Fire Designs

Designing **FIRE SAFETY** into buildings

REPORT FOR:
FIRE SAFETY
ACCESSIBILITY

ALTERATIONS TO AN EXISTING BUILDING

46 SPRING STREET
TAURANGA

- 7 February 2014
  (Issue 1)
- Reference N° 1400020

APPROVED
These plans are approved in accordance
with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

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- **FIRE ENGINEERING DESIGN**
- **BUILDING INSPECTIONS**
- **ACCESSIBILITY**
- **ACCEPTABLE SOLUTIONS FIRE DESIGN**

DOCUMENT CONTROL

Reference N^{o} 1400020

Issue	Date	Prepared / Reviewed	Status / Comments
Issue 1	07/02/2014	DOD/ PD	

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PURPOSE OF THIS REPORT

The purpose of this report is to satisfy the Tauranga City Council that the proposed alterations to the existing building will comply with the following provisions of the Building Act 2004 and amendments that relate to means of escape from fire, protection of other property, fire rating performance and access and facilities for persons with disabilities.

> **Section 17: All building work to comply with the building code.** – *All building work must comply with the building code to the extent required by this Act whether or not a building consent is required in respect of that building work.*
>
> **Section 112: Alterations to existing buildings.**
>
> (1) *A building consent authority must not grant a building consent for the alteration of an existing building, or part of an existing building, unless the building consent authority is satisfied that, after the alteration, the building will—*
>   (a) *comply; as nearly as is reasonably practicable, with the provisions of the building code that relate to –*
>   (i) *means of escape from fire; and*
>   (ii) *access and facilities for persons with disabilities (if this is a requirement in terms of section 118); and*
>   (b) *continue to comply with the other provisions of the building code to at least the same extent as before the alteration.*
>
> **Section 118: Access and facilities for persons with disabilities to and within buildings.** – *If provision is being made for the construction or alteration or any building to which members of the public are to be admitted ... reasonable and adequate provision by way of access, parking provisions and sanitary facilities must be made for persons with disabilities who may be expected to;*
>
> (a) *visit or work in that building; and*
> (b) *carry out normal activities and processes in that building.*

This report demonstrates compliance with The New Zealand Building Code Fire Safety Clauses by using the following Approved Documents:

- C/AS4 Public Access (Amendment 2, 19 December 2013)
- C/AS5 Offices (Amendment 2, 19 December 2013)
- D1/AS1 Access routes (10 October 2011)
- F6/AS1 Visibility in escape routes (10 October 2011)
- F7/AS1 Warning Systems (10 April 2012)
- F8/AS1 Signs (10 April 2012)

The fire design issues detailed in this report are the minimum required to satisfy the requirements of the Building Code. Unless specifically stated, this report does not address matters in addition to the Building Act such as owners and / or tenants property and contents protection. The owner is advised to check the acceptability of the provisions of this report with the property insurer.

This report is a performance document intended to be used by the Architects / Designers and other consultants in implementing their detailed design and preparing their working drawings and specifications. The consultants whose documentation is required to incorporate the requirements of this report are expected to have read this report, understood the implications as it affects their scope of work and have incorporated the relevant fire safety requirements, including incorporating a Fire Engineering Design plans into their drawings and specifications.

This report deals specifically with the requirements of this project and this client. It is not intended for any other purpose or to be used by any other parties.

Matters concerning an evacuation scheme under the Fire Safety and Evacuation of Buildings Regulations 2006 should be discussed directly with the New Zealand Fire Service.

Compliance Schedule
There are specified systems identified in this report that are required to be recorded on a Compliance Schedule. Please refer to Section Fire Compliance Schedule Items on page 18 of this report.

Fire Service Design Review Unit
In accordance with Section 46(1) of the Building Act 2004 certain applications for Building Consent must be provided to the New Zealand Fire Service Commission for review by the Fire Service Design Review Unit (DRU).

- As the building works subject to this report does not fit within the criteria under Clauses 1, 2, and 3 as listed in the DBH Gazette Notice No 49 effective 7 May 2012, this application is NOT required to be forwarded to the DRU.
- Please refer to Section Fire Service Design Review Unit on page 20 of this report.

End of Section

SCOPE / DOCUMENTATION

The proposal is to carry out seismic strengthening works to the existing three level building.

Fire Designs considers this design to be alterations to an existing building. The alterations are assessed in terms of compliance with the building code for means of escape in accordance with section 112 of the Building Act 2004.

The primary method of construction of the building is concrete columns and beams with concrete mid-floor levels.

Three stairs provide for the means of escape from the first floor with two stairs from the top floor level.

The following drawings / documentation has been reviewed in the compiling of this fire engineering design report for general compliance with IPENZ Practice Note 22. To ensure that the specific fire safety requirements are clearly identified, it is recommended that "Fire Engineering Design" drawings be included in the building consent submission set.

General Description	Sheets	Revision	Date
Existing ground floor plan	A1101	-	28 Jan 14
Existing first floor plan	A1102	-	28 Jan 14
Existing second floor plan	A1103	-	28 Jan 14

In accordance with NZBC Clause A3, this building is classified as Importance **Level 2**

- Buildings posing normal risk to human life or the environment, or a normal economic cost, should the building fail.

A site visit was carried out by David O'Donnell for Fire Designs Limited on the 30th January 2014.

The building has a current Building Warrant of Fitness (BWoF No. 226).

The following Fire Safety Precautions as per the New Zealand Building Code (NZBC) C/AS4, Table 2.1 are installed in the building:

- An automatic fire sprinkler system.
  This system is connected to the NZ Fire Service (PFA No. 220075).

The following specified systems as set out in the Compliance Schedule Handbook are installed in the building:

- **SS 1** Automatic systems for fire suppression.
- **SS 2** Automatic or manual emergency warning systems for fire or other dangers.
- **SS 4** Emergency lighting systems.
- **SS 8** Lifts, escalators, travelators, or other systems for moving people or goods within buildings
- **SS 14** Emergency power systems for, or signs relating to, a system or feature specified in any of SS 1 to SS 13.
- **SS 9** Mechanical ventilation or air conditioning systems.
- **SS 14** Emergency power systems for, or signs relating to a system or features specified in any clauses 1 – 13 (SS 14/2)
- **SS 15** Other fire safety systems or features (systems for communicating information intended to facilitate evacuation, final exits, fire separations, signs, fire separations).

End of Section

GAP ANALYSIS

The following Table summarises the areas of non-compliance to C/AS4 & 5 and how full compliance will now be achieved to a nearly as reasonably practicable (ANARP) solution.

	Existing building	C/AS4 Compliance	Action
PART 2: Firecells, fire safety systems and fire resistance ratings			
Fire Safety Systems	Type 6: Automatic fire sprinkler system with manual call points	Type 4: Automatic fire alarm system with smoke detection and manual call points	***Upgrade fire alarm system to Type 7 See Part 2***
	No smoke control in HVAC system	Type 9: Smoke control in air handling	***Install smoke control in HVAC system See Part 2***
PART 4: Control of internal fire and smoke spread			
FRR's	Building constructed to achieve a 30/30/30 FRR	30/30/30 FRR required (Sprinkler protected)	Compliance achieved
Doors	Existing fire doors installed	-/30/-Sm fire doors required with smoke seals	***Upgrade existing doors by installing intumescent smoke seals (ANARP) See Section 4.9***
Fire stopping	Penetrations in mid floors	Fire stop all penetrations in mid-floors	***Appropriately fire stop penetrations in the fire rated mid-floor levels See Section 4.4***

End of section

C/AS5: PART 1 GENERAL

1.1 Introduction and Scope

Table 1.1 Risk Group:

CA/ WB	Retail shops & Offices (Ground floor)
CA	Gymnasium & Bohemian Tattoo (Level 1)
WB	Office tenancies (3) (Level 2)

1.2 Using this Acceptable Solution

The primary risk group shall be that one within the firecell that has the most onerous fire safety requirements.

The primary risk group for this building is **CA.**

1.3 Alterations and change of use to buildings

If this Acceptable Solution is being used for an assessment of new building work that is an 'alteration' to an existing building, Parts 2, 3, 4 and 6 of this Acceptable Solution shall be considered to the extent necessary for compliance with the Building Act.

1.4 Calculating occupant loads

Table 1.2 Occupant densities for risk group CA & WB

Activity	Area (m^2)	m^2 / person	Occ. Load	Total
GROUND FLOOR				
Tenancy A - Safe path stair	27	n/a	-	
Tenancy B - Diamond Design	91.5	5	18	
Tenancy C - Spring Cafe	100	1.1	91	
Tenancy D - Ray White	74	10	7	
Tenancy E - Langtons Lingere	156	5	31	
Tenancy F - GR8 4U	118	5	24	
Tenancy G - Gregory	110	5	22	
Tenancy H - Blur	94	10	9	
Tenancies I & J - Ray White offices	157	10	16	
Storage	89	n/a	-	218
1st FLOOR				
Tenancy A - Gymnasium	691	5	138	
Tenancy A – Consulting rooms	125	10	13	
Tenancy A – Offices	105	10	10	
Tenancy K - BohemianTattoo	148	10	15	176
2nd FLOOR				
Offices	745	10	75	75

End of Part 1

C/AS5: PART 2 FIRECELLS, FIRE SAFETY SYSTEMS & FIRE RESISTANCE RATINGS

2.2 Fire safety systems

Table 2.1 Fire safety systems

Primary Risk group	CA/ WB
Escape height	>4.0m but ≤25m
Occupant Load	100 to 1000
Alarm Type	See note [1]
Other precautions	9[2], 18[3]

Notes:

1. **Fire Alarm System**

   An existing Type 6 automatic fire sprinkler system is installed throughout the building to NZS 4541. This system is to remain in the building.

   Upgrade the existing fire alarm system to meet the requirements of a **Type 7** automatic fire sprinkler and smoke detection system.

   - In areas where smoke detectors cannot be installed due to steam or moisture the sprinkler heads will meet the requirements of heat detectors.
   - Installation of the smoke detection component of the fire alarm system is to be in accord NZS 4512:2010 and be certified as a compliant system by an accredited inspection body (NZS 4512:2010: 107.1(e)).
   - Smoke detectors shall be installed in the three safe path stairs.
   - A direct connection to a certified fire alarm monitoring company is required for the sprinkler and smoke detection systems.

   Note: During the inspection it was noted that sprinkler heads on the first floor where installed up against an office partition wall. Have the fire alarm agent survey the system to ensure compliance with NZS 4541.

2. **Smoke Control System (Type 9)**

   Smoke control is required in the HVAC system it shall comply with the requirements of either:

   a) AS/NZS 1668: Part 1 and interface with any Type 4 or 7 system installed if it is self-contained detection, control and provision of output signal/alarm, or

   b) NZS 4512 to provide ancillary function output for control of the HVAC system if a Type 4 or 7 alarm system is used as a means of smoke detection.

3. **Fire Hydrant System (Type 18)**

   A fire hydrant system is not required as the hose run distance from a parked appliance is <75m.

2.3 Fire resistance ratings (FRR)

2.3.2 If a sprinkler system is provided, the FRR for risk group CA/ WB shall be:

Life Rating = **30 minutes**	Applies to this building/ report
Property rating = **60 minutes**	Does not apply to this building/ report

End of Part 2

C/AS5: PART 3 MEANS OF ESCAPE

3.1 General principles

3.1.1 All buildings shall have means of escape from fire which include escape routes.
An escape route (see Figure 3.1) shall provide protection to any occupant escaping to a safe place from a fire within a building.

- The three internal stairs are fire separated from all adjacent spaces on each floor by existing 30 minute FRR's (See Section 4.9)

3.2 Number of escape routes

GROUND FLOOR

A single designated means of escape is provided from each tenancy via the main front entrance door direct to the outside or alternatively into the common arcade walkway where there are two directions of escape leading to a safe place.

The means of escape from the storage/ carpark area is via the door leading direct to the outside

FIRST FLOOR

Bodyzone

Three designated means of escape are provided from the tenancy via the safe path stairs leading direct to the outside at ground level.

Bohemian Tattoo

Two means of escape are provided from the tenancy via the doors leading into the safe path stairs.

SECOND FLOOR

Two designated means of escape are provided from the tenancy via the safe path stairs leading direct to the outside at ground level.

3.3 Height and width of escape routes

The minimum widths of the escape routes are to be 850 mm where the occupant load is >50 people

Doors subdividing accessible routes of travel are to be no less than 760 mm clear open width.

In all other instances the minimum widths of the escape routes are permitted to be 700 mm for horizontal travel.

Accessible escape routes must have a minimum width of 1200mm horizontal and 1100mm vertical travel.

3.4 Length of escape routes

Table 3.2 Travel Distances on escape routes for risk group CA & WB

Area	Primary Risk Group	Dead End Open Path[1]		Total Open Path[1]	
		Permitted	Actual[2]	Permitted	Actual[2]
GROUND FLOOR					
Diamond Design	CA	50	24	120	n/a
Int floor storage	WB	75	<33[3]	150	n/a
Spring Cafe	CA	50	17	120	31
Ray White	WB	75	33	150	n/a
Int floor storage	WB	75	<46[3]	150	n/a
Langtons Lingere	CA	50	21	120	n/a
Int floor storage	WB	75	<33[3]	150	n/a
GR8 4U	CA	50	19	120	n/a
Gregory	CA	50	18	120	n/a
Blur	CA	50	32	120	n/a
Ray White offices	WB	75	27	150	n/a
Storage area	WB	40	22	100	n/a
FIRST FLOOR					
Gymnasium	CA	50	16	120	52
Bohemian Tattoo	CA	50	12	120	24
SECOND FLOOR					
Offices	WB	75	13	150	43

Notes:

[1] The lengths of the escape routes are shown in metres with the permitted increase where a Type 7 fire alarm system is installed.

[2] The distances of travel are the worst case from each vacant floor area to a safe place outside or into the safe path stairs.

[3] On an intermediate floor the length for compliance with Table 3.2 shall be taken as 1.5 times the measured length. The 1.5 times the measured length only applies to the floor level and not the measured length of the stairs. The measured length of the stairs is to be multiplied by 1.2, the landing measured length is to be multiplied by 1.0.

[4] The Risk Group with the shortest maximum length is to be used where multiple Risk Groups use the same escape route (C/AS5 3.4.2 (b)).

3.9 Exitways

The three stairs from the upper floor levels are designed as safe paths (exitways) and are fire separated from all adjacent spaces by 30 minute FRR's including -/30/-sm fire doors (See Section 4.9).

3.10 Control of exitway activities

The safe path stairs shall not be used for storage of combustibles

The lift in the safe path on the ground floor meets the requirements of paragraph 3.10.3.

Smoke control on the lift landing doors is not required as a Type 7 fire alarm system is installed.

3.13 Single escape routes

A single means of escape from some of the tenancies is acceptable as the dead end open path is less than the allowable limits, the occupant load in each area is less than 50 and the escape height is less than 25m as the building is sprinkler protected.

3.15 Doors subdividing escape routes

On the doors subdividing accessible routes of travel the unlocking and opening motion is to be a single lever or push / pull action (D1/AS1 paragraph 7.0).

All other doors subdividing escape routes are to be fitted with night latches that are not capable of being locked from the inside, preventing escape.

Door subdividing escape routes capable of being used by >50 people are to swing in the direction of escape.

Vision panels are installed in the existing fire doors leading into the safe path stairs.

3.16 Signs

All escape routes shall have signs complying with NZBC F8.

Doors designated as fire or smoke control doors shall have signs on both sides of the leaf's adjacent to the handles or push plates stating 'Fire Door, Please Keep Closed'.

Existing illuminated EXIT signs are installed in the building. Have a suitably qualified person survey the signage after the alterations and floor layouts are completed.

- Design and installation of the illuminated signs is to be in accordance with AS 2293.1:2005.

End of Part 3

C/AS5: PART 4 CONTROL OF INTERNAL FIRE & SMOKE SPREAD

4.1 Firecells

- A 30/30/30 FRR is required as the building is sprinkler protected.

GROUND FLOOR

The ground floor is a single firecell fire separated from the three safe path stairs.

FIRST FLOOR

The floor level is designed as a separate firecell fire separated from the three safe path stairs.

SECOND FLOOR

The floor level is designed as a separate firecell fire separated from the two safe path stairs.

4.4 Fire stopping

The continuity and effectiveness of fire separations shall be maintained by approved fire stops.

- All electrical sockets and switches penetrating fire rated walls are to have approved fire rated switch boxes and intumescent pads.
- All electrical fittings, wiring etc penetrating the fire rated mid-floor are to be installed in approved fire rated enclosures and wiring through approved fire collars or mastics that achieve the minimum required FRR.
- All uPVC and plastic and metal pipes penetrating fire rated walls, floors and ceilings to be fitted fire rated collars.
- Fire stopping collars, wraps, etc. are to be tested and installed in accordance with AS 4072.1:1992.
- Any ventilation ducts penetrating fire rated mid-floors are to be fitted with approved fire rated dampers or similar to achieve the minimum required FRR.

During the inspection it was noted that the multiple PVC pipes penetrate the concrete mid-floor level in the storage/ carpark area on the ground floor. Have all these pipe penetrations installed with fire collars [Photo 1]

It was also noted that a HVAC duct penetrated the mid-floor that did not appear to be installed with a fire damper. Have a suitably qualified HVAC engineer survey the system to ensure that fire damper/s are installed in any ducting penetrating fire rated floors or walls.

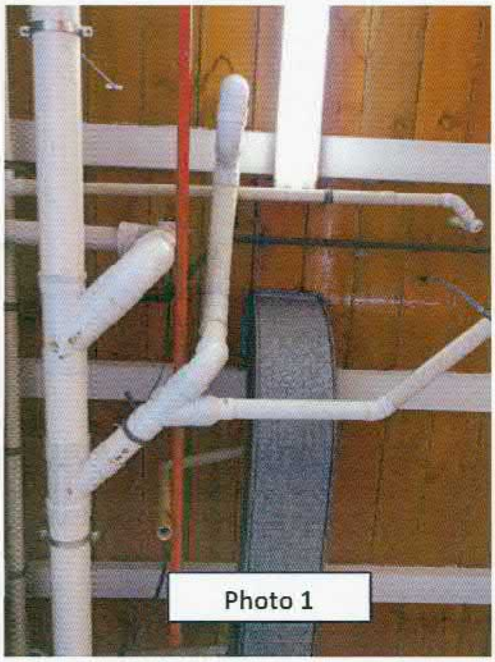


Photo 1

In the Gregory tenancy on the ground floor air conditioning pipes and wiring penetrated the fire rated mid-floor. Appropriately firestop the penetrations with fire rated collars [Photo 2].

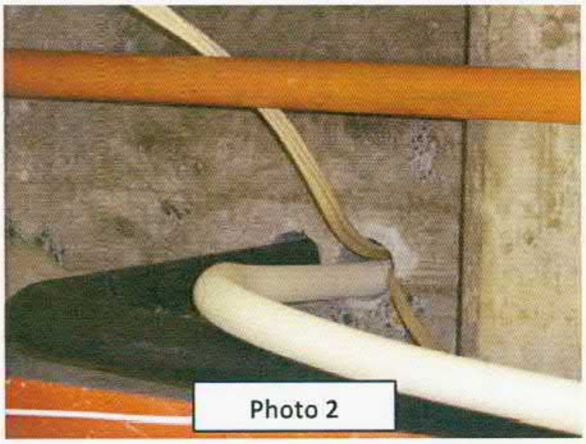


Photo 2

4.9 Exitways

There is no requirement to provide smoke lobbies before the safe path stair from each floor level as the building is sprinkler protected.

The escape height from the building is less than 10m. The FRR is required to be 30 minutes.

The existing safe path stairs are fire separated from all adjacent floor spaces by 30 minute FRRs by:

GROUND FLOOR

- The existing concrete walls and concrete stair construction.
- The existing timber framed walls separating the stairs from the ground floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the concrete mid floor. These walls are considered to achieve a 30 minute FRR – OK.

FIRST FLOOR

Stair 1

- The existing timber framed walls separating the stair from the floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the concrete mid floor. These walls are considered to achieve a 30 minute FRR – OK.
- The existing door leading into the stair from the gymnasium tenancy is a 36mm solid core door installed with Georgian Wired Glass (GWG) vision panels, self-closer and 35mm x 20mm door stops.

  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable.
- The three existing Georgian Wired Glass sidelight panels adjacent the main entrance fire door are considered to achieve a 30 minute FRR – OK.

Stair 2

- The existing timber framed walls separating the stair from the floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the concrete mid floor. These walls are considered to achieve a 30 minute FRR – OK.
- The existing door leading into the stair from gymnasium tenancy is a 42mm solid framed door installed with two 640mm x 580mm GWG glass panels, self-closer and 35mm x 25mm door stops.

  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable.

Stair 3

- The existing timber framed walls separating the stairs from the floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the concrete mid floor. These walls are considered to achieve a 30 minute FRR – OK.
- The existing door leading into the stair from gymnasium tenancy is a 42mm solid framed door installed with GWG glass vision panels, self-closer and 35mm x 25mm door stops.

  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable.
- The existing door leading into the stair from Tattoo tenancy is a 42mm solid framed door installed with two 640mm x 580mm GWG glass panels, self-closer and 35mm x 25mm door stops.

  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable.

SECOND FLOOR

Stair 1

- The existing timber framed walls separating the stair from the floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the roofing system. These walls are considered to achieve a 30 minute FRR – OK.
- The existing door leading into the stair from floor level is a 42mm solid framed door installed with two 640mm x 580mm GWG glass panels, self-closer and 35mm x 25mm door stops.
  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable.

Stair 2

- The existing timber framed walls separating the stair from the floor spaces are lined with existing plasterboard linings. These walls continue up above the suspended ceiling system to the underside of the roofing. These walls are considered to achieve a 30 minute FRR – OK.
- The existing door leading into the stair from the floor level is a 42mm solid core door installed with GWG glass vision panels, self-closer and 35mm x 25mm door stops.
  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable. Adjust the self-closer so the door latches closed.
- The existing door leading into the stair from the ablution area of the floor level is a 42mm solid core door installed with GWG glass vision panels, self-closer and 35mm x 25mm door stops.
  Upgrade the door by installing intumescent smoke seals to the door frame. This will achieve a -/30/-sm fire door to as nearly as is reasonably practicable. Adjust the self-closer so the door latches closed.
  (Also refer to the Fire Plans at the rear of this report for details).

4.11 Protected shafts

Ensure all services are fully fire stopped at each floor level as detailed in Section 4.4 above, then there is no requirement to enclose them in a fire separated protected shaft systems.

4.13 Floors

4.13.1 Full Floors

- The existing mid floor levels and the supporting elements are concrete which achieves the 30 minute FRR required.

4.13.4 Intermediate Floors

- The three existing intermediate floors on the ground floor level are lined with existing plasterboard linings which is considered to achieve the 30 minute FRR required.

4.13.5 Intermediate Floor Conditions

The intermediate floor meets the requirements of this paragraph

4.13.6 Intermediate Floor Areas

Ground floor area (m^2)	Open Int. floor (m^2)	Enclosed Int. floor (m^2)	Percentage (%)	Fire Alarm
1327	n/a	76	6	n/a [1]

Note 1: A Type 7 automatic fire alarm system is to be installed in the building.

4.15 Concealed spaces

The existing fire rated walls terminate at the underside of the concrete mid floor levels and at the underside of the roof cladding on the top level with any gaps fully fire stopped.

4.16 Closures in fire and smoke separations

The upgrading of existing fire doors has been detailed in section 4.9 above.

4.17 Interior surface finishes, floor coverings and suspended flexible fabrics

4.17.1 Surface finishes for walls and ceilings

Existing surface finishes are generally painted finishes on paper faced plasterboard wall and ceiling linings. These surface finishes are deemed to comply with the appropriate SFI, SDI values that correspond to the Group No 2.

All new surface finishes are to comply with Table 4.1.

Table 4.1 Surface finishes

Space	Surface	Group No
Exitways	Wall & ceiling linings	2
Crowd spaces	Wall linings	3
Crowd spaces	Ceiling linings	2
All other occupied spaces	Wall & ceiling linings	3 (sprinkler protected)
Ducts for HVAC systems	Internal surfaces	2
Ducts for HVAC systems	External surfaces	3

4.17.4 Flooring

All new floor coverings are to comply with Table 4.2.

Table 4.2 Critical radiant flux requirements for flooring

Space	Minimum Critical Radiant Flux
Exitways in all buildings	2.2 kW/m^2
Occupant load >50 people	1.2 kW/m^2
All occupied spaces	1.2 kW/m^2

4.18 Building services plant

The smoke detection system shall automatically turn off all mechanical ventilation which are not required for fire safety.

End of Part 4

C/AS5: PART 6 FIREFIGHTING

6.1 Fire service vehicular access

Street access is provided to within 20m of the front of the building and the Fire Service sprinkler inlet for fire fighting purposes.

6.2 Information for firefighters

The existing fire alarm indicator panel and Fire Service sprinkler inlet are located in a position close to the Fire Service attendance point and in accordance with NZS 4512 and NZS 4541.

End of Part 5

F6 / AS1 Visibility In Escape Routes

Lighting for emergency.

Engage the services of a suitably qualified person to survey the existing emergency lighting system and extend to all levels of the building, ensuring compliance with NZBC F6 Visibility in Escape Routes.

End of Section

D1 Access Routes

Clause D1.3.2

An accessible toilet is provided in the building, designed to G1/AS1.

Clause D1.3.4

Accessible routes to have signs (symbols of access ♿) complying with NZBC F8.

Accessible lift to comply with Clause D2 “Mechanical installation for Access”.

Paragraph 1.3 Threshold weather stops

The threshold weather stop at accessible entrance is to be not > 20mm high.

Paragraph 2.1 Slip resistance

Slip resistance for access routes for walking surfaces to comply with Table 2.

Paragraph 2.2 Width

The clear width of an accessible route shall be no less than 1200 mm.

Paragraph 4.0 Stairway

The main entrance stairway is to be upgraded by providing continuous handrails each side of the stair. This will achieve an accessible stair to as nearly as is reasonably practicable.

The other two stairs meet the requirements of common stairs.

Paragraph 7.0 Doors

Doors subdividing accessible routes of travel into and within the building shall have at least a 760mm clear opening, be capable of being opened with one hand and have a lever action operation for locks and latches.

End of Section

Fire Compliance Schedule Items

Fire Designs Limited has reviewed the Specified Systems listed below and has identified the systems pertaining to the building as identified by this report. Fire Designs Limited does not guarantee that the Specified Systems identified below are the only systems pertaining to the building. Please ensure that a comprehensive check of all possible systems is carried out when completing the Compliance Schedule.

Existing Compliance Schedule Number: 226 **Expiry Date: 02/06/2014**

SS	Specified System	Maintenance to:	Inspections to:	New	Existing /Modify
1	Automatic systems for fire suppression **Type: 6** (As part of Type 7 system) Performance standard: NZBC: C3, F7	NZS 4541	NZS 4541		✓
2	Automatic or manual emergency warning systems for fire or other dangers **Type: 4** (As part of Type 7 system) Performance standard: NZBC: F7	NZS 4512:2010	By IQP: NZS 4512:2010	✓	
3/3	Interfaced fire or smoke doors or windows Performance standard: NZBC: C2, C3	AS 4085:1992 appendix A NZS4239:1993 appendix A	AS 4085:1992 appendix A NZS4239:1993 appendix A Daily inspections by owner for crowd type occupancies. Monthly inspections for all other occupancies with annual inspection & maintenance by IQP.		✓
4	Emergency lighting systems including Illuminated EXIT signage Performance standard: NZBC: F6, F8	AS/NZS 2293.2:1995 Section 3	AS/NZS 2293.2:1995 Section 3 by IQP		✓
8/1	Passenger carrying lifts Performance standard: NZBC: D2	NZS 4332:1997 part 2.5 BS EN 81:2003 D2/AS3 BS EN 81:2003	By IQP to: NZS 4332:1997 part 2.5 BS EN 81:2003 D2/AS3 BS EN 81:2003		✓
9	Mechanical ventilation or air conditioning systems Performance standard: NZBC: G4 COBSE Handbook ASHRAE Handbook	NZS 4302:1987 part 2 AS 1851:2005 section 6	By IQP to: NZS 4302:1987 part 2 AS 1851:2005 section 6 AS/NZS 3666.2:2002 AS 1851:2005 section 18 If fitted with smoke / Fire control		✓
14/2	Signs relating to specified systems Performance standard: NZBC: F8	NZS 4512:2010	By IQP to: NZS 4512:2010		✓

15/2	Final exits Details: Refer to Fire Plans Performance standard: NZBC: F6	Maintained in a safe condition: freedom from obstructions, locking, blocking, barring, storage of combustibles and ease of opening any door leading into the escape route and at the final exit.	Fire Safety & Evacuation of Building Regulations 2006. Compliance Schedule Handbook 2011. Daily inspections by Owner for crowd type occupancies. Monthly inspections for all other occupancies with annual inspection & maintenance by IQP.		✓
15/3	Fire separations as shown on the fire plan in this report Performance standard: NZBC: C1 – C6	AS 1851:2005 Section 17 Compliance Document C/AS4 Fire Safety	AS 1851:2005 Section 17 Compliance Document C/AS4 Fire Safety Daily inspections by owner for crowd type occupancies. Six monthly inspections for all other occupancies with annual inspection & maintenance by IQP.		✓
15/4	Signs for communicating information intended to facilitate evacuation Type: **EXIT** Performance standard: NZBC: F8	Immediate replacement or refurbishment of signs if missing, incorrect or illegible	Daily inspections by owner for crowd type occupancies. Monthly inspections for all other occupancies with annual inspection & maintenance by IQP.		✓

End of Section

Fire Service Design Review Unit

In accordance with Section 46(1) of the Building Act 2004 certain applications for Building Consent must be provided to the New Zealand Fire Service Commission for review by the Fire Service Design Review Unit (DRU).

1	**Section 21A of Fire Service Act 1975**	**Yes**	**No**		
	1(a) 100 or more people present?	✓			
	1(b) Employment for >10 people?	✓			
	1(c) Accommodation for >5 people?		✓		
	Section 1 Triggered?			Yes	
	2(a) 100 or more people present?		✓		
	2(b) Storage or processing of hazardous materials?		✓		
	2(c) Early childcare facilities?		✓		
	2(d) Specialised Nursing, medical or geriatric care provided?		✓		
	2(e) Specialised care for people with disabilities?		✓		
	2(f) People in Lawful detention?		✓		
	Section 2 Triggered?			Yes	
	Evacuation Scheme required in terms of Fire Service Act?				Yes
2	**Building Act**	**Yes**	**No**		
	(a) Compliance by means <u>other than</u> Clauses				
	(i) C1 - 6		✓		
	(ii) D1/AS1		✓		
	(iii) F6/AS1		✓		
	(iv) F8/AS1		✓		
	Section (a) Triggered?			No	
	(b) Modification or Waiver of Clauses				
	(i) C1 - 6		✓		
	(ii) D1/AS1		✓		
	(iii) F6/AS1		✓		
	(iv) F8/AS1		✓		
	Section (b) Triggered?			No	
	(c) Fire safety system affected? (except minor)		✓		
	Section (c) Triggered?			No	
	Building Act trigger(s)?				No
3	**Household Units & Fit-outs**				
	Section 3 Triggered?				No
	DBH Gazette Notice No 49 dated 3 May 2012				
	Are there at least two triggers (must include section 1) from column 6?				No
	Is the Building Consent Authority required to forward a copy of this application to the DRU of the Fire Service Commission for comment on matters relating to *means of escape from fire,* and the *requirements for fire fighting?*				**No**

Appendix A: Fire Plans

Protective Coatings Specification

TG-2012-115103

carboline
Coatings - Linings - Fireproofing

Altex Coatings Limited
PO Box 142
TAURANGA
New Zealand

Phone: (64-7) 541-1221
Fax: (64-7) 541-1310

Supercedes : 11311
Spec Type : New
Job Name : 18526 - A & J: Standard Specifications
Description : System 03: Interior/ Exterior Steelwork ...Three coat high gloss finish
Location : Tauranga, New Zealand
Environment : Interior/ Exterior moderate to coastal Cat B: Low – Cat D: High
Substrate : Mild Steel

Company : Arnold & Johnstone Ltd
Contact : Richard Arnold
Address : PO Box 933
Title :
City : Tauranga
Postcode :
Region : Bay of Plenty
Phone : 07 578 0921
Country : New Zealand
Email : richard@ajeng.co.nz

Surface Preparation

Where necessary, grind sharp edges to a smooth 2 mm radius before blasting.
Abrasive blast to SSPC SP10 (Sa2.5) to achieve a uniform jagged blast profile of between 35 and 50µm.
Apply Coat 1 to the prepared SP10 substrate.
Apply full coats of Coats 2 and 3.
All surfaces must be clean and dry before painting

Coating System

Product	Coating	Colour	TC	WFT	DFT	MR	MinRC	MaxRC	Thin	Note
1 - Carbozinc 859 EZ2	full prime		9.3	107	75	4:1	1.5 hrs	1 mth	#2	
2 - Carboguard 690	full coat		5.3	188	150	4:1	2 hrs	7 days	#2	
3 - Carbothane 134 HG	full coat		11.7	86	60	4:1			#25	

TC = Theoretical coverage m2/litre
WFT = Wet Film Thickness um
DFT = Dry Film Thickness um
MR = Mix ratio by volume

MinRC = Recoat Minimum@20°C/50% RH
MaxRC = Recoat Maximum@20°C/50% RH
Thin = Thinner(Spray)

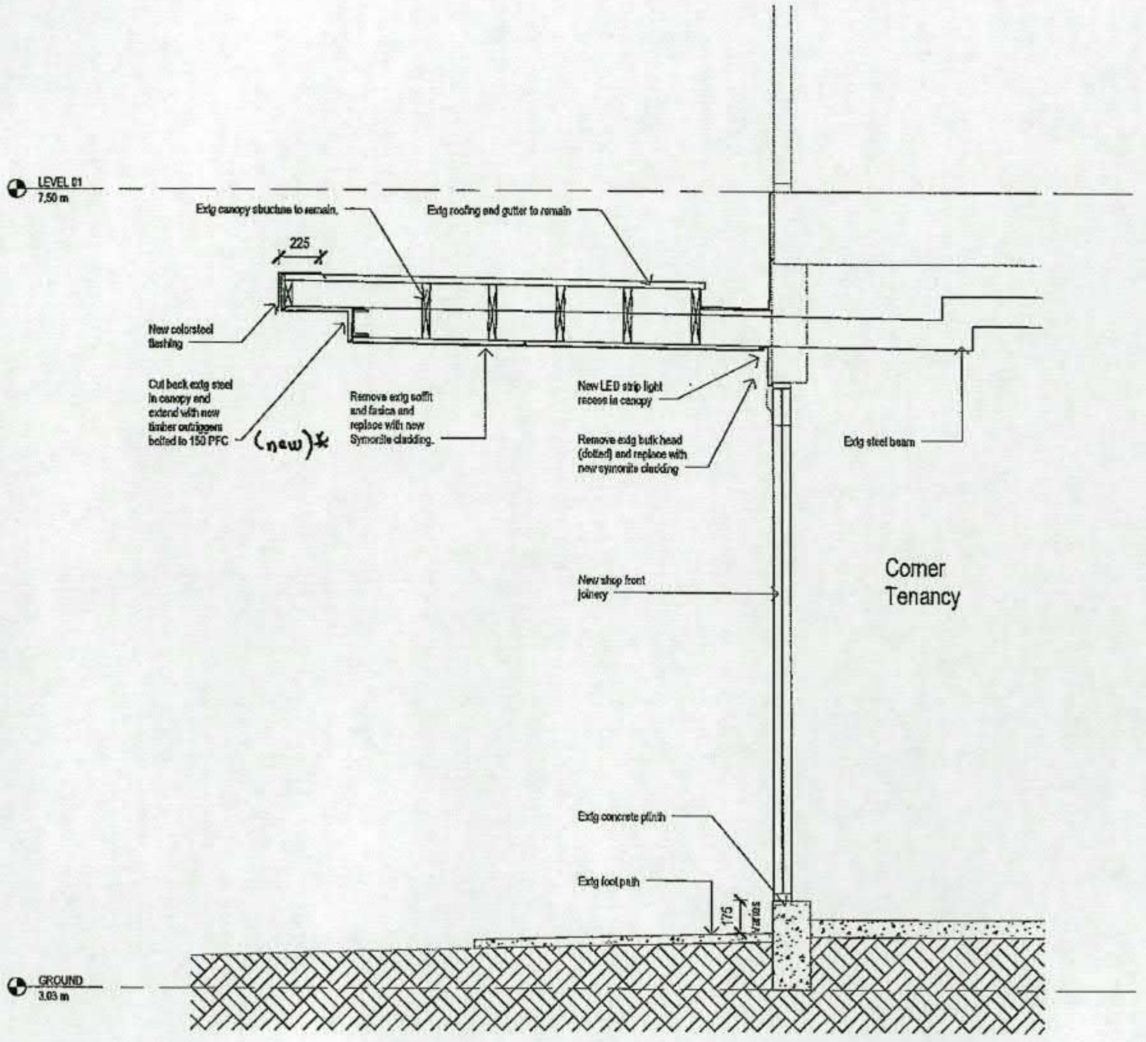
Notes

Complies with AS/NZS 2312:2002 system PUR4, 15 to 25 years for an exterior coastal environment category C: medium (35 µm rust/ year, ISO 9223 category 3).

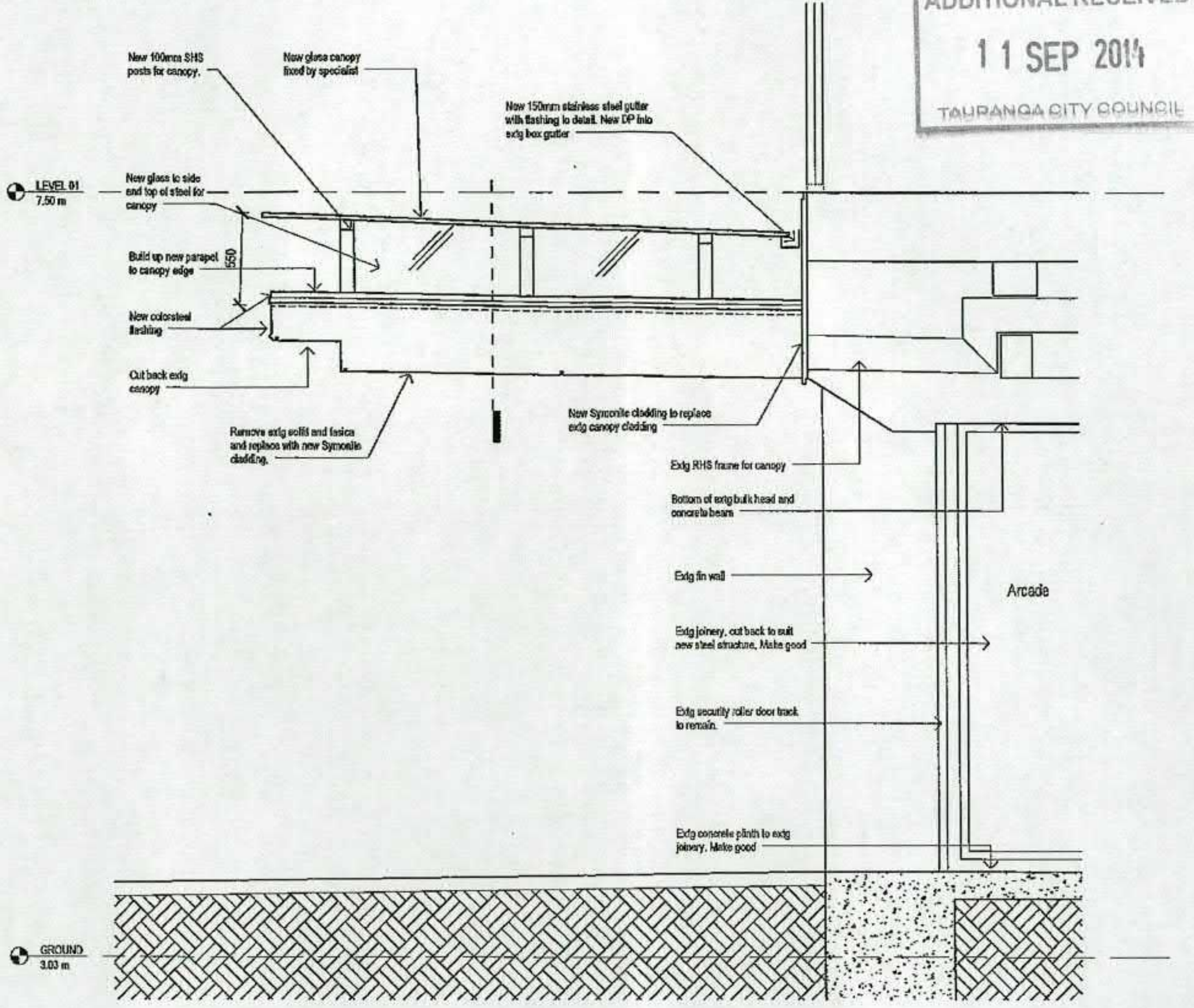
Repair of weld damaged and mechanically damaged areas:
Degrease in accordance with SSPC SP1 to remove all soluble contamination. Power tool clean to SSPC SP3 all weld damaged areas. Lightly abrade overlap area and sand topcoat mechanically damaged areas to a fine matt finish. Spot prime all SP3 prepared areas with Carbozinc 858 applied at 75 µm DFT. Allow to cure for 3 hours minimum. Spot coat with Coats 2 and 3, all spot primed areas, progressively lapping over original paint.
NB: DO NOT exceed maximum recoat times

Issue Date:	Authorised By:	Issued By:	Written By:
Friday, 10 August 2012	Neil Adamson	Elliot Gaensicke	Neil Adamson

- For specific details referred to in the above specification, please refer to the relevant product or material safety data sheets
- Spray application is normally recommended. Suitable equipment may include airless/air assisted airless /HVLP or conventional pressure pot equipment
- If the specified thickness is not achieved in one coat, additional coats must be applied to meet the specified D.F.T. Stripe coats should be brush applied.
- Any contamination or moisture which occurs between coats must be removed by suitable means before applying successive coats in the system.
- Care must be taken handling and applying all paint coatings. All stated minimum and maximum recoat times are based on 20°C/50% RH.
- This specification has been issued in good faith based on information given by the Client at the time of issue. Altex Coatings Ltd has taken all reasonable steps to ensure the specification meets the needs of the client but reserves the right to amend or withdraw the specification if (a change in conditions so dictate)

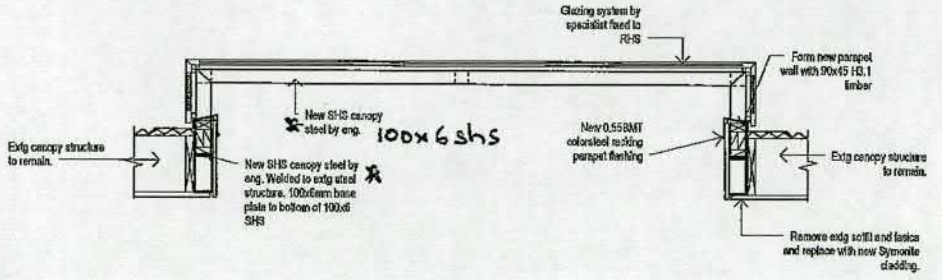


2
A1400
Corner Shop Front canopy
A1 SCALE 1 : 20

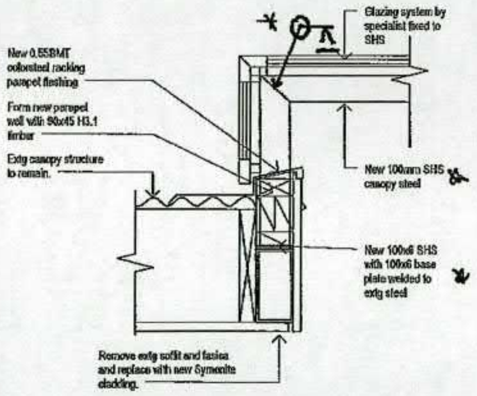


1
A1400
New Canopy Grey Street
A1 SCALE 1 : 20

NOTES :- Refer notes on 11413 - S04
especially 1(c) and 1(i)
- Prepare and paint steelwork
to Carboline specification
TG 2012 - 115103



3
A1400
New Canopy Section
A1 SCALE 1 : 20



4
A3103
Canopy edge detail
A1 SCALE 1 : 10

DESIGN ENGINEER

The structural elements designated *
on this drawing have been designed by
Arnold & Johnstone Ltd, Consulting Engineers

Job No. 11413 Signed 31 07 14

BUILDING CONSENT

General notes:
1. Do not scale off drawings.
2. Contractor shall varify and be responsible for all dimensions on site.
3. Architects to be notified of any variation between the site dimensions and those on plans.

REVISIONS

FIRSTPRINCIPLES
architects

+64 7 574 6728, po box 14214, tauranga MC 3143, new zealand

Project:
SPRING STREET

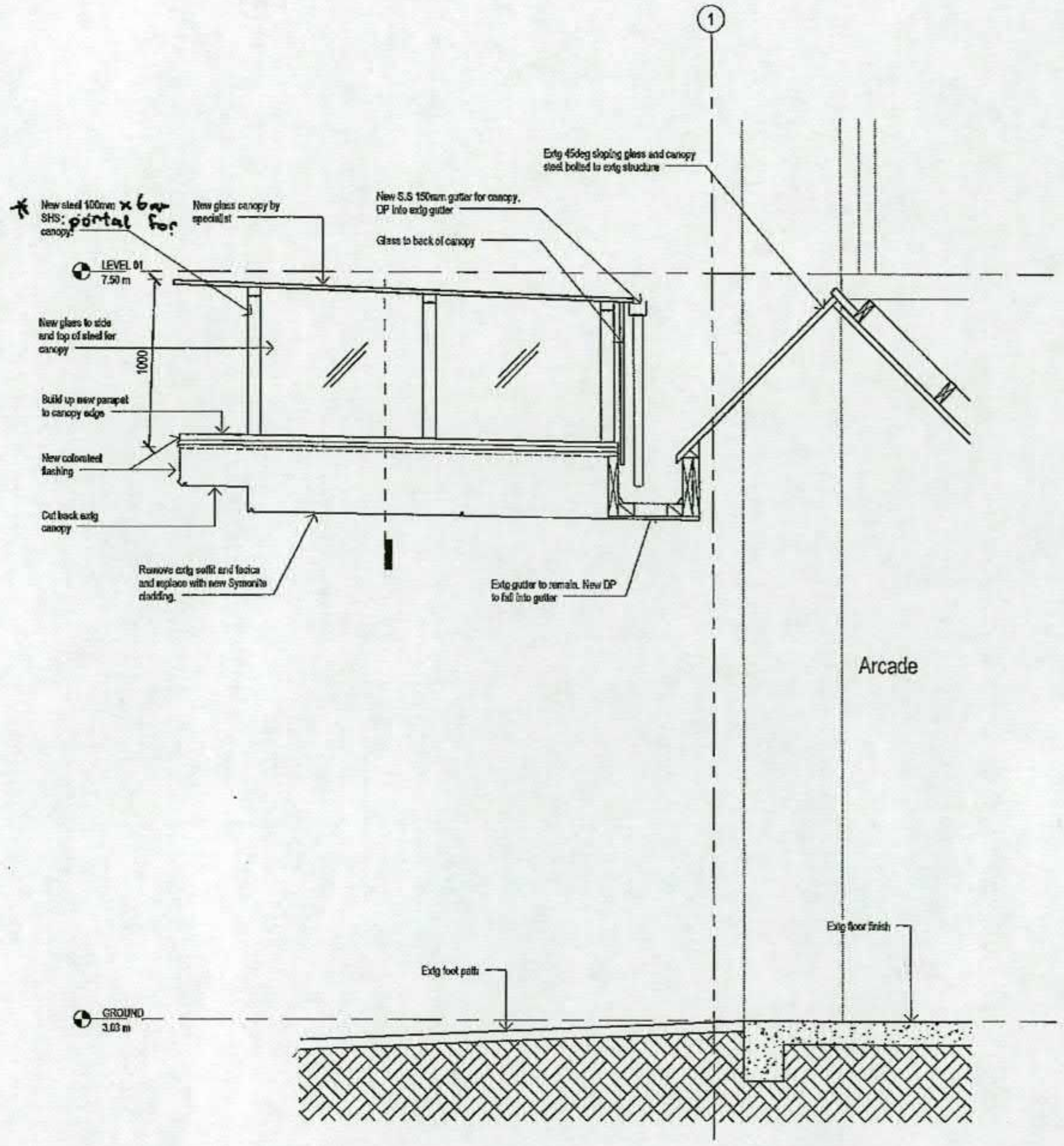
Address: Spring Street

Drawing:
CANOPY SECTIONS

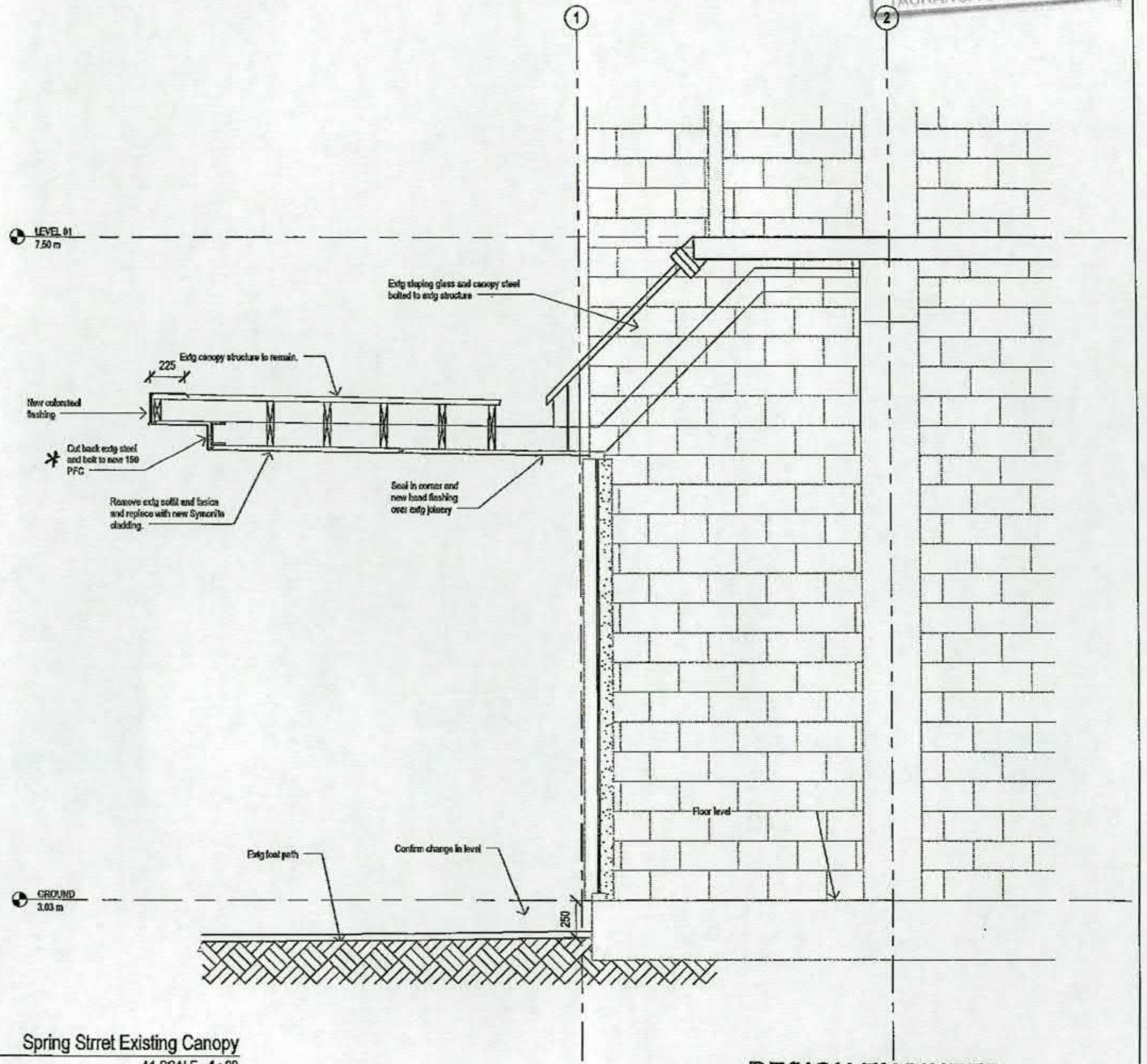
Scale: As indicated @ A1

Drawn By:	Checked By:	Date:
KU	GP	29/07/14
Project No.	Sheet No:	Revision:
RCP_03	A3102	

ADDITIONAL RECEIVED
11 SEP 2014
TAURANGA CITY COUNCIL



1
A1400
Spring Street New Entry Canopy
A1 SCALE 1 : 20



2
A1400
Spring Strret Existing Canopy
A1 SCALE 1 : 20

DESIGN ENGINEER

The structural elements designated *
on this drawing have been designed by
Arnold & Johnstone Ltd, Consulting Engineers

Job No. 11413 Signed 31 07 14

APPROVED
These plans are approved in accordance
with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

BUILDING CONSENT

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REVISIONS

FIRSTPRINCIPLES
architects

+64 7 574 6728, po box 14214, tauranga MC 3143, new zealand

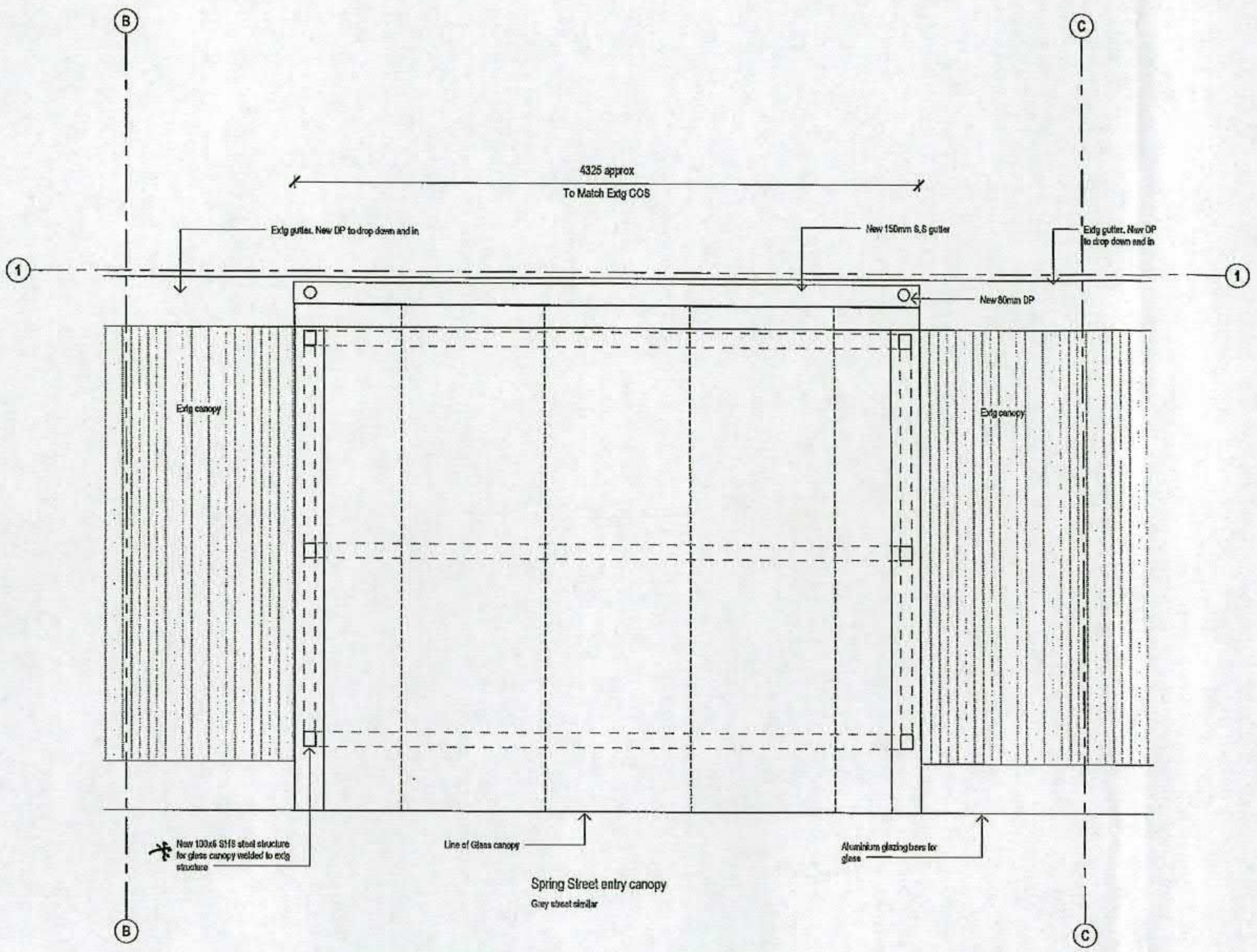
Project:
SPRING STREET

Address: Spring Street

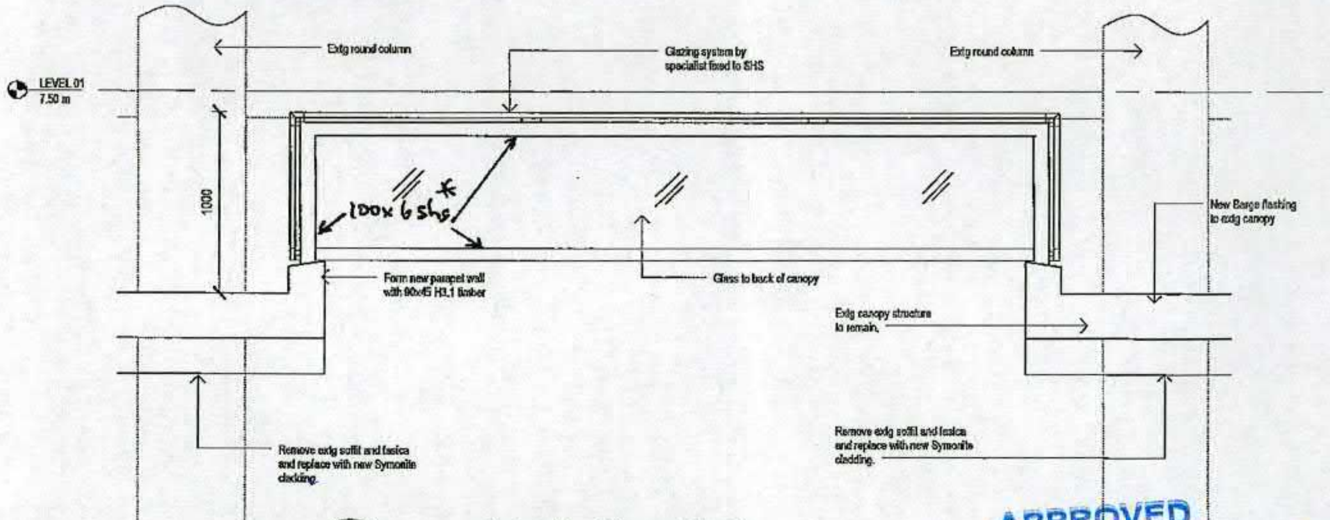
Drawing:
CANOPY SECTIONS

Scale: 1 : 20

Drawn By: KU
Checked By: GP
Date: 29/07/14
Project No. RCP_03
Sheet No: A3103
Revision:



1
A1701
Spring Street Canopy Plan
A1 SCALE 1 : 20



2
A1400
Spring Street Canopy Elevation
A1 SCALE 1 : 20

DESIGN ENGINEER

The structural elements designated *
on this drawing have been designed by
Arnold & Johnstone Ltd, Consulting Engineers

Job No. 11413 Signed RGA 31 07 14

APPROVED
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with The NZ Building Code.
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TAURANGA CITY COUNCIL

BUILDING CONSENT

General notes:
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3. Architects to be notified of any variation between the site dimensions and those on plans.

REVISIONS

FIRSTPRINCIPLES
architects

+64 7 574 6728, po box 14214, tauranga MC 3143, new zealand

Project:
SPRING STREET

Address: Spring Street

Drawing:
CANOPY PLAN AND ELEVATION

Scale: 1 : 20

Drawn By:	Checked By:	Date:
KU	GP	07/31/14
Project No.	Sheet No:	Revision:
RCP_03	A3104	

RESCO

Products: Vanities / Screens	Product Codes: RV and RS
Vanities and Screens: Updated May 2014	

Vanities and Screens

Vanities

Cost effective and easy to install, our pre-assembled units are ready for plumbers to connect.
Dirt traps have been minimised though innovative design, allowing for simple and efficient cleaning.

Suitable for high and low pressure water supply systems in high use ablution areas.

Screens

Resco's privacy screens are perfect for high use and wet areas.
We can do modesty screens up to full screens. The Compact Laminate panels provide extended product life, and the screen colour can be matched or contrasted to the cubicle systems and Multicom wall paneling.

Recommended for

Public areas

Schools

Sport and recreational areas

Community clubs

Camping and caravan sites, campgrounds

Shopping centres

Offices

Hotel complexes

Features

- Impervious to waters so suitable for high use and wet areas.
- Cost effective way to meet the building code
- Smooth screen surface for easy cleaning.
- CNC machined half round edging.
- Available in Resco AntiBac panels that kills bacteria for the lifetime of the panel
- New Zealand's largest range of Compact Laminate colour and finishes
- Custom made to suit
- Easy to clean and low maintenance

Edge treatment

- No edging is required as Compact Laminate is a finished product, a simple furniture oil enhances the black edge.

Options

Vanities

Different configurations are available, including corner, single, double or triple sinks.

Screens

- Full screens
- Modesty screens
- Kindy screens
- Shower screens

Colours

Panel Colours

Vanities and Screens are available in:

Resco AntiBac range
12 stock colours
20 accent colours – (12 week lead time)

Laminex range
16 colours

Visit the Web site (www.resco.co.nz) or call for samples

See over page for typical system layout and sizing.

Aluminium colours

The Vanity and Screens aluminum extrusions are available in any of the Dulux - Duralloy powder coating colour range or Silver Anodised.

Our standard colour is Silver Pearl.

RESCO ANTIBAC PANEL
Lifetime Protection

Vanities and Screens are now available in an exciting new Compact Laminate panel made with cutting-edge anti-microbial technology that continuously destroys bacteria, for the lifetime of the panel.

Vanities&Screens
Perfect for wet and high abuse areas

Dimensions

As vanities are custom made to your measurements, depths and widths, they can be varied to suit.

Standard vanity dimensions are:

1 Sink and mixer 900 mm wide x 500 mm deep x 250 mm high (plus 100 mm high splash screen)

2 Sinks and 2 mixers 1800 mm wide x 500 mm deep x 250 mm high (plus 100 mm high splash screen)

3 Sinks and 3 mixers 1800 mm wide x 500 mm deep x 250 mm high (plus 100 mm high splash screen)

6 Sinks and 6 mixers 3600 mm wide x 500 mm deep x 250 mm high (plus 100 mm high splash screen)

Durability and Maintenance

- Compact Laminate panels equal an extended life.
- Resco AntiBac panel kills bacteria for the lifetime of the panel.
- Being a tough, durable product it is perfect for high traffic locations and because it is impervious to water it is ideal in wet areas.
- Easily cleaned with a mild detergent.
- 10-year guarantee on panel integrity and 2 years on hardware

10 YEAR
PANEL INTEGRITY
GUARANTEE

Lead time

If panel is in stock, once dimensions are confirmed, lead time can be as fast as a few days.

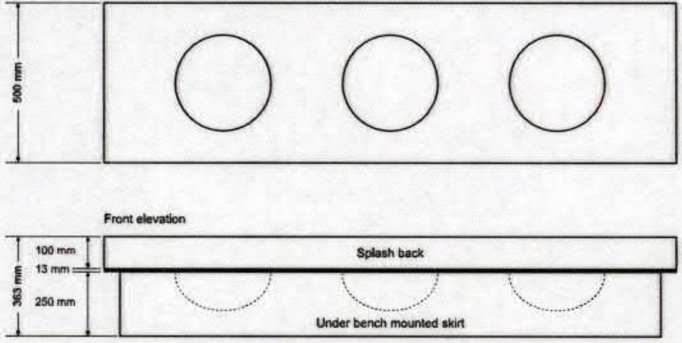
If accent colour range, this is ordered in and has a 12 week lead time.

Contact our team for accurate lead times.

Installation

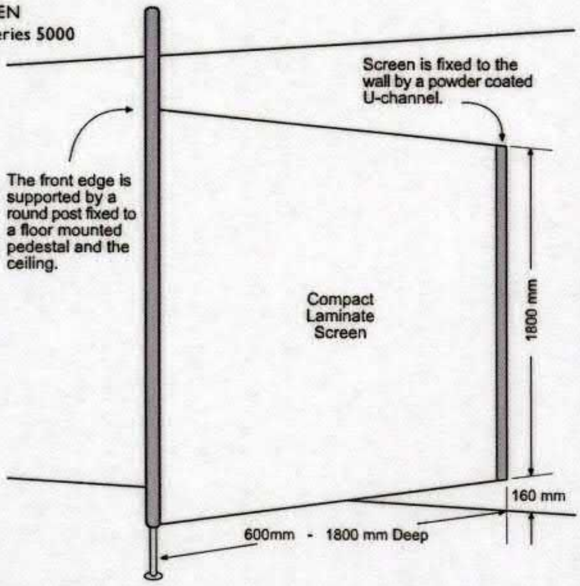
Resco has an installation service available, or customers can install themselves as Resco vanities and screens can be delivered to site. Packs include installation manuals and hardware.

Resco Vanities - Indicative elevations

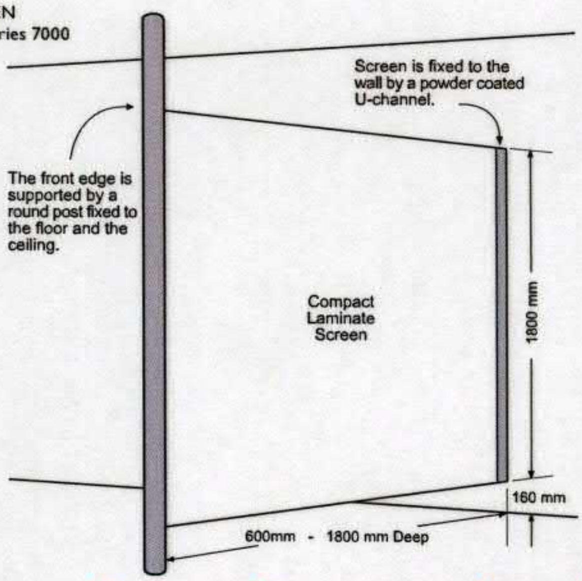


Resco Screens - Indicative options

FULL SCREEN
FS-1800 / Series 5000



FULL SCREEN
FS-1800 / Series 7000



See over page for more screen products and options

This information may change without notice.

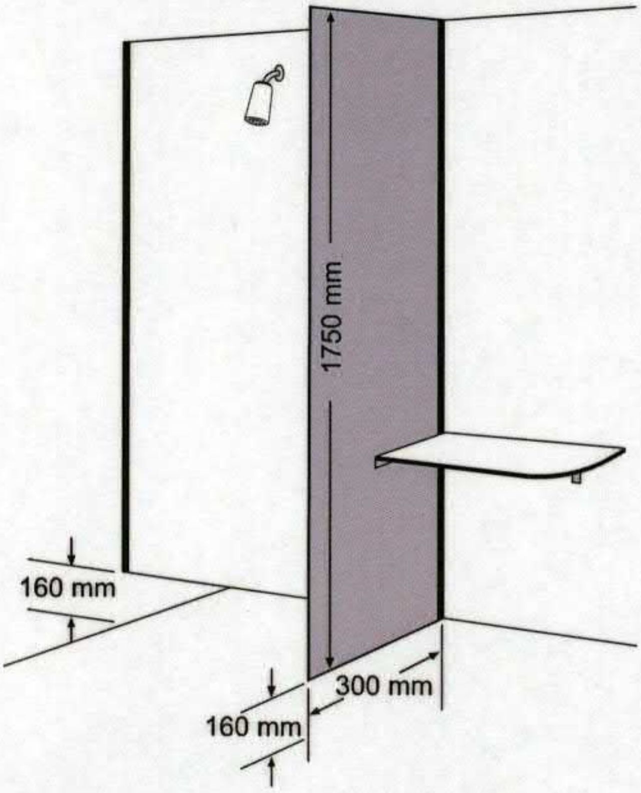
Vanities&Screens

Perfect for wet and high abuse areas

Resco shower screen - Indicative elevation

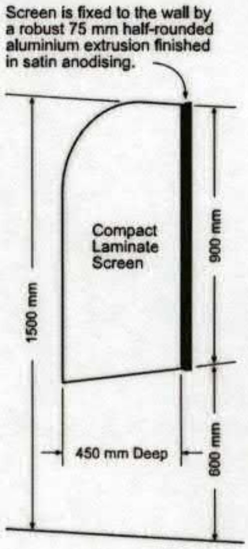
SHOWER SCREEN SC-1700

Shower screen can be either a Compact Laminate panel or curtain.

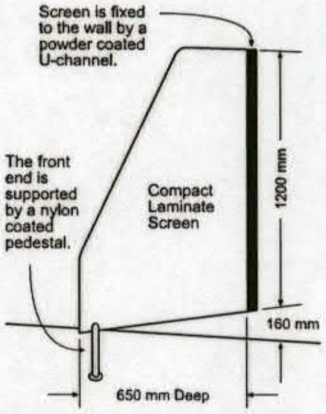


Resco screens - Indicative elevations

MODESTY SCREEN MS-900

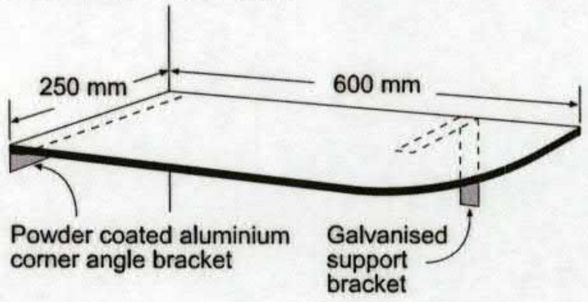


KINDY SCREEN KS-1200

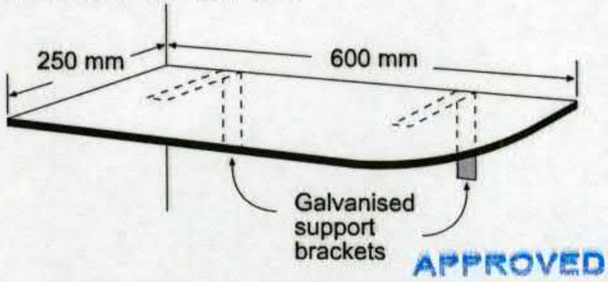


Resco shower seats - Indicative elevations

SHOWER SEAT SC-900p (shower panel option)



SHOWER SEAT SC-900c (shower curtain option)



Contact

For pricing, email your plans or drawings to:

service@resco.co.nz
or fax 07 850 1026.

Call Resco on **0800 800 950** for their full range or visit the Web site **www.resco.co.nz** and click on **Vanities/ Screens**.

RESCO

Resco Limited.
12 Kahu Cresent
Te Rapa, Hamilton 3200
New Zealand

Vanities&Screens
Perfect for wet and high abuse areas

MCH Limited
GRAHAM COX BE(Hons) MIPENZ
MIKE HORSLEY BE MIPENZ
CIVIL AND STRUCTURAL ENGINEERS

19 Willow Street
PO Box 1029
TAURANGA 3140
Telephone: (07) 578-4071
Facsimile: (07) 578-4176

APPROVED
These plans are approved in accordance with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

PRODUCER STATEMENT – PS2 – DESIGN REVIEW

ISSUED BY: MCH Ltd
(Review Firm)

TO: Prime Investment Group
(Owner)

TO BE SUPPLIED TO: Tauranga City Council
(Territorial Authority)

IN RESPECT OF: Seismic Strengthening to 71% NBS
(Description of Building Work)

AT: 46 Spring Street
Tauranga
(Address)

LOT .... **DP** .... **SO** ....

MCH Ltd (Review Firm) has been engaged by Resource Coordination Partnership Ltd (Owner/Developer/Contractor) to review the design documents for this project in respect of the requirements of Clause(s) B1/VM1 of the Building Regulations 1992

The design is for ☒ All ☐ ~~Part only~~ as specified in the building consent of the building work and has been prepared by Arnold & Johnstone Ltd (Design Firm) in accordance with B1/VM1 (verification method(s)/acceptable solutions(s)) (respectively) of the approved documents issued by the Building Industry Authority and is described in Arnold & Johnstone's design report and calculations, ref; 11413 (V133), dated Nov'12 and the drawings 11413, S01-S12 (all Rev.B), issued 25 Jul'14

the specification and other documents according to which the building is proposed to be constructed. As an independent design professional covered by a current policy of Professional Indemnity Insurance to a minimum value of $200,000, I advise that on the basis of the review I have undertaken **I BELIEVE ON REASONABLE GROUNDS** that subject to:

(i) the site verification of the following design assumptions
-all elements meet the durability requirements of the NZ Building Code
-inspection of construction by the Territorial Authority
-all non-specific design construction to NZS 3604:2011 and NZS 4229:2013

(ii) all proprietary products meeting the requirements of the performance specification, the drawings, specification and other documents according to which the building is proposed to be constructed comply with the relevant provisions of the Building Code.

SIGNED BY Graham Cox ON BEHALF OF MCH Ltd

GBCox
(Signature suitably qualified Design Professional) DATE: 31-7-14

BE (Civil), MIPENZ, CPEng (Chartered Professional Engineer No: 50782)
(Professional Qualifications)

PO Box 1029, Tauranga
(Address)

Note: This statement shall be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Review Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.

CALCULATIONS

SEISMIC STRENGTHENING

46 SPRING STREET

TAURANGA

APPROVED
These plans are approved in accordance
with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

FOR

PRIME INVESTMENT GROUP

ARNOLD & JOHNSTONE LTD

18 CAMERON ROAD, TAURANGA
P O 933, TAURANGA
PHONE: 578 0921
FAX: 578 0924
EMAIL: admin@ajeng.co.nz

JOB NO: 11413
30 July 2014

ARNOLD & JOHNSTONE LTD

CONSULTING CIVIL & STRUCTURAL ENGINEERS

Job No. 11413

APPROVED
These plans are approved in accordance with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

PRODUCER STATEMENT – PS1 – DESIGN

ISSUED BY: Arnold & Johnstone Ltd *(Design Firm)*

TO: Tauranga City Council *(Building Consent Authority)*

IN RESPECT OF: Seismic Structural Strengthening to original building (stage 1) *(Description of Building Work)*

FOR: Prime Investment Group *(Owner/Developer)*

AT: 46 Spring Street Tauranga *(Address)*

We have been engaged to provide structural engineering design services in respect of the requirements of Clause B1 Structure of the Building Code for only the items marked * and countersigned by me on the drawings for the above building work prepared by:

Arnold and Johnstone Ltd 11413 S01 - S12 revision B

The design carried out by us has been prepared in accordance with the Compliance Documents issued by Department of Building & Housing, Verification Method B1/VM1, and Acceptable Solution B1/AS1.

On behalf of the Design Firm, and subject to:

(i) Site verification of the ultimate bearing capacity of the ground beneath the building being 300 kPa minimum, and
(ii) All proprietary products meeting their performance specification requirements;
(iii) All steelwork must be inspected by the Engineer prior to closing in

I believe on reasonable grounds the building, if constructed in accordance with the drawings countersigned by me, and the calculations and details provided by us, will comply with the relevant provisions of the Building Code.
R G Arnold BE, MIPENZ (Structural), CPEng No 16215, IntPE *(Design Professional)*

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000.
The Design Firm is a member of ACENZ

SIGNED BY Richard George Arnold ON BEHALF OF Arnold & Johnstone Ltd *(Design Firm)*

Date 25 07 14 (signature)

Note: This statement shall only be relied upon by the Building Consent authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

ARNOLD & JOHNSTONE LTD
CONSULTING CIVIL & STRUCTURAL ENGINEERS
ACENZ

JOB No 11413
PAGE
BY
DATE

APPROVED
These plans are approved in accordance with The NZ Building Code.
These plans must remain on site.
TAURANGA CITY COUNCIL

JOB 46 Spring Street

INDEX

JOB No 11413
PAGE 0
BY RHA
JOB 46 Spring Street
DATE 25 07 14

SYNOPSIS.

Building was constructed in 2 stages
1958 approx half total area - adjacent to Grey Street 2 storey
1985 - adjacent to Spring Street 3 stories

An IEP was carried out on both stages which showed that the
stage 1 was 38% NBS }
stage 2 was 71% NBS } both determined by our selves

The Building Owners instructed us to strengthen stage 1 to 71% NBS in addition it was proposed that 3 internal columns to stage 1 be removed.

The stage 2 extension was specifically designed to be seismically independant to the stage 1 structure plus was independant of stage 1 for gravity loads.

Both stages have concrete frames in both directions.

Both stages have a raft slab foundation founding approx 1.2m below ground level with 2 slabs and a sub floor non access space.

A geotechnical investigation for Seismic Assessment was carried by S&L Consultant's as per their attached report 20695 dated 17 02 14.

The structural capacity of Stage 1 Concrete frames at both ground and first floor were inadequate for 71% NBS Seismic loads and were strengthened using steel portals in both directions. The capacity of the existing foundations was adequate for the 71% NBS Seismic Loads. The steel portals have been designed to resist all the seismic loads.

The structure has been assumed to be adequate for all gravity loads. There are no signs of cracking nor settlement beyond normal tolerances.

JOB No 11413
PAGE L1.
BY RHA
DATE Nov 12.

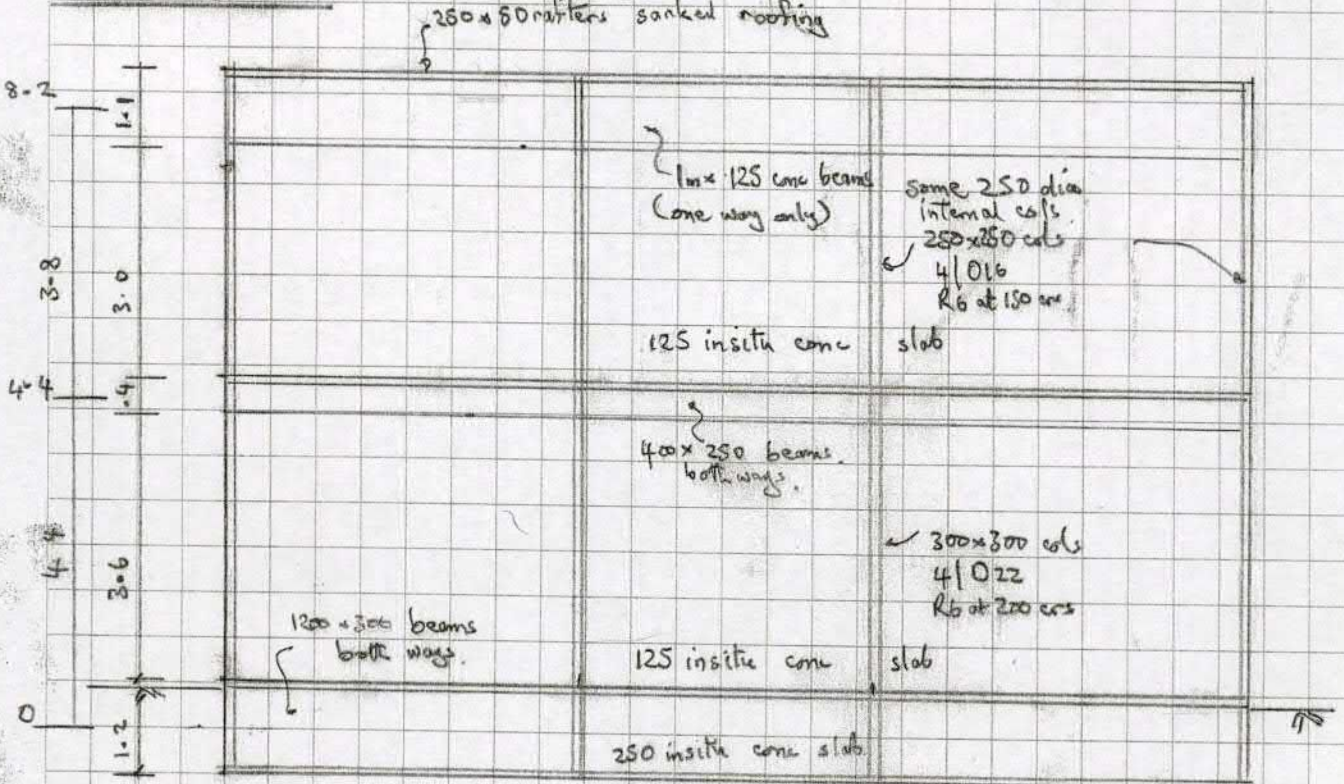
JOB State Insurance corner Spring & Grey St.

designed 1958 D.E.E.

Description 2 storey conc framed building (both ways) approx 4m grid both ways.
concrete roof beams
note columns prob too small and wide stirrup spacing.
raft foundation minimal settlement refer 1985 geo report
class D soil
low net bearing pressure as 1m of soil removed refer 1985 geo report.
Majority of building is rectangular in plan but is] shaped.
with small "flange" at north and south end.
building had large extension in 1985 but structurally independant.

Plan view see L2.

Cross Section



Strengthen to 71% NBS which is calculated capacity by IEP for 1985 extension.

JOB No 11413
PAGE L3
BY
JOB
DATE

LOADING.

Floor area = 573m² ✓

Gravity

Roof = (0.8 roofing + sarking + ceiling + 0.8 conc beams + 0.4 ½ part + misc) = 2 × 573 + 1 × 110 ½× perim walls ~~0 × 573~~ = 1256 ✓

First floor = 3.0 slab 125 + 2.0 beams + 0.5 part + 0.5 ceiling + services = 6.0 × 573 + 2 × 110 = ~~6.0 × 573~~ = 3658 ✓

Gd fl = 3 + 1.0 + 0.5 = 4.5 × 573 + 2 × 110 = 2799 ✓

Found. = 6.0 + 1.0 = 7 × 573 = 4012 ✓

Live Load for seismic

Roof = 0

First = 3 × 573 × ~~0.4~~ 0.3 = ~~688~~ 516

gd = 3 × 573 × 0.4 = 688 ✓

Seismic

✓ Class D soil

μ = 1.25 conc frames + few 150 shear walls

T = 0.5 sec 0.4

Ch (T) = 3.0 ✓

Z = 0.2

R = 1.0 0.71

N = 1.0

C(T₁) = 3.0 × 0.2 × ~~1~~ × 1 × 0.71

= ~~0.6~~ 0.43

Sp = ~~0.923~~ 0.90 conc ✓ steel

ku = (1.25 − 1.0) 0.5 / 0.7 + 1

= ~~1.18~~ 1.14

Cd (T₁) = ~~0.6 × 0.925 / 1.18~~ 0.43 × 0.9 / 1.14

= ~~0.47~~ = 0.34

For prelim design increase all lat load by 20% to allow for eccentricity etc

level	W=G+0.4Q	h_i	W_i h_i	0.92F×W_ih_i/Σ	ΣF
r	1256	8-2	10299	1018 + 253	1271
1st.	4346	4.4	19122	1891	3162
	5602		29422	2420	

F = 5602× 0-47 × 1.2
= 3162
0-92F = 2909
0.08F = 253

Note this is for 100% N.B.S.

se L4 R

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PAGE L4R
BY
JOB
DATE 20 01 14

Revised distribution
using R = 71%

level	G+0.3Q	hi	W hi	0.92F×W hi / Σ F	
r	1256 +0	8.2	10300	763 + 185	948
1st.	3658+516 ^{4174}	4.4	18366	1360	2308
	5430		28666		2308

F = 5430 × 0.34 × 1.25 for ecc etc
= 2308
0.92F = 2123
0.8 F = 185

JOB No 11413
PAGE ST1
BY RGA
DATE 23 1 14
JOB

Strengthening to 71% NBS
ref L1 to L4R for loading.

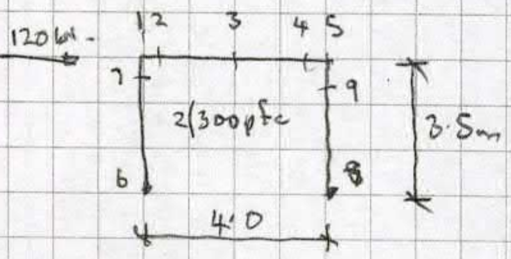
First floor Transverse Frames

Assume double steel portal frames takes all G + Eu
distribute lat load by area.
7 internal frames 2 ext frames.

∴ load / int frame = 948/8
= 118.5
say = 120 kN.

11413ST1

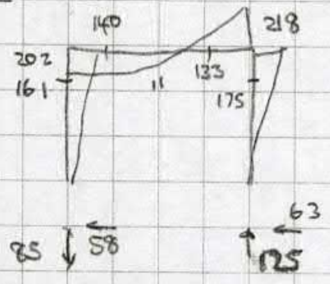
G = 10 kN/m
Eu = 120 kN.



G + 0.25 Eu
defl = 11.8 mm say OK as conc sl will add some stiffness

G + Eu.

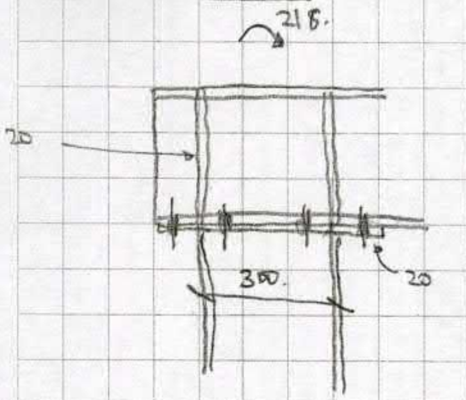
2/300pfc



try 2/300 PFC.
M^*_{max} = 218
ϕM_s = 2 × 152 × 0.86
= 261 > 218 ∴ OK

note I's bolted to beam + col. at 1.2m crs.
say Lc = 1.5.

Bolted Connection



$M^* = 218$
$N^*_{t/c} = 218 / 0.3$
$= 727$ kN.

2/4 M24 8.8

try 2× [illegible]/M 24 8.8
$\phi N_t = 4 \times 0.8 \times 800 \times 353$
$= 903$ kN > 727 kN ∴ OK.

Transfer load into pfc's

$N^* = 120$ kN.

try 4/M 20 (shear.) expoxy into beam — Epcon C6
embed 100 mm e = 300 mm a = 500 mm
(resistant to cyclic loading + vibration
superior strength in shallow embedment)

$\phi N_{bc} = 100.9 \times 0.79 \times 1 \times 0.83 \times 0.89 \times 4$
$= 233 > 120$ ∴ OK.

$\phi N_{ss} = 59 \times 4$
$= 236 > 120$ ∴ OK.

Bolt column base

N^*_t T = 85 $N^*_s = 58$ kN.

try 4/M20 epoxy into col.

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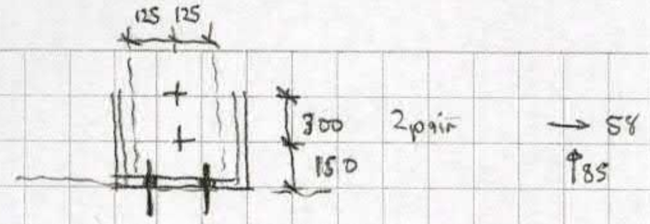


Uplift

bolts in shear. a = 300 e = 125 note load is ⊥ to e. embed 125,

in col. $\phi N_{ss} = 4 \times 27.1 \times 0.79 \times 2 \times 0.98 \times 1.0$

$= 168$ kN

2× 2 M20 col

horz + 2× 2 M20 slab.

bolts in slab. e = 500 a = 150 embed = 100,

shear.

$\phi N_{sc} = 4 \times 277 \times 0.79 \times 1 \times 0.56 \times 0.6$

$= 230$ kN

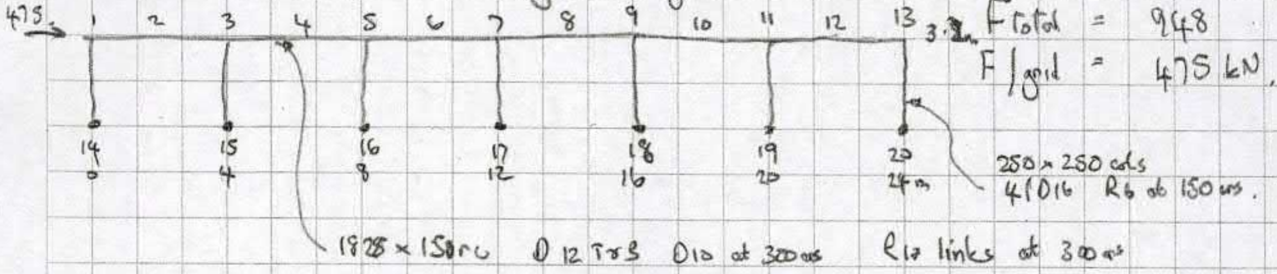
Combine $= 85/168 + 58/230$

$= 0.76 < 1.0$ ∴ OK

First floor longitudinal portal strengthening for 71% NBS

assume 2 rows 6 bays. grids 6x9.

Ftotal = 948
F/grid = 475 kN.



G = 10 kN/m
Q = 0 kN/m
Eu = 475 kN

	A	I	Z
1828x 150 beam	274×10^3	76×10^9	8.3×10^6
250 x 250 col	62×10^3	325×10^6	2.6×10^6
300pfc	5×10^3	72×10^6	0.48×10^6

11413 FL1

G + 0.25 Eu

conc frame only fixed at base
def 1 = 76 mm high.

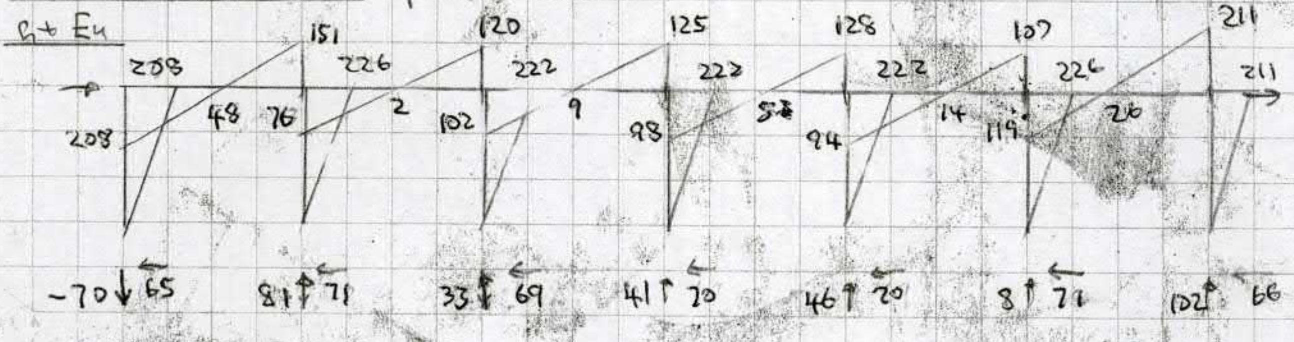
1/380 pfc

add 380pfc frame. pined at base note ht = 2.8m
for E = 2×10^8
beam eqv = 27 + 5 = 32 $\times 10^3$ mm^2 I = 760 + 72 = 832 $\times 10^6$ Z = 8.3 + 0.5 = 8.8 $\times 10^6$

conc frame + pfc pinned at base
def 1 = 9.5mm OK. this is conserv as some small fixity at col base

Conc frame + 300PFC pinned at base

G + Eu



Check capacity existing beam & col.

Beam 1828 × 150.
rein D12 T & B + D10 at 300 crs   R10 links at 300 crs

say D = 1200
$A_s = D12 + 3 \times 78 = 346$

$\phi M_s = 0.85 \times 346 \times 300 (1200 - 0.59 \times 346 \times 300 | 150 \times 20)$
$= 104$ kNm

M^*_{max} at ends = 211 kNm > 104
int = 151 kNm > 104

Columns. 250 × 250
4/D16   R6 stps at 150 crs
say $\phi M_s = 0.85 \times 402 \times 300 (200 - 0.59 \times 402 \times 300 | 250 \times 20)$
$\simeq 19$ kNm < 226 ∴ ignore

Assume PFC frame takes all the load. (conserv)

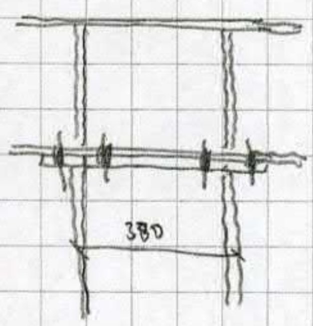
M^*_{max} beams = 211 kNm
col = 226 kNm.

Try 380 pfc
$\phi M_s = 238 \times 0.97$ bolt to col at 1m crs
$= 231 > 226$

1/380 pfc

Column Splice

$M^* = 226$ kNm



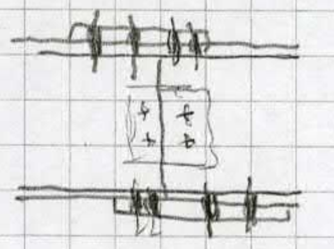
Try 2 | M30

$N^*_{t/c} = 226 / 380$
$= 595$ kN

$\phi N^*_{t/c} = 0.8 \times 2 \times 561 \times 800$
$= 718$ kN > 595 ∴ OK

2 | M30

Mid span splice



$M^*_{max} = 48$ kNm

try 2 | M20 HT

$N^*_s = 48 / 0.38$
$= 126$ kN

2 | M20,

$\phi N_s = 0.8 \times 0.6 \times 2 \times 245 \times 800$
$= 188$ kN > 126 ∴ OK.

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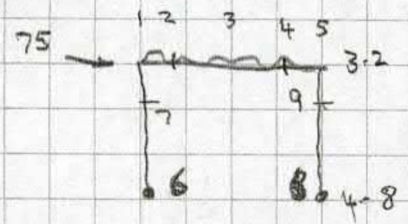
Check 2x portal grid 1 combine with portals grid 9

portal grid 9 = 8 bays
where as portal grid 6 = 6 bays

say load on portals grid 1 = 150 kN
but 2 portals
∴ load / portal = 75 kN ea
Assume portal takes all load.

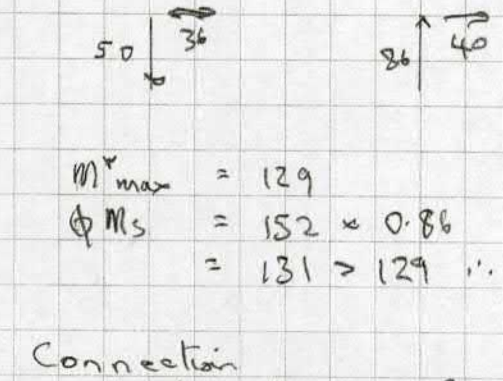


G = 10 kN/m

1/300 pfc portal

G + 0.25 Eu
dif = 11.3 mm say OK esp as conservative

G + Eu



1/300 pfc

M^*_{max} = 129
ϕM_s = 152 × 0.86
= 131 > 129 ∴ OK

Lc = 1.5m
conserve for pfc portal to take all load.

Connection
portal knee ref FT2

1×4/M24 8.8

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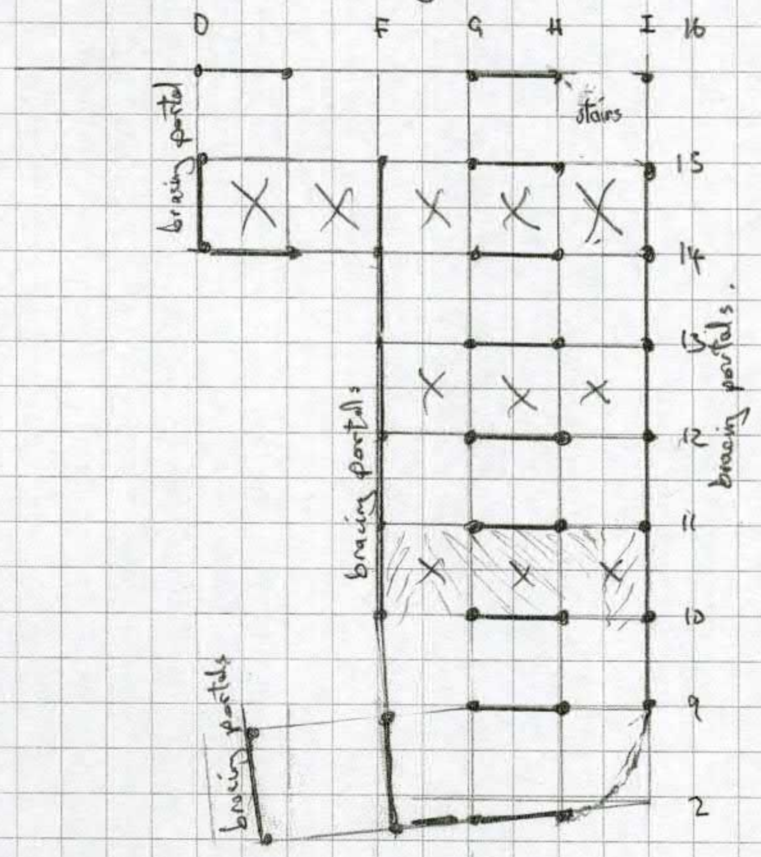
Roof bracing

Transfer roof load into Longitudinal frames.



Eu = 948 kN.
note this includes extra 20%
for ecc etc.

Roof bracing plan.

longitudinal portal frames on grids D F & I
Eu total = 948 kN ref p LR4
Total roof area = 573 m^2 ref 9L3.

Reid brace
RB 20

Load into roof bracing between grids H & I transfer to grid I
trib area = $\frac{1}{2}$(G→H → H-I)
= $\frac{1}{2}$(× 3.85 + 3.93) × 33m
= 129 m^2

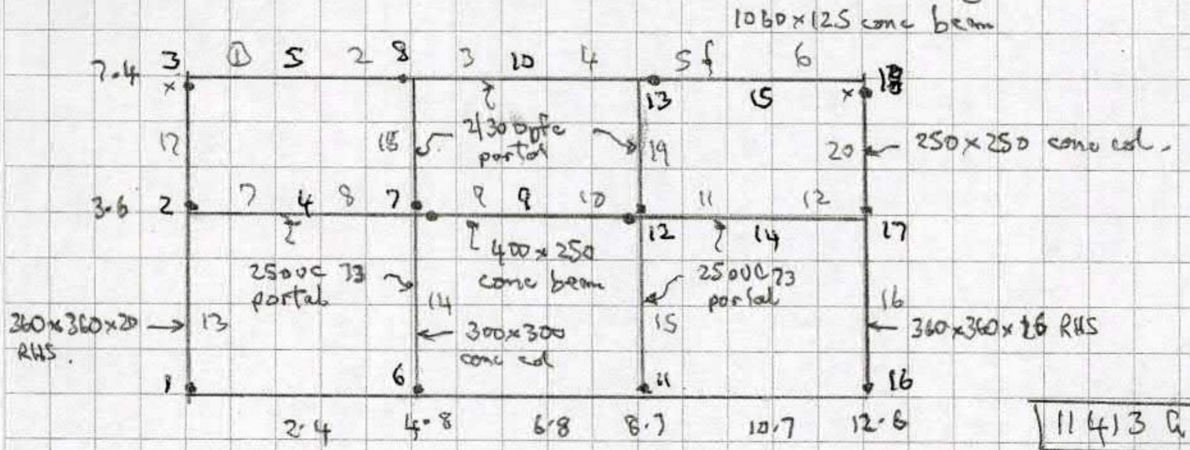
∴ Load into bracing H→I = 948 × 129/523
= 212 kN

but 3 pair of braces (tension only - Reid brace —
∴ load/brace
= (212/3) $\sqrt{2}$
= 100 kN.

Reid brace 20 dia cap = 0.8 × 314 - 500
= 125 kN > 100 ∴ OK.

check

Ground Floor Transverse, Frame 71% NBS   grids 12 → 15.



11413 GT1

Assume all seismic load taken by steel strengthening
7 internal Frames + 2 external Frames

Eu roof / frame = 948/8   ref L4R
= 118.5
= 120 kN / frame

Eu 1st fl / frame = 1360/8   ref L4R
= 170 kN / frame

G.
roof + sarking + ceiling + services   conc beam
G roof = 4× 1.2 + 3 = 8 kN/m
Q roof = 0.25×4 = 1 kN/m

fl   part   ceil + serv   conc beam
G 1st = 4×(3 + 0.5 + 0.5) + 3 = 20 kN/m
Q 1st = 4× 3 = 12 kN/m

Members:

		E	A	I	Z
①	1060× 125 r beam	13×10^6	132×10^3	12×10^9	23×10^6
④	2/300 pfc	2×10^8	10×10^3	144×10^6	1×10^6
③	250× 250 col.	13×10^6	62×10^3	0.33×10^9	2.6×10^3
②	400 × 250 1st beam	13×10^6	100×10^3	1.3×10^9	6.7×10^6
⑥	250UC73	2×10^8	10×10^3	228×10^6	0.9×10^6
⑦	354×354×16 RHS	2×10^8	21.5×10^3	405×10^6	2.3×10^6
⑤	300×300 col.	13×10^6	90×10^3	0.7×10^9	4.5×10^6

$G + 0.4Q + 0.25E_u$

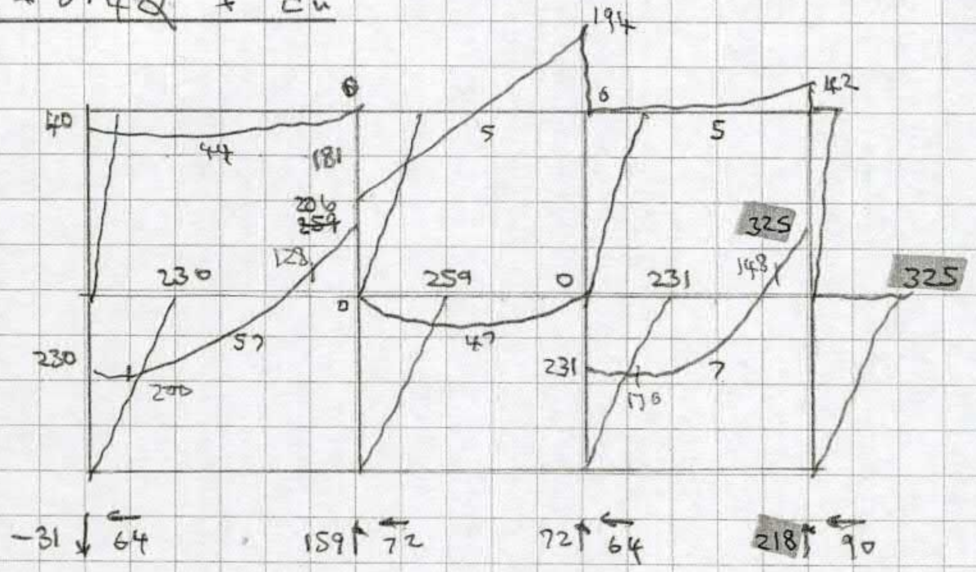
def 3 = 21 mm nett = 12 mm say OK as conc provide some stiffnes
2 = 9 mm "

$1.2G + 1.5Q$

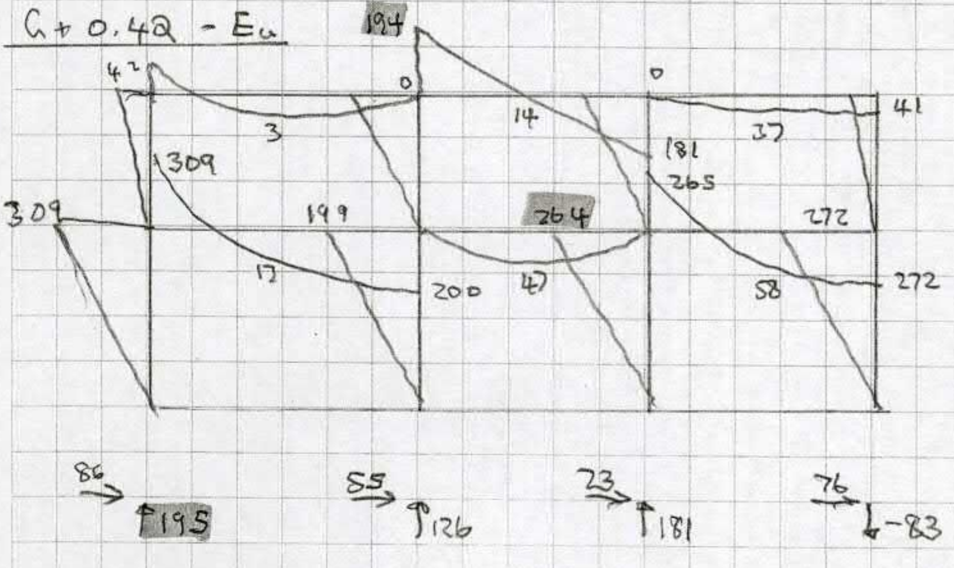
existing frames OK but check for found load

	1	6	11	16
N* ↓	131	227	203	108
→	19	14	8	13

$G + 0.4Q + E_u$



$G + 0.4Q - E_u$



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Beam

$M^*_{max} = 325$ kNm

$\phi M_s = 268 \times 0.97$ Lc = 2

$= 258$

250U 90

250 UC 90

$\phi M_s = 309 \times 0.98$

$= 303$ say OK as 450 × 350 r.c. continuous takes diff

Col 250 UC

$M^* = 264$ kNm

use 250 UC 90

$\phi M_s = 303 > 264$ ∴ OK.

250 UC 90

354 × 354 × 16 RHS col.

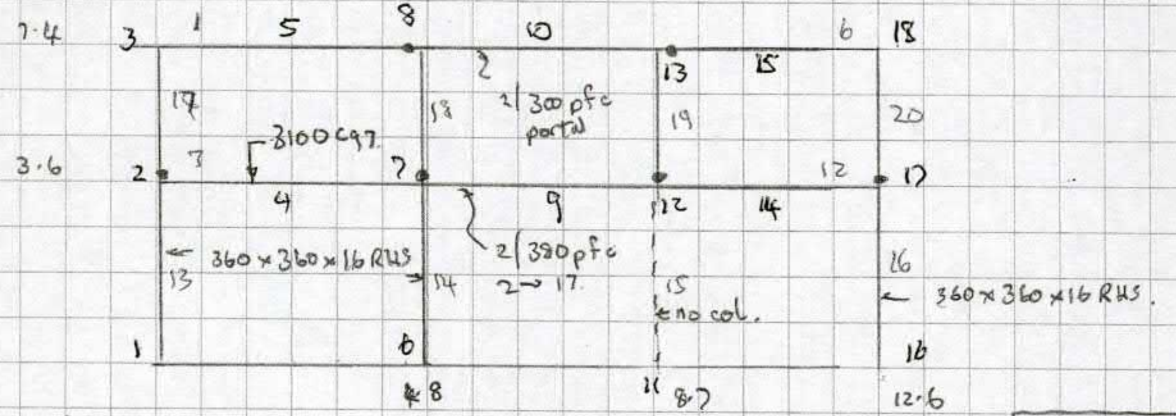
$M^*_{max} = 325$ kNm

354 × 354 × 16 RHS

$\phi M_s = 0.9 \times 300 \times 2.3$

$= 621$ kNm > 325 ∴ OK.

Ground floor transverse grids 9, 10, 11 (remove column grid H).



11413 GT2

Deflections

G + 0·4Q + 0·25 Eu

def 2_x = 8mm OK

3_x = 25mm net = 17mm say OK as conc frames provide some stiffness

12_y = 8mm OK

G + 0.7Q

def 12_y = 9mm OK = L/433 say OK.

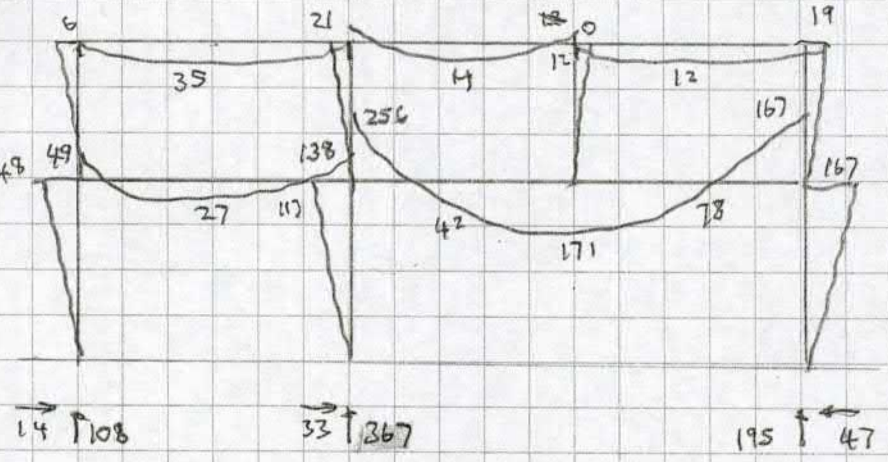
G + 0·4Q + Eu

12_y = 10mm OK

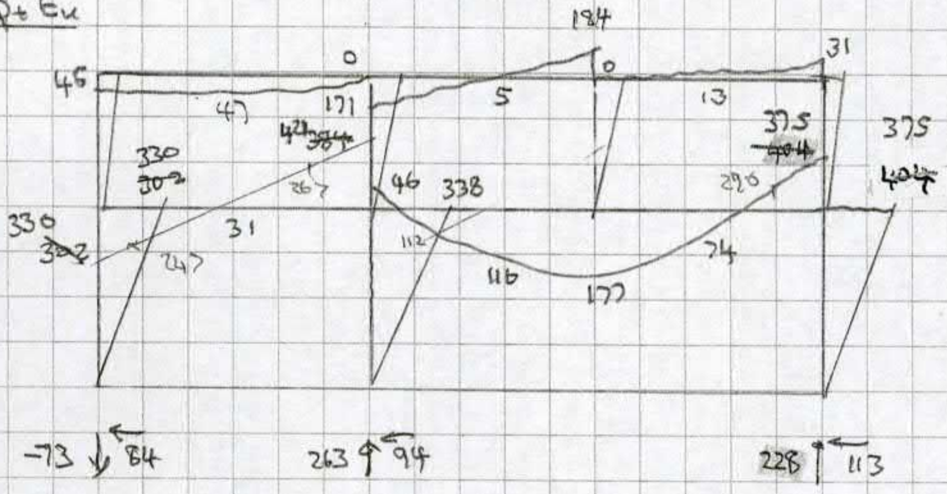
G + 0·4Q − Eu

12_y = 6mm OK.

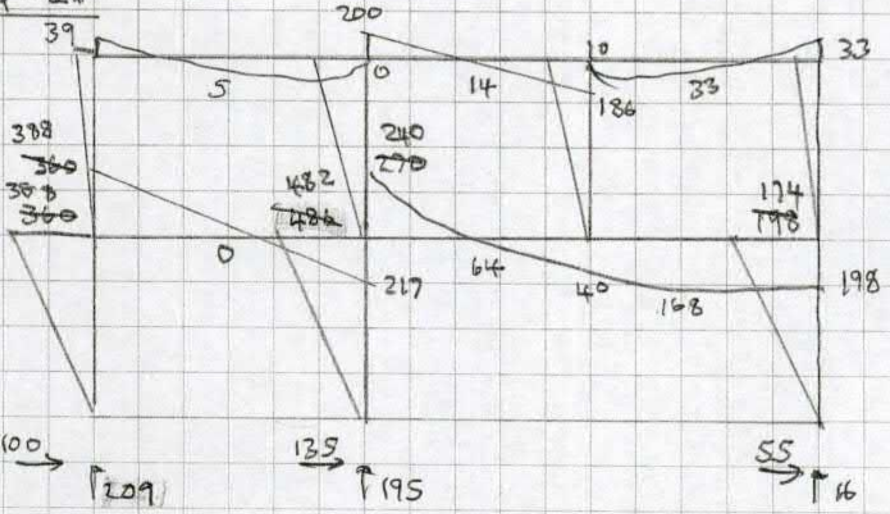
1.2G+1.5Q



G+0.4Q+Eu



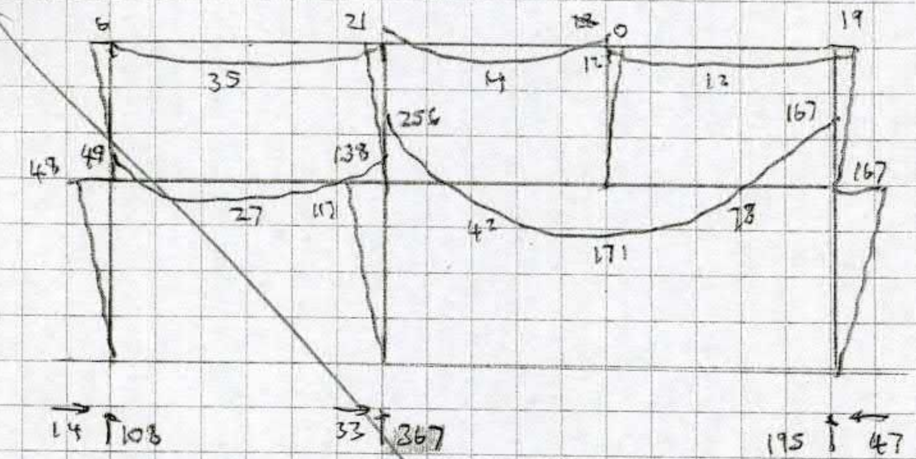
G+0.4Q−Eu



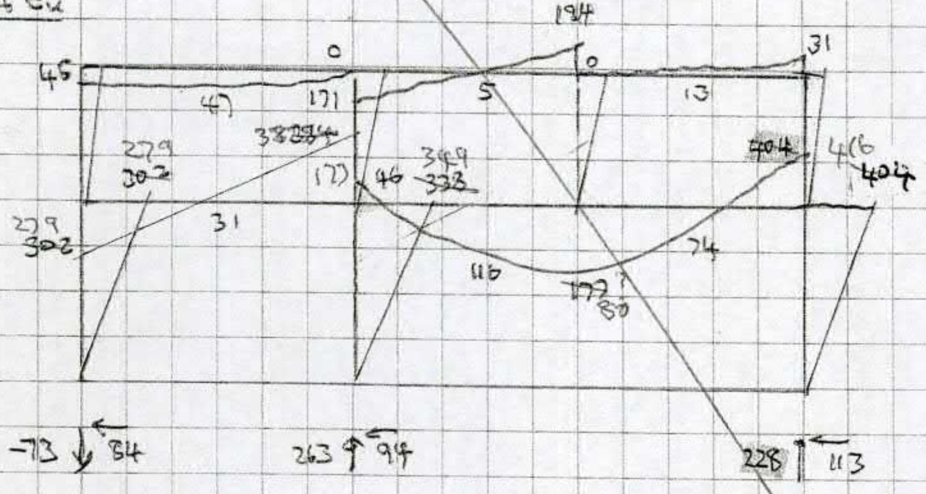
for² 380 partial fixg
rotation through

box ☐

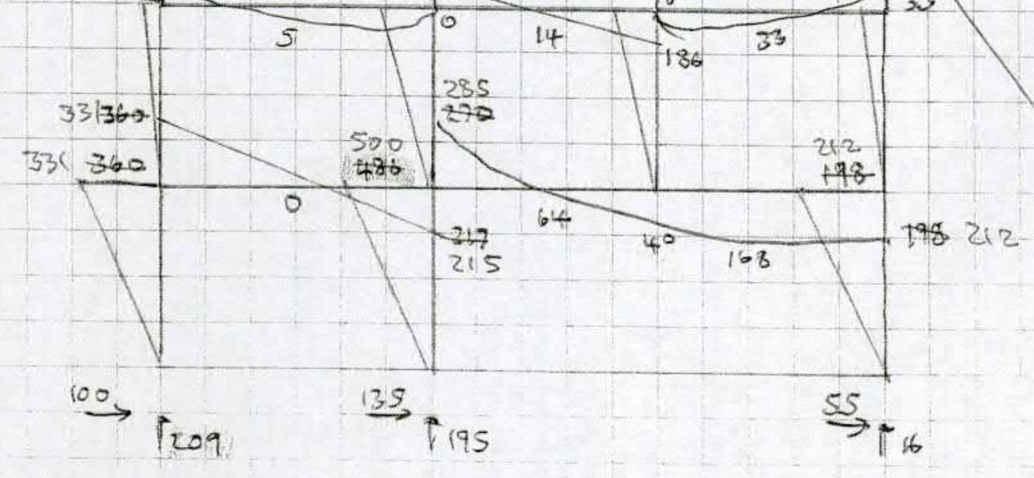
1.2G + 1.5Q



G + 0.4Q + Ex



G + 0.4Q − Ex



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Beam

M^*_{max} = 404 kNm

2/380 pfc

ϕM_s = 2 × 238 × 0.89   Lc = 1.5 m

= 423 > 404 ∴ OK.   2/380pfc

Column

M^*_{max} = 486

354 × 354 × 16 RHS

ϕM_s = 0.9 × 300 × 2.3 × 0.9   354×354×16 rhs

= 558 kNm > 486 kNm

Check footing for bearing

Internal

N^*_{max} ↓ = 367

N^*_{max} → = 33

Bearing

300 × 1m deep beams on 4m grid

225 btm slab

150 top slab

say bearing area = 3m × 3m   Internal

Internal N^*_{max} = 367

∴ bearing = 367/9

= 41 kPa

say allow ult bearing = 300/2×2

= 75 kPa > 41 ∴ OK.

say bearing area ext = 3 × 1.5m

External N^*_{max} = 209

bearing = 209/4.5

= 46 kPa < 75 ∴ OK.

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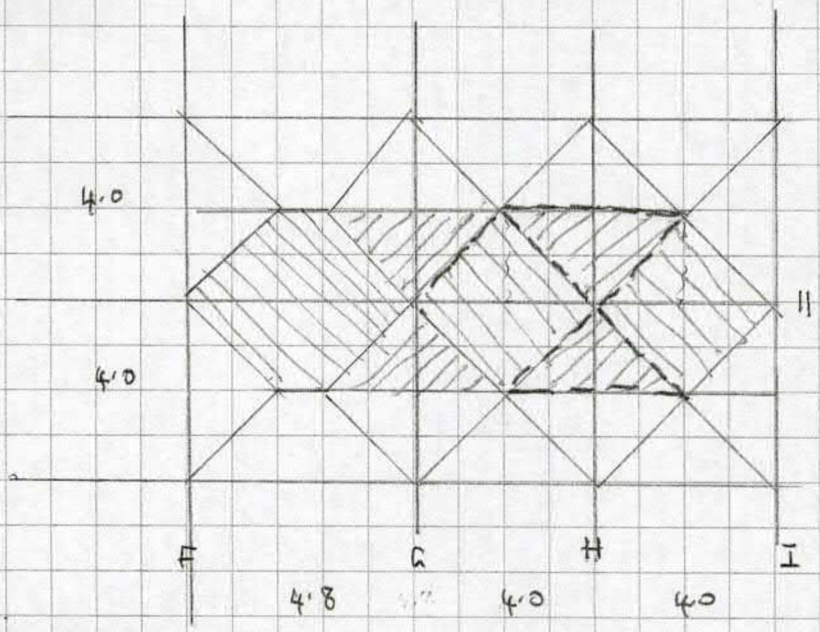
Check floor loading more accurately for 8m span.

Geqv = 6 8 kPa
Q = 3 kPa,



11413 GT3

loading

G point at H11 - 4×2×2×0.5 ×6 = 48kN. from beam grid H
Q point at H11 = 24kN,

G beam load
at G = 0 at mid span = 4×6 = 24kN/m
Q at G = 0 at mid span = 4×3 = 12 kN/m.

G + 0.7Q
def 12 = 9mm same as prev. (ref GT4)

1.2G + 1.5Q
M^*_{12} = 188 kNm similar to previous 17[illegible] ref GT5.
but beam designed for 404kNm ref GT5.

Check roof load at col H11
G = 0.8×4×4 + 4×3 = 25kN
Q = 0.25×4×4 4kN

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1.2G + 1.5Q

M^*_{cz} = 227 kNm > 171

but ϕM_s = 423 ∴ OK ref GT 6

G + 0.7Q

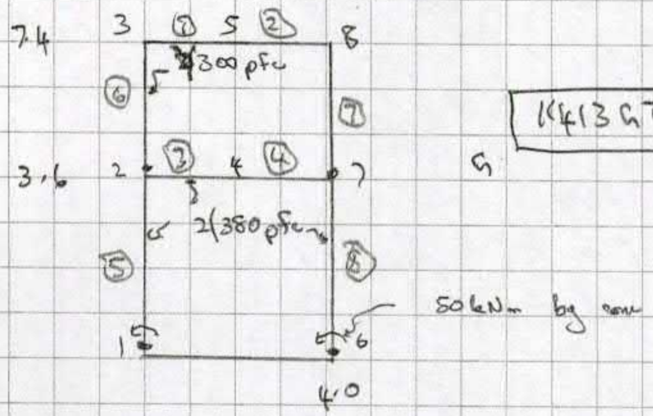
def = 10.5mm

= L/243 ∴ OK

Trans frames grid 2. grid 16 similar

Eu per internal frame = 170 kN 1st fl
120 kN roof.

say load grid 2 = grid 16 = 70% internal frame.
ie 1st = 120 kN
r = 85 kN.



KK13 GT5

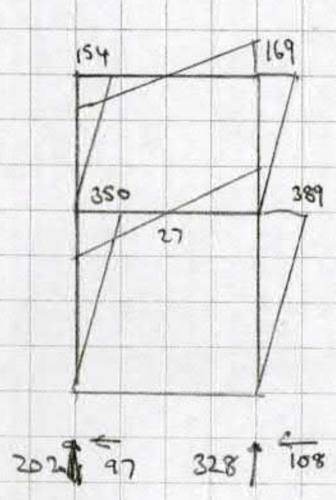
G

50 kNm by conc cols. = 30% capacity

G + 0.4Q + 0.25 Eu + M_{base}.

defl 2x = 6 mm
3x = 17 mm
nett = 11 mm. however conc frame will provide some stiffness plus 1st fl col ht is 0.4 m less. ∴ OK.

Assume steel frame takes all load.
G + 0.4Q + Eu



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PAGE GT10
BY
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JOB

2/300 pfc

$M^*_{max} = 169$ kNm.

$\phi M_s = 152 \times 0.89 \times 2$ Lc = 1.5m 2/300pfc portals

$= 270 > 169$ ∴ OK.

2/ 380 pfc

$M^*_{max} = 389$

$\phi M_s = 238 \times 0.89 \times 2$ Lc = 1.5m 2/380 pfc portal

$- 423$ kNm > 389 kNm

Connection

300pfc

$N^*_t = 169 / 2 \times 0.3$

$= 282$ kN

try 2/M24 bolts

$\phi N_t = 0.8 \times 353 \times 800 \times 2$ 2× 2/M20's bolts.

$= 451$ kN OK

try 2/M20

$\phi N_t = 0.8 \times 245 \times 800 \times 2$

$= 313$ kN > 282 ∴ OK

380 pfc

$\phi N_t = 389 / 2 \times 0.38$

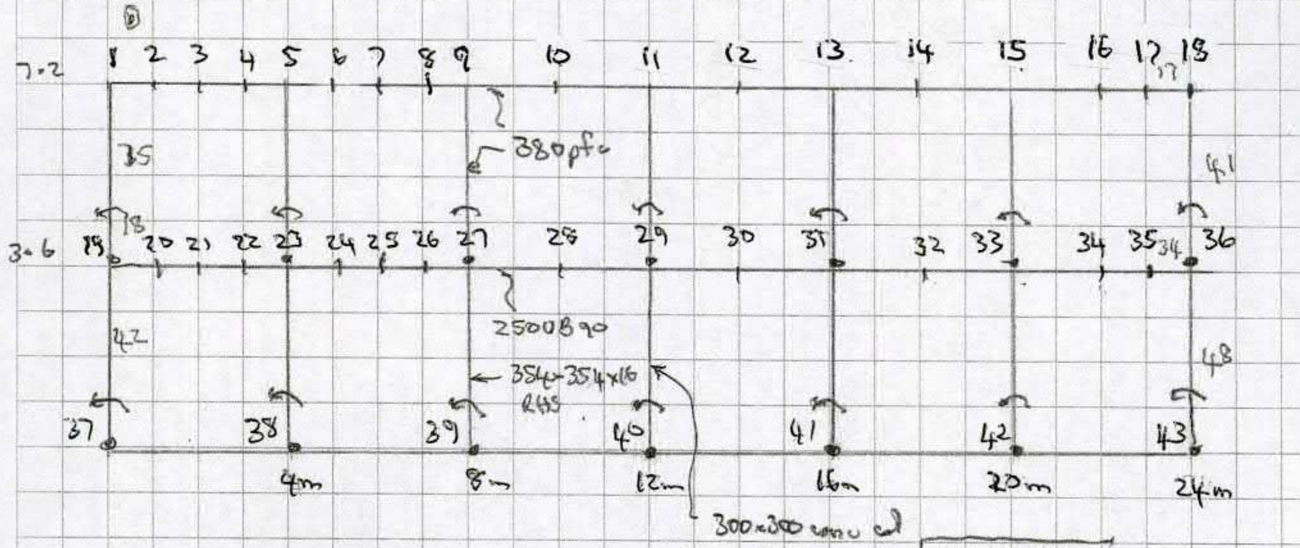
$= 512$ kN

try 2/M30 2× 2/M30 bolts

$\phi N_t = 0.8 \times 561 \times 800 \times 2$

$= 718$ kN > 512.

Ground floor Longitudinal Frame grid F ~ I 71% NBS



11413 GL1

En 50% to frames on grids F ~ I.

Eu (frame)

roof = 948/2 = 478 kN/frame

1st floor = 1360/2 = 680 kN/frame

note braced frames 11413 GL4

G roof

conc

= 3 × 0.15 × 24 + 1.2 = 12 kN/m

FL cbeam glaz sbeam

G first = 3 × 4 + 3 + 2 + 1 = 18 kN/m

Q first = 2 × 3 = 6 kN/m

Re deflection

Consider fixity of conc cols

300 × 300 4/D22 R6 at 150 crs.

$\phi M_s = 0.85 \times 4 \times 380 \times 300 (235 - 0.59 \times 1520 \times 300 / 300 \times 20)$

$= 74$ kNm

say cracked section = 67% ϕM_s

= 50 kNm

for 1st FL same col but say M resisting = 25 kNm.

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PAGE GL2

BY

JOB

DATE 14

Deflection

steel frames only

at roof level = 28mm nett = 12mm causes as long col.

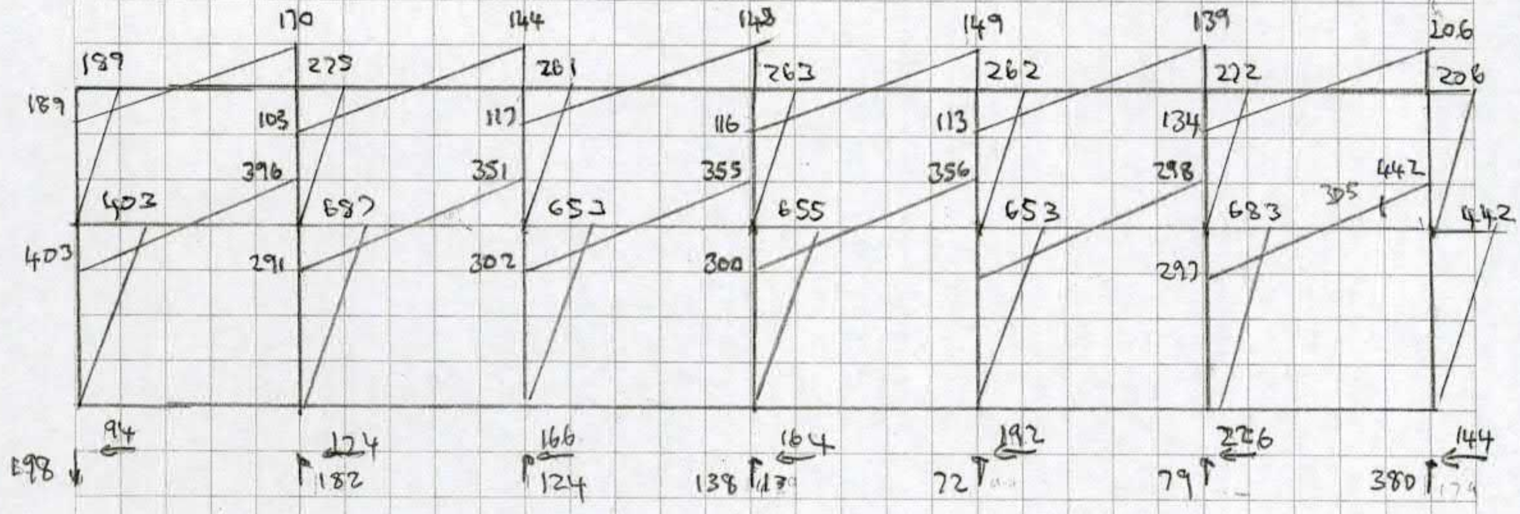
1st fl = 16 mm. high

steel frame + part concrete fixity as per GL1

at roof level = 20 mm nett = 12. OK.

1st fl = 8 mm OK

G+0.4Q+Eu steel frame only.



Check capacity 382× 352× 16 steel encased column.

$I = 2 \times \overset{16\times}{352}^3 / 12 + 2 \times 320 \times 16 \times 168^2$

$\approx 405 \times 10^6 \text{ mm}^4$

$Z = 2 \cdot 3 \times 10^6 \text{ mm}^3$

check → $S = 1 \cdot 2 \times 2 \cdot 3 = 2 \cdot 7$

say $\phi M_s = 0 \cdot 9 \times 300 \times 2 \cdot 7 \times 0 \cdot 95 \times$

$= 692$

$M^*_{max} = 683 < 692 \therefore$ OK.

Check capacity 250UC90 Lc = 2.

$\phi M_s = 309 \times 0.97$

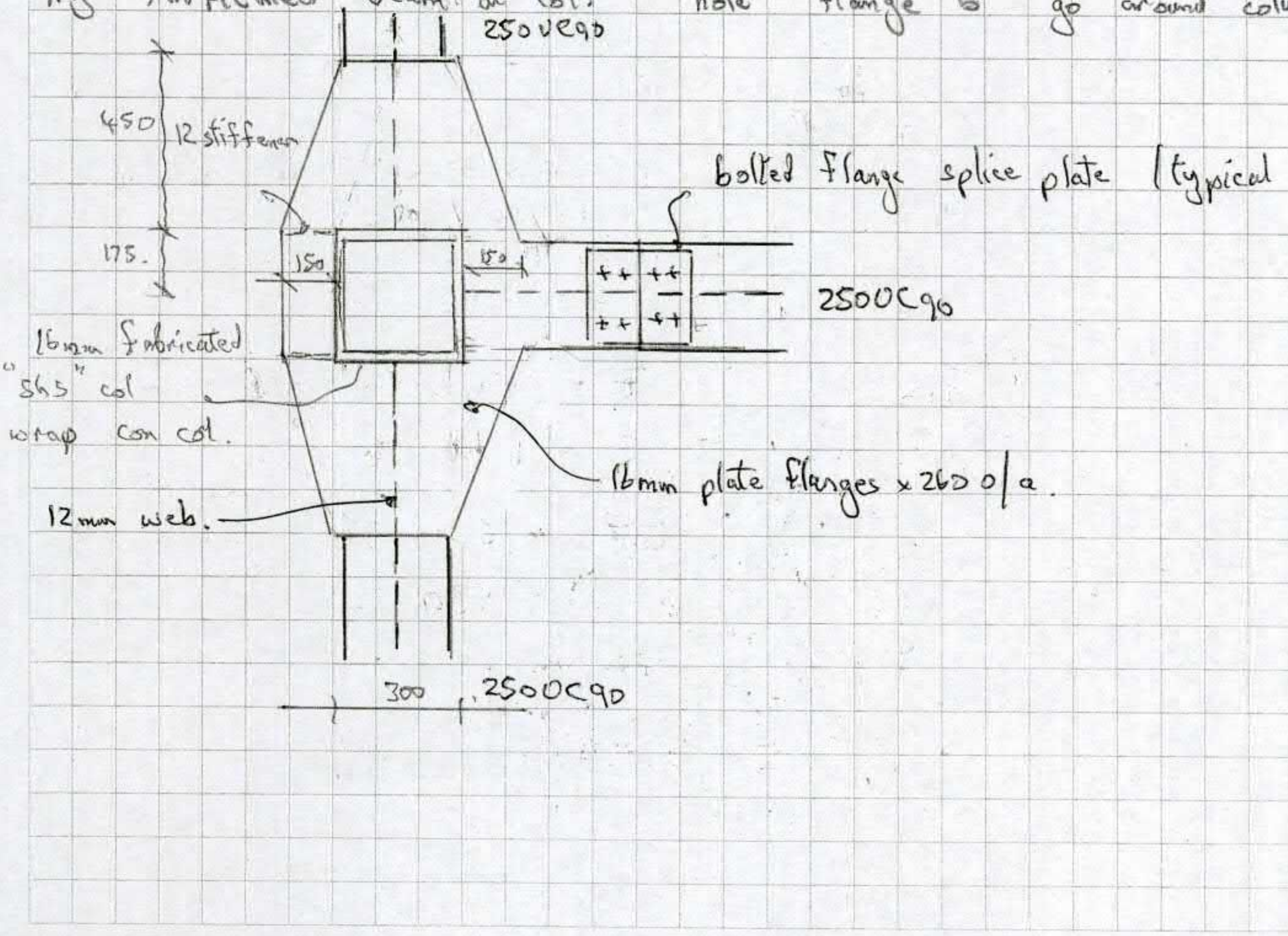
$= 300$ kNm

$M^*_{splice} = 305$ kNm ∴ say OK conc beam has some capacity.
note this is max for total frame.

but M^*_{max} at ℄ col

$= 442$ kNm.

Try fabricated beam at col. note flange to go around column.



JOB No 11413
PAGE C1
BY
JOB
DATE 14

Connections
Bolted splices

Ground Trans.
250 UC 90

M^*_{max} = 200 kNm. at splice 600 mm 11413 G11
N^* = 191 kN from ℄ col.

try 20 mm plate 4 | M24
N^*_s = 200 | 256
= 781 kN

ϕN_s = 0.6 0.8 × 4 × 353 × 800
= 542 too small

4 | M30

try 4 | M30
ϕN_s = 0.6 × 0.8 × 4 × 561 × 800
= 865 > 781 ∴ OK.

esp as M* away from ℄ will be smaller.

Check shear
N^* = 191 kN
try 2 | M24
ϕN_s = 0.6 × 0.8 × 2 × 353 × 800
= 271 kN

2 | 380 pfc
M^*_{max} = 290 kN

N^*_s = 290 | 380
= 763

use 4 | M30
ϕN_s = 865 > 763 ∴ OK

4 | M30

Ground Long

ref 11413 S CiL1 250UB90

nat node 35 (splice 3)

$M^* = 305$ kNm

$N^* = 223$ kN

Try 20 mm plate 6/M30 bolts

$N^*_s = 305 / 256$
$= 1191$

ref C1

$\phi N_s = 1292 > 1191$ ∴ OK

6/M30
20mm plates

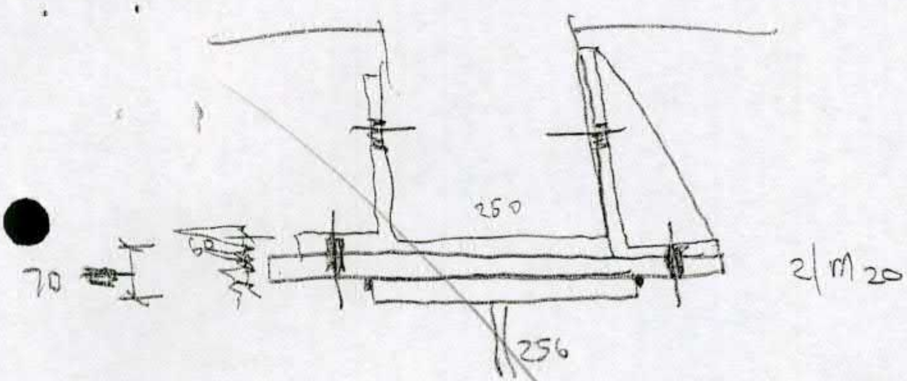
Check bolts for bearing

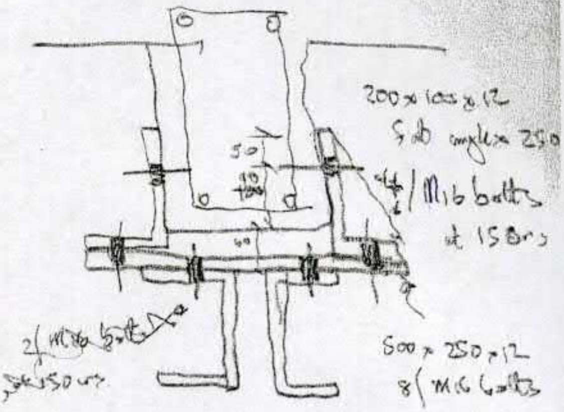
$V_b = 1.4 \, f_{yp} \, d_f \, t_p \, k_p$
$= 1.4 \times 300 \times 30 \times 20 \times 1 \quad \times 6 \quad \times 0.8$
$= 1209$ kN > 1191 ∴ OK.

Check ply for bearing.

$V_b = 3.2 \times d_f \, t_p \, f_{up}$
$= 3.2 \times 30 \times 20 \times 300 \times 0.8 \times 6 \quad \times 0.8$
$= 2214 > 1191$

or $V_b = a_e \, t_p \, f_{up}$
$= 60 \times 20 \times 300 \times 6 \times 0.8 \quad \times 0.8$
$= 1382 > 1191.$ critical





C3

shear = 2308 / 2 × 6 × 3

=

Transfer shear from conc beam to steelbeam.

say 3 pair brackets × 6 bays,
½ frame shortest pair bays.

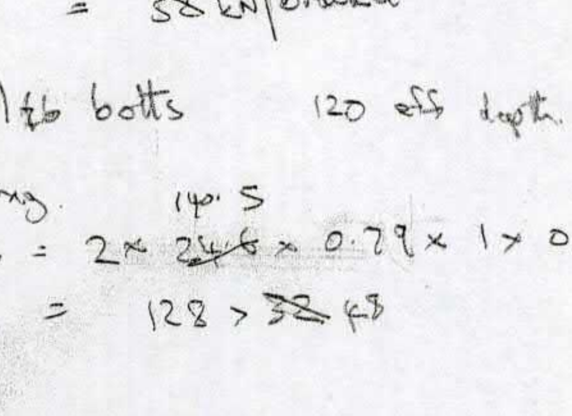
N^*_s = 2308 / 2 × ~~3~~ × 2 × 6
= ~~38~~ 49 kN/bracket

try 2/M16 bolts   120 eff depth.   e = ~~125~~ 400   a = 150

shear long.
ϕN_s = 2 × ~~24.6~~ 140.5 × 0.79 × 1 × 0.~~74~~ 58 × 1
= 128 > ~~38~~ 48

or ϕN_s = 2 × 39.7
= 79 kN > 48 OK

shear pl.
N^* = 200
2/M20
ϕN_s = 0.6 × 0.8 × 2 × 245 × 830
= 19560,



720
180

JOB No 1413
PAGE C4
BY
JOB
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Check capacity support 1st FL at H9,10, 4

re 1413 GT2 N^*_{member} 19 = 32.4kN. 1.2G+1.5Q

1.2G beam/FL = 20× 1.2 = 24 kN/m
1.5Q beam FL = 12× 1.5 = 18 kN/m.
42 kN/m

E_u roof = 120 kN
E_u 1st = 170 kN.

E_u G+0.4Q + E_u

N^*s 2-3,	11 ↓	12 →
N^* 7-8	45 ↓	45 →
N^* 12-13	110 ↓	48 →
N^* 17-18	30 ↓	14 →

1.0 G beam/FL = 20 kN/m
0.4Q beam/FL = 12×0.4 = 5 kN/m
25 kN/m

Bracket to support col load.
try 4 brackets as per detail 7/08 2 pair
2/M16, epoxy 150 into beam e = 100

note bolts confined by reinforcing say increase e to 200,
re Ramset Epcon 6 a = 150

N^*_s = 49.7× 0.88×1×0.65.×1
= 28.4 kN/bolt
= 56.8 kN/bracket.

1.2G+1.5Q N^* = 32.8 kN,
but 4brackets ϕN_s = 4× 56.8
= 227kN > 32.8 ∴ OK

G+E_u = 30↓ + 48→
= 78kN < 227 ∴ OK.

transfer
Check shear from conc beam to steel beam grid G → I

$1.2G + 1.5Q$ $N^* = 42$ kN/m

assume 8 brackets total

$\Sigma N^* = 42 \times 8$

$= 336$ kN.

brackets cap $\Sigma N_s = 8 \times 56.8$

$= 448 > 336$ kN ∴ OK.

transfer Eu total grid 9, 10, 11,

$= 170 + 120$

$= 290$ kN.

12 brackets

∴ shear/bracket $\equiv 24$ kN. →

$G + 0.4Q = 25 \times 13$

$= 325$ kN

$\equiv 27$ kN

Σ shear $= 27 + 24$

$= 51$ kN/bracket < 56 ∴ OK.

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JOB No 11413
PAGE SW 1
BY
DATE

JOB

Check shear cap of 150 conc walls
9 m long
D10 at 300 crs b w
assume ties than cols

say V_u = 400 kN
v_i = 400 / 0.75 × 150 × 0.8 × 9
= 0.5 MPa

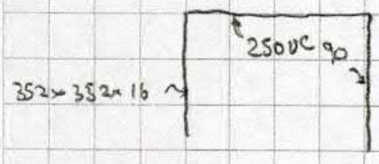
ρ min = 0.7 / f_y
= 0.0023
$A_{s m}$ = 0.0023 × 150 × 300
= 105

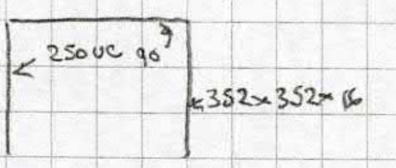
but A_s = 78 mm ∴ too small.
∴ cannot use as shear walls

Welded Connections re Box Columns and Beam / Box Columns

Max Moments and Column Shear.

Transverse grids 12 - 15





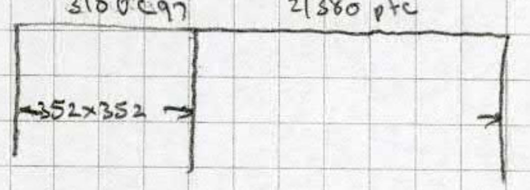
Ref p GT1 and GT2 → $\boxed{11413\ GT1}$

250UC M^*_{max} = 325 kNm.

352×352 M^*_{max} = 352 kNm.
$N^*_{s\,max}$ = 85 kNm.

∴ Max beam flange tension at col.
= 325 / (260 − 16)
= 1332 kN.

Transverse grids 9 - 11



ref. GT4 and GT5 → 11413 GT2

310UC M^*_{max} = 421 kNm

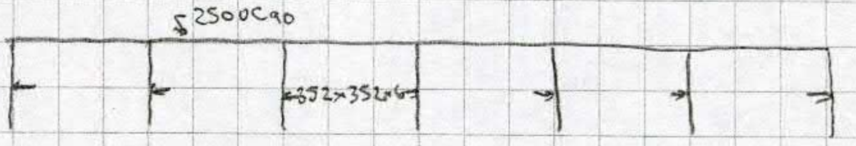
2/380 pfc M^*_{max} = 375 kNm not critical

352×352 M^*_{max} = 482 kNm
$N^*_{s\,max}$ = 134 kNm.

310 UC 97 max beam flange tension at col.
= 421 / (308 - 16)
= 1442 kN

2/380 pfc = 375 / (380 - 16)
= 1030 kN.

Long grids F + I



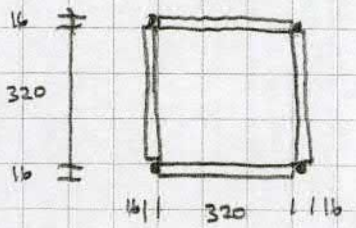
ref. GL1 + GL2. and. 11413 GL1

250 UC M^*_{max} = 443 kNm

352×352 M^*_{max} = 688 kNm.
N^*_{max} = 191 kN

250UC max tension flange at col.
= 443 / 260 - 16
= 1816 kN.

Box Column weld plates at corners with fillet welds.
SP fuw = 410 MPa.



N^*_{max} all cols = 191 kN.

N/mm = V Q / I

V = 191 kN
Q = 320 × 16 × 168
= 860 × 10^3 mm^3
I = 2×320×16 × 168^2
+ 2×16×320^3/12
= 376 × 10^6

N/mm = 191 × 10^3 × 860 × 10^3 / 376 × 10^6
= 440 N/mm

8 mm fw = 0.8 × 0.6 × 410 × 8/$\sqrt{2}$ × 2 welds
= 2226 N/mm > 440 ∴ OK

8 mm fw
fuw = 410. MPa.

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PAGE We 3
BY
DATE
JOB

Transverse beams

Max flange Tension = 1442 kN

try SP f_{uw} = 410 2/8mm fw.

assume tension transferred to column via 2 side flanges 320 mm long.

$\phi N_{t\,weld} = 2 \times 2 \times 0.8 \times 0.6 \times 410 \times 8/\sqrt{2} \times 320$

$= 1425$ kN < 1442.

try SP f_{uw} = 480

$\phi N_{t\,weld}$ = 1668 kN > 1442 ∴ OK.

2/8mm fw
f_{uw} = 480 MPa.

Long beams.

Max flange tension = 1816 kN.

Try 2/10mm fw SP f_{uw} = 480.

$\phi N_{t\,weld} = 2 \times 2 \times 0.8 \times 0.6 \times 410 \times 10/\sqrt{2} \times 320$

$= 2085 > 1816$ kN.

2/10mm fw
f_{uw} = 480 MPa.

Check butt welds of flange/collar plates to transfer tension (see detail sheet S10).

Max Tension = 1816 kN.

Assume 2× 150 width of flange/collar.

use medium tensile plates

Capacity full pen butt weld

$= 0.9 \times 350 \times 150 \times 16 \times 2$

$= 1512$ kN. < 1816

All flange plates shall be f_y = 350 MPa Medium tensile

Try 200mm wide

$= 2016 > 1816$.

min width of flange plates to be 200 mm.

ground floor portals.

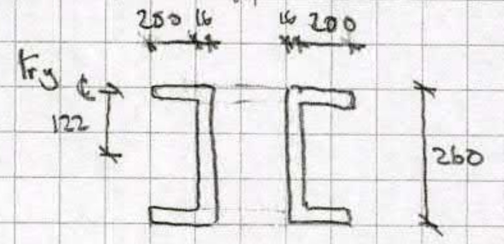
Beams have been sized for reduced M^* at splice

Check capacity of " stub beams for M^* at ℄ col.

(a) 250 UC 90 (max for longitudinal portals on grids F & I)

$M^*_{max} = 443$ kNm

Try



$I = 4 \times 200 \times 16 \times 122^2 + 2 \times 16 \times 260^3 / 12$

$= 236 \times 10^6$

$Z = 1.82 \times 10^6$

$S = 1.82 \times 1230 / 1100$

$= 2.03 \times 10^6$

OK

$\phi M_s = 0.9 \times 2.03 \times 300 \times 0.95$

$= 522$ kNm > 442 ∴ OK.

(b) 250 UC 90 max for transverse grids 12-15.

$M^*_{max} = 325$ kNm,

use 2× 150 flange plates

$I = 190 \times 10^6$

$S = 1.63 \times 10^6$

OK

$\phi M_s = 418 > 325$ ∴ OK.

(c) 310 UC 97

$M^* = 421$ kNm

use 2/ 150 × 16 flange plates.

$I = 4 \times 150 \times 16 \times 146^2 + 2 \times 16 \times 308^3 / 12$

$= 282 \times 10^6$

OK.

$Z = 1.83 \times 1600 / 1450$

$S = 2.02$

$\phi M_s = 519 > 421$ ∴ OK.

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JOB No ~~11420~~ 11413
PAGE ST 1
BY RGA
DATE Feb 12

JOB

Stairs 85

Spring St Stair (Stair A sheet S12
Span 5. m.

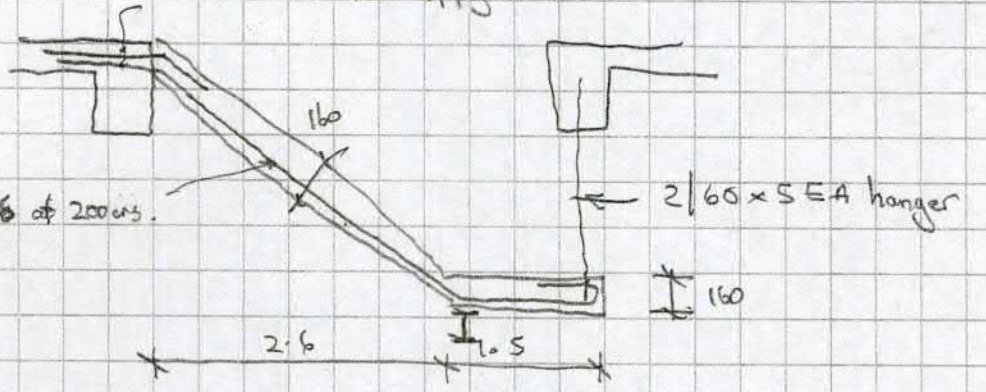
G = 5
Q = 3

M^* = (1.2× 5 + 1.5× 3) 5²/8
= 33kNm

ϕM_s = 0.85× 201× 430(130 − 0.59× 201× 430 (200× 25)) /·2
= 44 > 33 ∴ OK re G+Q

Stair support.

rein extend into floor topping and beam



stair well anchored at floor level
landing hangs by angle (strut/tie)
∴ stair can move during seismic movement.
∴ ideally min flexure at stair/landing

But landing/stair not detailed for vertical upwards loading

∴ provide addition support. at stair/landing
Try 200 UB

span. 3.5m
1.2G+1.5Q = 10.5× 2.5 × 3.5²/8
= 40 kNm critical

G+Eu = 2× 5 × 2.5× 3.5²/8
= 38 kNm

say Eu = G during upwards acc.

Try 200UB25

200UB25

ϕM_s = 75× 0.55
= 41 kNm > 38>40 . OK.

JOB No ~~1420~~ 11413
PAGE 2
BY
DATE

JOB

<u>Post</u>

spn. 4m

Sag $N^* = 26 \times 1.8 \times 2$

$= 95kN.$

Try 89×5 shs

$\phi N_c = 801 \times 0.35$

$= 175 > 95 \therefore$ OK.

89×5 shs

Stair B. (service lane) = Stair C (Gray St) sheet A15 + S18
Steel stringers 152 PFC

Stair at landing can move laterally during seismic ∴ OK.
supported on ~~beam~~ steel beam
Stringers bolted to face of floor beam OK.

Check M12 dynabolts fixing

$G = 1 \times 1.2 \times 2.5 = 3$ kN
$Q = 3 \times 1.2 \times 2.5 \quad 9$ kN.

$1.2G + 1.5Q$
$N^* = 1.2 \times 3 + 1.5 \times 9$
$= 17$ kN.

$2(G+Q) = 2(3+9)$
$N^* = 24$ kN

bolts OK.

but 4/M12 dynabolts
= 6 kN / bolt.

Assume shear only.
Assume 100 depth -

$\phi N_{s\,conc} = 14.3 \times 0.79 \times 1 \times 0.8 \times 1 \times$
$= 9$ kN > 6 OK

$\phi N_{s\,bolt} = 15.8$ kN > 6 OK

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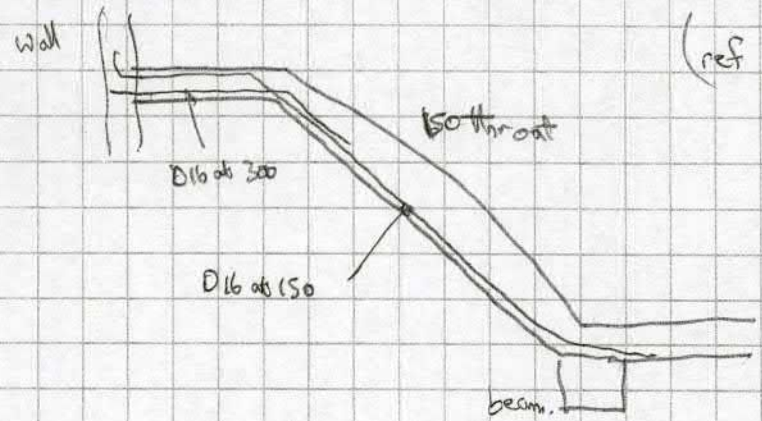
A C E N Z

JOB No 11413
PAGE 4
BY
DATE
JOB

Stair S8.
Main stairs spring st.

(ref S3)



OK

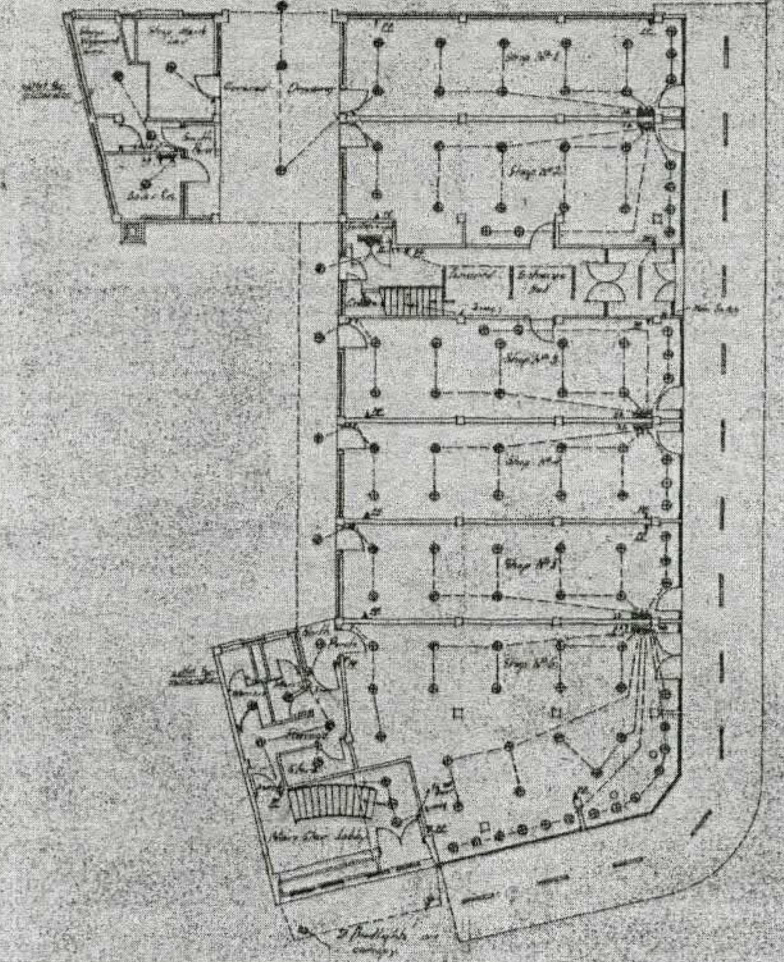
2 storey bld
Walls on 2-3 sides ∴ stiff (see S1)
un likely to move much. better detail at landing.

Rear stairs (internal)
short flights (ref S3.)
rein ok
walls 3 sides (see S1)

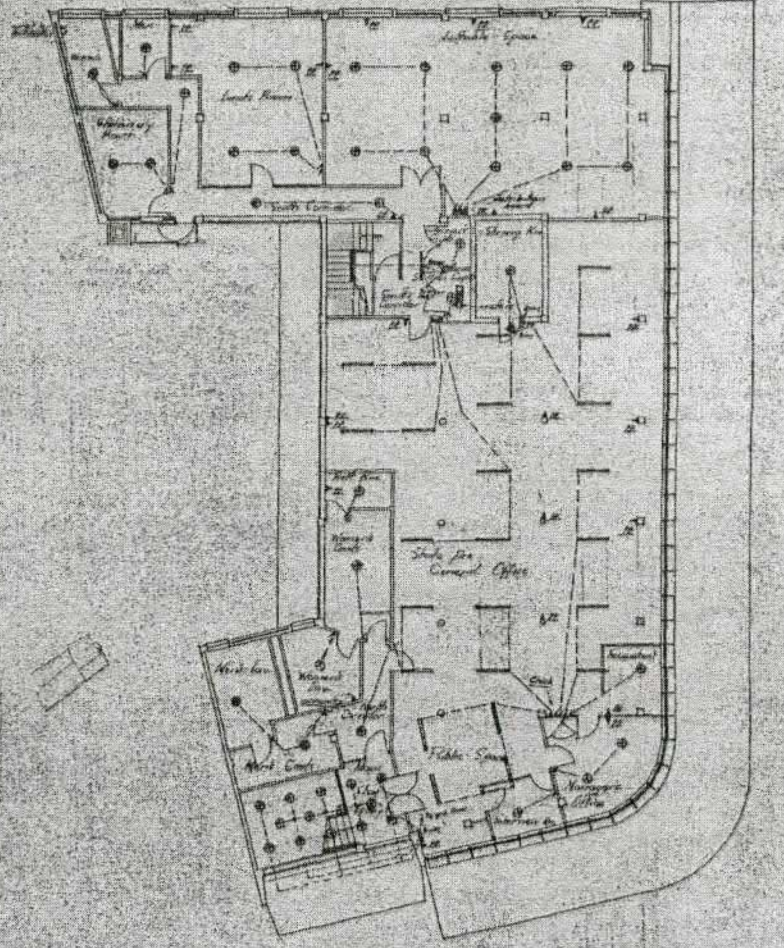
OK.

new Grey st stairs
steel as per 85 bld ∴ OK.

Stairs



Ground Floor Plan



First Floor Plan

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AUCKLAND - - NEW ZEALAND

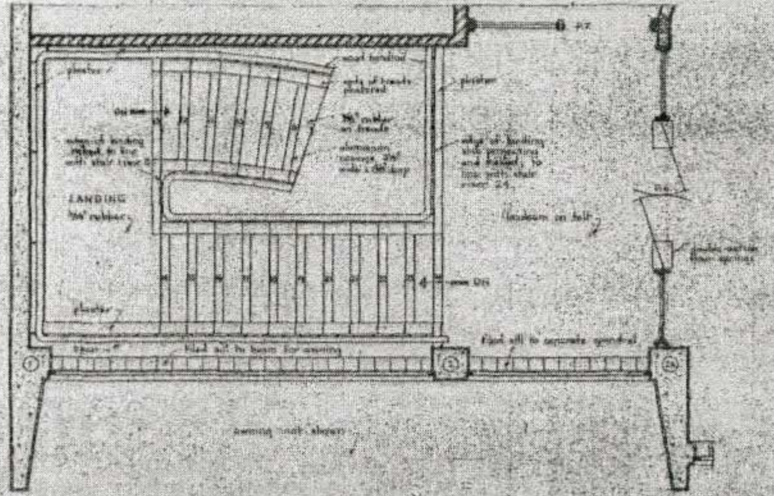
N.Z. GOVT. STATE FIRE BUILDING
TAURANGA

DATE April 19[illegible]
DRAWN BY
CHECKED BY

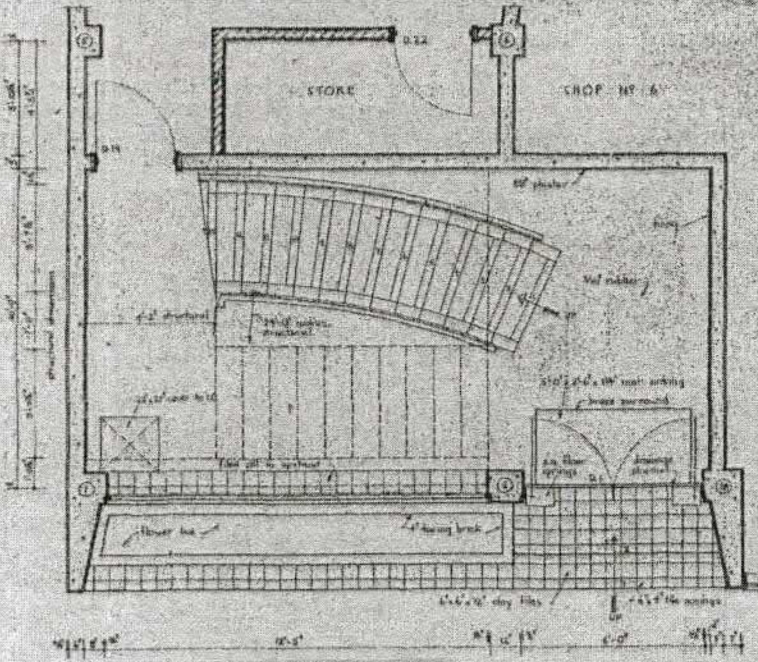
Lighting Plans

SCALE 1/8" = 1'0"
DRAWING NO 4

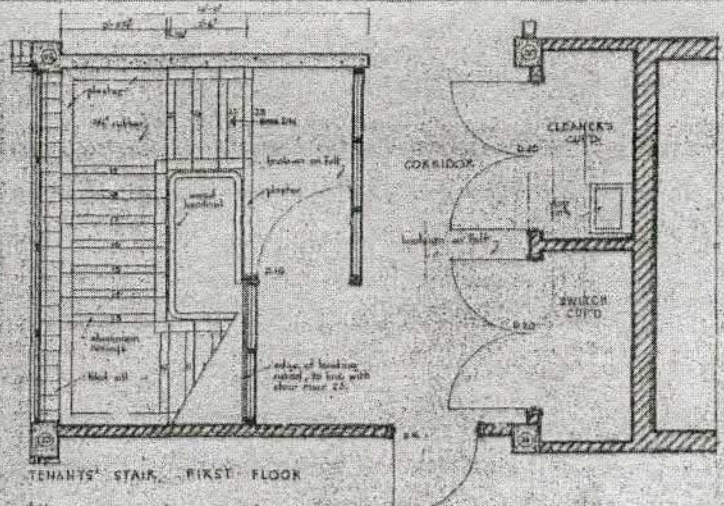
2387



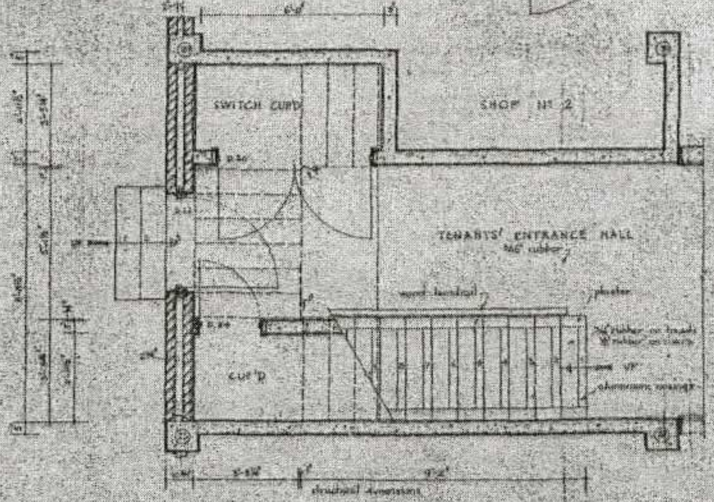
MAIN STAIR LOBBY, FIRST FLOOR



MAIN STAIR LOBBY, GROUND FLOOR



TENANTS' STAIR, FIRST FLOOR



TENANTS' STAIR, GROUND FLOOR

NOTE. Dotted lines in Ground Floor stair plans [illegible]. All risers and Landing edges rake back 1". See detail, Sheet 6.

2387

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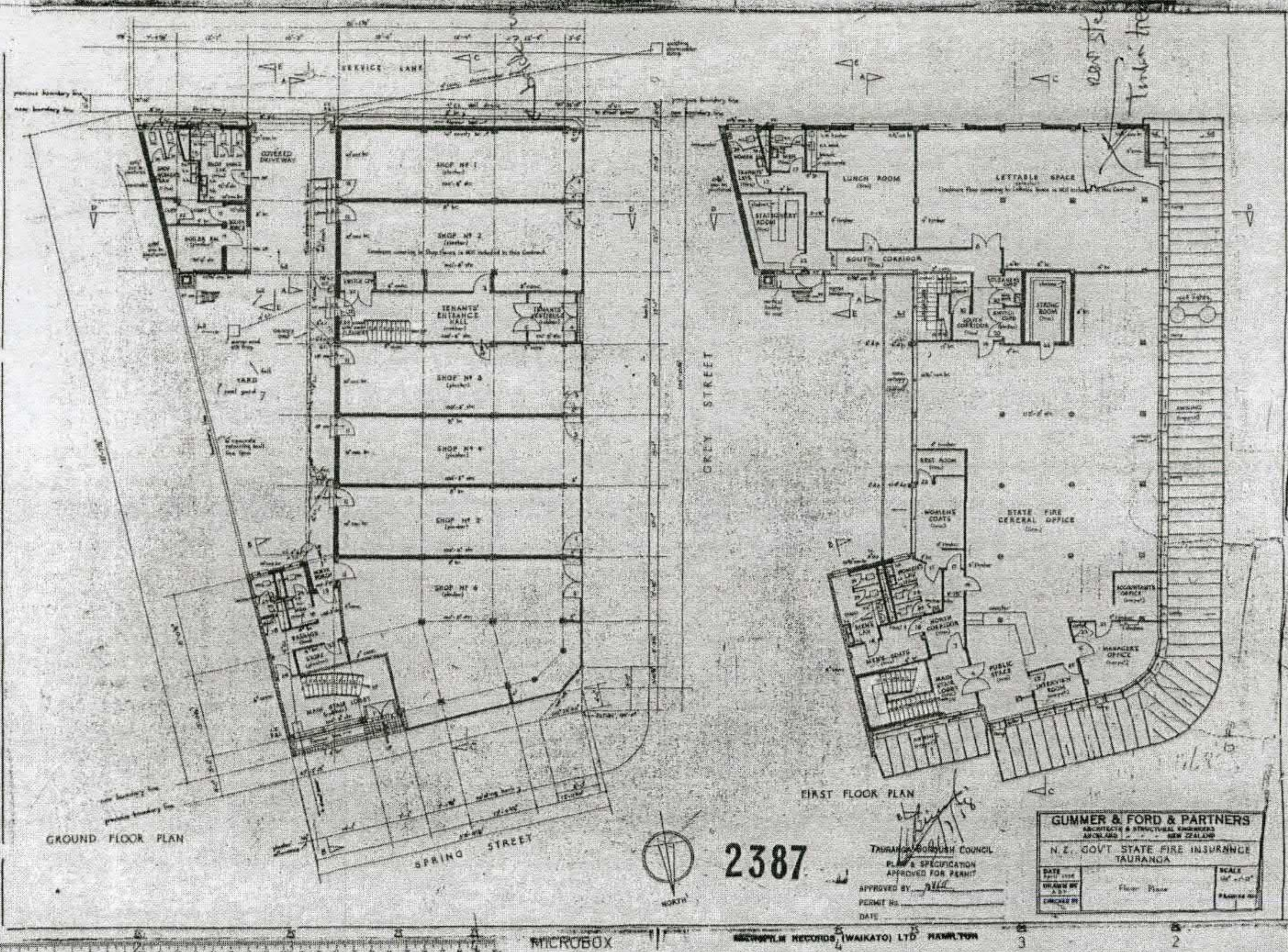
AUCKLAND - - - NEW ZEALAND
N.Z. GOV'T STATE FIRE INSURANCE
TAURANGA
Stair plans
SCALE 1/4" - 1'-0"
DRAWING No 5

58



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TAURANGA BOROUGH COUNCIL
PLAN & SPECIFICATION
APPROVED FOR PERMIT
APPROVED BY ________
PERMIT No. ________
DATE ________

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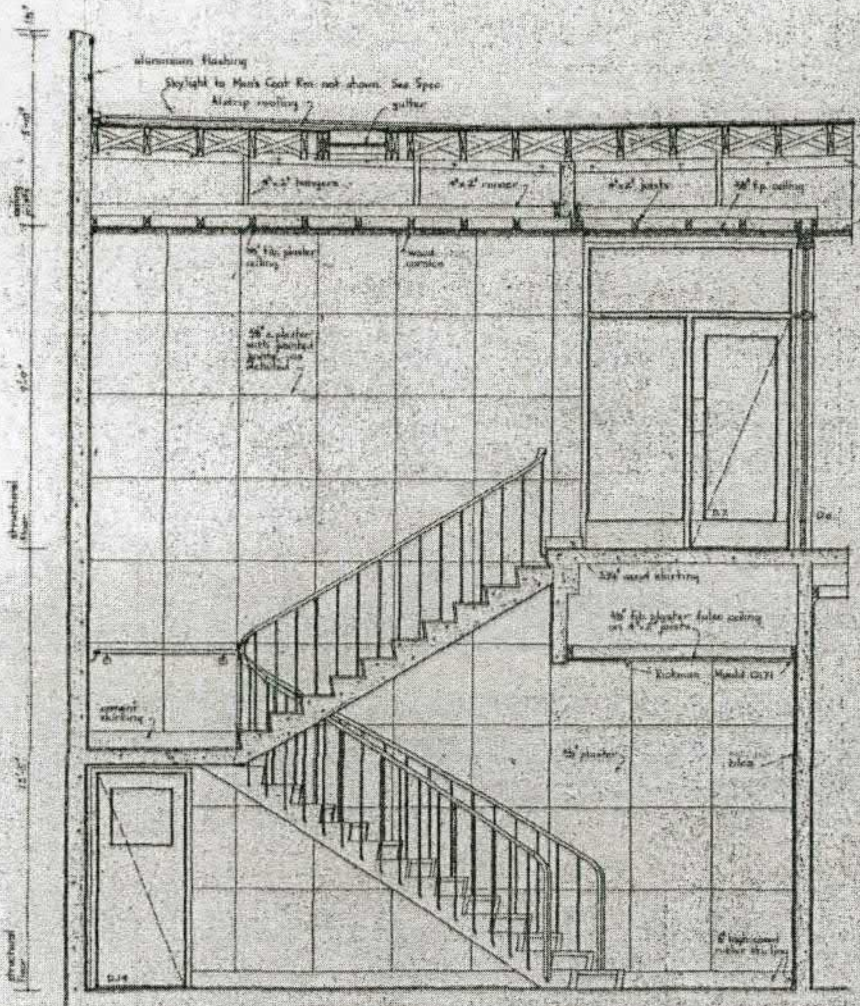
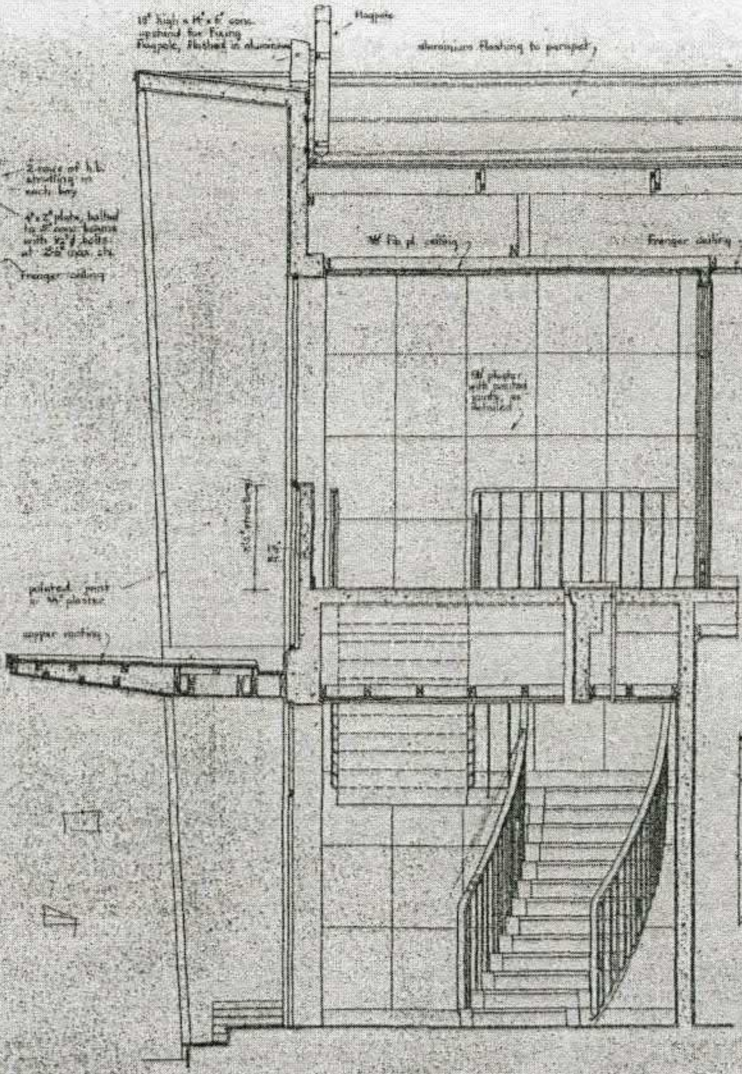
AUCKLAND - - - NEW ZEALAND

N.Z. GOVT STATE FIRE INSURANCE
TAURANGA

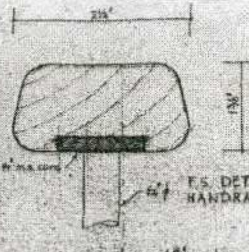
DATE April 1958	Floor Plans	SCALE 1/8" = 1'-0"
DRAWN BY A.D.P.		
CHECKED BY		



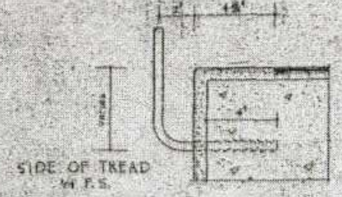
E-W. SECTION THROUGH MAIN STAIR LOBBY



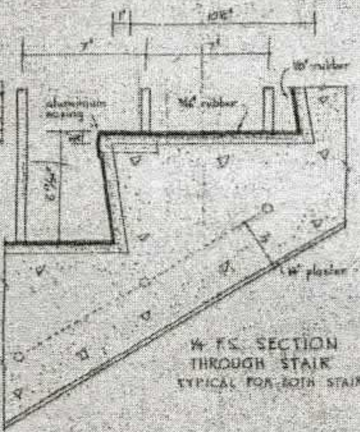
N-S. SECTION THROUGH MAIN STAIR LOBBY



F.S. DETAIL OF HANDRAIL



SIDE OF TREAD
¼ F.S.



¼ F.S. SECTION
THROUGH STAIR
TYPICAL FOR BOTH STAIRS

POINTED JOINTS IN PLASTER (F.S.)

2387

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AUCKLAND - - - NEW ZEALAND

N.Z. GOV'T STATE FIRE INSURANCE
TAURANGA

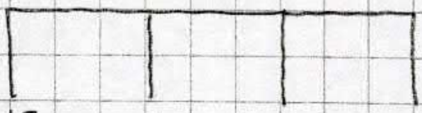
DATE April 1948	Sections through Main Stair lobby, and stair details	SCALE ½" = 1'-0" ¼ F.S., F.S.
DRAWN BY J.E.T.		
CHECKED BY C.W.C.		DRAWING No. 6

Foundations

Transverse 4 columns grids 12 - 15.

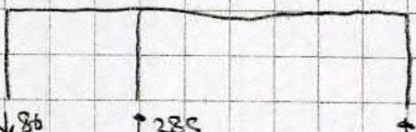
G+0.4Q+Eu

11413 GT1.



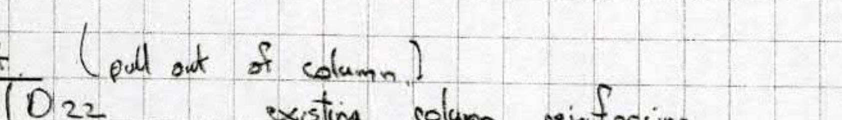
G+Q ± Eu	↕7	↑131	↑50	↑229
1.2G+1.5Q	135	220	202	37

Transverse 3 columns grids 9 - 11. 11413 GT2.



G+0.4Q+Eu	↓86	↑285	↑220
G+0.4Q+Eu	↑212	↑177	↑23
1.2G+1.5Q	↑105	↑370	↑194

Long



G+0.4Q+Eu	↓$\boxed{225}$	↑197	↑122	↑130	↑136	↑74	↑345
1.2G+1.5Q	↑83	187	179	180	179	187	83.

Check uplift (pull out of column)

Chk 4| D22 existing column reinforcing.

$N^*_t = 225$ kN

$\phi N_t = 0.8 \times 4 \times 380 \times 300$
$= 368 > 225$ ∴ OK.

Check 4| M 24 in shear.

$\phi N_{tn} = 4 \times 109 \times 0.88 \times 1 \times 1$
$= 383$

$\phi N_{ts} = 4 \times 86.8$
$= 347$ critical > 225 ∴ OK.

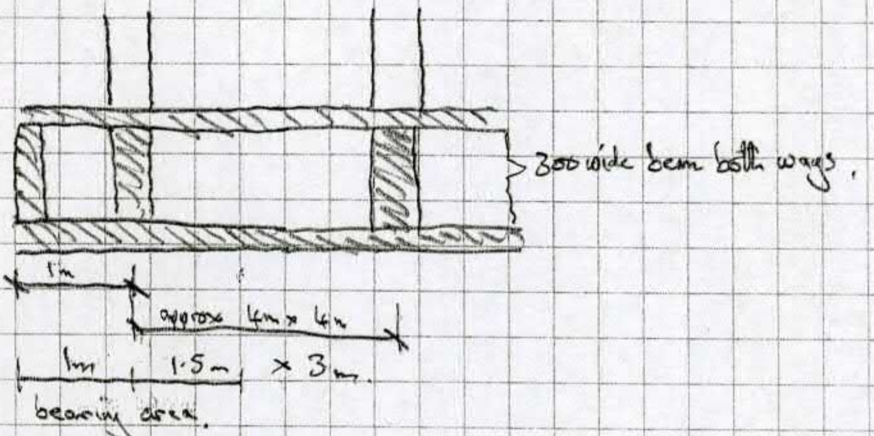
note bolts within core. plus conc col confined by steel 'box' + epoxy)
say $e = 300$

OK.

Check mass bearing
$G + 0.4Q + E_n$

---

lower subfloor slab is 225 thick
perim col. $N^*_{max} = 345kN$ $I_7 = F_{15} = F_9 = F_{15}$



bearing $= 345 / 2.5 \times 3$
$= 46$ kPa OK.

allow ult $= 300 / 2 \times 2$
$= 75$ kPa > 46 ∴ OK.

Internal Column. (G9→11 critical
$N^* = 370$ kN $1.2G + 1.5Q$
bearing $= 370 / 3 \times 3$
$= 41$ kPa < 75 kPa ∴ OK. OK.

Table IEP-1: Initial Evaluation Procedure – Step 1

Table IEP-1 Initial Evaluation Procedure Step 1 **Page 1....**

(Refer Table IEP - 2 for Step 2; Table IEP - 3 for Step 3; Table IEP - 4 for Steps 4, 5 and 6)

Building Name
Location 46 Soring Street 1985 extension

Ref. 114/3
By RG Arnold
Date 23 02 12

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

see attached

1.2 Sketch of building plan

see attached

1.3 List relevant features

3 storey conc frame building on conc raft foundations

1.4 Note information sources

Tick as appropriate

Visual Inspection of Exterior	☑
Visual Inspection of Interior	☑
Drawings (note type) structural	☑
Specifications	☐
Geotechical Reports	☑
Other (list)	☐

Table IEP-2: Initial Evaluation Procedure – Step 2

Table IEP-2 **Initial Evaluation Procedure Step 2** **Page 2....**

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Step 3; Table IEP - 4 for Steps 4, 5 and 6)

Building Name **Ref.**
Location **By**
Direction Considered: a) Longitudinal b) Transverse
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt) **Date**

Step 2 - Determination of (%NBS)$_b$

2.1 Determine nominal (%NBS) = (%NBS)$_{nom}$

a) Date of Design and Seismic Zone

tick as appropriate

Pre 1935 ☐ See also notes 1, 3
1935-1965 ☐
1965-1976 Seismic Zone; A ☐
B ☐
C ☐
[✓ 1976-1992] Seismic Zone; A ☐ See also note 2
B ☑
C ☐
1992-2004 ☐

b) Soil Type

From NZS1170.5:2004, Cl 3.1.3
A or B Rock ☐
C Shallow Soil ☐
[✓ D Soft Soil] ☑
E Very Soft Soil ☐

From NZS4203:1992, Cl 4.6.2.2
(for 1992 to 2004 only and only if known)
a) Rigid ☐
b) Intermediate ☐

c) Estimate Period, T 0·5 Seconds

Can use following:

$T = 0.09h_n^{0.75}$ for moment-resisting concrete frames
$T = 0.14h_n^{0.75}$ for moment-resisting steel frames
$T = 0.08h_n^{0.75}$ for eccentrically braced steel frames
$T = 0.06h_n^{0.75}$ for all other frame structures
$T = 0.09h_n^{0.75}/A_c^{0.5}$ for concrete shear walls
$T \leq 0.4\text{sec}$ for masonry shear walls

Where h_n = height in m from the base of the structure to the uppermost seismic weight or mass;
$A_c = \Sigma A_i(0.2 + L_{wi}/h_n)^2$
A_i = cross-sectional shear area of shear wall i in the first storey of the building; in m^2
l_{wi} = length of shear wall i in the first storey in the direction parallel to the applied forces; in m
with the restriction that l_{wi}/h_n shall not exceed 0.9

d) (*%NBS*)$_{nom}$ determined from Figure 3.3: 17 (*%NBS*)$_{nom}$

Note 1: For buildings designed prior to 1965 and known to be designed as public buildings in accordance with the code of the time, multipy (*%NBS*)$_{nom}$ by 1.25.
For buildings designed 1965 - 1976 and known to be designed as public buildings in accordance with the code of the time, multiply (*%NBS*)$_{nom}$ by 1.33 - Zone A
1.2 - Zone B

Note 2: For reinforced concrete buildings designed between 1976-84 multiply (*%NBS*)$_{nom}$ by 1.2 1·2

Note 3: For buildings designed prior to 1935 multiply (*%NBS*)$_{nom}$ by 0.8 except for Wellington where the factor may be taken as 1. 20·4 (*%NBS*)$_{nom}$

Continued over page

Table IEP-3: Initial evaluation procedure – Step 3

Table IEP-3 **Initial Evaluation Procedure Step 3** Page ......

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Ref.
Location	By
Direction Considered: a) Longitudinal b) Transverse	
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)	Date

2

Step 3 - Assessment of Performance Achievement Ratio (PAR)

(Refer 3.4.3)

Critical Structural Weakness	Building Score	Effect on Structural Performance *(Choose a value - Do not interpolate)*		
3.1 Plan Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	Factor A 1·0	0.4 max	0.7	1
3.2 Vertical Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	Factor B 1·0	0.4 max	0.7	[✓ 1]
3.3 Short Columns *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	Factor C 1·0	0.4 max	0.7	1

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect

Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 0·7 0-7

Table for Selection of Factor D1

	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2: - Height Difference Effect

Select appropriate value from Table

Factor D2 0·9

Table for Selection of Factor D2

	Severe	Significant	Insignificant
	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1
Height Difference 2 to 4 Storeys	0.7	0.9	1
Height Difference < 2 Storeys	[✓ 1]	1	1

Factor D 0·7 *(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)*

		Severe	Significant	Insignificant
3.5 Site Characteristics - *(Stability, landslide threat, liquefaction etc)* *Effect on Structural Performance*	Factor E 0·7	0.5 max	[✓ 0.7]	1

conserv. see geo report.

3.6 Other Factors

Factor F 1·0 For ≤ 3 storeys - Maximum value 2.5, otherwise - Maximum value 1.5. No minimum.

Record rationale for choice of Factor F:

....

3.7 Performance Achievement Ratio (PAR)
(equals A x B x C x D x E x F) 0·7

Table IEP-2: Initial Evaluation Procedure – Step 2 continued

Table IEP-2 Initial Evaluation Procedure Step 2 continued

Page 3....

2.2 Near Fault Scaling Factor, Factor A

If $T \leq 1.5$sec, Factor A = 1

a) Near Fault Factor, $N(T,D)$
(from NZS1170.5:2004, Cl 3.1.6)

b) Near Fault Scaling Factor = 1/N(T,D) Factor A 1.0

2.3 Hazard Scaling Factor, Factor B

a) Hazard Factor, Z, *for site* 0.20
(from NZS1170.5:2004, Table 3.3)

b) Hazard Scaling Factor
For pre 1992 = $1/Z$
For 1992 onwards = Z_{1992}/Z
(Where Z_{1992} is the NZS4203:1992 Zone Factor from accompanying Figure 3.5(b)) Factor B 5.0

2.4 Return Period Scaling Factor, Factor C

a) Building Importance Level 2
(from NZS1170.0:2004, Table 3.1 and 3.2)

b) Return Period Scaling Factor from accompanying Table 3.1 Factor C 1.0

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ 2.0
(shall be less than maximum given in accompanying Table 3.2)

b) Ductility Scaling Factor
For pre 1976 = k_{μ}
For 1976 onwards = 1
(where k_{μ} is NZS1170.5:2004 Ductility Factor, from accompanying Table 3.3) Factor D 1.0

2.6 Structural Performance Scaling Factor, Factor E

a) Structural Performance Factor, S_p 0.7
from accompanying Figure 3.4

b) Structural Performance Scaling Factor = $1/S_p$ Factor E 1.42

2.7 Baseline %NBS for Building, $(\%NBS)_b$

(equals $(\%NSB)_{nom}$ x A x B x C x D x E) 145

Table IEP-4: Initial evaluation procedure – Steps 4, 5 and 6

Table IEP - 4 Initial Evaluation Procedure Steps 4, 5 and 6 Page ...

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 3 for Step 3).

Building Name
Location
Ref.
By
Date

Step 4 - Percentage of New Building Standard (%NBS)

	Longitudinal	Transverse	
4.1 Assessed Baseline (%NBS)$_b$ (from Table IEP - 2)	145	145	2
4.2 Performance Achievement Ratio (PAR) (from Table IEP - 3)	0.49	0.49	2
4.3 PAR x Baseline (%NBS)b	71.0	71.0	
4.4 Percentage New Building Standard (%NBS) (Use lower of two values from Step 4.3)		71.0	2

Step 5 - Potentially Earthquake Prone?
(Mark as appropriate)

%NBS > 33 [✓ NO]

%NBS ≤ 33 YES

Step 6 - Potentially Earthquake Risk?
(Mark as appropriate)

%NBS ≥ 67 [✓ NO]

%NBS < 67 YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade B

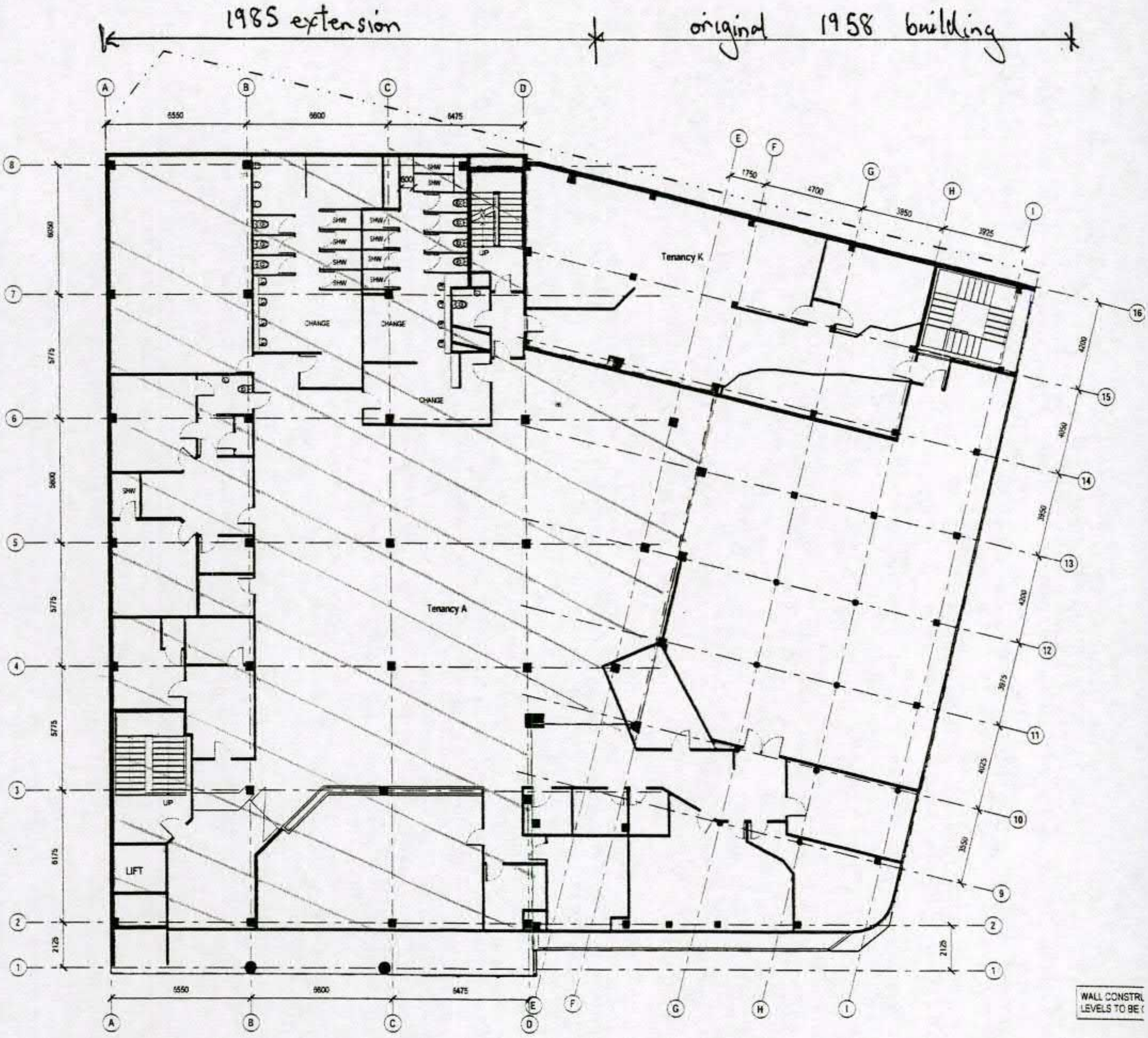
Evaluation Confirmed by .... Signature

R G ARNOLD .... Name

16215 .... CPEng. No

Relationship between Seismic Grade and %NBS:

Grade:	A+	A	B	C	D	E
%NBS:	> 100	100 to 80	80 to 67	67 to 33	33 to 20	< 20



1985 extension

original 1958 building

STING FLOOR PLAN
A1 SCALE 1 : 100

WALL CONSTRU
LEVELS TO BE (

ects Limited and is not to be

n site.
ensions and those on plans

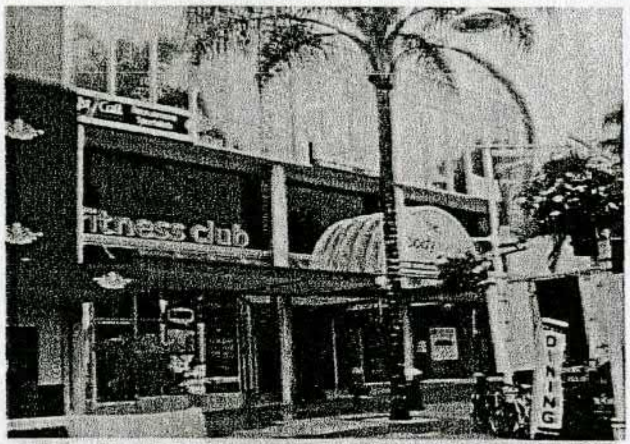
REVISIONS

FIRSTPRINCIPLES
architects
+64 7 574 6726, po box 14214, tauranga MC 3143, new zealand

Project:
46 SPRING ST
Address Project Address

Drawing:
EXISTING FIRST FLOOR PLAN
Scale 1 : 100 @ A1 A3 SCALE 1 : 200

Dra
LC
Pro
R(


fitness club
DINING


body
HOL

Our ref: 20695

17 February 2014

Resource Coordination Partnership Ltd
PO Box 15039
Tauranga

Attention Shane Forward

Re: Geotechnical Investigations for Seismic Assessment
Building at 46 Spring Street, Tauranga

1.0 Introduction

As instructed in your letter of 16 January 2014 we have undertaken an additional subsoil investigation at 46 Spring Street to add to the subsoil data that is available and applicable to the building on that property. The purpose of the accumulation of this data is to assist Richard Arnold of Arnold & Johnstone Ltd in his evaluation of the building structure and the detailing of seismic strengthening works.

The building is at the corner of Spring Street and Grey Street. Aerial photography on the Council website indicates that the building was constructed in about 1964. The building has been occupied by the State Insurance Office.

In August 1984, Tonkin & Taylor undertook investigations on the site of a proposed extension to the original building which took in the site of an old picture theatre to the east. In their report dated September 1984, Tonkin & Taylor stated that the existing State Insurance Building was on a raft foundation and recommended that the intended foundation for the building extension would also be in the form of a compensated raft.

This report discusses the results of the Tonkin & Taylor investigation of 1984 and our recent investigations of February 2014.

2.0 Site Geology

The geology is the building site is described in the publication "Geology of the Tauranga Area" by Briggs et al from the Department of Earth Sciences of the University of Waikato (1996) as comprising

- Silts, sands and gravel of modern streams with reference to the presence of the adjacent harbour estuary before land reclamation took place at The Strand further to the east , or
- Fluvial terrace deposits comprising sands, gravels, lignites and lacustrine silts. These deposits overlay ignimbrite at depth

Past test results of other investigations in our office files indicate that Grey Street was constructed in a shallow gully that extended from the Spring and Willow Street area up to the higher ground at Elizabeth Street.

3.0 Subsurface Investigations

Two machine drilled boreholes were put down under the supervision of Tonkin & Taylor on 22 August 1984 at locations shown on attached plan 20695-01. Borehole 1 was to 24.5 m deep and borehole 2 , 19.7 m deep.

With the boreholes being relatively close together, each showed similar subsoils being

- Sandy silts, and silty sands to depths of 11.3 m in borehole 1 and 12.8 m in borehole 2. SPT N values were in the range of 2 to 11. Sandy gravelly filling was present from the surface to 1.0 m in borehole 1 and to 1.5 m in borehole 2. In the depth range of 1.5 m to 3.4 m in borehole 2, the silts were noted as being slightly organic.
- From 11.3 m to 20.6 m in borehole 1 and 12.8 m to 18 m the presence of firm silty peat containing silty and sandy horizons.
- Below the peat in both boreholes medium dense to dense pumiceous slightly gravelly and slightly silty sands. Uncorrected SPT N values were recorded in the range of 22, 26 and 38. These soils showed the characteristics of weathered Te Ranga or Waiteariki ignimbrite. The subsurface conditions are described in detail on the attached borehole logs.

Investigations were undertaken by Perry Geotech and managed by S & L Consultants Ltd on 5 February 2014, and comprised

- A static cone penetrometer (CPT) test to 30 m which was located as access would permit, to the south east of the State Insurance Building, as shown on 20695-01
- A machine drilled borehole down the vertical alignment of the CPT probe, to a depth of 10.5 m.

The test site was prepared, initially, by a small hand excavated pit to pass beside the high voltage power cables and telecommunications services known to be in the area. The excavation was then backfilled along with the installation of a pvc standpipe. The CPT and drilling head were passed down the standpipe.

A summary log of the soils found in the borehole is attached along with CPT plots, with depth, of

- Cone resistance
- Soil behaviour type to indicate the subsoil types
- Undrained shear strengths
- Equivalent SPT N Values

The borehole showed the presence of similar subsoils to those found by Tonkin & Taylor under the surface filling to 1.5 m deep. These subsoils comprised estuarine silts with some organic inclusions notably as an organic silt containing small wood fragments and vegetation in the depth range of 2.2 m to 2.9 m. Below that depth, silts with some minor organic inclusions were present. No insitu testing was undertaken in the borehole but the sands and silts below 2.9 m were described by our supervisor as being variously loose, stiff or soft. The groundwater level established in the borehole as being 2.9 m below the ground level.

Photographs of these soils in sample core boxes are attached.

The soil behaviour type plot confirms the presence of fine grained silts to a depth of 20.5 m. Below that depth the Perry plot indicates that organic soils are present in the depth range of 19.5 m to 23 m whereas the Tonkin & Taylor boreholes found dense sands at 18.0 m (borehole 2) and 20.6 m (borehole 1).

The CPT plots of cone resistance, undrained shear strength and equivalent SPT N values with depth confirm the low strengths of the subsoils down to the dense sands. The CPT plot of soil behaviour did not indicate the peaty soils that were distinctive on the Tonkin & Taylor borehole logs although some organic contacts were noted in the depth range of 5 m to 6.5 m.

4.0 Discussion of Investigation Results

4.1 Test Results

The tests undertaken in February 2014 show similarity with the results of the Tonkin & Taylor investigations some 30 years previously in that the building is supported on estuarine and fluvial silts that had been deposited in an old gully that ran in an north south direction between the higher ground of Devonport Road to the east and Durham Street to the west. The peats present in the Tonkin & Taylor boreholes were probably derived from the vegetation cover on the old gully floor.

From their tests Tonkin & Taylor advised that they predicted a ground settlement under a compensated raft foundation system of about 3mm. Furthermore, they derived an allowable ground bearing capacity of 115 kPa from their tests (incorporating a factor of safety of 3) which would be well in excess of the contact pressures from the compensated raft arrangement for the floor slab and foundations. Tonkin & Taylor did not, however provide any opinions on parameters to be considered for seismic analyses.

4.2 Seismic Site Class

The existing building would have an Importance Level of 2 as described in NZS 1170.0, 2002. Seismic events to be considered in design are therefore

- In the serviceability limit state (SLS) a return period of 1 in 25 years.
- In the ultimate limit state (ULS) a return period of 1 in 500 years.

NZS 1170.5.2004 describes methodology for the determination of the site subsoil class based on the thickness of soil types and their relative strengths. As the underlying soils are predominantly cohesive types (silts and clays) the assessed undrained shear strengths taken from the CPT data can be used to determine seismic silt class. In this case the seismic soils class may be taken as **Class D** (a deep or soft soil site) where recorded undrained shear strengths are 12.5 kPa or lower down to a depth of 10m (refer to CPT plot.)

The evaluation of liquefaction potential described below has been based on a Class D site.

4.3 Liquefaction Potential and Induced Settlement

Cyclic liquefaction may occur during seismic activity when loose saturated cohesionless soils (mainly sands) are subject to cyclic shear loadings. As water pressures in the pores between soil particles increase effective (shear) strengths reduce. The results can be the development of significant vertical and lateral movements in the form of ground settlements and lateral movements on sloping sites. In such seismic events finer grained silts and clays can also undergo strength loss.

The CPT information has been used as the input data to the liquefaction assessment program CLiq. This software estimates the resistances of the soils present to cyclic loading for seismic loadings under ULS and SLS conditions. The software analysis is a solution to the methodology stated in the publication by the New Zealand Geotechnical Society (NZGS), July 2010 "Geotechnical Earthquake Engineering Practice _ Module 1, Guidelines for the Identification, Assessment and Mitigation of Liquefaction Hazards". An earthquake magnitude of 7.5 (Richter) was used in the analysis as stated in the NZGS guidelines. The standing groundwater level at 2.9 m deep was input so that the liquefaction potential would be assessed below that level (i.e. in saturated groundwater conditions).

Summary plots of the liquefaction analyses are attached.

Under serviceability limit state conditions (SLS) the analyses showed that no liquefaction would take place. No settlements were derived for the SLS analysis.

Under ultimate limit state conditions (ULS) the analyses show that vertical ground settlement of up to 84 mm may occur with the majority of this value predicted to take place due to minor liquefaction in the depth range of 10.5 m to 12.5 m where the CPT identified sensitive fine grained silty sands and sandy silts.

Minor liquefaction potential is identified in silty clays in the depth range of 2.8 m to 3.5 m. The settlement due to volume changes in this depth interval is estimated to be about 15 mm.

The results of the liquefaction analysis, based on data from one CPT, show that because of the presence of clayey soils or fine grained silts a low potential for liquefaction will exist. Estimated induced ground settlements are low at up to 84 mm. As the borehole data from the Tonkin & Taylor investigation and those of February 2014 are similar it is reasonable to expect that the liquefaction analysis undertaken would be applicable to the total area of the building as the land on which the building is located is essentially flat.

5.0 Settlement Under Gravity Loading

We understand, from observations by Mr Arnold of Arnold & Johnstone Ltd, that the building shows no obvious signs of having undergone vertical settlement due to consolidation of the support soils under gravity loading. The predictions of Tonkin & Taylor of 1984 regarding magnitudes of induced settlements, being very small, have therefore proved correct. This has been mostly due to the presence of a compensating raft foundation supporting both the original building of the 1960's and the extension soon after 1984.

6.0 Summary

The results of the investigations described in the Tonkin & Taylor report of September 1984 and the current investigation of February 2014 are summarised as follows

- The geological model described in published literature identified the property as comprising estuarine and fluvial sediments overlaying an ignimbrite base. The investigations have confirmed that these subsoils exist in the form of fine grained silts, silty clays and clays with weathered ignimbrite in the form of medium to dense sands being below 23.5 m in the CPT and shallower in the Tonkin & Taylor boreholes.
- Tonkin & Taylor predicted that vertical settlements due to consolidation initiated by the construction of the building extension at that time would be low provided that the foundation system is constructed in the same manner as for the original building by utilising a compensating raft structure. Current observations indicate that any ground settlement has not had any adverse effect on the building structure or its serviceability.
- The CPT data indicates that the building is located on subsoils that may be considered as seismic Class D.
- The potential for liquefaction under ultimate limit state seismic conditions is low as determined by analyses using the reputable and reviewed software CLiq. Vertical settlements, as a result of seismic activity, are estimated to be low and

within tolerable limits with the building being supported on the stiffened raft foundation.

7.0 Applicability

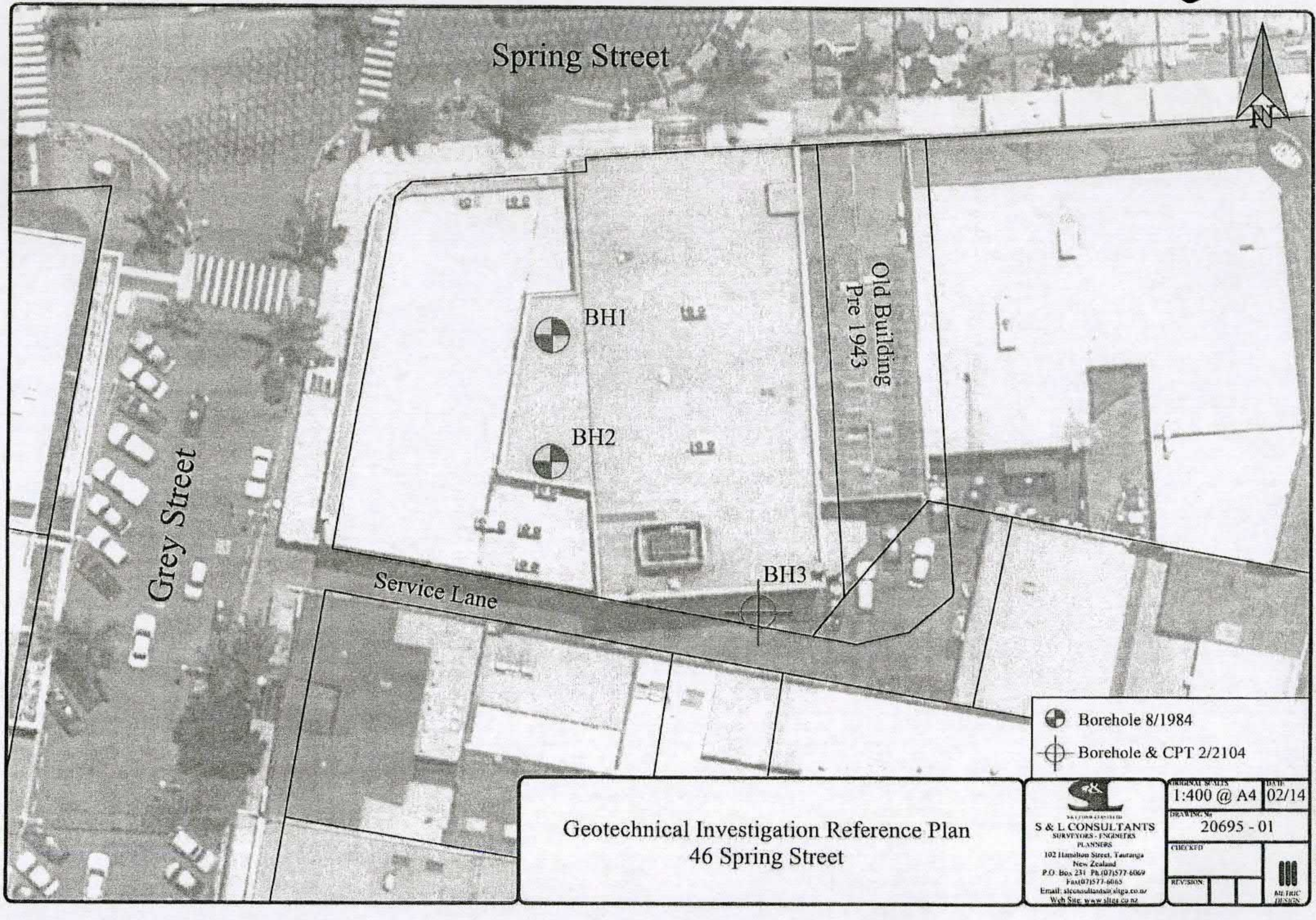
Recommendations contained in this report are based on data from investigation boreholes and test data. This information, because of access limitations, only refers to small volumes of the subsoils that are present and inferences about the nature and continuity of the subsoils away from the test locations are made but cannot be guaranteed.

This report has been prepared specifically for the building at 46 Spring Street to assist with the evaluation of the building structure and the detailing of seismic strengthening works and no responsibility is accepted by S & L Consultants Ltd for the use of any part of this report for other development sites without their written approval.

Yours faithfully
S & L Consultants Ltd

M W Hughes CPEng
Geotechnical Engineer

Attachment Reference plan 20695-01
Borehole logs, Tonkin & Taylor 1984
Borehole logs, S & L Consultants Ltd 2014
CPT plots
  - cone resistance
  - soil behaviour type
  - SPT N values
  - Undrained shear strengths
Liquefaction analysis summary sheets
Corebox photographs



Geotechnical Investigation Reference Plan
46 Spring Street

S & L CONSULTANTS
SURVEYORS - ENGINEERS
PLANNERS
102 Hamilton Street, Tauranga
New Zealand
P.O. Box 231 Ph.(07)577-6069
Fax(07)577-6065
Email: slconsultants@sltga.co.nz
Web Site: www.sltga.co.nz

ORIGINAL SCALES 1:400 @ A4	DATE 02/14
DRAWING No 20695 - 01	
CHECKED	
REVISION:	METRIC DESIGN

H:\20000 - 20999\20600 - 20699\20695 - RCR Ltd - 2 Grey Street\Drawings\Scheme\20695 - 01 - Geotechnical Investigation - B0.dwg

SITE: GREYSPRING - TAURANGA

BOREHOLE No. 1

JOB No: 6542 DATE DRILLED: 22/8 RL GROUND:

SHEET 1 OF 2

DESCRIPTION OF SOIL

FILL, sandy, silty, firm

SILT, sandy, sl.clayey pumiceous dilatant, with coarse sand layers yellow and grey

LOST CORE

SILT, as above, occ.rootlets, brown

SAND, gravelly, pumiceous

LOST CORE

SAND, with silt horizons, sl.clayey green

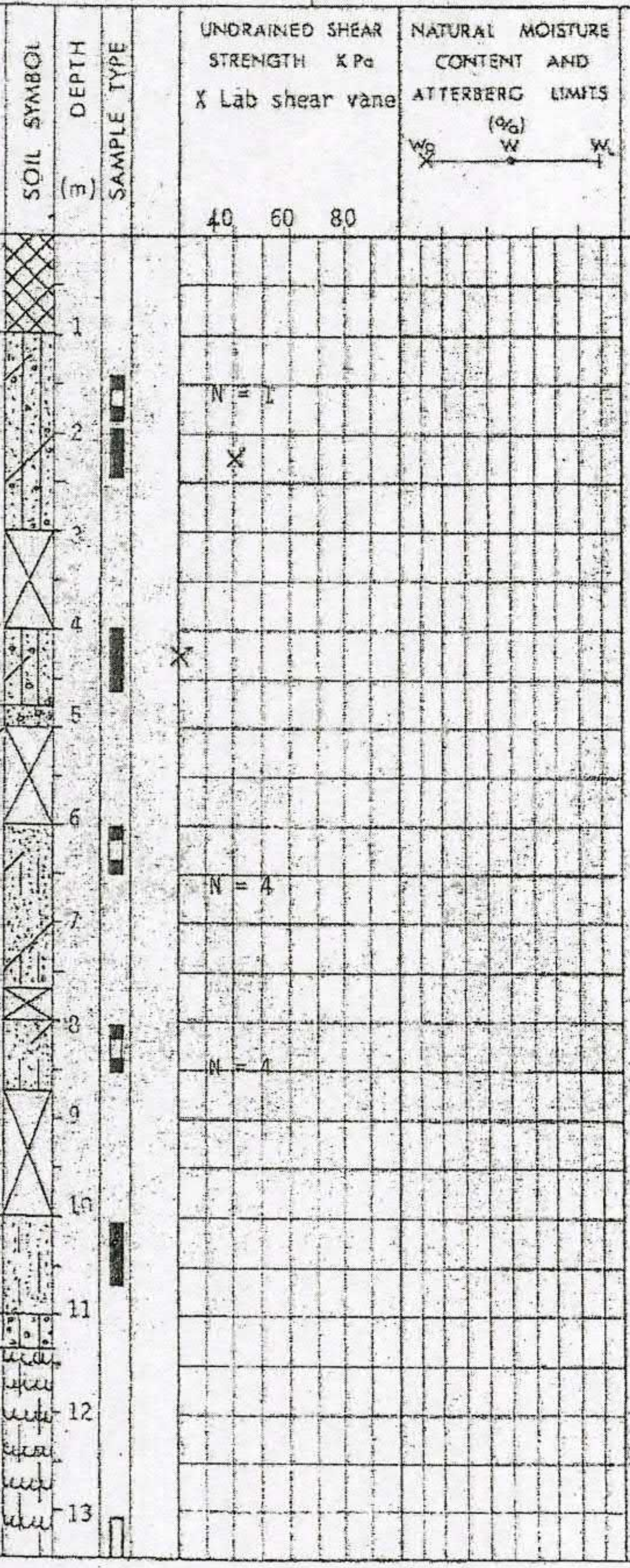
LOST CORE

LOST CORE

SAND, sl.silty, grey with green horizons

SILT, pumiceous, firm, grey

PEAT, silty, firm



NOTES:

DRILL METHOD: Machine Rotary Drilled

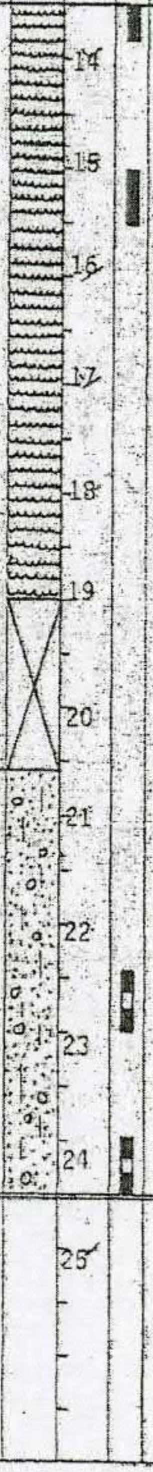
TONKIN & TAYLOR CONSULTING CIVIL AND FOUNDATION ENGINEERS

SITE: GREYSPRING - TAURANGA

BOREHOLE No. 1

JOB No: 6542 DATE DRILLED: 22/8 RL GROUND: SHEET 2 OF 2

DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	UNDRAINED SHEAR STRENGTH K Pa	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS (%) Wp W WL



PEAT

- with silty horizons

- sandy horizons

LOST CORE

SAND, sl.gravelley,sl.silty,
pumiceous, grey, med.to dense

N = 22

N = 26

END OF BOREHOE @ 24.5m

NOTES:

DRILL METHOD: Rotary Machine Drilled

TONKIN & TAYLOR CONSULTING CIVIL AND FOUNDATION ENGINEERS

SITE: GREYSPRING - TAURANGA

BOREHOLE No. 2

JOB No 6542 DATE DRILLED: 22/8 RL GROUND:

SHEET 1 OF 2

DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE		UNDRAINED SHEAR STRENGTH K Pa 40 60 80	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS (%) Wp W WL

FILL, sandy, gravelly, firm

SILT, sandy, sl.organic, with rootlets, dk.grey

SAND, silty, with coarser horizons pumiceous, stained red, green

LOST CORE

as above with silt pockets

LOST CORE

SAND, coarse, silty

LOST CORE

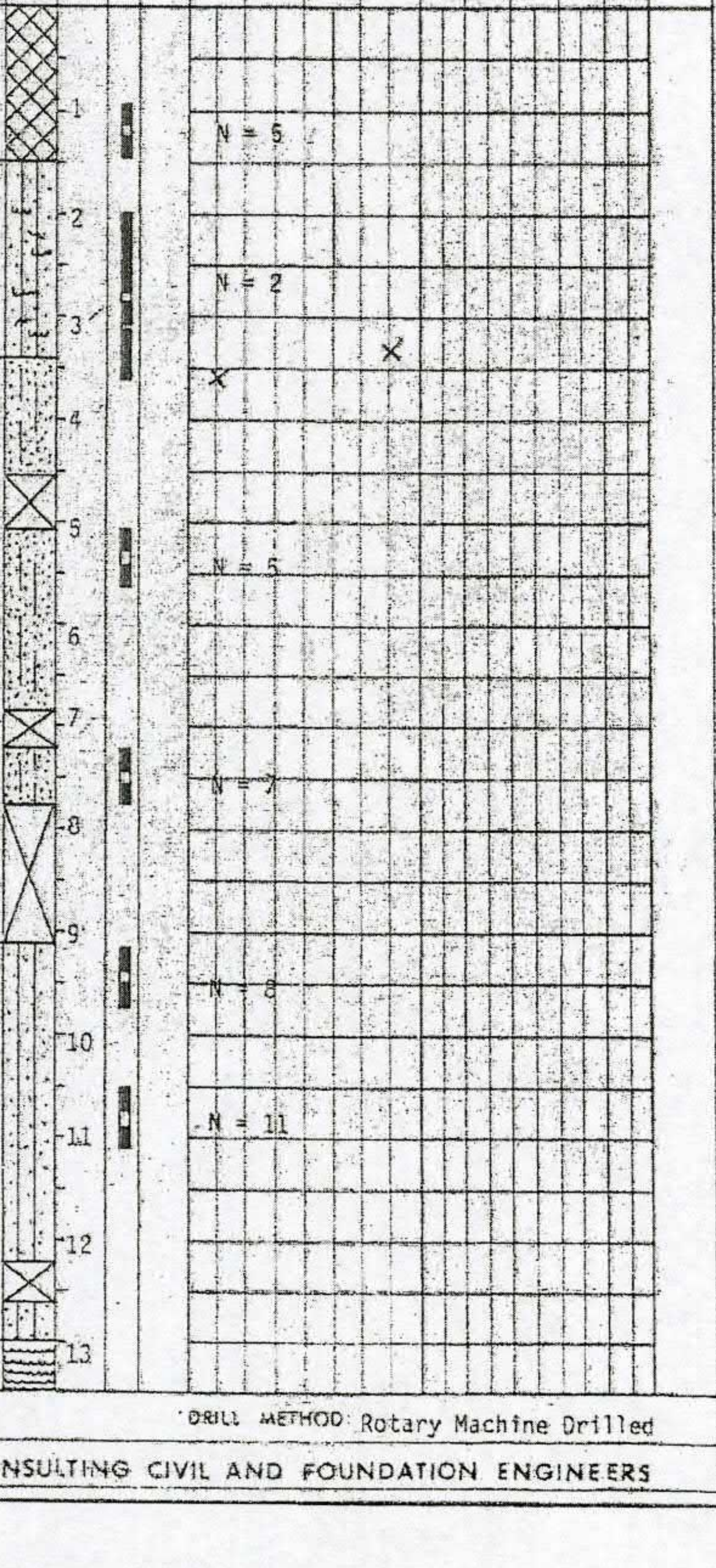
SILT, sl.sandy, grey pumiceous

- beomces organic

- becomes sandy med/coarse

LOST CORE

PEAT, silty firm



NOTES:

DRILL METHOD: Rotary Machine Drilled

TONKIN & TAYLOR CONSULTING CIVIL AND FOUNDATION ENGINEERS

SITE: GREYSPRING - TAURANGA

BOREHOLE No. 2

JOB No: 6542 DATE DRILLED: 22/3 RL GROUND:

SHEET 2 OF 2

DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	UNDRAINED SHEAR STRENGTH KPa	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS (%) Wp W WL
PEAT, woody, firm with silty horizons		14			
		15			
		16			
- becomes silty		17			
SAND, medium to coarse, dense, grey		18			
LOST CORE		19			
- as above				N = 38	
END OF BOREHOLE @ 19.7 m		20			
		21			

NOTES:

DRILL METHOD: Rotary Machine Drilled

TONKIN & TAYLOR CONSULTING CIVIL AND FOUNDATION ENGINEERS

Borehole 3

Site: Prime Investments Ltd; 46 Spring Street, Tauranga

Sheet: 1 Of: 3

Job No. 20695

Date Excavated: 5/2/2014

RL 3.3 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	SPT	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
GRAVEL (GAP 65); BROKEN CONCRETE; FILL						
		0.5				
Uncompacted SILT and SAND FILL from services trenches FILL						
		1.0		2.9 m		
		1.5				
SILT; slightly sandy; firm; very moist; slightly cohesive; grey orange brown mottles; rare shell fragments ESTURINE SILTS						
		2.0				
SAND (f-m) silty; loose; wet; black						
ORGANIC SILT; slightly sandy; wet; black contains wood, fibrous vegetative material						
		2.5				
				▽		
SILT; stiff; very moist; slightly cohesive; light grey dark brown organic staining		3.0				
SAND (f-m) silty; loose; wet; light grey rare pieces of wood						
		3.5				
SILT; stiff; wet; slightly cohesive; brown grey some vegetative material						
saturated		4.0				
becomes blue grey; very rare pieces of wood; rare shells soft		4.5				
		4.7				

EXCAVATION METHOD: HQ Coring, Tractor mounted Machine Drill Rig

S&L
SHRIMPTON & LIPINSKI

Borehole 3

Sheet: 2 Of: 3

Site: Prime Investments Ltd; 46 Spring Street, Tauranga

Job No. 20695

Date Excavated: 5/2/2014

RL 3.3 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	SPT	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
	× ×	4.8				
	× ×	5.0				
	× ×	5.5				
continues soft; saturated; blue grey rare traces of wood	× ×	6.0				
	× ×	6.5				
	× ×	7.0				
continues soft; saturated; blue grey rare traces of wood	× ×	7.5				
	× ×	8.0				
	× ×	8.5				
	× ×	9.0				
30 mm lens of ORGANIC SILT	× ×	9.4				

EXCAVATION METHOD: HQ Coring, Tractor mounted Machine Drill Rig

SHRIMPTON & LIPINSKI

Borehole 3

Site: Prime Investments Ltd; 46 Spring Street, Tauranga

Sheet: 3 Of: 3

Job No. 20695

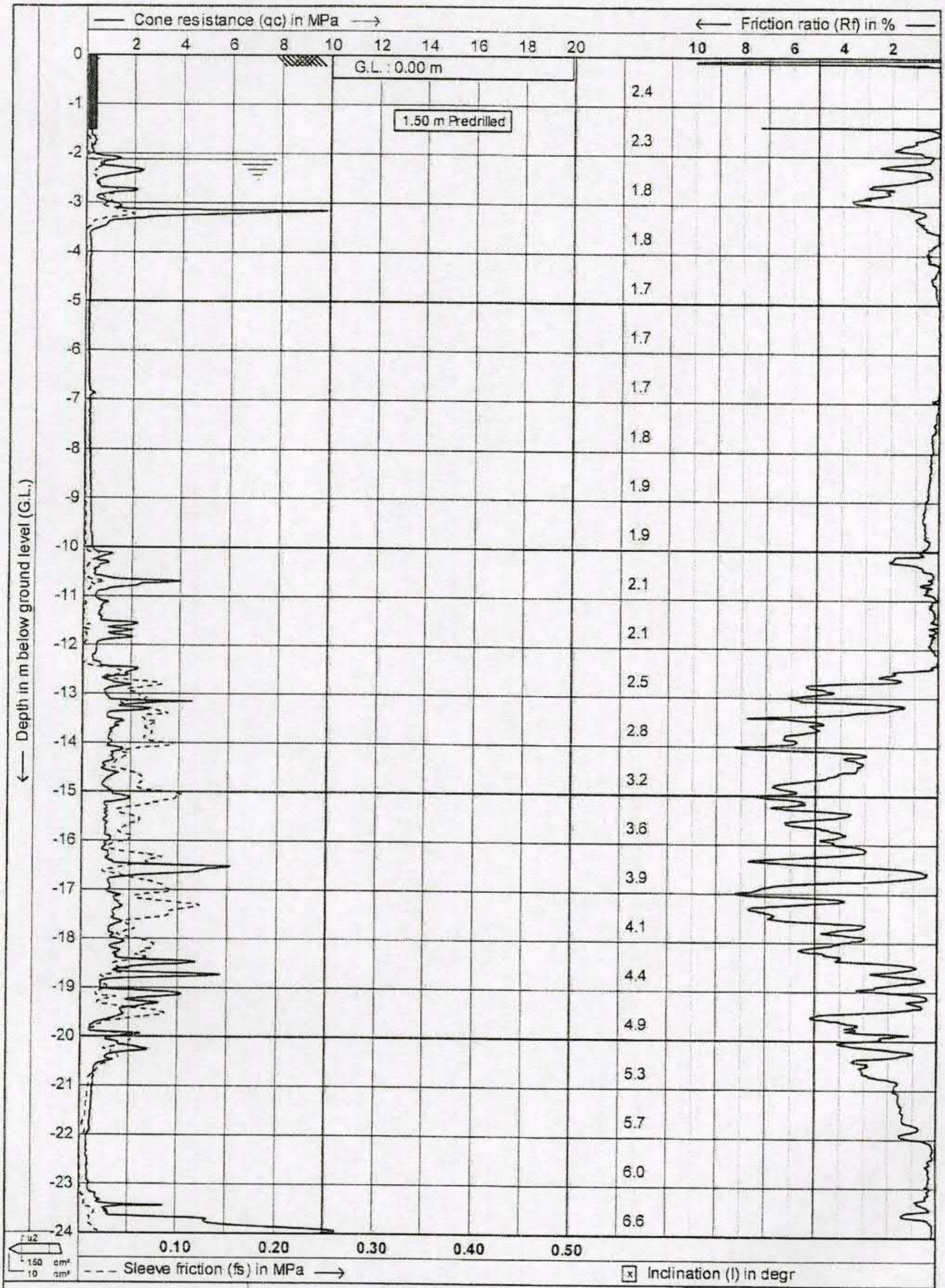
Date Excavated: 5/2/2014

RL 3.3 m Moturiki Datum

Logged By: N.I.

Description of Soil	Soil Symbol	Depth (m)	SPT	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
	× ×	9.5				
	× ×	10.0				
End of borehole 10.5 m	× ×	10.5				
		11.0				
		11.5				
		12.0				
		12.5				
		13.0				
		13.5				
		14.0				

EXCAVATION METHOD: HQ Coring, Tractor mounted Machine Drill Rig



PERRY GEOTECH

Test according A.S.T.M. Standard D 5778-12

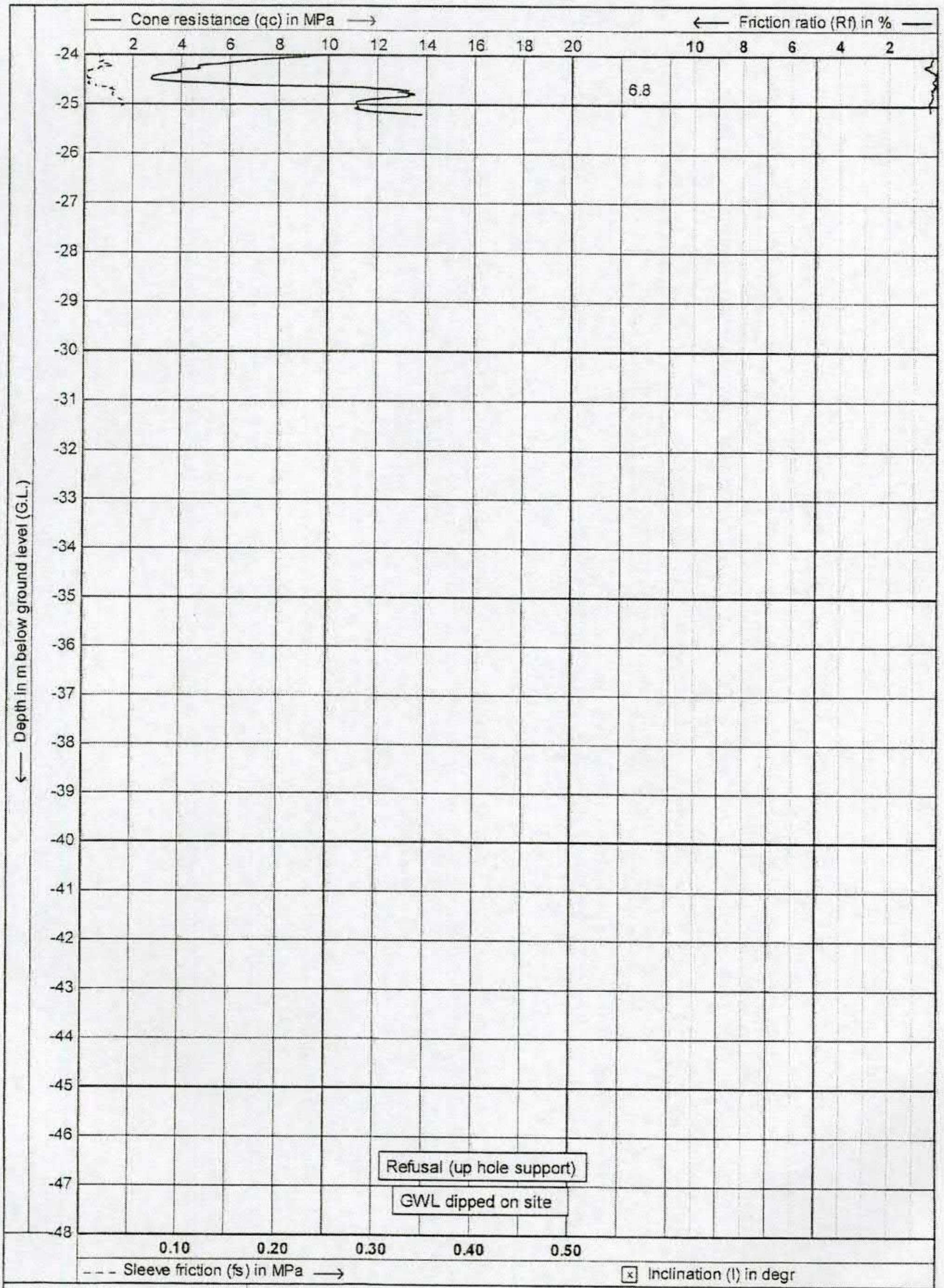
Project : **RCP**

Location: **14 Grey St - Tauranga**

Position: **0, 0 RD**

Date	: **5-2-2014**
Cone no.	: **C10CFIIP.C13184**
Project no. :	**05SL1**
CPT no.	: **01**

1/28



Refusal (up hole support)

GWL dipped on site

PERRY
GEOTECH

Test according A.S.T.M. Standard D 5778-12

Project : **RCP**

Location: **14 Grey St - Tauranga**

Position: **0, 0 RD**

Date : **5-2-2014**

Cone no. : **C10CFIIP.C13184**

Project no.: **05SL1**

CPT no. : **01** **2/28**