hokitika residents would be eligible to apply for space. Council provided the land to Abbeyfield free of charge. However, they are struggling to raise funding. They can use debt funding but have to raise between $500,000 and $1,000,000 cash to fund the project.

The Chief Executive, Susan Jenkins, advised that Abbeyfield would consider building a house in Hokitika if there was interest. Projects are driven by the local community and only get started if there is sufficient demand and potential funding. Gifted land helps make the project viable.

It is interesting to note a house was proposed in Westport some years ago, but funding could not be secured, and it has been cancelled.

Rest Homes

Rest homes are suitable for people who are not able to live independently. They are usually provided by private organisations and accommodation costs are generally subsidised by Central Government.

The only rest home in Hokitika is "Ultimate Care Allen Bryant". Elderly people are assessed as unable to live independently to be eligible for rest home care, or they can opt to pay for care themselves. The facility also caters for hospital care patients. There are currently vacancies.

Other rest home facilities are located in Greymouth.

This report does not recommend any investment in rest homes by DWL or WDC because it is a specialised and regulated area that is filled by private suppliers. However, Council provision of suitable land might attract future investment and DWL may have an advocacy role in attracting such investment in the region.

Overview of current stock

Destination Westland and Westland District Council own a total of 56 pensioner flats, 52 in Hokitika and four in Ross. Each of the sites is discussed in detail in appendix one, noting that inspections were external only.

Although the units are a little dated, 88% of survey respondents who are currently tenants rated their units as excellent or adequate. Only 2% rated their condition as poor.

Most of the units are single bedroomed. Only four are occupied by couples and the balance by singles.

Current rents are between $200 and $440 per fortnight, with the mean rent being $248 per fortnight or $126 per week. Rents are currently well below market. DWL has a policy of rents being set at 80% of market but many have not yet been increased to that level.

In the 2020-2021 year, a total of $121,000 has been allocated by WDC to DWL to upgrade the units including heating, double glazing and bathrooms. We suggest approval be sought to reallocate the funds to ensure all the units have a heat pump and extraction fans in the kitchens and bathrooms. There should be sufficient funds to double glaze the units in Ross which are the most modern in the pool.

Neira Doig, Resident at 97 Tancred Street.

The only pensioner units in the smaller settlements are in Ross. Anecdotally, there is demand in other small settlements, but this was not shown through the survey nor supported by the rental agency spoken to. More consultation is needed in these towns to determine if there is need and if so, how to best address it.

Current Financials

WDC contracts DWL to manage the Pensioner Housing Portfolio. DWL advise the following figures were achieved for the 19/20 year:

Income	$361,560
Direct Expenses	$174,419
Management Fee	$141,102
Depreciation	$ 28,657
Profit	$17,382 or 4.8%

If more regular maintenance is undertaken to improve the quality of the units, the profit would quickly diminish. Depreciation is for the Tudor Street units owned by DWL and some upgrade elements in the other units paid for by DWL.

Council contributed the following amounts for pensioner/social housing in 19/20:

Management fee	$ 63,636
Depreciation	$165,686
Total	$229,322

Since the 18/19 year WDC has been accumulating depreciation as cash to pay for future upgrades, with the balance of that fund was $109,000 at 30 June 2020.

Proposed Budget for Current Portfolio

If rents are increased to market over say four years, then substantially more funds would be available for maintenance and improvements.

Hypothetical budget for 2025:

Income	$695,760
Direct Expenses	$200,000
Management Fee	$180,000
Depreciation	$225,000
Upgrades	$ 65,000
Profit	$ 25,760

The effect of current and future demographics

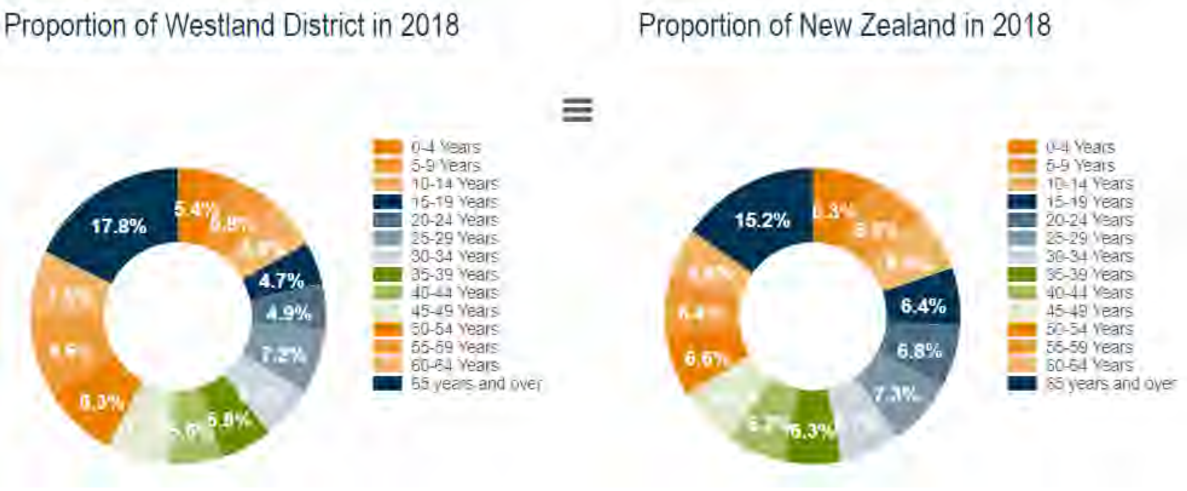
The 2018 population of Westland was 8640. It is projected to remain reasonable static through to 2043.

Figure 7 Westland Project Population 2013 – 2043[8]

Figure 5 provides the High, Medium and Low scenarios produced by Statistics New Zealand's population projections. Medium scenarios are accepted for policy making as the most likely scenario for projecting population.

In 2013, approximately 17.8% of the population was 65 or over compared to 15.2% for all of New Zealand and 15.5% in Westland. A further 24.3% of Westland residents were in the 50-64 age bracket in 2018. The median age for Westland in 2016 was 42.8 compared to the average for New Zealand at 38.

Figure 8. Population ages groups Westland and New Zealand [9]



New Zealand's population is aging, and in Westland that trend is greater.

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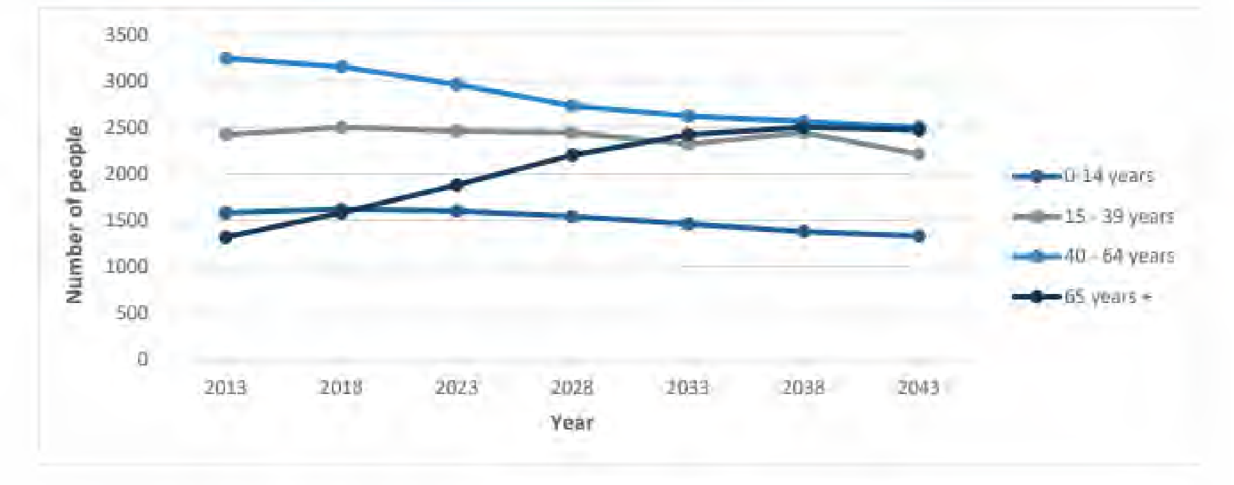
[8] Summary Westland District Council Environmental Scan 2019-2020, Website: https://www.westlanddc.govt.nz/sites/default/files/Final%20Summary%20Westland%20District%20Council%20Environmental%20Scan%202019.pdf

[9] Infometrics, Community Profile,Website: http://community.infometrics.co.nz/west%20coast%20region/Profile/Age

Figure 9 Westland Population by broad age group 2013 – 2043[10]



A range of population growth statistics are available with all predicting static population growth but increased numbers of residents in the 65 plus age group.

As the population of older residents increases, demand for aged care services, including appropriate housing, will increase.

Around 3.8% of people aged 65 and over are currently tenants of Council/DWL pensioner units. A further 4.5% are registered on the waiting list so a total of 8.3% of over 65's are currently or wish to be living in Council/DWL pensioner housing.

If we use the figure of 3.3% per annum being the projected growth in number of residents over 65, that would be 1741 by 2026. Assuming the same percentage are seeking housing assistance, that would be equivalent to 144 people.

This supports the need to increase the pool of available pensioner housing.

Another challenge is that 59% of the population live rurally in Westland rather than in the urban centres and consideration needs to be given to whether additional pensioner housing is provided in the rural towns (Ross, Harihari, Franz Joseph, Fox, Whataroa, Haast).

South Westland residents were invited to participate in a survey about the future provision of pensioner housing (see below). No residents participated in the survey.

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[10] Summary Westland District Council Environmental Scan 2019-2020, Website: https://www.westlanddc.govt.nz/sites/default/files/Final%20Summary%20Westland%20District%20Council%20Environmental%20Scan%202019.pdf

Survey findings

A survey form was sent to current tenants, those on the waiting list and other older residents seeking clarity about what people want from housing as they age. 38 responses were received.

When asked what the most important things were when considering elderly housing options, the three most important factors were warmth, location and cost in that order. Only 28% of survey respondents receive a rent subsidy from the government and many did not know what it was. It is likely that more would be eligible but don't know to ask.

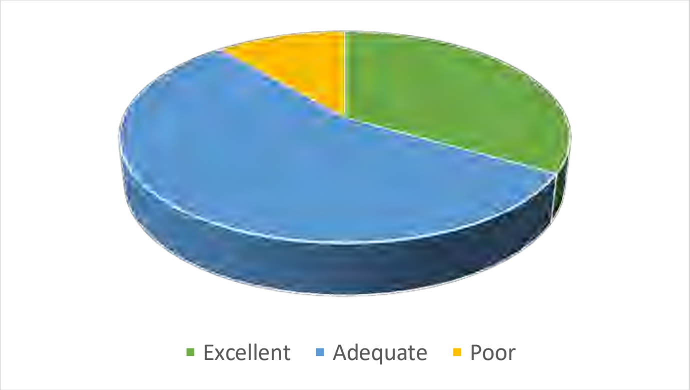
A surprising number of respondents would prefer two bedroom units and most are looking for car parks. Most people would prefer to live in the CBD, with the second most popular option being "anywhere".

An advertisement was placed in the South Westland newsletter "The Community Contact" asking residents who were interest in participating in the survey to phone or email. No-one asked to complete the survey.

A copy of the survey is attached as appendix 3.

Q1. Are you a current tenant?

Q2. If so, how do you rate your unit?



Respondents commented that they would like a heat pump, double glazing and kitchen extract fan. They also noted the need for a garage and somewhere to store their scooter.

Other comments include that the flats are old and inadequate, and poorly maintained.

One respondent noted she had been a tenant for 16-17 years and was quite satisfied.

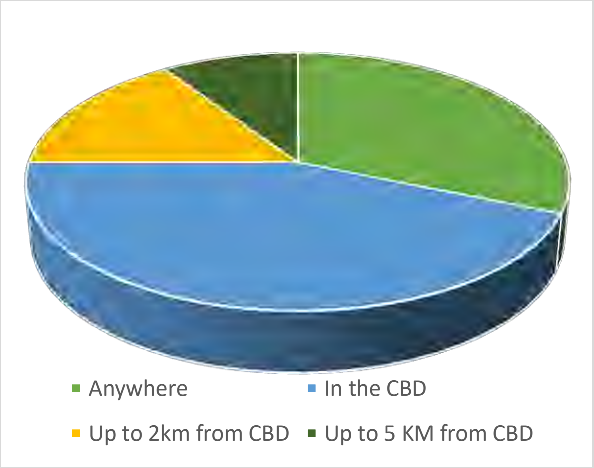
Q3. Is your rent subsidised?

Many respondents either didn't understand this question or weren't even aware that a subsidy was available.

Q4. Do you want to move into a Destination Westland flat?

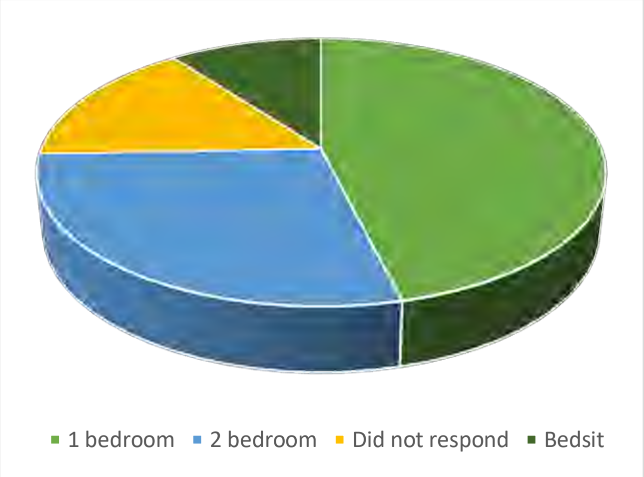
18 respondents confirmed their wish to move into a flat within the next five years.

Q5. Where would you like to live?



While most respondents would prefer to live within the CBD, many would be happy further afield. One respondent noted they would prefer to live in Ross.

Q6. What style of unit would you prefer?



Q7. Do you need your unit to have accessibility?

It appears many misunderstood this question – 21 answered no and the same number answered yes. The "yes" responses seem higher than they should be. However, some would genuinely require accessibility and therefore any future developments need to take that into account.

Q8. Would you prefer the unit to be furnished?

Only 6% of respondents would prefer a furnished unit.

Q9. Would you like an area of garden to tend?

Approximately 30% of respondents would like a garden area, with the remaining 70% not wanting to do any gardening.

Q10. Do you require a car park?

58% of respondents require a car park for their unit.

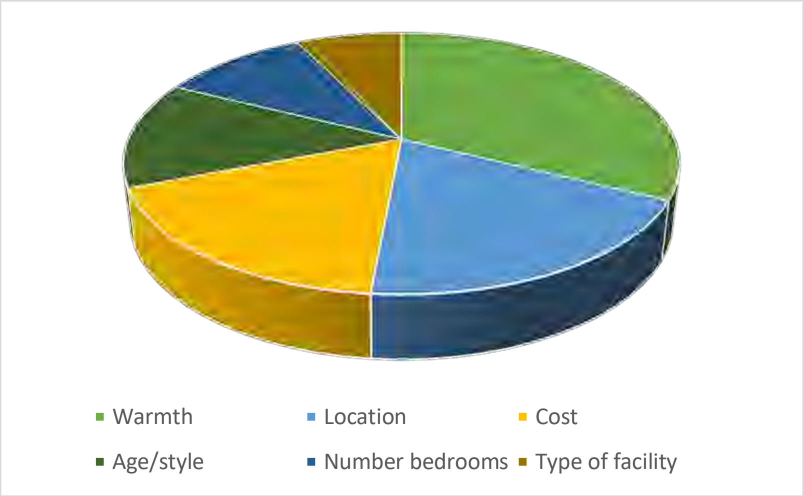
Q11. What style of property would you prefer?

An equal number of people who had a preference would prefer to live in a stand-alone house or had no preference. 11% would prefer living in a unit with people of a similar age, and 9% would prefer a unit with people of mixed ages.

Q12. What type of assistance do you require for your day to day living?

The most common response was gardening, home maintenance and cleaning.

Q13. What factor is the most important to you when considering future housing?



Respondents were most concerned about having a warm home, and then where it was located. The third area of concern was cost.

Summary

Unfortunately, there wasn't a great response to the survey which we estimate to have reached around 300 people. However, there are a number of things we have learned:

a) Not many residents receive Central Government rental subsidy, and many did not realise assistance is available. This will be passed on to Age Concern to see if they can educate residents about this option.
b) The issue most respondents were concerned about is a warm home, followed by location and then cost. It seems that people would be prepared to pay more for the right home.
c) The majority of residents do not want furniture or a garden.
d) Most respondents want a car park.
e) Most people want to live in town, but many would consider any option including a little more remote.
f) Many respondents would like the option of a two-bedroom unit. We are unsure if they realised it would likely cost more.
g) Current tenants are generally satisfied with their units and upgrading heating and ventilation would improve the units.

Partnership with Iwi

Māori are disproportionately represented on state housing waiting lists in New Zealand. They are more likely to live in housing of poor condition compared with the rest of the population. Māori are also less likely than non-Māori to own their own house.

Màori represented 14.4% of the population of Westland in 2018 compared to 12.6% in 2013. Increasing Màori population is reflected throughout New Zealand and predictions are that the percentage will continue to grow.

DWL does not currently have any eligibility criteria, and while the establishment of one is proposed in this strategy, racial preference is not recommended.

In discussing the need for housing allocation for kaumatua, Francois Tumahai and Paul Madgwick noted that there is a developing need. An option might be for Iwi to contribute funding towards a small number of units within future developments that are to be held for kaumatua. This merits further discussion.

Viata Reeves, Sewell Street Units

Asset Ownership

Currently, most of the assets belong to Westland District Council and management is contracted to DWL. Is that the correct ownership model?

a) Status Quo (Council retains ownership)

Benefits to DWL:

- Council pays a management fee of approximately $63,000 per annum.
- Council is responsible for the capital upgrades and deferred maintenance of the units.

Benefits to WDC

- Impact on balance sheet (less than 1% of current assets).
- Council has full control of the assets.

b) Transfer Assets to DWL

Benefits to DWL

- Strengthen balance sheet.
- Ability to sell land to fund future developments.

Benefits to WDC

- Reduce costs and therefore rates (no depreciation or management fee). $229,322 cost in 2019-2020.

The risk in DWL taking ownership of the current housing stock is the cost of capital improvements and deferred maintenance, particularly because of the requirement to meet healthy homes standards. If Council's depreciation reserve is transferred along with the assets, or used in the meantime to improve the condition of the properties. The funding would ensure that healthy homes upgrades could be completed and some of the most urgent deferred maintenance undertaken. Without that funding DWL would face significant deficits in the housing portfolio over several years.

Owning the properties would mean that as new stock is developed, some of the older stock could be decommissioned and the land sold to reduce debt of help fund future developments. Council might make that reinvestment a condition of transfer to give the public some comfort that the transfer results in public benefit.

The effect of transferring the asset has little impact on Council's balance sheet as the value is less than 1% of the total Council assets. Even with the transfer of the depreciation reserve, Council, and therefore ratepayers, benefit because there would be no future requirement to fund management of upgrades of the units.

Transfer of the assets would require public consultation or inclusion in the upcoming long-term plan.

Strategic Principles and Vision

Westland District Council does not have a policy in relation to older persons or elderly housing but the Long Term Plan 2018 to 2028 (LTP) notes that Council has historically provided low cost housing for a small number of elderly. It states that "the provision of social housing with smaller accommodation units and little outdoor maintenance requirements, make it possible for the elderly to remain independent for longer."

The rationale for financing this activity are noted as:

Public benefits	The District as a whole benefits from the knowledge that pensioners on low incomes are housed in reasonable accommodation locally. The need to travel out of the District to visit elderly family or friends is decreased.
Private benefits	Tenants provided with housing are the prime beneficiaries.

The key issues are detailed in the LTP:

- The demand for this service is disproportionate to the ever-increasing aged population in Westland.
- In 10 years the elderly housing assets will only be able to cater for 3% of persons aged 65 and over in Westland.
- Current rental income levels are insufficient to maintain and sustain this activity and rent will be increased from 1 July to an average price of 80% of market value.

It is evident that Council views the provision of elderly housing as a valuable contributor to a healthy community. The question is how the services is best provided and funded and by whom, both now and into the future.

Principles

Establishing a number of principles will facilitate the future direction for the provision of pensioner housing:

- Elderly residents are a critical sector of our community.
- Elderly housing should be warm, easily accessible, one or two bedrooms and close to the CBD.
- Council, CCO's or Community Housing Providers are the only organisation currently providing such housing specifically for the elderly population and that is unlikely to change in the foreseeable future.
- Additional and replacement units are required now and into the future.
- Partnerships may help with the provision of elderly housing.
- The provision of elderly housing should be self-funding.
- Maintaining depreciation reserves will ensure adequate funding for future upgrades.

Goals

a) Improve the quality of the current housing stock

Most current residents who responded to the survey are happy with their homes. Given people generally see a warm home as their greatest priority, and to address the requirements of the healthy homes legislation, all units should have heat pumps and kitchen and bathroom extract fans installed asap. If ceiling insulation hasn't been checked, this should be done as well and refreshed as required.

Going forward depreciation should be set aside as a sinking fund to be used for future upgrades, particularly for any new developments. As rents increase, more funding will be available to upgrade the older units.

A plan should be established to decommission some of the older units starting with Revell Street.

b) Develop new units

Demand certainly justifies the development of new units. However, it seems that it can only be financially viable if low interest funding can be obtained, most likely through the Local Government Funding Authority. Providing a deposit through the sale of other land would also help.

One or two units within each development could have two-bedrooms and they do not all need to have a car port. Development should be within the CBD or nearby.

New developments should only be undertaken where the subsequent expenses can be met by the income.

Repurposing other properties such as motels should be considered where future income streams support the required investment.

Further discussion should be had with Iwi regarding a small proportion of units being set aside for kaumatua.

Further investigation is needed to establish demand in the small settlements.

c) Review the eligibility criteria to reduce demand

There are currently no criteria for potential tenants apart from being over 65. That means that anyone is eligible for pensioner housing regardless of the level of assets or income they have. That is particularly unfair if housing is subsidised by ratepayers, many of whom have low income and assets.

Adopting eligibility criteria ensures that pensioner housing is provided only to those with greatest need and will help reduce demand for subsidised housing. However, it is recommended that the level of assets and income be set relatively high given that market rent is to be charged.

d) Ensure pensioner housing is not subsidised by other ratepayers.

Ideally the pensioner housing portfolio should be self-sustaining, including setting aside funds for future maintenance/depreciation.

If rents are not adequate to cover costs including depreciation, then there will need to be some form of subsidy. It is unreasonable to put that burden onto other ratepayers.

Market rent is the amount a landlord might reasonably expect to receive, and a tenant might reasonably expect to pay, for a tenancy. It needs to be similar to the rent charged for similar properties in similar areas.

The only fair way to set rents is at market level. The rents are currently well below market and the increases would be significant. Increases would have to take into account the vulnerability of the tenants and be introduced over up to four years to soften the effect. Additional income could be used to increase maintenance on the units and upgrade them to negate obsolescence.

Rent for the Revell Street flats should be moved to 80% of market to reflect their age and condition.

If individual tenants find the rent costs too high, they can investigate whether they are eligible for a rent subsidy from Central Government. It is likely that applicants and current tenants will need education about the rent subsidy and assistance in applying for it.

e) Further investigate partnership options

It would be beneficial to further investigate a partnership with Iwi to establish some units specifically for kaumatua. This would require some financial contribution by Iwi.

Retirement villages offer an ideal choice for those residents wanting to downsize the family home. They also provide safety, companionship, and reduction in the burdens of home ownership (maintenance, gardening etc). Many include a rest home so that transition is easy for residents.

Retirement villages are primarily provided by for-profit organisations and therefore demand, and profitability must be present. Council could play a pivotal role in negotiating with providers and the public to advocate for this type of housing.

Such a development would require a suitable site. A portion of the old racecourse land could be set aside for sale or lease to an appropriate retirement village development.

f) Ensure that elderly residents are catered for in our community

DWL currently keep other social agencies informed of future developments, vacancies and changes in policies. A close relationship means they in turn, can keep DWL up to date with trends and information they have. These relationships are important and should continue.

Council may wish to draft a policy to ensure the needs of that sector of the community is well catered for and taken into account for projects that may have an impact on their independence.

Future Development Options

The benefits of developing further elderly housing are as follows:

- Some of the older stock could be exited.
- Reduction in maintenance and upgrade costs.
- Healthier homes for our most vulnerable residents.
- People may stay in Hokitika rather than moving elsewhere in the region or New Zealand.
- As people move out of their current homes, the pool of available housing will increase.
- Repurposing other property might provide a quick and easy way of increasing stock although no options for that are considered in this report.

Assumptions:

In assessing the development and operating costs a number of assumptions have been made:

- The developments were assessed based on one-bedroom units, each with a car port. We note from the survey that many residents would prefer a two-bedroom unit and as it seems many residents would pay more, that option should be looked at during detailed design.
- Fit-out would include floor coverings, carpet, light fittings, laundry tub, bathrooms, kitchen, electric range and range hood and a heat pump.
- Trading bank loans at 5% interest repaid over 30 years.
- LGFA loans at 2% interest repaid over 30 years.
- Cash depreciation reserve or 1% per annum set aside as sinking fund. Depreciation to be accrued would be 1.5%.
- Budgets are based on cash rather than accrual accounting.

DWL undertook a development proposal for Kaniere road in early 2020 including drafting house plans, a site plan and having the development costed. This information provides a good basis for assessing the other potential development opportunities shown below.

These development examples are based on some identified vacant and development sites. These sites have not been examined in depth. They are used for hypothetical development and operating budgets. The sites may not actually be feasible for any number of reasons, and other sites may be identified as more practical.

Prior to any development, further financial analysis would need to be undertaken. If the development is not financially sustainable, then it shouldn't be undertaken.

Planning considerations

The Westland District Council District plan sets the development rules for residential zoned land. The rules that most effect the development of new pensioner housing are the requirement for set-backs, height restrictions, and the need for each housing allotment to be on 300 square metres of land.

Resource Consent will be required for all of the development examples below, and indeed for any proposed development because it is impractical to allow 300 square metres of land for each unit. Council planners have advised that the use of good design to ensure each dwelling has suitable outdoor living and parking would likely make the consenting process easier to achieve.

Vacant Site – 115-131 Sewell Street

This site is located very close to the existing housing stock, is roughly flat and measures 3691m2. There is some cleanfill and other earthworks on the site. There was a subdivision consent lodged in 2010 but it was subsequently withdrawn. It is zoned residential.

The site is an irregular shape but could accommodate around 15 one-bedroom units along with appropriate driveways, parking, outdoor living areas and infrastructure areas.

The rateable value of the site is $205,000, legal description Lot 6 DP 1988 and rating reference 2586014300.

A development on this site would likely result in 15 units. Using the development figures for Kaniere road as a basis, the total cost to develop would be $3,300,000 or $220,000 per unit, assuming the land could be purchased for around $250,000.

If the entire project was debt funded through a trading bank the finance cost would be approximately $75,000 per annum.

If cash of $400,000 could be put into the project from property sales and it was funded through the LGFA, the project would break even.

Vacant Site - 105-117 Fitzherbert Street

Located on the corner of Hampden and Fitzherbert Streets, this property is also adjacent to the railway tracks on the north west boundary. Around half of the site is flat and level with Fitzherbert street, with the balance of the site falling to the north west. The site is currently in three titles as follows:

105 Fitzherbert St	607 m2	$88,000	Sec 3338	2585014800
113 Fitzherbert St	809 m2	$88,000	Sec 3337	2585015000
117 Fitzherbert St	809m2	$88,000	Sec 3336	2585015100

The total area of the site is 2225m2 with a rateable value of $264,000. It was purchased by the current owner in 2010 for $335,000 and it is for sale for offers over $349,000.

Using the same development template, the cost to build nine units on the land would be $2,171,000 or $241,000 per unit. That is on the assumption that the land could be purchased for around $350,000.

If the entire project was debt funded the loss would be approximately $65,000 per annum.

As above, if $400,000 could be put into the project from the sale of other land and the project was funded by the LGFA, it could return around $6,000 per annum profit.

Hokitika Racecourse

Secs 1333-1336, 3701 DP 361252	2585005000	Land 19.55 ha	Land value $1,230,000	Capital Value $320,000

The racecourse land is owned by Council. Part is currently zoned residential (the western and northern areas) with the balance zoned rural. It surrounded by housing to the north west and south west and has good access of Park Street and secondary access to the south. There is a primary school and preschool nearby. It is approximately 0.8km to the town centre.

Council is considering rezoning at least part of the site as medium density residential which would facilitate housing. Some of that rezoned land could be sold and some retained for future pensioner housing.

A development budget based on the plan and costs for development of the Kaniere site would see 31 units constructed on around 4768 m2. The full development cost would be $5,970,00,000 or $192,000 per unit, assuming no cost to purchase the land.

If fully bank funded, the operating budget shows a loss of $167,000,000 per annum.

If a deposit of $200,000 was put into the project from other land sales, and the project was funded through the LGFA, the operating costs are break-even.

188 Kaniere Road

This site is currently owned by DWL and Westroads. It is large – 2.9206 hectares, and reasonably flat. There are a number of small waterways running through the site and it appears to be poorly drained. It is approximately 8 km for the town centre. The site is zoned “small settlement” with rules similar to residential. The rating valuation is $255,000.

A development proposal was drafted in early 2020 proposing 31 units at a total development cost of $6,300,000 or $203,000 per unit.

While the site might be ideal for residential development, it is not considered suitable for pensioner housing because of the distance to amenities. It would only suit residents who drive, or if transport was provided. The site would require a considerable amount of preparation including drainage.

Summary

While the cost of land is low, the cost to develop a brown or green fields site is significant, and it is difficult to avoid an operating loss if the debt is obtained at trading bank rates. A new housing development would only be financially sustainable with one or some of the following:

1. Sale of other land to reduce the debt funding required.
2. Capital contribution from Central Government for example through the PGF.
3. Debt funding through the LGA, reducing the interest and therefore debt repayments.

For all of the above examples, if proceeds of land sales or other funding to be used as a deposit and the balance of development costs could be funding through the Local Government Funding Authority (LGFA) at say 2% interest, then the project can break even.

Operating Costs

There are two options for funding the operating costs related to Pensioner Housing:

a) Local Government

Rent is subsidised by ratepayers. The criteria for eligibility would usually be controlled so that only people with few assets and minimal income are eligible. Rent is set below market.

Currently rents are subsidised eg 80% of market, but the eligibility criteria is not clear. Therefore, ratepayers are subsidising the elderly housing tenants, regardless of their own circumstances.

b) Central Government

Rent is set at market levels. Where people are suffering hardship through low income and/or few assets, then they are eligible for a rental subsidy through MSD.

The financial results for Pensioner Housing for the year ended 30 June 2020 are as follows:

Rental Income	$361,860
Expenses	$174,419
Management	$141,000
Depreciation	$ 28,657
	$ 17,784

Council is now setting aside depreciation as cash so that it is available for future renewals, but for many years that wasn't done, and the units are dated with little funding available for upgrades. A significant sum will need to be spent on the units to ensure they comply with the Healthy Homes Standards. In particular:

- Insulation in the ceilings will need to be checked to ensure it meets the standards and topped up if necessary.
- All units must have a fixed heater in the living rooms. This would generally be a heat pump.
- Extract fans must be fitted to all bathrooms and kitchens.

These requirements must be met for any new or renewed tenancies after July 2021.

When drafting operating budgets for future development, depreciation or a sinking fund should always be included to ensure adequate funds are available to support future maintenance and upgrades.

Recommendations:

a) Introduce eligibility criteria.

Proposed Eligibility Criteria

Applicants must:

Be aged over 65 years. Applications will be accepted from applicants over 60 years if they have special circumstances.

Be a New Zealand resident

Be retired from full-time work.

Have assets of less than $100,000 for a single person and $150,,000 for a couple. This includes the value of any major asset sold within 5 years of applying, and any asset held in the name of a Trust where the applicant is a beneficiary or Settler.

Be capable of living independently.

Have an income of less than $50,000 per annum for a single applicant and $85,000 for a couple.

Must have an association with Westland.

- Seek confirmation from waiting list that they meet the new criteria.
- Include the criteria in application forms and have future applicants confirm in writing that they meet them.

b) Increase rents to market.

- Gradually increase rents for current tenants, and to 80% of market for Revell Street.
- New tenants to commence at market rent.
- Include education for current and future tenants about rent subsidies. Include a brochure and/or application form with their review or application documentation. Ensure employees fully understand how the subsidy works

c) Transfer Assets to DWL

WDC to consult on the transfer the housing assets and associated depreciation reserve to DWL. Ideally this would take place at the end of the current financial year. The depreciation reserve to be tagged to undertake deferred maintenance on the Council units.

d) Upgrade Heating and ventilation

All units to have heat pumps, bathroom and kitchen ventilation and adequate ceiling insulation before the end of the 2020-2021 financial year. Seek approval from Council to amend expenditure of the capital funds allocated for this year to ensure all units have heat pumps and ventilation and are upgraded as much as possible. If funds allow, install double glazing into the Ross units first. If the depreciation reserve is transferred, it may facilitate double glazing in all units (except for Rewell Street).

e) Increase maintenance on existing units

As rents are increase, additional funds could be used to increase maintenance of the existing portfolio. Long term maintenance plans should be put in place so that priorities can be identified and implemented, and funds accumulated for high cost items over time.

f) Develop new units

DWL to fully investigate and implement a new housing development or repurposing property in or near the CBD.

- Development must at least break even, preferably with funding from LGFA.
- Include at least nine units.
- Most units to have a car port.

Once complete, the Revell Street tenants to transfer into these or other units, with any balance to be filled from the waiting list.

g) Sell excess land and source other funding options

Revell Street site to be sold as a development block with proceeds reducing the overall debt for the project.

DWL to source other property holdings to identify redundant sites that could be sold to fund future housing developments.

DWL to continue to seek Government funding for housing developments.

h) DWL to further investigate partnership opportunities with Iwi

As the number of Màori in our communities increases, it might be beneficial to have units specifically tagged for Kaumatua. For any future developments, detailed conversations should take place with Iwi to establish a way to achieve this.

i) Undertake further consultation in small communities to determine demand

Despite residents not choosing to participate in the survey, there is still anecdotal evidence that there is demand for pensioner housing in some of the smaller towns. DWL to liaise with the community associations to determine the extent of that demand, and if needed, how it can best be addressed.

j) Relationships with Social Agencies

DWL to continue to develop relationships with social agencies dealing with elder residents and community housing. This will ensure good sharing of information and the ability of all parties to deliver the best outcomes to customers.

k) Council to advocate and/or facilitate Retirement Village development

Council or its appointee to approach Retirement Village providers and advocate for the development of that style of housing in Hokitika. Council could attract development through rezoning part of the old racecourse site and then leasing or selling it to an appropriate party.

Another option is to covenant some of the land at the racecourse for occupation by elderly residents so that a village-like neighbourhood is created without the need for external investment.

l) Council to consider drafting a strategy for "Age Friendliness"

The global Age-Friendly Cities Project was started by the World Health Organisation in 2006, and identified eight key areas where communities can become more age-friendly:

1. Outdoor spaces and buildings
2. Transportation
3. Housing
4. Social Participation
5. Respect and social inclusion
6. Civic participation and employment
7. Communication and Information
8. Community Support and Health Services.

The benefits of age friendliness include:

- making it easy for people to stay connected with each other
- helping people stay active and healthy
- supporting people who are no longer able to take care of themselves to live with dignity and enjoyment
- treating everyone with respect.

Visitors to a unit in Sewell Street

Implementation

As this strategy was commissioned by both Westland District Council and Destination Westland Limited, the following is the proposed implementation process:

1. A draft was presented to the Economic Development Committee of Council on 29 October 2020 for discussion and feedback. Feedback has been incorporated into this strategy.
2. A draft was presented to the Board of Destination Westland Limited on 30 October 2020 for discussion and feedback. Feedback has been incorporated into this strategy.
3. A final to be approved for formal adoption by the Board of Destination Westland Limited on or before 12 November 2020.
4. A final to be considered by Westland District Council on 26 November 2020 for formal adoption.

This strategy should be reviewed in 5-10 years.

Units at Tancred Street

Appendix One - Current Housing Stock

199 Revell street – Mary Meyers flats

Lot 2 DP2041	2586009701	Land 790m2	Building 170m2	Land value $205,000	Capital Value $325,000	Zoning Res

The property is long and thin with access from Sewell street and bordering beach front land to the north west. It is noted that residents are encroaching into the beach front land, with the building being built very close to the north west boundary. Although not within Council's identified coast erosion zone the proximity to the beach is of ongoing concern and it would cause additional constraints for any rebuild on the site.

This building comprises one rectangular block of four units built in approximately 1965. External cladding is concrete block and cement wallboard, steel roof and aluminium joinery. There is good vehicle access and informal parking areas and the units are or could easily be accessible.

The building is in average condition, noting that some repainting is due, and exteriors need to be washed down. It is dated and not well insulated. A resident told me her unit is very cold.

205 Revell Street – Mary Myers Flats

Sections 3268 and 3270	2586009900	Land 1791m2	Buildings 300m2	Land value $330,000	Capital Value $530,000	Zoning Res

The land comprises two roughly square blocks adjoining beach front land to the north west. There is good access to Revell Street and the site is spacious with a lot of open areas. Again, there is some encroachment by residents into the adjacent beach front land and the proximity to the beach is of ongoing concern and it would cause additional constraints for any rebuild on the site.

The buildings are in three blocks of two units each. They are constructed of concrete block with steel roofs and a mixture of aluminium and wooden window frames. There is adequate parking although parking areas are not formed. Access is via 3 steps so accessibility is more challenging.

The buildings are in average condition. All wooden areas need repainting and the blockwork requires washing down. Although the interiors were not inspected, it is assumed they are dated and cold.

97 Tancred Street

Lot 1 DP 2149	2586016900	Land 1423m2	Buildings 380m2	Land value $195,000	Capital Value $650,000	Zoning Res

This is a good, rectangular block of land with dual access to both Tancred and Revell streets. It is in an excellent location, close to the town centre facilities. There is adequate off-street parking

There are 3 buildings constructed of concrete block with iron roof and aluminium joinery, estimated to have been constructed in ???? and compromise ten units. There are some accessory buildings, for example a conservatory and garden sheds. The buildings are low so easy to make them accessible if required. Again, a resident advised that the flats are cold in Winter and very dated inside.

The buildings are in good condition and there are good paths and gardens.

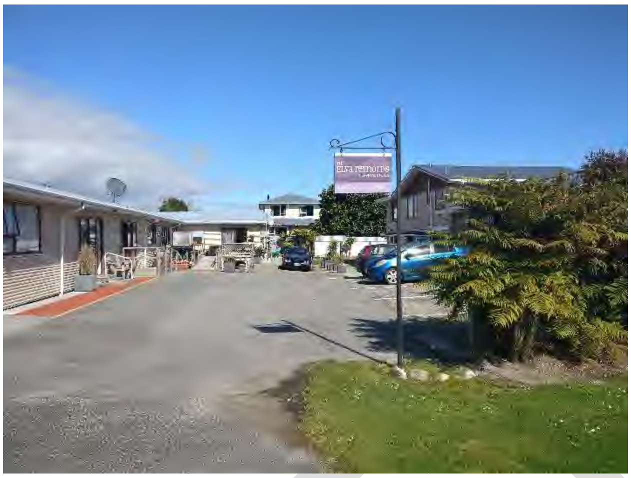
82-88 Sewell Street – Jim Keenan Flats

Secs 3347 & 3361	2586015301 2986015400	Land 5340m2	Buildings 1441m2	Land value $535,000	Capital Value $2,920,000	Zoning Res

This property is a large area bordered by Sewell street in the north west, Hampden street in the north east and the railway lines to the south east. It seems to comprise nine smaller blocks of land but there are only two titles. Vehicle access is provided via three driveways off Sewell Street and there is formed off street parking although some residents are parking on grassed areas.

There are a total of five blocks of flats comprising 22 individual units built in approximately 1965. They are clad with cement board and iron roof and have aluminium joinery. Apart from some evidence of rusting nails and meter board covers, the units are in reasonable condition. They would benefit from exterior washdown and some isolated painting. The have good paths and gardens. Units are built with a lovely north facing aspect and tenants spoken to are happy although they note it is cold in winter. The interior of one unit was viewed and it is dated.

123 Tudor Street – Elva Reynolds Flats



Lots 2-3 DP 1540	2585009701	Land 1500m2	Buildings 522m2	Land value $195,000	Capital Value $710,000	Zoning Res

This property is a roughly square lot on the corner of Tudor and Brittan Streets. It was previously a motel development. The site is less than 2 km from the town centre. It has good vehicle access off both Tudor and Brittan Streets.

The buildings were constructed around 1971, comprising a large two-storey building that contains 5 units and an L-shaped single storey block that contains 4 two-bedroomed units that are accessible. The buildings have corrugated iron cladding and roof and aluminium joinery.

The buildings are in good condition although soffits and barge boards need repainting. Residents spoken to are happy in these flats.

201 Revell Street – Residential House

Sec 3264, 3366	2586009700	Land 558m2	Buildings 120m2	Land value $155,000	Capital Value $210,000	Zoning Res

This property is an older house located between 199 and 205 Sewell Street that was strategically purchased by DWL so that the whole block of 3139 m2 is available for sale of redevelopment.

The house was constructed in 1925 with timber cladding, iron roof and timber joinery. It is in very poor condition.

24 Gibson Street, Ross

Secs 126 and 126A	2589026100	Land 1467m2	Buildings 264m2	Land value $53,000	Capital Value $320,000	Zoning Res

This property is a rectangular site with a lovely north facing aspect, located a few hundred meters from the main street of Ross.

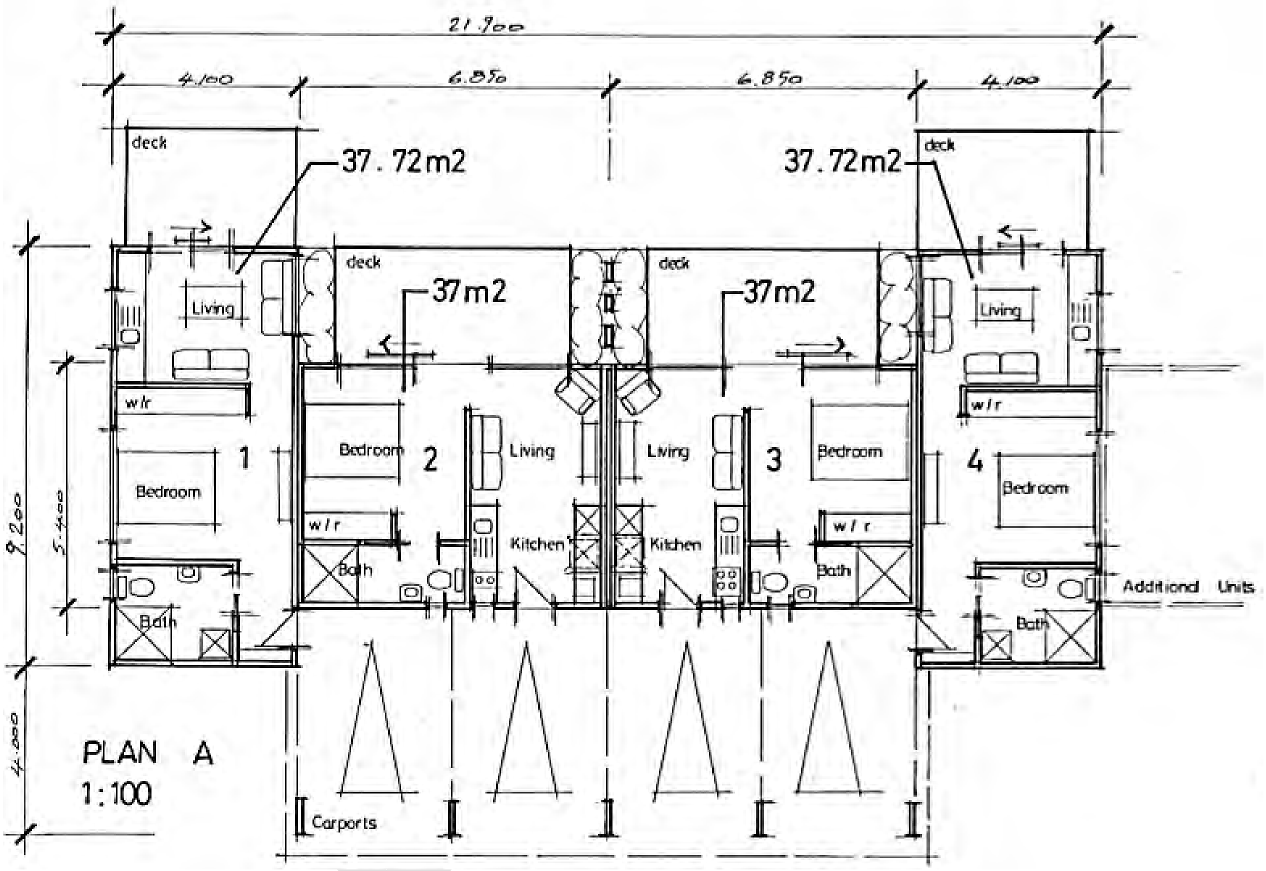
The building is in one block comprising four units built in approximately 2001. The exterior cladding is fibre cement board, iron rooves and aluminium windows. Each unit has a garage. There is good access, slightly raised from Gibson Street, sealed drive and off-street parking. The units are accessible and in excellent condition.

Appendix 2 - Model house

The Kaniere Estate proposal included the development of the site with a range of one and two bedroom housing options. Only the one-bedroom house design was priced and so that has been used as our model house for the purpose of analysing future development costs and options.

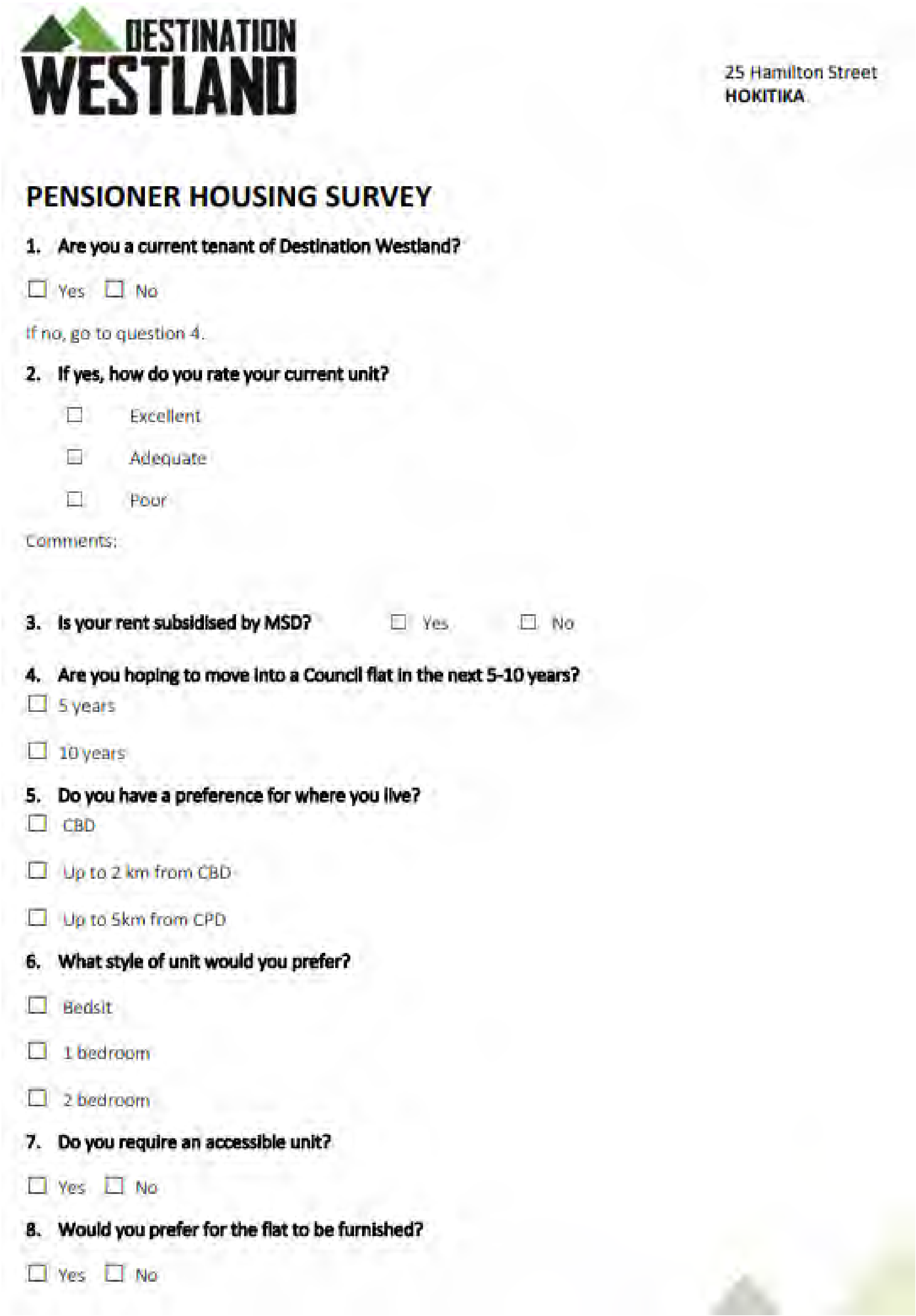
The one-bedroom units measure 38 square metres and include living/kitchen, bathroom with laundry, one bedroom, car port and deck. The construction would be single storey with coloursteel roof, brick and weatherboard cladding and double glazed windows and doors.

An example of the floor plan for the units is shown below:



Each unit would be landscaped and have access to a clothes-line, garden area and outdoor living areas. No specific allowance has been made for mobility scooters, but this could be accommodated on decks or car ports depending on the individual circumstances.

Appendix 3 – Survey



DESTINATION WESTLAND

25 Hamilton Street
HOKITIKA

PENSIONER HOUSING SURVEY

1. Are you a current tenant of Destination Westland?

☐ Yes ☐ No

If no, go to question 4.

2. If yes, how do you rate your current unit?

☐ Excellent

☐ Adequate

☐ Poor

Comments:

3. Is your rent subsidised by MSD? ☐ Yes ☐ No

4. Are you hoping to move into a Council flat in the next 5-10 years?

☐ 5 years

☐ 10 years

5. Do you have a preference for where you live?

☐ CBD

☐ Up to 2 km from CBD

☐ Up to 5km from CPD

6. What style of unit would you prefer?

☐ Bedsit

☐ 1 bedroom

☐ 2 bedroom

7. Do you require an accessible unit?

☐ Yes ☐ No

8. Would you prefer for the flat to be furnished?

☐ Yes ☐ No

DESTINATION WESTLAND

25 Hamilton Street
HOKITIKA

9. Would you like an area of garden to care for?

☐ Yes ☐ No

10. Do you require a car park?

☐ Yes ☐ No

11. What style of facility would you prefer?

☐ Stand-alone dwelling

☐ A flat in a complex with other flats occupied by similar aged people

☐ A flat in a complex with other flats occupied by a range of aged people

☐ Not concerned

12. What type of assistance would you prefer (Tick all that apply)?

☐ Gardening

☐ Home maintenance

☐ Cleaning

☐ Cooking

☐ Shopping

☐ Entertainment and activities

13. Which of the following factors are the most important to you – please enter a number from 1 – 7 (1 being the most important and 7 being the least)?

☐ Age/style of the flat

☐ Location

☐ Warmth/insulation

☐ Number of bedrooms

☐ Cost

☐ Type of facility

☐ Good neighbours

www.destinationwestland.co.nz

Appendix 4 – Acknowledgements

The following provided information and assistance with the formation of this strategy. Their input has been greatly appreciated.

- Melina Theurillat – Property Brokers, Hokitika
- Scott Figenshow, CEO - Community Housing Aotearoa
- Susan Jenkins – Chief Executive, Abbeyfield
- Francois Tumahai
- Paul Madgwick
- Jo Grimmer, WINZ Queenstown Office
- Jo Burney, Development West Coast
- Julie Scott, CE, Queenstown Lakes Community Housing Trust
- Karyn Mathieson, South Westland Community Contact
- Mel Anderson, CEO, Destination Westland

Report to Council

DATE: 26 November 2020

TO: Mayor and Councillors

FROM: Accountant

FINANCIAL PERFORMANCE: OCTOBER 2020

1. Summary

1.1. The purpose of this report is to provide an indication of Councils financial performance for four months to 31 October 2020.

1.2. This issue arises from a requirement for sound financial governance and stewardship with regards to the financial performance and sustainability of a local authority.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in May 2018, which are set out in the Long Term Plan 2018-28. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council that the Council receive the financial performance report to 31 October 2020.

2. Background

2.1. Council receives monthly financial reporting so that it has current knowledge of its financial performance and position against budgets. A more detailed performance report is presented to the Audit and Risk Committee on a quarterly basis which includes non-financial information against KPI's adopted through the Long Term Plan.

3. Current Situation

3.1. The financial performance report has had some changes made to the format and the actual data presented.

3.2. The information in the report is now of a more summarised nature, with only permanent variances over $25,000 having comments. Temporary differences which are mainly budget phasing are not now commented on as these will either approximate budget by the end of the financial year, or become a permanent variance which will be noted.

3.3. With the inclusion of the sustainability report, it is not now necessary to include such detail to Council in the financial report, as the key business indicators are included in the sustainability report.

3.4. The financial performance report to 31 October 2020 attached as **Appendix 1** and contains the following elements;

   3.4.1. Sustainability report
   3.4.2. Statement of Comprehensive Revenue and Expense
   3.4.3. Notes to the Statement of Comprehensive Revenue and Expense
   3.4.4. Statement of Financial Position
   3.4.5. Revenue and Expenditure Graphs
   3.4.6. Debtors
   3.4.7. Debt position
   3.4.8. Capital expenditure

4. Options

4.1. Option 1: The Council can decide to receive, or not receive the report.

5. Risk Analysis

5.1. Risk has been considered and no risks have been identified.

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as being low as the report is for information purposes only.

7.2. No public consultation is considered necessary

8. Assessment of Options (including Financial Considerations)

8.1. Option 1 This report is to inform Council on the monthly financial position and to encourage financial stewardship.

8.2. There are no financial implications to this option as the financial implications are discussed within the body of the report itself.

9. Preferred Option(s) and Reasons

9.1. Option 1

10. Recommendation(s)

10.1. That the report be received.

John Kagagi
Accountant

Appendix 1: Financial Performance to October 2020

Appendix 1.

Financial Performance

Year to October 2020

Contents

Sustainability Report

Total revenue	Total expenditure	Total surplus/(deficit)
$10.14M	$8.24M	$1.89M
Is 23.71% more than the total budget of $8.19M	Is 1.11% less than the total budget of $8.15M	Is 4440.70% more than the total budget of- $0.04M

SUSTAINABILITY

Rates to operating revenue		**50.18%**
Rates Revenue	$5.09M	
Operating Revenue	$10.14M	

50.18% of operating revenue is derived from rates revenue. Rates revenue includes penalties, water supply by meter and is gross of remissions. Operating revenue excludes vested assets, and asset revaluation gains.

Balanced budget ratio		**122.98%**
Operating revenue	$10.14M	
Operating expenditure	$8.24M	

Operating revenue should be equal or more than operating expenditure. Operating revenue excludes vested assets and asset revaluation gains. Operating expenditure includes deprecation and excludes landfill liability and loss on asset revaluations. Year to date revenue is 122.98% of operating expenditure.

Interest to rates revenue (LGFA Cov.)		**3.90%**
Net interest and finance costs	$0.20M	
Rates Revenue	$5.09M	

3.90% of rates revenue is paid in interest. Our set limit is 25% of rates revenue. Net interest is interest paid less interest received. Rates revenue includes penalties, water supply by meter and gross of remissions.

Interest to operating revenue		**1.96%**
Net Interest and finance costs	$0.20M	
Operating revenue	$10.14M	

1.96% of operating revenue is paid in interest. Our set limit is 10% of operating revenue. Net interest is interest paid less interest received.

Liquidity Risk (LGFA Cov.) **153.15%**

Gross debt	$20.82M
Undrawn committed facilities	$2.78M
Cash and cash equivalents	$8.28M

The liquidity risk policy requires us to maintain a minimum ratio of 110% which is also an LGFA covenant. Our current liquidity risk is 153.15%

Essential services ratio **117.62%**

Capital expenditure	$2.27M
Depreciation	$1.93M

Capital expenditure should be equal or more than depreciation for essential services, for year to date capex is 117.62% of depreciation. Essential Services are Water Supply, Wastewater, Stormwater, and Roading.

Statement of Comprehensive Revenue and Expense

Statement of Comprehensive Revenue and Expense For the period ended October 2020	Notes	Full Year Forecast ($000)	Full Year Budget ($000)	YTD Budget ($000)	Actual YTD ($000)	Variance YTD ($000)	Var/Bud %
Revenue							
Rates		15,915	15,907	5,078	5,086	7	0.15%
Grants and subsidies	01	7,268	5,593	2,227	3,902	1,675	75.23%
Interest Revenue		33	43	14	4	(10)	-70.12%
Fees and Charges		1,948	1,947	662	662		0.06%
Other revenue	02	1,479	1,209	212	482	270	127.45%
Total operating revenue		26,642	24,700	8,193	10,136	1,943	23.71%
Expenditure							
Employee Benefit expenses		4,236	4,236	1,415	1,415	()	-0.01%
Finance Costs	03	781	867	289	203	(86)	-29.77%
Depreciation	04	7,239	7,141	2,380	2,479	99	4.14%
Other expenses	05	12,450	12,373	4,067	4,144	78	1.91%
Total operating expenditure		24,706	24,616	8,151	8,241	90	1.11%
Operating Surplus/(Deficit)		**1,936**	**84**	**42**	**1,894**	**1,853**	**4440.70%**

Notes to the Statement of Comprehensive Revenue and Expense

Comments were provided on permanent variances over $25,000 only.

01 Grants and subsidies

The variance of $1.7m is due to carrying forward of unspent grants received in last financial year and unbudgeted grants received for below projects;

- $709k for Old Christchurch Road project
- $400k for Jackson Bay wharf project
- $539k for Community halls and War memorial renovation projects
- $550k for Butlers new cell development project
- $319k for Carnegie building project
- $250k each for Mayors task force job funding project and Responsible camping projects
- $128k for Waterfront development project
- $122k for Haast potable water storage project

These favourable variances are partially offset by lower than planned variances from NZTA ($746k), Responsible camping operational grants ($590k) and other grants ($256k).

02 Other Revenue

This variance is mainly due to unbudgeted recoveries income from National Emergency Management Agency for March and December 2019 flood event welfare and response/recovery claims.

03 Finance costs

This variance is mainly due to lower than expected interest rate prevailing in the market and efficient liquidity management.

04 Depreciation and amortisation

Actual depreciation is higher than anticipated due to capitalisation of some significant Roading assets and Franz Josef Wastewater assets in the 2019-20 Financial year.

05 Other expenses

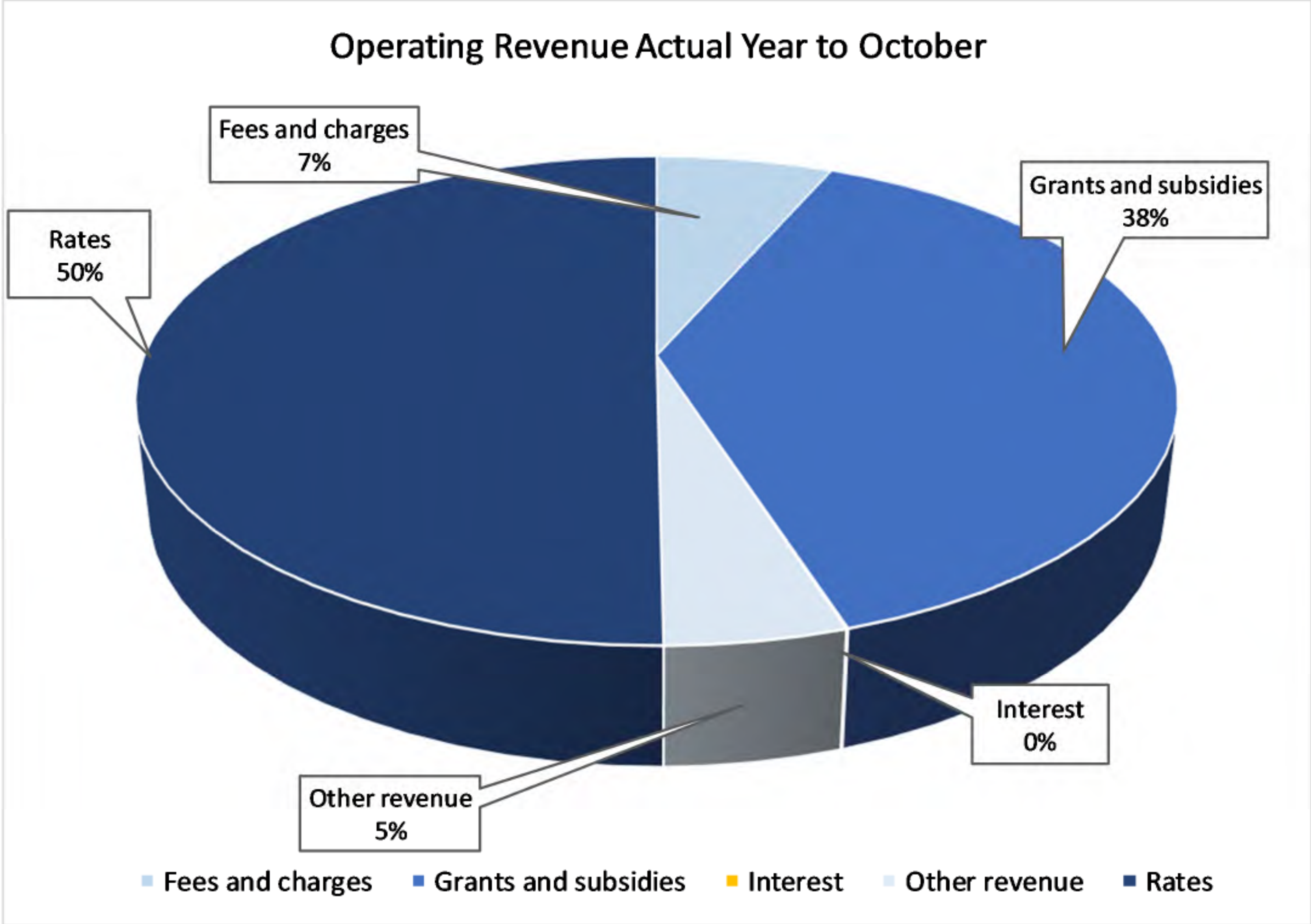
Mainly due to timing of roading expenditure and HR recruitment costs

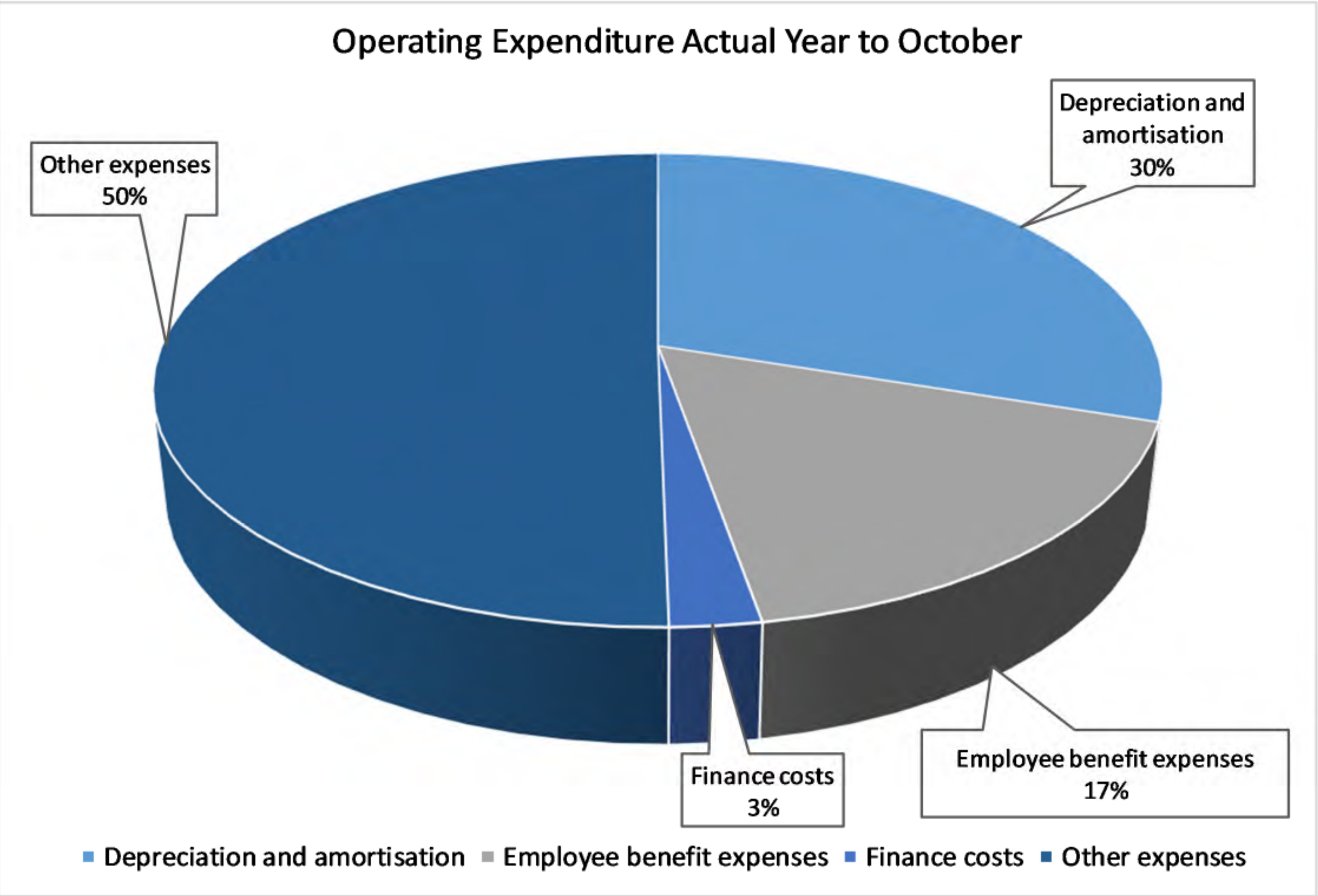
Statement of Financial Position

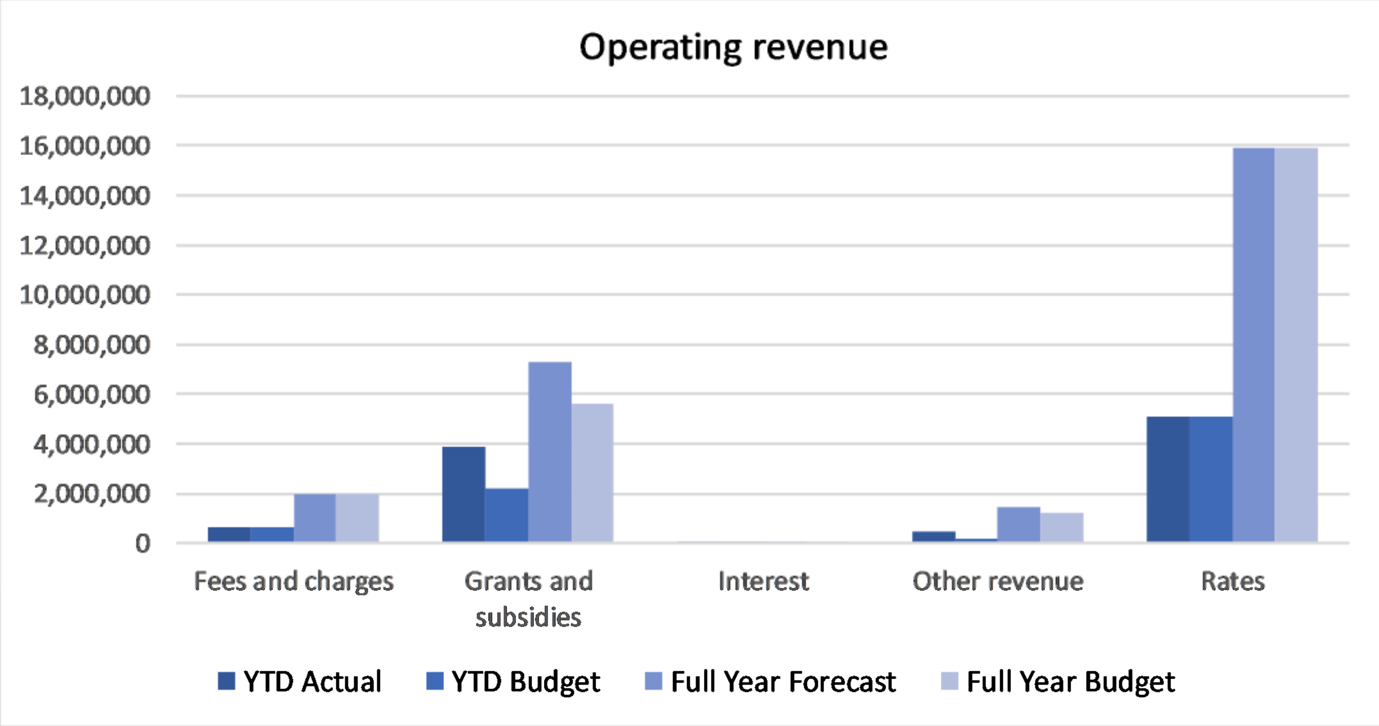
Statement of Financial Position
For the period ended October 2020

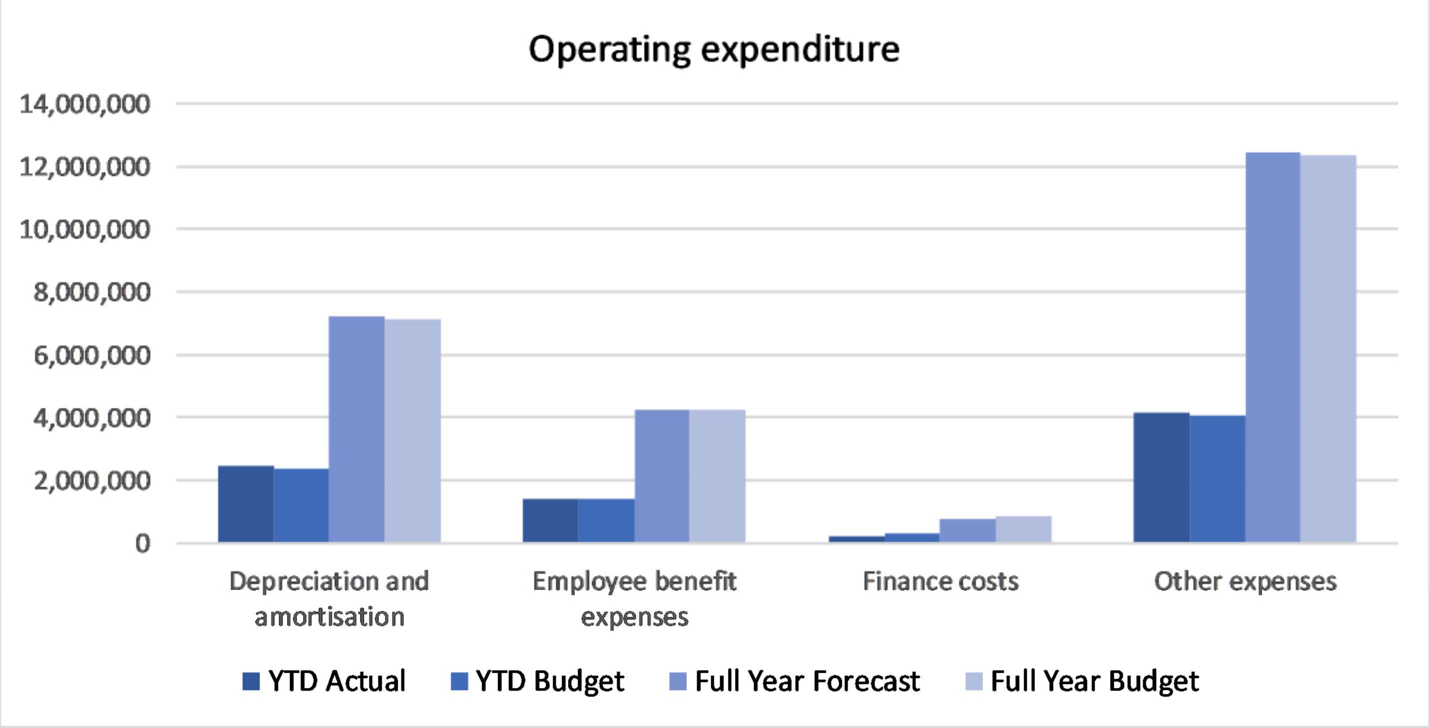
	October YTD ($000)	Annual Plan 20/21 ($000)	Actual 19/20 ($000)
Current Assets			
Cash & cash equivalents	8,270	3,689	5,123
Debtors & other receivables	4,133	5,251	4,211
Assets held for sale	-	-	-
Other financial assets	-	-	48
Total Current Assets	12,403	8,941	9,382
Non-current Assets			
Council Controlled Organisation	8,695	8,695	8,695
Intangible assets	67	329	74
Assets Under Construction	6,207	1,474	2,955
Other Financial Assets	362	366	314
Property, Plant and Equipment	403,195	407,540	405,665
Total Non-current assets	418,525	418,405	417,703
Total Assets	430,928	427,346	427,085
Current Liabilities			
Creditors & other payables	3,275	2,807	3,407
Employee benefit liabilities	495	374	476
Tax payable	3	3	3
Borrowings	4,200	-	3,000
Derivative financial intruments	34	-	34
Other	1,303	395	425
Total Current Liabilities	9,310	3,579	7,345
Non-current Liabilities			
Borrowings	16,618	25,626	16,618
Employee benefit liabilities	41	38	42
Provisions	2,040	2,222	2,040
Derivative financial intruments	1,107	673	1,097
Other Non-current liabilities	32	32	32
Total Non-Current Liabilities	19,839	28,591	19,829
Total Liabilities	29,149	32,170	27,175
Net Assets	401,779	395,175	399,911
Equity			
Retained earnings	152,972	142,381	151,089
Restricted Reserves	9,022	10,774	9,038
Revaluation reserves	239,721	241,956	239,721
Other comprehensive revenue and expense reserve	64	64	64
Total Equity	401,779	395,175	399,911

Revenue & Expenditure Graphs









Debtors as at 31 October 2020

Type	Over 90 Days	60-90 Days	30-60 Days	Current	Total ($)
Building Consents	18,323	428	1,674	30,166	50,591
Building Warrants	1,995	965	145	- 415	2,690
Resource Consents	6,952	186	-	- 1,372	5,765
Sundry Debtors	40,095	10,221	18,778	267,580	336,674
Grand Total	**67,364**	**11,800**	**20,597**	**295,959**	**395,720**

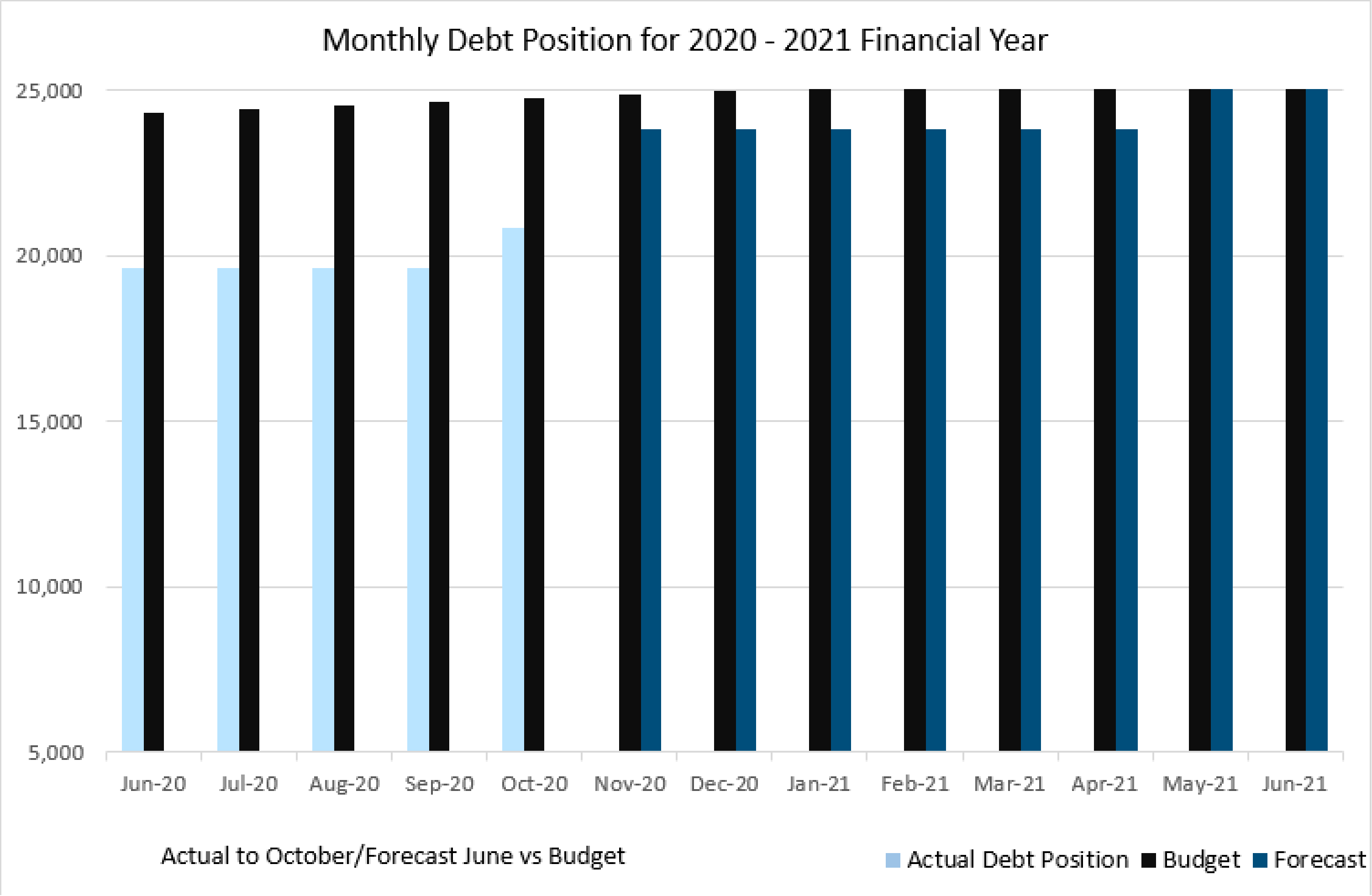
Rates Debtors as at 31 October 2020

Rates Debtors at 30 September 2020		**528,062**
Rates instalment	3,857,476	
Less payments received	-532,021	
Paid in advance change	-752,069	
Previous years write off's	-3,323	
Write off's	-3,439	
Penalties	-962	
Discounts	-91	
Court Cost	0	
		2,565,570
Total Rates Debtors at 31 October 2020		**3,093,633**
Arrears included above at 31 October 2020	3,093,633	
Arrears at 31 October 2019	3,100,868	
Increase/(decrease) in arrears		**-7,235**

Debt Position

Debt Position 2020/2021 ($000)

	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21
Actual Debt Position	19,618	19,618	19,618	19,618	20,818								
Budget	24,339	24,446	24,554	24,661	24,768	24,875	24,983	25,090	25,197	25,304	25,412	25,519	25,626
Forecast						23,818	23,818	23,818	23,818	23,818	23,818	25,618	25,618



Forecast Debt Position for 2020-2021 Financial Year

Forecast as at	**Jun-21**
Opening Balance	19,618
Loan funded capex forecast	10,200
Forecast repayments 2020-21	-4,200
Forecast balance June 2021	**25,618**

Capital Expenditure

CAPITAL EXPENDITURE 2020-2021	Budgets					
	2019-2020 Carried Forward Budget	Full Year Annual Plan (AP)	YTD Actual Expenditure	Budget Remaining	YTD Spent as a % of AP	Notes
Leadership	51,810	371,112	41,028	381,893	10%	Main projects included in this section are Council HQ refurbishment project, Refurbishment of visitor area project, Council HQ generator project, Website development and teleconferencing equipment projects. All the projects are on track except for the Council HQ refurbishment project which is on hold pending the EQ report to be presented to council for a decision.
Planning & Regulatory Services	-	6,000	-	6,000	0%	This is the Noiser meter project and not expecting any delays at this stage as per the project manager.
Leisure Services & Facilities - Park & Reserves	102,278	847,710	841	949,148	0%	Main projects included in this section are Cass square development projects (New Toilet, upgrade of playground equipment etc.), Ross and Whataroa playground equipment upgrade projects. All projects are on track to be completed in this financial year.
Leisure Services & Facilities - Other	615,857	1,291,395	214,894	1,861,275	11%	Some of the major projects included in this section are Carnegie building project, Civil defence emergency containers project and Hokitika Revitalization plan project. Although the YTD actual capex spending is lower, projects are expected to be completed as planned in this financial year.
Solid Waste	183,523	515,000	33,258	665,265	5%	The Butlers intermediate capping project has been postponed to 2022 due to post Covid stimulus funding received for the Fox Landfill waste to be carted to Butlers Landfill. Other than that all the projects are expecting to be completed as planned.
Stormwater	1,625,312	1,382,240	57,438	2,950,114	2%	Mains upgrade programme is on track and design works has commenced for works on Livingstone Street. All the other projects planned for this financial year is also on track as per the project managers.
Transportation	-	2,776,940	332,129	2,475,948	12%	YTD spending is low due to resealing works to commence early summer. All capital projects will be completed before the year end to include Structures Component Replace project, Sealed Road Pavement Rehabilitation project, Local and SPR Low Cost Low Risk projects.
Wastewater	1,532,881	2,681,156	174,268	4,039,769	4%	All the projects are on track to complete in this financial year except for Hokitika Outfall structure project which was cancelled due to change in project scope. However this will be replaced by the WWTP upgrade project which will be funded by post Covid stimulus funding.
Water Supply	1,144,069	1,335,550	229,742	2,351,955	9%	YTD actual spending is on track to complete carryover projects delayed due to Covid 19. Some projects are still in the planning stage however Mains upgrade programme, Arahura Water treatment plant project and Fox Glacier Plant upgrade projects are on track and all expected to be completed by year end.
Total Capital Expenditure	**5,255,730**	**11,207,103**	**1,083,599**	**15,681,367**	**7%**	

Capital Expenditure

Total Capital Expenditure	**5,255,730**	**11,207,103**	**1,083,599**	**15,681,367**	**7%**	
Projects in WIP from 2019-2020	**656,901**	**-**	**568,241**	**189,991**	**87%**	The main projects included in this section are Sunset point development project and Franz Josef - Mains upgrade programme. All project works are on track to be completed in this financial year.
Total Unbudgeted Capital Expenditure	**4,415,831**	**-**	**1,600,374**	**3,296,717**	**36%**	The main project included in here is the Butlers new cell development project and it is on track to be completed in this financial year.
Total Capital Expenditure	**10,328,461**	**11,207,103**	**3,252,214**	**19,168,075**	**15%**	

Report to Council

DATE: 26 November 2020

TO: Mayor and Councillors

FROM: Community Development Advisor

Approval of Marks Road Local Purpose Reserve Fund – Community Portion

1. Summary

1.1. The purpose of this report is to advise Council that the Haast Community would like approval to utilise funds from the Marks Road Local Purpose Reserve Fund allocated to Community Development.

1.2. This issue arises from a Public Meeting where the Haast Community apportioned funds to community projects.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in May 2018, which are set out in the Long Term Plan 2018-28. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council approves the release of funds from the Marks Road Local Purpose Reserve Fund for community projects as they arise for payment, as set out in the schedule of minuted Haast Community Projects (Appendix 1).

2. Background

2.1. The reason the report has come before the Council is due to a Public Meeting in Haast where the community agreed to fund Community Projects from the Marks Road Local Purpose Reserve Fund.

2.2. Proceeds from the sale of a portion of the Marks Road Local Purpose Reserve in Haast were allocated fifty percent for Civil Defence and fifty per cent into Haast Community Projects.

2.3. The total amount of funds being held from the sale of a portion of the Marks Road Local Purpose Reserve after legal fees: $187,000.00

3. Current Situation

3.1. The Haast Community advertised a Public Meeting on the 19 November 2019, minuted by the Haast Promotions Group. Submissions for funding of Haast Community Projects were made, options were considered and the agreed options are detailed in **Appendix 1.**

3.2. Council approved disbursement of $22,608.14 at the 28 May 2020 Council Meeting toward the completion of the Dennis Road Track. This leaves funds ($40,891.86) available in the Marks Road Local Purpose Reserve Fund for Project 2: Dennis Road Track or for distribution by the Haast Community at a later date.

3.3. Community Projects were delayed due to weather events and the Covid-19 pandemic, these Community Projects were again ratified at the Haast Community Public Meeting, Tuesday 3 November 2020.

4. Options

4.1. **Option 1:** Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Community Projects as they arise for payment as set out in **Appendix 1.**

4.2. **Option 2:** Do not approve the release of funds from the Marks Road Local Purpose Reserve Fund for Haast Community Projects.

5. Risk Analysis

5.1. Risk has been considered and no risks have been identified.

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as low. These funds have been set aside for the purpose of community development in the Haast community.

7.2. Public consultation was undertaken through Public Meetings in Haast Tuesday 19 November 2020 and Tuesday 3 November 2020. The Haast Promotions Group resolved to approve the community projects outlined in **Appendix 1**.

8. Assessment of Options (including Financial Considerations)

8.1. **Option 1** – Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Community Projects as they arise for payment as set out in **Appendix 1.** The Haast community have followed a transparent procedure for the allocation of the Marks Road Local Purpose Reserve Fund.

8.2. **Option 2** - Do not approve the release of funds from the Marks Road Local Purpose Reserve Fund for Haast Community Projects. Council can ask the Haast Community to hold another Public Meeting and re-assess the distribution of these funds.

8.3. There are no financial implications to this option

9. Preferred Option(s) and Reasons

9.1. The preferred option is Option1: Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Community Projects as they arise for payment as set out in **Appendix 1.**

9.2. The reason that Option 1 has been identified as the preferred option is that the community has considered projects and apportioned funding at a Public Meeting and these funds have been set aside for the purpose of community development in the Haast community.

10. Recommendation(s)

10.1 That the report be received.

10.2 That Council approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Community Projects as they arise for payment as set out in Appendix 1.

Sarah Brown
Community Development Advisor

Appendix 1.

Haast Community Meeting Minutes – Tuesday, 19th November 2019

Funds from the sale of land: Marks Road Local Purpose Reserve Fund – Community Portion of $93,500.00

- **Project 1 – Beautification of Marks Road Reserve <u>$10,000.00</u>**

  Westland District Council have also put aside $10,000.00 for the beautification of Marks Road Reserve.

- **Project 2 – Completion of the Dennis Track (Remainder of Marks Road Local Purpose Reserve Fund)**

  Update: **Total of $22608.14 Approved by Westland District Council at 28 May 2020 Meeting**, leaving funds available in the Marks Road Local Purpose Reserve Fund for the Dennis Road Track **($40,891.86**) or for distribution by the Haast Community at a later date.

- **Project 3 – Development of Land Purpose Reserve Land RS 5954 BLK V11 <u>$20,000.000</u>**

  Update: Tuesday 3 November 2020

  Stage 1: Pauareka Road Reserve has been cleared and plan to re-instate walkway with a concreted walkway between Pauareka Road/Awarua Place and Opuka Place during summer 2020/2021.

Report to Council

DATE: 26 November 2020

TO: Mayor and Councillors

FROM: Community Development Advisor

Approval of Marks Road Local Purpose Reserve Fund – Civil Defence Portion

1. Summary

1.1. The purpose of this report is to advise Council that the Haast Community would like approval to utilise funds from the Marks Road Local Purpose Reserve Fund allocated to Civil Defence in the Haast Community.

1.2. This issue arises from a Public Meeting where the Haast Community apportioned the Marks Road Local Purpose Fund for Civil Defence projects.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in May 2018, which are set out in the Long Term Plan 2018-28. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council approves the release of funds from the Marks Road Local Purpose Reserve Fund for Haast Civil Defence projects as they arise for payment (Appendix 1).

2. Background

2.1. The reason the report has come before the Council is due to a Public Meeting 3 November 2020 in Haast where the community agreed to fund Civil Defence Projects from the Marks Road Local Purpose Reserve Fund.

2.2. Proceeds from the sale of a portion of the Marks Road Local Purpose Reserve in Haast were allocated fifty percent for Civil Defence and fifty per cent into Haast Community Projects.

2.3. The total amount of funds being held from the sale of a portion of the Marks Road Local Purpose Reserve Fund after legal fees: $187,000.00.

3. Current Situation

3.1. The current situation is the Haast Community held a Public Meeting 3 November 2020, minuted by the Haast Promotions Group. Submissions for funding of Haast Civil Defence Projects were made, options were considered and agreed options are detailed in **Appendix 1.**

3.2. Council approved disbursement of $7,113.06 for Stage One Purchase of Civil Defence equipment at a Council Meeting 25 July 2019. This leaves $86,386.94 remaining in the Civil Defence portion of the Marks Road Local Purpose Reserve Fund.

4. Options

4.1. **Option 1:** Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Civil Defence Projects as they arise for payment as set out in **Appendix 1.**

4.2. **Option 2:** Do not approve the release of funds from the Marks Road Local Purpose Reserve Fund for Haast Civil Defence Projects.

5. Risk Analysis

5.1. Risk has been considered and no risks have been identified.

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as Low. These funds have been set aside for the purpose of civil defence in the Haast community.

7.2. Public consultation was undertaken through a Public meeting Tuesday 3 November 2020. The Haast promotions Group resolved the Civil Defence projects outlined in Appendix 1.

8. Assessment of Options (including Financial Considerations)

8.1. **Option 1**: Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Civil Defence Projects as they arise for payment as set out in Appendix 1. The advantage of approving the release of funds from the Marks Road Reserve Fund for Civil Defence equipment aligns with Westland District Council's Long Term Plan of supporting communities to be become more resilient.

8.2. **Option 2**: Do not approve the release of funds from the Marks Road Local Purpose Reserve Fund for Haast Civil Defence Project. The advantage of not approving the release of funds from the Marks Road Reserve Fund is the fund remains intact and the Haast Community can apply to utilise these funds at another time.

8.3. There are no financial implications to these options.

9. Preferred Option(s) and Reasons

9.1. The preferred option is: Option 1- Approve the release of funds from the Marks Road Local Purpose Reserve Fund for the Haast Civil Defence Projects as they arise for payment as set out in Appendix 1.

9.2. The reason that Option 1 has been identified as the preferred option is that Civil Defence equipment aligns with Westland District Council's Long Term Plan of supporting communities to be become more resilient.

10. Recommendation(s)

10.1. That the report be received.

10.2. That Council approve the release of funds from the Marks Road Local Reserve Fund for the Haast Civil Defence Projects (appendix 1) as they arise for payment.

Sarah Brown
Community Development Advisor

Appendix 1:

Haast Community Meeting Tuesday 3 November 2020

Funds from the sale of land: Marks Road Local Purpose Reserve Fund – Civil Defence Portion of $93,500.00

Stage One Purchase of Haast Civil Defence equipment $7,113.06 approved at Council Meeting 25 July 2019.

Update of spending of Civil Defence portion of Marks Road Local Purpose Reserve fund
Also present: Sarah Brown/Lauren Emmanuel/ Simon Bastion – Westland District Council

Lauren Emmanuel to liaise with Haast Primary school about the use of emergency testing facility "Rockstar" for use in emergency situation for pupils to contact families via text/email as to its viability/practicality in Haast region. To discuss Sat-phone (paid for out of Marks Road Local Purpose Reserve Fund) for school emergency use. Haast School is the Hannah's Clearing CD site in event of an emergency.

• **Water Storage Tanks for Haast Hall, Okuru Hall and St Johns building** to be purchased and installed under the Marks Road Local Purpose Reserve Fund Civil Defence Fund, also note need for a Haast Hall standalone generator for use during an emergency.
Motioned: Darkie Henderson, Seconded: Pamela Adams.

Quotes have been forwarded by contractors to Council. Awaiting final decision from council to commence work. Darkie Henderson has confirmed he will lay pad for Haast Hall tank.

• **Haast Hall requires a stand-alone generator** for use during an emergency. Council has offered to get a price for a suitable model that will meet requirements. Funding to come from Marks Road Local Purpose Reserve Fund Civil Defence funding. **Motioned: Darkie Henderson, Seconded: Pamela Adams**

• **Bathroom and kitchen upgrade confirmed as part of work for Haast Hall**. Estimated figure around $160,000 from PGF for Haast Hall (Simon Bastion). Information requested from Council for work to Okuru Hall from PGF fund as quotes have been requested and submitted. Simon Bastion indicated Community would be updated.

Community expressed concerns. Advised by Nicola Johnston that as community is fragmented by large waterways down the Jackson Bay road and given that the Haast Hall may be required to provide travellers/tourists with emergency shelter it is reasonable to expect that an available facility such as Okuru Hall has basics such as enough functioning toilets with hot water etc. Lauren has acknowledged that she has viewed the Okuru Hall and is aware of the toilets.

Report to Council

DATE: 26 November 2020

TO: Mayor and Councillors

FROM: Group Manager, District Assets

Detailed Seismic Assessment - Westland District Council Offices

1. Summary

1.1. The purpose of this report is to inform Council of the Detailed Seismic Assessment (DSA) for the Westland District Council Building at 36 Weld Street, Hokitika.

1.2. This issue arises from the requirements for property owners, engineers and councils to act on the MBIE Guidelines for seismic assessment of existing buildings, released in 2018.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in May 2018, which are set out in the Long Term Plan 2018-28. Refer page 2 of the agenda.

1.4. That council commits to make structural improvements to Council Offices to increase the building from 34%NBS to meet at least the 67%NBS.
Council also instructs the Chief Executive to seek external funding opportunities towards the project.

2. Background

2.1. The reason the report has come before the Council is due to the requirements of the Earthquake Prone Buildings Act (EQPBA), which came into force in July 2017, that local authorities identify potentially earthquake prone buildings for further assessment as the first step in improving the seismic performance of these buildings. The building rating % NBS is used to define which buildings are earthquake prone under this regime.

2.2. The MBIE Guidelines for seismic assessment of existing buildings provide methods for two levels of assessment: Initial Seismic Assessment, for a broad indication of the likely level of seismic performance of a building; and Detailed Seismic Assessment, for a more comprehensive assessment.

2.3. The seismic assessment methods rate a building as a percentage of the new building standard applied to an equivalent new building on the same site.

2.4. The Guidelines also provide an overview and outline of the key principles of reducing seismic risk within buildings – designing seismic ‘improvement’.

2.5. A building with an earthquake rating less than 34% NBS it is considered to be an Earthquake-Prone Building (EPB) in terms of the Building Act 2004. A building rating less than 67% NBS is considered as an Earthquake Risk Building (ERB).

2.6. The differences in seismic hazard across New Zealand are included in the rating. People generally understand that seismic risk is lower in Auckland than Wellington, for example, but often don't realize that this is taken into account in the % NBS rating so that two buildings in different cities both rated 50% NBS present the same seismic risk profile

2.7. The guidelines were updated and enhanced in 2017 in order to provide additional guidance to engineers to improve accuracy and promote consistency between different engineers completing assessments. Differences in earthquake ratings can still arise for many reasons, including: judgement call differences between assessors, and information available at the time of the assessment.

3. Current Situation

3.1. The current situation is that Simco Consulting has undertaken a Detailed Seismic Assessment (DSA) for the Westland District Council Building at 36 Weld Street, Hokitika. The format of the investigation and reporting is in accordance with "The Seismic Assessment of Existing Buildings, Part B - Initial Seismic Assessment" and "Part C – Detailed Seismic Assessment".

3.2. Westland District Council (WDC) also engaged Simco Consulting to undertake a preliminary seismic strengthening design to 67% NBS. The summary of the preliminary strengthening design and cost is contained in their report.

3.3. Overall, the building is considered to be 34% NBS. Strengthening of the diaphragm connection to the stairwell walls is required to achieve this 67% NBS rating.

4. Options

4.1. **Option 1**: This report concludes by recommending that Council make structural improvements to Council Offices to increase the building from 34% NBS to meet at least the 67% NBS. It is further recommended by Council staff to apply for external funding for the works as a building is used for community purposes. The cost estimate prepared for this report is for structural works only and recommended that a full estimate is prepared when the strengthening scheme is fully designed.

4.2. **Option 2**: Do not proceed with the recommendations in the report and take no action.

5. Risk Analysis

5.1. Risk has been considered and the following risks have been identified as medium risk

5.2. The focus is on life safety performance rather than damage to the building or its contents unless this might lead to damage to adjacent property. The earthquake rating assigned is, therefore not reflective of serviceability performance.

5.3. Table 1. Building Grading System for Earthquake Risk Percentage of New Building Standard (%NBS) Building Grade Approx. Risk Relative to a New Building Life-Safety Risk Description >100 A+

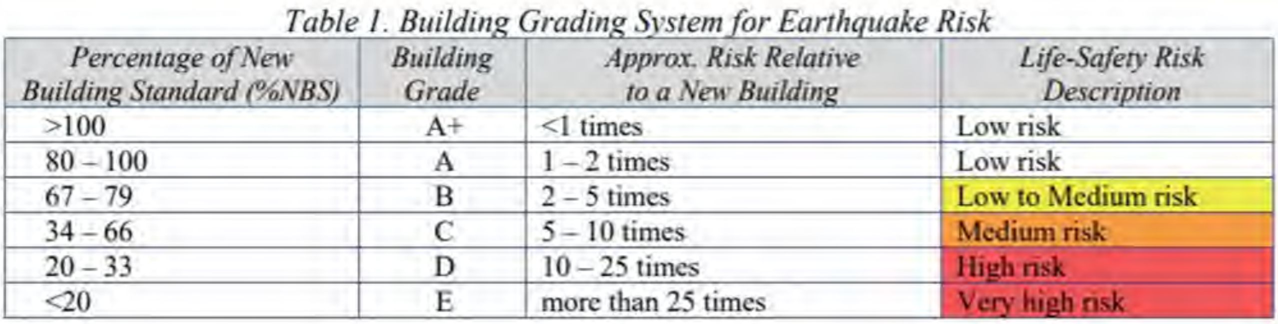


Table 1. Building Grading System for Earthquake Risk

Percentage of New Building Standard (%NBS)	*Building Grade*	*Approx. Risk Relative to a New Building*	*Life-Safety Risk Description*
>100	A+	<1 times	Low risk
80 – 100	A	1 – 2 times	Low risk
67 – 79	B	2 – 5 times	Low to Medium risk
34 – 66	C	5 – 10 times	Medium risk
20 – 33	D	10 – 25 times	High risk
<20	E	more than 25 times	Very high risk

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

6.2. Worksafe New Zealand has issued an advisory [Worksafe, 2018] to reassure people that meeting the timeframes for improving the seismic performance of buildings in accordance with the EQUBA is sufficient to meet their responsibilities under the Health and Safety at Work Act 2015.

7. Significance and Engagement

7.1. The level of significance has been assessed high as the Council Offices are defined as a Strategic Asset in Council's Significance and Engagement Policy. This is the operation centre for Council staff as well as providing access to the community as a Council function.

7.2. There is a potentially significant cost associated with the decision to make structural improvements to Council Offices to increase the building from 34%NBS to meet at least the 67%NBS.

7.3. No public consultation is considered necessary.

8. Assessment of Options (including Financial Considerations)

8.1. **Option 1**

8.1.1. This report concludes by recommending that Council make structural improvements to Council Offices to increase the building from 34%NBS to meet at least the 67%NBS to meet the EQPBA requirements.

8.1.2. The scope of the work can be included in the Long Term Plan budgeting process. Initial unbudgeted costs will be required to progress a Lotteries funding application.

8.1.3. Should Council decide to fund alternative options further consultation through the Long Term Plan needs to be considered.

8.2. **Option 2**

8.2.1. Not progressing with the recommendations in this report at this time will postpone the works on the Council Offices, which are required to meet the EQPBA. Council has the option to apply for an extension of time to complete the works.

9. Preferred Option(s) and Reasons

9.1. The preferred option is Option 1.

9.2. This would ensure that the Council Office building can be strengthened to requirements and can serve the community and Council in future for key operating functions. This allows for consideration of external funding for the earthquake strengthening works required to meet the EQPBA

10. Recommendation(s)

10.1. That the report be received.
10.2. That council commits to make structural improvements to Council Offices to increase the building from 34%NBS to meet at least the 67%NBS.
10.3. Instruct the Chief Executive to seek external funding opportunities towards the project.

Louis Sparks
Group Manager, District Assets

Appendix 1: Simco Consulting: Detailed Seismic Assessment - Westland District Council Offices

DETAILED SEISMIC ASSESSMENT

WESTLAND DISTRICT COUNCIL OFFICES

36 WELD STREET

HOKITIKA

ISSUE 2

10 November 2020

JOB NO: 20005

E: kevins@simcoconsulting.co.nz **P: 027-434-1672**

Contents

1. ASSESSMENT INFORMATION

1.1. Background

A Detailed Seismic Assessment (DSA) has been undertaken for the Westland District Council Building at 36 Weld Street, Hokitika. The format of the investigation and reporting is in accordance with "The Seismic Assessment of Existing Buildings, Part B - Initial Seismic Assessment" and “Part C – Detailed Seismic Assessment”. See the DSA summary table in Appendix A, structural calculations in Appendix B, and original structural drawings in Appendix C.

We have subsequently been engaged by the Westland District Council (WDC) to undertake a preliminary seismic strengthening design to 67%NBS. The summary of the preliminary strengthening design is contained in this report.

1.2. Investigations

A quantitative assessment of the building has been carried out to determine the likely earthquake capacity of the building relative to the current code (%NBS). This assessment was based on the following:

- No site inspection has been able to be undertaken as this work has been undertaken during the Covid19 Level 4 lockdown.

- Review of original structural and architectural drawings as prepared by the Ministry of Works dated to c1947. The following sheets were provided:
    - Layout Drainage & Roof Plans, Details of Septic Tank, Cycles, etc
    - Ground & First Floor Plans
    - Elevations & Sections
    - Details of Vestibule & Main Stair
    - Exterior Details
    - Further Column Details
    - Foundation Tie Beams
    - 1st Floor Beams
    - Roof Beams
    - North and South Walls
    - Miscellaneous External Walls & Chimney Details
    - 1st Floor, Roof, and Penthouse Roof Details
    - Main and Rear Staircases

2. Building Information

2.1. Building Description

The building is a 1948 Ministry of Works designed building, originally constructed as the Hokitika Post Office. The building structure is a mixture of concrete frames and concrete walls. The walls are significantly punctured with openings for windows and doors. Originally, the building was two-storeyed, with a 6” concrete mid-floor and a 5” concrete roof. It has since had a third floor added. A lightweight timber structure was added over the whole top floor (the original 5” thick roof). No drawings of this structure have been provided, but it is visible in Google Maps. There ae also ground floor additions on the southern elevation. The building has been built out to the line of the edge of the original southern stairwell. There is a single storey loading dock and bicycle storage area on the northern side of the building This last area was part of the original building construction.

Figure 1: Westland District Council - 36 Weld Street, Hokitika (image retrieved from LINZ)

2.2. Gravity System

The structural system at roof level is unknown, though is assumed to be timber or steel purlins spanning between transverse portals aligned with the frames of the floor beneath. These frames then transfer the loads to foundation pads, and to the soil beneath.

Internally, the 6” (first floor) and 5” (second floor) concrete slabs span two-ways between the reinforced concrete beams and the external wall lines. The beams carry loads to the columns and the pads beneath; the walls carry the loads to continuous foundation beams, and then through to the soil beneath.

2.3. Lateral System

The building has concrete floors at first and second floor levels. These floors act as diaphragms to distribute lateral loads to the in-plane walls.

3. SUMMARY OF DSA METHODOLOGY

3.1. Assessment Parameters

3.1.1. Occupancy Type & Importance Level

The building has a typical commercial use, and thus qualifies as Importance Level Two (IL2) under NZS1170.0:2004 definitions.

3.1.2. Site Subsoil Class

The site was assumed as Subsoil Class D. This is typical of Hokitika soils and is a conservative assumption.

3.1.3. Ductility, μ

A ductility of $\mu = 1.25$ was assumed for both directions. This was determined after review of the structural system and reinforcement detailing provided for the lateral-load resisting elements (walls/cantilever columns). Generally, the walls are well-detailed, but have no particular protection against hinging i.e. no stirrups, and transverse steel is generally spaced at 12" centres. The reinforcement is round bar, but the bars are typically anchored with 180° hooks and long lap lengths. The probable plastic rotation capacities of the wall piers were assessed and concluded to support the adoption of the nominally ductile response.

The shear demand on the various wall elements has been scaled up to elastic loads to provide a further hierarchy against failure.

3.1.4. Structural Performance Factor, S_p

A value of $S_p = 0.9$ was assumed, consistent with NZS3101:2006 specification for a nominally ductile concrete structure.

3.1.5. Geometric Assumption

The plans date to 1948 and are imperial. Whilst there are drawings for most walls, there are no elevations available for some walls e.g. the internal 'spine' wall. Some elements of the walls were not dimensioned on the drawings. These were assessed for the analysis by scaling off the available drawings. The analytical models used in determining the wall stiffnesses also show the geometry assumed for each panel. The geometry of the walls was checked during the site visit and updates made where required.

3.1.6. Load Distribution & Diaphragm Modelling Philosophy

The diaphragm has been modelled using a grillage model with 0.5m crs grid. This follows the methodologies discussed in the Concrete Buildings assessment guidelines (C5). The loads have been applied at the CoM, and at +/- 0.1b offsets as specified by the loadings codes. A bidirectional case has been considered with 100% applied load on one axis and 30% on the perpendicular axis. The supports provided by the walls and frames were modelled at a single point along their line to simplify the interpretation of the model results. These supports were modelled as springs, with the spring stiffness at each floor calibrated to the stiffness of each wall determined from a separate planar analysis.

3.1.7. Round Bars

Destructive investigation has confirmed that the structure is reinforced with round bars. These bars are predominantly anchored with 90- or 180-degree hooks as per the drawings / notes. The heavier bars around openings have straight development but have been taken $54d_b$ past the openings, significant lengths for 280MPa bars. By comparison, NZS3101:2006 requires a development length of 22 d_b for a Grade 300 deformed bar. As per C5.4.4 of the concrete guidance, round bars require a development length 2x that of an equivalent deformed bar i.e. $44d_b$. Accordingly, these straight bars have been considered to have sufficient anchorage to develop their full tensile strength.

3.2. Building Element Capacity Tables

Table 1: North Wall

FACTOR ASSESSED	%NBS
Flexural Capacity	65%
Shear Capacity	40%
Shear Transfer from Diaphragm	75%
Sliding Capacity / Base Shear Transfer	100%

Table 2: Spine Wall

FACTOR ASSESSED	%NBS
Flexural Capacity	34%
Shear Capacity	34%
Shear Transfer from Diaphragm	67%

Table 3: South Wall (West / Short End)

FACTOR ASSESSED	%NBS
Flexural Capacity	40%
Shear Capacity	50%
Shear Transfer from Diaphragm	60%

Table 4: South Wall (East / Long End)

FACTOR ASSESSED	%NBS
Flexural Capacity	34%
Shear Capacity	60%
Shear Transfer from Diaphragm	100%

Table 5: Supplementary Longitudinal Wall 6" & 10"

FACTOR ASSESSED	%NBS
Flexural Capacity	75%
Shear Capacity	100%
Shear Transfer from Diaphragm	100%
Sliding Capacity / Base Shear Transfer	100%

Table 6: East & West Walls

FACTOR ASSESSED	%NBS
Flexural Capacity	34%
Shear Capacity	100%
Shear Transfer from Diaphragm	55%
Sliding Capacity / Base Shear Transfer	100%

Table 7: South Stairwell 8" Wall – Eastern Side

FACTOR ASSESSED	%NBS
Flexural Capacity	67%
Shear Capacity	100%
Load Transfer from Diaphragm	<34%*
Sliding Capacity / Base Shear Transfer	100%

* Upgrade required

Table 8: South Stairwell – Western Side

FACTOR ASSESSED	%NBS
Flexural Capacity	40%
Shear Capacity	40%
Shear Transfer from Diaphragm	<34%*
Sliding Capacity / Base Shear Transfer	67%

* Upgrade required

Table 9: Boiler Room 6" Wall

FACTOR ASSESSED	%NBS
Flexural Capacity	100%
Shear Capacity	100%
Shear Transfer from Diaphragm	100%
Sliding Capacity / Base Shear Transfer	100%

Table 10: Clerical Room 6" Wall

FACTOR ASSESSED	%NBS
Flexural Capacity	<34%*
Shear Capacity	55%
Shear Transfer from Diaphragm	34%
Sliding Capacity / Base Shear Transfer	34%

* Not a limiting element for overall building

Table 11: Strong Room Transverse Walls

FACTOR ASSESSED	%NBS
Flexural Capacity	100%
Shear Capacity	100%
Shear Transfer from Diaphragm	70%

Table 12: Coal Bunker Walls

FACTOR ASSESSED	%NBS
Flexural Capacity	50%
Shear Capacity	34%
Shear Transfer from Diaphragm	34%

3.3. Results of DSA

The DSA identified that the main structural elements of the building could achieve 34%NBS with strengthening of the diaphragm connections to the two southern stairwell walls. The failure mode of the building was expected to be formation of flexural mechanisms within some walls at 34%NBS (μ = 1.25, Sp = 0.9) in both the longitudinal and transverse directions. Shear failure mechanisms were identified in some walls in each of the transverse and longitudinal directions at capacities ranging from 40% to 50%NBS (μ = 1.0, Sp = 1.0).

The following works must be undertaken in order to achieve this 34%NBS rating.

1. The southern stairwell walls require strengthening by installation of new drag bars / steel angles to connect them to the floor diaphragm.
2. There are several bays of infill masonry at the second floor. These should be removed and replaced with lightweight timber or similar.

4. 67%NBS STRENGTHENING

4.1. 67%NBS Strengthening Philosophy

The Detailed Seismic Assessment (DSA) was undertaken assuming nominally ductile loads ($\mu = 1.25$, Sp = 0.9) for flexural forces, and elastic loads ($\mu = 1.0$, Sp = 1.0) for shear forces to provide a hierarchy against undesirable shear failure mechanisms. This same philosophy has been applied to the strengthening design i.e. elements are designed to achieve 67% of current code loads.

4.2. 67%NBS Strengthening Schemes Considered

Two strengthening methods were considered: one utilising primarily steel and the second utilising mainly concrete. The steel solution involves large steel members being fed into the building. This requires some more detailed buildability investigation. To establish the preliminary cost plan, the concrete scheme was used as this scheme can be easily constructed. The steel solution cost advantages can be research as part of the next stage of design.

4.3. 67%NBS Strengthening Required

The following elements are included in the strengthening design. Refer to the strengthening drawings in Appendix D for further details.

1. New 200mm thick reinforced concrete walls alongside the eastern and western ends of the south wall (both floors)
2. New 150mm thick reinforced concrete walls alongside the eastern and western ends of the north wall (both floors)
3. New 150mm thick reinforced concrete walls alongside the central portion of the ‘spine wall’ (both floors)
4. Infilling of a small window section with 200mm thick reinforced concrete on the north wall
5. Infilling of a small area of 150mm thick wall in the coal bunker wall
6. Cutting out of two areas of 200mm thick wall at in the spine wall at first floor
7. Removal of several areas of brick infill between gravity frames
8. New diaphragm connections to the east, west, clerical room, and coal bunker walls (L2 only)
9. New diaphragm drag ties to the south stairwell walls (both floors)
10. New 150x6SHS frame above the ground floor strongroom walls (L1 to underside of L2)
11. 200x9SHS frames alongside the east and west walls (G to L1 only)
12. 180PFC braced frame alongside the clerical wall (both floors)

5. PRICING

5.1. Price Estimate

Pricing for the above strengthening works to 67%NBS has been provided by the firm Grant Moore and Associates Ltd (see Appendix E). The preliminary price estimate is $1,246,000 + GST. The following are exclusions from this price:

- Professional fees
- Contingency
- Non-structural alterations to the existing fitout
- Removal of tenants' / owner's furniture and fitout
- Relocation expenses
- New floor coverings (toilet included, make good balance)
- Painting of existing unaltered surfaces
- Repainting of exterior (external painting infill areas has been allowed for)
- Siteworks
- Future increased costs

This price estimate is attached in Appendix B.

5.2. Construction Staging & Timing

The work may be carried out in stages to reduce the overall disruption to Council operations. We anticipate this staging involving shutting off areas of the building while the strengthening work is undertaken. We recommend beginning work on the ground floor before moving up to the second floor as many of the concrete walls are continuous over both levels.

Some of the work will be loud, so night-time operation may be required for some or all the work. Note that any additional fees for night-time work have not been allowed for in the above pricing.

6. DETAILED SEISMIC ASSESSMENT RESULTS

Overall, the building is considered to be 34%NBS, with the likely failure mechanism to be flexural failure occurring in various wall elements. Strengthening of the diaphragm connection to the stairwell walls is required to achieve this 34%NBS rating.

This report has been prepared by Kevin Simcock, of Simco Consulting Ltd (CPEng 67375 - Structural & Geotechnical), on behalf of the Westland District Council. Kevin has been involved in the design, repair, and assessment of new and existing buildings for over 35 years.

SIMCO CONSULTING LTD

K J Simcock

BE (Hons), ME
MIPENZ, IntPE (NZ)
CPEng (structural & geotechnical) 67375

APPENDIX A: DSA SUMMARY TABLE

1. Building Information	
Building Name/ Description	Westland District Council Building
Street Address	36 Weld Street, Hokitika
Territorial Authority	Westland District Council
No. of Storeys	Three
Area of Typical Floor (approx.)	270m^2
Year of Design (approx.)	1946
NZ Standards designed to	Unknown
Structural System including Foundations	Lightweight steel portals on top floor over concrete walls in longitudinal and transverse direction. Concrete diaphragm floors distribute loads. Foundation beams and slab-on-grade.
Does the building comprise a shared structural form or shares structural elements with any other adjacent titles?	An external concrete block bike shed area on the ground floor on the northern side.
Key features of ground profile and identified geohazards	None known.
Previous strengthening and/ or significant alteration	Addition of lightweight top floor onto original roof.
Heritage Issues/ Status	Not a heritage building
Other Relevant Information	-

2. Assessment Information	
Consulting Practice	Simco Consulting Ltd
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings	This report has been prepared by Kevin Simcock, of Simco Consulting Ltd (CPEng 67375 - Structural & Geotechnical). Kevin has been involved in the design, repair, and assessment of new and existing buildings with the Canterbury region for over 35 years.
Documentation reviewed, including: • date/ version of drawings/ calculations • previous seismic assessments	Original structural drawings by Ministry of Works c1946 Structural drawings for top floor addition by Paul B. Kaye Consulting Engineer c1989 No structural calculations No previous assessments
Geotechnical Report(s)	No
Date(s) Building Inspected and extent of inspection	19/06/2020; visual inspection of full building internally
Description of any structural testing undertaken and results summary	Contractor undertook destructive investigation to confirm that the reinforcement is round not deformed.
Previous Assessment Reports	-
Other Relevant Information	-

3. Summary of Engineering Assessment Methodology and Key Parameters Used

Occupancy Type(s) and Importance Level	2
Site Subsoil Class	D
For a DSA:	
Summary of how Part C was applied, including: • the analysis methodology(s) used from C2 • other sections of Part C applied	Equivalent static analysis assuming loads distributed on tributary width Concrete calculations as per NZS3101 & C5 Assessment Guidelines
Other Relevant Information	NTR

BUILDING DESCRIPTION AND ASSESSMENT METHODOLOGY

The Westland District Council is a 1940s era (approx 1948 design) reinforced concrete building located in Hokitika. It was originally two storeys, with reinforced concrete floors and roof. A lightweight floor has since been built on top of the original 5" thick roof. The building is a mixture of frames and walls; the frames carry internal gravity loads, and the walls provide the lateral resistance. The walls are typically 8" thick for 'structural' walls, with internal walls generally 6" thick. There is a 10" thick strong room on the ground floor. The walls sit on well-reinforced foundation beams, with a 5" ground slab over hardfill.

The building has been assessed as a nominally ductile building using the equivalent static method (ESA) and with reference to the guidance in the 'Yellow Book' (C5 of the DSA guidance). ESA is applicable for all buildings with a fundamental period less than 0.4s. This building is very stiff due to the concrete walls and hence will satisfy this requirement. The building is not expected to sustain a fully ductile response due to the detailing used (no confinement of ends of walls, anchorage with 180 degree hooks, and round bars). However, it is well-detailed for a building of its age and the main bars all terminate in hooks. Additionally, the probable plastic rotation capacity of all of the wall piers was estimated using the C5 guidance and checked against the deflections generated from the wall grillage models. This provided confidence that the nominal ductility capacity was a reasonable assumption as many of the elements can achieve significant rotation before the probable onset of loss of gravity support.

The floor weight calculations are included in the calculations, along with the ESA distribution calculated for the building. An additional summary page is included to outline the diaphragm assessment methodology. The loads were applied as distributed loads to a grillage model representing the diaphragm. The reactions at frames were single-springs. The loads were applied in 100% + 30% direction, with the main force direction offset by +/- 0.1b as required. This gives a total of 6 primary cases and 24 combination cases. The critical total shear and overturning moment were considered in the selection of the loads to apply. Typically, the critical shear case was chosen (though this was usually the same case).

Title:	ESA Force Distribution	**Job No**	:
		Page	: 1
Description:	WDC Building	**Date**	: 14/04/2020
		Author	: MS
		Reviewer	:
		Revision	: 0

ESA Force Distribution

Overall Length	37.0	m
Overall Width	15.2	m

Floor	(m) **H_i**	(kN) **W_i**
Roof	11.1	518
2	8.23	4224
1	4.42	6300
	ΣW	11042 *kN*

Note: for this model the top floor is relatively flexible and is assumed to act fairly independently of the floors below
As such, the storey force for the 'Roof' level calculated above will be lumped at the top floor (2nd level) of the frames

				(1.0, 1.0)	*(1.25, 0.9)*	*(2.0, 0.7)*
Level	(m) **H_i**	(kN) **W_i**	(kN.m) **W_iH_i**	(kN) **F_i**	(kN) **F_i**	(kN) **F_i**
2	8.23	4742	39027	9196	7462	4100
1	4.42	6300	27846	5711	4634	2546
	Σ	11042	66873	14907	12095	6646
			$C_d(T)$	1.35	1.10	0.60
			V*	14907	12095	6646

Date 11/04/20
Job No
Engineer MS
Sheet No
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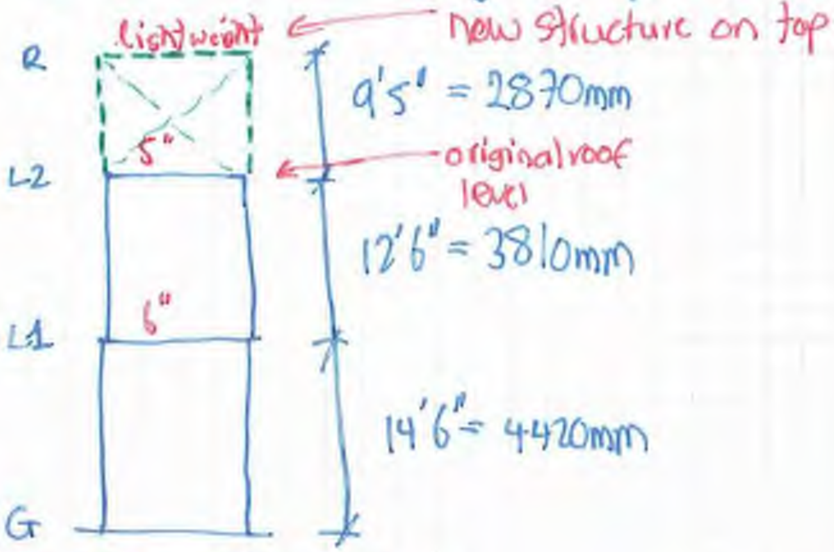
WEIGHTS

Building is 3-storey, w/ conc. floors & walls on 2 levels & lightweight top level.



Building footprint is:

Floor = 49'8" × 121'4" = 15.14m × 36.98m = 560m^2 overall

+

Stairs = 17'6½" × 15'0" = 5.35m × 4.57m = 24.4m^2

NOTE Stairs are the only part of the building with a 3^{rd} floor conc. roof ⇒ the old 'penthouse' had a 5" conc. slab roof.

The floorplates for L1 & L2 are very similar, plus or minus some lengths of concrete wall. Thus calculate G_{floor}, Q, SDL based on same Area @ both levels & vary the loads for walls, columns, and frames to suit differing interstorey heights.

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Weights

$G_{6"} = 24kN/m^3 \times (6" \times 25.4mm/_{inch})/_{10^3}$ = 3.66kPa ⇒ 3.7kPa

$G_{5"}$ = 3.05kPa ⇒ 3.1kPa

SDL allow 0.5kPa for fitout/partitions + services & ceilings below

Q = 3.0kPa

Lightweight roof = 0.5kPa
Lightweight walls = 0.4kPa × 2.87m = 1.2kN/m

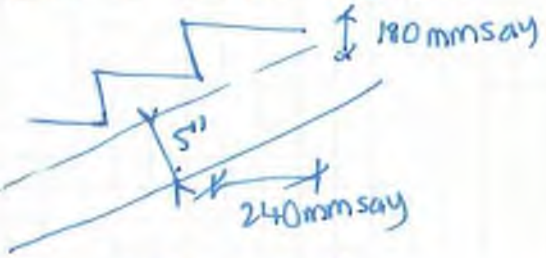
Typ. beam = $24kN/m^3 \times 12" \times 30"$ = 5.6kN/m long

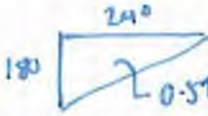
Typ. col = $24kN/m^3 \times 16" \times 16"$ = 4.0kN/m high

Wall : 6" = 3.7kPa
8" = 4.9kPa
10" = 6.1kPa

Glazing allow 15mm = 25.5kN/m × 0.015m = 0.38kPa

Stairs 5" throat thickness



∴ 

$\left.\begin{array}{l} 24kN/m^3 \times \ldots 0.52kN \times \left(\frac{1m}{0.24m}\right) = 2.2kPa \\ + 24kN/m^3 \times 5" = 3.05kPa \end{array}\right\}$ = 5.3kPa for stairs

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Level 1

$15'0'' = 4.57m$ $\quad 24'10'' = 7.57m$

Loosely we have walls on all 4 sides + 5 bays (15'0") of wall down the middle + stairwell + ~ 6 bays (24'10") across the middle, say avg weight 8" equiv.

We have 7 bays of 24'10" x 2 beams + 29 16" x 16" columns + 5 extra 15'0" beams.

End walls ~ 80% conc, 20% glazing. Long walls ~ 80%.

$\therefore$

$G_{floor} = 3.7kPa \times 560m^2 = 2072kN$

$G_{SDL} = 0.5kPa \times 560m^2 = 280kN$

$Q = 3kPa \times (\psi_a = 0.5) \times (\psi_e = 0.3) \times 560m^2 = 252kN$

$Walls = 4.9kPa \times \left(\frac{4.42m}{2} + \frac{3.81m}{2}\right) = 19.7kN/m$
$\times \left[\left((8 \times 2 + 5) \times 4.57m\right) + \left((2 \times 2 + 6) \times 7.57m\right)\right] \times 80\% = 2706\ kN$

$Beams = 5.6kN/m \times \left((7 \times 2) \times 7.57m + 5 \times 4.57m\right) = 721kN$

$Columns = 4kN/m \times 29 \times \left(\frac{4.42m}{2} + \frac{3.81m}{2}\right) = 477kN$

$Glazing = 2706kN \times \left(\frac{0.38kPa}{4.9kPa}\right) \times \left(\frac{20\%}{80\%}\right) = 52kN$

Stairwell

$17'11'' = 5.46m$

$G = 5.3kPa \times 24.4m^2 \times 80\% = 103kN$

$Q = 4kPa \times 0.5 \times 0.3 \times 24.4m^2 \times 80\% = 11.7kN$

$Walls = 4.9kPa \times (2 \times 5.46m) \times \left(\frac{4.42m}{2} + \frac{3.81m}{2}\right) = 220kN$

$Glazing = 0.38kPa \times 4.57m \times \left(\frac{4.42m}{2}\right) + \left(\frac{3.81m}{2}\right) = 7kN$

$A = 584m^2$ $\quad \underline{6902kN}$
$(11.8kPa)$

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Level 2

$G_{floor} = 2072kN \times 5''/6''$ $= 1727\ kN$

G_{SDL} = } as previously $= 280kN$

Q = } $= 252kN$

$$\text{Walls} = 2706kN \times \overbrace{\left(\frac{3.81m}{2}\right) \Big/ \left(\frac{3.81m}{2} + \frac{4.42m}{2}\right)}^{46\%\ \text{trib height}} = 1254kN$$

$$\text{Beams} = 721kN \times 26''/30'' = 625kN$$

$$\text{columns} = 4kN/m \times 29 \times \left(\frac{3.81m}{2}\right) = 221kN$$

$$\text{Glazing} = 52kN \times 0.46 = 24kN$$

Stairwell

G = as previous $= 103kN$

Q = as previous $= 12kN$

$$\text{Walls} = 220kN \times \frac{\left(\frac{3.81m}{2} + \frac{2.87m}{2}\right)}{\left(\frac{4.42m}{2} + \frac{3.81m}{2}\right)} = 179kN$$

81%

$$\text{Glazing} = 7kN \times 0.81 = 6kN$$

Area $= 584m^2$
(8.0kPa)

4683 kN

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Roof

$G = 0.5kPa \times 560m^2$ $= 280kN$

$Q = 0$ in seismic case

Walls = don't have a plan ∴ estimate lengths

perimeter $= (8 \times 4.57m) + (2 \times 2 \times 7.57m)$

$= 67m$

internal say similar

$\approx 140m \times 0.4kPa \times \frac{2.87m}{2}$ $= 80kN$

Stairwell

$G = 3.1kPa \times 24.4m^2$ $= 76kN$

Walls $= 4.9kPa \times (2 \times 5.46m) \times \frac{2.87m}{2}$ $= 77kN$

Glazing ~ 5kN $= 5kN$

518kN

$A = 584m^2$

$(0.9kPa)$

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Seismic Distribution

$C_h(T) = 3.00$ [D/E & very stiff]
$Z = 0.45$ [Hokitika]
$R = 1.0$ [IL2]
$N = 1.0$

1.35g for elastic loads

Level	(kN) W_i	(m) H_i	(kN.m) W_iH_i	$\frac{W_iH_i}{\Sigma W_iH_i}$	(kN) F_i (μ=1.0)
2	5201*	8.23	42804	58.4%	10,086
1	6902	4.42	30507	41.6%	6253
	12103kN		73311 kN·m		16339kN ✓

$V^*_{base} = 12103kN \times 1.35g = 16339kN$

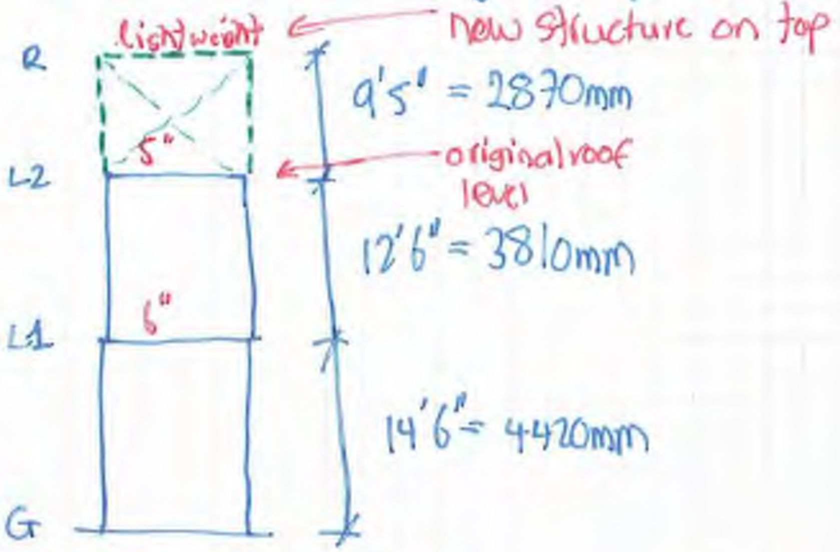
$$F_i = \underset{\uparrow top}{0.08V^*} + 0.92 \times \frac{W_iH_i}{\Sigma W_iH_i} \cdot V^*$$

* top storey very flexible relative to below → lump mass at roof & check w/ parts loads later.

Date 11/04/20
Engineer MS
File Name WDC DSA
Job No
Sheet No

WEIGHTS

Building is 3-storey, w/ conc. floors & walls on 2 levels & lightweight top level.



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NOTE Stairs are the only part of the building with a 3rd floor conc. roof ⇒ the old 'penthouse' had a 5" conc. slab roof.

The floorplates for L1 & L2 are very similar, plus or minus some lengths of concrete wall. Thus calculate G_{floor}, Q, SDL based on same Area @ both levels & vary the loads for walls, columns, and frames to suit differing interstorey heights.

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Date 11/04/20
Engineer MS
File Name WDC DSA
Job No
Sheet No

Weights

$G_{6''} = 24kN/m^3 \times (6'' \times 25.4mm/_{inch})/_{10^3} = 3.66kPa \Rightarrow 3.7kPa$

$G_{5''} = 3.05kPa \Rightarrow 3.1kPa$

SDL allow 0.5kPa for fitout/partitions + services & ceilings below

Q = 3.0kPa

lightweight roof = 0.5kPa
lightweight walls = 0.4kPa × 2.87m = 1.2kN/m

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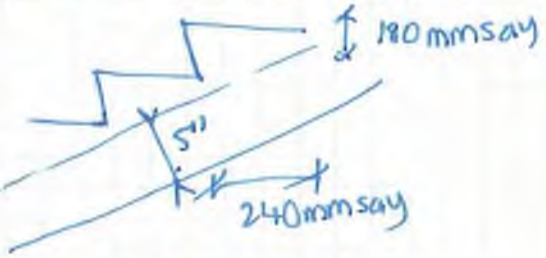

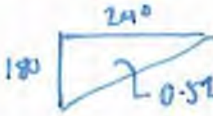

$\therefore$ $24kN/m^3 \times$ 0.52kN $\times \left(\frac{1m}{0.24m}\right) = 2.2kPa$
$+ 24kN/m^3 \times 5'' = 3.05kPa$
} = 5.3kPa for stairs

Date 11/04/20
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Level 1 $15'0'' = 4.57\,\mathrm{m}$ $24'10'' = 7.57\,\mathrm{m}$

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End walls ~ 80% conc, 20% glazing. Long walls ~ 80%.

∴

$G_{floor} = 3.7\,\mathrm{kPa} \times 560\,\mathrm{m}^2 = 2072\,\mathrm{kN}$

$G_{SDL} = 0.5\,\mathrm{kPa} \times 560\,\mathrm{m}^2 = 280\,\mathrm{kN}$

$Q = 3\,\mathrm{kPa} \times (\psi_a = 0.5) \times (\psi_e = 0.3) \times 560\,\mathrm{m}^2 = 252\,\mathrm{kN}$

$\text{Walls} = 4.9\,\mathrm{kPa} \times \left(\frac{4.42\,\mathrm{m}}{2} + \frac{3.81\,\mathrm{m}}{2}\right) = 19.7\,\mathrm{kN/m}$
$\times \left[\left((8 \times 2 + 5) \times 4.57\,\mathrm{m}\right) + \left((2 \times 2 + 6) \times 7.57\,\mathrm{m}\right)\right] \times 80\% = 2706\,\mathrm{kN}$

$\text{Beams} = 5.6\,\mathrm{kN/m} \times \left((7 \times 2) \times 7.57\,\mathrm{m} + 5 \times 4.57\,\mathrm{m}\right) = 721\,\mathrm{kN}$

$\text{Columns} = 4\,\mathrm{kN/m} \times 29 \times \left(\frac{4.42\,\mathrm{m}}{2} + \frac{3.81\,\mathrm{m}}{2}\right) = 477\,\mathrm{kN}$

$\text{Glazing} = 2706\,\mathrm{kN} \times \left(\frac{0.38\,\mathrm{kPa}}{4.9\,\mathrm{kPa}}\right) \times \left(\frac{20\%}{80\%}\right) = 52\,\mathrm{kN}$

Stairwell $17'11'' = 5.46\,\mathrm{m}$

$G = 5.3\,\mathrm{kPa} \times 24.4\,\mathrm{m}^2 \times 80\% = 103\,\mathrm{kN}$

$Q = 4\,\mathrm{kPa} \times 0.5 \times 0.3 \times 24.4\,\mathrm{m}^2 \times 80\% = 11.7\,\mathrm{kN}$

$\text{Walls} = 4.9\,\mathrm{kPa} \times (2 \times 5.46\,\mathrm{m}) \times \left(\frac{4.42\,\mathrm{m}}{2} + \frac{3.81\,\mathrm{m}}{2}\right) = 220\,\mathrm{kN}$

$\text{Glazing} = 0.38\,\mathrm{kPa} \times 4.57\,\mathrm{m} \times \left(\frac{4.42\,\mathrm{m}}{2}\right) + \left(\frac{3.81\,\mathrm{m}}{2}\right) = 7\,\mathrm{kN}$

$A = 584\,\mathrm{m}^2$
$(11.8\,\mathrm{kPa})$

$\underline{6902\,\mathrm{kN}}$

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Level 2

$G_{floor} = 2072kN \times 5''/6''$ = 1727 kN

G_{SDL} = } as previously = 280kN

Q = } = 252kN

$$\text{Walls} = 2706kN \times \overbrace{\left(\frac{3.81m}{2}\right) \Big/ \left(\frac{3.81m}{2} + \frac{4.42m}{2}\right)}^{46\%\ \text{trib height}} = 1254kN$$

$\text{Beams} = 721kN \times 26''/30''$ = 625kN

$\text{columns} = 4kN/m \times 29 \times \left(\frac{3.81m}{2}\right)$ = 221kN

$\text{Glazing} = 52kN \times 0.46$ = 24kN

Stairwell

G = as previous = 103kN

Q = as previous = 12kN

$$\text{Walls} = 220kN \times \frac{\left(\frac{3.81m}{2} + \frac{2.87m}{2}\right)}{\left(\frac{4.42m}{2} + \frac{3.81m}{2}\right)} \; 81\% = 179kN$$

$\text{Glazing} = 7kN \times 0.81$ = 6kN

Area = $584m^2$
(8.0kPa)

4683 kN

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Roof

$G = 0.5kPa \times 560m^2$ $= 280kN$
$Q = 0$ in seismic case

Walls = don't have a plan ∴ estimate lengths

perimeter $= (8 \times 4.57m) + (2 \times 2 \times 7.57m)$
$= 67m$

internal say similar
$\approx 140m \times 0.4kPa \times \frac{2.87m}{2}$ $= 80kN$

Starwell

$G = 3.1kPa \times 24.4m^2$ $= 76kN$
Walls $= 4.9kPa \times (2 \times 5.46m) \times \frac{2.87m}{2}$ $= 77kN$
Glazing ~ 5kN $= 5kN$

$A = 584m^2$
$(0.9kPa)$

518kN

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Engineer MS
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Seismic Distribution

$C_h(T)$ = 3.00 [D/E & very stiff]
Z = 0.45 [Hokitika]
R = 1.0 [IL2]
N = 1.0

1.35g for elastic loads

Level	(kN) W_i	(m) H_i	(kN·m) W_iH_i	$\frac{W_iH_i}{\Sigma W_iH_i}$	(kN) F_i (μ=1.0)
2	5201*	8.23	42804	58.4%	10,086
1	6902	4.42	30507	41.6%	6253
	12103kN		73311 kN·m		16339kN ✓

$$V^*_{base} = 12103\text{kN} \times 1.35g = 16339\text{kN}$$

$$F_i = \underset{\uparrow \text{top}}{0.08V^*} + 0.92 \times \frac{W_iH_i}{\Sigma W_iH_i} \cdot V^*$$

* top storey very flexible relative to below → lump mass at roof & check w/ parts loads later.

CALCULATION SKETCH SHEET	**DATE:** 13/05/2020 **JOB No.:** 1560 **SHEET No.:** **REVISION:** 0	SIMCO CONSULTING
PROJECT: WESTLAND DISTRICT COUNCIL DSA	**ENGINEER:** MS	**CHECKED BY:**
DESCRIPTION:		

DIAPHRAGM MODELLING METHODOLOGY

The diaphragm has been modelled using a grillage model with 0.5m crs following the methodologies discussed in the concrete building assessment guidelines (C5), and in the papers by John Scarry.

The diagonal members represent concrete struts so they are compression only. They are modelled as 125mm / 150mm thick concrete (5" / 6"), with a width of 0.53x the grillage spacing i.e. 0.53x 500mm = 265mm. The up / down and left / right members represent both tension and compression in the steel and / or concrete. They are modelled as 125mm / 150mm thick concrete thick concrete with a width of 0.75x the spacing i.e. 375mm.

The loads have been applied at the CoM, +/- 0.1b. The building is fairly regular in both directions; as such, the CoM of the building was assumed at the centroid of the floor plate of each level. The forces have been applied at each node within the model. For the load cases through the CoM the forces were equal at each node. For the +/- 0.1b cases the loads vary across the floor plate. Conceptually, this is representing the trapezoidal distribution of forces that results when an eccentric load. The magnitude of each force was determined by calculating the loading pattern required to generate a trapezium with 'Area' equal to the total floor force, and a centroid at the required +/- 0.1b offset.

The supports for the walls and frames have all been modelled at a single point. This simplifies the design process for the walls / frames. A separate model was generated showing the walls as spring stiffnesses (Knode = Ktotal / nNodes for each wall). This allows a better investigation of the flow of internal forces within the diaphragm.

The walls / frames have been modelled as spring supports in the appropriate direction. The spring stiffnesses have been determined by modelling the element in SpaceGass, applying a 1000kN unit load at first floor and second roof (original roof) in separate load cases, and calculating a stiffness based off the resultant deflection. These calculations are also included in this calculation package. The use of spring supports helps to capture the torsional response of the building (over and above the torsion induced by accidental eccentricity).

The plans date to 1948 and are imperial. There is no elevation available for some walls e.g. the internal 'spine' wall. The walls were modelled as truss elements following the same procedure detailed for the walls. This had the benefit of allowing panel elevations to be drawn inside an analytical model. These 'elevations' are included in these calculations and show the assumed panel geometry.

The diaphragm itself will be checked against the elastic loads from the model.

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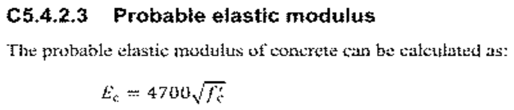
Title:	Stiffness of various lateral elements	**Job No**	:
		Page	: 1
Description:	WDC Building	**Date**	: 23/04/2020
		Author	: MS
		Reviewer	:
		Revision	: 0

Lateral Element Stiffness

Assumed concrete strength for typical Portland Cement concrete	$f'_{c,original}$	=	*25*	*MPa*
Assumed aging of 1.5x	f'_c	=	*37.5*	*MPa*
Estimate the Young's Modulus as per below	E_c	=	*28782*	*GPa*



C5.4.2.3 Probable elastic modulus

The probable elastic modulus of concrete can be calculated as:

$$E_c = 4700\sqrt{f'_c}$$

Note: in table below, numbers on the left are identifiers - they're primarily used to help me organise my models

Longitudinal		(kN) **P**	n_{nodes}	Level 1 (mm) **Δ**	Level 1 (kN/m) **K**	Level 2 (mm) **Δ**	Level 2 (kN/m) **K**	Level 1 K_y	Level 2 K_y
101	*North Wall*	1000	72	0.17	*5,882,353*	0.44	*2,272,727*	81,699	31,566
102	*South Wall (Short)*	1000	19	1.32	*757,576*	4.42	*226,244*	39,872	11,908
102	*South Wall (Long)*	1000	46	1.89	*529,101*	3.25	*307,692*	11,502	6,689
103	Spine	1000	46	0.13	*7,692,308*	0.87	*1,149,425*	167,224	24,988
104	Supplementary Longitu	1000	28	0.42	*2,380,952*			85,034	

Transverse		(kN) **P**	n_{nodes}	Level 1 (mm) **Δ**	Level 1 (kN/m) **K**	Level 2 (mm) **Δ**	Level 2 (kN/m) **K**	Level 1 K_x	Level 2 K_x
201	Typical Frame	1000		683	*1,464*	900	*1,111*		
202	East	1000	31	0.67	*1,492,537*	1.57	*636,943*	48,146	20,547
202	West	1000	31	0.67	*1,492,537*	1.57	*636,943*	48,146	20,547
203	Clerical Room	1000	16	1.32	*757,576*	3.71	*269,542*	47,348	16,846
204	Coal Bunker (East)	1000	12	2.81	*355,872*	7.10	*140,845*	29,656	11,737
204	Coal Bunker (West)	1000	9						
205	Boiler Room	1000	12	1.00	*1,000,000*			83,333	
206	Strong Room (East)	1000	12	0.92	*1,086,957*			90,580	
206	Strong Room (West)	1000	12	0.92	*1,086,957*			90,580	
207	Toll Boxes	1000	-	3.70	*270,270*			*Added to South Stair (East)*	
208	South Stair (East)	1000	16	1.28	*781,250*	4.02	*313,397*	65,720	19,587
208	South Stair (West)	1000	16	1.97	*507,614*	5.63	*177,620*	31,726	11,101

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Post-inspection Changes

South Wall 'Long' has had some sections removed at eastern end.

$\Delta_{L1,original}$ = 1.28mm

$\Delta_{L2,original}$ = 2.52mm

Now, remove wall sections & update

$\Delta_{L1,new}$ = 1.89mm => K = 529,104 kN/m

$\Delta_{L2,new}$ = 3.25mm => K = 307,692 kN/m

The spine wall has also had some infill sections at ground level + 1 new opening @ the eastern end

$\Delta_{L1,original}$ = 0.46mm

$\Delta_{L2,original}$ = 0.89mm

$\Delta_{L1,new}$ = 0.13mm => K = 7,692,308 kN/m

$\Delta_{L2,new}$ = 0.87mm => K = 1,149,425 kN/m

These values need to be fed back into the diaphragm model to get new loads on the walls.

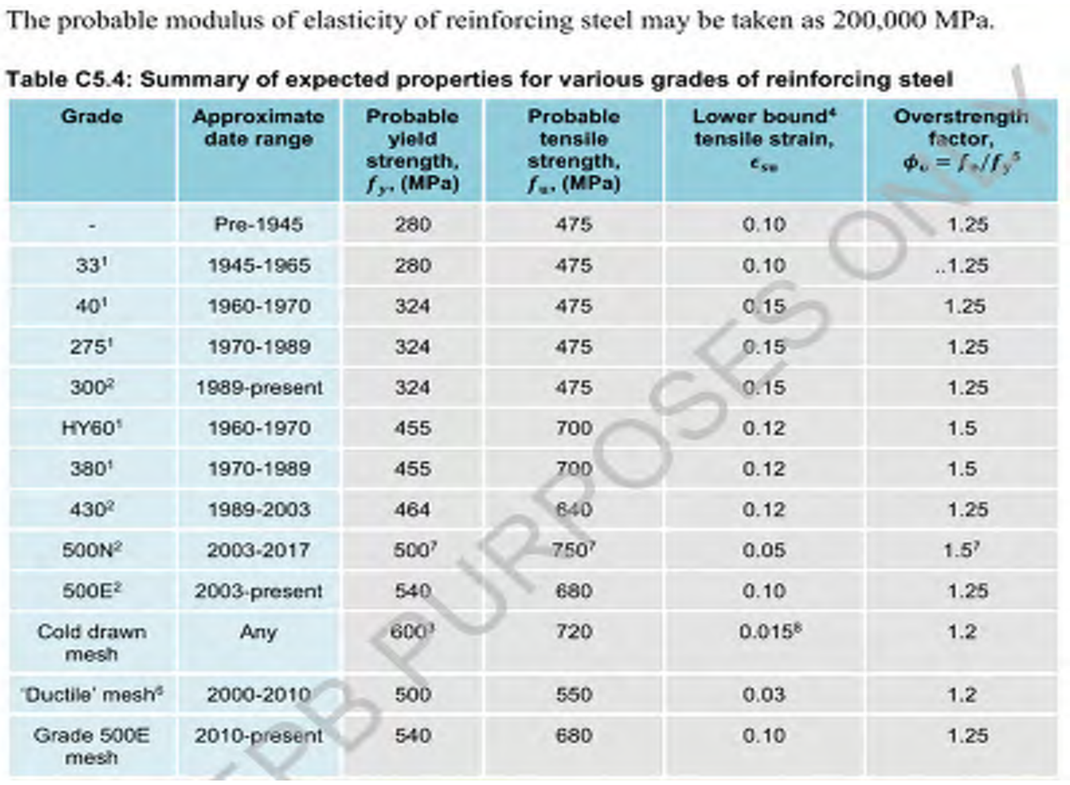
SIMCO Consulting Ltd

Title: Reinforcing Steel Capacities

Description: WDC Building

Job No :
Page : 1
Date : 27/04/2020
Author : MS
Reviewer :
Revision : 0

Reinforcing Steel Capacities



The probable modulus of elasticity of reinforcing steel may be taken as 200,000 MPa.

Table C5.4: Summary of expected properties for various grades of reinforcing steel

Grade	Approximate date range	Probable yield strength, f_y, (MPa)	Probable tensile strength, f_u, (MPa)	Lower bound[4] tensile strain, ϵ_{su}	Overstrength factor, $\phi_o = f_u/f_y$[5]
-	Pre-1945	280	475	0.10	1.25
33[1]	1945-1965	280	475	0.10	..1.25
40[1]	1960-1970	324	475	0.15	1.25
275[1]	1970-1989	324	475	0.15	1.25
300[2]	1989-present	324	475	0.15	1.25
HY60[1]	1960-1970	455	700	0.12	1.5
380[1]	1970-1989	455	700	0.12	1.5
430[2]	1989-2003	464	640	0.12	1.25
500N[2]	2003-2017	500[7]	750[7]	0.05	1.5[7]
500E[2]	2003-present	540	680	0.10	1.25
Cold drawn mesh	Any	600[3]	720	0.015[8]	1.2
'Ductile' mesh[6]	2000-2010	500	550	0.03	1.2
Grade 500E mesh	2010-present	540	680	0.10	1.25

Bar #	Designation	d_b	d_b	Bar Area	Yield Stress	Ultimate	Capacity
-		*inches*	*mm*	*mm²*	*MPa*	*MPa*	*kN*
1	1/8"	0.125	3.175	7.917	280	475	2.2 *kN*
2	1/4"	0.25	6.35	31.67	280	475	8.9 *kN*
3	3/8"	0.375	9.525	71.26	280	475	20.0 *kN*
4	1/2"	0.5	12.7	126.7	280	475	35.5 *kN*
5	5/8"	0.625	15.88	197.9	280	475	55.4 *kN*
6	3/4"	0.75	19.05	285	280	475	79.8 *kN*
7	7/8"	0.875	22.23	387.9	280	475	108.6 *kN*
8	1"	1	25.4	506.7	280	475	141.9 *kN*
9	1-1/8"	1.125	28.58	641.3	280	475	179.6 *kN*
10	1-1/4"	1.25	31.75	791.7	280	475	221.7 *kN*
11	1-3/8"	1.375	34.93	958	280	475	268.2 *kN*
12	1-1/2"	1.5	38.1	1140	280	475	319.2 *kN*

SIMCO Consulting Ltd

Title: Diaphragm Shear Capacity
Description: WDC Building

Job No :
Page : 1
Date : 13/05/2020
Author : MS
Reviewer :
Revision : 0

Diaphragm Shear Transfer to Walls

Ability of diaphragm to transfer shear into the walls. Typically the internal frames have 1/2" at 9" crs,
external walls have say 3/8" at 8" crs. Note: the lengths below are the length tied into the diaphragm, which is generally the length of the wall
calcs are based off a shear friction model with mu = 1.0, and loads are the elastic demands for the walls at the top floor

Longitudinal	**L_{wall} (m)**	**V* (kN)**	**V* (kN/m)**	**d_b (")**	**s (")**	**n_{sides}**	**V_n**	**%NBS**
101 *North Wall*	37	3,583	97	0.375	9	1	74	77%
102 *South Wall (Short)*	9.6	1231	128	0.375	9	1	74	58%
102 *South Wall (Long)*	23	1506	65	0.375	9	1	74	100%
103 Spine	23	3847	167	0.375	12	2	111	67%
104 Supplementary Wall	13.8	1301	94	0.375	12	2	111	100%

Transverse	**L_{wall} (m)**	(kN) **V* (kN)**	**V* (kN/)**	**d_b (")**	**s (")**	**n_{sides}**	**V_n**	**%NBS**
202 East	15.4	2196	143	0.375	7	1	95	67%
202 West	15.4	2741	178	0.375	7	1	95	54%
203 Clerical Room	10.4	1905	183	0.375	12	1	56	30%
204 Coal Bunker (East)	7.6	1132	149	0.375	12	1	56	37%
204 Coal Bunker (West)	3.8	0	0	0.375	12	2	111	-
205 Boiler Room	7.6	848.6	112	0.375	12	2	111	100%
206 Strong Room (East)	5.2	729.6	140	0.375	12	2	111	79%
206 Strong Room (West)	5.2	834.3	160	0.375	12	2	111	69%
206 South Stair (East)	5.8	2174	*N/A - upgrade required*					
206 South Stair (West)	5.8	1292	*N/A - upgrade required*					

Bar #	**Designation**	**d_b**	**d_b**	**Bar Area**	**Yield Stress**	**Ultimate**	**Capacity**
-		*inches*	*mm*	*mm^2*	*MPa*	*MPa*	- *kN*
1	1/8"	0.125	3.175	7.917	280	475	2.2 *kN*
2	1/4"	0.25	6.35	31.67	280	475	8.9 *kN*
3	3/8"	0.375	9.525	71.26	280	475	20.0 *kN*
4	1/2"	0.5	12.7	126.7	280	475	35.5 *kN*
5	5/8"	0.625	15.88	197.9	280	475	55.4 *kN*
6	3/4"	0.75	19.05	285	280	475	79.8 *kN*
7	7/8"	0.875	22.23	387.9	280	475	108.6 *kN*
8	1"	1	25.4	506.7	280	475	141.9 *kN*
9	1-1/8"	1.125	28.58	641.3	280	475	179.6 *kN*
10	1-1/4"	1.25	31.75	791.7	280	475	221.7 *kN*
11	1-3/8"	1.375	34.93	958	280	475	268.2 *kN*
12	1-1/2"	1.5	38.1	1140	280	475	319.2 *kN*

SIMCO Consulting Ltd

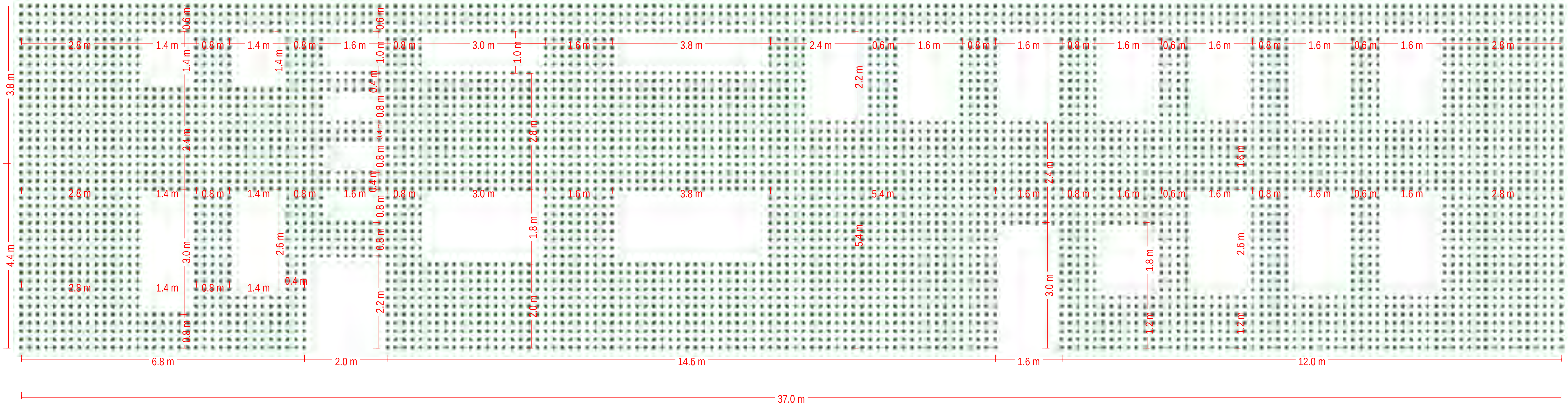
Title:	Critical Load Cases for Walls	**Job No**	:
		Page	: 1
Description:	WDC Building	**Date**	: 13/05/2020
		Author	: MS
		Reviewer	:
		Revision	: 0

Critical Cases / Design Shears

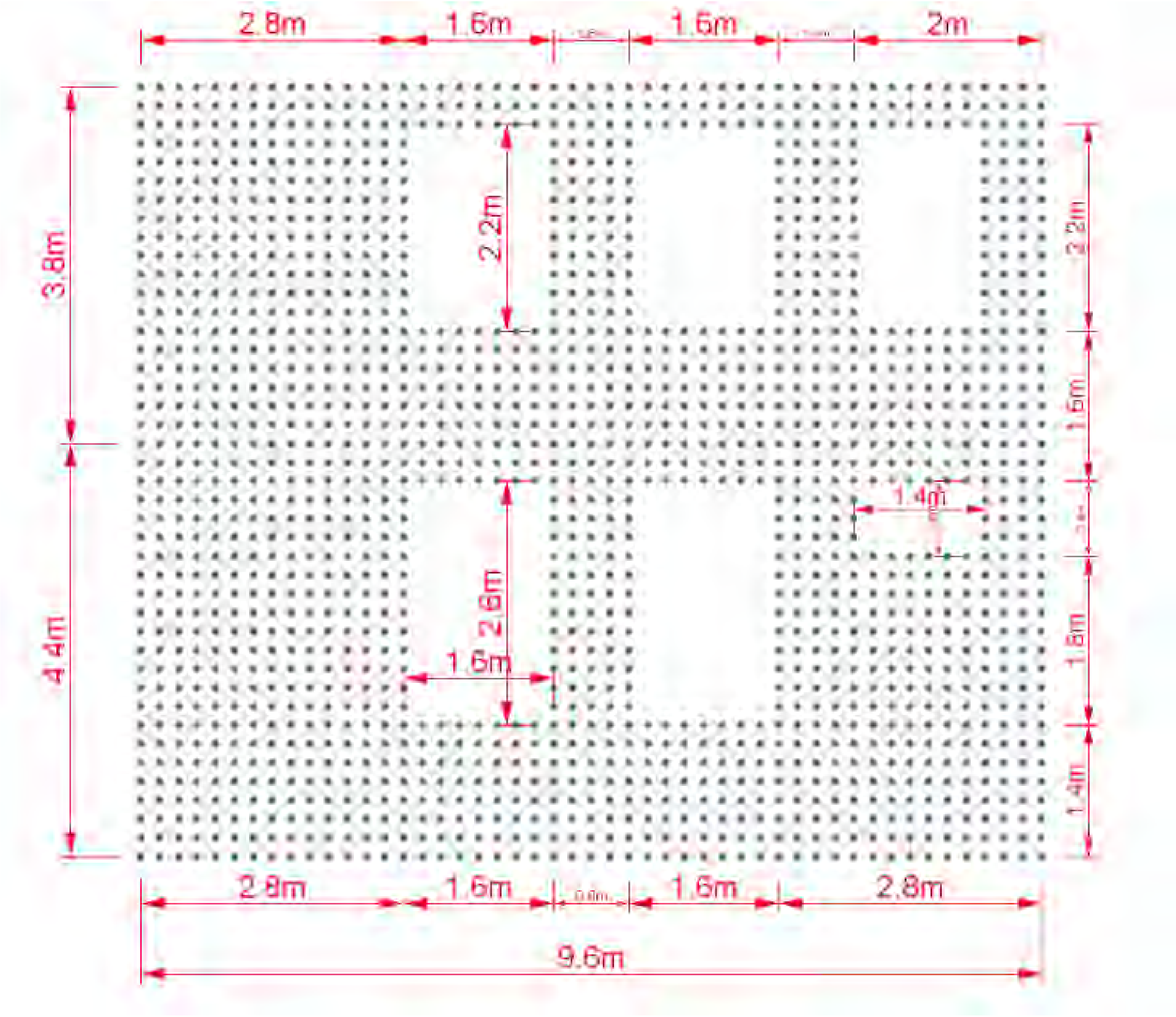
Ability of diaphragm to transfer shear into the walls. Typically the internal frames have 1/2" at 9" crs,
external walls have say 3/8" at 8" crs. Note: the lengths below are the length tied into the diaphragm, which is generally the length of the wall
calcs are based off a shear friction model with mu = 1.0, and loads are the elastic demands for the walls at the top floor or first floor if single storey

	New		*Original*		***Change L1***	***Change L2***	*μ = 1.0*	*μ = 1.25*		*μ = 1.0*	*μ = 1.25*	
Longitudinal	**V_1* (kN)**	**V_2* (kN)**	**V_1* (kN)**	**V_2* (kN)**	**%**	**%**	**Orig. V %NBS**	**Orig. M %NBS**	***SF***	**New V %NBS**	**New M %NI**	**Justification for Scaling Factor (SF)**
101 *North Wall*	1,360	3,583	1484	3522	-8%	2%	41%	63%	1	41%	63%	*Slight increase at top floor and 8% reduction at mid floor - probably improves overall wall, and 2% extra load at the critical top floor is negligible therefore no change in %*
102 *South Wall (Short)*	854	1,231	893	1189	-4%	4%	*Reassed - scaling not needed*			40%	60%	*Wall was reassessed following site visit updates*
102 *South Wall (Long)*	623	1,506	855	1745	-27%	-14%	*Reassed - scaling not needed*			50%	60%	*Wall was reassessed following site visit updates*
103 Spine	2,197	3,847	1552	3653	42%	5%	*Reassed - scaling not needed*			40%	34%	*Wall was reassessed following site visit updates*
104 Supplementary Wall	1,301	0	1516	0	-14%	-	100%	77%	1.1	111%	86%	*Loads reduced by 14%, so scaled up by ~10%*
	94.29	165.1										
					Change L1	***Change L2***						
Transverse	**V* (kN)**	**V* (kN)**	**V_1* (kN)**	**V_2* (kN)**	**%**	**%**						
202 East	1,001	2,196	976	2095	3%	5%	34%	100%	1.0	34%	100%	*Slight increase at this end but load was based off higher West wall already so OK*
202 West	1,217	2,741	1219	2705	0%	1%	34%	100%	1.0	34%	100%	*No change*
203 Clerical Room	935	1,905	829	1707	13%	12%	*Reassed - scaling not needed*			34%	45%	*Confirmed geometry on-site so updated calcs*
204 Coal Bunker (East)	399	1,132	562	1642	-29%	-31%	*Reassed - scaling not needed*					*Wall geometry was different on site so was reassessed*
204 Coal Bunker (West)	-	-	194	0	-	-	*This wall has been removed at some point in history*					
205 Boiler Room	849	0	741	0	15%	-	100%	100%	1.2	100%	115%	*Shear was >>100% so no change, moment was ~100% so reduced by 15% proportional to new load*
206 Strong Room (East)	730	0	690	0	6%	-	100%	100%	1.0	100%	100%	*Minimal load change*
206 Strong Room (West)	834	0	821	0	2%	-	100%	100%	1.0	100%	100%	*Minimal load change*
208 South Stair (East)	850	2,174	833	2086	2%	4%	100%	67%	1.0	100%	67%	*~3% overall change not signficant*
208 South Stair (West)	630	1,292	626	1253	1%	3%	100%	34%	1.0	100%	34%	*~2% overall change not signficant*

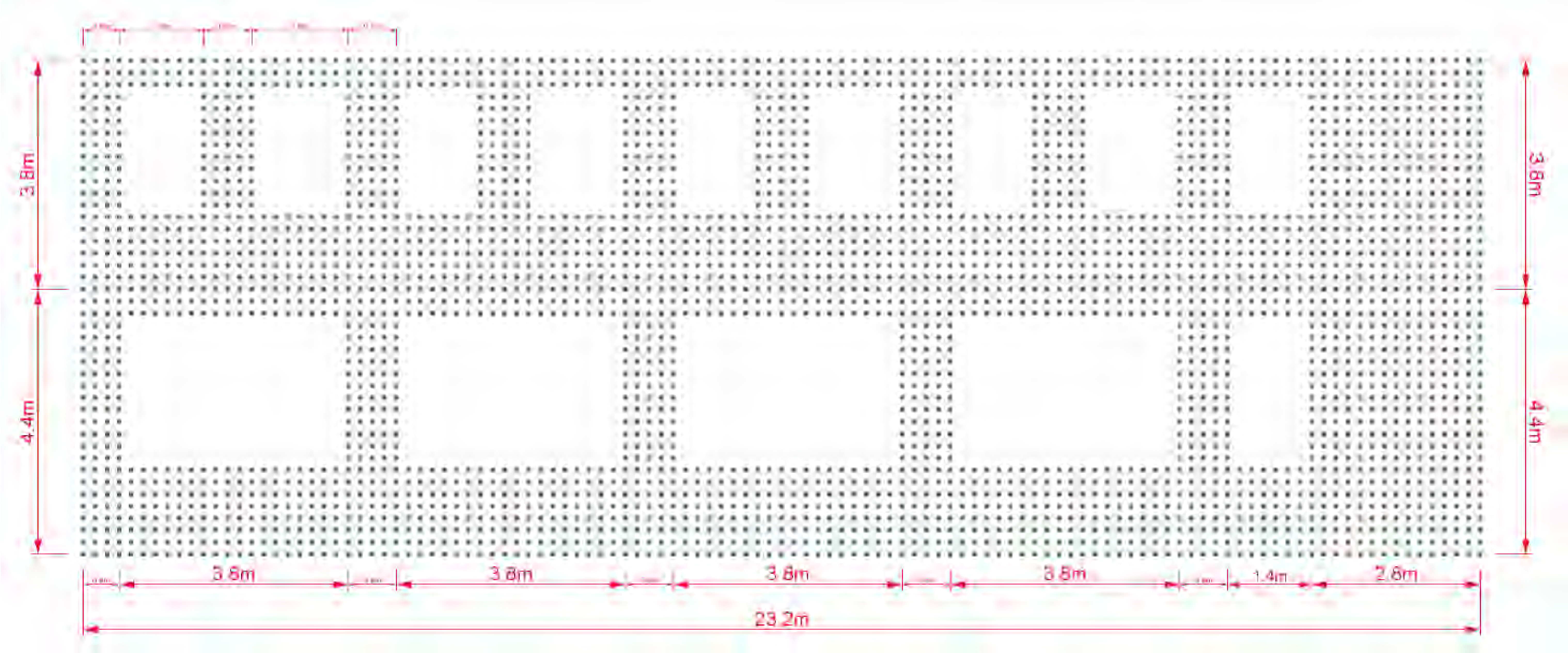
101. NORTH WALL



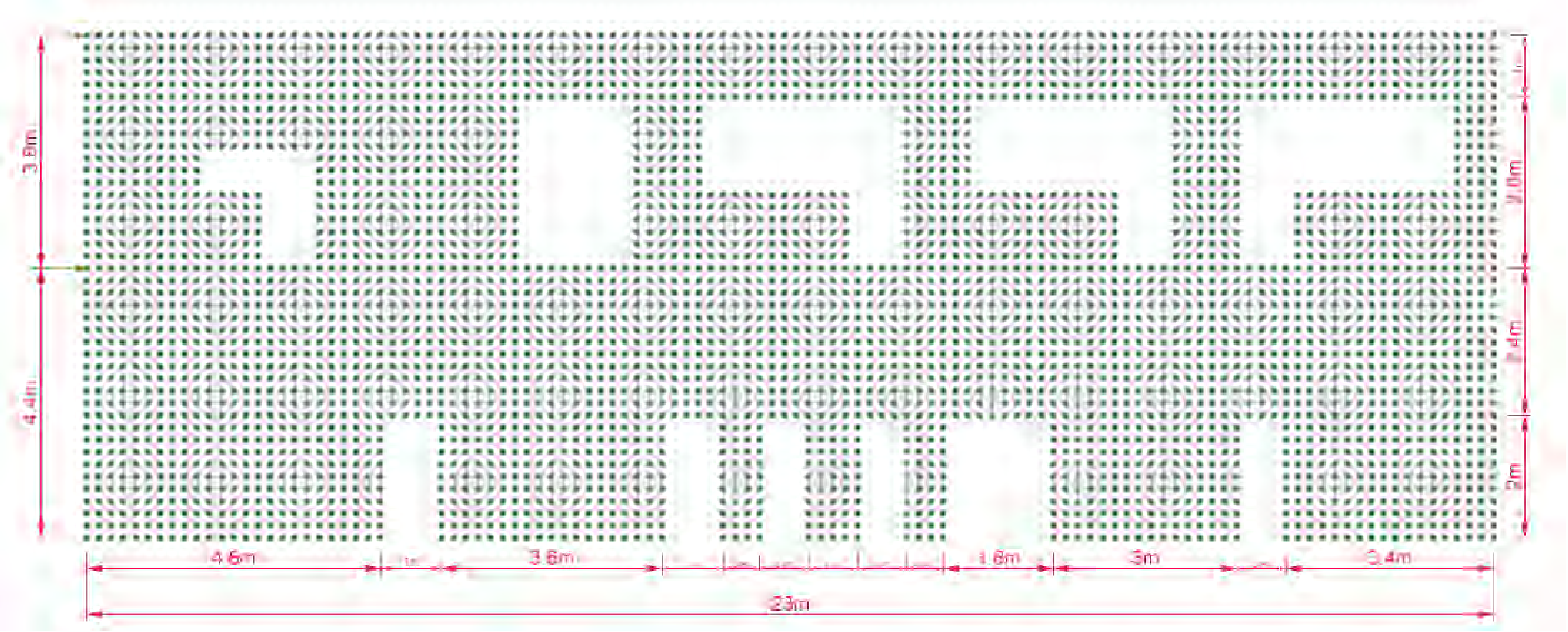
102. SOUTH WALL (SHORT)



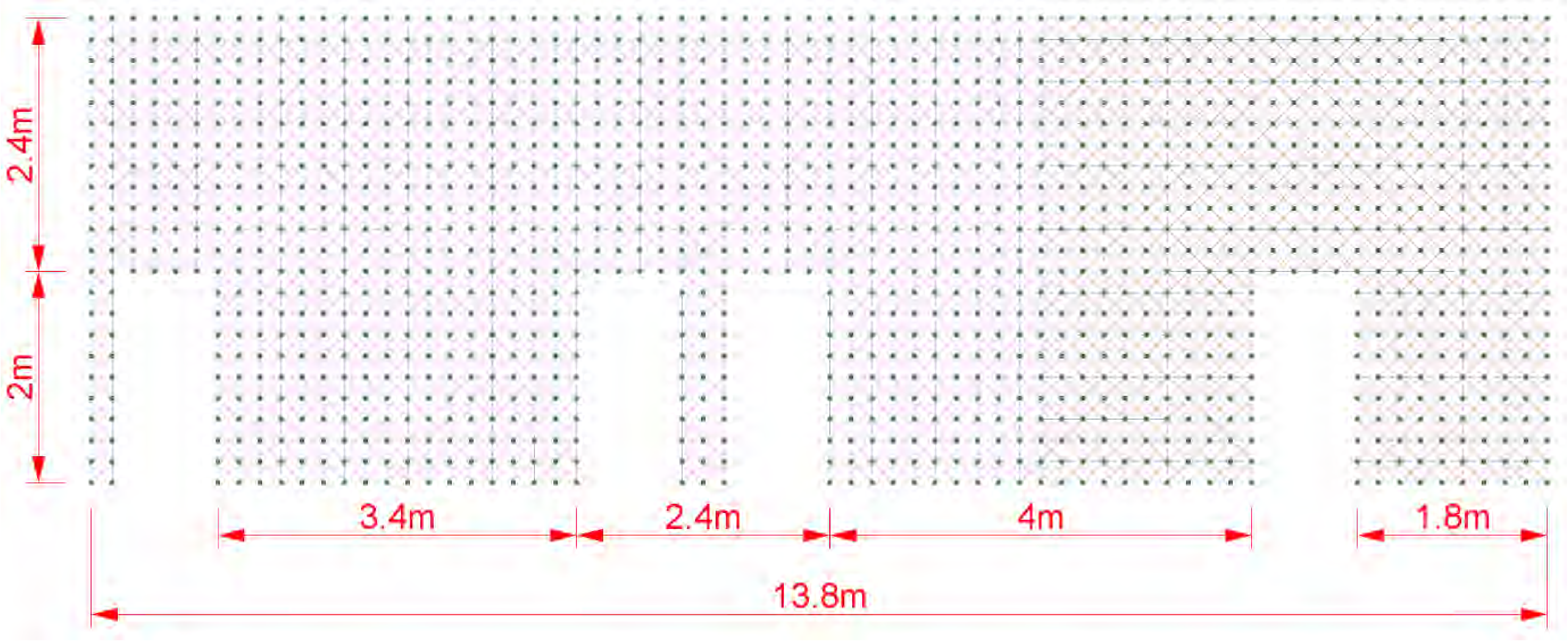
102. SOUTH WALL (LONG)



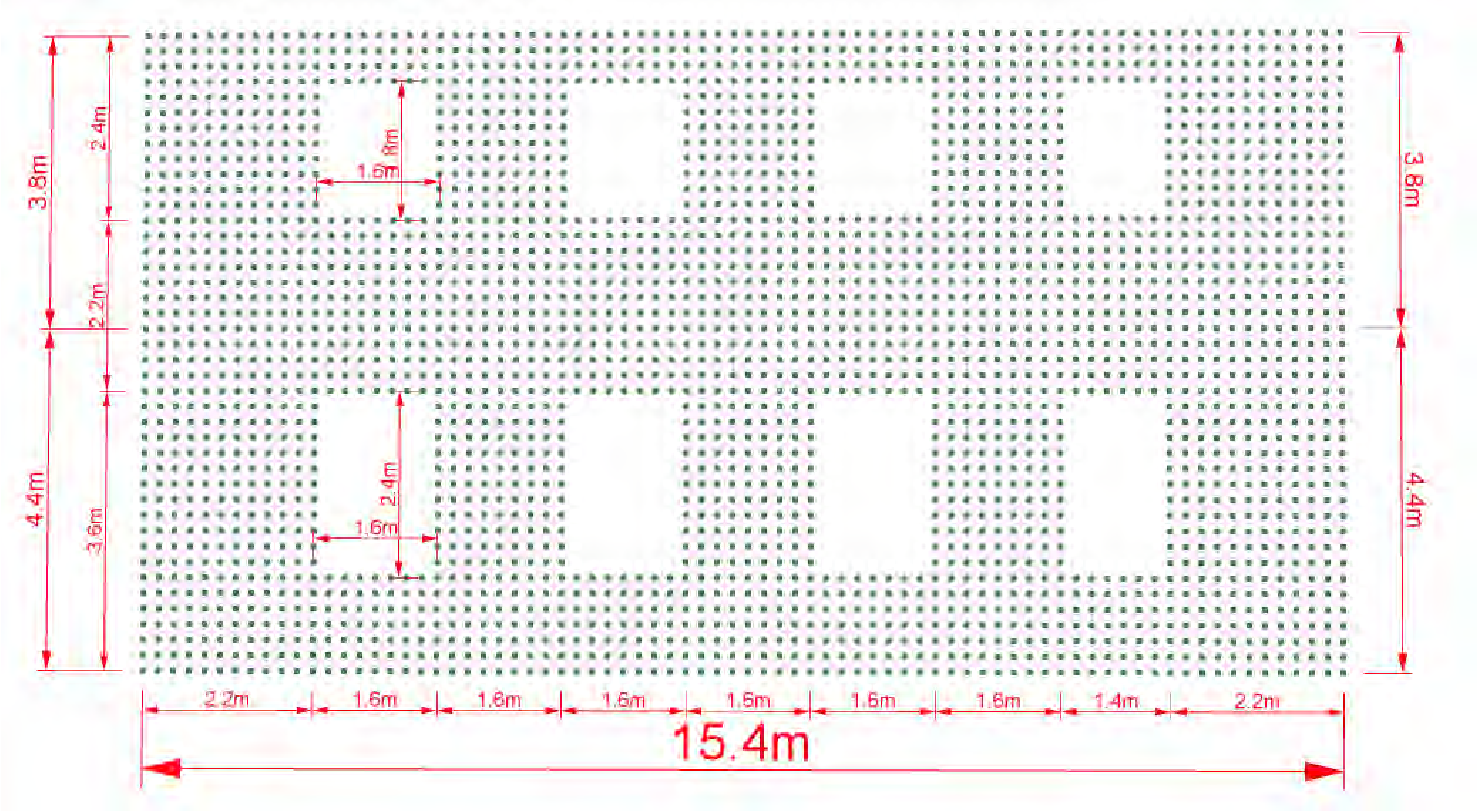
103. SPINE WALL



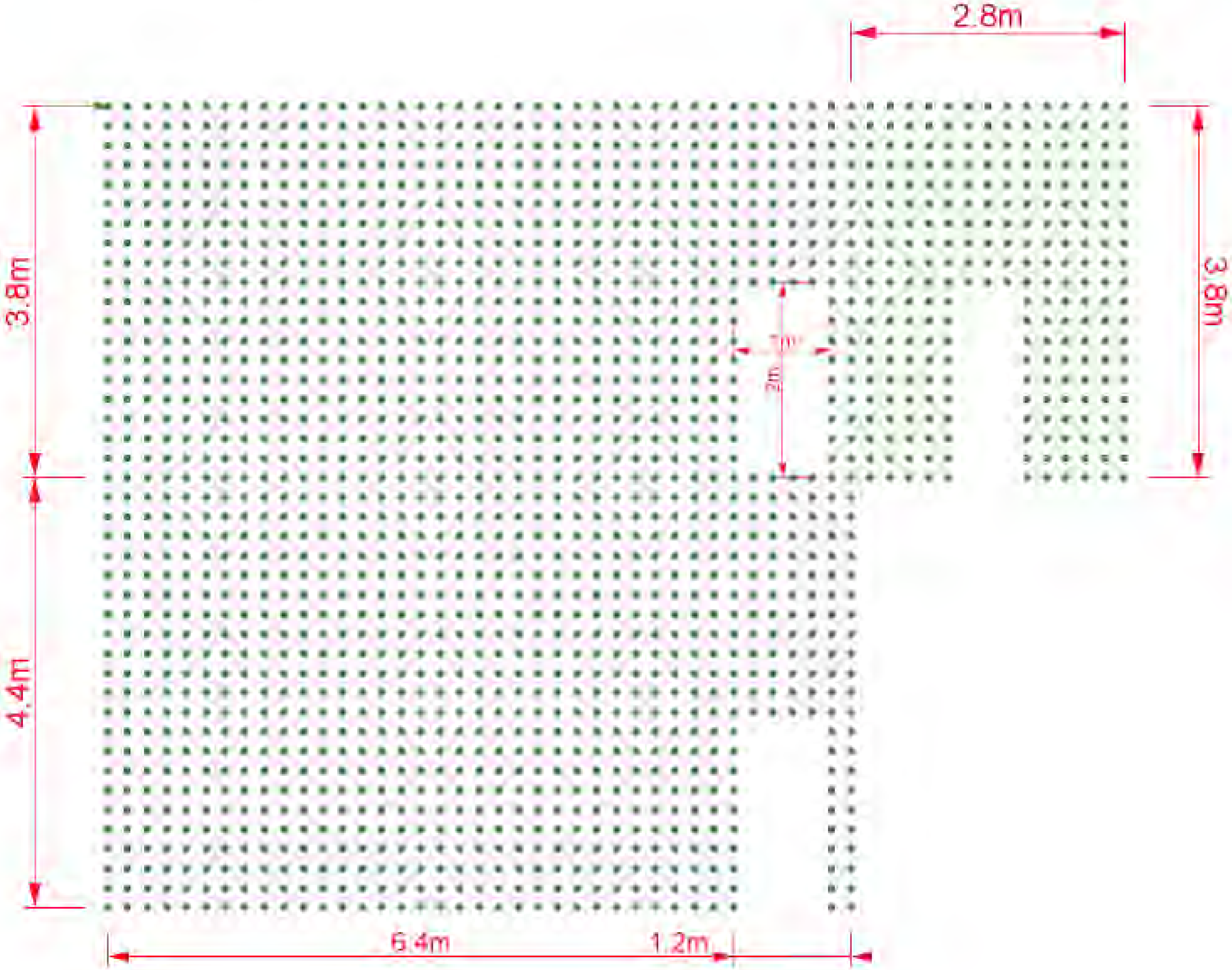
104. SUPPLEMENTARY LONGITUDINAL WALLS



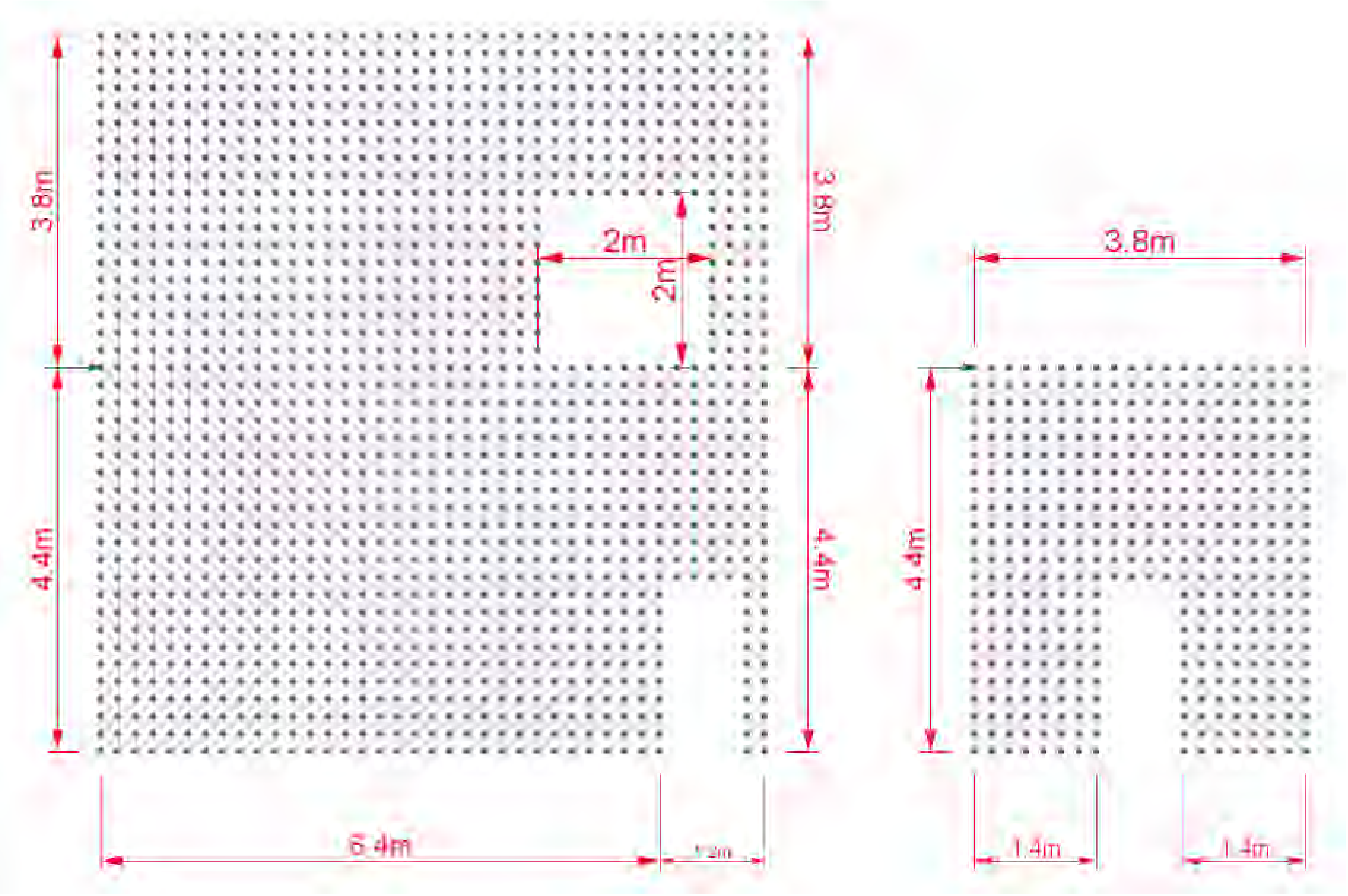
202. EAST & WEST WALLS



203. CLERICAL ROOM

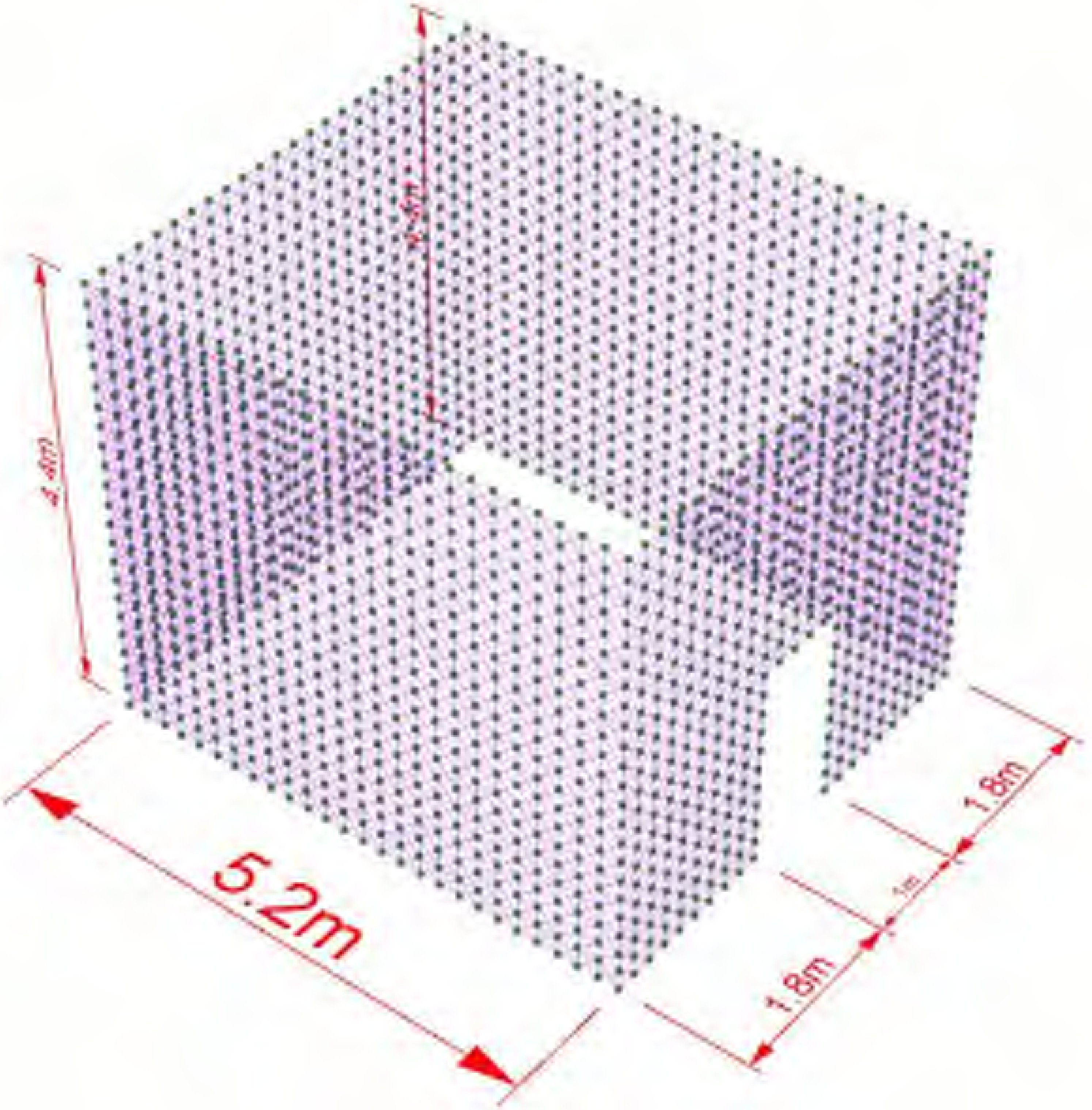


204. COAL BUNKER

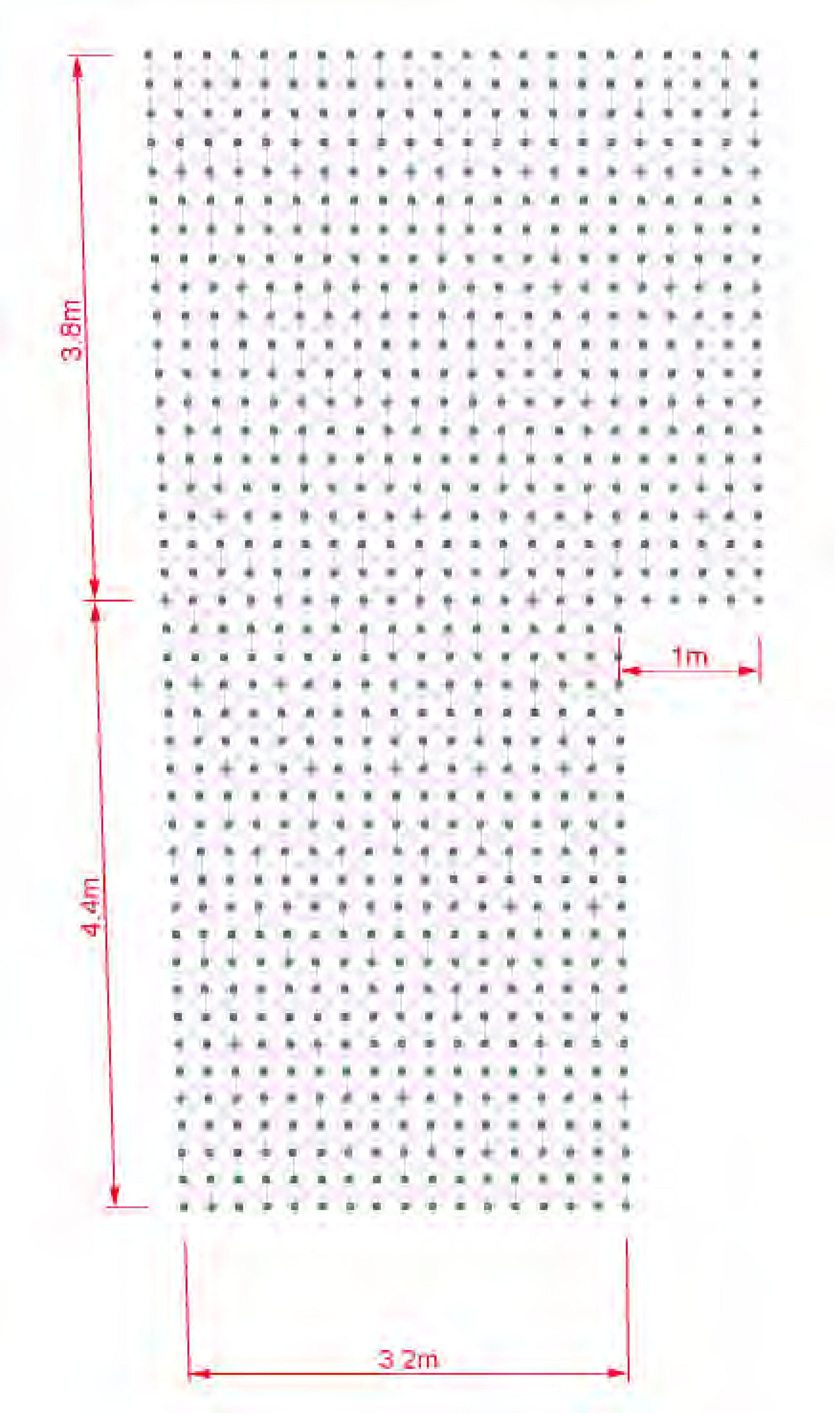


205. BOILER ROOM

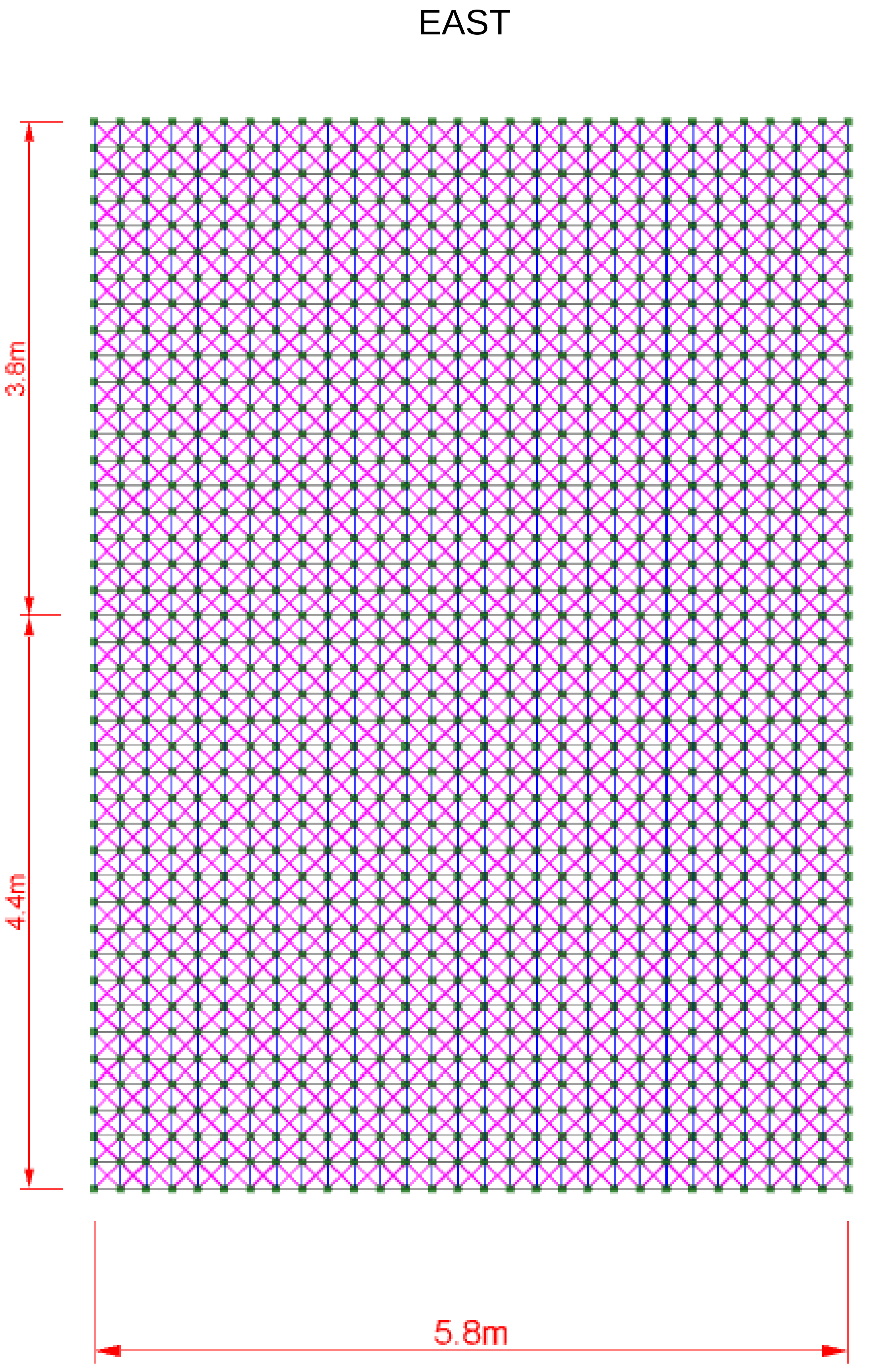
206. STRONG ROOM

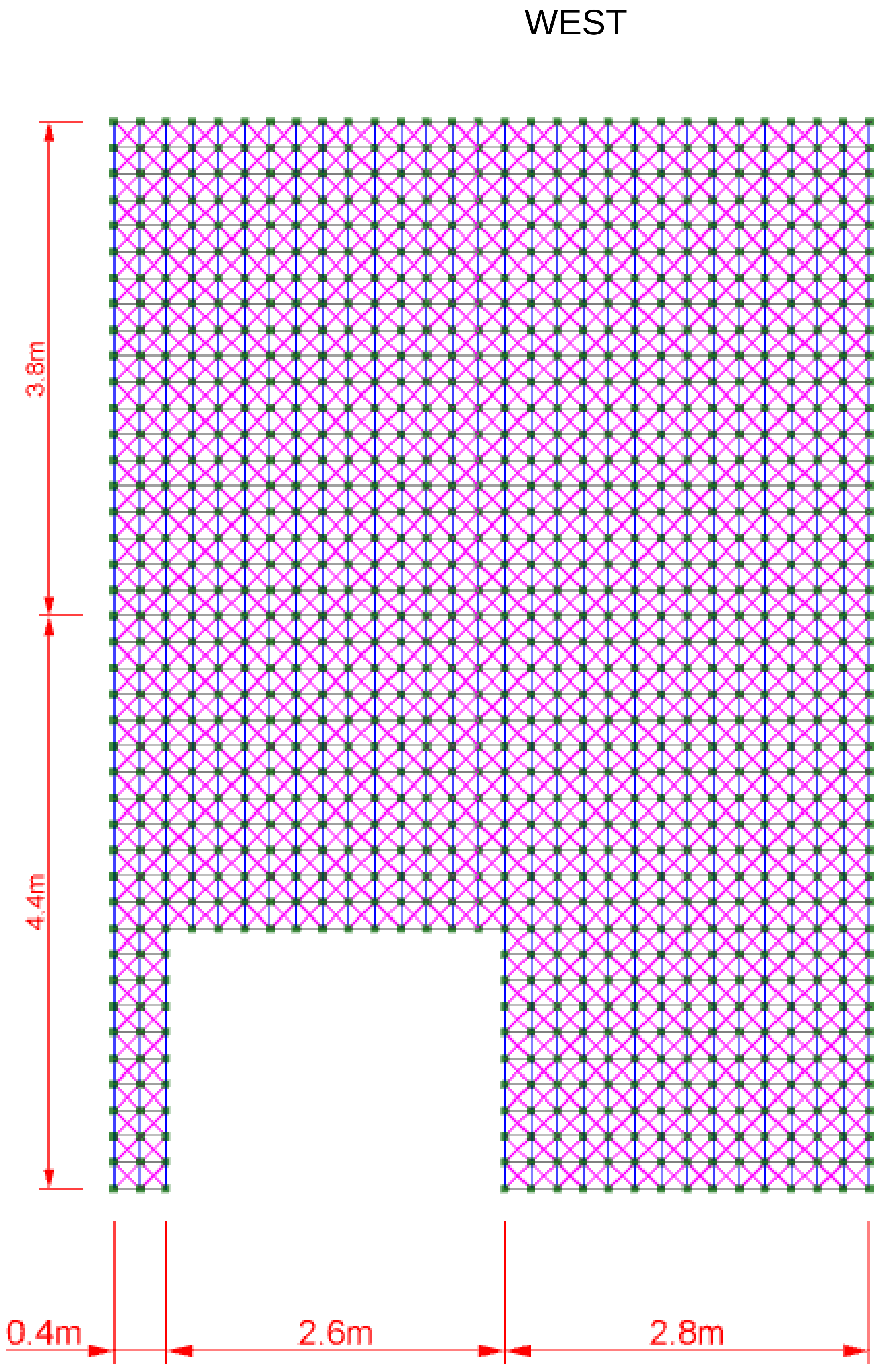


207. TOLL BOX WALL



208. SOUTH STAIRWELL





NORTH WALL

CALCULATION SKETCH SHEET

DATE:	22/05/2020
JOB No.:	
SHEET No.	
REVISION:	0
ENGINEER	MS
CHECKED BY:	

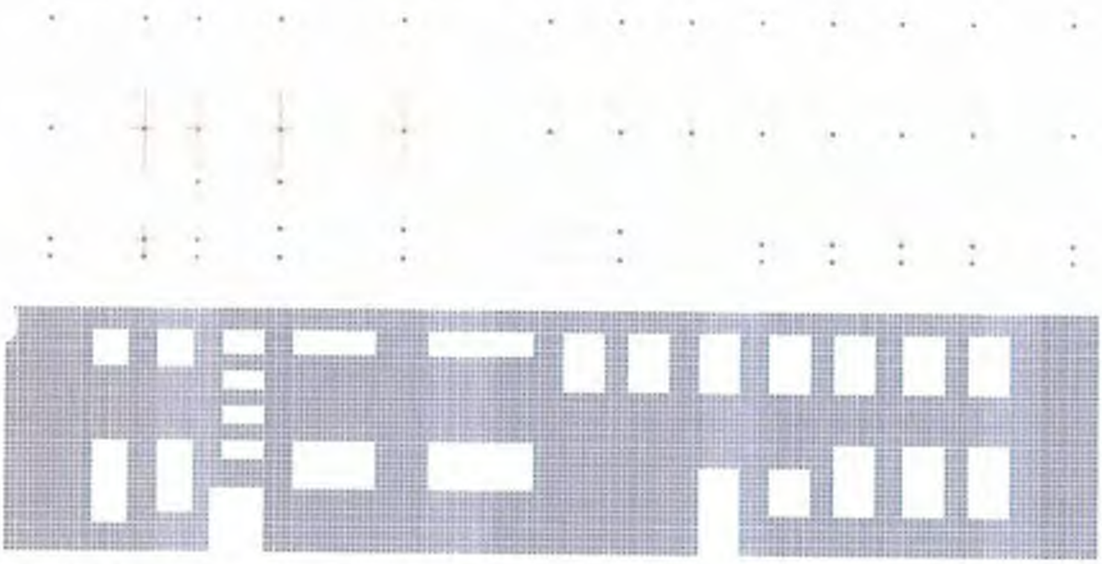
SIMCO CONSULTING

PROJECT: WESTLAND DISTRICT COUNCIL DSA

DESCRIPTION:

NORTH WALL MODELLING METHODOLOGY

The North Wall is a fairly complex wall, with openings along its length. The image below shows the assumed layout of the wall. A frame model has been used to determine the design loads on the various piers and spandrels. Due to the complexity of the wall, a variety of modelling options were explored. This page discusses the various models and the reason for the final design loads chosen.



The wall has been modelled using the centreline geometry of the piers. The spandrels have been modelled at the floor heights (4.4m / 8.2m). As can be seen in the rendered frame model (top), the section sizes have been matched to the geometry of the wall.

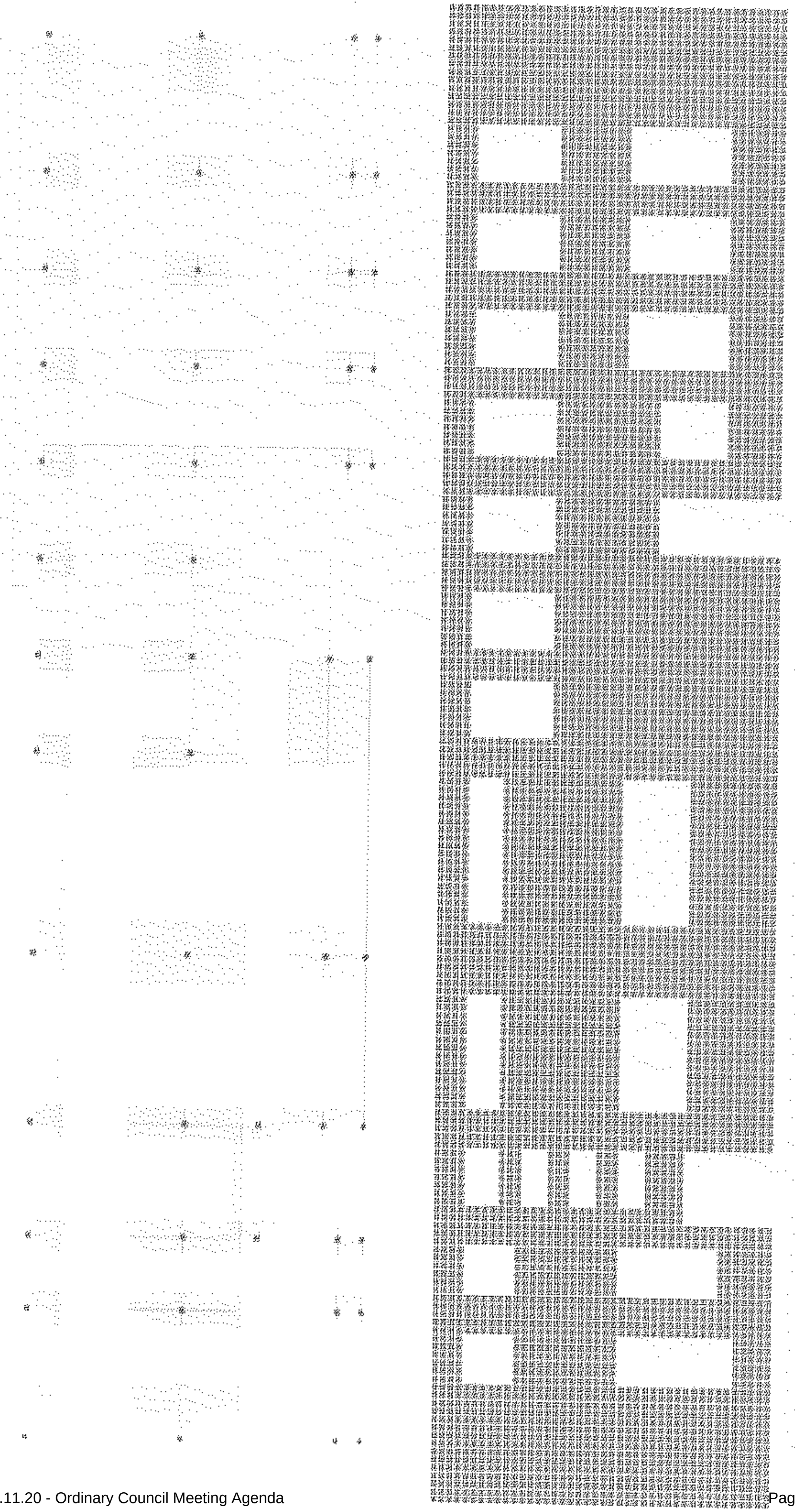
Various models were analysed to determine the likely shear distribution. These models were all considered to have issues arising from the static nature of analysis. Loosely, the models tended to provide unrealistic shear distributions (the expected distributions were estimated from L^3 ratios and a model that reflected this was considered realistic), and excessive spandrel demands implying very low capacities for the overall system.

The final model was a frame model as above, but a pseudo pushover analysis was employed following the method set out in the paper "Displacement-Based Assessment and Improvement of a Typical New Zealand Building by an Average Engineer". Flexural and shear capacities were calculated for each of the piers and spandrels. The elastic loads were applied in a primary load case, and a load combination setup to apply a % of this load. The % load was incremented up until an element reached its flexural capacity. At this point the member was pinned and an opposing moment applied at the member end equal to its flexural capacity. This was repeated until either a member failed in shear or the whole system failed.

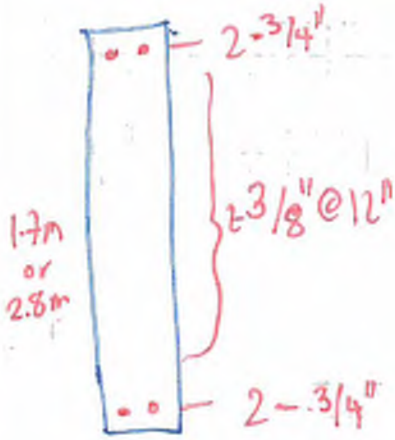
The critical capacity was determined to be the shear capacity of the 5.4m long section of wall in the middle, which failed at 41% elastic loads. For interest, the pushover was continued until a flexural mechanism formed. This was deemed to be at 51% of elastic loads (63% nominally ductile), at which point the top floor formed a mechanism and 'collapsed'. The first element yielded at a top floor displacement of 1.55mm, with the shear failure occurring at 2.42mm - a ductility of 1.56. Accordingly, a ductility of 1.25 is likely to be appropriate; however, given the age and nature of construction (round bar 1940s era concrete), and the brittle shear failure mechanism, a final capacity of 40%NBS at elastic loads is considered appropriate.

Element	% Load *of elastic*	% Load *of mu = 1.25*	ΔΔ_1 *mm*	Δ_2 *mm*	
End Spandrels L2	36	46	0.51	1.55	*first yield*
2.8m Pier ground floor	38	48	0.53	1.63	
2.0m Spandrels each end L1	39	49	0.62	1.9	
2.8m piers above bottom spandrel (near ground)	-	-	-	-	
1.6m spandrel next to 1.6m pier	-	-	-	-	
1.6m pier L1	-	-	0.66	2.26	
Shear failure occurs in main ground floor wall	42	53	0.72	2.42	
Entire line of 0.8m @ L2	50	63			
Base of 2.8m piers @ L2	51	65	0.99	3.18	
Flexural failure of almost entire top floor					
		Shear Failure	μ_{L1}	1.41	-
			μ_{L2}	1.56	-

FRAME MODEL (TOP) SHOWING DEPTH OF SECTIONS USED TO REPRESENT WALL MODEL (BOTTOM)



L1 Spandrel (2.8m portion)



$V_{prob,1.7m}$ = 421kN

$M_{prob,1.7m}$ = 554kNm

$V_{prob,2.8m}$ = 589kN

$M_{prob,2.8m}$ = 954kN.m

	(μ=1.25)		(μ=1)	
$L_{spandrel}$	M^k	%NBS	V^+	%NBS
1.7m	697kN·m	79%	347kN	82%
2.8m	1609kN·m	59%	631kN	93%

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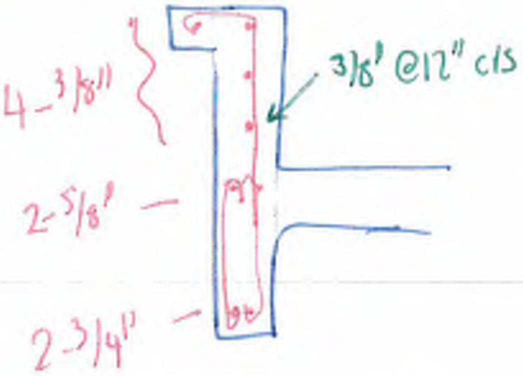
L2 Spandrel – 1.6m

$V^* = 313\ kN \quad (\mu = 1)$

$M^* = 720\ kN \cdot m \quad (\mu = 1.25)$

$V_{prob} =$



$V_s = 71mm^2 \times 280MPa \times {}^{1600mm}/_{300mm} = 106kN$

$V_c = 62kN$ (from spreadsheet)

$\therefore V_{prob} = 0.85 \times (106kN + 62kN) = 143\ kN$ ($46\%\ \mu = 1$)

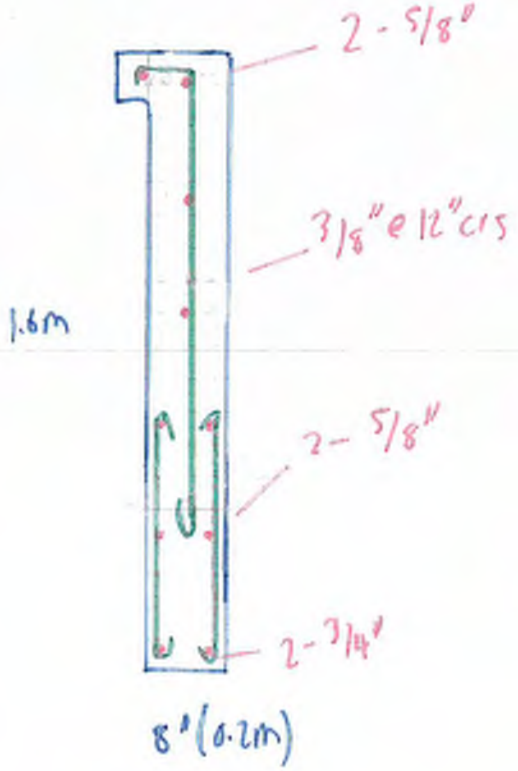
$M_{prob} = 294\ kN \cdot m$ ($41\%\ \mu = 1.25$)

likely performance is to fail in flexure ∴ cantilever wall mode results.

Max spandrel @ L2

$M^* = 684\text{ kN·m}$ $(\mu = 1.25)$

$V^* = 379\text{ kN} \times {}^{1.14}/_{0.9} = 481\text{ kN}$ $(\mu = 1)$



$M_n = 294\text{ kN·m}$ (43%)

$V_c = 1.5 \times 0.54 \times 0.29 \times \sqrt{37.5\text{MPa}} \times (0.8 \times 0.2\text{m} \times 1.6\text{m})$
$= 368\text{ kN}$

$V_s = 71\text{mm}^2 \times 280\text{MPa} \times {}^{1600\text{mm}}/_{300\text{mm}} \times 2$
$= 212\text{ kN}$

$\therefore V_n = 0.85 \times (368\text{kN} + 212\text{kN})$
$= 493\text{kN}$ (100%)

2.8m Piers

2.8m long w/ 5/8" @ each end & 3/8" @ 12" throughout

$M^* = 684\text{ kN·m}$

$V^* = 461\text{ kN} \times {}^{1.14}/_{0.9} = 584\text{kN}$

$M_n = 831\text{ kN·m}$ (100%) $(\mu = 1)$

$V_n = 680\text{ kN}$ (100%) $(\mu = 1)$

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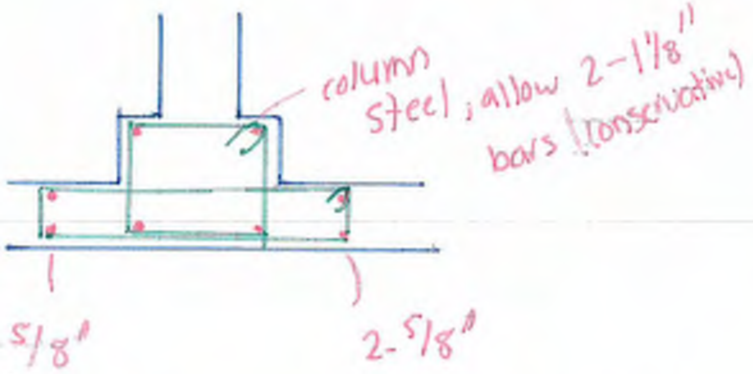
0.8m Piers

$M^* = 338\,kN\cdot m$

$V^* = 318\,kN \times {}^{1.14}/_{0.9} = 403\,kN$

NOTE// most of the piers are super flexible & take minimal load. The critical pier is shorter ∴ stiffer



$M_n \sim 329\,kN\cdot m$ (allow 100%) $(\mu = 1.25)$

$V_n \sim 204\,kN$ (51%) $(\mu = 1)$

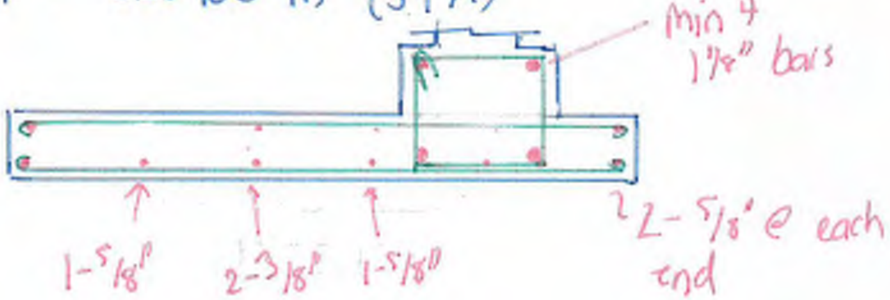
Central 1.6m Pier

$M^* = 988\,kN\cdot m$ $(\mu = 1.25)$

$V^* = 942\,kN \times {}^{1.14}/_{0.9} = 1193\,kN$ $(\mu = 1)$

$V_n = 365\,kN$ (31%) allow 34%

$M_n = 586\,kN\cdot m$ (59%)



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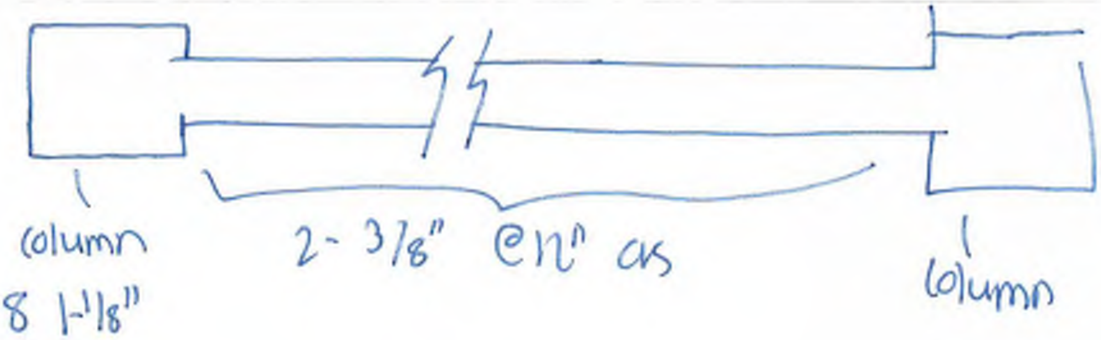
5.4m Pier

$V^* = 3598kN$ $(\mu=1)$

$M^* = 6265kN\cdot m$ $(\mu=1.25)$
$N^* - 97kN$ tension $(\mu=1.25)$

$V_{prob} = 1433kN$ (40% $\mu=1$)

M_{prob} :



8 1-1/8" bars
$A_s = 641mm^2$ ea $\times 8 = 5130mm^2$

$\therefore M_{prob} = 8644kN\cdot m$ (100% $\mu-1.25$)

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2.8m Pier

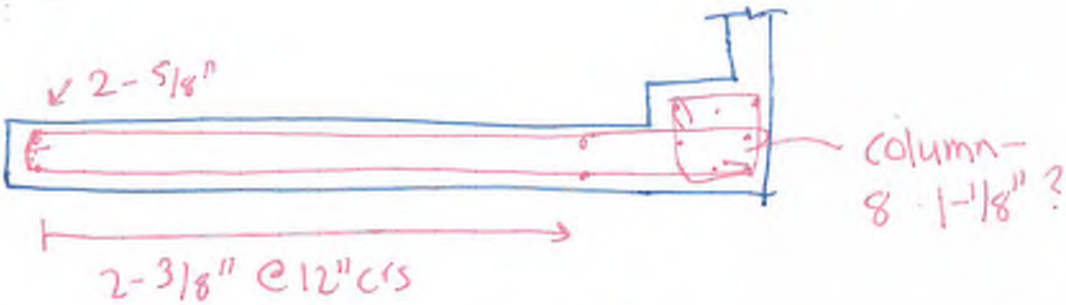
V^*_{L2} = 1455kN (μ=1)

V^*_{L1} = 515kN (μ=1)

M^*_{L2} = 2193kN·m w/ 104kN tension (μ=1.25)

M^*_{L1} = 860kN·m w/ 400kN tension (μ=1.25)

V_{prob} = 804kN L2 = 55% μ=1
L1 = 100% μ=1



Critical direction is w/ 5/8" bars on tension side

$M_{prob,L2}$ = 698kN·m (32% allow 34%) μ=1.25

$M_{prob,L1}$ = 339kN·m (39%) μ=1.25

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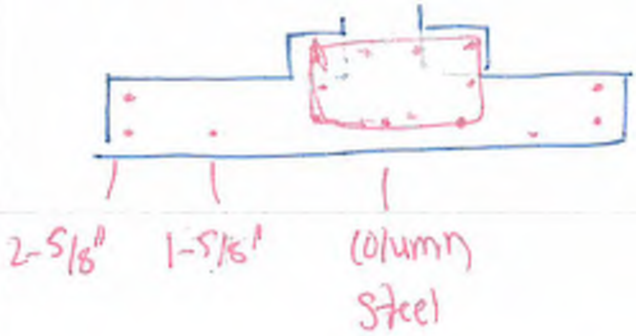
1.6m Pier

$V^* = 272kN$ $\mu = 1.0$

$M^* = 409 kN \cdot m$ $\mu = 1.25$

$N^* = 19 kN$ tension $\mu = 1.25$



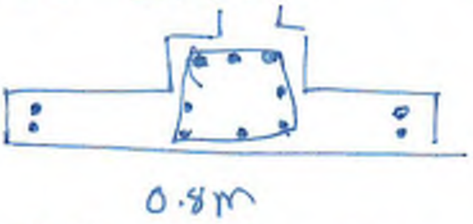
$V_{prob} = 420kN$ (100% $\mu = 1$)

$M_{prob} = 586 kN \cdot m$ (100% $\mu = 1.25$)

0.8m Piers

Take $\sim V^* = 30-40kN \rightarrow 100\%$ by inspection ($\mu = 1$)
$\sim M^* = 65 kN \cdot m$ ($\mu = 1$)

Have columns + 5/8" bars



2-5/8" @ 0.7m lever = $78 kN \cdot m$ ∴ 100% easy
@ $\mu = 1$

SPINE WALL

CALCULATION SKETCH SHEET

DATE: 28/06/2020
JOB No.:
SHEET No.
REVISION: 0

SIMCO CONSULTING

PROJECT: WESTLAND DISTRICT COUNCIL DSA
ENGINEER: MS
CHECKED BY:

DESCRIPTION:

SPINE WALL MODELLING METHODOLOGY

The 'Spine Wall' is a 5-bay long wall that runs down the middle of the building. It runs over two-storeys and is 8" thick doubly-reinforced with 3/8" bars at 12" crs generally. There are no elevations of this wall, so a geometric layout was assumed from the plan views provided. A printout of the plan was taken to site and the wall's construction confirmed. This primarily involved tapping along the wall to identify areas of timber infill, which were readily identifiable against the concrtee areas.

This wall was initially modelled at about 34%, but has since been updated. This is because the site visit identified that the wall has been altered from its original geometry. Specifically, several openings at the ground floor have been infilled circa late 2000s, and one new opening has been cut near the eastern end. The assumed geometry for the top floor was very accurate, with only one minor change needed (slightly enlarging an opening in one location) that had a minimal impact on the overall wall performance. The wall stiffness was remodelled following the site visit and the lower level was found to attract significantly more load due to the infilled areas.

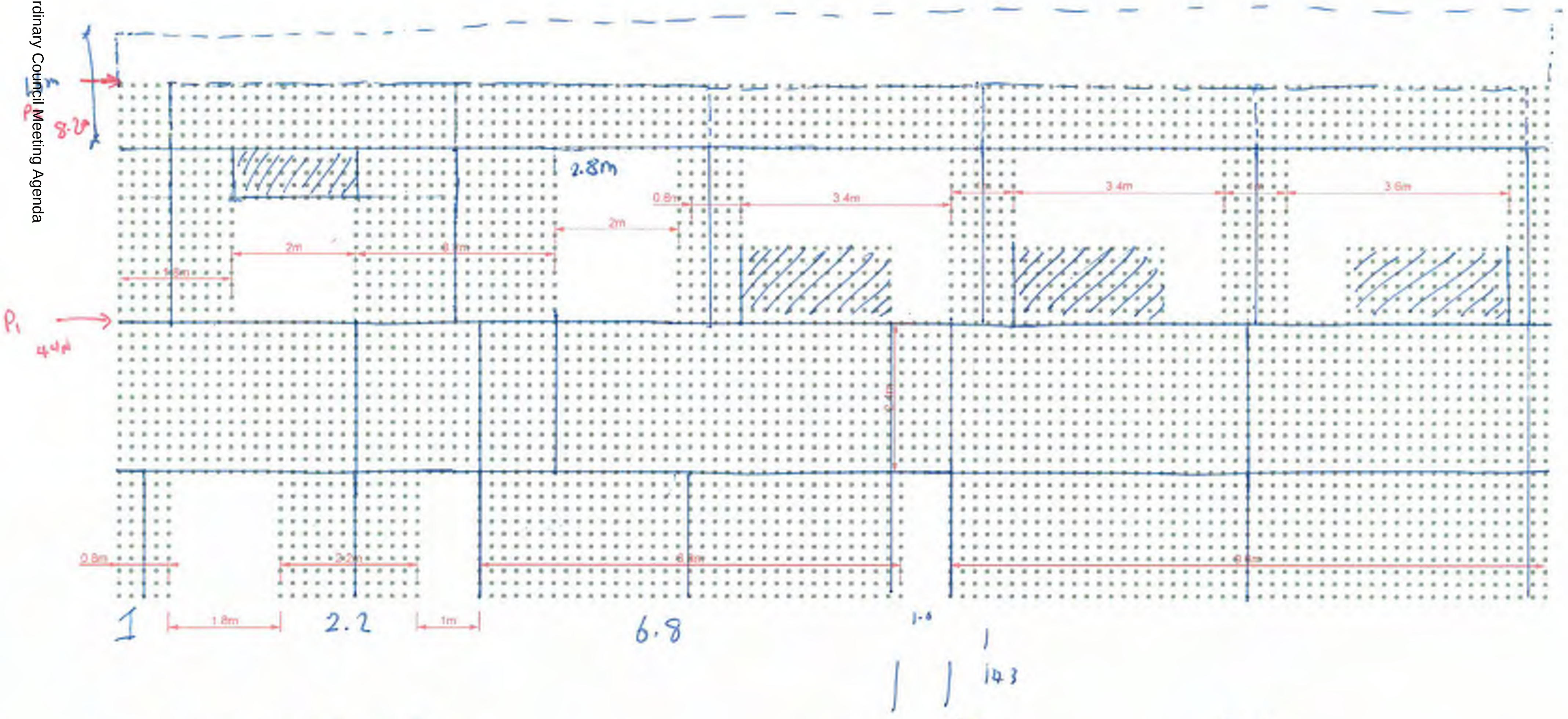
During the site visit we spoke to a WDC representative who informed us that he had been part of the team that carried out the original infill works. He couldn't remember the specifics of the job, but it appears that original high-level windows, and some doors, were boxed up and infilled. The nature of reinforcement used is unknown. However, it is reasonable to expect that modern deformed reinforcement of grade 300 or 430 was used, likely in a single layer, epoxied into the wall. These infill sections were assumed to provide overall similar performance to the existing wall steel.

The Spine Wall was modelled using a similar pushover procedure to the North Wall i.e. following the method set out in the paper "Displacement-Based Assessment and Improvement of a Typical New Zealand Building by an Average Engineer". Flexural and shear capacities were calculated for each of the piers and spandrels. The elastic loads were applied in a primary load case, and a load combination setup to apply a % of this load. The % load was incremented up until an element reached its flexural capacity. At this point the member was pinned and an opposing moment applied at the member end equal to its flexural capacity. This was repeated until either a member failed in shear or the whole system failed.

The top floor was found to be significantly critical over the bottom floor, with a flexural mechanism forming at about 26% mu = 1.0 loads i.e. ~33% mu = 1.25 loads. At this point no elements had failed at the lower level. The overall wall capacity was concluded to be 34% as the analysis model did not take full account of the gravity forces on the wall that would have helped to improve its overall performance.

No individual elements failed in shear (all failed first in flexure), so the shear capacities at each floor were hand-checked at the critical shear plane (i.e. shortest overall length) and found to be approximately 45% (mu = 1.0) at the top floor, and 60% (mu = 1.0) at the bottom floor. This assumed that the flexural mechanism would allow load to redistribute to all elements along the line so the total shear capacity could be included.

Thus, 34% for flexure (mu = 1.25) and 45% for shear (mu = 1.0) were the final assessed capacities.



$0.8^3 + 2.2^3 + 6.8^3 + 9.6^3$

$= 1216$

$9.6 = 73\%$ (4412W)

$6.8 = 26\%$ (1571W)

P = 6044W

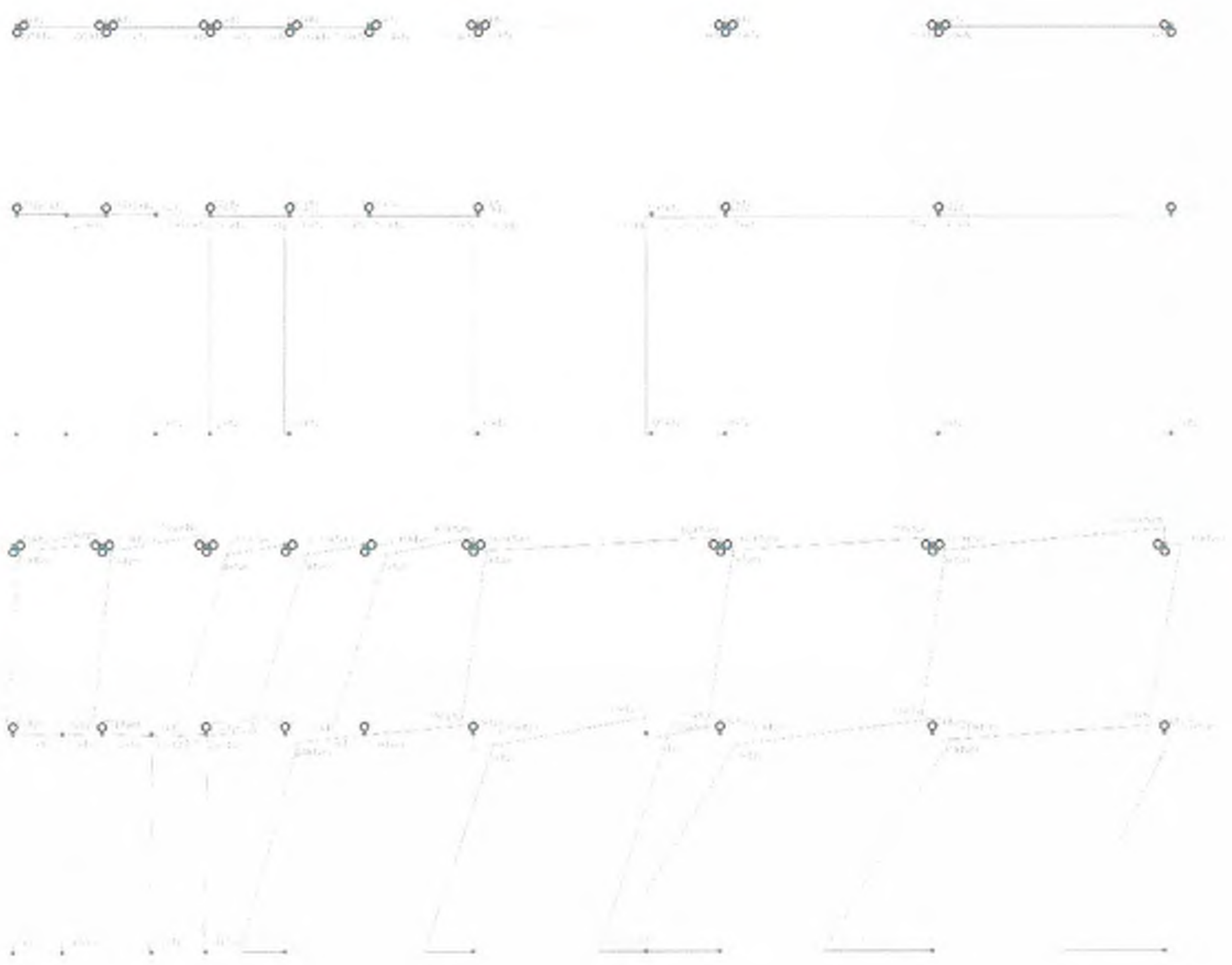
9.6 = 4025W

6.8 = 2024W

Spine Wall 28/06

Final Mechanism

Spine Wall SFD & BMD 28/06



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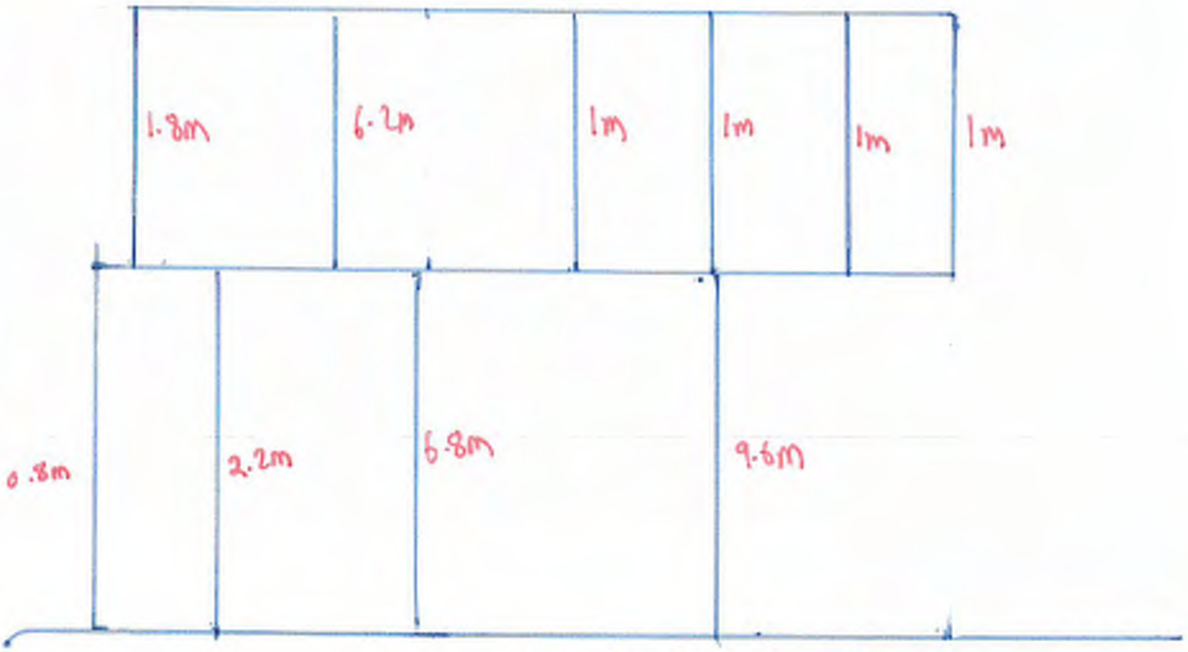
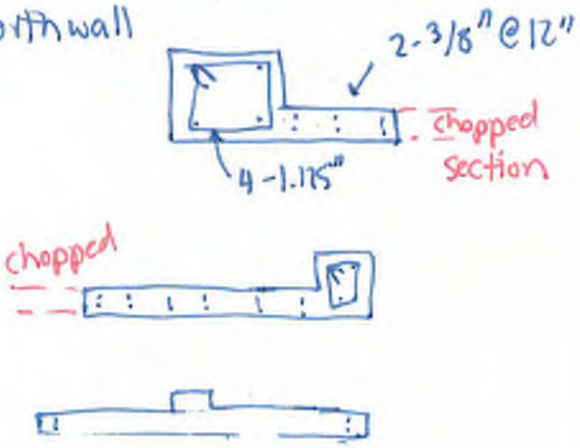
Spine Wall Frame Model



↙ similar to North wall



0.8m
V_{prob} = 204kN
M_{prob} = 146kN·m

2.2m
V_{prob} = 282kN
M_{prob} = 435kN·m

6.8m
V_{prob} = 1408kN
M_{prob} = 7483 kN·m

9.6m
V_{prob} = 1895kN
M_{prob} = 25784kN·m

1.8m
V_{prob} = 282kN
M_{prob} = 211kN·m (weak direction)

3.2m
V_{prob} = 861kN
M_{prob} = 1276kN·m

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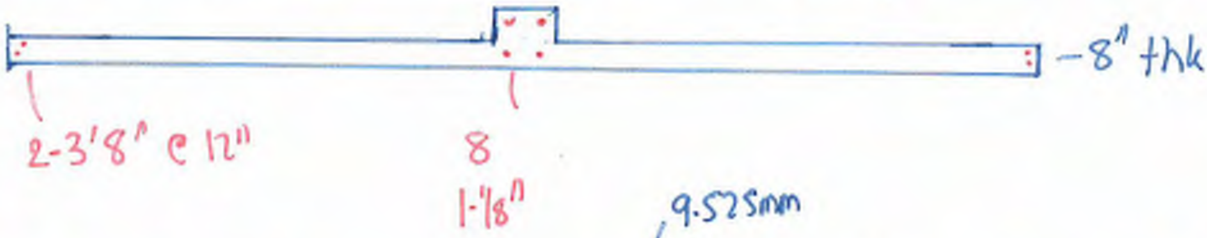
<u>1m</u> V_{prob} = 167 kN
M_{prob} = 165kN·m

<u>2.4m spandrel</u> V_{prob} = 613kN
M_{prob} = 538kN·m

<u>1.6m Spandrel</u> V_{prob} = 493kN (from North wall)
M_{prob} = 294kN·m "

6.8m Wall

$M^* = 7862kN \cdot m \quad V^* = 2332kN \quad (\mu = 1)$



$$A_s = 6800mm/300mm \times \left(2 \times \left(\overset{9.525mm}{3/8} \times 25.4mm\right)^2 \times \frac{\pi}{4}\right) + \left(8 \times (1.125 \times 25.4mm)^2 \times \frac{\pi}{4}\right)$$

$= 8360mm^2$

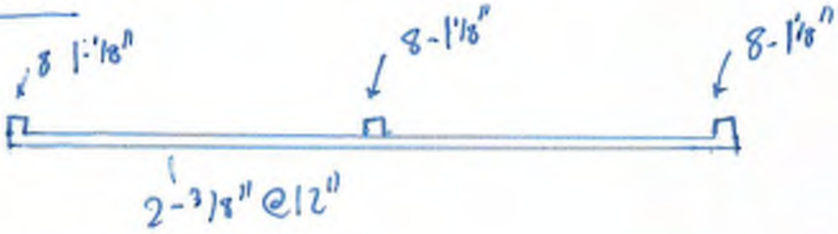
$V_{conc} = 1390kN$

$V_s = \left(2 \times \left(\frac{9.525mm}{2}\right)^2 \times \pi\right) \times \frac{2000mm}{300mm} \times 280MPa$

$= 266kN$

$\therefore V_{prob} = 0.85 \times (266kN + 1390kN) = 1408kN$

9.6m Wall



$V_s = 266kN$ as above

$V_c = 1963kN$

$\therefore V_{prob} = 1895kN$

$M_{prob} = 25184 kN \cdot m$

1.8m Wall (2nd floor) $V^* = 530kN$, $M^* = 1180kN \cdot m$ $(\mu = 1)$

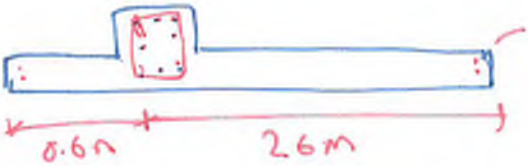
I assume 2-5/8" as consistent w/ other walls

$M_{prob} = 211kN \cdot m$

$V_{prob} = 282kN$

3.2m Wall (2nd floor)

$M^* = 5298 \, kN \cdot m$, $V^* = 2045 kN$



2-3/8"@12"

$M_{prob} = 1276kN \cdot m$

$V_{prob} = 861kN$

2.4m Spandrel

Assume same as north wall (2-5/8" @ edges)

$V_{prob} = 613kN$

$M_{prob} = 538kN \cdot m$

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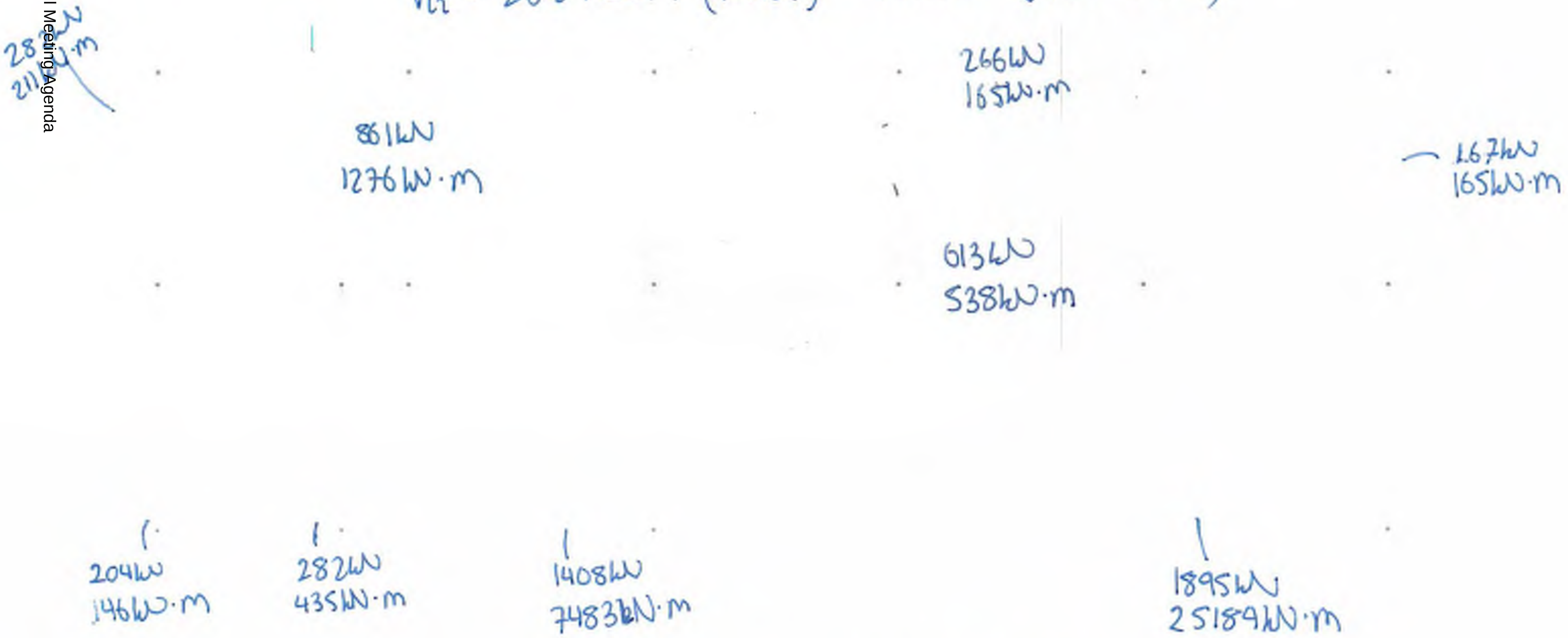
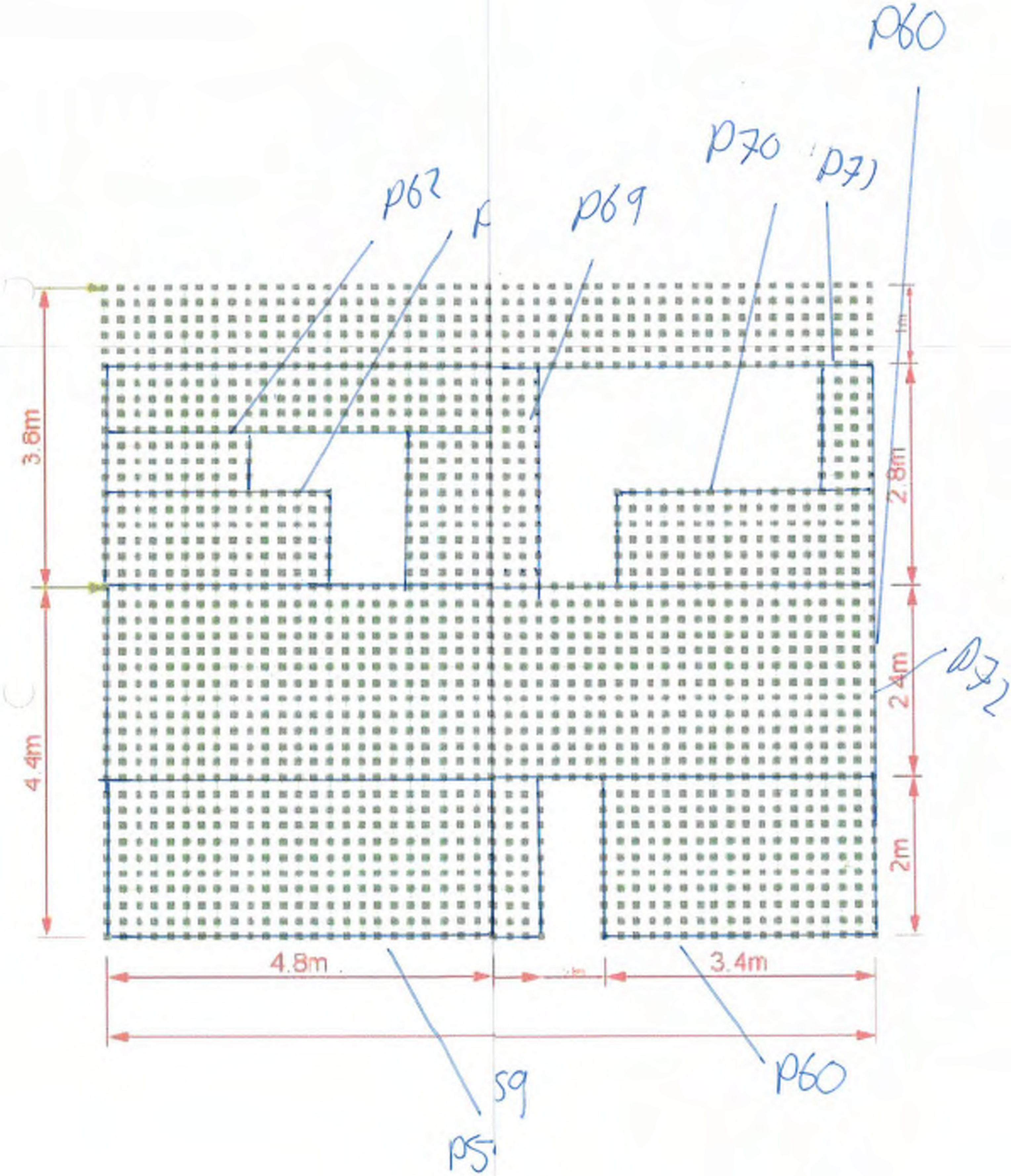
$V^{k}_{L2,\mu=1} = 3847kN$ $V^{k}_{L1,\mu=1} = 2197kN$

$V_{L2} = 282 + 861 + (4 \times 167) = 1811kN$ $(47\%\ \mu = 1)$



$V_{L1} = 204 + 282 + 1408 + 1895 = 3789kN$ $(63\%\ \mu = 1)$


P60
P70
P71
P62
P
P69
3.8m
1m
2.8m
2.4m
P72
4.4m
2m
4.8m
3.4m
59
P60
P5

SOUTH WALL (LONG)

Date 12/05/20
Job No
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Sheet No
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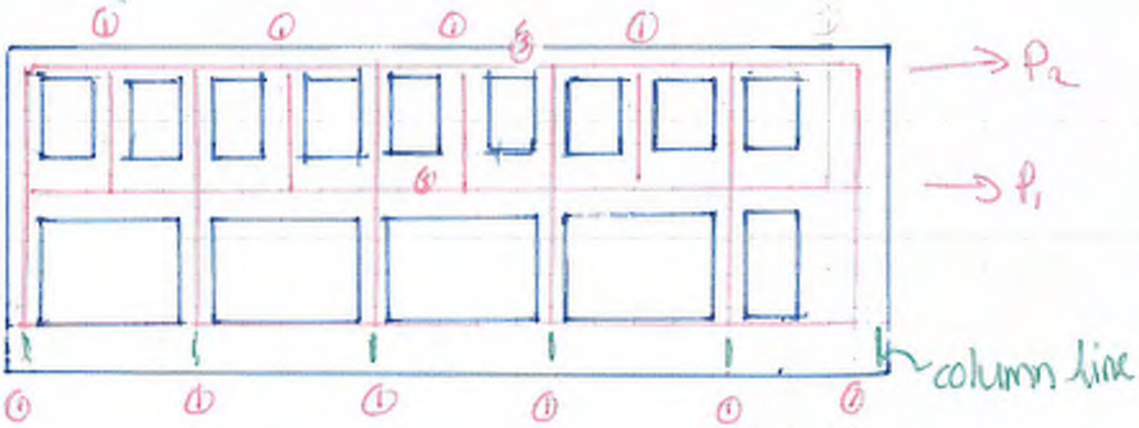
South Wall (Long)

Loads updated 28/06 following site visit

$P_2 = 1506\,kN \times 0.9/1.14 = 1189\,kN$ $(\mu = 1.25)$

$P_1 = 623\,kN \times 0.9/1.14 = 492\,kN$ $(\mu = 1.25)$

This wall can be readily represented by a frame model



① - 0.8m deep ③ = 1.6m deep sp

② = 2.8m deep

- Columns 4.4m & 3.8m high
- Use beam clear span = 3.8m & 1.4m

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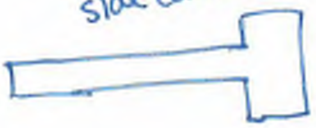
Ground Floor 2.8m leg $(\mu=1.25)$



when on tension side column is on tension side of wall

$M^* = 3422$ kN·m

$V^* = 931$ kN

$N^* = -905$ kN

2- 5/8" @ each ends

$\therefore M_n = 2968$ kN·m (87%)

$V_{prob} = 849$kN (75% $\mu=1.25$, 59% $\mu=1$)

0.8m Piers $(\mu=1.25)$

$M^* = 389$ kN·m

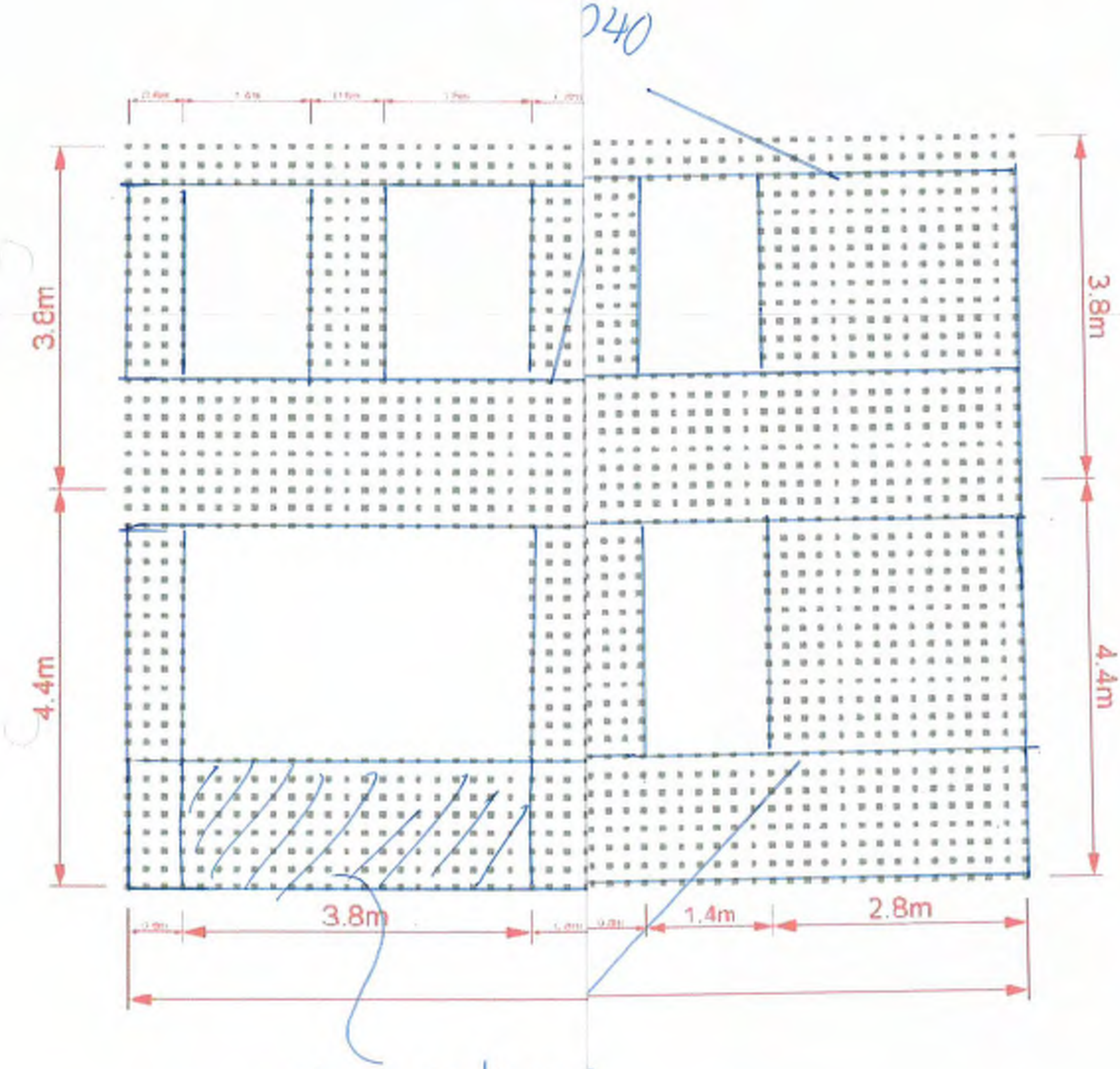
$V^* = 171$ kN

$N^* = -441$ kN

$V_{prob} = 196$kN [treating as a column]
≥ 100% $\mu=1.25$, 91% $\mu=1.0$

$M_{prob} = 183$kN·m [47% $\mu=1.25$]

Wall ~50% flexure, 60% shear



these sections removed

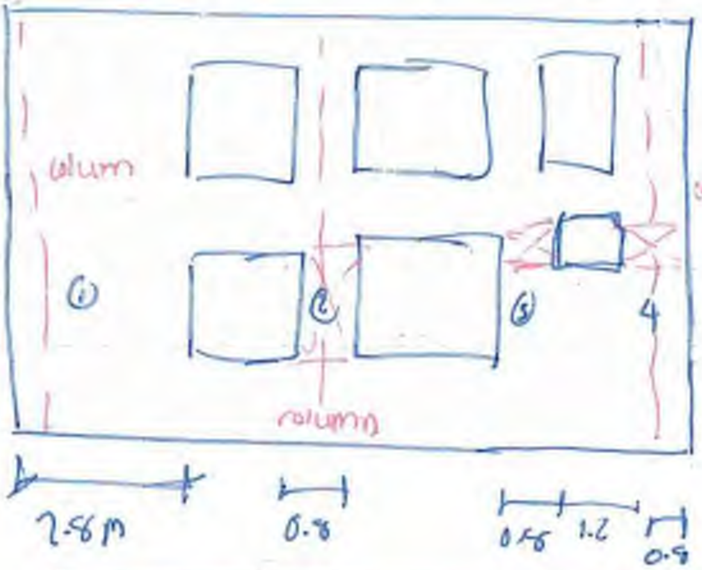
SOUTH WALL (SHORT)

Date 12/05/20
Engineer MS
File Name WDC DSA
Job No
Sheet No

South Wall (Short)

$P_2 = 1231\,kN \times 0.9/_{1.14} = 972\,kN$

$P_1 = 854\,kN \times 0.9/_{1.14} = 674\,kN$



Call it
60% V μ=1
40% M μ=1.25

SS 28/06

#	M^k	V^*	N^k	V_{prob}	$M_{prob'}$
1	893	634	-478	849kN	361; (40%)
2	223	122	-138	308kN	193 (86%)
3	384	628	-10	249kN	no column →119 (31%)
4	318	444	-429	249kN	193 (61%)

NOTE// chose worst-case M^k & N^* combo, which may not be in same load case as the worst-case shear

Average these (3&4)

$\therefore V^* = \frac{628kN + 444kN}{2} = 536kN$ each (46%)

Total line = 1655kN (56% elastic, 70% μ=1.25)

Date 28/06/20
Engineer MS
File Name WDC DSA
Job No
Sheet No

Spandrel level 2

$$M^k = \frac{628+293+177+215+181+266}{6} = 293kN\cdot m$$
$(\mu=1.0)$

$\therefore$ @ $\mu=1.25$ = 232kN·m

Standard 1.6m spandrel

M_{prob} = 165kN·m (71% $\mu=1.25$)

V_{prob} = 266kN (100% $\mu=1$)

$2_o V^k$ = 242kN ($\mu=1$)

@ Lower level

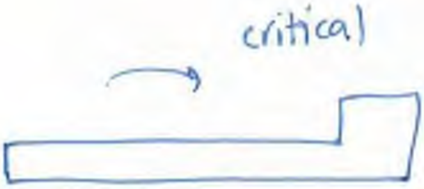
$$M^k = \frac{581+340+291+365+420+509}{6} \times {}^{0.9}/_{1.14}$$

= 330kN·m (50% $\mu=1.25$)

V^k = 244kN (68% $\mu=1$)

2.8m Leg

V_{prob} = 849kN
M_{prob} = 1438kN·m (comp side)



2_o w/ 383kN comp

V^k = 1328kN (63% $\mu=1$)

M^k = 3317kN·m (43% $\mu=1.25$)

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Title: Wall ULS Capacity

Description: South Wall (Short) 2.8m
Note: only self load axial considered

Job No :
Page : 1
Date : 11/05/2020
Author : MS
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Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.20	m	
Wall Length	L_w	=	2.80	m	
Wall Height	H_w	=	4.40	m	
Axial Load	N^*	=	-318	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	11	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	270	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	ϕ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	36.5	mm	*Iterated until forces balance*

Axial load

$N^1 = 24kN/m^3 \times 0.2m \times 2.8m \times 8.2m = 110kN$

+

floor say 2m trib

$N^2 = 24kN/m^3 \times (0.15m + 0.125m) \times 2m \times 2.8m = 37kN$

$\therefore 110kN + 37kN - 478kN = 331kN$

↳ allowed ~50kN tota
for 0.3Q etc

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Title:	Wall ULS Capacity	**Job No** :
		Page : 2
Description:	South Wall (Short) 2.8m	**Date** : 11/05/2020
	Note: only self load axial considered	**Author** : MS
		Reviewer :
		Revision : 0

MOMENT CAPACITY OF SECTION

Layer -	n_{bar} -	d_b mm	A_i *mm^2*	x_i *mm*	ε -	σ *MPa*	Force *kN*	Lever Arm *mm*	Moment *kN.m*
1	2	9.525	143	50	0.0011	223	32	14	0
2	2	9.525	143	320	0.0233	280	40	284	11
3	2	9.525	143	590	0.0455	280	40	554	22
4	2	9.525	143	860	0.0677	280	40	824	33
5	2	9.525	143	1130	0.0899	280	40	1,094	44
6	2	9.525	143	1400	0.1122	280	40	1,364	54
7	2	9.525	143	1670	0.1344	280	40	1,634	65
8	2	9.525	143	1940	0.1566	280	40	1,904	76
9	2	9.525	143	2210	0.1788	280	40	2,174	87
10	2	9.525	143	2480	0.2010	280	40	2,444	98
11	2	15.875	396	2750	0.2232	280	111	2,714	301
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45									
Axial Load				1,400			-318	1,364	-434
Concrete Section			5,763		-0.003		-184	-22.1	4
							0		361

β.c.b (mm²)

$\alpha.f'c.A_r$

Should balance to zero

ΦM_n	361	kN.m

SIMCO Consulting Ltd

Title:	Wall ULS Capacity	**Job No** : **Page** : 1 **Date** : 11/05/2020 **Author** : MS **Reviewer** : **Revision** : 0
Description:	South Wall (Short) 0.8m *Note: only self load axial considered* no column	

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.20	m	
Wall Length	L_w	=	0.80	m	
Wall Height	H_w	=	4.40	m	
Axial Load	N^*	=	17	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	4	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	233.3	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	"
Neutral Axis	c_{uls}	=	45.7	mm	*Iterated until forces balance*

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: South Wall (Short) 0.8m
Note: only self load axial considered

Job No :
Page : 2
Date : 11/05/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm²*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	2	15.875	396	50	0.0003	57	22	4	0
2	2	9.525	143	283	0.0156	280	40	238	9
3	2	9.525	143	517	0.0309	280	40	471	19
4	2	15.875	396	750	0.0463	280	111	704	78
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45									
Axial Load				400			17	354	6
Concrete Section			7,217		-0.003		-230	-27.6	6
							0		119

$\beta . c . b$ (mm²)

α f'c.A_c

Should balance to zero

ΦM_n	119	kN.m

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: South Wall (Short) 0.8m
Note: only self load axial considered

Job No :
Page : 1
Date : 11/05/2020
Author : MS
Reviewer :
Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.20	m	
Wall Length	L_w	=	0.80	m	
Wall Height	H_w	=	4.40	m	
Axial Load	N^*	=	-412	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	4	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	233.3	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	69.5	mm	*Iterated until forces balance*

Title: Wall ULS Capacity

Description: South Wall (Short) 0.8m

Note: only self load axial considered

W/ column

Job No :
Page : 2
Date : 11/05/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm²*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	2	15.875	396	50	-0.0008	-169	-67	-20	1
2	2	28.575	1,283	250	0.0078	280	359	180	65
3	2	28.575	1,283	550	0.0207	280	359	480	173
4	2	15.875	396	750	0.0294	280	111	680	75
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45									
Axial Load				400			-412	330	-136
Concrete Section			10,988		-0.003		-350	-42.1	15
							0		193

β.c.b (mm²)

α.f'c.A_c

Should balance to zero

ΦM_n	193	**kN.m**

SUPPLEMENTARY LONGITUDINAL WALL

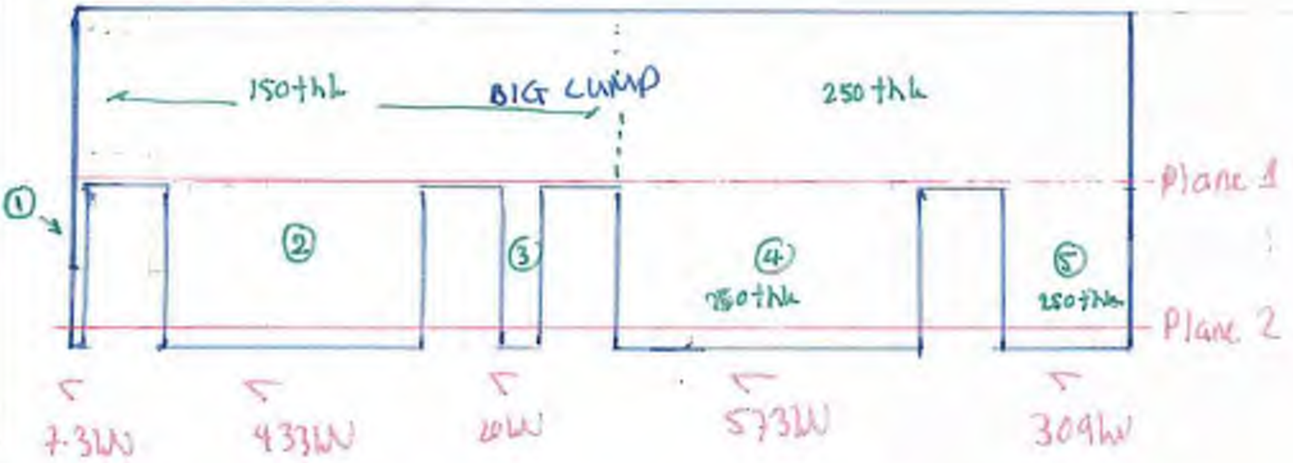
Date 03/05/20
Engineer MS
File Name WDC OSA
Job No
Sheet No

Supplementary Longitudinal Walls

Run longitudinally near northern side. Typ. 6" wall but 10" around the strong room. However appear to be a continuous wall, as shown in section B of the original plans, ∴ assess as one wall.

$P_e = 1511kN \times {}^{0.9}/_{1.14} = 1193kN$ 28/06 now 1301kN @μ=1.0

$\therefore V^* = 1511kN \; (\mu = 1)$



NOTE, EQ → 4 ← applied & critical result taken ∴ numbers above don't sum to V*

Big Lump

$V^* = 1511 kN$
$M^* = 1193kN \times 2.4m = 2863kN \cdot m$

Even if only single-layer of 3/8" @12"

$M_n = 6650kN \cdot m \; (100\%)$ $\mu = 1.25$

$V_{prob} = 2535kN \; (100\%)$ $\mu = 1$

Date 03/05/20
Job No
Engineer MS
Sheet No
File Name WDC DSA

Element	t (mm)	$\mu=1$ V^* (kN)	$\mu=1.25$ M^* (kN·m)	V_{prob} (kN)
1	150	9	14	45 (100%)
2	150	548	866	604 (100%)
3	150	25	40	93 (100%)
4	250	725	1146	906 (100%)
5	250	391	618	470 (100%)

All 2000mm high

this column required for V_{prob} calc

$\therefore V_{prob} = (45 + 604 + 93 + 906 + 470) = 2118$ kN

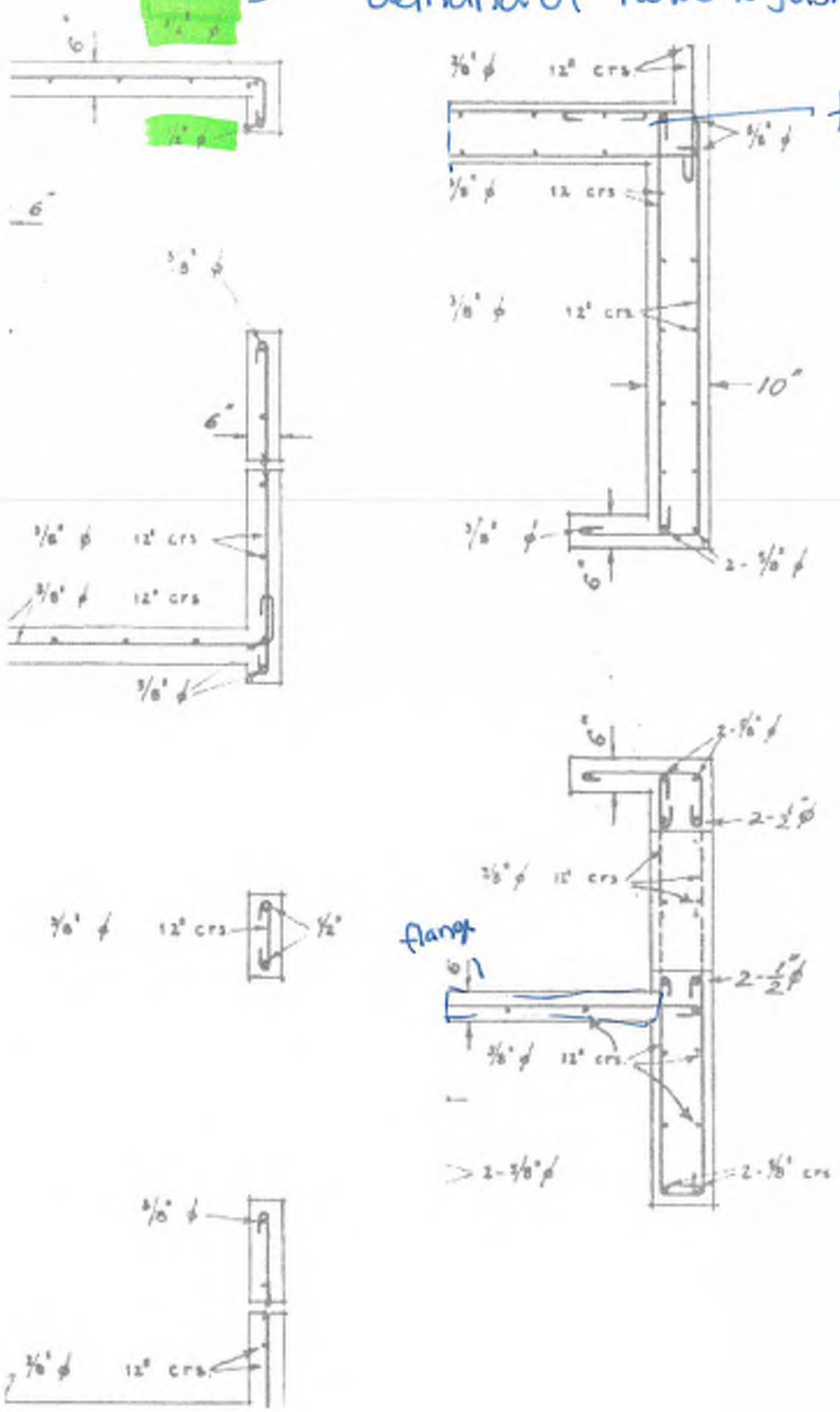
$V^* = 1511$ kN $\therefore$ 100% NBS

Moment Capacity - see steel layout on next page

Element	M^* (kN·m)	M_n (kN·m).	% NBS
1	~4 →	~4	100%
2	866 ←	593	68%
3	36 ←	7	19%
4	1150 ←	1287	100%
5	308 ←	230	75%

NOTE// only critical case shown $\therefore M^*$ may not match the top table if global force gives net tension on that pier.

axial capacity of 3/4" + 1/2" ~115kN for demand of 120kN ≈ just ok



take flange 8xtw ~2m

flange

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Engineer MS
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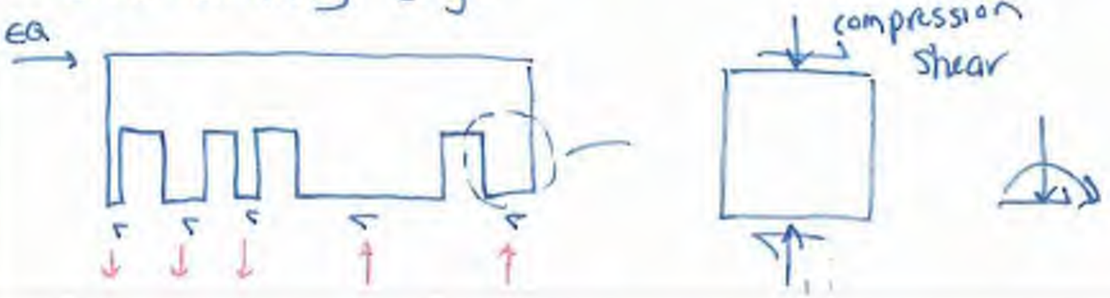
Note that each element also has a net tension or compression depending on the global overturning e.g.



Which gives benefit/reduction in capacity of the wall against flexure. The magnitude of this is simply the Σrxn of that section of wall - the net sum of flexural rxns will be zero for the shear on that panel ∴ the net out-of-zero is the t/c required for the global stability.

See printout over the page

In ← the wall is 100% for flexure as the large compression on the central 4m pier ensures capacity.

In → it is 77% as the net tensions on 4 piers reduces capacity. Have assumed load distribution of shear along the line.

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Title: Wall ULS Capacity

Description: Supplementary Wall
Net tension / compression

Job No :
Page : 1
Date : 3/05/2020
Author : MS
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Moment Capacity of Piers

H = 2.0 m

Element	V^* ->	M^* ->	N^* ->	M_n	
	kN	*kN.m*	*kN*	*kN.m*	
1	2.0	4.0	-120	0	
2	299.0	598.0	-101	307	
3	18.0	36.0	-36	7	
4	575.0	1150	-120	1287	
5	301.0	602.0	376	230	
		2390 kN.m		*1831 kN.m*	**77%**

Element	V^* <-	M^* <-	N^* <-	M_n	
	kN	*kN.m*	*kN*	*kN.m*	
1	7.3	14.6	145	38	
2	433	866	72	593	
3	20	40	-2.7	14	
4	580	1160	135	2461	
5	154	308	-349	960	
		2389 kN.m		*4066 kN.m*	**170%**

Date 03/05/20
Job No
Engineer MS
Sheet No
File Name WDC DSA

Diaphragm Transfer

$V^* = 1511kN / 13.8m = 109kN/m \quad (\mu = 1)$

looks like there may only be the main steel coming up from the wall

Say 3/8" @ 12" crs

$V_n = 0.85 \times (71mm^2 \times 280MPa \times 1000mm/300mm) \times (\mu = 1) \times 2sides$

$= 112 kN/m$ (100%)

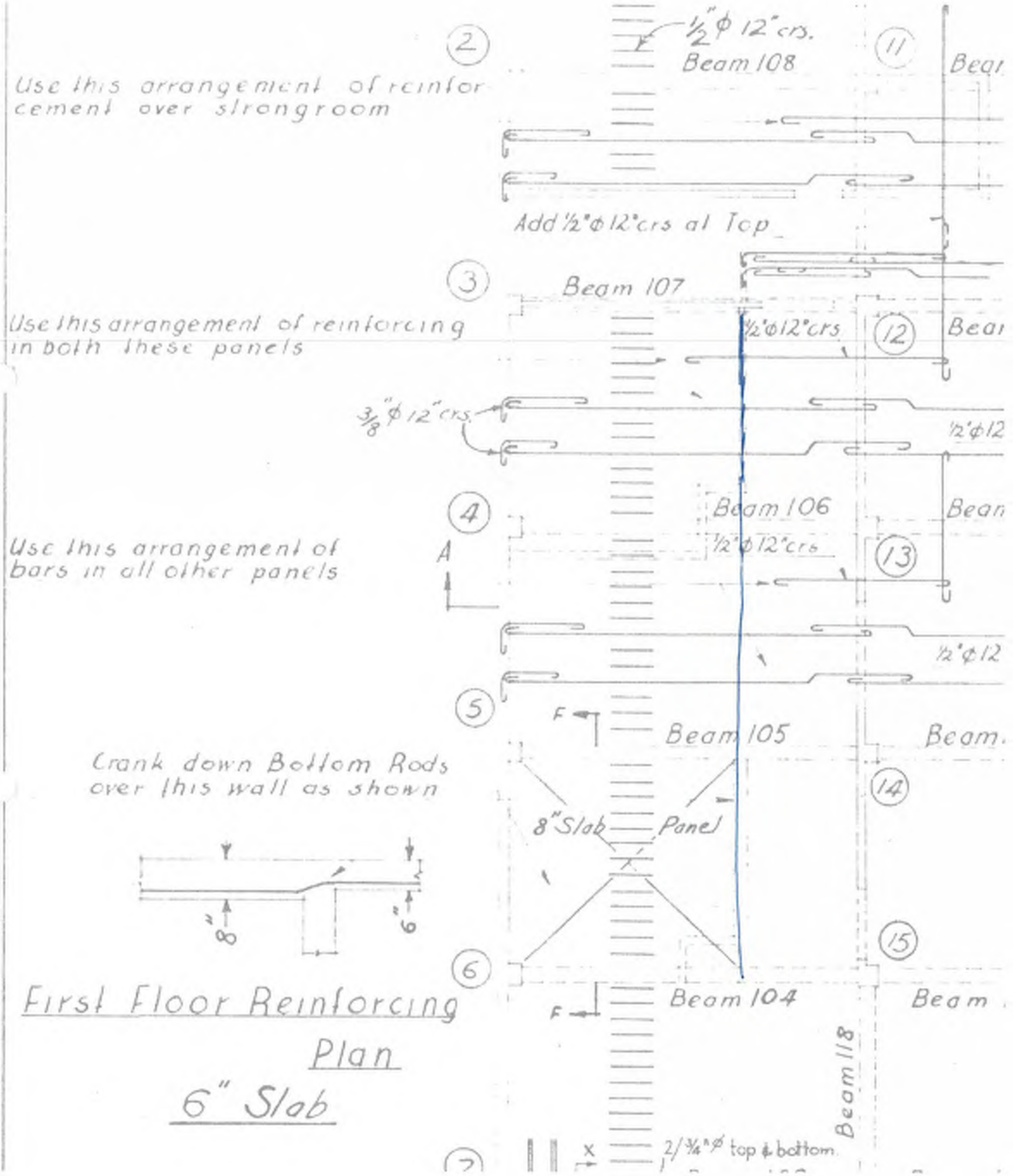
Should be conservative.

Base Shear

$V^* = 1193kN / (3.4m + 4m + 1.8m) = 130kN/m$

$A_s = 926mm^2 + 3325mm^2 + 1971mm^2 = 6222mm^2$

$\therefore V_n = 0.85 \times 6222mm^2 \times 280MPa \times (\mu = 1) = 1480kN$ OK
(100%)



First Floor Reinforcing Plan

6" Slab

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: Supplementary Wall - Top Block

Note: only self load axial considered

Job No :
Page : 1
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	13.80	m	
Wall Height	H_w	=	2.40	m	
Axial Load	N^*	=	119	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	47	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	297.8	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	253.8	mm	*Iterated until forces balance*

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: Supplementary Wall - Top Block

Note: only self load axial considered

Job No :
Page : 2
Date : 3/05/2020
Author : MS
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MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm^2*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	9.525	71	50	-0.0024	-482	-34	-204	7
2	1	9.525	71	348	0.0011	222	16	94	1
3	1	9.525	71	646	0.0046	280	20	392	8
4	1	9.525	71	943	0.0082	280	20	690	14
5	1	9.525	71	1241	0.0117	280	20	988	20
6	1	9.525	71	1539	0.0152	280	20	1,285	26
7	1	9.525	71	1837	0.0187	280	20	1,583	32
8	1	9.525	71	2135	0.0222	280	20	1,881	38
9	1	9.525	71	2433	0.0258	280	20	2,179	43
10	1	9.525	71	2730	0.0293	280	20	2,477	49
11	1	9.525	71	3028	0.0328	280	20	2,774	55
12	1	9.525	71	3326	0.0363	280	20	3,072	61
13	1	9.525	71	3624	0.0398	280	20	3,370	67
14	1	9.525	71	3922	0.0434	280	20	3,668	73
15	1	9.525	71	4220	0.0469	280	20	3,966	79
16	1	9.525	71	4517	0.0504	280	20	4,264	85
17	1	9.525	71	4815	0.0539	280	20	4,561	91
18	1	9.525	71	5113	0.0574	280	20	4,859	97
19	1	9.525	71	5411	0.0610	280	20	5,157	103
20	1	9.525	71	5709	0.0645	280	20	5,455	109
21	1	9.525	71	6007	0.0680	280	20	5,753	115
22	1	9.525	71	6304	0.0715	280	20	6,051	121
23	1	9.525	71	6602	0.0750	280	20	6,348	127
24	1	9.525	71	6900	0.0786	280	20	6,646	133
25	1	9.525	71	7198	0.0821	280	20	6,944	139
26	1	9.525	71	7496	0.0856	280	20	7,242	144
27	1	9.525	71	7793	0.0891	280	20	7,540	150
28	1	9.525	71	8091	0.0926	280	20	7,838	156
29	1	9.525	71	8389	0.0962	280	20	8,135	162
30	1	9.525	71	8687	0.0997	280	20	8,433	168
31	1	9.525	71	8985	0.1032	280	20	8,731	174
32	1	9.525	71	9283	0.1067	280	20	9,029	180
33	1	9.525	71	9580	0.1102	280	20	9,327	186
34	1	9.525	71	9878	0.1138	280	20	9,624	192
35	1	9.525	71	10176	0.1173	280	20	9,922	198
36	1	9.525	71	10474	0.1208	280	20	10,220	204
37	1	9.525	71	10772	0.1243	280	20	10,518	210
38	1	9.525	71	11070	0.1278	280	20	10,816	216
39	1	9.525	71	11367	0.1314	280	20	11,114	222
40	1	9.525	71	11665	0.1349	280	20	11,411	228
41	1	9.525	71	11963	0.1384	280	20	11,709	234
42	1	9.525	71	12261	0.1419	280	20	12,007	240
43	1	9.525	71	12559	0.1454	280	20	12,305	246
44	1	9.525	71	12857	0.1490	280	20	12,603	251
45	1	9.525	71	13154	0.1525	280	20.0	12,901	257
Axial Load				6,900			119	6,646	792
Concrete Section		30,076			-0.003		-959	-153.6	147
							0		6,650

β.c.b (mm²)

α.f'c.A_c

Should balance to zero

ΦM_n	6650	kN.m

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 1
Critical axial case

Job No :
Page : 1
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	0.40	m	
Wall Height	H_w	=	2.00	m	
Axial Load	N^*	=	-117	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	12.7	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	3	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	161.9	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	0.0	mm	*Iterated until forces balance*

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 1
Critical axial case

Job No :
Page : 2
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm*^{2}	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	19.05	285	38.1	#######	######	######	38	######
2	1	12.7	127	361.9	#######	######	######	362	######
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
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33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				200			-117	200	-23
Concrete Section		0			-0.003		0	0.0	0
							######		######

$\beta.c.b$ (mm^2)

$\alpha.f'c.A_c$

Should balance to zero

ΦM_n ###### kN.m

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 2
Critical axial case

Job No :
Page : 1
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	3.40	m	
Wall Height	H_w	=	2.00	m	
Axial Load	N^*	=	96	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	13	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	277	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	82.8	mm	*Iterated until forces balance*

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 2
Critical axial case

Job No :
Page : 2
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm^2*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	9.525	71	38	-0.0016	-324	-23	-45	1
2	1	9.525	71	315	0.0084	280	20	232	5
3	1	9.525	71	592	0.0184	280	20	509	10
4	1	9.525	71	869	0.0285	280	20	786	16
5	1	9.525	71	1146	0.0385	280	20	1,063	21
6	1	9.525	71	1423	0.0485	280	20	1,340	27
7	1	9.525	71	1700	0.0586	280	20	1,617	32
8	1	9.525	71	1977	0.0686	280	20	1,894	38
9	1	9.525	71	2254	0.0786	280	20	2,171	43
10	1	9.525	71	2531	0.0887	280	20	2,448	49
11	1	9.525	71	2808	0.0987	280	20	2,725	54
12	1	9.525	71	3085	0.1087	280	20	3,002	60
13	1	9.525	71	3362	0.1188	280	20	3,279	65
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
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36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				1,700			96	1,617	156
Concrete Section			9,814		-0.003		-313	-50.1	16
							0		593

β.c.b (mm^2)

α.f'c.A_c

Should balance to zero

ΦM_n	593	**kN.m**

SIMCO Consulting Ltd

Title:	Wall ULS Capacity	**Job No** :
		Page : 1
Description:	Supplementary Wall	**Date** : 3/05/2020
	Element 3	**Author** : MS
	Critical axial case	**Reviewer** :
		Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	0.40	m	
Wall Height	H_w	=	2.00	m	
Axial Load	N^*	=	-33	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	12.7	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	3	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	161.9	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	10.0	mm	*Iterated until forces balance*

Title:	Wall ULS Capacity	**Job No**	:
		Page	: 2
Description:	Supplementary Wall	**Date**	: 3/05/2020
	Element 3	**Author**	: MS
	Critical axial case	**Reviewer**	:
		Revision	: 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm²*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	12.7	127	50	0.0120	280	35	40	1
2									
3	1	12.7	127	350	0.1019	280	35	340	12
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
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35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				200			-33	190	-6
Concrete Section			1,186		-0.003		-38	-6.1	0
							0		7

β.c.b (mm²)

α.f'c.A_c

Should balance to zero

ΦM_s	7	**kN.m**

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Title:	Wall ULS Capacity	**Job No**	:
		Page	: 1
Description:	Supplementary Wall	**Date**	: 3/05/2020
	Element 4	**Author**	: MS
	Comp case	**Reviewer**	:
		Revision	: 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.25	m	
Wall Length	L_w	=	4.00	m	
Wall Height	H_w	=	2.00	m	
Axial Load	N^*	=	135	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	15	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	280.3	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	"
Neutral Axis	c_{uls}	=	161.0	mm	*Iterated until forces balance*

SIMCO Consulting Ltd

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 4
Comp case

Job No :
Page : 2
Date : 3/05/2020
Author : MS
Reviewer :
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MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_s	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm²*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	9.525	71	38	-0.0023	-458	-33	-123	4
2	1	9.525	71	338	0.0033	280	20	177	4
3	1	9.525	71	638	0.0089	280	20	477	10
4	1	9.525	71	938	0.0145	280	20	777	16
5	1	9.525	71	1238	0.0201	280	20	1,077	21
6	1	9.525	71	1538	0.0257	280	20	1,377	27
7	1	9.525	71	1838	0.0313	280	20	1,677	33
8	2	15.875	396	2050	0.0352	280	111	1,889	209
9	2	15.875	396	2250	0.0389	280	111	2,089	232
10	2	9.525	143	2533	0.0442	280	40	2,372	95
11	2	9.525	143	2817	0.0495	280	40	2,656	106
12	2	9.525	143	3100	0.0548	280	40	2,939	117
13	2	9.525	143	3383	0.0600	280	40	3,222	129
14	2	9.525	143	3667	0.0653	280	40	3,506	140
15	2	15.875	396	3950	0.0706	280	111	3,789	420
16	1	9.525	71	3950	0.0706	280	20	3,789	76
17									
18	12	9.525	855	2150	0.0371	280	239	1,989	476
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				2,000			135	1,839	248
Concrete Section			31,796		-0.003		-1,013	-97.4	99
							0		2,461

β.c.b (mm²)

α.f'c.A_c

Should balance to zero

ΦM_n	2461	**kN.m**

SIMCO Consulting Ltd

Title:	Wall ULS Capacity	**Job No**	:
		Page	: 1
Description:	Supplementary Wall	**Date**	: 3/05/2020
	Element 4	**Author**	: MS
	Tension case	**Reviewer**	:
		Revision	: 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.25	m	
Wall Length	L_w	=	4.00	m	
Wall Height	H_w	=	2.00	m	
Axial Load	N^*	=	-72	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	15	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	280.3	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	94.7	mm	*Iterated until forces balance*

SIMCO Consulting Ltd

Title:	Wall ULS Capacity	**Job No** :
		Page : 2
Description:	Supplementary Wall	**Date** : 3/05/2020
	Element 4	**Author** : MS
	Tension case	**Reviewer** :
		Revision : 0

MOMENT CAPACITY OF SECTION

Layer -	n_{bar} -	d_b *mm*	A_i *mm²*	x_i mm	ε -	σ *MPa*	Force *kN*	Lever Arm mm	Moment *kN.m*
1	1	9.525	71	3962	0.1225	280	20	3,867	77
2	1	9.525	71	3662	0.1130	280	20	3,567	71
3	1	9.525	71	3362	0.1035	280	20	3,267	65
4	1	9.525	71	3062	0.0940	280	20	2,967	59
5	1	9.525	71	2762	0.0845	280	20	2,667	53
6	1	9.525	71	2462	0.0750	280	20	2,367	47
7	1	9.525	71	2162	0.0655	280	20	2,067	41
8	2	15.875	396	1950	0.0588	280	111	1,855	206
9	2	15.875	396	1750	0.0525	280	111	1,655	183
10	2	9.525	143	1467	0.0435	280	40	1,372	55
11	2	9.525	143	1183	0.0345	280	40	1,089	43
12	2	9.525	143	900	0.0255	280	40	805	32
13	2	9.525	143	617	0.0165	280	40	522	21
14	2	9.525	143	333	0.0076	280	40	239	10
15	2	15.875	396	50	-0.0014	-283	-112	-45	5
16	1	9.525	71	50	-0.0014	-283	-20	-45	1
17									
18	12	9.525	855	1850	0.0556	280	239	1,755	420
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				2,000			-72	1,905	-137
Concrete Section			18,699		-0.003		-596	-57.3	34
							0		1,287

β.c.b (mm²)

α.f'c.A_r

Should balance to zero

ΦM_n	1287	**kN.m**

SIMCO Consulting Ltd

Title:	Wall ULS Capacity	**Job No**	:	
		Page	:	1
Description:	Supplementary Wall	**Date**	:	3/05/2020
	Element 5	**Author**	:	MS
	Tension case	**Reviewer**	:	
		Revision	:	0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.25	m	
Wall Length	L_w	=	2.00	m	
Wall Height	H_w	=	4.40	m	
Axial Load	N^*	=	-296	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	8	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	274.8	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	*^*
Neutral Axis	c_{uls}	=	31.3	mm	*Iterated until forces balance*

Title: Wall ULS Capacity

Description: Supplementary Wall
Element 5
Tension case

Job No :
Page : 2
Date : 3/05/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm^2*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	2	15.875	396	38	0.0007	131	52	7	0
2	2	12.7	253	313	0.0270	280	71	282	20
3	2	9.525	143	588	0.0534	280	40	556	22
4	2	9.525	143	863	0.0798	280	40	831	33
5	2	9.525	143	1137	0.1061	280	40	1,106	44
6	2	9.525	143	1412	0.1325	280	40	1,381	55
7	2	9.525	143	1687	0.1589	280	40	1,656	66
8	2	15.875	396	1962	0.1852	280	111	1,931	214
9									
10	3	9.525	214	1000	0.0929	280	60	969	58
11									
12									
13									
14									
15									
16									
17									
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Axial Load				1,000			-296	969	-287
Concrete Section			6,176		-0.003		-197	-18.9	4
							0		230

β.c.b (mm^2)

α.f'c.A_c

Should balance to zero

ΦM_n	230	**kN.m**

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	Element 5	**Author**	: MS
	Comp case	**Reviewer**	:
		Revision	: 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

Wall Thickness	t_w	=	0.25	m	
Wall Length	L_w	=	2.00	m	
Wall Height	H_w	=	4.40	m	
Axial Load	N^*	=	429	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	2	-	
Wall End to Bar Centroid	-	=	38.1	mm	
Number of Vertical Bars	n_{bar}	=	8	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	274.8	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	ϕ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	113.2	mm	*Iterated until forces balance*

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	Comp case	**Reviewer**	:
		Revision	: 0

MOMENT CAPACITY OF SECTION

Layer -	n_{bar} -	d_b *mm*	A_i *mm^2*	x_i *mm*	ε -	σ *MPa*	Force *kN*	Lever Arm *mm*	Moment *kN.m*
1	2	15.875	396	1962	0.0490	280	111	1,849	205
2	2	12.7	253	1687	0.0417	280	71	1,574	112
3	2	9.525	143	1412	0.0344	280	40	1,299	52
4	2	9.525	143	1137	0.0272	280	40	1,024	41
5	2	9.525	143	863	0.0199	280	40	749	30
6	2	9.525	143	588	0.0126	280	40	475	19
7	2	9.525	143	313	0.0053	280	40	200	8
8	2	15.875	396	38	-0.0020	-398	-158	-75	12
9									
10	3	9.525	214	1000	0.0236	280	60	887	53
11									
12									
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Axial Load				1,000			429	887	380
Concrete Section			22,350		-0.003		-712	-68.5	49
							0		960

β.c.b (mm²)

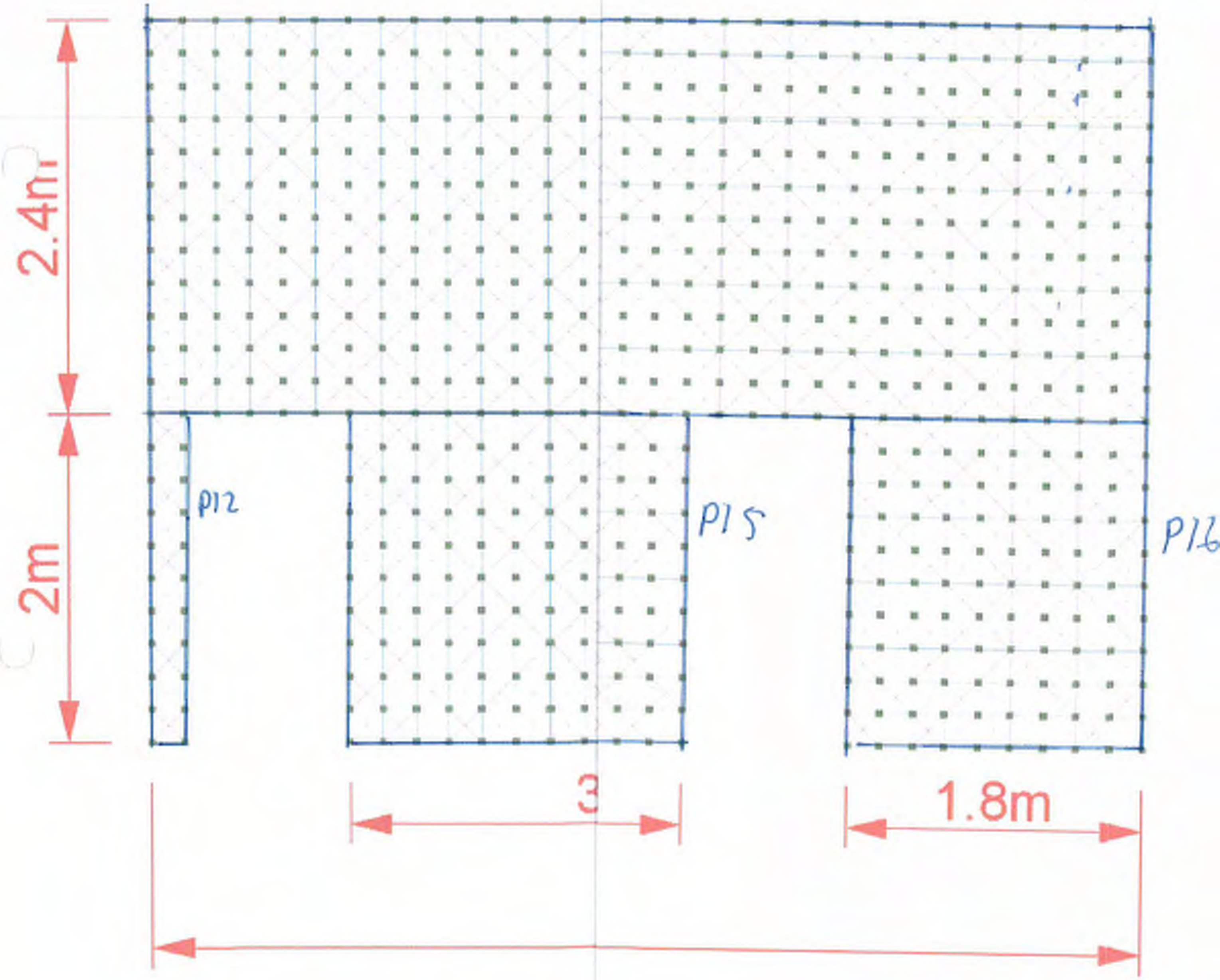
$\alpha.f'c.A_c$

Should balance to zero

ΦM_n	960	kN.m

EAST & WEST WALLS

104. SIAL WALLS



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East & West Walls

Same walls @ both ends, 8.2m high × 15.4m long × 8" thick. They have regular openings so behave as a coupled wall.

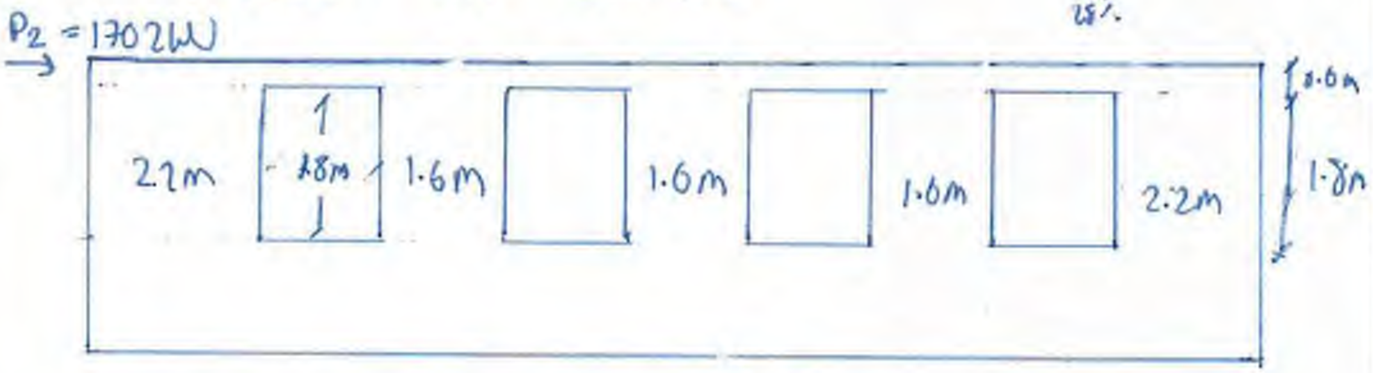
Critical checks are shear capacity of piers & coupling beam. These walls are the main lateral element N-S ∴ important to not fail in a brittle way.

East wall is more highly-loaded ∴ check this → can directly scale the %NBS if need be.

$P_2 = 2156kN \times {}^{0.9}/_{1.14} = 1702kN$

$P_1 = 1022kN \times {}^{0.9}/_{1.14} = 807kN$

4.86
2.56
28%



Shear capacity of these L2 Piers

Assume: $P \propto L^2$

$V^{*} = \therefore 2.2m = 2.2^2 / 3\times1.6^2 + 2\times2.2^2 = 28\% \Rightarrow 477kN \times {}^{1.14}/_{0.9} = 604kN$

$V^{*} = \therefore 1.6^2 = 1.6^2 / 3\times1.6^2 + 2\times2.2^2 = 15\% \Rightarrow 255kN \times {}^{1.14}/_{0.9} = 323kN$

$V_{prob\ 2.2m} = 640kN$ (100% $\mu = 1$)

$V_{prob\ 1.6m} = 521kN$ (100% $\mu = 1$)

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Moment Capacity of 2.8m Piers

$M^k_{1.6m,L2} = \frac{770+770+690}{3} = 710\ kN\cdot m$

$M^k_{1.6m,L1} = \frac{1097+1110+1042}{3} = 1083\ kN\cdot m$

$M^k_{2.2m\,L2} = \frac{351+303}{2} = 327\ kN\cdot m$

$M^k_{2.2m,L1} = \frac{1105+977}{2} = 1041\ kN\cdot m$

$M_{n,1.6m} = 334\ kN\cdot m$ (31% L1, 47% L2)

$M_{n,2.2m} = 608\ kN\cdot m$ (58% L1, 100% L2)

∴ piers 34% M^k $\mu=1.25$

Coupling Beams

$V^k_{L2} = 389\ kN$ $(\mu=1)$

$M^k_{L2} = \frac{656+501}{2} = 579\ kN\cdot m$ $(\mu=1.25)$

$V^k_{L1} = 667\ kN$ $(\mu=)$

$M^k_{L1} = \frac{824\ kN\cdot m + 863\ kN\cdot m}{2} = 843\ kN\cdot m$ $(\mu=1.25$

Check V^k, M^k and rotation

$M_{n,L2}$ = 366kN·m (63%)

$M_{n,L1}$ = 446kN·m (53%)

Use standard shear formulae

∴ $V_{prob,L2}$:

$\alpha = 3 - {}^{492kN\cdot m}/_{307kN \times 1.8m}$ = 2.11 → use 1.5

β = 0.54

γ = 0.29

∴ $V_c = 1.5 \times 0.54 \times 0.29 \times \sqrt{37.5MPa} \times (0.8 \times 0.2m \times 1.8m)$ = 414kN

$V_s = A_v \cdot f_{yt} \cdot {}^{d}/_{s}$ = $2 \times 71mm^2 \times 280MPa \times {}^{1.8m}/_{0.3m}$ = 239kN

∴ $V_{prob} = 0.85 \times (414kN + 239kN)$ = 555kN (100%)

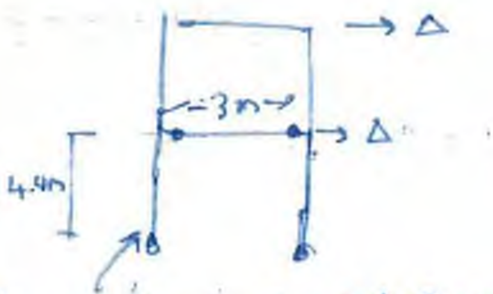
repeat for 2.0m @ L1

V_{prob} = 678kN (100%)

∴ not shear controlled (μ=1)

Check rotation demand:

→ s = 300mm ∴ s ≤ d/3



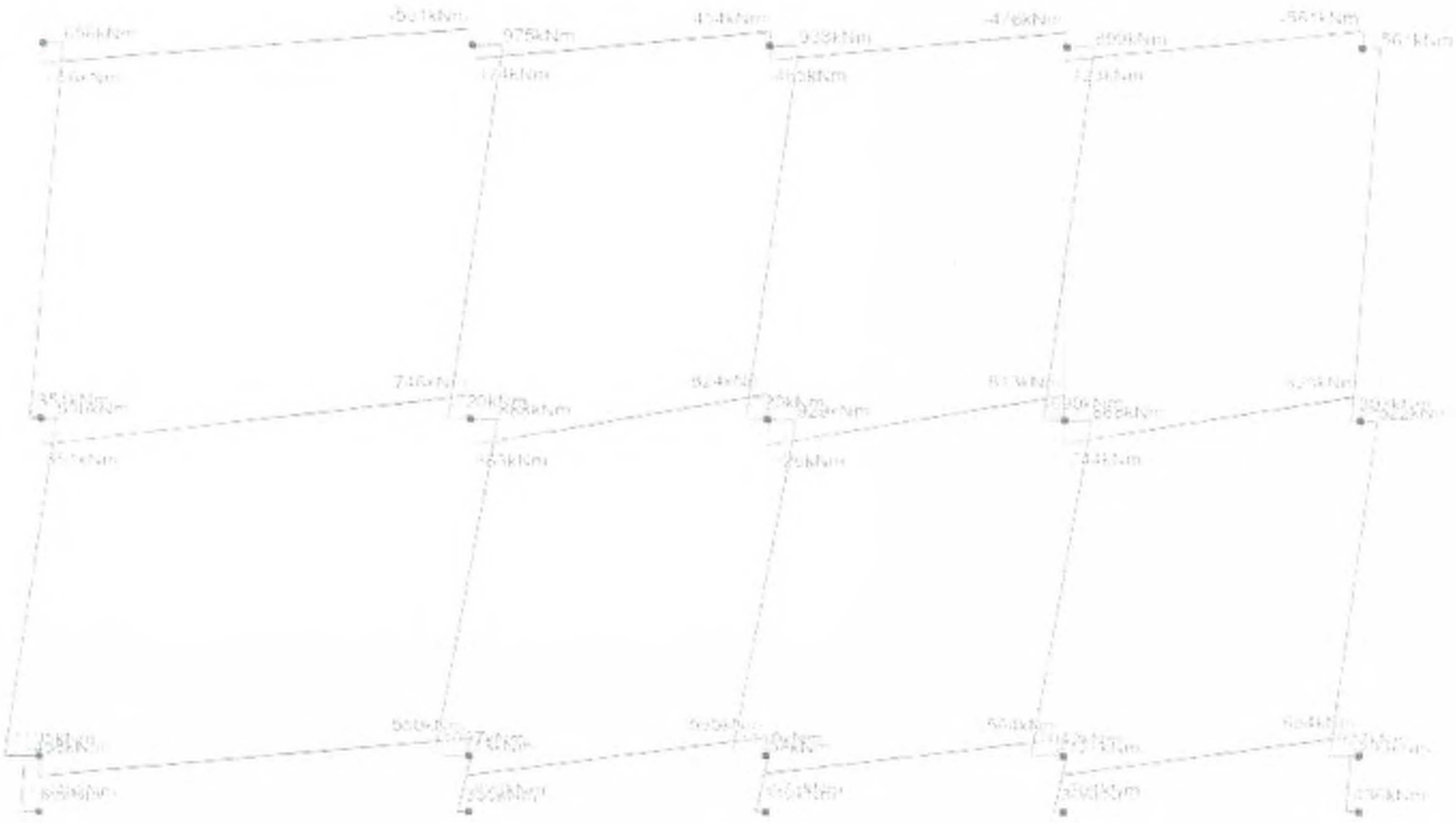
l_p = 436mm, Δ = ~2.5mm

∴ θ = 0.006 → by inspection coupling beams ok in column,

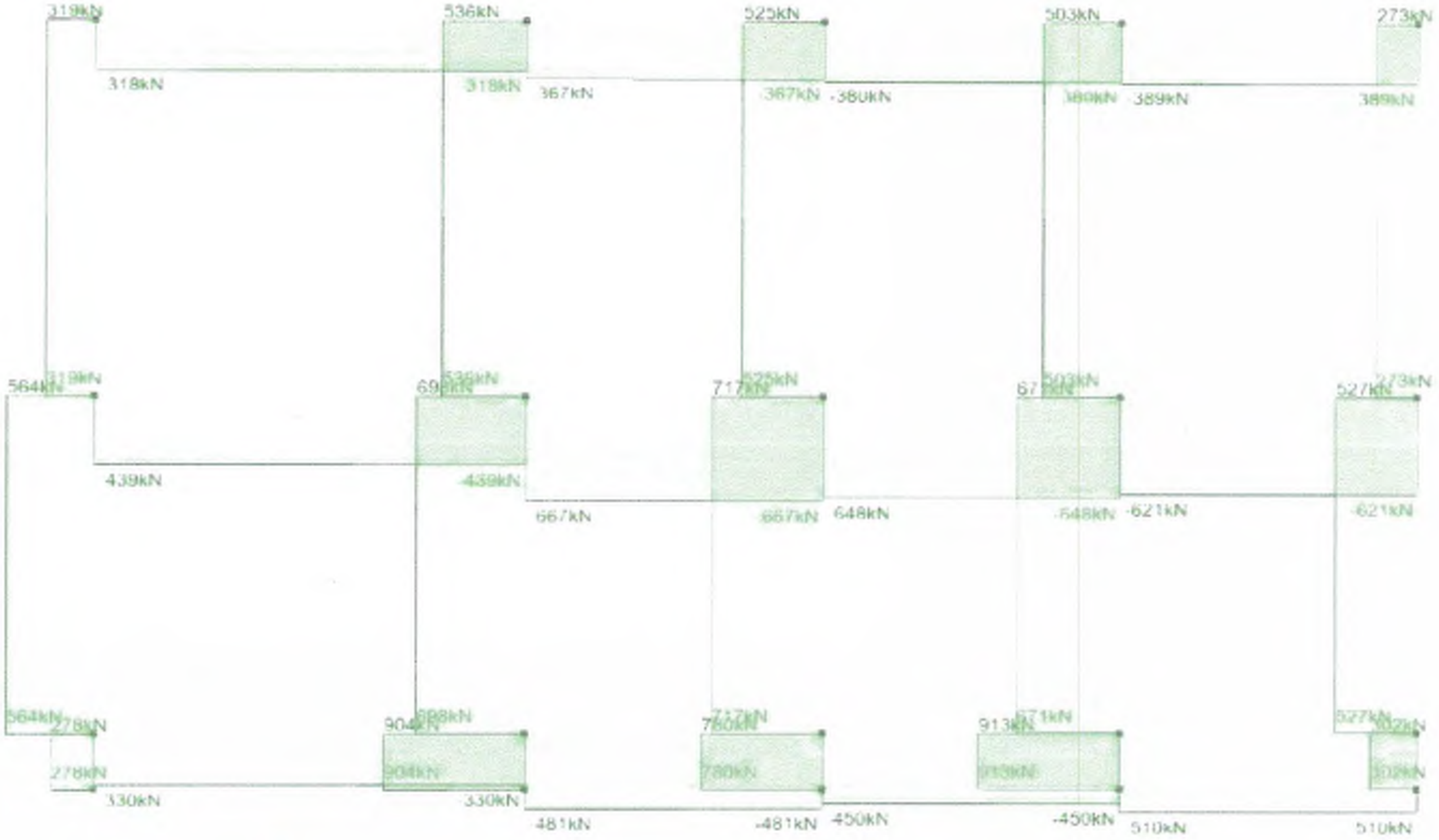
East & West Wall

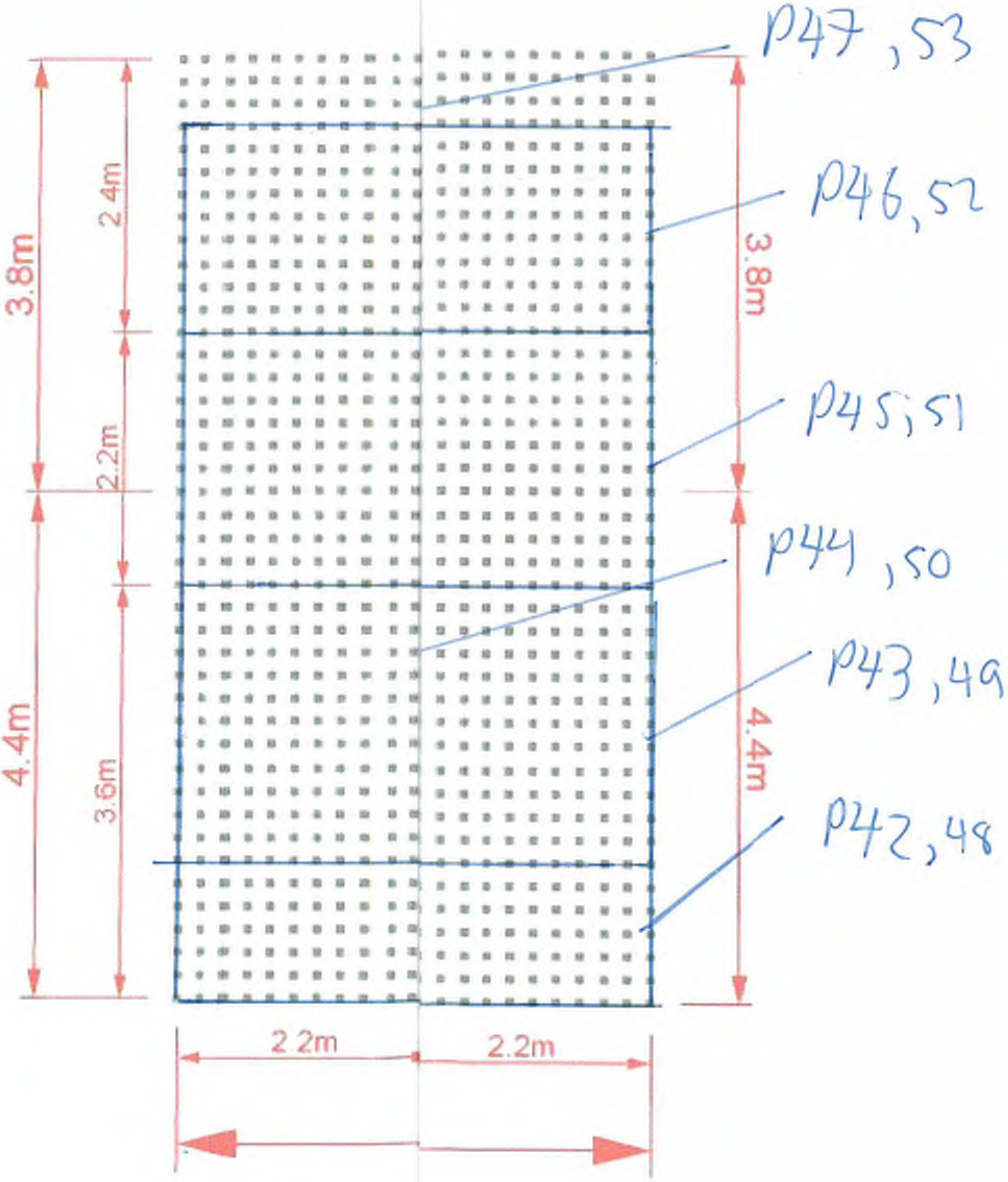
$\mu=1.25$

M^*



East/West Wall $\mu = 1.0$ load'.




P47 ,53
P46,52
P45;51
P44 ,50
P43,49
P42,48
3.8m
2.4m
2.2m
4.4m
3.6m
3.8m
4.4m
2.2m
2.2m

STAIRWELL WALLS

SOUTH STAIRWELL

The southern stairwell has 2 transverse walls, one each on the east & west side. The eastern wall is solid, the western wall has an opening. Technically, these walls are 3-storey, but the top storey is a lightweight roof ∴ ignore the top storey - there is little load applied there. Note that the weight of this floor has been accounted for.

Eastern wall

At ground floor it is in the same line as the Toll Box Wall.

$\therefore P_2 = 2097\,kN \times 0.9/1.14 \quad = 1655\,kN$

$P_1 = \frac{781250\,kN/m}{1051520\,kN/m} \times 841\,kN \times 0.9/1.14 \quad = 493\,kN$ $\left(\begin{matrix}625kN \\ @\mu=1\end{matrix}\right)$

$\therefore V^* = \left(1655\,kN + 493\,kN\right) \times 1.14/0.9 \quad = 2721\,kN$ $(\mu=1)$

$M^* = (1655\,kN \times 8.2m) + (493\,kN \times 4.4m) = 15740\,kN \cdot m$ $(\mu=1.25)$

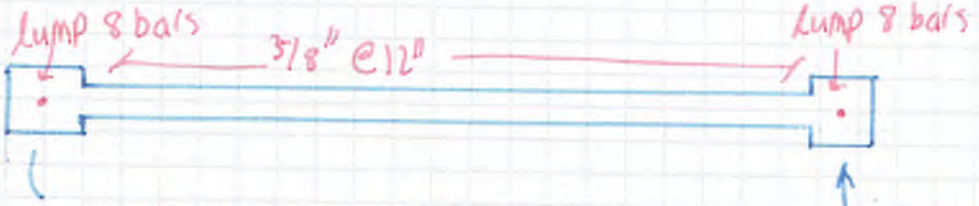
Wall is 8" thick w/ 2 layers of 3/8" bars @ 12" c/s.

$V_{prob} = 1971\,kN^*$ (100%)

* At this point I've spreadsheeted the calcs to save having to repeat the same calcs for every wall.

Flexural Capacity

$M^* = 15740 kN.m$



columns @ either end (*24)

column * 29

Don't have a specific detail for this column - generally columns have 8x 1-1/8" bars at G → L1 & may step down to 4 bars @ L1 → L2

1-1/8" = 28.575mm lumped @ colum ℄ (0.2m in from ends)

Standard steel 2x 3/8" @ 12" c/s through middle.

$\phi M_n = 10438 kN.m$ (66%) → have only considered self weight axial

∴ allow 67% NBS

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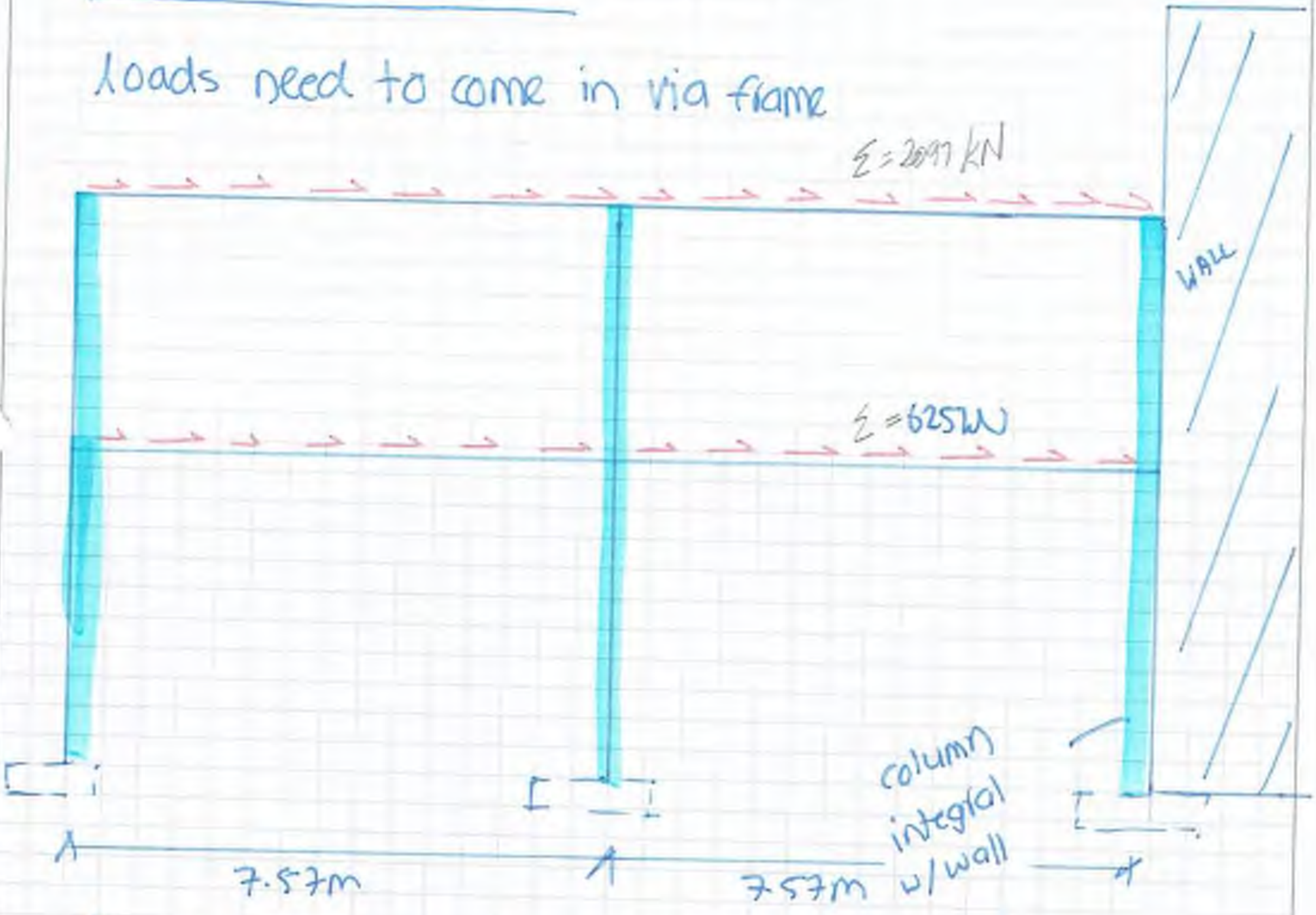
Diaphragm Transfer

loads need to come in via frame



$V^* = 2097kN$ (max floor force, $\mu = 1$, $S_p = 1$)

$\therefore V^d = 2097kN / 7.57m = 277kN/m$

Have 1/2" @ 7" crs

$\therefore \phi V_n = 0.85 \times \left(\frac{1/2 \times 25.4mm}{2}\right)^2 \overset{\times\pi}{\wedge} \times \left(\frac{1000mm}{7 \times 25.4mm}\right) \times 280MPa \times (\mu = 1) \times 2 sides$

$= 340 kN/m > 277kN/m$ OK

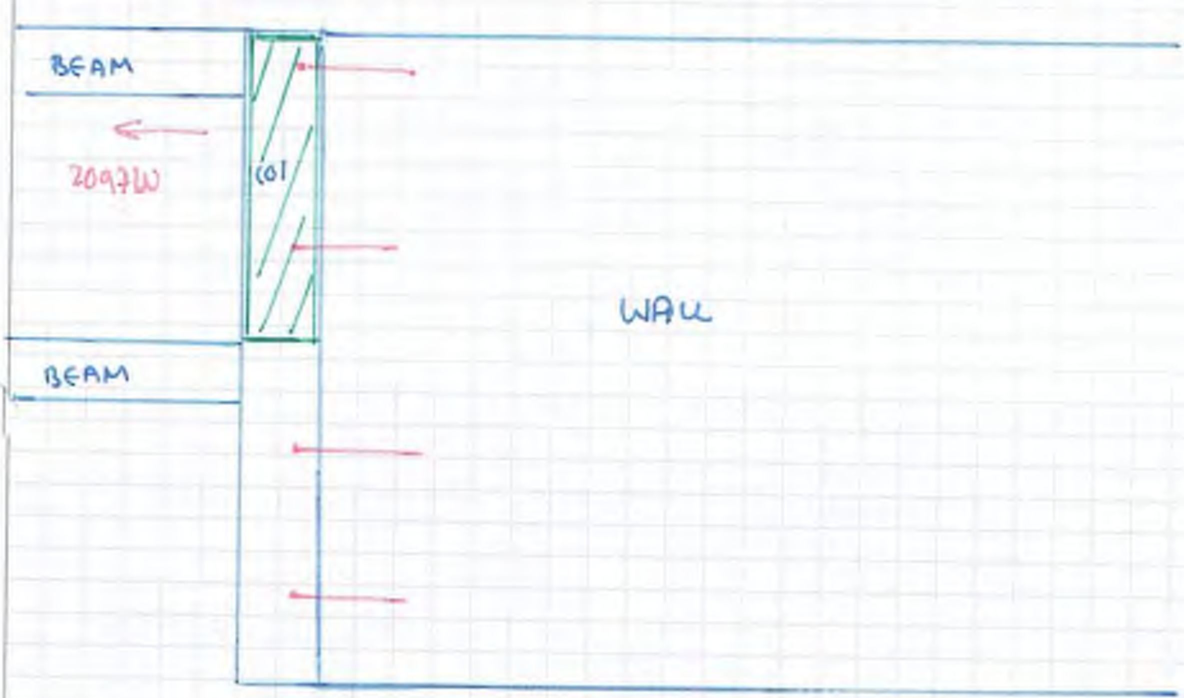
Check beam longitudinal steel in beam R12

2-5/8" → 15.875mm
2-1" → 25.4mm
2-7/8" → 22.225mm

$\}$ $A_s = 2185mm^2 \rightarrow N_t = 612kN$ (30%)

Allow 34% NBS

Column → Wall Connection



Say use column to pass load to wall

Max is: $\left(\frac{9.525mm}{2}\right)^2 \times \pi \times 280MPa \times \left(\frac{1000mm}{300mm}\right) \times 3.8m /10^3 = 253kN\ (12\%)$

This would also have to utilise column shear capacity

×N.G

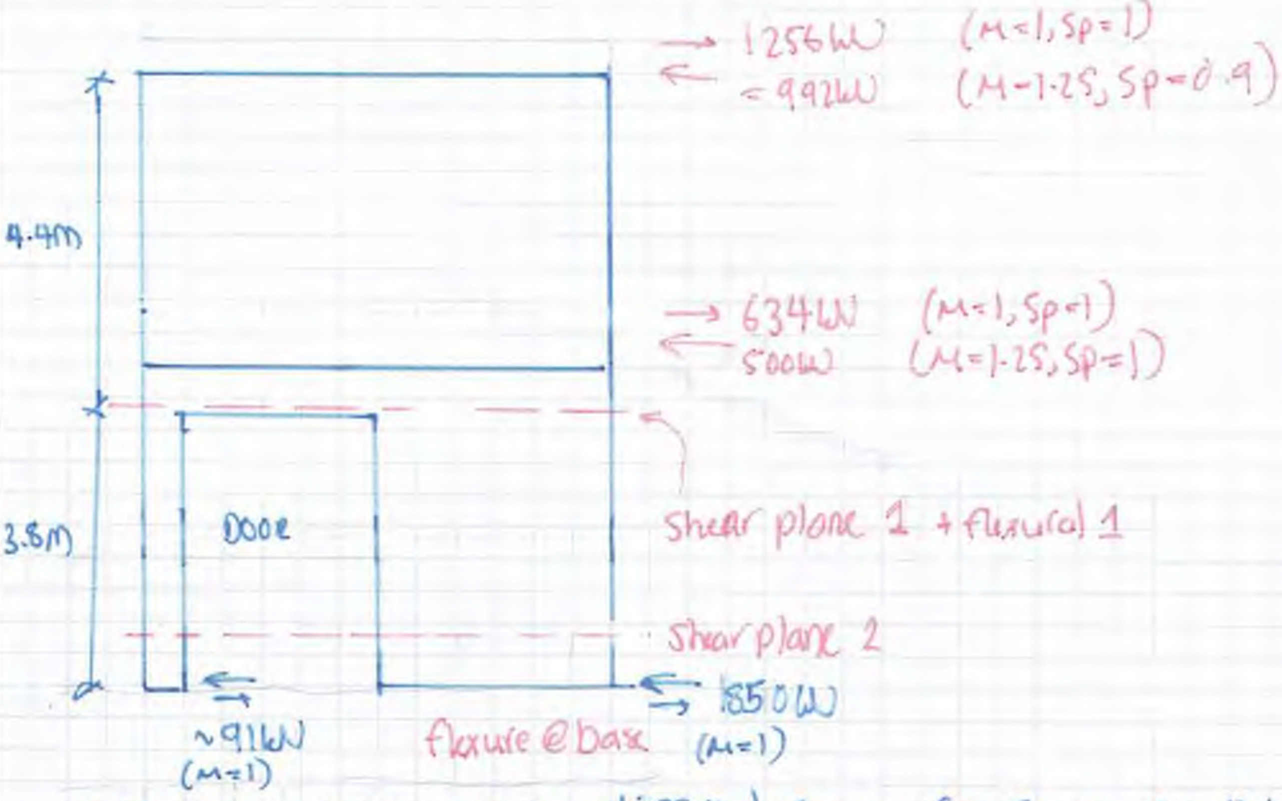
Will have to drill bars through the column and weld them in

$A_{s,side} = \sim 2185mm^2 \times 280MPa / 500MPa = 1224mm^2$

2/ HD32 required per side.

$\therefore N_t = 612kN + 2 \times 2 \times (0.9 \times 804mm^2 \times 500MPa) = 2059kN$ ✓ ok (2%)

Western Wall



NOTE// Max shears are in different cases. for EQ→ the thin pier takes no shear as it functions only as a tension element. For EQ← the confinement of the axial load helps it take shear ∴ critical case of large comp + bending + shear.

Main Body of wall First (Top block)

$V^* = (1256kN + 634kN) = 1890kN \quad (\mu=1)$

$M^* = (992kN \times 4.4m) + (500kN \times 0.6m) = 4665kN\cdot m \quad (\mu=1.25)$

This part of the wall is comparable to the eastern side

∴

$V_{prob} = 1971\ kN \quad (100\%)$

$M_{prob} = 10438\ kN\cdot m \quad (100\%)$

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Big Pier

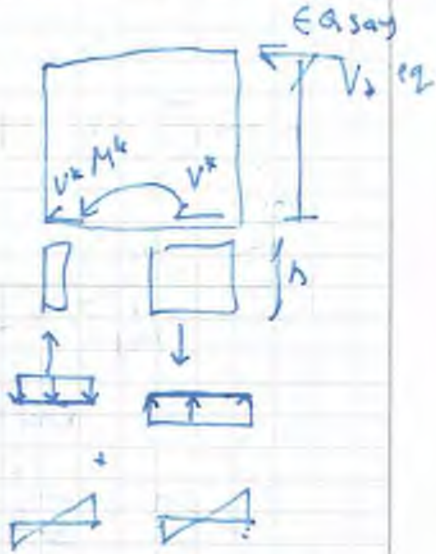
2.8m long × 3.8m high

Worst - case it takes ~97% of the shear load

∴ $V^* = 1851$ kN ($\mu = 1$)

$M^* = 6723$ kN·m ($\mu = 1.25$)

w/ $T^* = 1028$ kN worst case ($\mu = 1.25$)



$V_{prob} = 766$ kN (41% NBS)

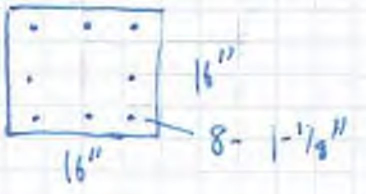
$M_n = 824$ kN·m (15% NBS)


Tension side OK
comp side ✓ OK

Small Pier

$V^* = 91$ kN ($\mu = 1$)
$M^* = 274$ kN·m

$N_c^* = 1172.5$ kN



comp. case

$M_n = 384$ kN·m ✓ OK (100%)

for similar uplift calcs see coal bunker wall

Tension case

$V^* = 32$ kN
$M_t^* = 122$ kN·m
$T^* = 1220$ kN => $M_n = 42$ kN·m (34%)

Need 520 kN of axial load (Gravity) to give sufficient capacity. Self weight gives ~50 kN => 34% NBS

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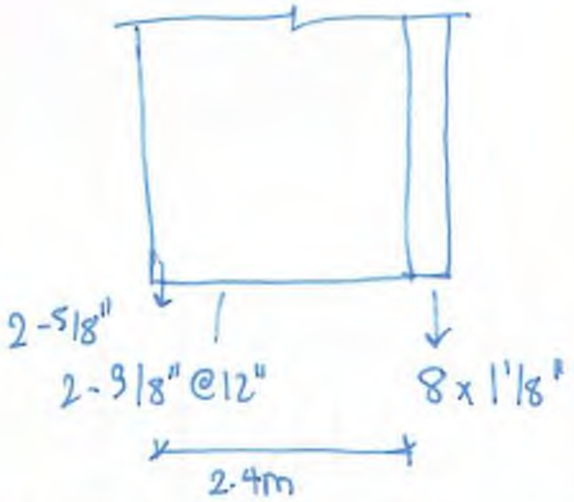
Base Shear

$V^* = 1292\text{kN} + 630\text{kN} = 1922\text{kN} \quad (\mu = 1.0)$



$\therefore \; 3/8'' \Rightarrow 71.3\text{mm}^2$
$5/8'' \Rightarrow 198\text{mm}^2$
$1'1/8'' \Rightarrow 641\text{mm}^2$

$\therefore A_s = (2 \times 198\text{mm}^2) + (2 \times 71.3\text{mm}^2 \times 300\text{mm}/2400\text{mm}) + (8 \times 641\text{mm}^2)$

$= 5542\text{mm}^2$

$\therefore V_{friction} = 0.85 \times 5542\text{mm}^2 \times 280\text{MPa} = 1319\text{kN} \quad (69\% \; \mu = 1)$

So without consider axial load, shear friction is ~67%.

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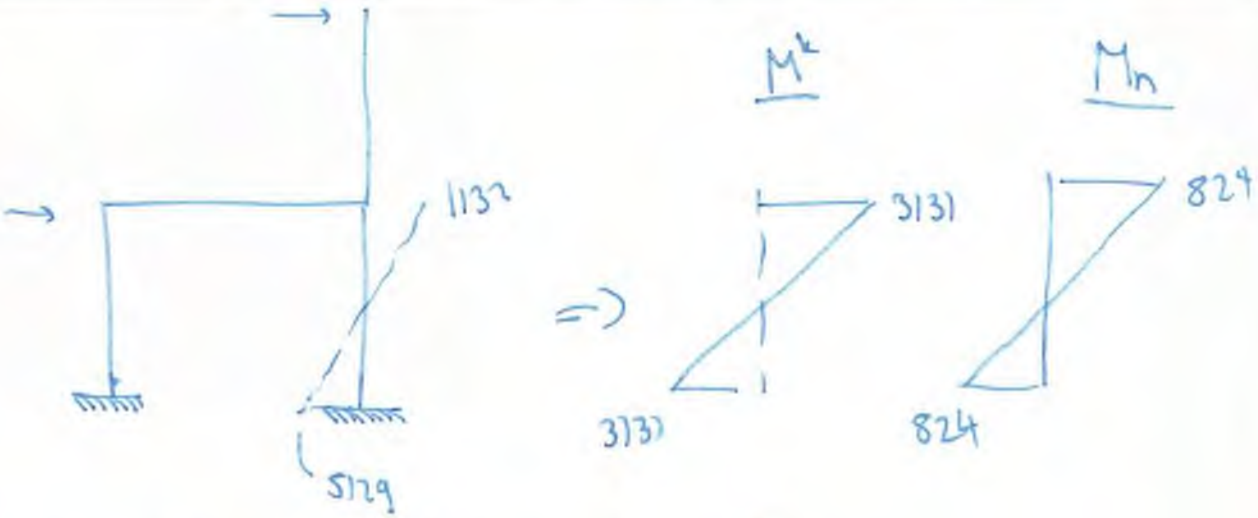


M_n = 824kN·m (26%, μ=1.25)
↳ this model × > 34%.

East wall is 67% for flexure ∴ allow <u>34%</u>.
↳ reduce East wall to 60%.

↳ load redistribution as they are close to each other.

actually OK as big bars are on tension side

← T^* = 986kN, M^* = 5128kN·m
M_n = 2810kN·m (55%, μ = 1.25)

→ C^* = 986kN, M^* = 5128 kN·m
M_n = 2018kN·m (39%, μ=1.25)

Axial Capacity

Use 3101 for confinement stirrups

$$A_{sh} = \frac{(1 - p_t \cdot m) \cdot S_h \cdot h''}{3.3} \cdot \frac{A_g}{A_c} \cdot \frac{f'_c}{f_{yt}} \cdot \frac{N^k}{\phi f'_c \cdot A_s} - 0.0065 \cdot S_h \cdot h''$$

cover to main bars is 1.5"

∴ stirrups have 1.5" - 3/8" = 1 1/8" = 28.6mm

$\therefore h'' = 16 \times 25.4\text{mm} - 2 \times 28.6\text{mm} \quad - 349.2\text{mm}$

$\therefore A_c = 349.2\text{mm} \times 349.2\text{mm} \quad = 122 \times 10^3\,\text{mm}^2$

$p_t = 8 \times \left(\frac{28.6\text{mm}}{2}\right)^2 \times \pi \Big/ 400\text{mm} \times 400\text{mm} \quad = 0.032$

$m = f_y / 0.85 f'_c = 280 / 0.85 \times 37.5 \quad - 8.78$

$$\therefore A_{sh} = \frac{(1 - 0.032 \times 8.78) \times 254\text{mm} \times 349\text{mm}}{3.3} \times \frac{160 \times 10^3\,\text{mm}^2}{122 \times 10^3\,\text{mm}^2} \times \frac{37.5\text{MPa}}{280\text{MPa}} \times$$

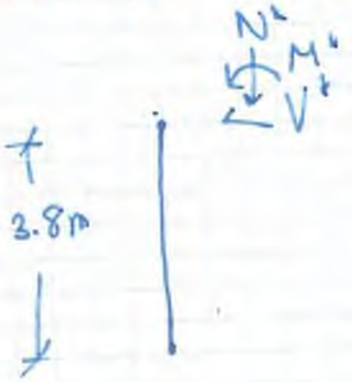
$$\frac{1173\text{kN}}{\cdot 37.5\text{MPa} \times 160 \times 10^3\,\text{mm}^2} - 0.0065 \times 254\text{mm} \times 349\text{mm}$$

$\doteq 665 - 576 = 89\text{mm}^2 / 2\text{ legs} \quad - 44.5\text{mm}^2$

Have 3/8" ⇒ $A_{prov} = 71\text{mm}^2$ ∴ 100% NBS

Will need to strengthen diaphragm connection to wall.

Now check the 'pier' as a column in comp. case



$274kN \cdot m \times \frac{1000N}{kN} \times \frac{1000mm}{m}$

$V^* = 72kN$
$M^* = 274kN \cdot m$
$N^*_c = 1173kN$ $\quad N^*_G \sim 70kN$

$A_g = 160{,}000\ mm^2$ & $f'_c = 37.5\ MPa$

$\therefore N_c = 6000kN \sim 20\%$ utilised on quick check.

Shear

$$V_{cn} = \left[\frac{0.5 \cdot \sqrt{f'_c}}{M^*/v.d} \cdot \sqrt{1 + \frac{N^*_G}{0.5 \times A_g \times \sqrt{f'_c}}}\right] \times 0.8 A_g$$

Where $d = 0.8 \times d_c$ i.e. 80% of full depth

$$\therefore = \left(\frac{0.5 \times \sqrt{37.5 MPa}}{274kN \cdot m / 72kN \times 0.8 \times 0.4m}\right) \times \left(\sqrt{1 + \frac{70kN \times 10^3}{0.5 \times 0.4m \times 0.4m \times \sqrt{37.5 MPa}}}\right) \times 0.8 \times 0.4m \times 0.4m \times 10^3$$

$$M^*/v.d = 274kN \cdot m / 72kN \times 0.8 \times 0.4m = 11.9 \rightarrow max = 4 \therefore use\ 4$$

$$= 0.765 \times 1.07 \times 0.8 \times 0.4m \times 0.4m \times 10^3 = 104.8kN$$

$\therefore 100\%$ $(\mu = 1)$

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Base Shear

$V^* = 1461kN$

$V_n = 0.85 \times (1536mm^2 \times 280MPa + 137kN) \times (\mu - 1)$ ← G self weight load from model

$= 482kN$ (33%)

Allow 34% for some extra roof weight etc

To reach 67% need:

$\Rightarrow 1467kN \times 0.67 - 482kN = 501kN$ ×

∴ refinement not required at this stage.

TOLL BOX WALL

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Toll Box Wall

This is a single-storey rectangular panel that lies on the same line as the eastern wall of the stairwell. In the analysis, the spring stiffness of the 2 walls was added together & modelled as a single wall. They can be separated out to check each wall:

$$P_1 = \frac{270{,}270\text{kN/m}}{1{,}051{,}520\text{kN/m}} \times 841\ \text{kN} = 216\text{kN} \quad (\mu=1, S_p=1)$$

$$\therefore V^* = 216\text{kN} \qquad (\mu=1)$$

$$M^* = 171\text{kN} \times 4.4\text{m} = 750\text{kN}\cdot\text{m} \qquad (\mu=1.25)$$

Concrete Shear

$$\alpha = 3 - {}^{750\text{kN}\cdot\text{m}}/_{171\text{kN}\times 4.4\text{m}} = 2.0 \Rightarrow 1.5$$

$\beta = 0.54$ as previously

$\gamma = 0.29$ for ductility demand 0.64

$$\therefore V_c = 1.5 \times 0.54 \times 0.29 \times \sqrt{37.5\text{MPa}} \times (0.8 \times 150\text{mm} \times 3200\text{mm})$$
$$= 552\text{kN}$$

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Steel Shear

$V_s = A_s \cdot f_{yh} \cdot d/s$ ← assumes 45° crack => conservative

$= 71mm^2 \times 280MPa \times 3200mm/300mm = 212kN$

∴

Capacity

$V_p = 0.85 \times (552kN + 212kN) = 649kN > 171kN$
(100% $\mu = 1$)

Moment

$M^* = 750kN \cdot m$

Need axial force to help w/ moment

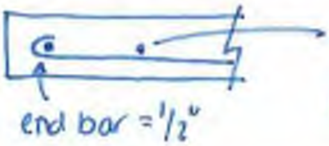
$W_{self} = 24kN/m^3 \times 0.15m \times 4.4m \times 3.2m = 51kN$

Also have floors; 24' 10" = 7.57m of 6" floor

$\therefore W_{floor} = 24kN/m^3 \times 0.15m \times 7.57m \times 3.2m = 87kN$

with this, $M_n = 650\ kN \cdot m$

NOTE//



end bar = 1/2"

typical mesh = 3/8"@12" c/s
(standard detail)

Wall is tied into gravity frame on same line;
Stability requires:

$P_{req} = (750kN \cdot m - 650kN \cdot m)/3.2m = 31.3kN$ @ end of wall

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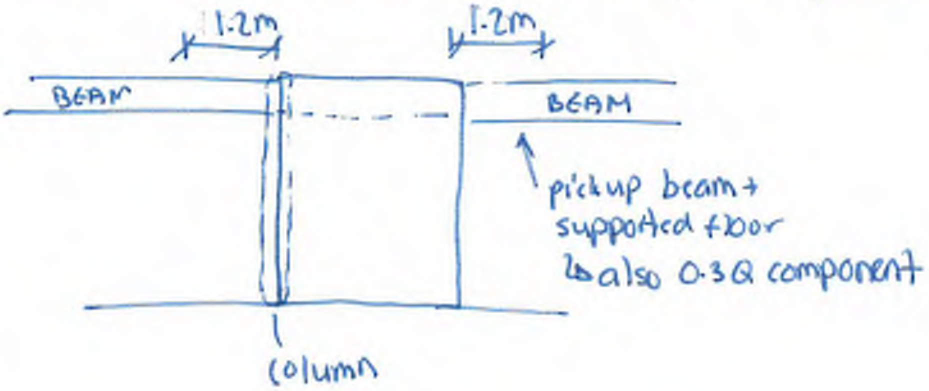
Floor is 27.7kN/m => OK by inspection (1.2m req)



Diaphragm Shear Transfer

$V^* = 216kN$ @ $\mu = 1, S_p = 1$

$\therefore V^* = 216kN/3.2m = 68kN/m < 101kN/m$ as previous

Base Shear Transfer

$V^* = 171kN$

$\phi V_n = 0.85 \times 12 \times 71mm^2 \times 280MPa \times (\mu = 1) = 203kN$ OK

Without considering axial force.

Title:	Wall ULS Capacity	**Job No**	:
		Page	: 2
Description:	Boiler Room	**Date**	: 30/04/2020
	Note: only self load axial considered	**Author**	: MS
		Reviewer	:
		Revision	: 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm^2*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	12.7	127	50	-0.0013	-266	-34	-40	1
2	1	9.525	71	337	0.0083	280	20	247	5
3	1	9.525	71	625	0.0179	280	20	535	11
4	1	9.525	71	912	0.0275	280	20	822	16
5	1	9.525	71	1199	0.0370	280	20	1,109	22
6	1	9.525	71	1486	0.0466	280	20	1,397	28
7	1	9.525	71	1774	0.0562	280	20	1,684	34
8	1	9.525	71	2061	0.0658	280	20	1,971	39
9	1	9.525	71	2348	0.0754	280	20	2,258	45
10	1	9.525	71	2635	0.0850	280	20	2,546	51
11	1	9.525	71	2923	0.0946	280	20	2,833	57
12	1	12.7	127	3210	0.1042	280	35	3,120	111
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
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34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
Axial Load				1,630			138	1,540	213
Concrete Section			10,644		-0.003		-339	-54.3	18
							0		650

β.c.b (mm²)

$\alpha.f'c.A_c$

Should balance to zero

ΦM_n	650	**kN.m**

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Title: Wall ULS Capacity

Description: Toll Box Room

Job No :
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CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES					
Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	3.26	m	
Axial Load	N^*	=	138	kN	*+ve load is a compression load, assumed to act at section centroid*
LONGITUDINAL STEEL PROPERTIES					
Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	12	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	287.3	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*
CONCRETE PROPERTIES					
Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	Φ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	89.8	mm	*Iterated until forces balance*

% x 841W = 216W

% x 2097W = 432W

COAL BUNKER

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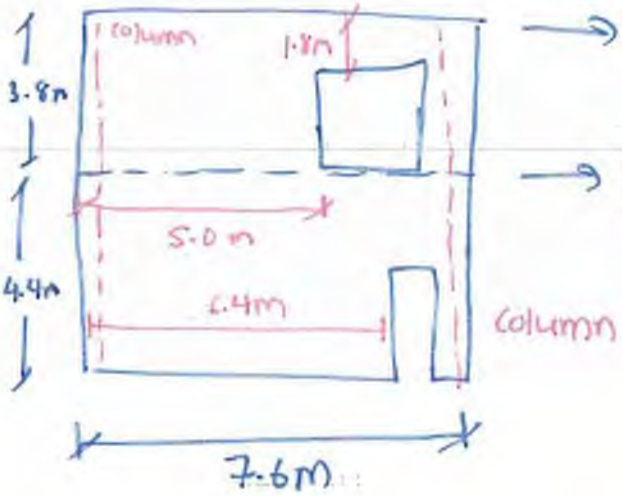
Coal Bunker

Have an 'east' & 'west' wall

East 6" thick



$\rightarrow P_2 = 1642kN \times {}^{0.9}/_{1.14} = 1296kN$

$\rightarrow P_1 = 562kN \times {}^{0.9}/_{1.14} = 444kN$

$V^{*}_{top} - 1296kN$ $(\mu = 1)$

$M^{*}_{top} = 1296kN \times 3.8m = 4925kN \cdot m$

Critical EQ ←

$M_{prob} = 12414 kN \cdot m$ (100%)

$V_{prob} = 482kN$ (37%) in 5.0m leg

Vertical shear in spandrel

$8 \times (1\tfrac{1}{8}'' \times 25.4mm)^2 \times \pi/4 \times 280MPa = 1436kN$

$V_{prob} = 227kN$ (1.8m deep) $= \sim 16\%$ @ $\mu = 1$

Alternative is pure cantilever mode of wall

$M_{prob} = 2386kN \cdot m$ (48%) w/ 37% for shear

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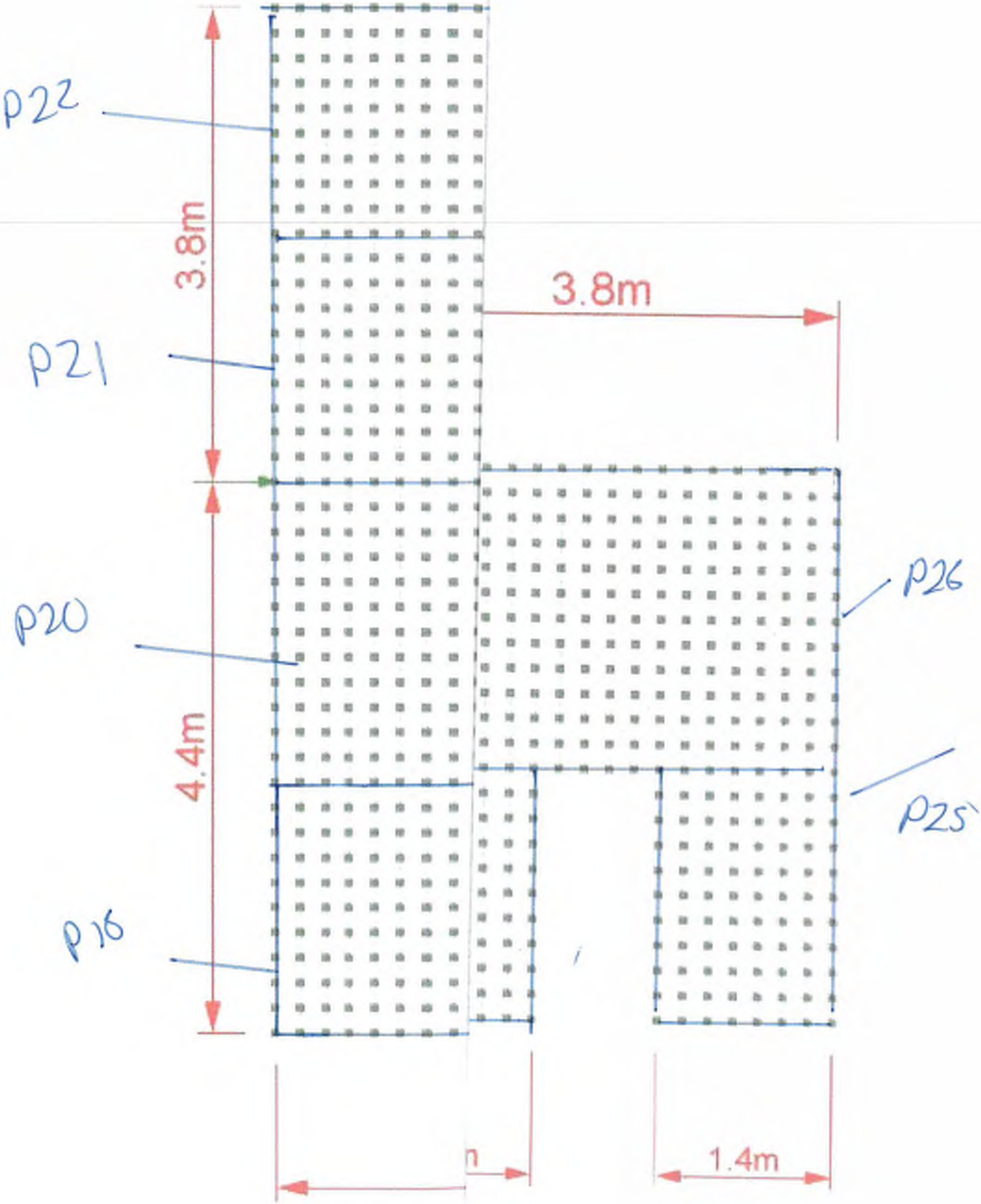
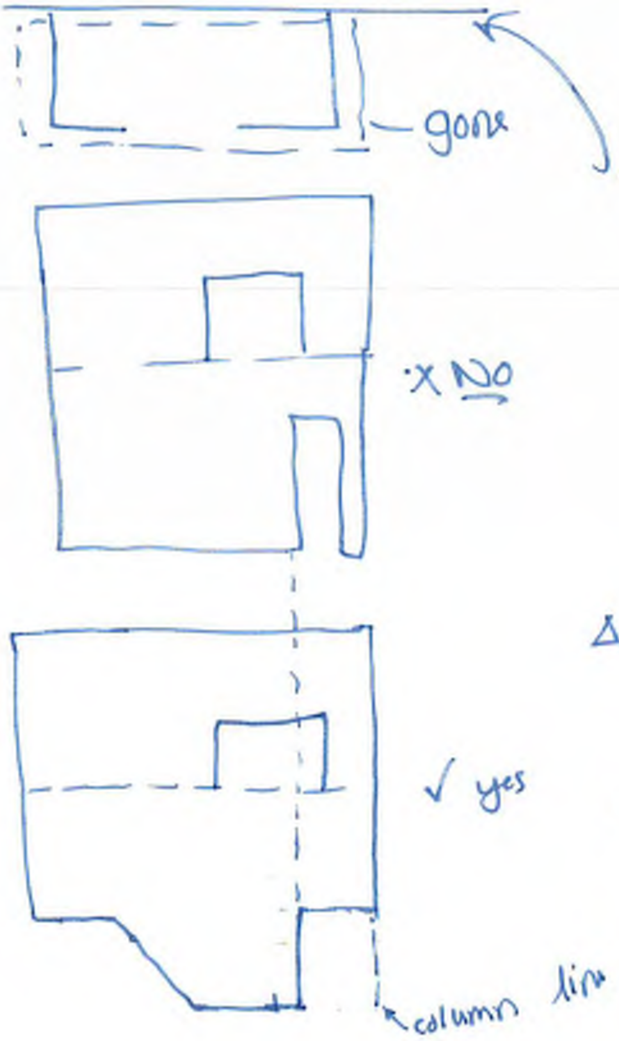
Ground floor

$M^*=$

0



There were also some changes to the coal bunker:



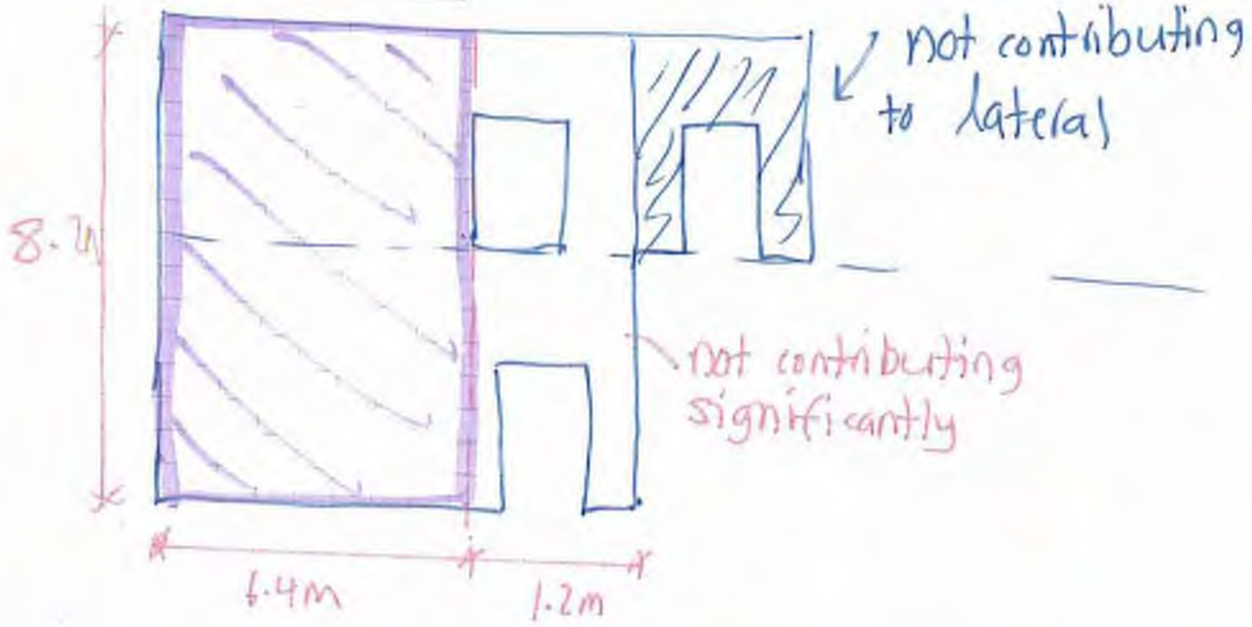
looks different:

Δ_{u2} = 7.10mm (old = 3.95mm) K = 140,845kN/m

Δ_{u} = 2.81mm (old = 1.79mm) K = 355,872kN/m

CLERICAL ROOM

Clerical Room



Wall is primarily a 6.4m x 8.2m x 150thk wall.

Δ_{full} = 9.44mm vs $\Delta_{6.4m}$ = 9.88mm

∴ assess cantilever portion for full load

$P_2 = 1686kN \times 0.9/1.14 = 1331kN$ @ 8.2m

$P_1 = 822kN \times 0.9/1.14 = 649kN$ @ 4.4m

∴ $V^* = 1980kN \times 1.14/0.9 = 2508kN$ $(\mu=1)$

$M^* = 13770kN\cdot m$ $(\mu=1.25)$

$V_{prob} = 1346kN$ (54%)

$M_n = 1891kN\cdot m$ (14%)

21/06: $V^* = 1905kN$ (L2) @ $\mu=1$ => = 1504kN
= 935kN (L1) @ $\mu=1$ => = 738kN

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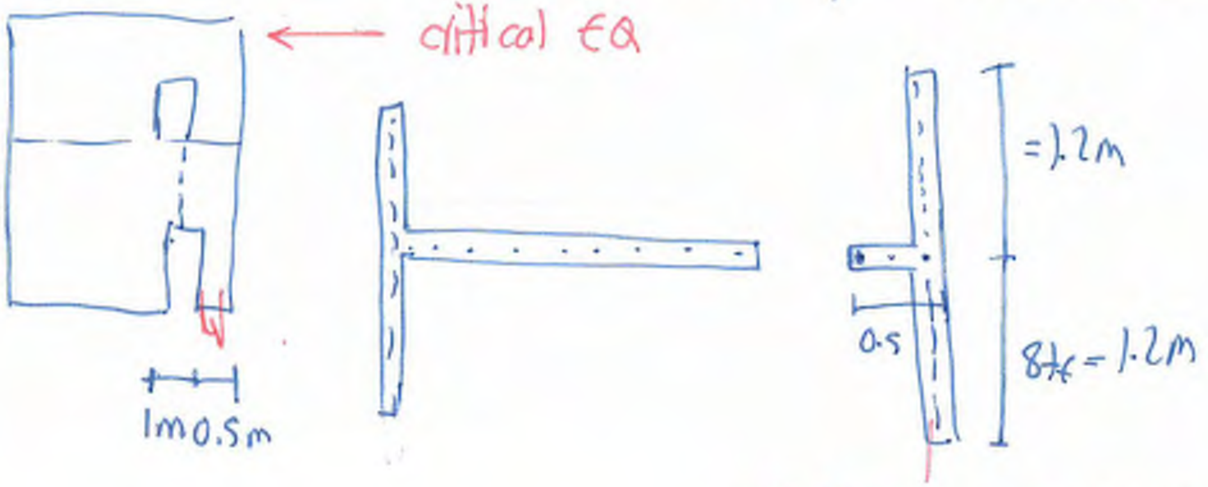
Clerical Room Wall

6" thick, singly reinforced.

$M^* = (1504kN \times 8.2m) + (738kN \times 4.4m) = 15,580kN \cdot m$



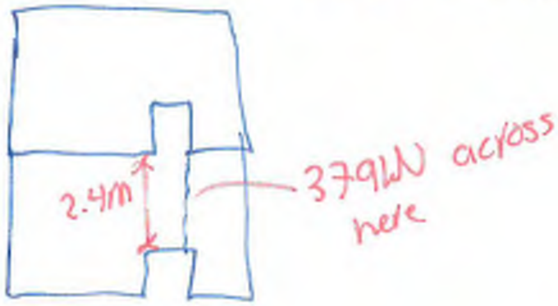
2·3/8" @12" say 9 sets in 2.4m
∴ 18 bars per end

$M_{prob} = 4786\ kN \cdot m$ (31% μ=1.25)

$V^* = 2840kN$

$V_{prob} = 1346kN$ (47% μ=1.25)

Check vertical shear @ critical point



$V_{prob} \sim 482kN$ ok

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Diaphragm Shear

$V^* = 1686\text{kN} / 6.2\text{m} = 272\text{kN/m}$ (μ=1.0, top floor)

Shear friction of bars in topping as previous

$= 344\text{kN/m}$ $\underset{s}{\text{ok}}$ (100%)

Base Transfer

$V^* = 1980\text{kN}$

$V_n = 0.85 \times (1568\text{mm}^2 \times 280\text{MPa}/10^3 + 183\text{kN}) \times (\mu = 1.0)$

$= 529\text{kN}$ (27%)

→ 144kN extra axial load required for 34%

5.5" avg floor thickness

$\therefore \frac{(6'' + 5'')}{2} \times (25.4\text{mm}/1'') \times 24\text{kN/m}^3 \times 6.2\text{m long} \times 2 \text{ floors} \times L_{req} = 144\text{kN}$

$\therefore L_{req} = 3.46\text{m}$ trib ~ reasonable when considering spacing on east side + wall weight + 0.3Q

Allow 34%

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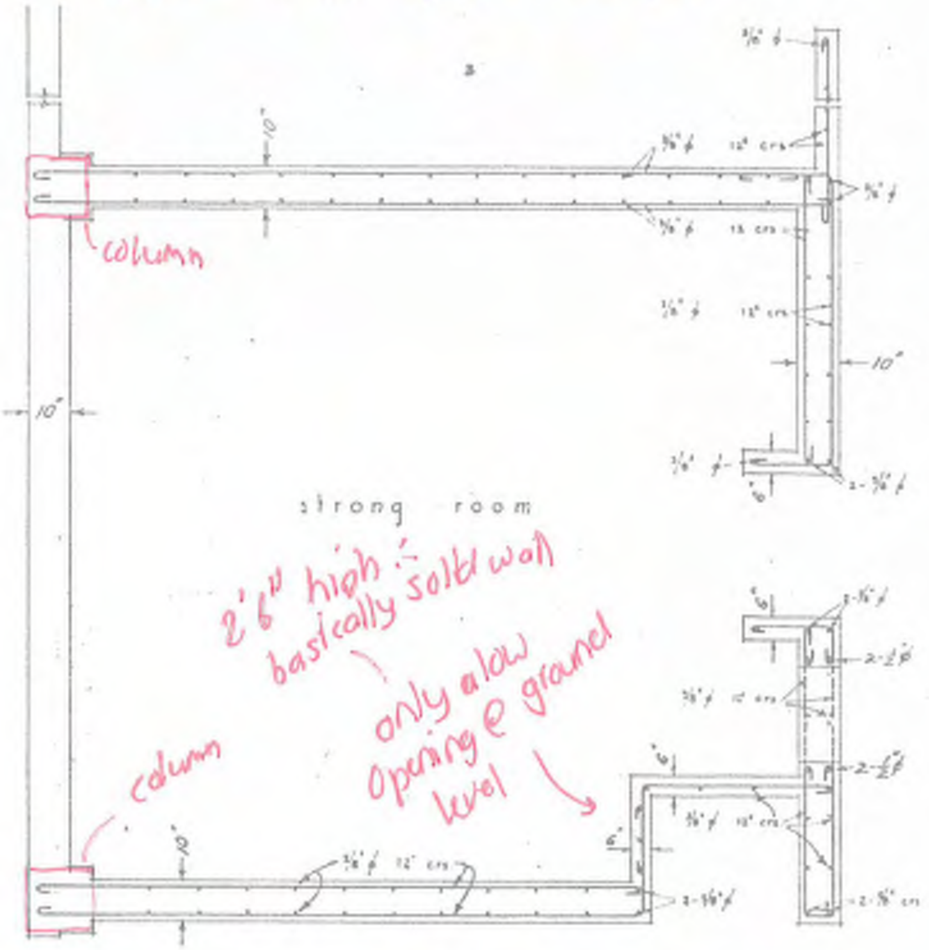
STRONG ROOM

Effectively flanged walls:

$P_1 = 821\text{kN} \times {}^{0.9}/_{1.14} = 648\text{kN}$

$\therefore M^k = 648\text{kN} \times 4.4\text{m} = 2852\text{kN.m}$



M_{prob} (3/8"@12" crs both faces) = 2283kN·m

$\therefore A_{sreq} = \dfrac{2852\text{kN·m} - 2283\text{kN·m}}{(5.2\text{m} - \underset{\uparrow c}{0.127\text{m}}) \times 280\text{MPa}} \times 10^3 = 401\text{mm}^2$

1 - 1/8" bar in column = 644 mm² (1 req ✓ ok)

5/8" bar in end wall = 198mm² (2 req ✓ ok)

(100% for flexure

BOILER ROOM

BOILER ROOM

Wall is a rectangular panel 4.4m x 7.6m, 6" thick & singly-reinforced w/ 3/8" @ 12" c/s. One end is integral w/ the column, the other has a slight flange w/ the return wall.

loads @ $\mu = 1.25, S_p = 0.9$

$V^* = 737kN$

21/06 $V^* = 849kN$ @ $\mu = 1, S_p = 1.0$
$= 670kN$ @ $\mu = 1.25, S_p = 0.9$
∴ OK

$M^* = 582kN \times 4.4m = 2560kN \cdot m$

Shear Capacity

$V_{prob} = 0.85 \times (V_c + V_s + V_n)$

where

$V_c = \alpha . \beta \cdot \gamma \cdot \sqrt{f'_c} \times (0.8A_g)$

$\alpha = 3 - \frac{M}{V \cdot h}$ $1 \leq \alpha \leq 1.5$ $= 3 - \frac{2560kN \cdot m}{582kN \times 4.4m} = 2 ∴ 1.5$

$\beta = 0.5 + 20\rho_l \leq 1$ $= 0.5 + 20 \times 0.002 = 0.54$

$\gamma = 0.29$ for ductility demand 0.49

Typical minimum steel in walls is 3/8" @ 12" c/s in 6" wall

~9.5mm bars @ 300mm c/s in 150mm walls (71mm² per bar)

$∴ \rho_l = 302mm^2/m \Big/ 1000mm \times 150mm = 0.0020$

$∴ V_c = 1.5 \times 0.54 \times 0.29 \times \sqrt{37.5MPa} \times (0.8 \times 0.15m \times 7.6m)$
$= 1312kN$

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$$V_s = A_v \cdot f_{yh} \cdot \frac{h_{cr}}{s}$$

where

$$h_{cr} = \frac{l'}{\tan\theta_{cr}} \leq h_w \Rightarrow l' = l_w - c - c_o$$

$$\theta_{cr} = 45 - 7.5\left(\frac{M}{V \cdot l_w}\right) \geqslant 30°$$

$c_o = \sim 50mm$ cover
$c = \sim 156mm$
$l_w = 7600mm$

$\therefore l' = 7394mm$

$$\theta_{cr} = 45 - 7.5 \times \left(\frac{2580kN \cdot m}{582kN \times 7.6m}\right) = 40.7°$$

$$\therefore h_{cr} = \frac{7394mm}{\tan(40.7°)} = 8609mm$$

$$\therefore V_s = 71mm^2 \times 280MPa \times \frac{8609mm}{300mm} = 570kN$$

Ignore axial load benefit unless very close to the line ⇒ this wall isn't

$\therefore V_{prob} = 0.85 \times (1312kN + 570kN) = 1600kN$ (100%)

$M_{prob} = 2388kN \cdot m$ assuming only 3/8" @ 12" c/s
⇒ allow for column steel & some flange effect

$\therefore$ 100% for moment

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foundation

Typical ground floor slab is 5" thick reinforced w/ 3/8" bars @ 9" crs central in slab.

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Diaphragm Shear Transfer

Diaphragm needs to transfer 737kN ($\mu=1, S_p=1$) loads.

Typical steel appears to be 1/2"@12" c/s

i.e. 12.7mm @ 300mm c/s (127mm² per)

∴ Shear friction

$$\phi V_n = 0.85 \times \left(\frac{12.7mm}{2}\right)^2 \times \pi \times 280MPa \times \left(\frac{1000mm}{300mm}\right) \times (\mu=1) \times 2\,sides$$

$$= 202\,kN/m$$

∴ @7.6m long

$$\phi V_n = 1532kN \geq 737kN \quad (100\%NBS)$$

Base Shear Friction

Allow for self-weight axial

$$N^* = 24kN/m^3 \times 0.15m \times 7.6m \times 4.4m = 120kN$$

$$3/8"@12"\,c/s \Rightarrow \frac{202kN/m}{2} = 101kN/m$$

$$\therefore \phi V_n = 0.85 \times \left(\frac{101kN/m}{0.85} \times 7.6m + 120kN\right) \times (\mu=1.0)$$

$$= 870kN > 737kN$$ OK

Title: Wall ULS Capacity

Description: Boiler Room

Note: only self load axial considered

Job No :
Page : 2
Date : 30/04/2020
Author : MS
Reviewer :
Revision : 0

MOMENT CAPACITY OF SECTION

Layer	n_{bar}	d_b	A_i	x_i	ε	σ	Force	Lever Arm	Moment
-	-	*mm*	*mm²*	*mm*	-	*MPa*	*kN*	*mm*	*kN.m*
1	1	9.525	71	50	-0.0020	-408	-29	-106	3
2	1	9.525	71	350	0.0037	280	20	194	4
3	1	9.525	71	650	0.0095	280	20	494	10
4	1	9.525	71	950	0.0153	280	20	794	16
5	1	9.525	71	1250	0.0210	280	20	1,094	22
6	1	9.525	71	1550	0.0268	280	20	1,394	28
7	1	9.525	71	1850	0.0325	280	20	1,694	34
8	1	9.525	71	2150	0.0383	280	20	1,994	40
9	1	9.525	71	2450	0.0441	280	20	2,294	46
10	1	9.525	71	2750	0.0498	280	20	2,594	52
11	1	9.525	71	3050	0.0556	280	20	2,894	58
12	1	9.525	71	3350	0.0614	280	20	3,194	64
13	1	9.525	71	3650	0.0671	280	20	3,494	70
14	1	9.525	71	3950	0.0729	280	20	3,794	76
15	1	9.525	71	4250	0.0787	280	20	4,094	82
16	1	9.525	71	4550	0.0844	280	20	4,394	88
17	1	9.525	71	4850	0.0902	280	20	4,694	94
18	1	9.525	71	5150	0.0960	280	20	4,994	100
19	1	9.525	71	5450	0.1017	280	20	5,294	106
20	1	9.525	71	5750	0.1075	280	20	5,594	112
21	1	9.525	71	6050	0.1132	280	20	5,894	118
22	1	9.525	71	6350	0.1190	280	20	6,194	124
23	1	9.525	71	6650	0.1248	280	20	6,494	130
24	1	9.525	71	6950	0.1306	280	20	6,794	136
25	1	9.525	71	7250	0.1363	280	20	7,094	142
26	1	9.525	71	7550	0.1421	280	20	7,394	148
27									
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36									
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38									
39									
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45									
Axial Load				3,800			120	3,644	437
Concrete Section			18,501		-0.003		-590	-94.5	56
							0		2,388

$\beta.c.b\ (mm^2)$

$\alpha.f'c.A_c$

Should balance to zero

ΦM_n	2388	kN.m

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Title: Wall ULS Capacity

Description: Boiler Room

Note: only self load axial considered

Job No :
Page : 1
Date : 30/04/2020
Author : MS
Reviewer :
Revision : 0

CONCRETE SECTION CHECK

Currently calculates the flexural capacity of a concrete section, including allowance for the benefit of axial load

SECTION PROPERTIES

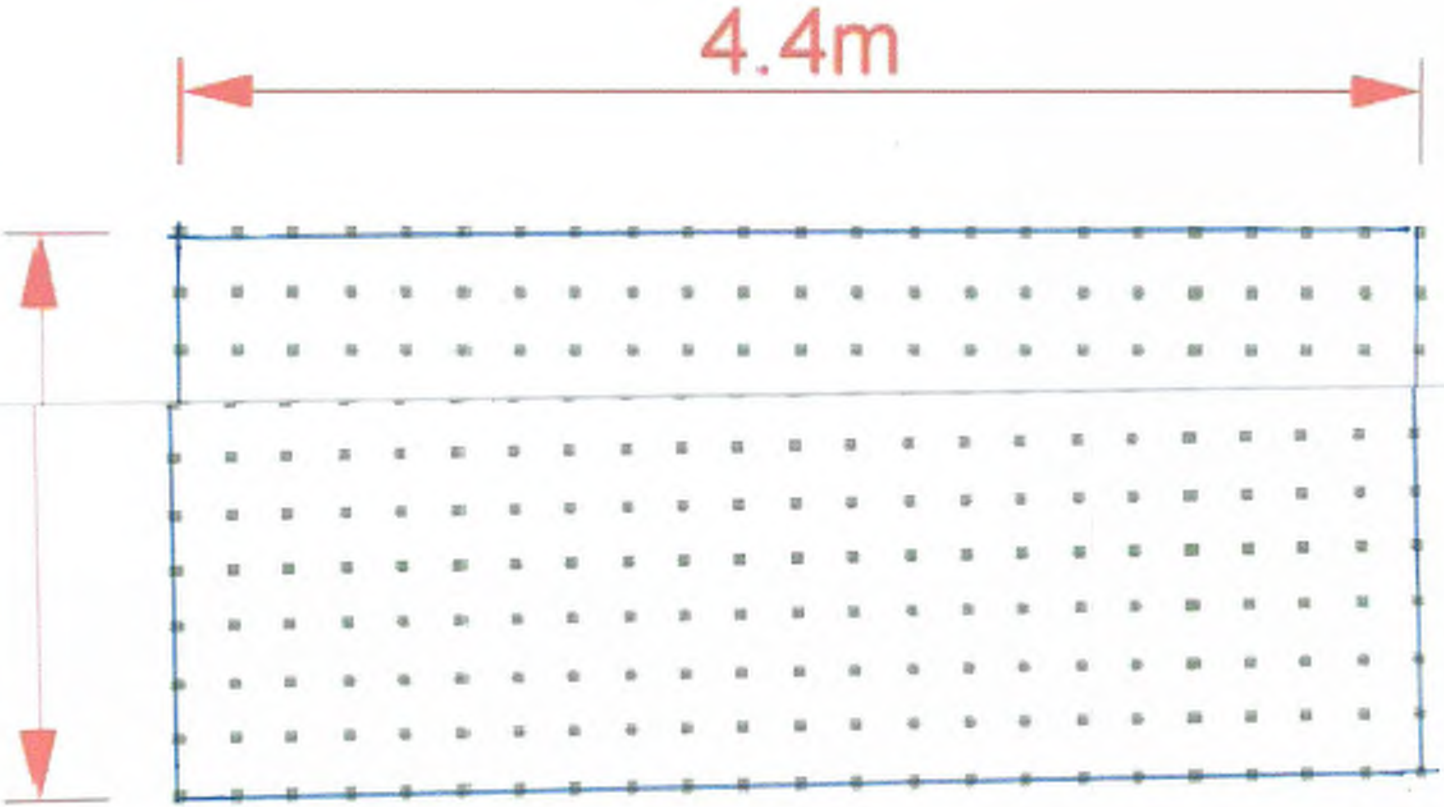
Wall Thickness	t_w	=	0.15	m	
Wall Length	L_w	=	7.60	m	
Axial Load	N^*	=	120	kN	*+ve load is a compression load, assumed to act at section centroid*

LONGITUDINAL STEEL PROPERTIES

Young's Modulus	E_s	=	200	GPa	*200GPa is a standard assumption*
Yield Stress	f_y	=	280	MPa	*Usually 300MPa or 500MPa*
Yield Strain	ε_y	=	0.0014	-	*Bar yield strain*
Vertical Bar Size	d_b	=	9.525	mm	
Nominal Spacing	s_{nom}	=	300	mm	
Bars per Spacing	-	=	1	-	
Wall End to Bar Centroid	-	=	50	mm	
Number of Vertical Bars	n_{bar}	=	26	-	*Length of wall divided by number of bars*
'Actual' Spacing	s_{actual}	=	300	mm	*(Length of wall - 2x end bar distance) / (n_{bar} - 1)*

CONCRETE PROPERTIES

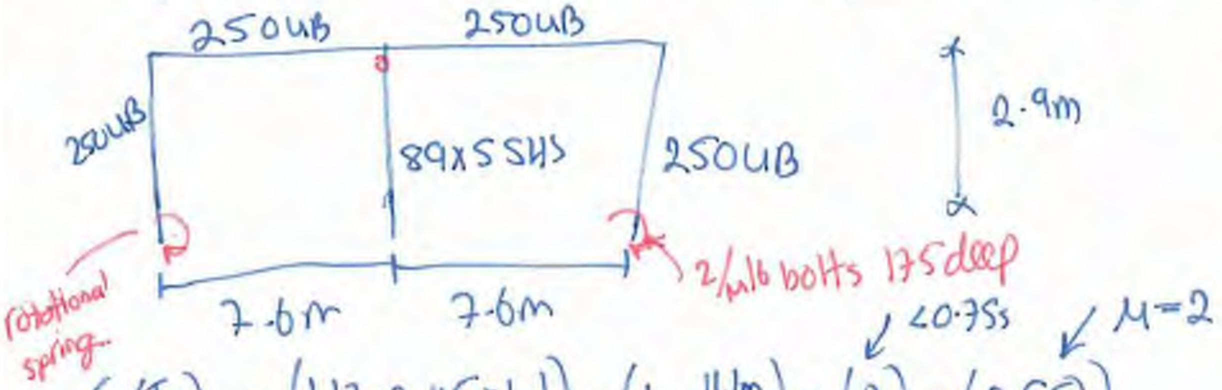
Comp. Strength	f'_c	=	37.5	MPa	*Typically 25-30*
Strength Reduction	ϕ	=	1.00	-	*Typically 0.85 for concrete in flexure*
Ultimate Strain	ε_{cu}	=	0.003	-	*Usually 0.003 or 0.004 - consider level of detailing*
-	α	=	0.85	-	*Calculated based off the concrete strength used (auto updates in this sheet)*
-	β	=	0.79	-	^
Neutral Axis	c_{uls}	=	156.1	mm	*Iterated until forces balance*


4.4m

TOP FLOOR FRAMES

Top floor frames

Top floor has 250UB25 portals @ 3.15m crs



< 0.75s   μ = 2

$C_p(T_p) = (1.17 \times 0.45 \times 1 \times 1) \times (1 + \frac{11.1m}{6}) \times (2) \times (0.55)$
$= 1.58g$

$G_{roof} = 0.5kPa$

$W_{wall} = 0.4kPa$

$\therefore P = [(0.5kPa \times 15.2m \times 3.15m) + (0.4kPa \times \frac{2.9m}{2} \times 2 \times 3.15m)] \times 1.58g$
$= 43.6kN$

$M^* = 30.8 kN{\cdot}m$ $(\mu = 2) \Rightarrow$ (leg)

$M_{sx} = 319 \times 10^3 mm^3 \times 320MPa / 10^3 = 102kN{\cdot}m$

$\therefore M_{bx}$ w/ $L_e = 2.9$ m $= 54 kN{\cdot}m$ (100%)

Check ~~rafter~~

$M^* = 39.3 kN{\cdot}m$, $M_b = 20 kN{\cdot}m$ (51%)

$l_e = 7600mm$

Date 21/07/20
Engineer MS
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Check BoH

$M^* = 30.8\text{kN}\cdot\text{m}$

$\therefore T^* = 30.8\text{kN}\cdot\text{m} / 2 \times {}^{0.25\text{m}}/_{2} \quad = 123\text{kN}$

M16 Trubolts used

So check modern design

$$\phi N_{uc} = 32.5\text{kN} \times 1 \times \underset{\uparrow \text{not cracked}}{1} \times \overset{\swarrow 32\text{MPa}}{1.0} \times \underset{\uparrow \text{edge OK}}{1} \times \overset{\swarrow 100\text{mm spacing}}{0.69} = 22.4\text{kN}$$

$\therefore 2 \times 22.4\text{kN} = 44.8\text{kN}$ (36% NBS)

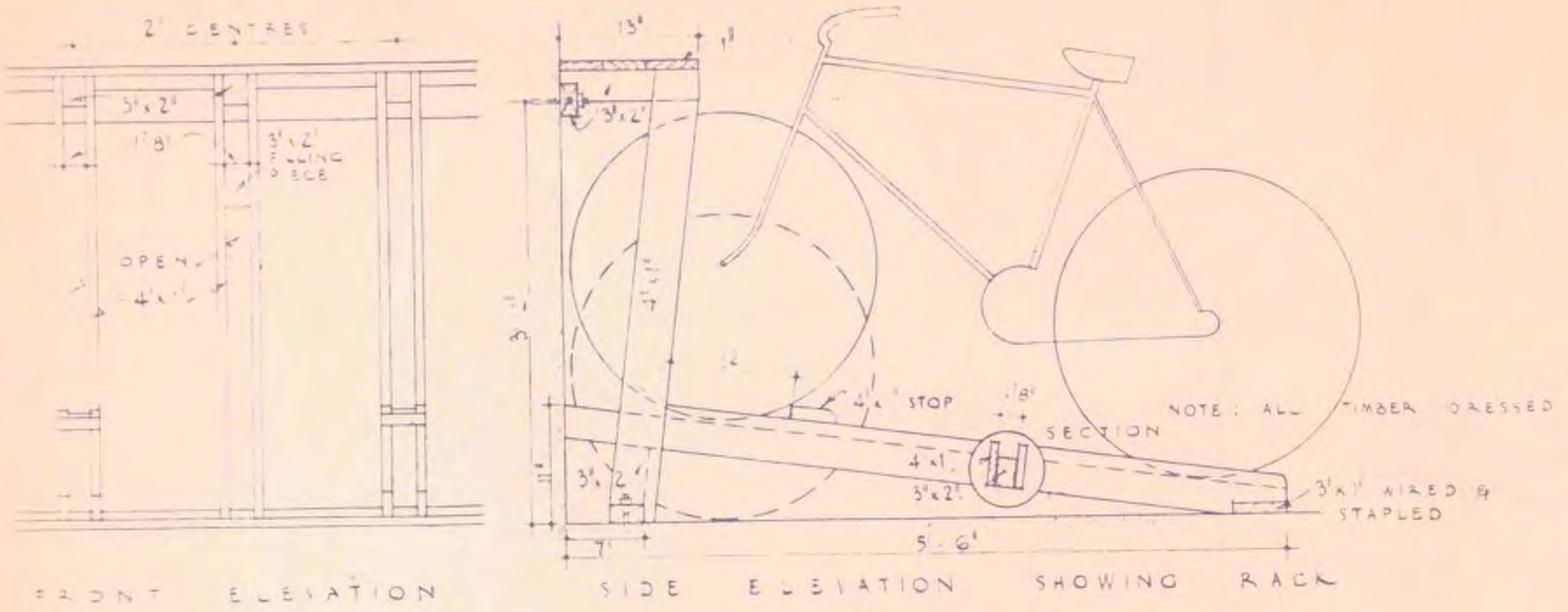
Alternatively pin model

$\therefore M^* = 69.4\text{kN}\cdot\text{m}$, $M_b = 20\text{kN}\cdot\text{m}$ (29% NBS)

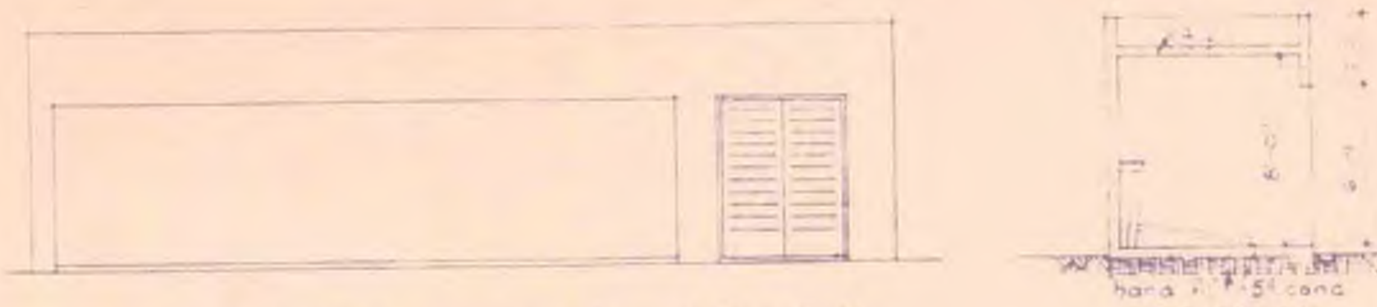
So have purlins @ 400 c/c $\therefore$ get M_{sx} 100%

APPENDIX B: STRUCTURAL CALCULATIONS

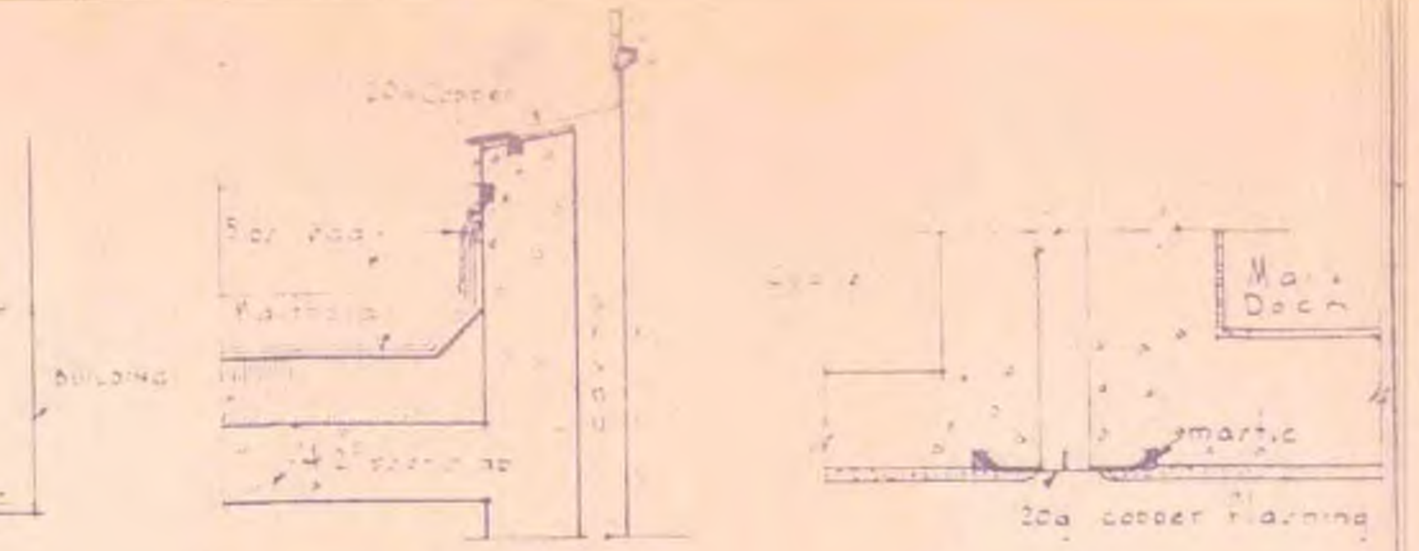
APPENDIX C: STRUCTURAL DRAWINGS



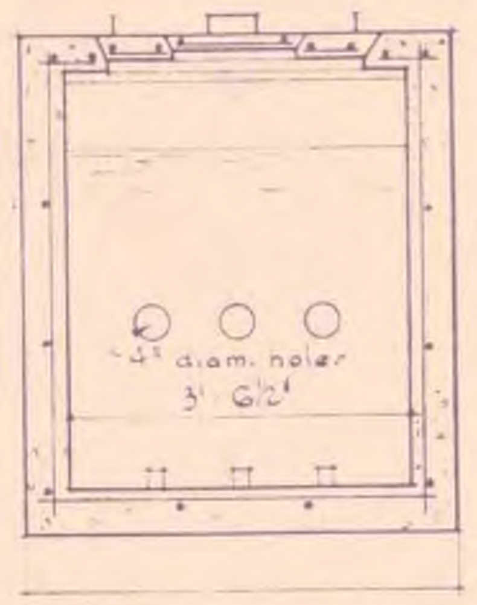
CYCLE RACK DETAILS SCALE 1" = 1 FOOT



CYCLE SHELTER
SCALE - 1/8" = 1'-0"

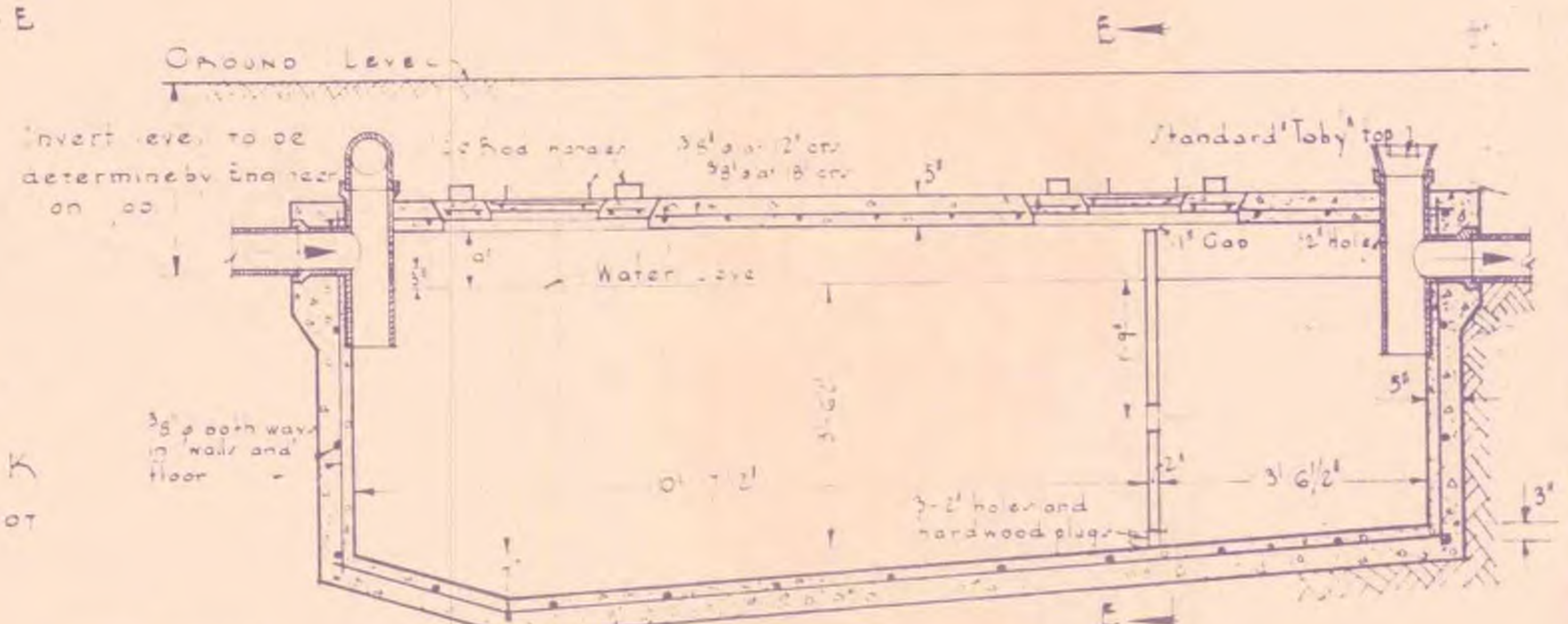


DETAIL OF FLASHING BETWEEN CYCLES & MAIL DOCK
SCALE - 1" = 1 FOOT



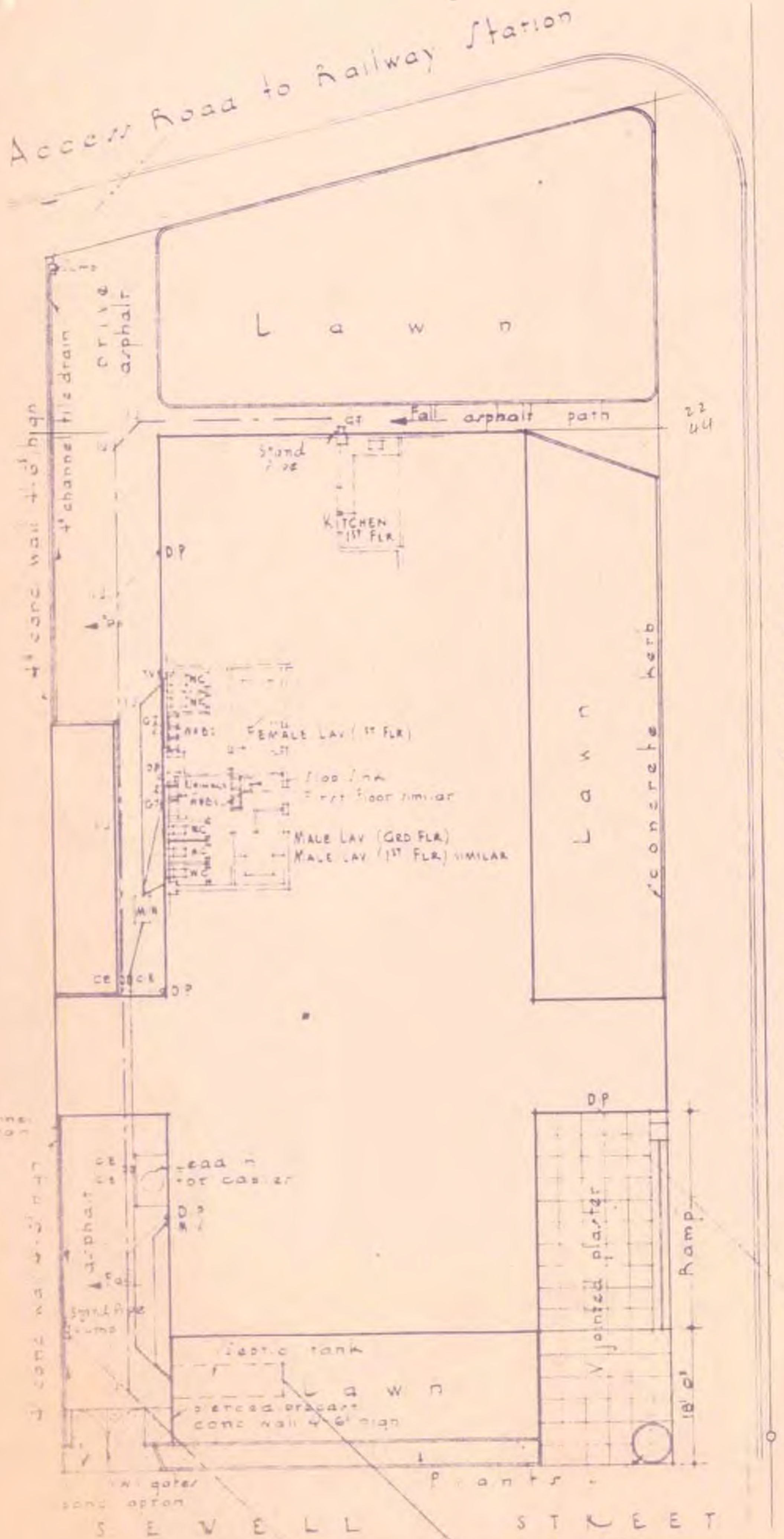
SECTION E-E

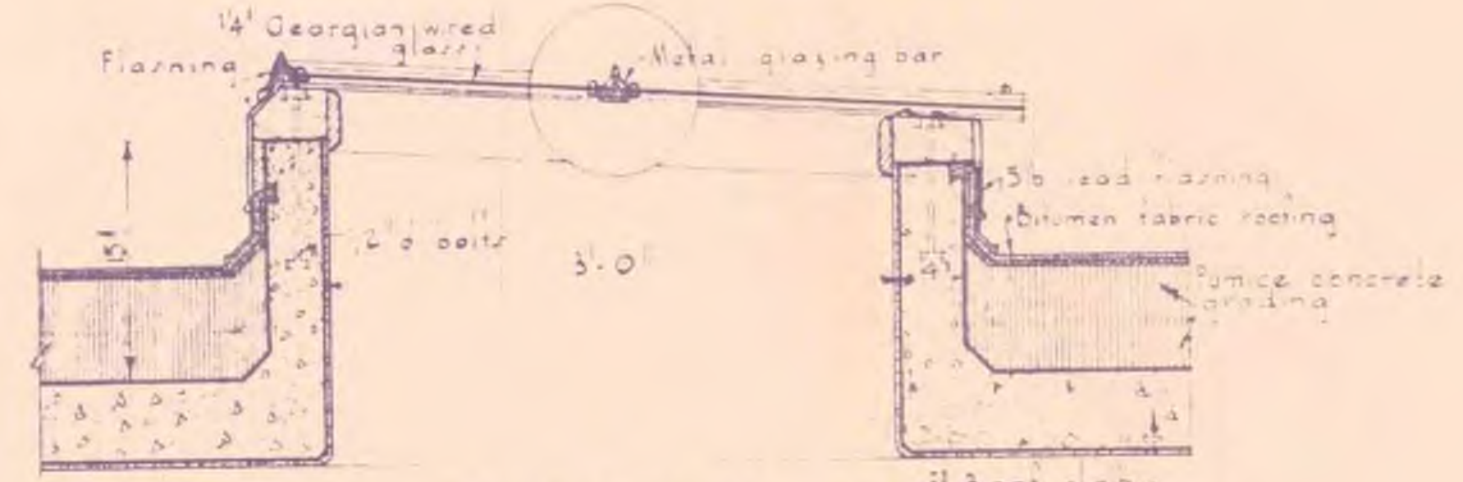
PLAN



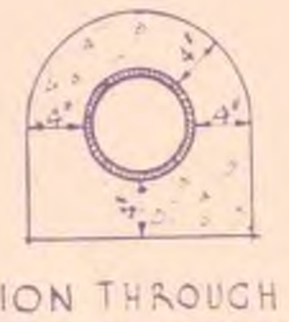
SECTION DD

DETAILS OF SEPTIC TANK
SCALE - ½" = 1 FOOT



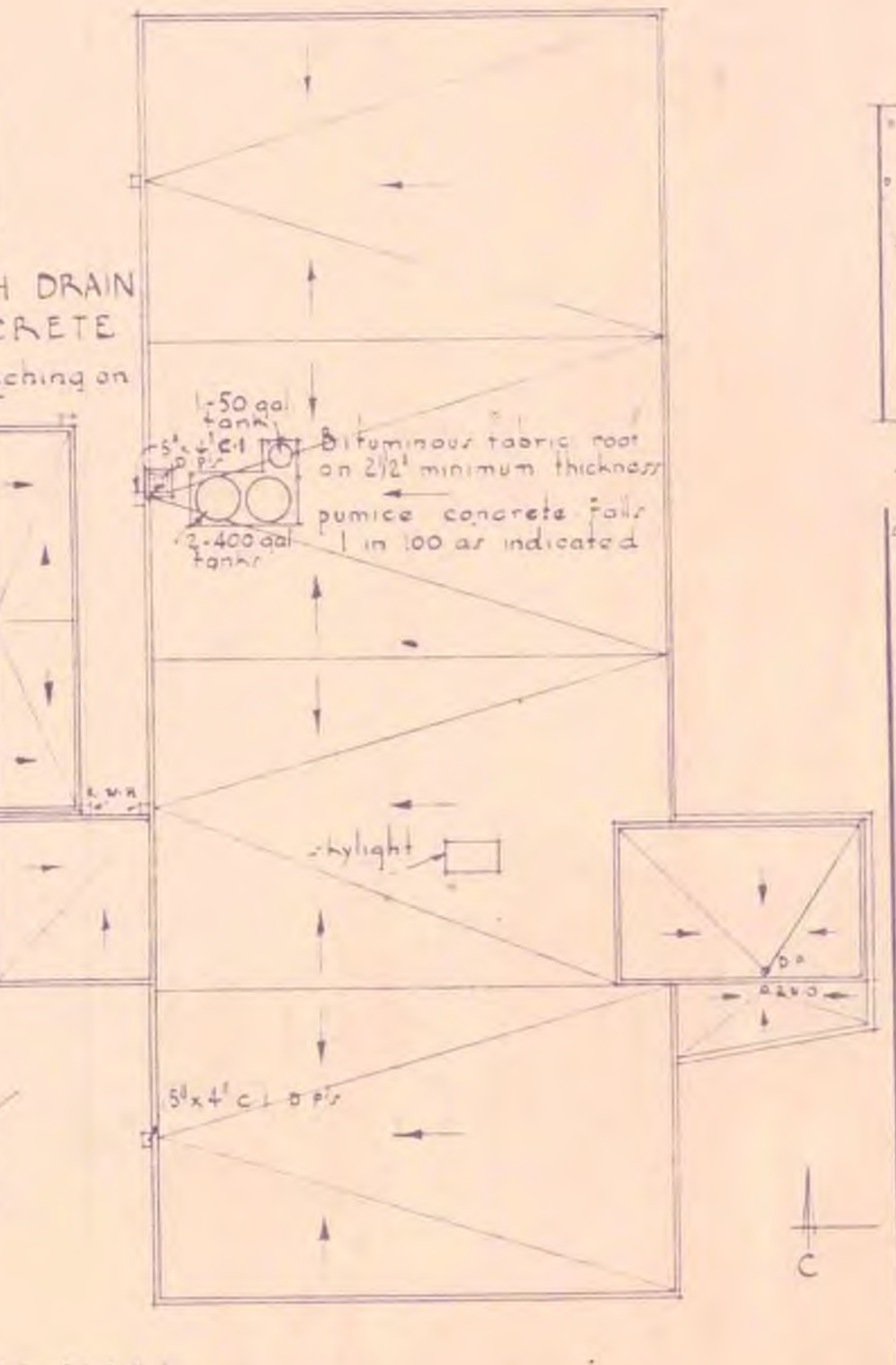


SECTION THROUGH SKYLIGHT OVER STORE
SCALE: 1" = 1 FOOT



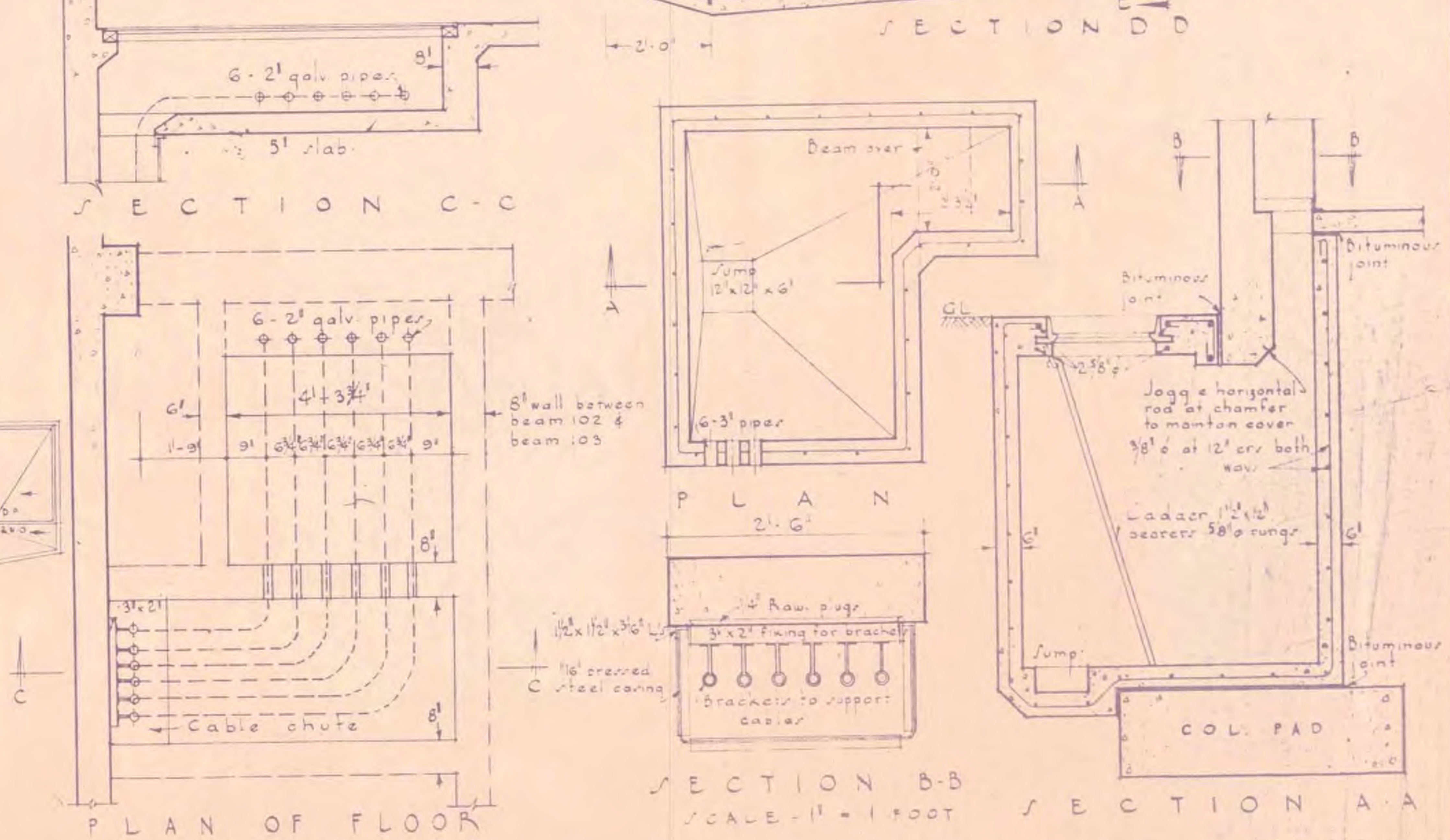
SECTION THROUGH DRAIN ENCASED IN CONCRETE

Note-All drains encroaching on driveways and under building shall be encased thus



NOTE: SEE SEPARATE PLANS & SPECIFICATION FOR THE REMOVAL & RE-ERECTION OF THE EXISTING POLICE STATION WHICH IS ON THE POST OFFICE SITE

ROOF PLAN
SCALE - 1/16" = 1 FOOT



PLAN OF FLOOR CHAMBERS TO MDF

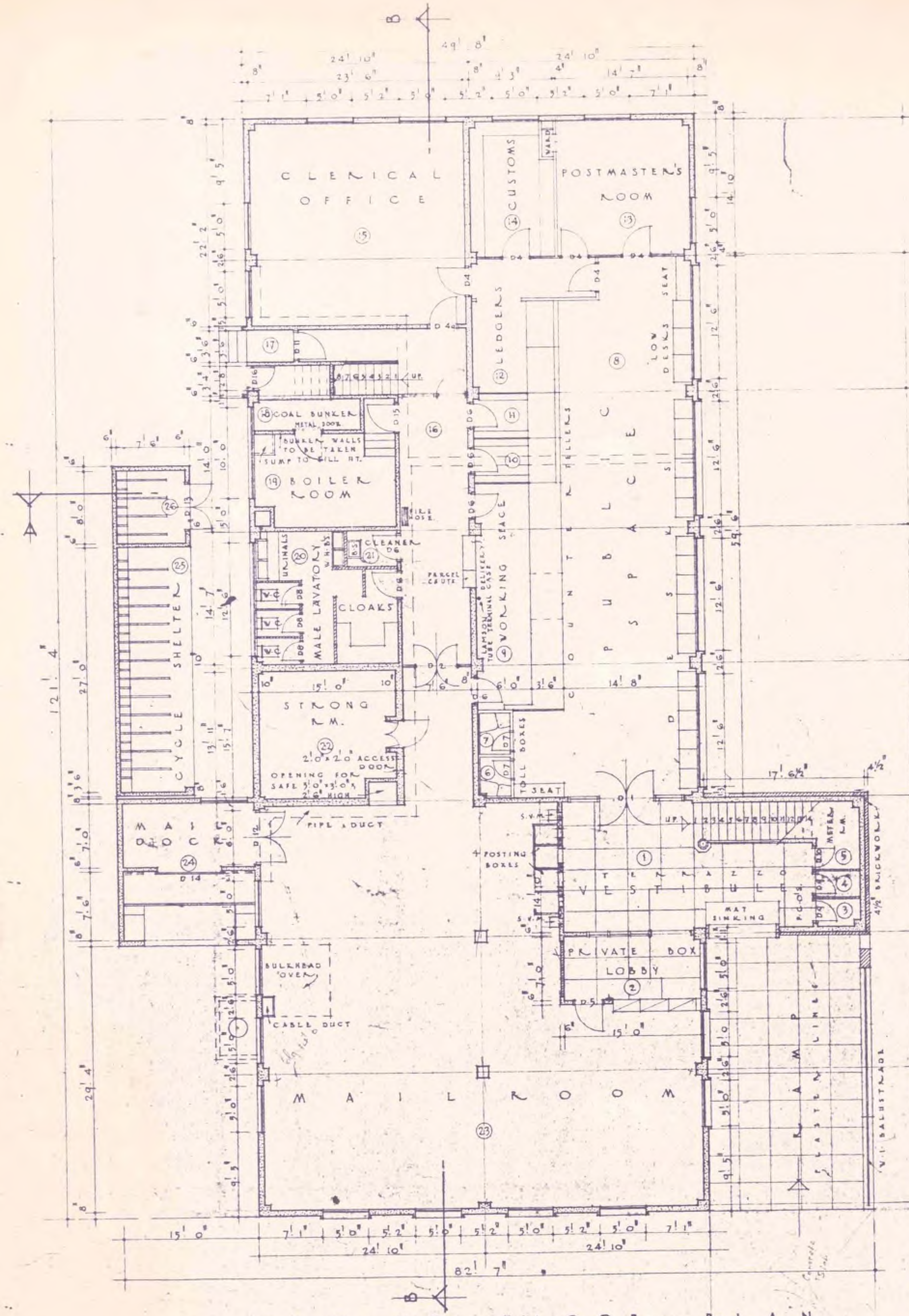
LEAD IN & CHUTE FOR CABLES
SCALE - ½" = 1 FOOT

46,43
1
NNC Oct/
KES /47

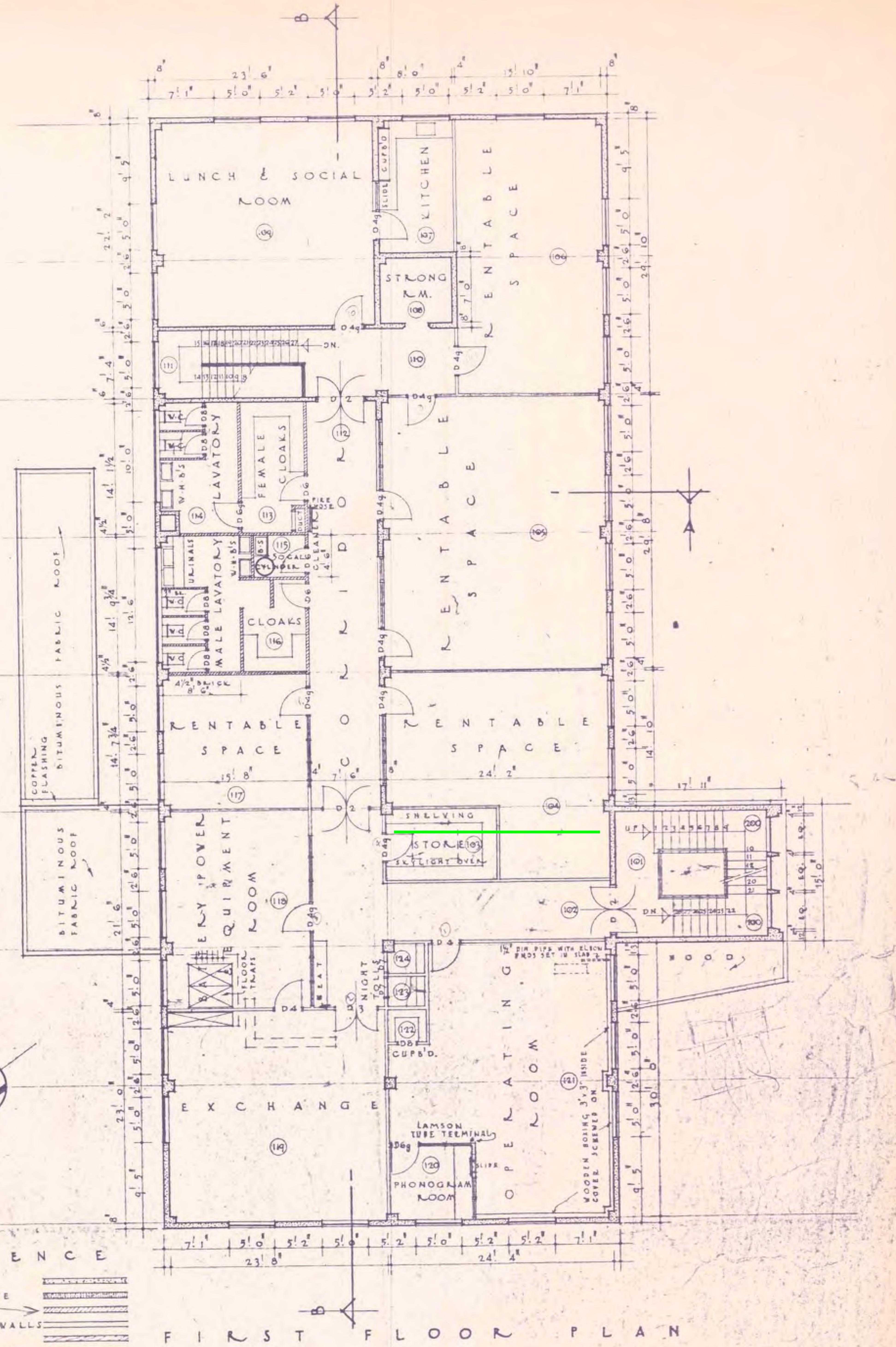
SCALES
1/16" = 1'. 0"
1/8" = 1'. 0"
1/2" = 1'. 0"
1" = 1'. 0"

NEW POST OFFICE BUILDING HOKITIKA
LAYOUT DRAINAGE & ROOF PLANS
DETAILS OF SEPTIC TANK CYCLES ETC.

P·W·D
126351



GROUND FLOOR PLAN



FIRST FLOOR PLAN

REFERENCE

CONCRETE
PUMICE CONCRETE
BRICK WORK
TIMBER FRAMED - WALLS
WROUGHT TIMBER
SOLID CORE BOARD
FIBRE BOARD
FIBROUS PLASTER
TERRAZZO
GLASS & VITROLITE
CAST STONE

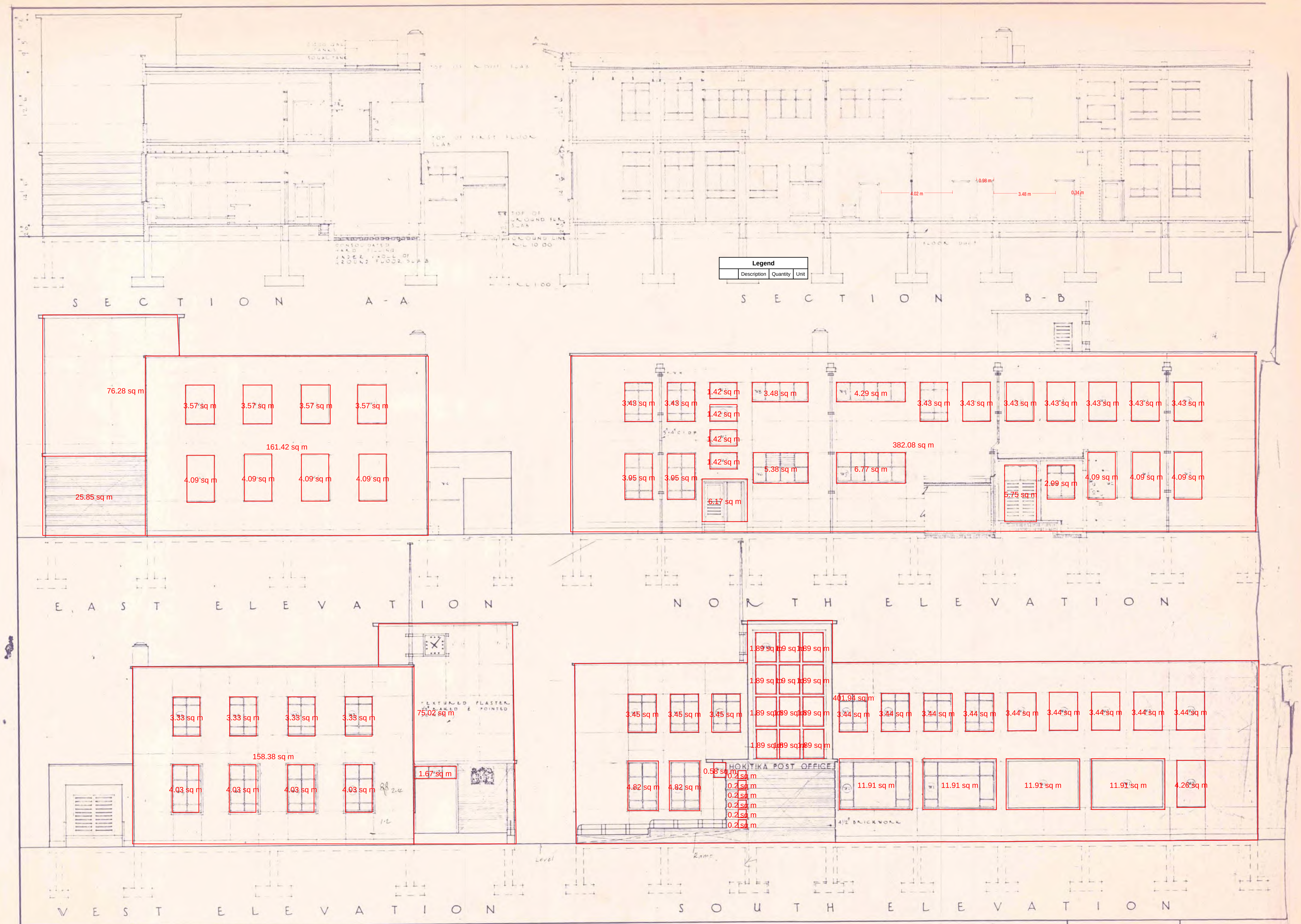
JOB No. 46/43		
SHEET 3	INITIALS	DATE
DRAWN BY	N.N.C.	NOV/
TRACED "	N.N.C.	/47
ADDITIONS "		
CHECKED "		APRIL 1948

SCALES
1/8" = 1'. 0"

NEW POST OFFICE BUILDING HOKITIKA
GROUND & FIRST FLOOR PLANS

PUBLIC WORKS ARCHITECTURAL DIVISION
GOVERNMENT ARCHITECT

P.V. 1263



4

46/43

N.N.C NOV/
N.N.C /47

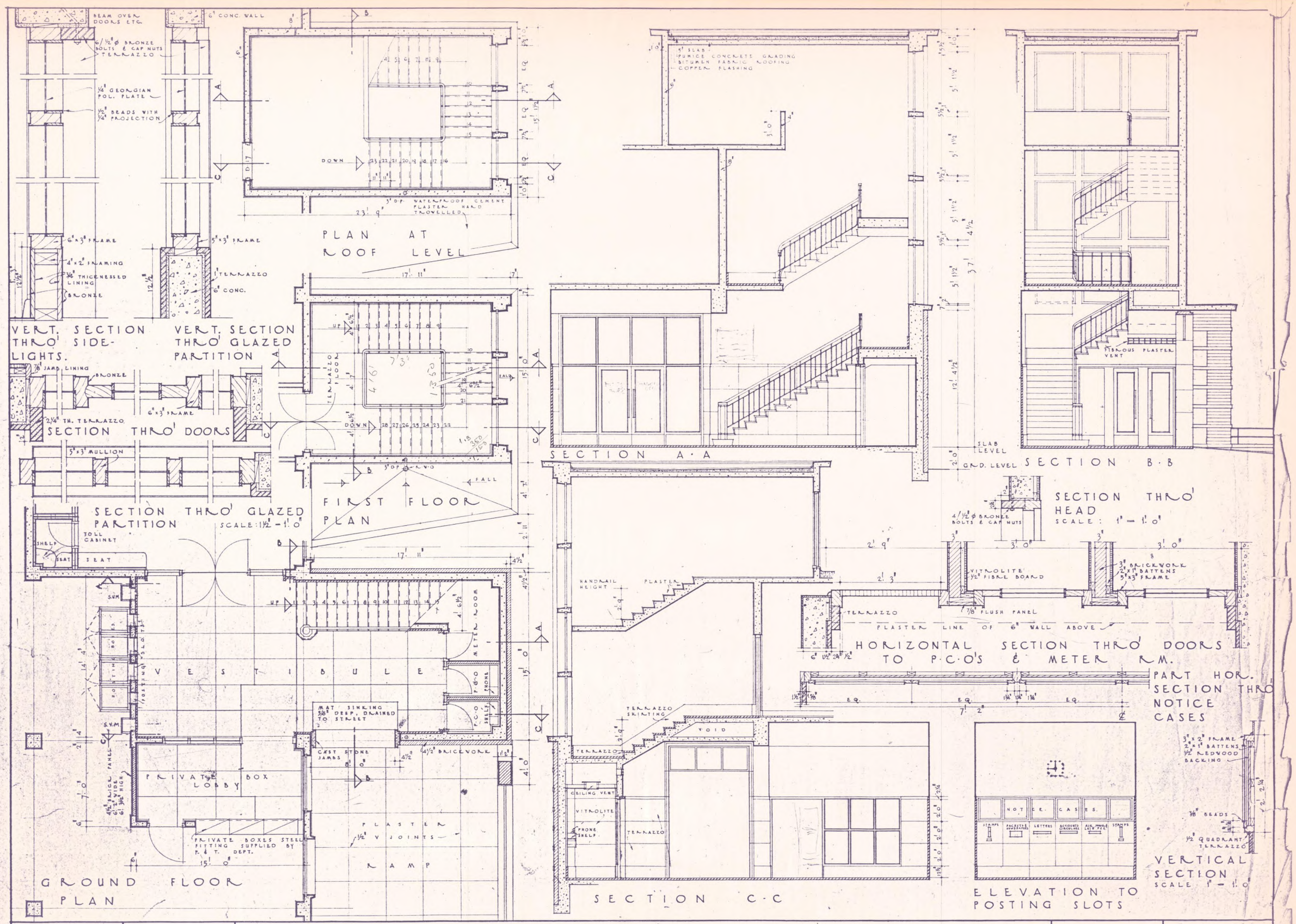
SCALES

1/8" = 1' 0"

NEW POST OFFICE BUILDING HOKITIKA

ELEVATIONS & SECTIONS

P.W.D.
126351

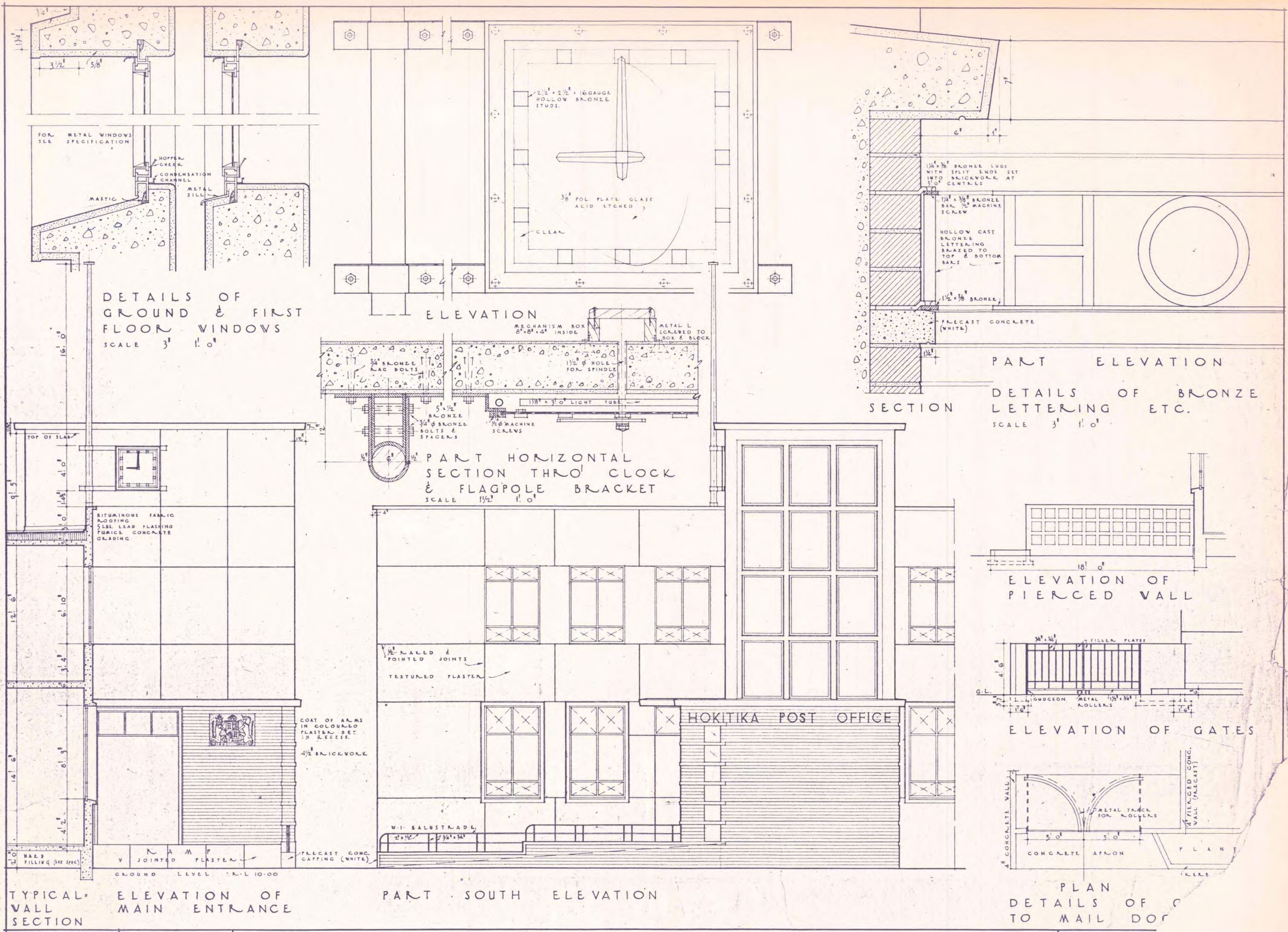


JOB No. 46/43
SHEET 5.
INITIALS DATE
DRAWN BY N.N.C Oct/47
TRACED N.N.C
ADDITIONS
CHECKED R.Full APRIL 1948.

SCALES
¼" = 1' 0"
1" = 1' 0"
1½" = 1' 0"

NEW POST OFFICE BUILDING HOKITIKA
DETAILS OF VESTIBULE & MAIN STAIR

P·W·D
12635



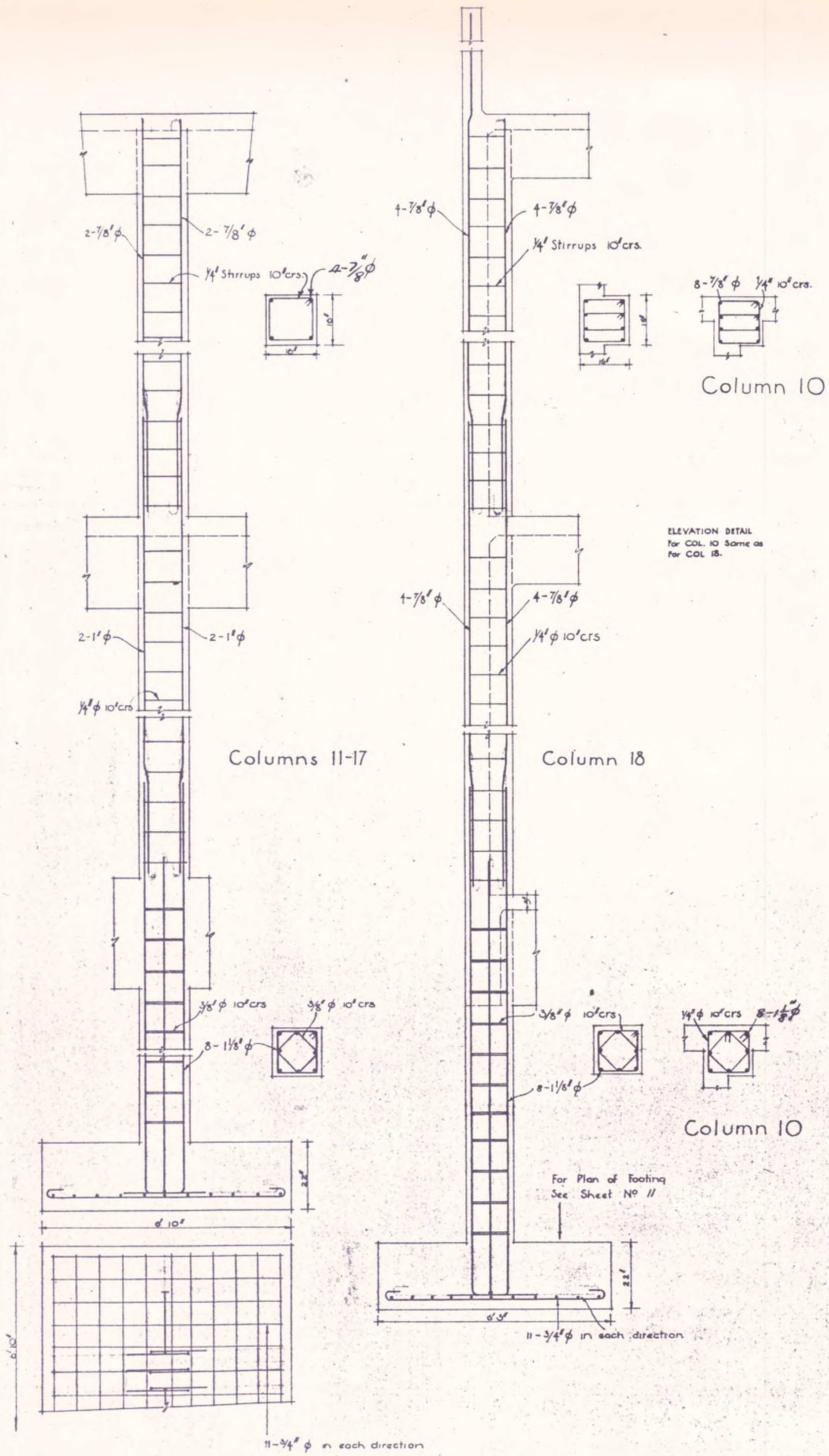
46/43
6

INITIALS	DATE
N.N.C	NOV/
N.N.C	/47
R.F.D.	APRIL 1948

SCALES
1/4" — 1'. 0'
1 1/2" — 1'. 0'
3" — 1'. 0'

NEW POST OFFICE BUILDING HOKITIKA

EXTERIOR DETAILS

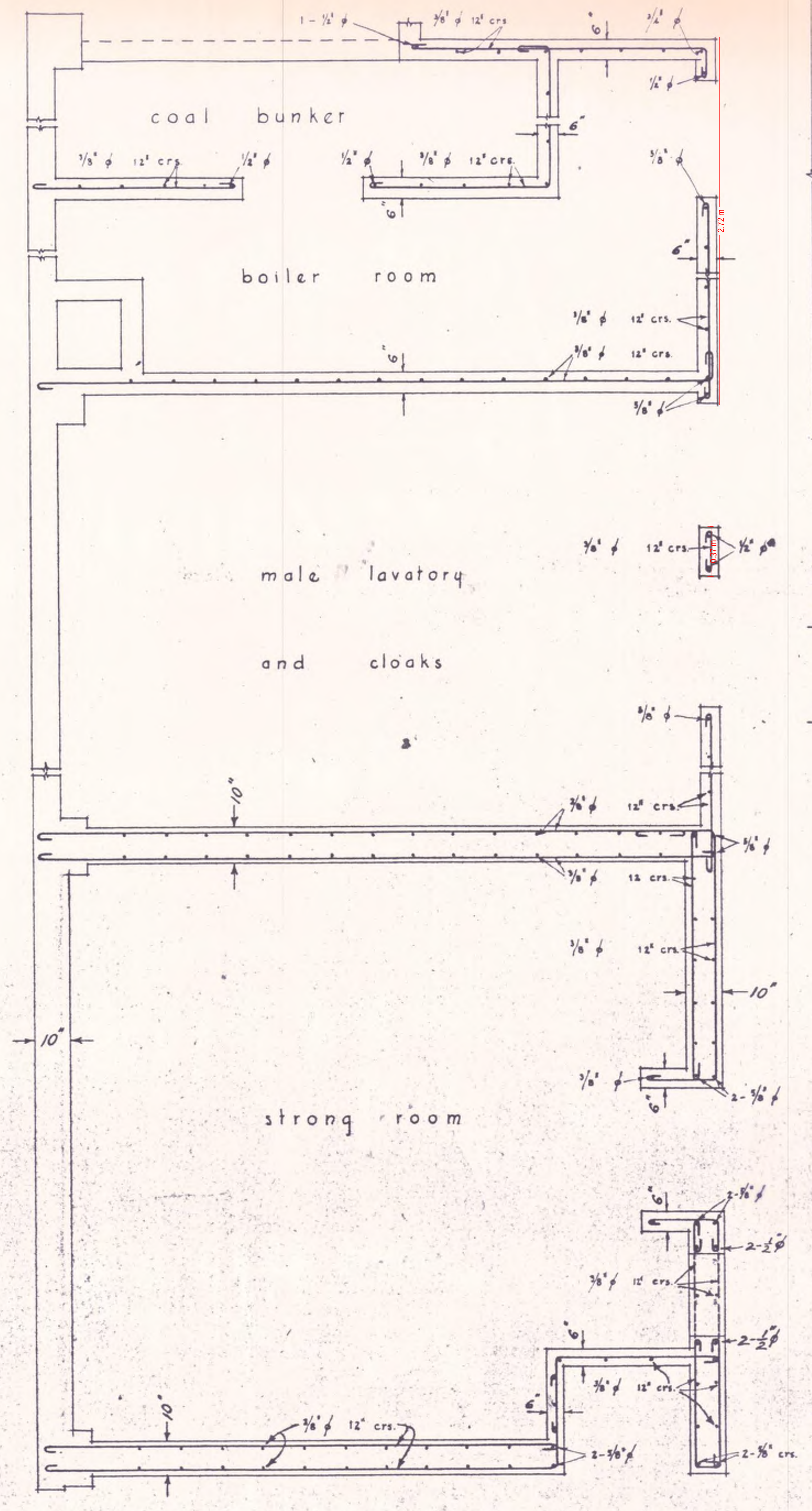


Columns 11-17

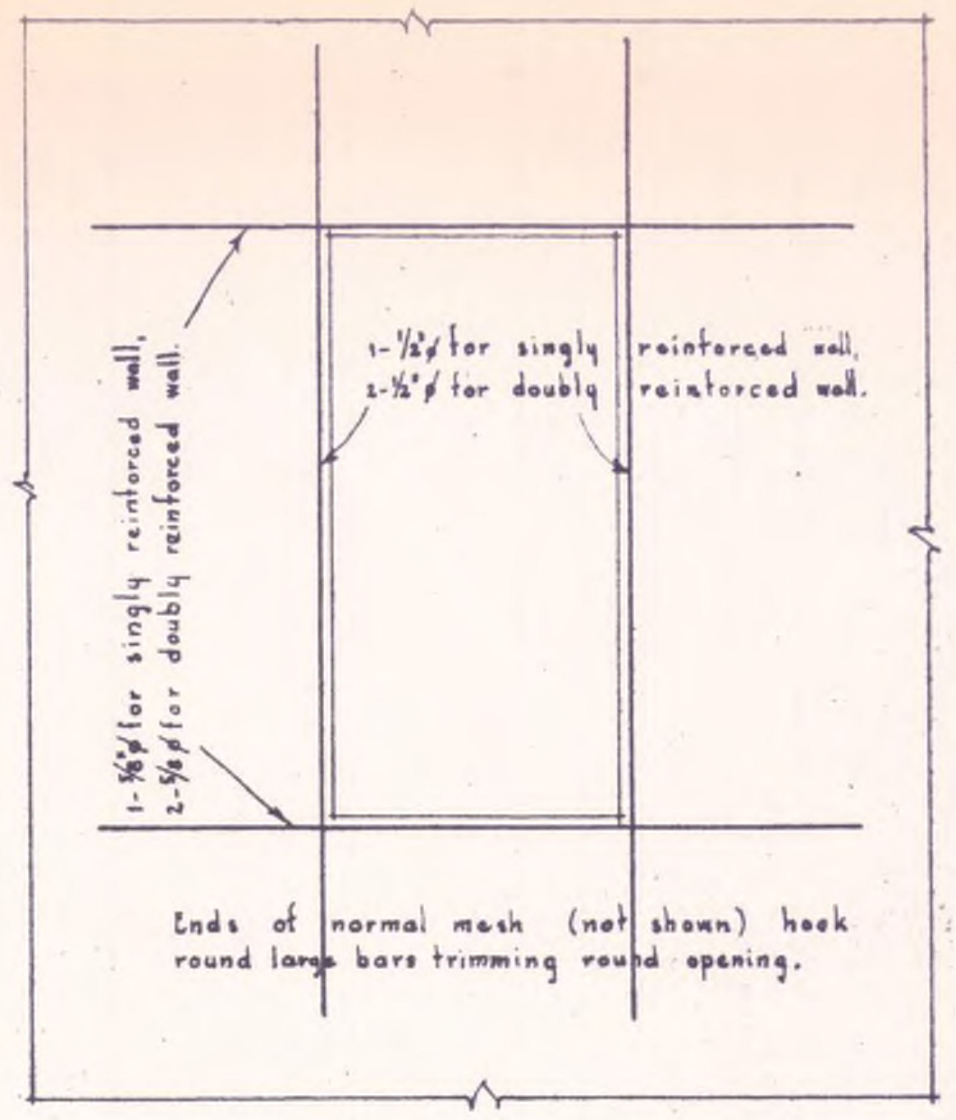
Column 18

Column 10

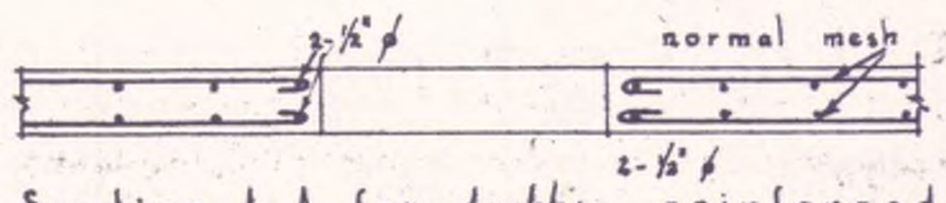
Column 10



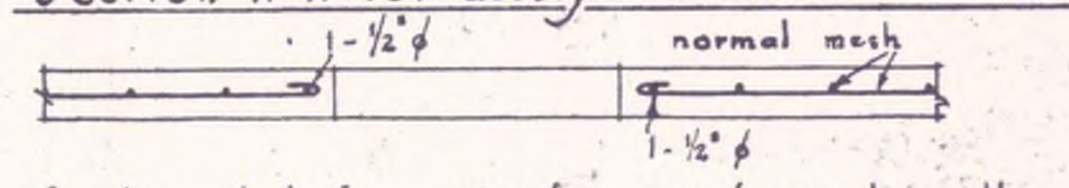
Horizontal Section through Ground Floor Partitions.



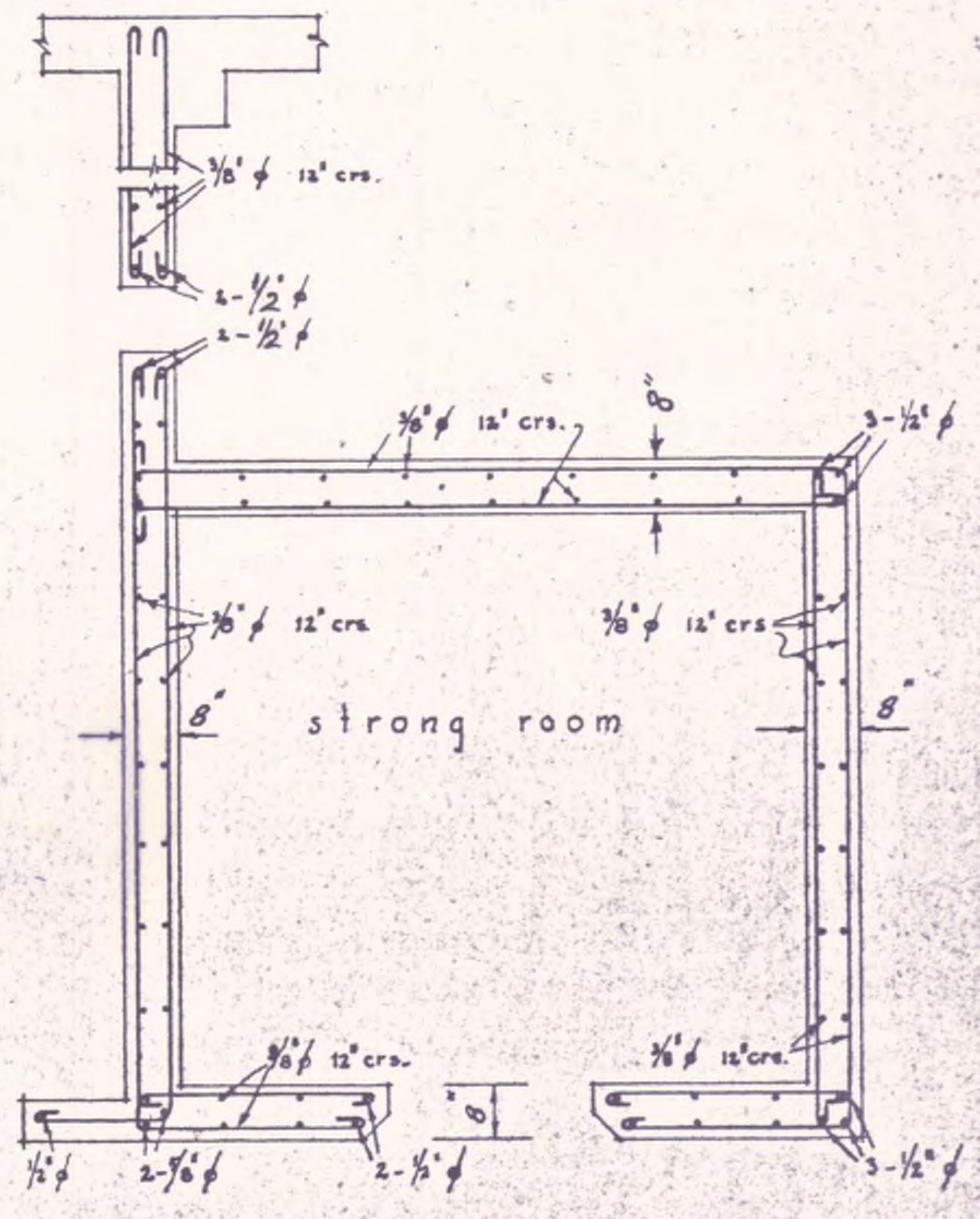
Typical Door opening in Interior Wall.



Section A-A for *doubly* reinforced wall.



Section A-A for *singly* reinforced wall.



Horizontal Section through Strong Room Area on First Floor.

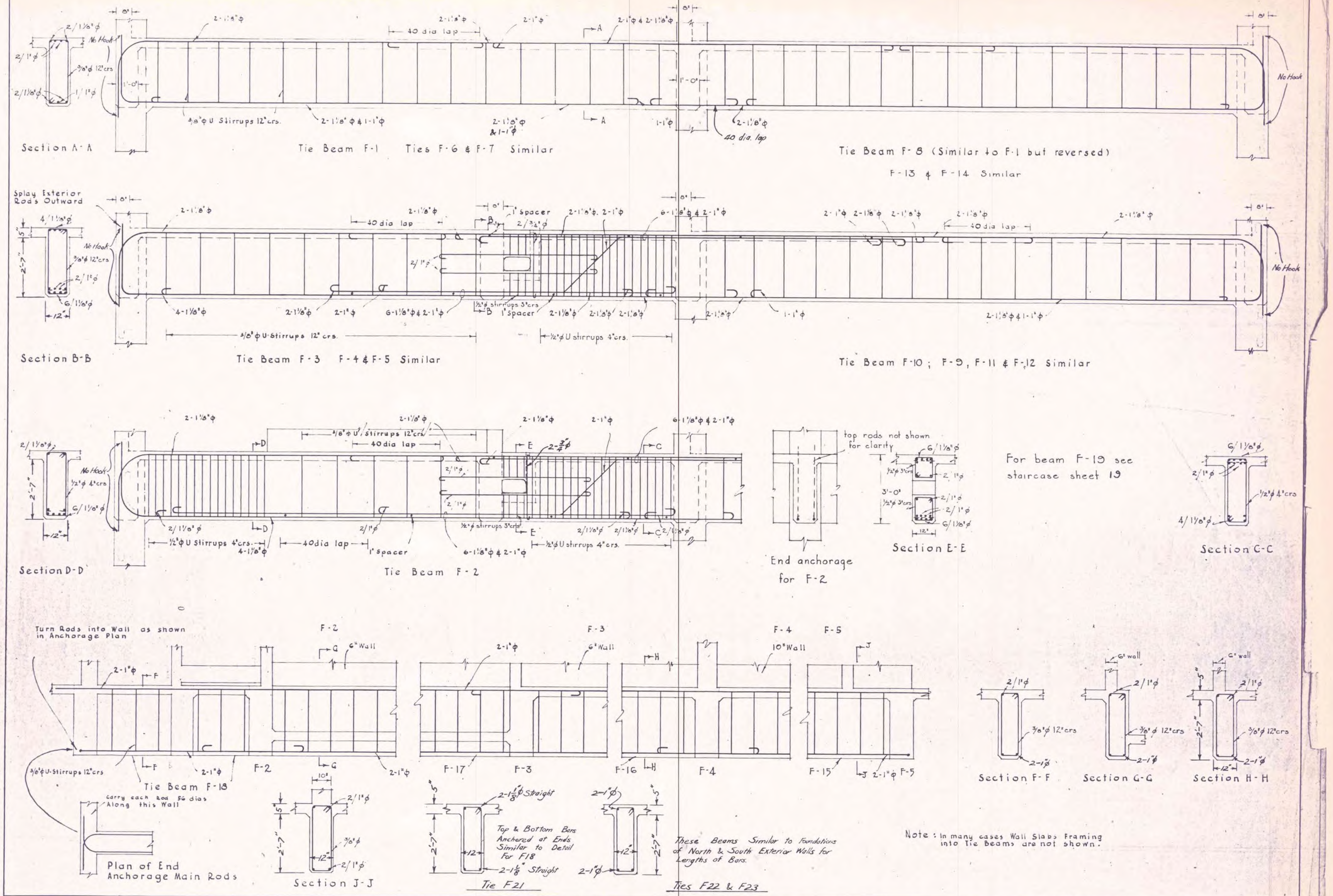
46/43
12
GMcK
T.S.&L.S. Jan 48
GfB April '48

SCALES
1/2" : 1 FT.

NEW POST OFFICE BUILDING HOKITIKA

·FURTHER COLUMN DETAILS·

Sheet No 12
in Set of 25
P.W.D. 126351



For beam F-19 see staircase sheet 19

Top & Bottom Bars Anchored at Ends Similar to Detail For F18

These Beams Similar to Foundations of North & South Exterior Walls for Lengths of Bars.

Note: In many cases Wall Slabs Framing into Tie Beams are not shown.

JOB No. 46/43
SHEET 13 DETAILS DTL.
DRAWN BY G. McK. FEB 47.
TRACED " R.F.
ADDITIONS " R.F. APR 47.
CHECKED "

SCALES
½" - 1 FT.

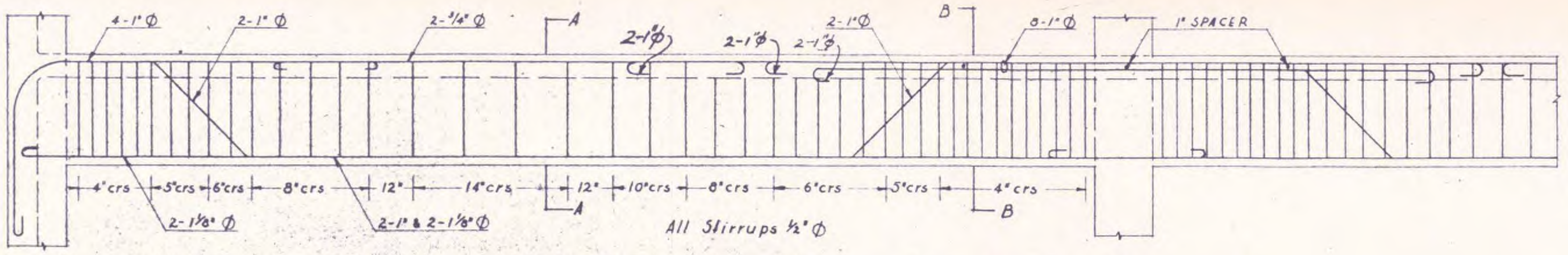
NEW POST OFFICE BUILDING HOKITIKA

FOUNDATION TIE BEAMS

Sheet No. 13
in Set of

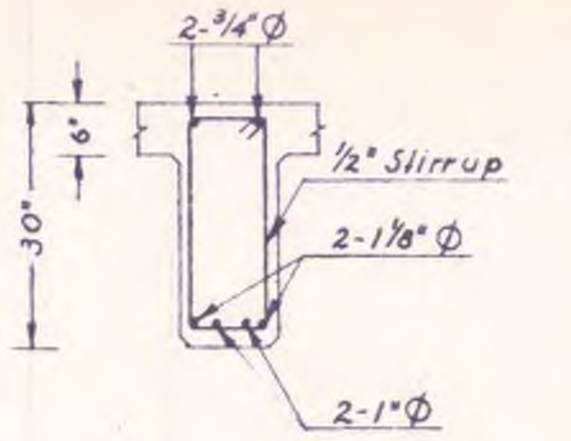
P.W.D. 126351

PUBLIC WORKS ARCHITECTURAL DIVISION
ARCHITECT

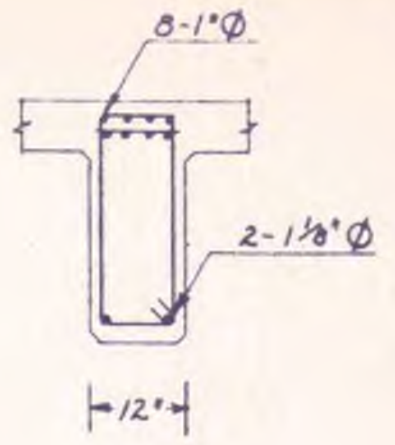


First Floor Beams 102, 103, 108. Beams 109–113, 115 Similar but Reversed

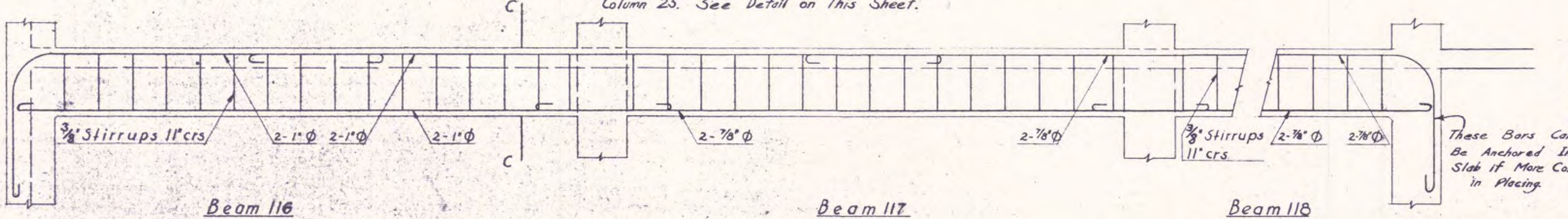
Beam 114 Similar except for end connection to Column 25. See Detail on This Sheet.



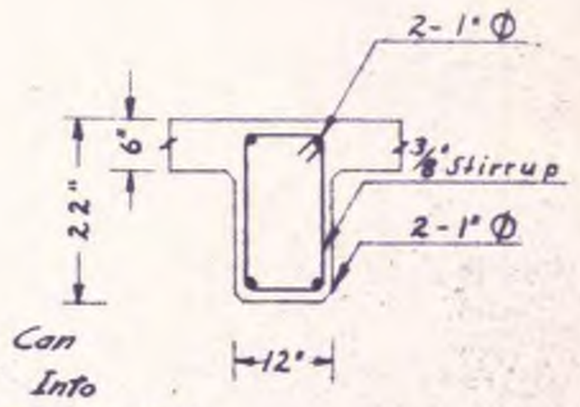
Section A-A



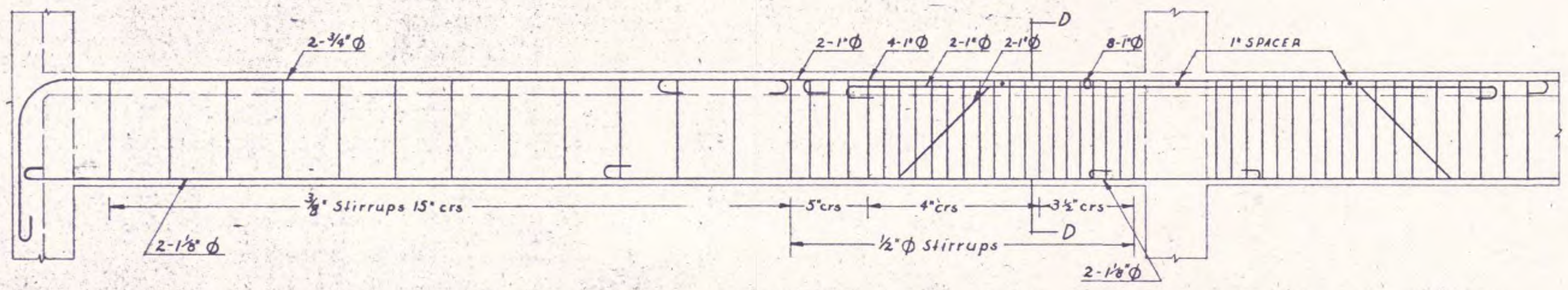
Section B-B



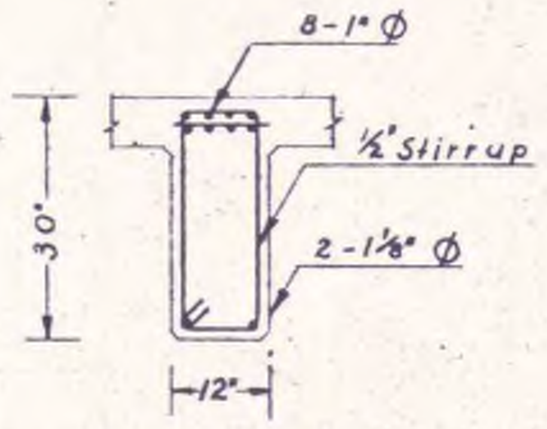
Beam 116 Beam 117 Beam 118



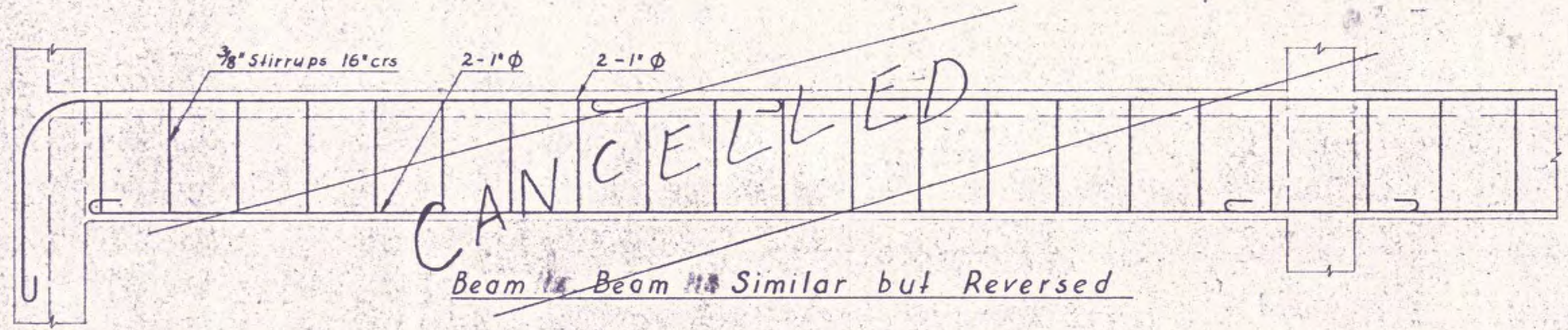
Section C-C



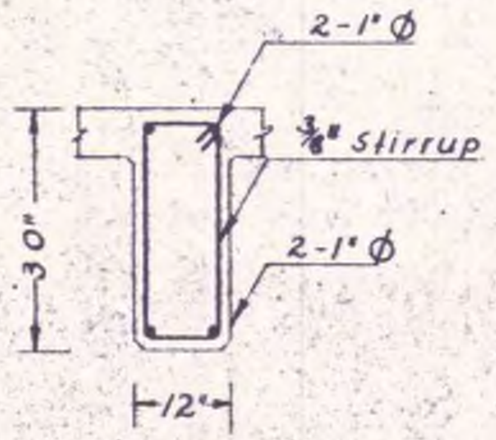
Beams 104–107



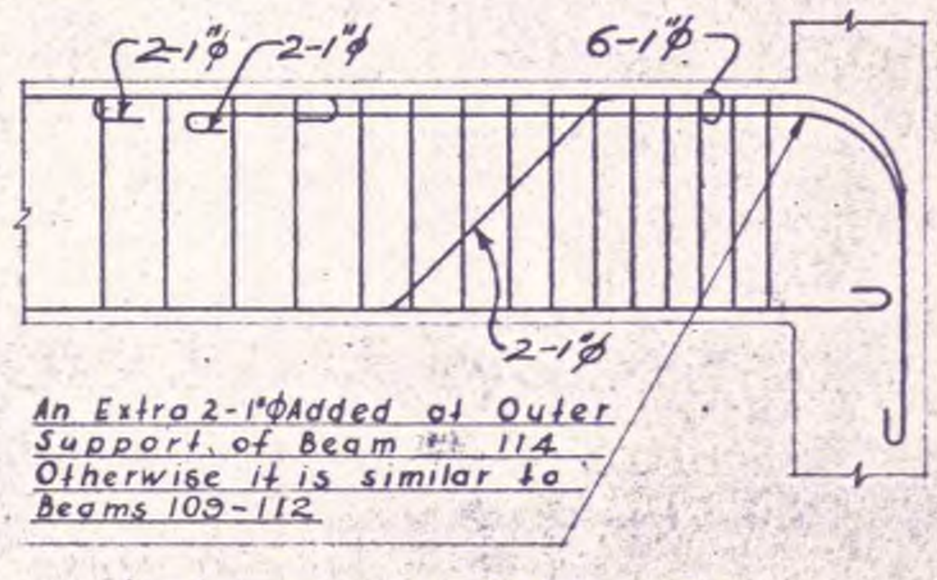
Section D-D



Beam Beam Similar but Reversed



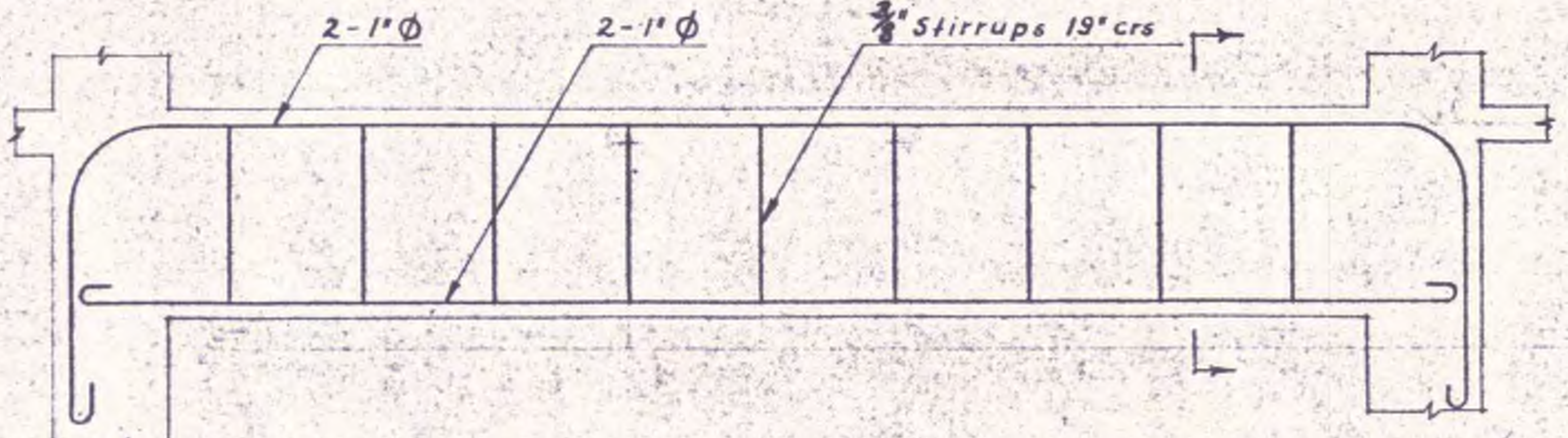
Section Beam 104



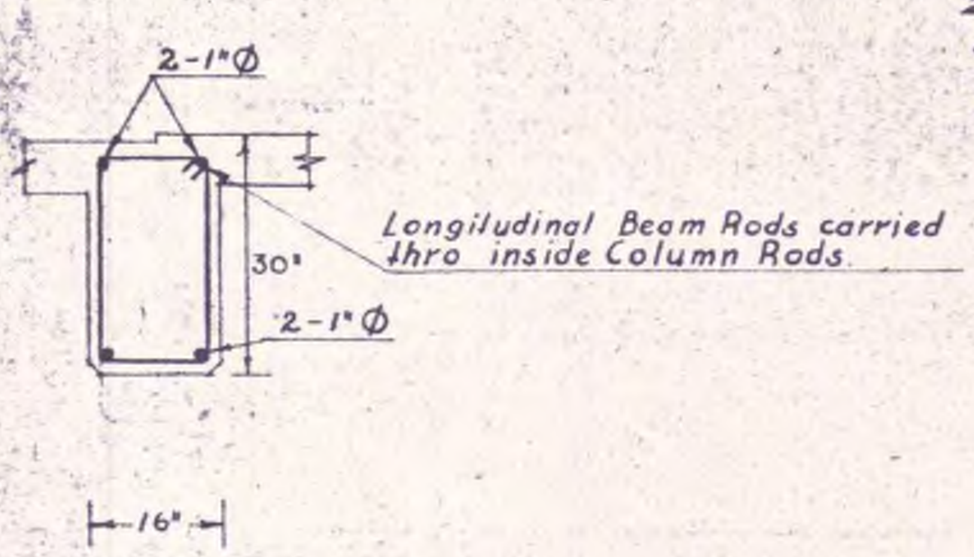
An Extra 2-1"Ø Added at Outer Support of Beam 114 Otherwise it is similar to Beams 109–112

Anchorage at Column 25

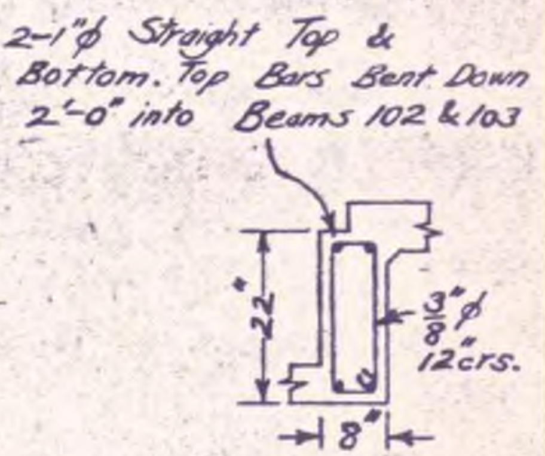
Beam 114



Beam 101



Section Beam 101



Section Beam 113

JOB No. 46/43
SHEET 15 | INITIALS | DATE
DRAWN BY G.McK Sept 46
TRACED R.F. Sept 46
ALTERATIONS G. McK. Rae '48
CHECKED B.B. April '48

SCALES

½" = 1 FT.

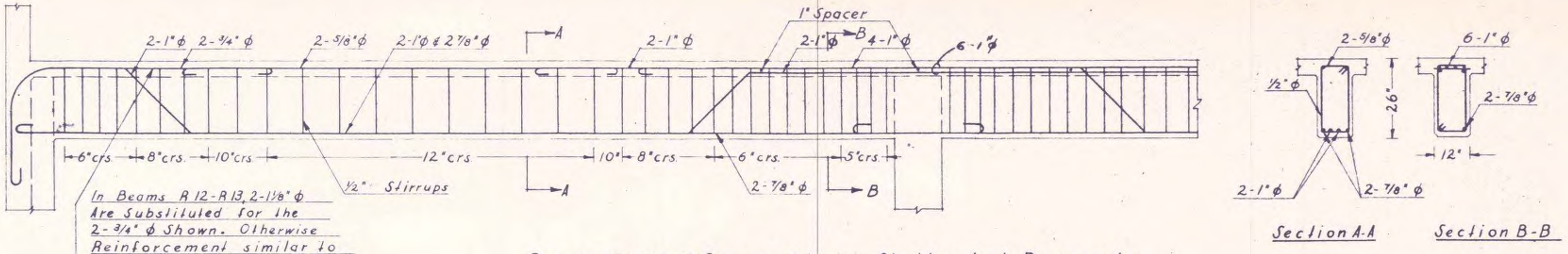
NEW POST OFFICE BUILDING HOKITIKA

1st FLOOR BEAMS

Sheet No. 15
in Set of 25

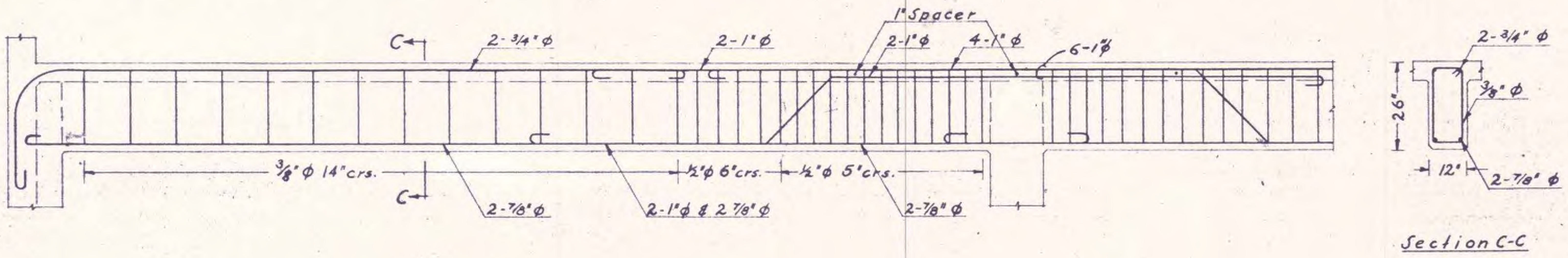
P.W.D. 126351

PUBLIC WORKS
ARCHITECTURAL
DIVISION
GOVERNMENT ARCHITECT

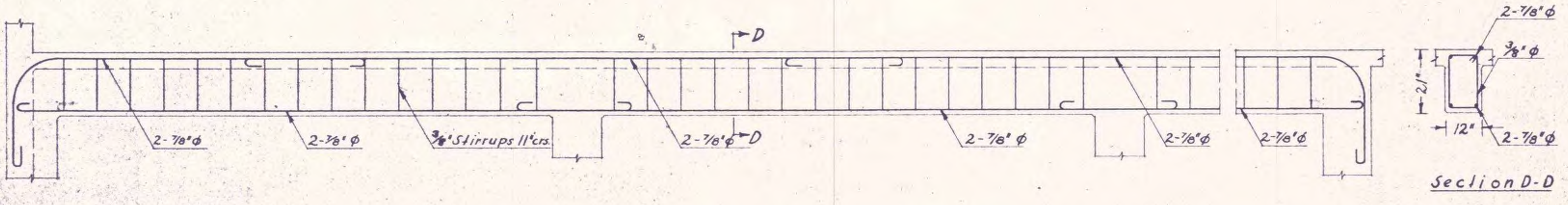


In Beams R 12-R 13, 2-1 1/8" ϕ Are Substituted for the 2-3/4" ϕ Shown. Otherwise Reinforcement similar to Beams R7-R11

Beams R1-R5 & R7, Beams R8-R14 Similar but Reversed.



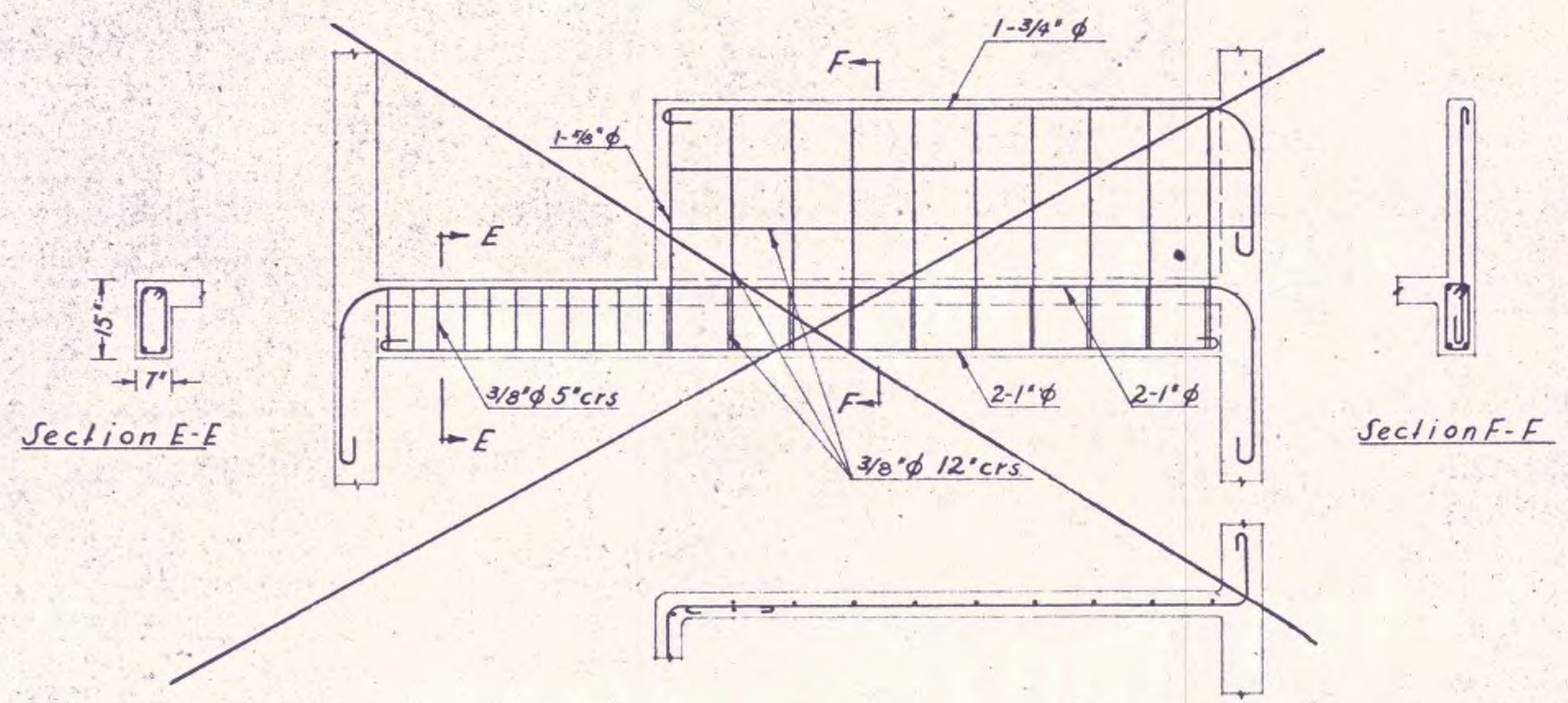
Beam R6.



Beam R15.

Beam R16.

Beam R17.



Landing Beam R18.

JOB No. 46/43
SHEET 16
DRAWN BY G.McK. Sep 46
TRACED R.F. Oct 46
ADDITIONS
CHECKED DB April 48

SCALES
1/2" = 1 FT.

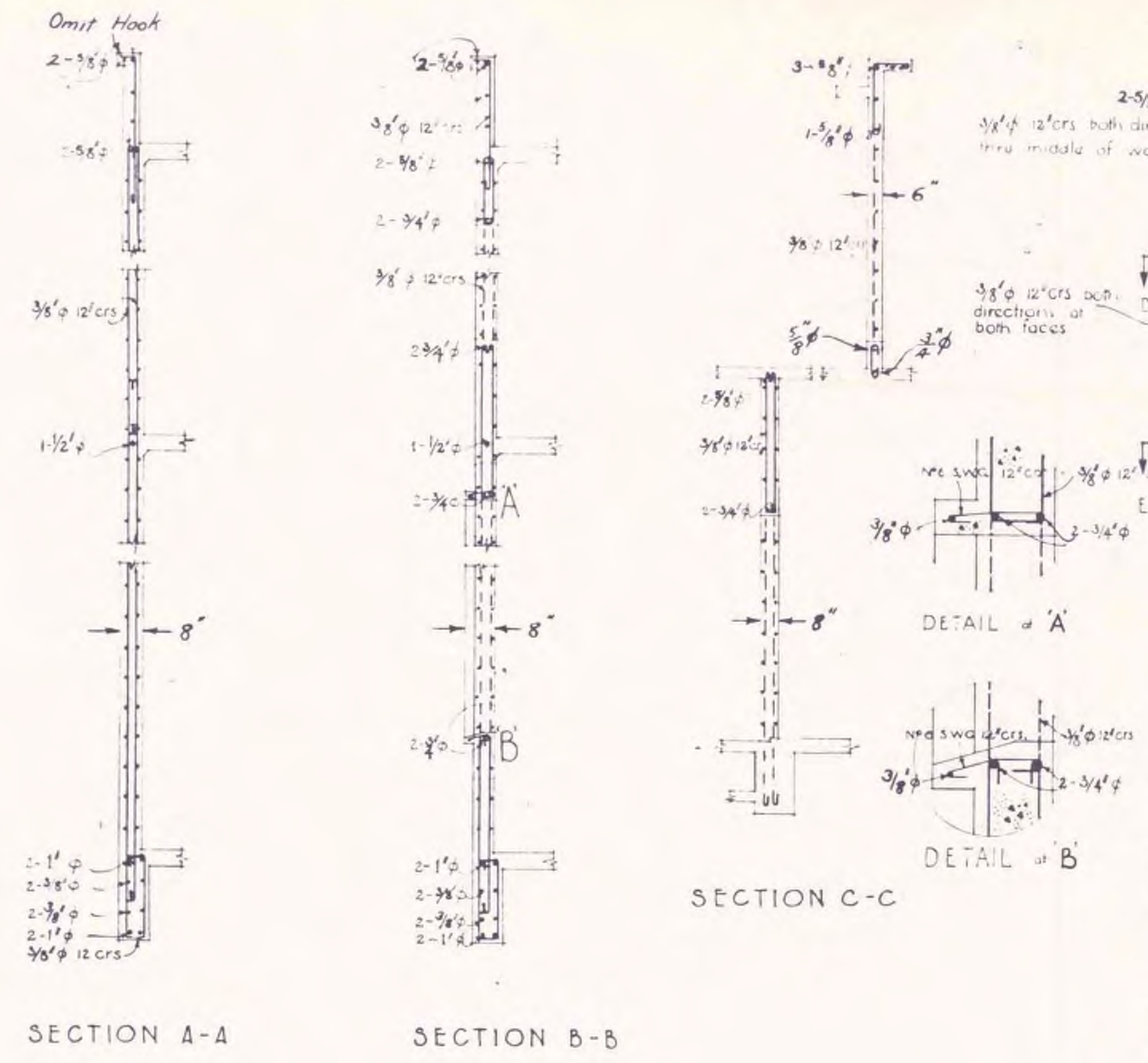
NEW POST OFFICE BUILDING HOKITIKA

ROOF BEAMS

Sheet No. 16
in Set of 25

P.W.D. 126351

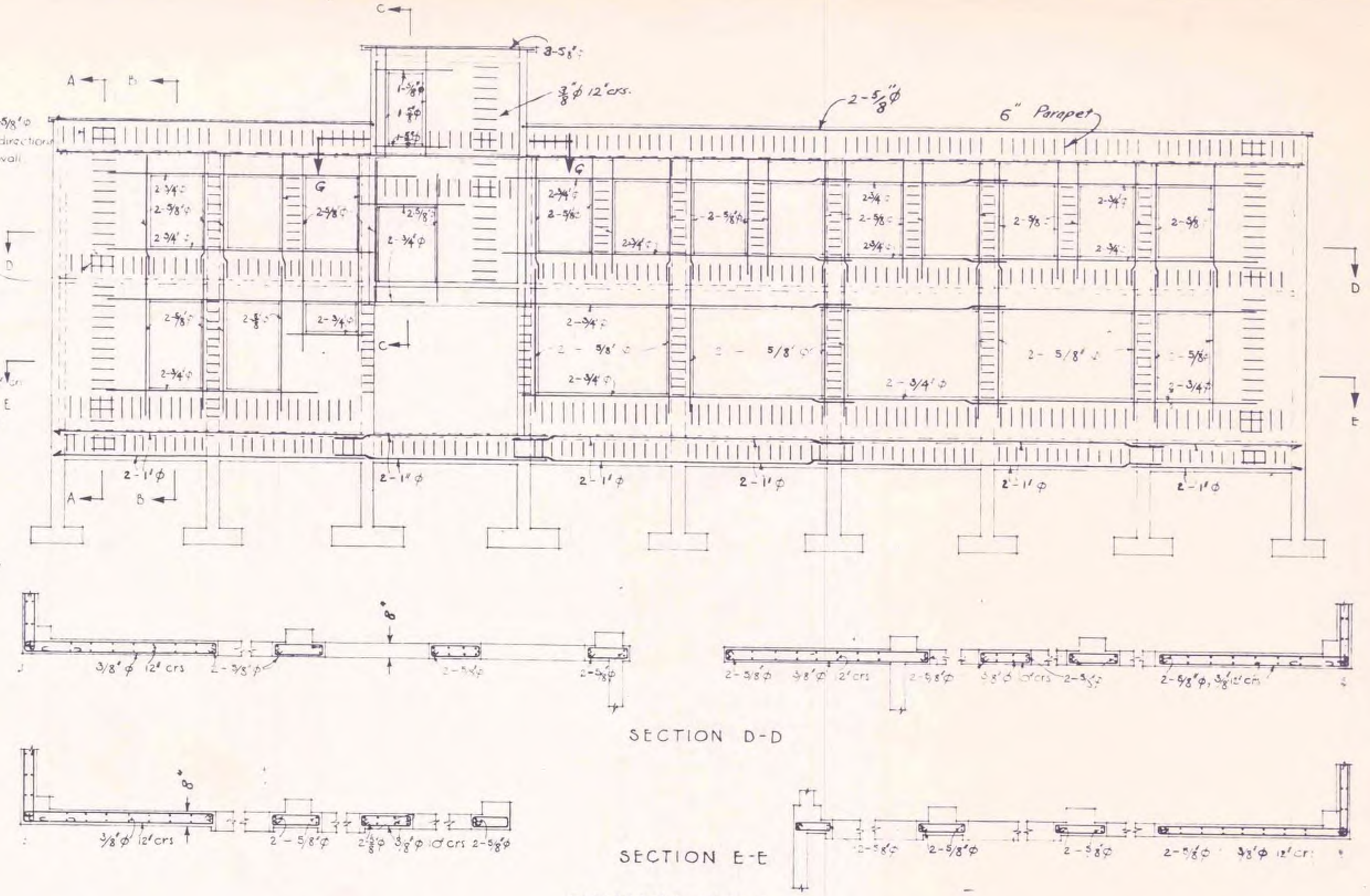
PUBLIC WORKS ARCHITECTURAL DIVISION



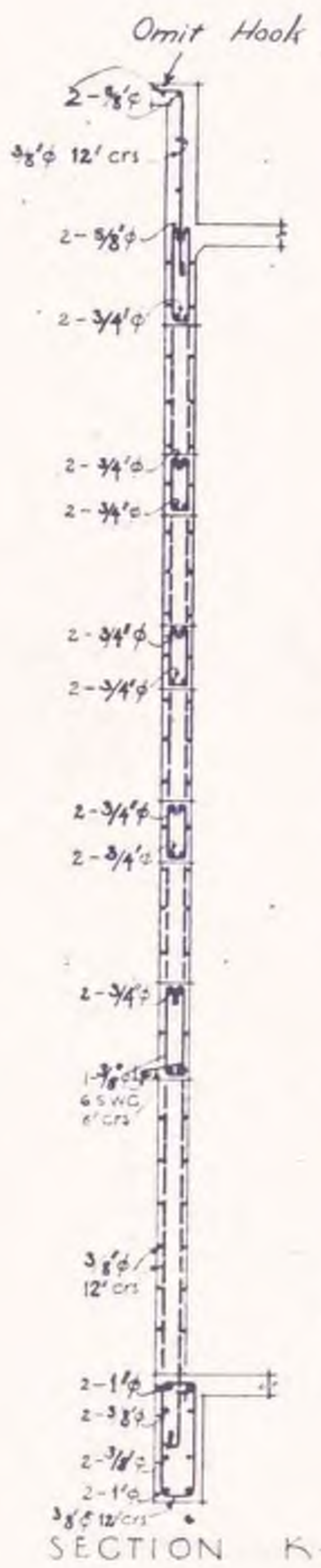
SECTION A-A

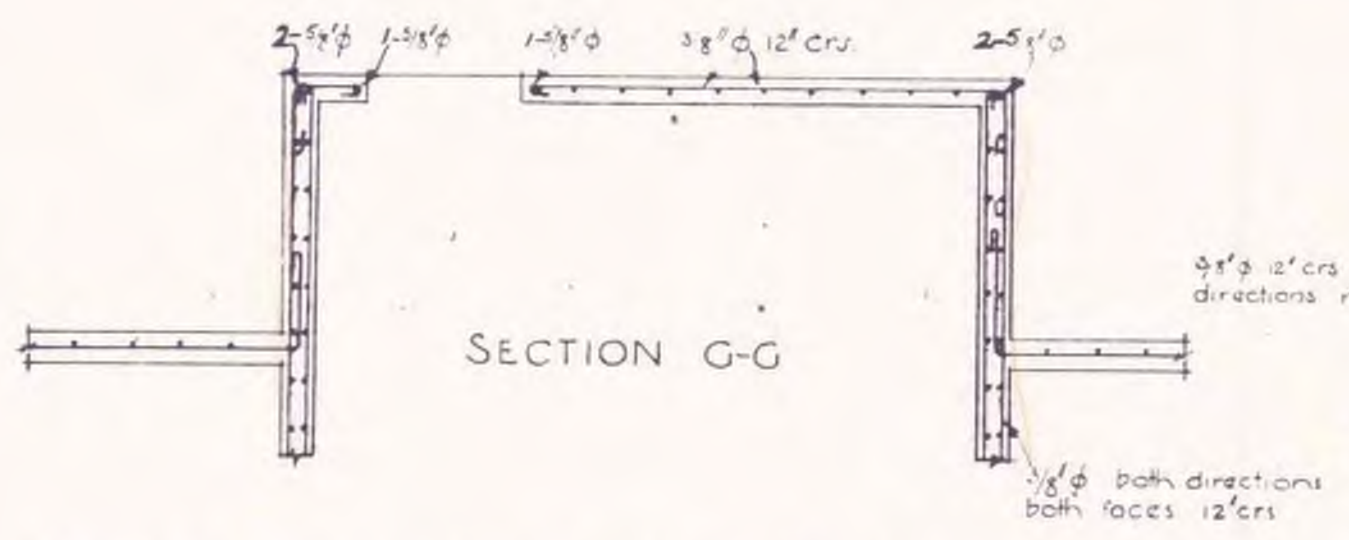
SECTION B-B

SECTION C-C



SOUTH WALL





SECTION G-G

SECTION H-H similar to SECTION A-A

SECTION K-K

1 LAPS AND ANCHORAGE OF WALL REINFORCEMENT ·

a All bars except heavy bars round wall openings, shall be hooked with standard hooks

b For bars with hooks laps shall be 40 diameters in length.

c For bars without hooks laps shall be 54 diameters in length.

d Heavy horizontal bars at openings shall be in lengths as long as possible Where laps in these bars are necessary they shall occur in piers between openings and shall be formed by joggling one bar above the other.

e Laps in 3/8" diameter horizontal wall reinforcement shall be staggered along the length of the wall

Laps in 3/8" diameter vertical wall reinforcement may be made if required immediately above ground floor slab level

f Horizontal bars at openings shall be anchored 54 diams Vertical bars at openings shall be anchored 40 diameters.

2 COVER ·

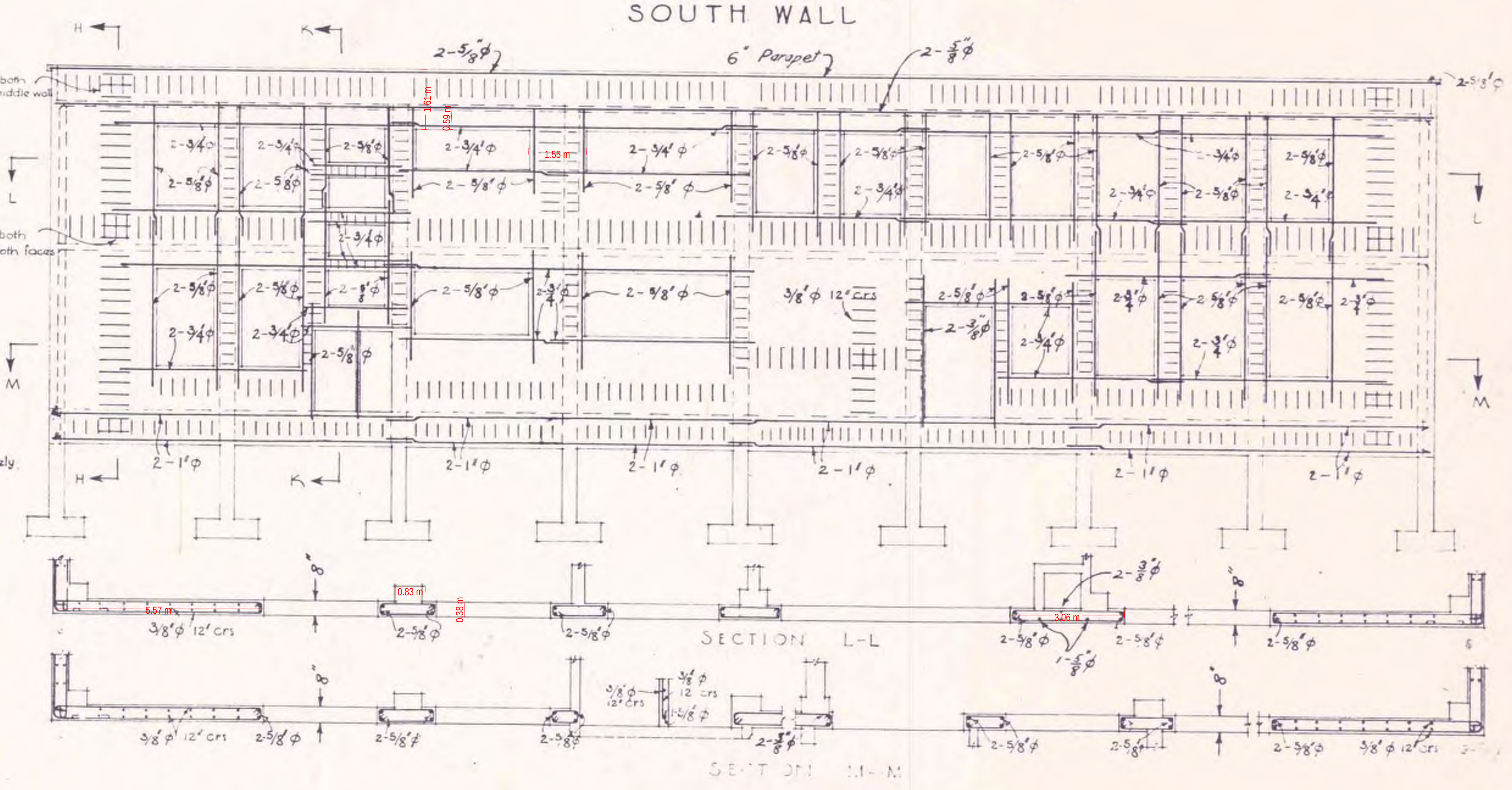
a Cover for 3/8"φ wall reinforcement shall 1¼" min & 1½" max. for exterior face of wall and 3/4" min and 1" max for interior face of wall. These covers shall be increased below ground level by placing horizontal steel on outside above ground level and on inside below ground level.

b Main reinforcement of columns, beams and around openings shall have 1½" cover

c Steel in column footings shall have 3" cover. Steel in wall footings shall have 2" cover

3. Normal roof slab, floor slab, column and footing reinforcing omitted for clarity. *on elevation details.*

4 *All Slab steel to have a minimum of 3/4" cover at top and bottom.*



NORTH WALL

17

46/43

G McK
H E G DEC 47
T H S JAN 48
April '48

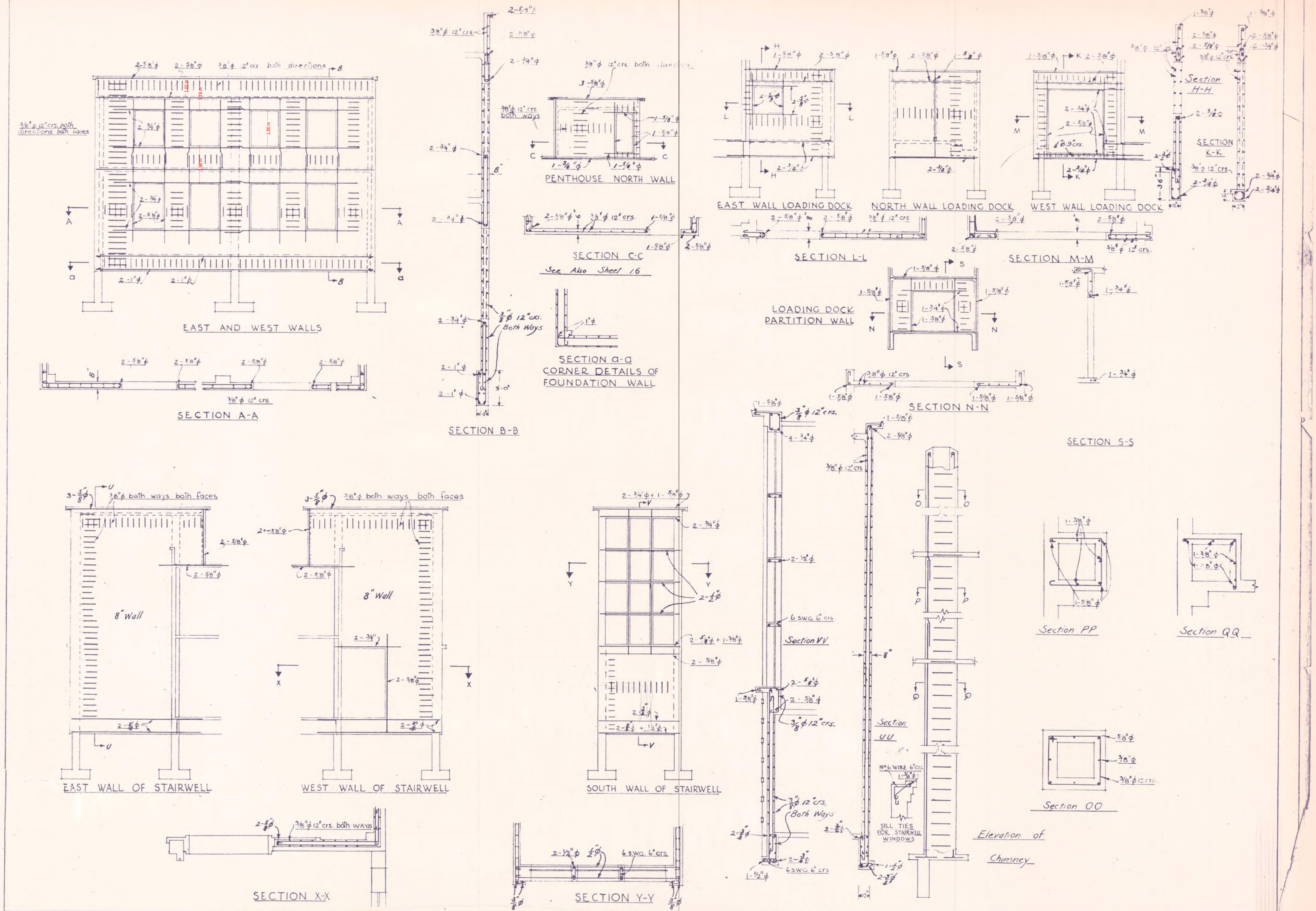
SCALES :-
1/8", 1/4" · 1'
1" · 1'

NEW POST OFFICE BUILDING HOKITIKA

NORTH AND SOUTH WALLS

SHEET No 17
IN SET OF 25

P.W.D. 126351



46/43

18

G McK. DEC '46
D.F.O. MCH '48
G McK.
DB April '48

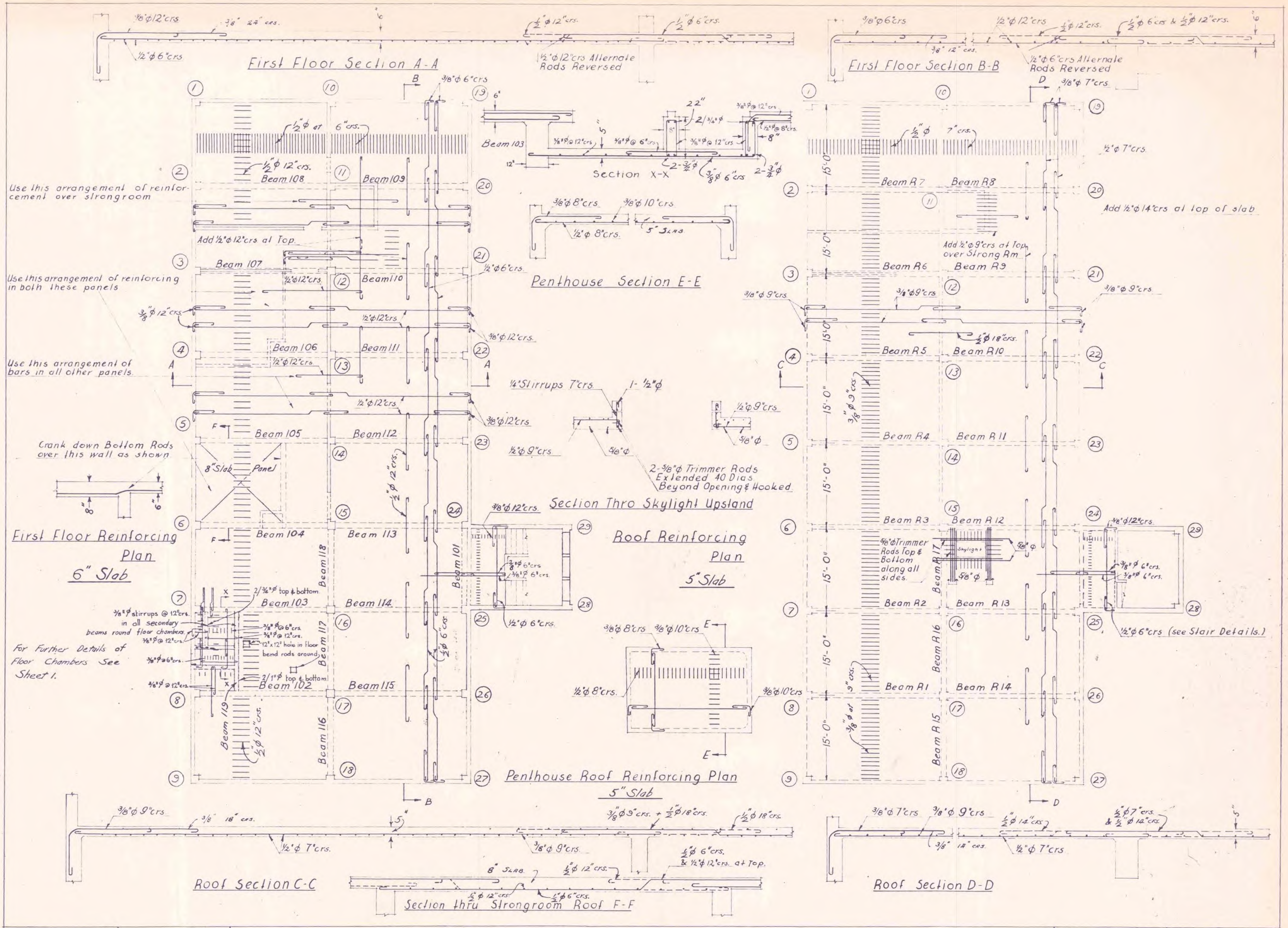
SCALES
1/8" = 1'-0"
1/4" = "
1/2" = "

NEW POST OFFICE BUILDING HOKITIKA

MISCELLANEOUS EXTERNAL WALLS & CHIMNEY DETAILS

SHEET No 18
IN SET OF 25

P.W.D 126351



46/43

19

G McK Oct 46
R F Oct 46
T.McA.
DG3 April '78

SCALES

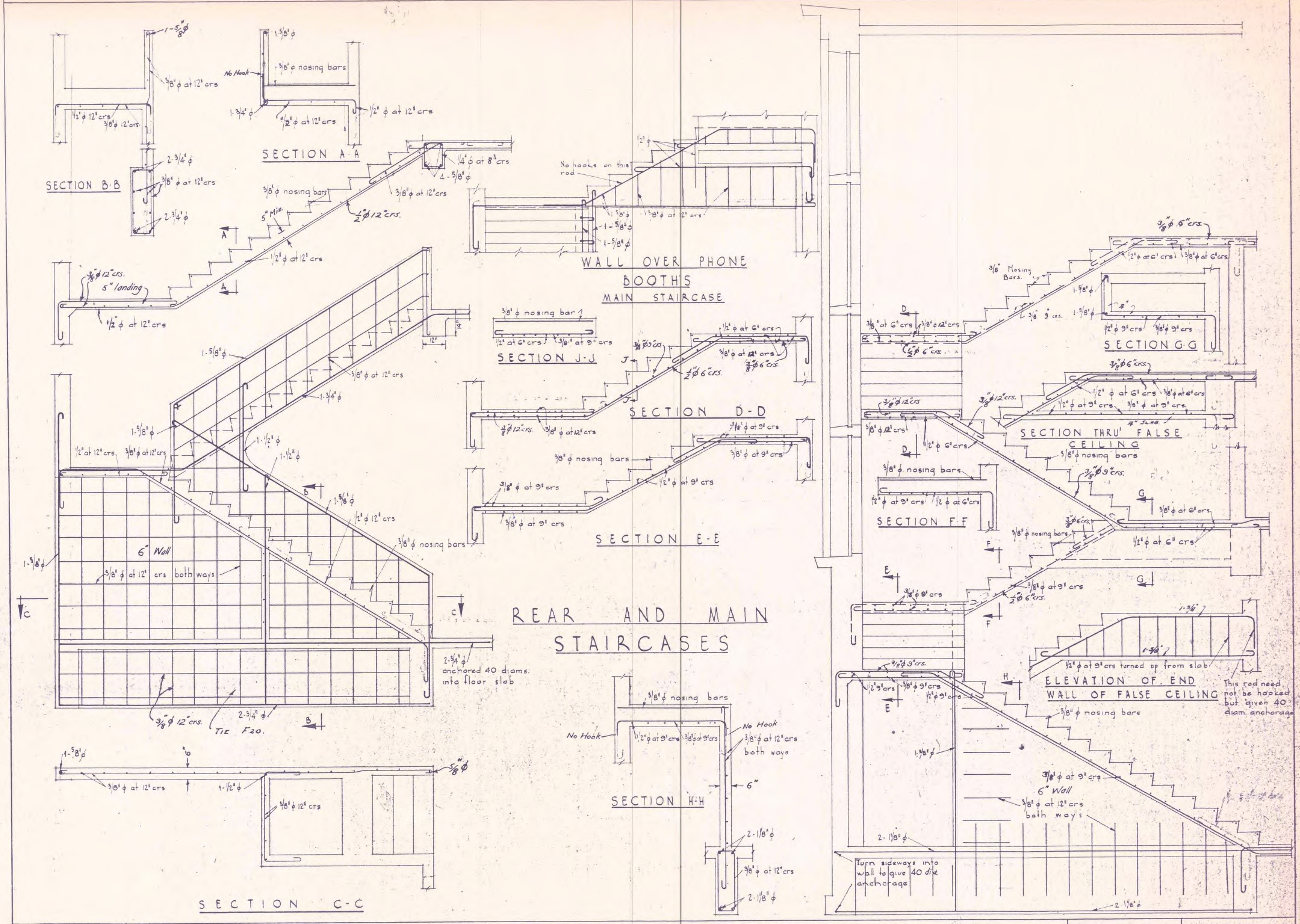
1/8" & 1/2" = 1 FT.

NEW POST OFFICE BUILDING HOKITIKA

1st. FLOOR, ROOF AND PENTHOUSE ROOF DETAILS

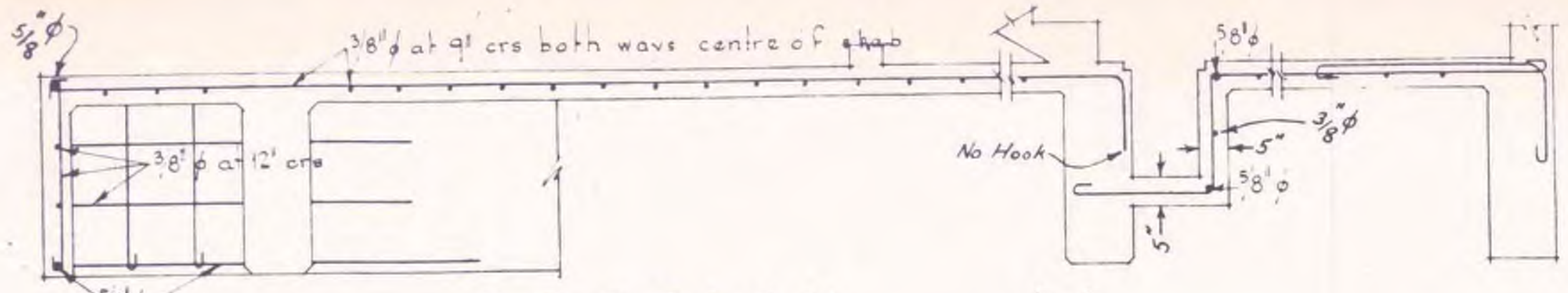
Sheet No. 19
in Set of 25

P.W.D. 126351

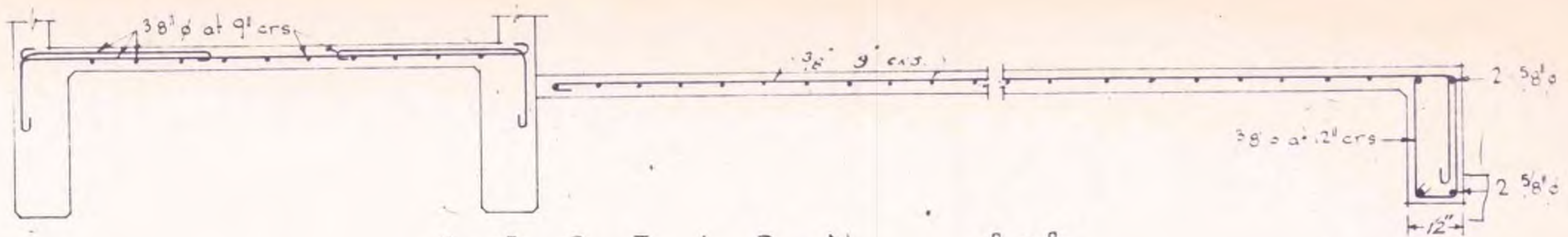


20 46/43 KEB June 47 G.P.K. Nov 28 DJB April '48	SCALES 1/2" = 1 FT	NEW POST OFFICE BUILDING HOKITIKA MAIN AND REAR STAIRCASES	SHEET No 20 IN SET OF 25. P.W.D 126351

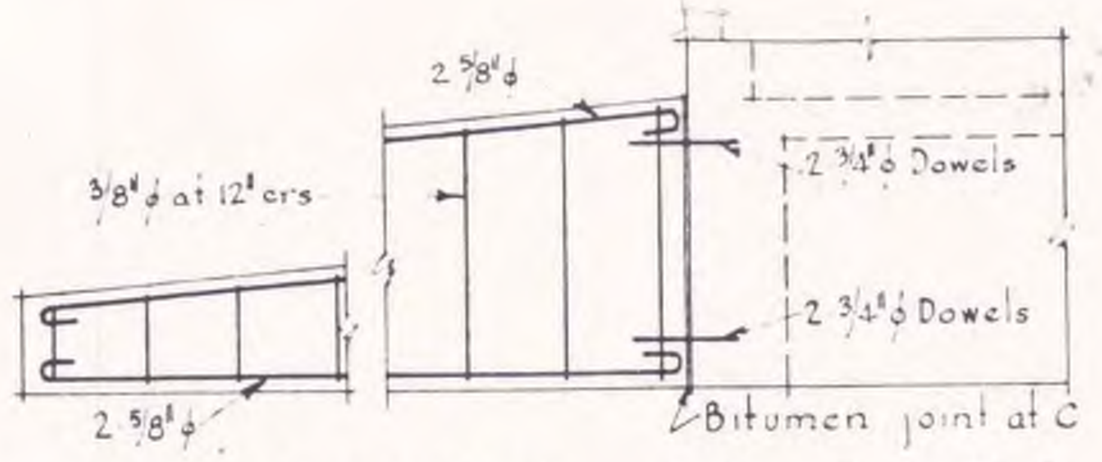
PUBLIC WORKS ARCHITECTURAL



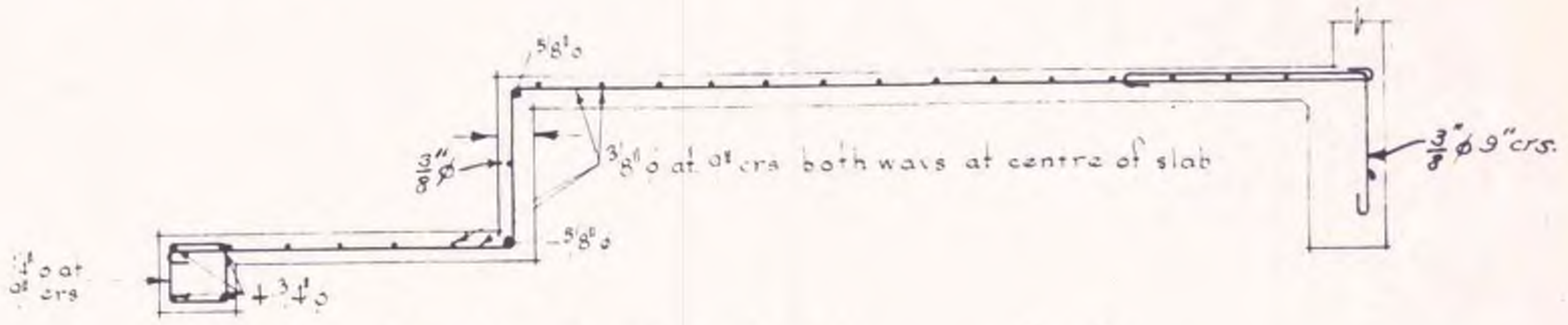
SECTION A·A



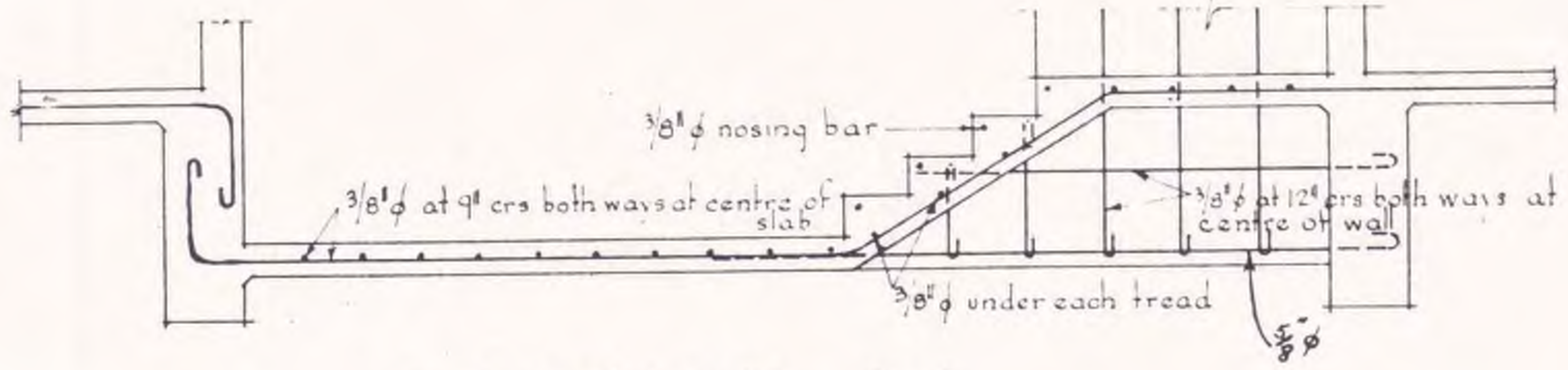
SECTION B·B



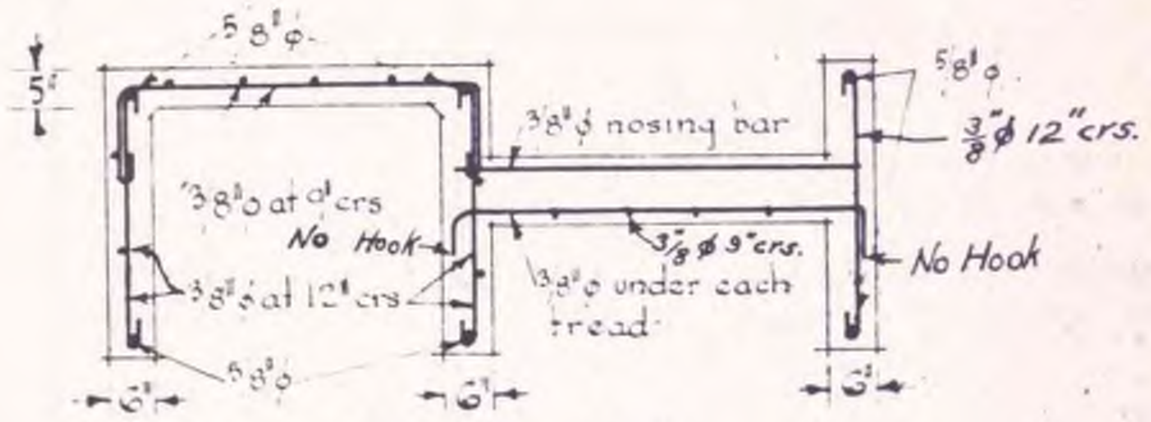
ELEVATION OF RAMP



SECTION D·D



SECTION E·E



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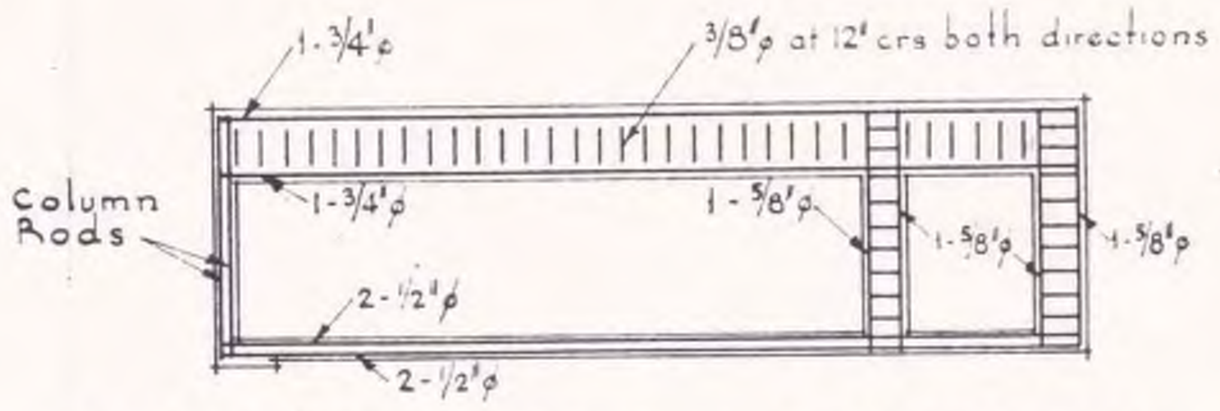
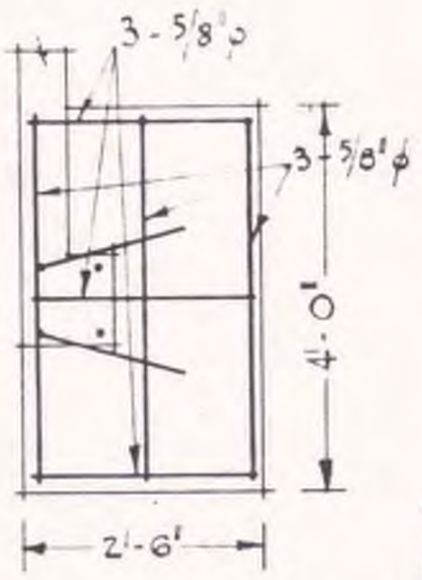
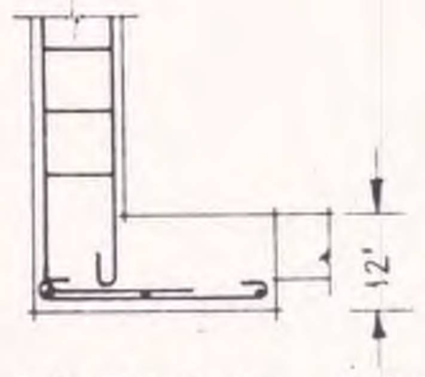


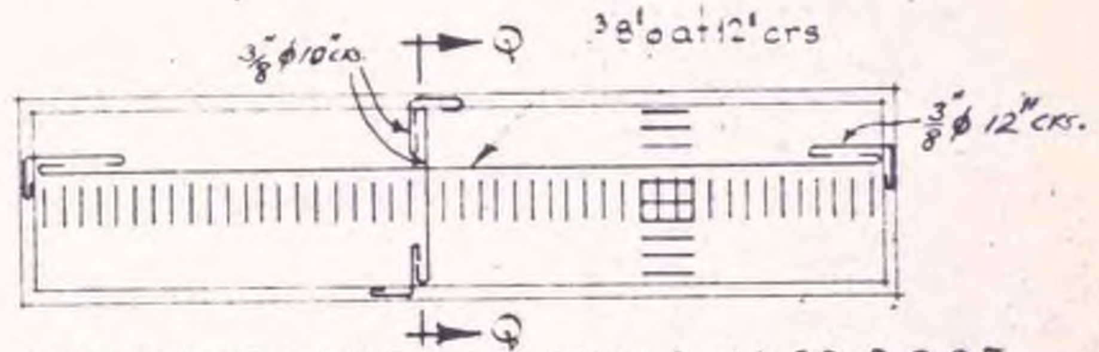
ENTRANCE WALL TO CYCLE SHED



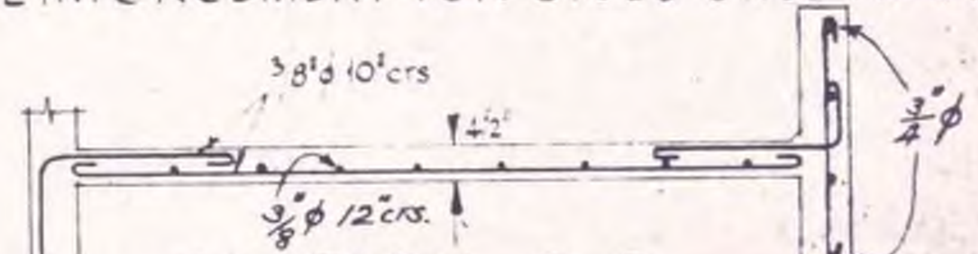
COLUMN FOOTING



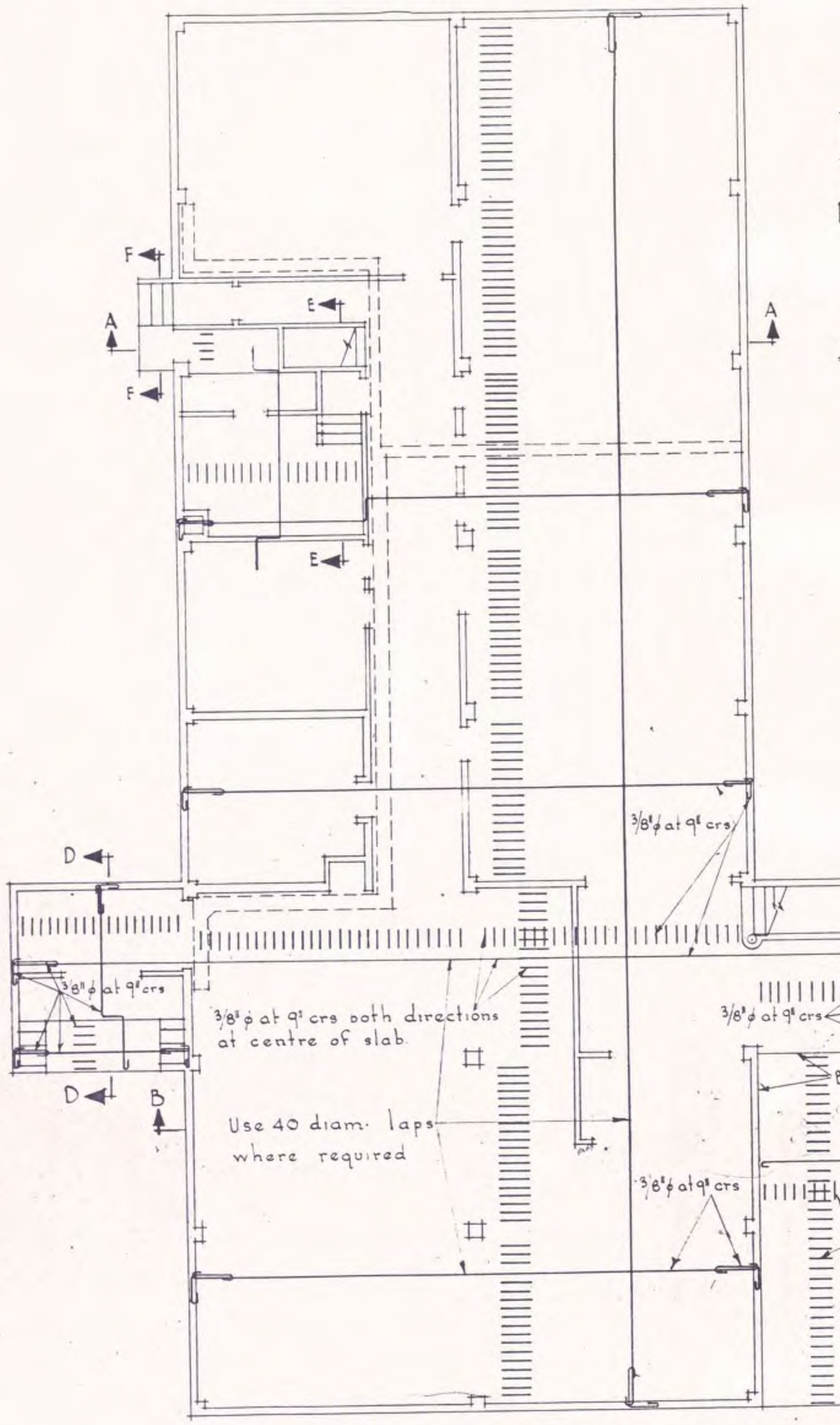
VERTICAL SECTION OF FOOTING



REINFORCEMENT FOR CYCLE SHED ROOF

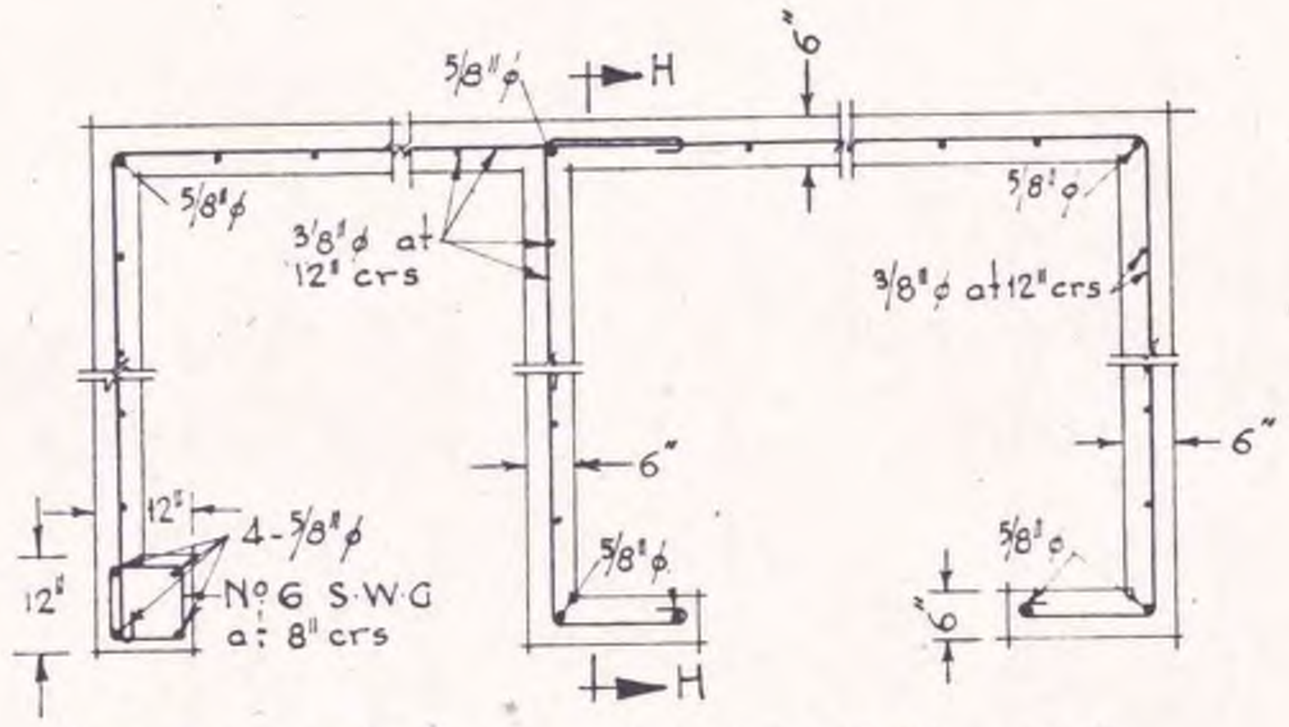


SECTION Q-Q

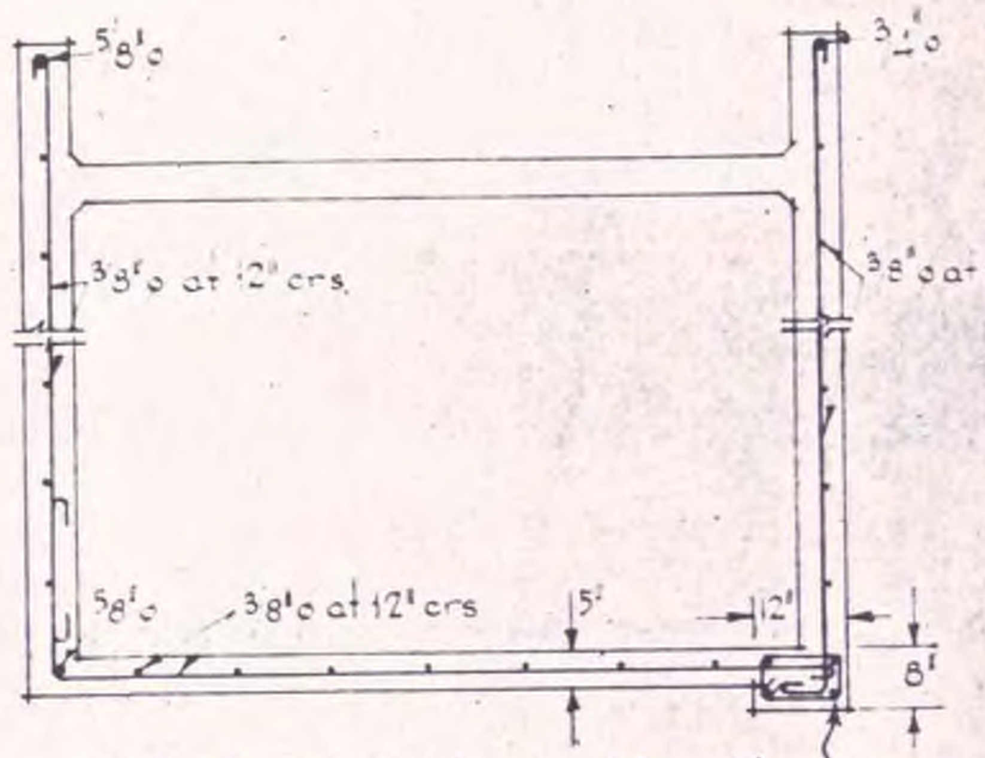


GROUND FLOOR REINFORCING PLAN [5" SLAB]

FOUNDATION TIE BEAMS NOT SHOWN FOR CLARITY.



HORIZONTAL SECTION OF CYCLE SHED



SECTION H-H

46/43
14
G.McK
K.E.B Jan'48
G.McK Apr '48
K.E.B April '48

SCALES
1/8" = 1 FOOT
1/2" = 1 FOOT

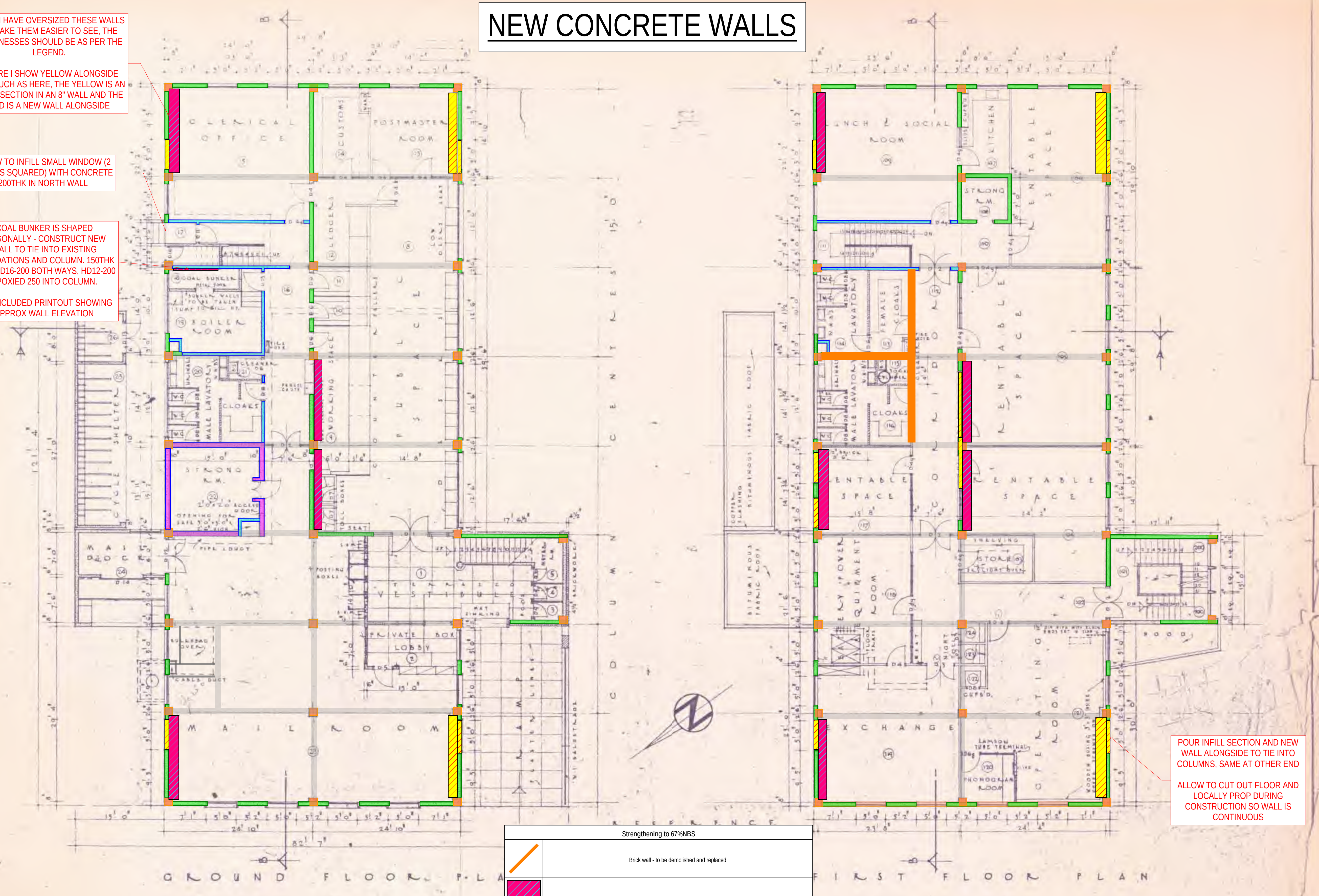
NEW POST OFFICE BUILDING HOKITIKA
GROUND FLOOR SLAB & MISCELLANEOUS DETAILS

SHEET No 14
IN SET OF 25

P.W.D 126351

APPENDIX D: 67%NBS STRENGTHENING DRAWINGS

NEW CONCRETE WALLS



NOTE: I HAVE OVERSIZED THESE WALLS TO MAKE THEM EASIER TO SEE, THE THICKNESSES SHOULD BE AS PER THE LEGEND.

WHERE I SHOW YELLOW ALONGSIDE RED, SUCH AS HERE, THE YELLOW IS AN INFILL SECTION IN AN 8" WALL AND THE RED IS A NEW WALL ALONGSIDE

ALLOW TO INFILL SMALL WINDOW (2 METRES SQUARED) WITH CONCRETE 200THK IN NORTH WALL

COAL BUNKER IS SHAPED DIAGONALLY - CONSTRUCT NEW WALL TO TIE INTO EXISTING FOUNDATIONS AND COLUMN. 150THK WITH HD16-200 BOTH WAYS, HD12-200 EPOXIED 250 INTO COLUMN.

SEE INCLUDED PRINTOUT SHOWING APPROX WALL ELEVATION

POUR INFILL SECTION AND NEW WALL ALONGSIDE TO TIE INTO COLUMNS, SAME AT OTHER END

ALLOW TO CUT OUT FLOOR AND LOCALLY PROP DURING CONSTRUCTION SO WALL IS CONTINUOUS

Strengthening to 67%NBS	
╱	Brick wall - to be demolished and replaced
▨	New 150thk wall 40MPa with HD12-200 Epoxied 250mm deep into existing columns, 120 deep into existing walls.
▨	New 200thk wall 40MPa with 2/ HD12-200 Epoxied 250mm deep into existing columns, 120 deep into existing walls.

JOB No. 46/43
SHEET 3
DRAWN N.N.C NOV/
TRACED N.N.C /47

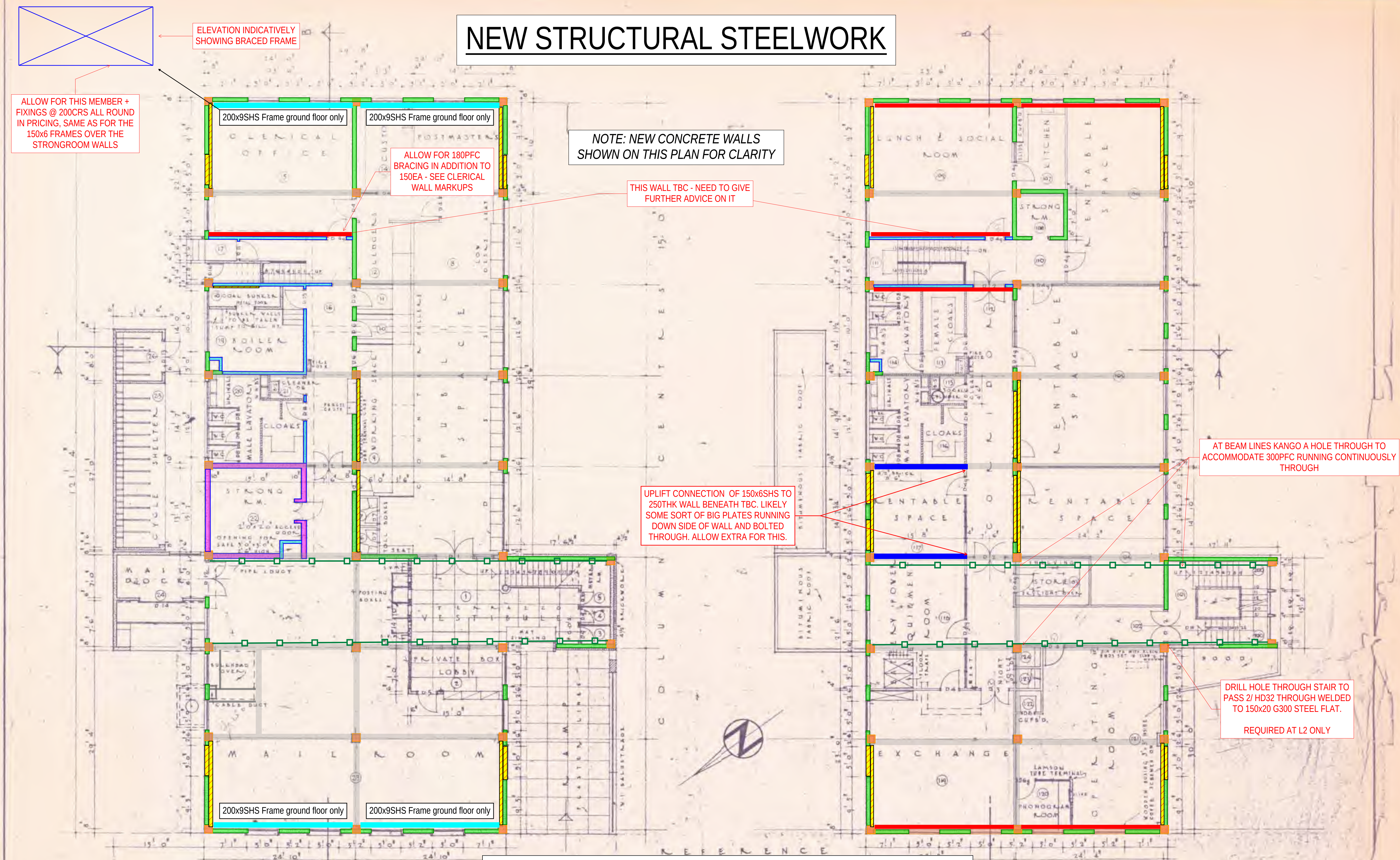
SCALES 1/8" = 1' 0"

NEW POST OFFICE BUILDING HOKITIKA
GROUND & FIRST FLOOR PLANS

PUBLIC WORKS ARCHITECTURAL DIVISION

P.V. 1263

NEW STRUCTURAL STEELWORK



ELEVATION INDICATIVELY SHOWING BRACED FRAME

ALLOW FOR THIS MEMBER + FIXINGS @ 200CRS ALL ROUND IN PRICING, SAME AS FOR THE 150x6 FRAMES OVER THE STRONGROOM WALLS

ALLOW FOR 180PFC BRACING IN ADDITION TO 150EA - SEE CLERICAL WALL MARKUPS

NOTE: NEW CONCRETE WALLS SHOWN ON THIS PLAN FOR CLARITY

THIS WALL TBC - NEED TO GIVE FURTHER ADVICE ON IT

UPLIFT CONNECTION OF 150x6SHS TO 250THK WALL BENEATH TBC. LIKELY SOME SORT OF BIG PLATES RUNNING DOWN SIDE OF WALL AND BOLTED THROUGH. ALLOW EXTRA FOR THIS.

AT BEAM LINES KANGO A HOLE THROUGH TO ACCOMMODATE 300PFC RUNNING CONTINUOUSLY THROUGH

DRILL HOLE THROUGH STAIR TO PASS 2/ HD32 THROUGH WELDED TO 150x20 G300 STEEL FLAT.

REQUIRED AT L2 ONLY

GROUND FLOOR PLAN

FLOOR PLAN

Legend	
🟦	150x6 SHS Frame to underside existing beam (~3.4m floor to beam)
🟦	200x9 SHS Frame to underside floor, fix into columns and wall
🟥	New 150x10EA either side of beam, bolted 80mm into underside of slab 5" with M16 G8.8 bolts @ 200crs with Hilti HIT-RE 500 V3 Epoxy
🟥	New 150x10EA either side of beam, bolted 80mm into underside of slab 5" with M16 G8.8 bolts @ 200crs with Hilti HIT-RE 500 V3 Epoxy
🟩	New 300PFC either side of beam, bolted 80mm into underside of slab 5" with M16 G8.8 bolts @ 200crs with Hilti HIT-RE 500 V3 Epoxy into both beam and underside of floor slab

JOB No. 46/43

SCALES 1/8" = 1' 0"

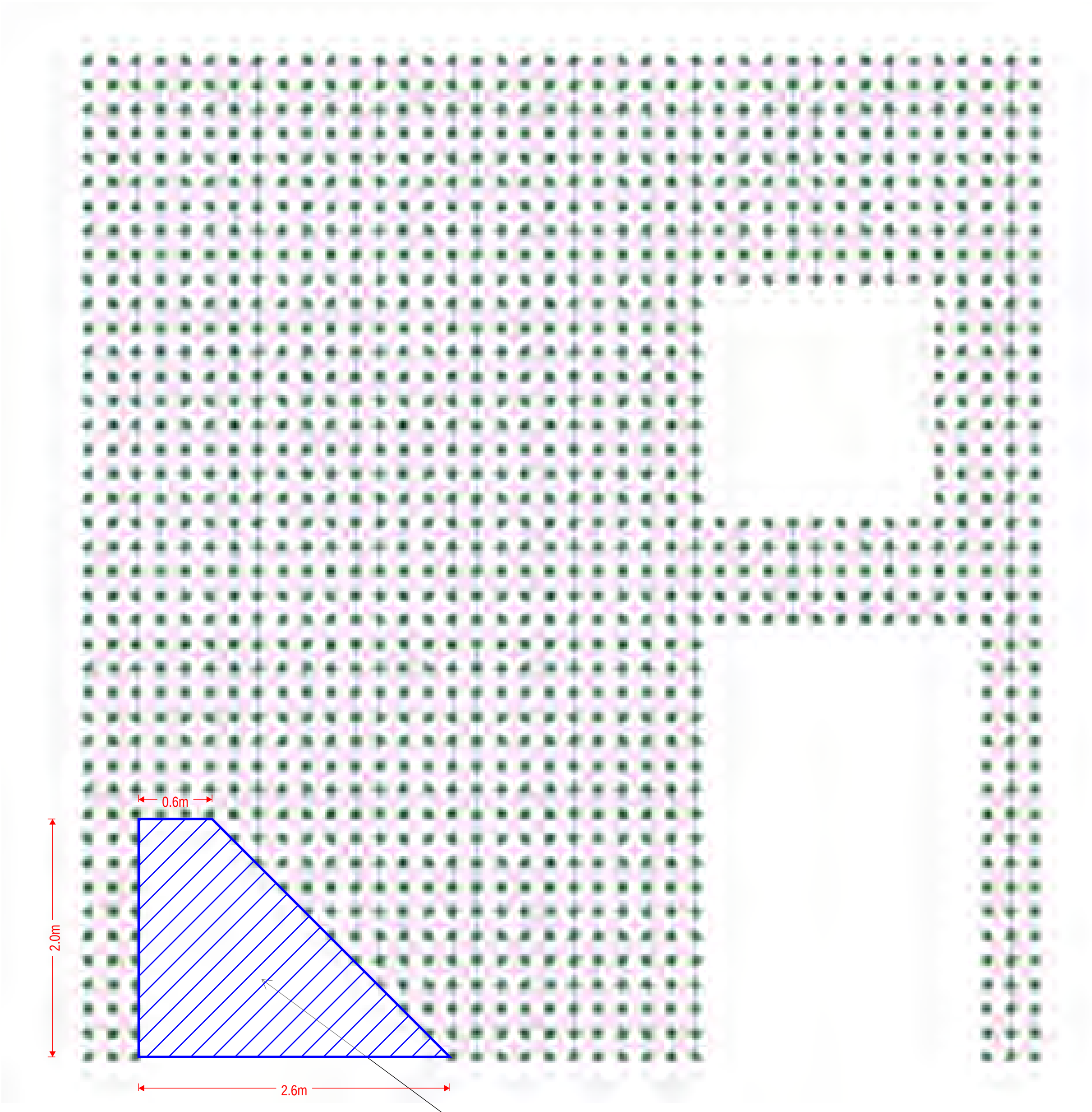
NEW POST ... ITIKA

GROUN... ANS

PUBLIC WORKS ARCHITECTURAL DIVISION

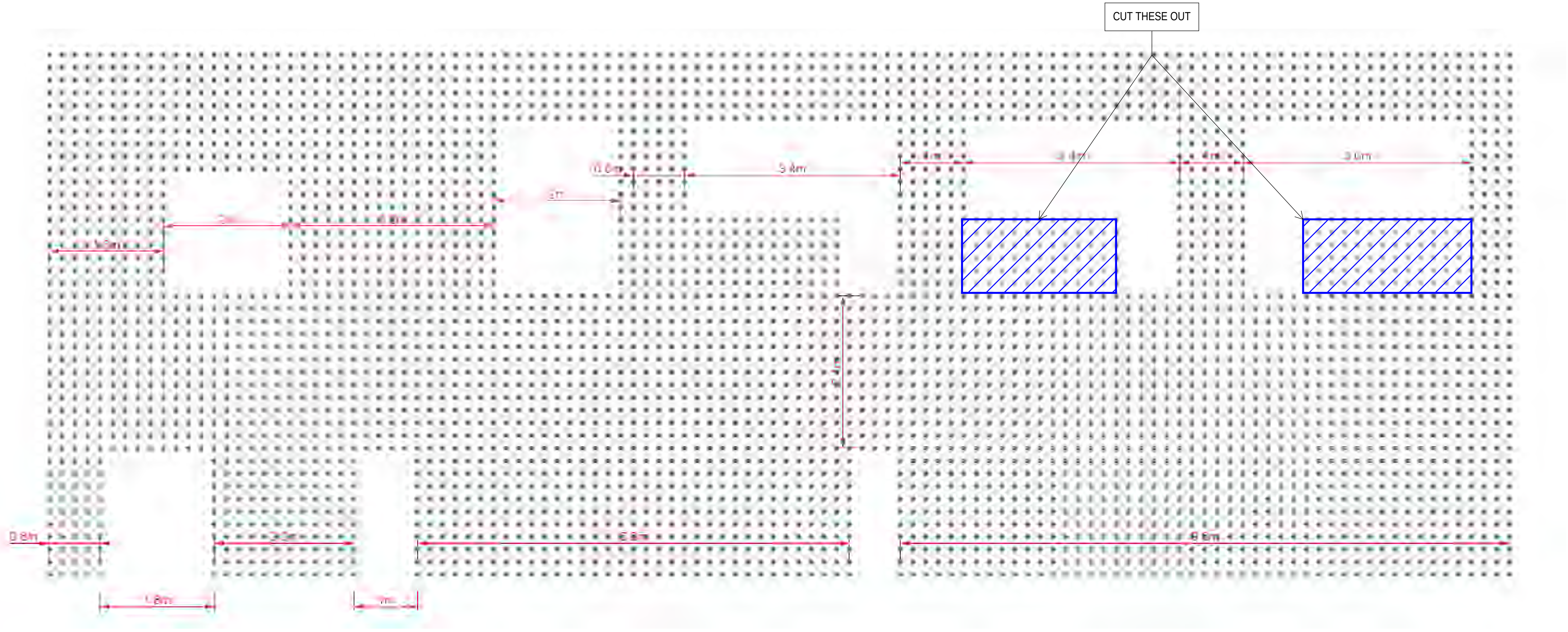
P.V. 1263

COAL BUNKER

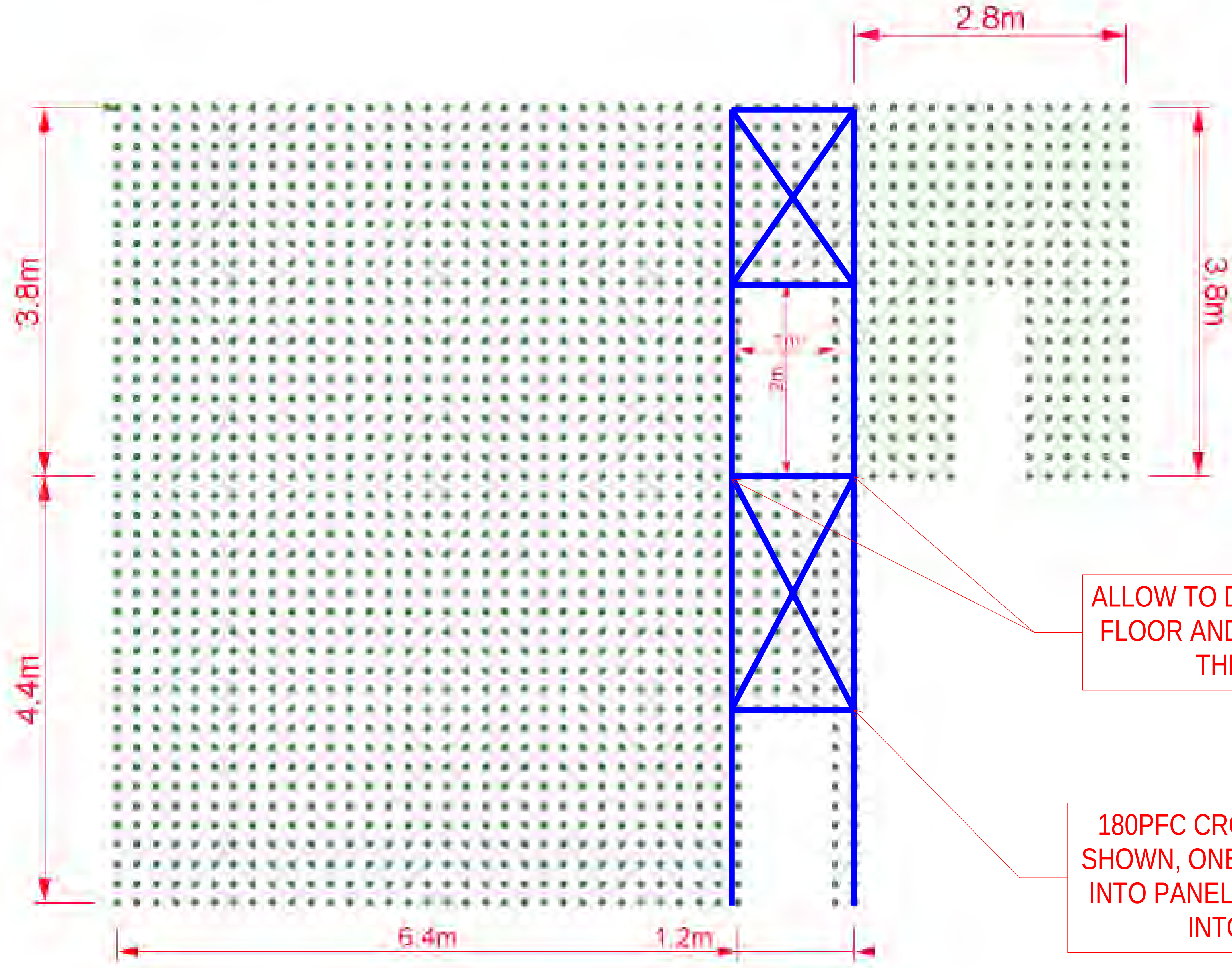


INFILL THIS
SECTION
150THK

SPINE WALL



CLERICAL WALL



ALLOW TO DRILL THROUGH FLOOR AND WELD 2/ HD32 THROUGH

180PFC CROSS-BRACING AS SHOWN, ONE SIDE ONLY, BOLT INTO PANELS, M16 AT 200CRS INTO PANELS

APPENDIX E: 67%NBS STRENGTHENING PRICE ESTIMATE

Grant Moore and Associates Ltd
Quantity Surveyors

364 Colombo Street,
Christchurch, New Zealand
Tel (03) 366-7375 or 0274 348 164

P.O. Box 1261,
Christchurch

1271ltr1

21st September 2020

Simco Consulting Ltd,
kevins@simcoconsulting.co.nz

Dear Sir,

RE: Preliminary Estimate, Strengthening Old Post Office Building, Weld Street, Hokitika

We have prepared a preliminary estimate of $1,246,000.00 (one million two hundred and forty six thousand dollars) plus GST for the above work based on the drawings supplied and verbal instructions. This is for the strengthening only and excludes non-structural work.

Attached is our estimate summary which includes exclusions at the end. It is recommended that a full estimate is prepared when the strengthening scheme is fully designed.

Yours faithfully

Grant Moore

Director

Director:

Grant Moore Reg QS, FNZIQS, MNZIOB

Estimate Summary

Job Name : 1271
Client's Name: Simco Consulting Ltd

Job Description
Post Office Building,
Weld Street,
Hokitika.

Trd No.	Trade Description	Trade %	Cost/m2	Trade Total
1	Preliminary Strengthening Estimate, Old Post Office Building, Weld Street, Hokitika.			
2	Concrete Option			
3				
4	Demolition	8.11		101,000
5	Concrete Work	22.71		283,000
6	Steelwork	20.14		251,000
7	Windows & Doors	0.32		4,000
8	Carpentry	16.85		210,000
9	Joinery	2.17		27,000
10	Plumbing	1.85		23,000
11	Electrical	1.69		21,000
12	Mechanical Services	0.40		5,000
13	Fire Protection	0.72		9,000
14	Floor Coverings	1.20		15,000
15	Lift	0.40		5,000
16	Plastering	0.72		9,000
17	Painting	3.61		45,000
18	Glazing	0.16		2,000
19	Scaffold	3.05		38,000
20				
21	Preliminaries	6.74		84,000
22	Margin	9.15		114,000
23				
24	EXCLUSIONS			
25	GST			
26	Professional Fees			
27	Contingency Sum			
28	Alterations To Existing Layout (Structural Alterations Allowed Only)			
29	Removal Of Tenants/Owners Furniture And Fittings			
30	Relocation Expenses			
31	New Floor Coverings (Toilet Included, Make Good Balance)			
32	Painting Of Existing Unaltered Surfaces			

Estimate Summary

Job Name : 1271
Client's Name: Simco Consulting Ltd

Job Description
Post Office Building,
Weld Street,
Hokitika.

Trd No.	Trade Description	Trade %	Cost/m2	Trade Total
33	Repainting Exterior (Infills Only Included)			
34	Siteworks			
35	Future Increased Costs			
		100.00		**1,246,000**

Final Total : $ **1,246,000**