HARRISON GRIERSON

REPORT TO CANTERBURY EARTHQUAKE RECOVERY AUTHORITY

Argent Building
82 Peterborough Street, Christchurch

Detailed Engineering Evaluation and Initial Evaluation Procedure Assessment

August 2012
HG Project No. 2150-131322-02
HG Document No. R001v1-CH131322-02_Argent-tck

HARRISON GRIERSON CONSULTANTS LIMITED

Document Control Record

Client	CHRISTCHURCH CITY COUNCIL
Project	Argent Building, 82 Peterborough Street
HG Project No.	2150-131322-02
HG Document No.	R001v1-CH131322-02_Argent-tck
Document	Detailed Engineering Evaluation

ISSUE AND REVISION RECORD

Date of Issue	August 2012
Status	Final
Originator	Tony Kelly - Engineer
Reviewed	Ian Williams - Senior Engineer
Approved for Issue	Damien McGill - Engineering Manager, Christchurch
Office of Origin	Christchurch
Telephone	03 962 9770
Facsimile	03 962 9771
Email	christchurch@harrisongrierson.com

REPORT TO CANTERBURY EARTHQUAKE RECOVERY AUTHORITY

Detailed Engineering Evaluation

Argent Building, 82 Peterborough Street, Christchurch

August 2012
HG Project No. 2150-131322-02
HG Document No. R001v1-CH131322-02_Argent-tck

CONTENTS

APPENDICES

DRAWINGS

Ian Krause Architects Ltd

A1.01	Site plan, foundation plan, and elevations
A1.02a	Floor, roof, and ceiling plans
A2.01a	Sections
A3.01	Details

Lovell-Smith & Cusiel Ltd

S1 to S10	Structural drawings

EXECUTIVE SUMMARY

Harrison Grierson has been instructed by the Christchurch City Council, to carry out structural assessments for the buildings at 82 and 84 Peterborough Street, Christchurch. Each building has been evaluated in a separate report. This report is for the Argent Building at 82 Peterborough Street, to the front of the site.

Our scope is to produce a Detailed Engineering Evaluation report in accordance with CERA requirements.

This report includes a detailed review of the record drawings for the building and completing an Initial Evaluation Procedure (IEP) to determine seismic capacity in terms of % of New Building Standard (%NBS).

The building was designed by Lovell-Smith & Cusiel Ltd in 1999. Its construction is precast concrete panels with welded connections with shallow ground beam foundations. The floors are reinforced concrete and the roof is lightweight Trimdek supported on a steel rafter at mid span with pressed steel purlins.

A geotechnical investigation was not carried out as part of this evaluation however, some minor liquefaction was observed – water, sand and fine silts were ejected in the car park and roadway adjacent to the building, indicating liquefaction of the underlying soils.

Earthquake damage includes minor cracking to the precast panels, loss of sealant from panel joints and cracking of internal finishes. A floor level survey carried out indicates possible settlement of the foundations.

Some cosmetic repairs are required, including repairs to hairline cracks and minor spall in precast concrete panels; cracks to internal wall partitions; and repairs to flexible sealant to exterior wall joints.

An Initial Evaluation Procedure has been completed for the building using the CERA excel format. The seismic rating has been assessed as 65% NBS or Seismic Grade C (67% to 33% New Building Standard).

No critical structural weaknesses have been identified and repairs are not necessary for continued safe occupancy.

1.0 INTRODUCTION

Harrison Grierson has been instructed initially by VBASE and latterly by the Christchurch City Council, to carry out a structural assessment for the buildings situated at 82 & 84 Peterborough Street, Christchurch.

Our scope is to produce a Detailed Engineering Evaluation report in accordance with CERA requirements.

This report includes reviewing of the record drawings for the building including a review of wall connection details and the stairs, and completion of an Initial Seismic Evaluation (IEP) to determine seismic capacity in terms of % of New Building Standard (%NBS).

Our engineers have carried out site inspections on 12 & 13 May 2011, 21 June 2011 & 9th January 2012 following the 22nd February earthquake and subsequent significant aftershocks.

This report is specific to the Argent building at 82 Peterborough Street, to the rear of the site

2.0 SITE ADDRESS AND DESCRIPTION

The site address is 82 Peterborough Street, Christchurch. The legal description is Lot 1 DP 81332.

The Argent Building is located to the front of the site (Lot 1), and measures approximately 14.5m by 13m (Figure 1).

Figure 1: The Argent Building, 82 Peterborough Street

The Argent Building has a basic two level layout as follows:

- Access to the building is via the ground floor (side door).
- The ground floor consists of mixed office space, a lunchroom and kitchenette, and bathrooms.
- An internal staircase provides access to the first floor.
- The first floor also consists of mixed office space.
- The floor footprint area of the building is approximately 190m^2.
- The original structural drawings by Lovell-Smith & Cusiel Ltd (1999) and architectural drawings by Ian Krause Architects Limited (1999) have been obtained from Christchurch City Council.

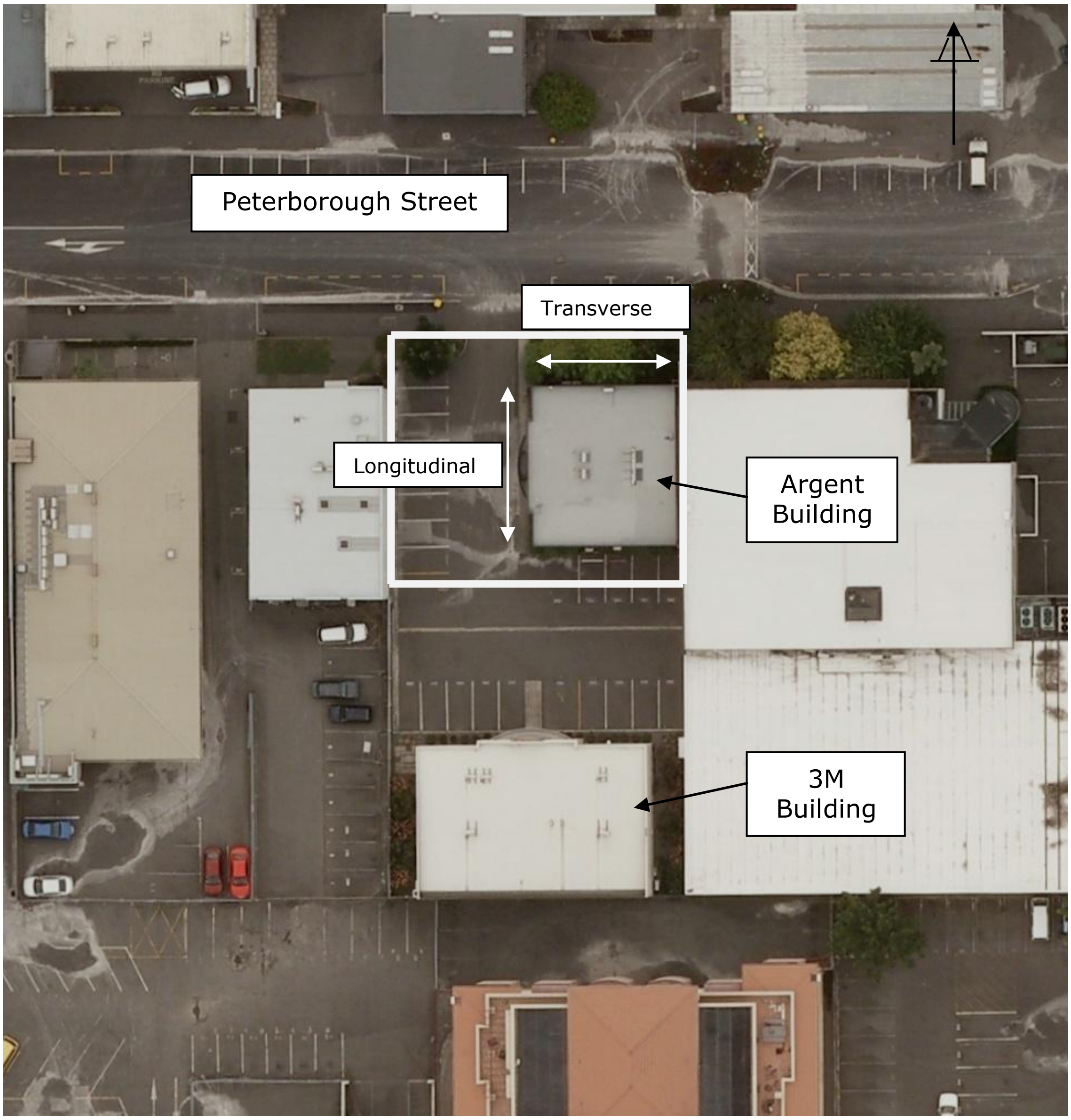


Figure 2: Christchurch Post-earthquake Aerial Photo (24 February 2011) showing site.

3.0 STRUCTURAL SYSTEM

The following is a summary of the structural systems as determined from the drawings:

Gravity System

- Lightweight metal roof cladding on DHS purlins and a 310UB40 rafter at mid span.
- Precast concrete wall panels and spandrels.
- 180 Hibond suspended floor slabs.
- Precast floor beams.
- 100mm cast insitu ground floor slab with 665 mesh throughout.
- Reinforced concrete (in-situ) foundation beams and columns.
- Precast concrete stairs and landings.

Lateral System

- 150mm precast concrete panels/spandrels in the longitudinal and transverse directions. Wall panels typically reinforced with H12 at 300mm centres each way located central.
- 180 Hibond suspended floor diaphragm.

4.0 GROUND CONDITIONS

A geotechnical investigation was not carried out as part of this evaluation.

Some minor liquefaction was observed – water, sand and fine silts were ejected in the carpark and roadway adjacent to the building, indicating liquefaction of the underlying soils.

There have not been any obvious signs of settlement around the exterior of the building.

5.0 SUMMARY OF OBSERVED DAMAGE

A visual inspection was carried out by Harrison Grierson engineers on 12-13 May 2011. Our visual inspections included the exterior and interior of the Argent Building. The locations of the damage are shown on the marked up plans included as Appendix 2.

The following observations were made from this inspection:

- Hairline cracks in both wing-wall extensions of the eastern shear wall
- Loss of flexible sealant on corner joints between precast concrete panel walls (Figure 3)
- Fracture of bottom edge concrete of precast panels on the south side wall (Figure 4)
- Crack, and in one instance fracture, of internal wall partition lining (Figure 5)
- Racked door frames

Figure 3: Corner joints, external walls

Figure 4: Precast panels, external south side wall

Figure 5: Internal wall partition

Another visual inspection of the building exterior and interior was carried out by Harrison Grierson engineers on 21 June 2011, following significant aftershocks on 13 June 2011.

It was noted from this inspection that the observed aftershock damage was unchanged from damage after the February earthquake, although the non-structural cracks in the GIB lining may have increased slightly.

Another visual inspection of the exterior and interior of the building was carried out by Harrison Grierson engineers on 9 January 2012, following significant aftershocks on 23 December 2011.

The following observations were made from this inspection:

- Further loss of flexible sealant on corner joints between precast concrete panel walls.
- Further fracture of bottom edge concrete of precast panels on the south side wall (Figure 4).
- Cracks and fracture of internal wall partition linings slightly worse.

The observed damage to the building has been broken down into three categories: Superficial, Minor and Major. Damage has been summarised below in each category.

Superficial			
Damage description	**Location**	**Investigations**	**Reason for damage**
1. Cracks to wing wall extensions	External eastern shear wall	Visual inspection	Stress cracking from building flexure
2. Loss of flexible sealant on exterior walls	External precast walls	Visual inspection	Movement from building flexure
3. Cracks to internal wall partitions	Internal wall partition GIB lining on ground floor	Visual inspection	Movement from building flexure
4. Hairline cracking to exterior panels	Generally around window and door locations	Visual inspection	Stress cracking from building flexure.
5. Superficial inverse pitting of bitumen pavement surface	Between drive and carparks outside the building entrance	Visual inspection	Liquefaction rising but not breaking the surface.

Minor			
Damage description	**Location**	**Investigations**	**Reason for damage**
6. Fracture of precast panels	External south side wall	Visual inspection	Stress cracking from building flexure
7. Differential settlement in floor levels	Ground and first floors	Floor level survey	Likely settlement of foundations.

Major			
Damage description	**Location**	**Investigations**	**Reason for damage**
None noted			

6.0 FLOOR LEVEL SURVEY

6.1 COMMENTARY

One of the difficulties of assessing floor level surveys post-earthquake is that no pre-earthquake as-built surveys exist. Therefore, an assumption must be made as to the accuracy or adherence to the prescribed tolerances at construction.

Whilst DBH has issued guidance for applicable standards for acceptable floor level tolerance in residential buildings suffering from earthquake damage, Harrison Grierson is unaware of similar guidance for commercial and industrial buildings.

The DBH document "Revised guidance on repairing and rebuilding houses affected by the Canterbury earthquake sequence" states that the maximum vertical differential settlement of a floor should be less than 50mm and the floor slope less than 1:200 (0.5%) between any two points less than 2m apart.

However, it goes on to say that international research indicates that people are not able to perceive slopes of less than 1%.

The New Zealand building Code references three separate building standards for the construction of concrete floors.

1. NZS 3109 – Concrete Construction. Floor flatness is referred to NZS 3114.

2. NZS 3114 - Concrete Surface Finishes. This code dictates the maximum tolerances allowed during construction. It is defined as 5mm change over a 3m long straight edge for a U2 class finish, typical for a carpeted floor. We note that this code is for construction tolerances and does not cover deflection or tolerance caused by sag over a long period.

3. AS/NZS 1170.0 – Structural Design Actions. Appendix C to this code gives guidelines for functionality of structural elements such as floors, beams etc. The mid span deflection limit for normal floors is given as Span/400, or approximately 16mm over 6.4m. We note that this is not a mandatory requirement but a guideline.

However, these are construction tolerances which should not necessarily apply to buildings affected by earthquake damage. Further, the nature of these premises means that high tolerances were unlikely to have been enforced during construction and are unlikely to be required for future serviceability.

On the basis that the only applicable guidance available is from DBH and although this is for domestic dwellings, it appears broadly applicable to office accommodation, therefore for the purposes of this report on this building we have taken the DBH guidance as a reasonable limit of tolerance for acceptance as earthquake damage not requiring repair to these premises.

Note that differential settlement of floor levels do not generally affect the integrity of the structure, rather the serviceability of the useable space within. Factors such as the intended use of the space, the practicality of repair and the effects of gradients on amenity of the space, need to be taken into account when assessing the results of floor level settlement.

6.2 SURVEY RESULTS

Internal levels were surveyed to an accuracy of +/- 5mm over both floors of the building. Analysis of the floor levels gave the following information.

<u>Ground Floor</u>

From an arbitrary datum of 0.00 the variation of level is -18 to +60mm giving an overall difference in level of 78mm. This is in excess of the DBH guidance.

The average floor slope is greater than 0.5%. The area of greatest concern is adjacent the east boundary wall in the northern office area where the last 2.5m of floor dives down at a grade of 1.7%. This is clearly noticeable once pointed out by the current occupants.

This indicates that there has been settlement of the exterior foundation ground beam in this location. Due to the floor coverings we were unable to check whether the floor has cracked but the location of the change of grade is consistent with the saw-cut line shown on the structural drawings. The floor is reinforced with 665 Mesh but it is possible that this could have been cut by the saw when the shrinkage control cuts were made.

<u>First Floor</u>

The variation of level on the first floor is 3.312 – 3.248m giving an overall difference in level of 64mm. This is in excess of the DBH guidance.

The average floor slope is also greater than 0.5%. The area of greatest concern is the North West office floor where the floor slope is 1.3%. Interestingly this does not correspond with the critical ground floor location. It appears that the foundation settlement mentioned above has not dragged the first floor down with it.

Recommendations

The current tenants are due to move out around the 9th September 2012. Following their departure the carpet should be lifted to fully inspect the continuity of both the ground floor slab and the first floor Hi-bond slab.

7.0 DISCUSSION – REPAIR WORKS

Repairs to remedy the identified superficial damage are as follows:

Repair Works	
Damage	**Repair methodology**
1. Cracks to wing wall extensions	Break out loose concrete and fill with suitable non-shrink grout. Paint to finish.
2. Loss of flexible sealant on exterior walls	Remove damaged sealant. Replace with flexible sealant (Ramset Hi-Seal, Bostik Seal-N-Flex 1, or Roadware Flexible Cement II). Paint over.
3. Cracks to internal wall partitions	Repair internal linings per the GIB Information Bulletin dated November 2011, and re-paint.
4. Hairline cracking to exterior panels	To protect reinforcing steel apply a high-build flexible paint system in accordance with manufacturer's specifications.
5. Superficial inverse pitting of bitumen pavement surface	None required.
6. Fracture of precast panels	Break out loose concrete. Completely abrade surface to produce sound concrete with good mechanical key. Fill with suitable non-shrink cementitious grout (Ramset Premier Grout MP, Sika Mono Top Structural Mortar, or Roadware Concrete Mender). Paint over.
7. Differential settlement in the floor slabs.	Further investigation required.

8.0 SEISMIC LATERAL LOAD RESISTANCE

An Initial Evaluation Procedure has been completed for the building, in the CERA excel format. As the damage observed is minor in nature, it is not likely to affect the overall lateral load capacity of the building. We can therefore conclude that the seismic resistance has not changed from its original pre-earthquake rating.

Seismic Rating		
Building	**Description and when built**	**Rating**
The Argent Building, 82 Peterborough Street, Christchurch - pre earthquake	Predominantly a two level reinforced concrete shear wall structure built in 1999	65% NBS or C grade
The Argent Building, 82 Peterborough Street, Christchurch – post earthquake	Predominantly a two level reinforced concrete shear wall structure built in 1999	65% NBS or C grade

The standardised report form prepared by CERA has been prepared and is attached to this report (Appendix 3).

9.0 FURTHER WORK

It is recommended that once the existing tenants vacate the premises in early September, floor coverings are lifted to inspect the first and second floor slabs.

Due to the measured floor slab displacement a verticality survey will also be carried out at this time.

10.0 BUILDING CONSENT

With reference to the Christchurch City Council Earthquake Prone Building policy, the building has a structural strength greater than 33% of the building code, therefore this policy does not apply. A building consent is not required for buildings with minor structural damage, as these repairs are exempt from building consent under Schedule 1 (a). Further confirmation from the Council may be required.

11.0 SUMMARY

The Argent building is a two storey concrete tilt-up building designed in 1999. Precast concrete panels resist lateral loads in both the longitudinal and the transverse direction.

Damage to the structure is generally superficial to minor in nature, however floor level surveys carried out indicate that differential settlement of the foundations may have occurred. Further investigation is required. This is more a question of serviceability limits rather than structural integrity.

Based on the above findings, we conclude that while the building has suffered minor damage, we believe that the building has no obvious structural defects that would prevent occupation. Using the IEP process, the building has a seismic rating of 65%NBS or Seismic Grade C (67% to 33% New Building Standard).

12.0 LIMITATIONS

12.1 GENERAL

This report is for the use by Christchurch City Council only for the stated purpose, and should not be used or relied upon by any other person or entity or for any other project or purpose. This report is based on our interpretation of the Initial Evaluation Procedure (IEP) process described by the New Zealand Society for Earthquake Engineering (NZSEE) recommendations titled Assessment and Improvement of the Structural Performance of buildings in Earthquakes dated June 2006. Our assessment is based principally on the information found for the building in council archives and a visual inspection. This report should be read in conjunction with the IEP worksheets and other appendices. No responsibility is accepted for the accuracy of information supplied by the Client or obtained from third party sources such as council archives and relied on for our report. The IEP process is intended as a coarse screening procedure for earthquake prone buildings and the outcome of the procedure is not intended as a definitive building rating, but to be used as a preliminary guide only. A more detailed assessment is needed if the information in this report is intended to be relied upon for any other purpose other than an initial assessment.

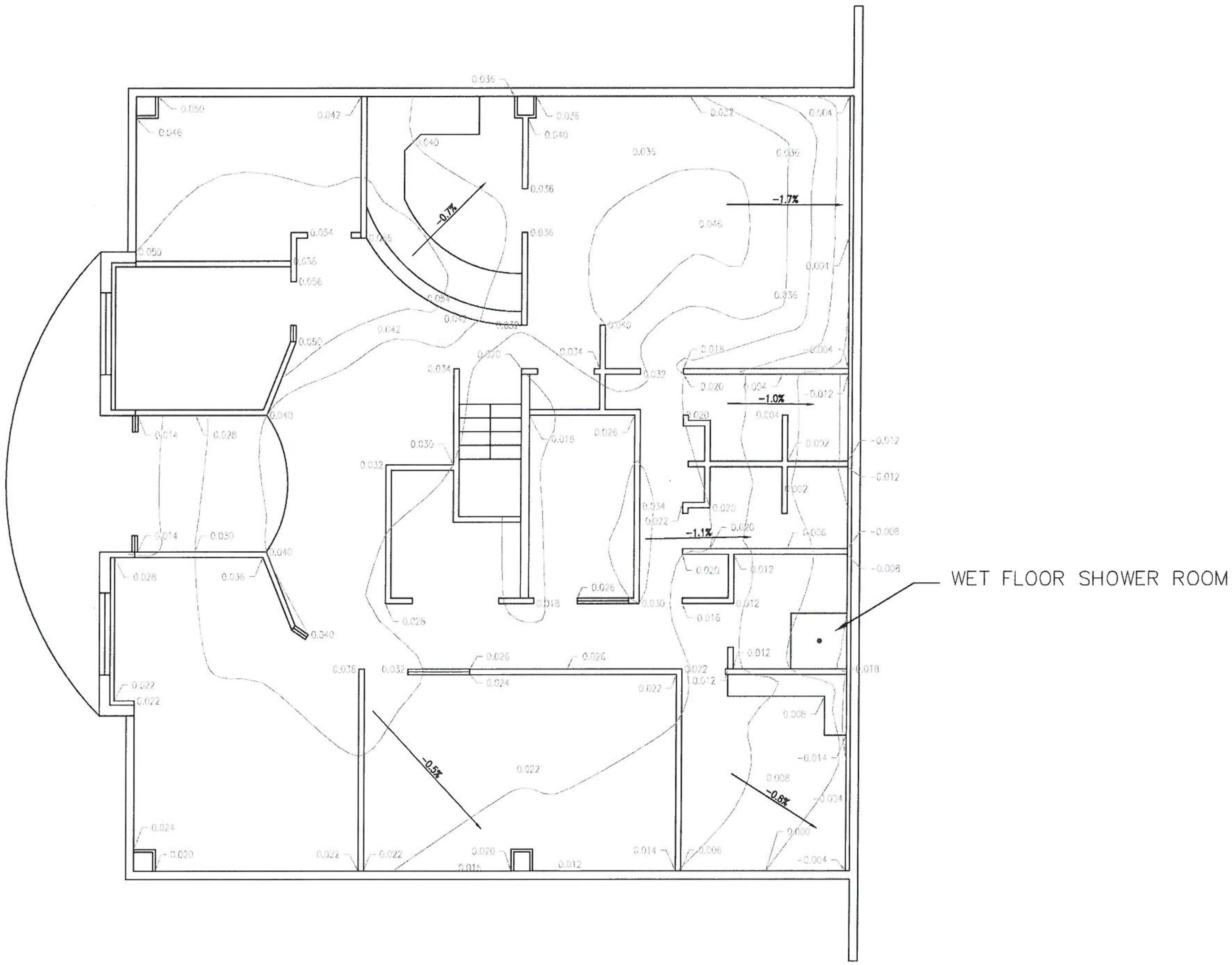
N:\2150\131322_02 82-84 Peterborough St\500 Del\510 Reports\82 - Argent\R001v1-CH131322-02_Argent-tck.doc

APPENDIX 1

Floor Level Survey Results

LEGEND

- CONTOUR
- 1.7% GRADE DOWN
- 0.032 POINT ELEVATION
- ● GULLY



GROUND FLOOR
(ARGENT BUILDING)

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ACENZ

ISO 9001 QUALITY ASSURED

NOTES

1. LEVELS HAVE BEEN SURVEYED USING A PRO2000 ZIP LEVEL. RELATIVE ACCURACY OF LEVELS +/−5mm.
2. ALL LEVELS IN mm, RELATIVE TO ASSUMED DATUM.
3. CONTOURS ARE AT 10mm INTERVALS.
4. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.
5. THIS PLAN IS ISSUED FOR A SPECIFIC PROJECT AND MAY NOT BE ALTERED OR USED FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF HARRISON GRIERSON.

HARRISON GRIERSON

ADVISORS AND DESIGNERS

Office of Origin: Christchurch
Level 1 84 Peterborough Street
Christchurch 8013
P +64 3 962 9770
www.harrisongrierson.com

REF	REVISIONS	BY	DATE

PROJECT:

82-84 PETERBOROUGH STREET
CHRISTCHURCH

TITLE:

FLOOR LEVEL SURVEY
ARGENT BUILDING
GROUND FLOOR

ORIGINATOR: EYS	DATE: 06.08.12	SIGNED:	PLOT BY: EYS
DRAWN: EYS	DATE: 06.08.12	SIGNED:	PLOT DATE: 15.08.12
CHECKED: ISW	DATE:	SIGNED:	SURVEY BY:
APPROVED: DXM	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS:

PROJECT No: 2150-131322	SCALES: 1:50 A1 1:100 A3	A1
DRAWING No: 131322-051		REV A

File: CHRISTCHURCH N:\2150\131322_A\CAD\131322-050.DWG

LEGEND

- CONTOUR
- 0.9% GRADE DOWN
- 3.258 POINT ELEVATION

FIRST FLOOR
(ARGENT BUILDING)

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ACENZ
ISO 9001 QUALITY ASSURED

NOTES

1. LEVELS HAVE BEEN SURVEYED USING A PRO2000 ZIP LEVEL. RELATIVE ACCURACY OF LEVELS +/−5mm.
2. ALL LEVELS IN mm, RELATIVE TO ASSUMED DATUM.
3. CONTOURS ARE AT 10mm INTERVALS.
4. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.
5. THIS PLAN IS ISSUED FOR A SPECIFIC PROJECT AND MAY NOT BE ALTERED OR USED FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF HARRISON GRIERSON.

HARRISON GRIERSON
ADVISORS AND DESIGNERS
Office of Origin: Christchurch
Level 1 84 Peterborough Street
Christchurch 8013
P +64 3 962 9770
www.harrisongrierson.com

REF	REVISIONS	BY	DATE

PROJECT:
82-84 PETERBOROUGH STREET
CHRISTCHURCH

TITLE:
FLOOR LEVEL SURVEY
ARGENT BUILDING
FIRST FLOOR

ORIGINATOR: EYS	DATE: 06.08.12	SIGNED:	PLOT BY: EYS
DRAWN: EYS	DATE: 06.08.12	SIGNED:	PLOT DATE: 15.08.12
CHECKED: ISW	DATE:	SIGNED:	SURVEY BY:
APPROVED: DXM	DATE: 16/8	SIGNED: [signature]	SURVEY DATE:

ISSUE STATUS:

PROJECT No: 2150-131322
SCALES: 1:50 A1, 1:100 A3
A1

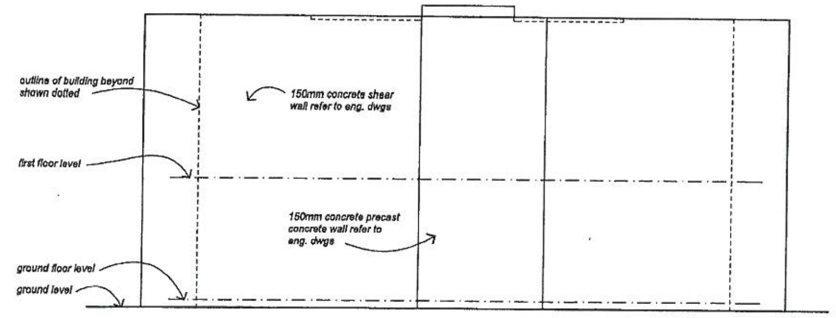
DRAWING No: 131322-052
REV: A

File: CHRISTCHURCH N:\2150\131322_A\CAD\131322-050.DWG

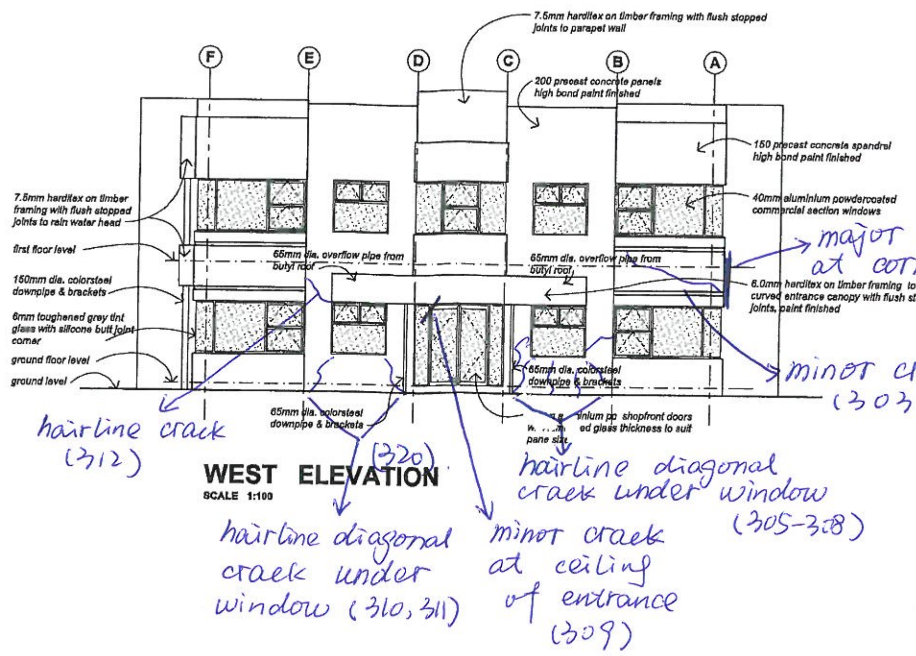
APPENDIX 2

Marked Up Drawings Showing Damage Locations

IAN KRAUSE ARCHITECTS LIMITED
NZIA Practice
Level 3
250 Oxford Terrace
P.O. Box 1766
Christchurch
Tel 03 366 0323
Fax 03 379 8269
email ika@xtra.co.nz



EAST ELEVATION
SCALE 1:100



WEST ELEVATION
SCALE 1:100

GENERAL LEGEND

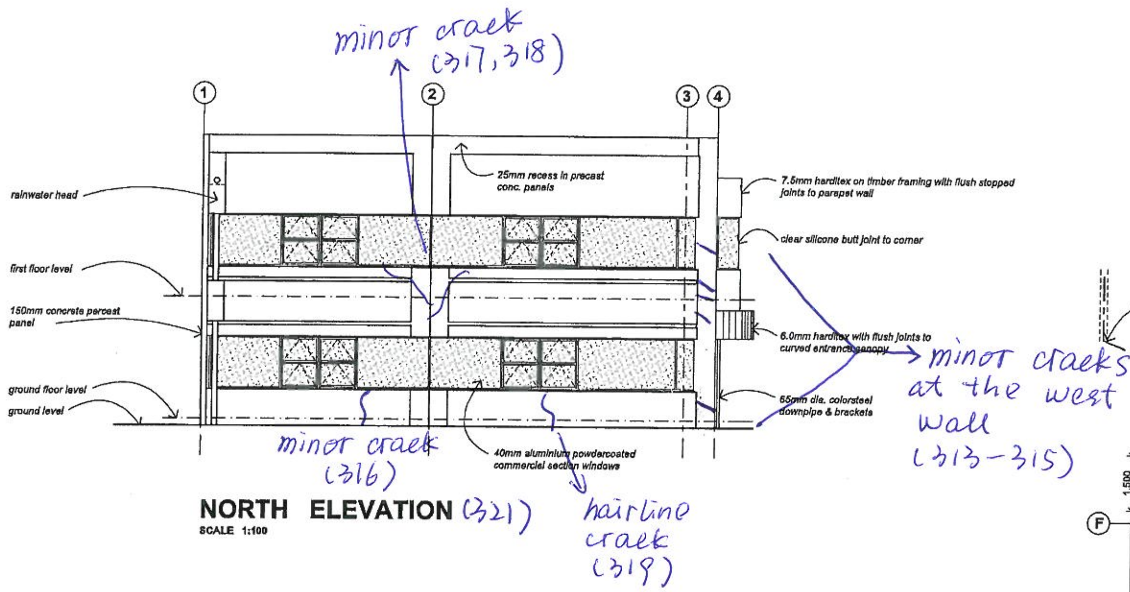
t.o.s	top of sump
b.o.k	bottom of kerb
t.o.k	top of kerb
	existing site levels
15.670	new site levels
ht	hose tap
	75mm concrete slab on hardfill with broom finish
	Asphaltic paving on compacted hardfill
dp	downpipe
g	garden
wm	water meter final position confirmed on site
	25mm domestic water supply

PLANT SCHEDULE

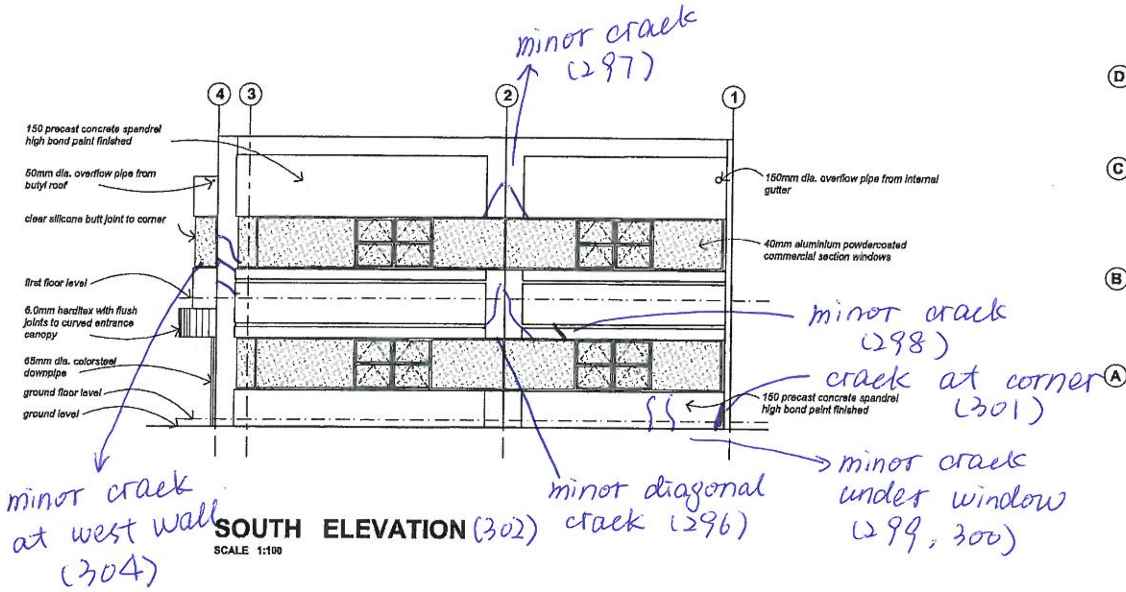
1 Fraxinus Raywoodii
2 Euganoides "Mini Green"
3 Agapanthus (blue) @ 600 ctrs
4 Choisya Ternata @ 1.0m ctrs

LEGAL DESCRIPTION

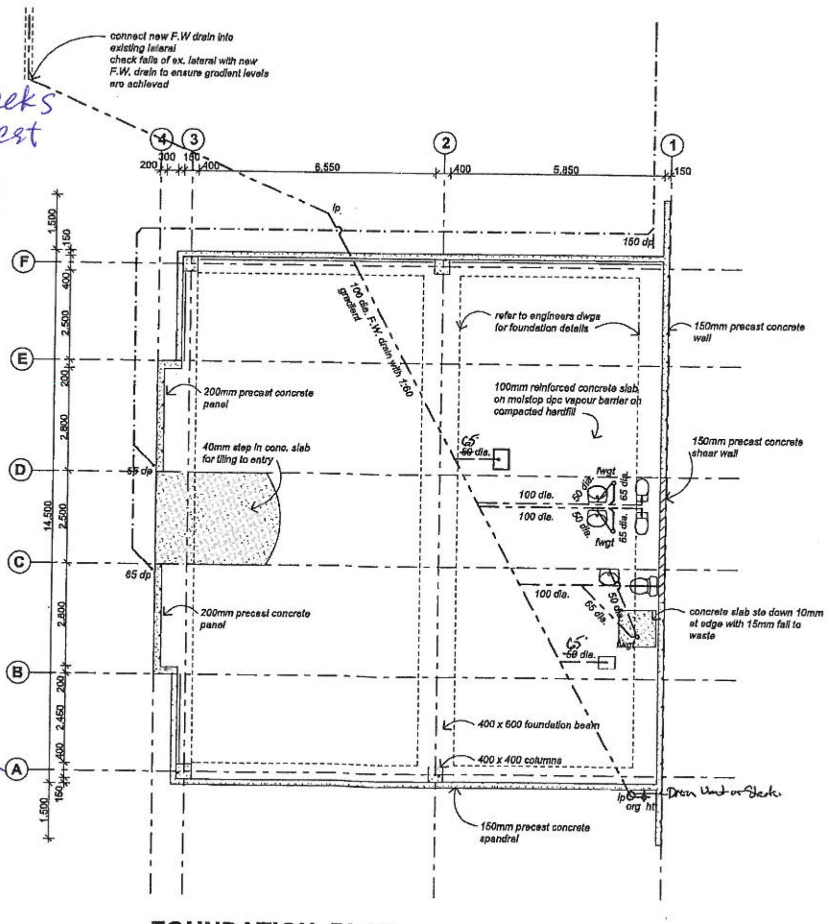
Lot : 1
DP : 4922
CT : 350/94, 350/95
Area : 1364sqm



NORTH ELEVATION (321)
SCALE 1:100

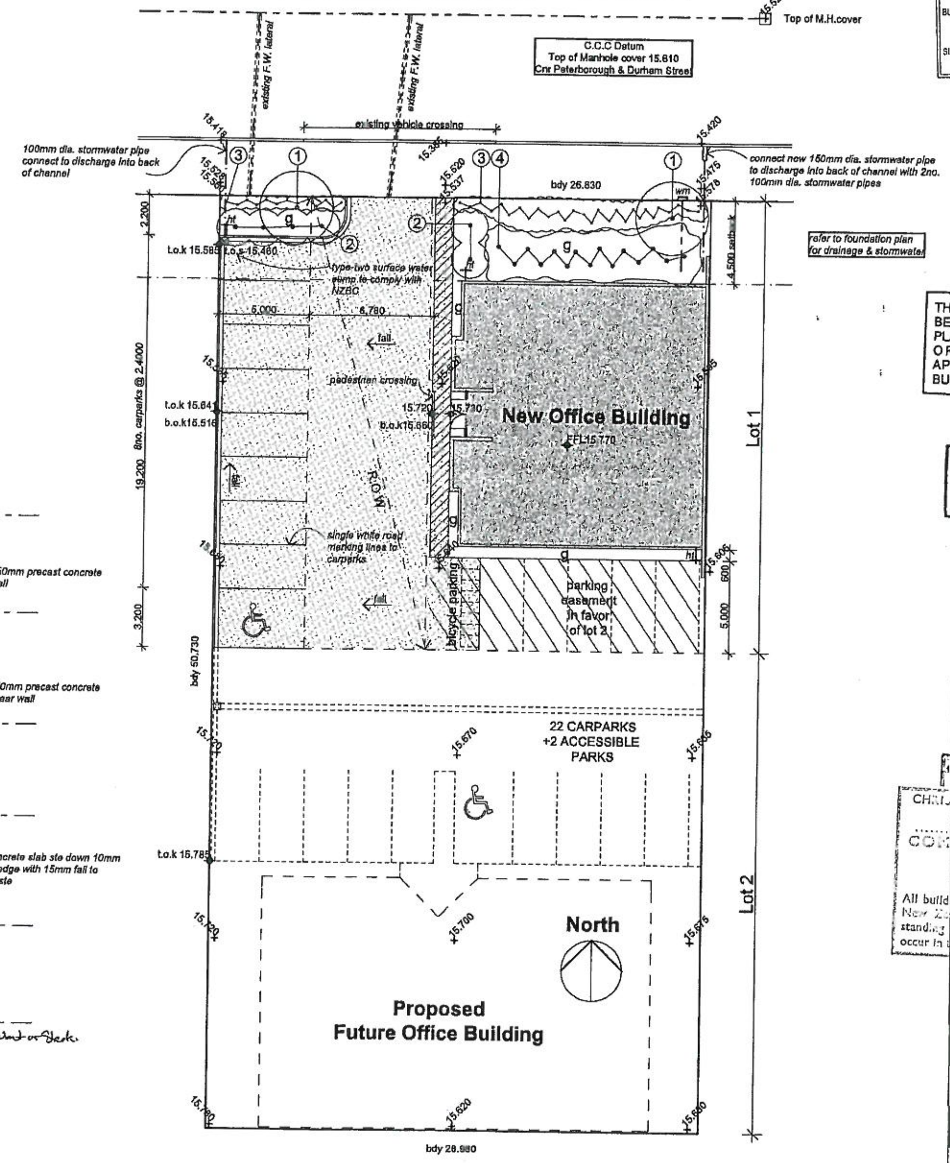


SOUTH ELEVATION (302)
SCALE 1:100



FOUNDATION PLAN
SCALE 1:100

PETERBOROUGH STREET



SITE PLAN
SCALE 1:200

NEW OFFICE BUILDING FOR AMP ARGENT GROUP

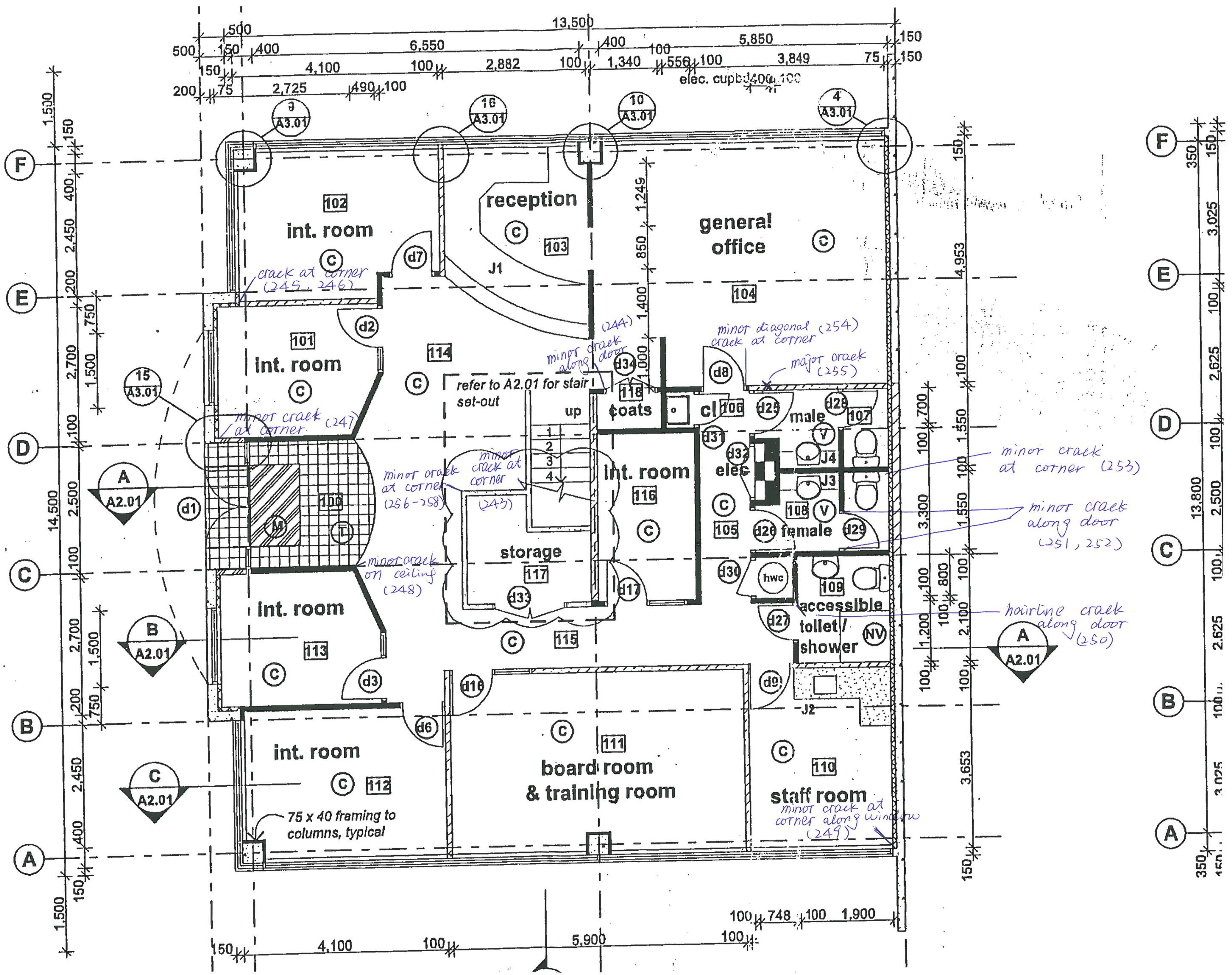
84 PETERBOROUGH STREET

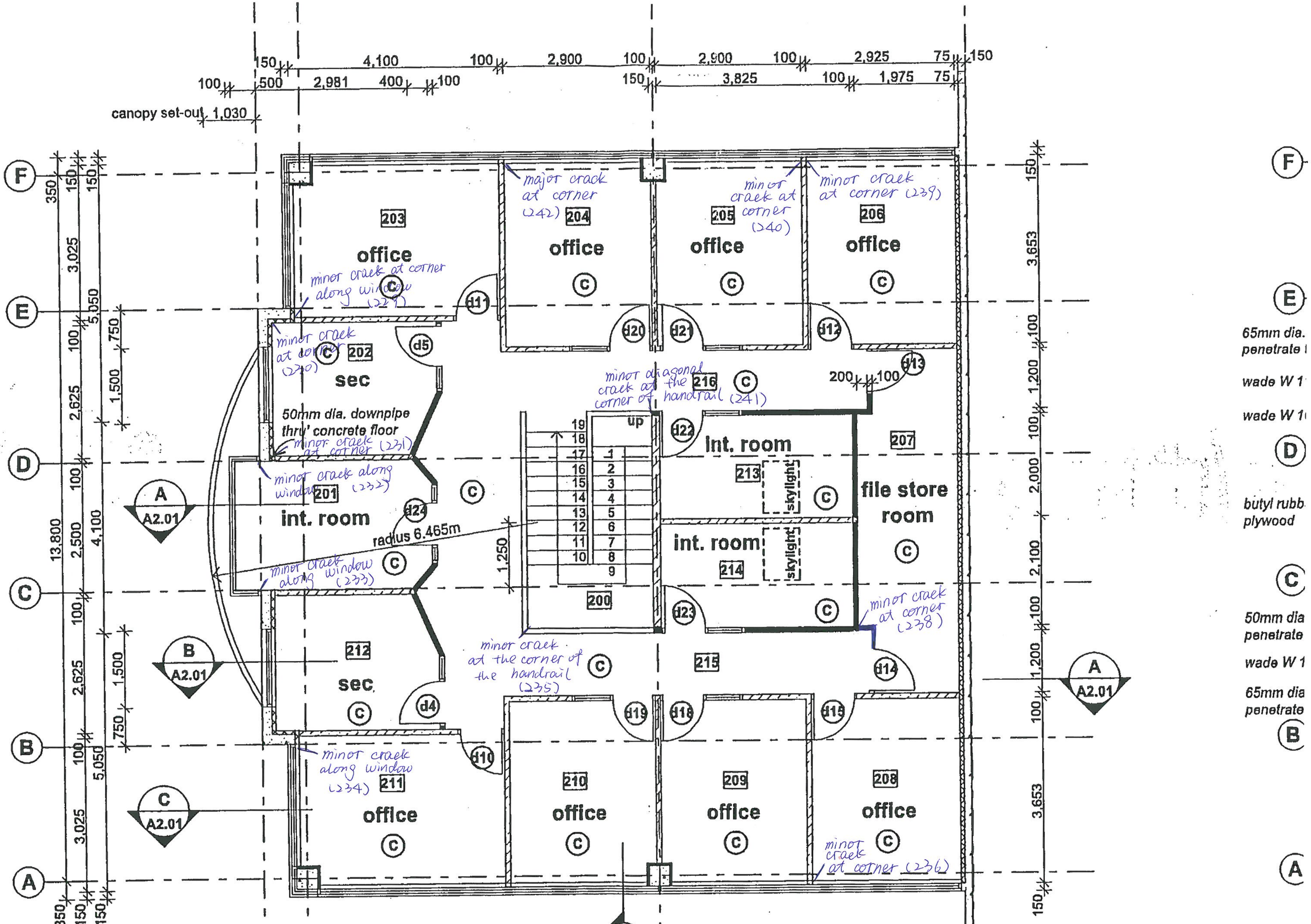
AFS Building

BUILDING CONSENT

21 JUL 1999

DATE:	JULY 1999
SCALE:	1 : 100, 1 : 50
JOB NO:	1381
SHEET NO:	A1.01


reception
general office
int. room
int. room
int. room
int. room
int. room
storage
coats
elec
male
female
accessible toilet / shower
board room & training room
staff room
refer to A2.01 for stair set-out
75 x 40 framing to columns, typical
elec. cupbd
crack at corner (245, 246)
minor crack along door (244)
minor diagonal crack at corner (254)
major crack (255)
minor crack at corner (247)
minor crack at corner (256-258)
minor crack at corner (243)
minor crack on ceiling (248)
minor crack at corner (253)
minor crack along door (251, 252)
hairline crack along door (250)
minor crack at corner along window (249)



AFS Building
First Floor

APPENDIX 3

Detailed Engineering IEP Evaluation Sheets

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	The Argent Building	Reviewer:	Andrew Thompson
	Unit / No: / Street	CPEng No:	149819
Building Address:	82 Peterborough Street	Company:	Harrison Grierson Consultants Limited
Legal Description:	Lot 1, DP 81332	Company project number:	2150-131322-02
		Company phone number:	9175000
	Degrees / Min / Sec		
GPS south:		Date of submission:	
GPS east:		Inspection Date:	12/05/2011, 13/05/2011, 21/06/2011, 9/01/2012
		Revision:	1
Building Unique Identifier (CCC):		Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	4.00

Building

No. of storeys above ground:	2	single storey = 1 / Ground floor elevation (Absolute) (m):	4.10
Ground floor split?	no	Ground floor elevation above ground (m):	0.10
Storeys below ground	0		
Foundation type:	strip footings	if Foundation type is other, describe:	
Building height (m):	7.80	height from ground to level of uppermost seismic mass (for IEP only) (m):	7.8
Floor footprint area (approx):	190		
Age of Building (years):	13	Date of design:	1992-2004
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	commercial	Brief strengthening description:	
Use (upper floors):	commercial		
Use notes (if required):			
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	steel framed	rafter type, purlin type and cladding	310UB40 rafters, DHS purlins, lightweight metal roof
Floors:	other (note)	describe sytem	HIBOND floor slabs
Beams:	precast concrete	overall depth (mm)	
Columns:			
Walls:	load bearing concrete	#N/A	

Lateral load resisting structure

Lateral system along:	concrete shear wall	**Note: Define along and across in detailed report!** note total length of wall at ground (m):	
Ductility assumed, μ:	1.25	wall thickness (m):	
Period along:	0.42 ##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):		estimate or calculation?	
maximum interstorey deflection (ULS) (mm):		estimate or calculation?	
Lateral system across:	concrete shear wall	note total length of wall at ground (m):	
Ductility assumed, μ:	1.25	wall thickness (m):	
Period across:	0.42 ##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):		estimate or calculation?	
maximum interstorey deflection (ULS) (mm):		estimate or calculation?	

Separations:

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

Non-structural elements

Stairs:	precast, full flight	describe supports	
Wall cladding:	precast panels	thickness and fixing type	150mm
Roof Cladding:	Metal	describe	Ligtweight metal roof
Glazing:			
Ceilings:	light tiles		Suspended lightweight ceiling
Services(list):	HVAC		

Available documentation

Architectural	partial	original designer name/date	Ian Krause Architects Limited/1999
Structural	partial	original designer name/date	Lovell-Smith & Cusiel Ltd/1999
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance:		Describe damage:	refer to HG standard spreadsheet
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	moderate to substantial (1 in 5)	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	estimated
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	yes	Describe:	Cracks to precast panels & partitions

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

Recommendations

	Level of repair/strengthening required:	minor structural	Describe:	Cracks to precast panels & partitions
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	No major structural damage
Along	Assessed %NBS before:	65% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	See attached HG standard IEP report
	Assessed %NBS after:	65%		
Across	Assessed %NBS before:	65% ##### %NBS from IEP below		
	Assessed %NBS after:	65%		

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

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

h_n from above: 7.8m

Seismic Zone, if designed between 1965 and 1992:

not required for this age of building

Design Soil type from NZS4203:1992, cl 4.6.2.2:

	along	across
Period (from above):	0.42	0.42
(%NBS)nom from Fig 3.3:		

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0

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

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

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

2.2 Near Fault Scaling Factor

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

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

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:

Z_{1992}, from NZS4203:1992

Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

Building Importance level (from above): 2

Return Period Scaling factor from Table 3.1, **Factor C**:

2.5 Ductility Scaling Factor

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

2.6 Structural Performance Scaling Factor:

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

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

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

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

3.1. Plan Irregularity, factor A: 1

3.2. Vertical irregularity, Factor B: 1

3.3. Short columns, Factor C: 1

3.4. Pounding potential

Pounding effect D1, from Table to right

Height Difference effect D2, from Table to right

Therefore, Factor D: 0

3.5. Site Characteristics 1

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

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

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max value =1.5, no minimum		
Rationale for choice of F factor, if not 1		

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

3.7. Overall Performance Achievement ratio (PAR) **0.00** **0.00**

4.3 PAR x (%NBS)b: PAR x Baselline %NBS: **#DIV/0!** **#DIV/0!**

4.4 Percentage New Building Standard (%NBS), (before) **#DIV/0!**

Official Use only:

Accepted By

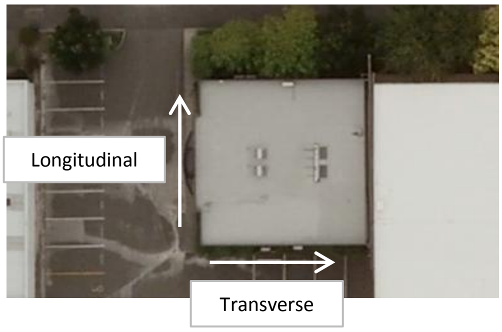
Date:

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

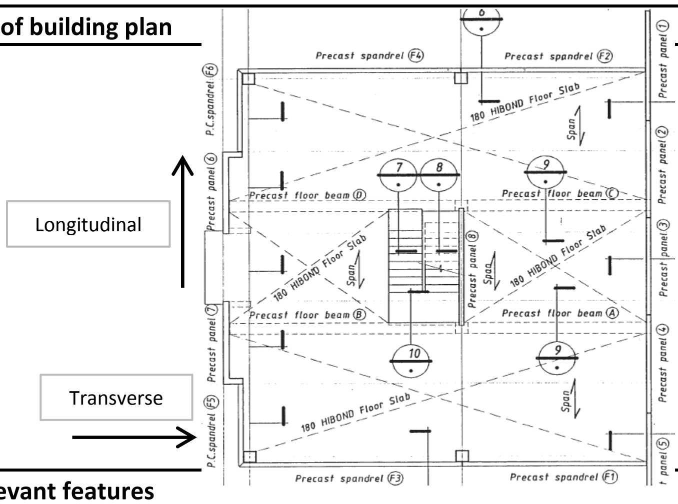
Building Name:	The Argent Building	**Ref:**	**2150-131322-02**
Location:	82 Peterborough Street, Christchurch	**By:**	MCW
		Date:	**20/08/2012**

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)



1.2 Sketch of building plan



1.3 List relevant features

Built c1999, Two storey office building, lateral load resisting systems RC panel walls supporting either the light metal roof or the HIBOND concrete floor slabs, ductility μ = 1.25

1.4 Note information sources

	Mark as appropriate
Visual Inspection of Exterior	☑
Visual Inspection of Interior	☑
Drawings (partial set only)	☑
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: The Argent Building **Ref:** 2150-131322-02

Location: 82 Peterborough Street, Christchurch **By:** MCW

Date: 20/08/2012

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

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

a) Date of Design and Seismic Zone

Date	Seismic Zone	Mark as appropriate	
Pre 1935		☐	See also notes 1,3
1935-1965		☐	
1965-1976	A	☐	
	B	☐	
	C	☐	
1976-1992	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	a) Rigid	☐
(for 1992 to 2004 only and only if known)	b) Intermediate	☐

c) Estimate Period, T

$T = 0.09h_n^{0.75}$	Moment Resisting Concrete Frames
$T = 0.14h_n^{0.75}$	Moment Resisting Steel Frames
$T = 0.08h_n^{0.75}$	Eccentrically Braced Steel Frames
$T = 0.06h_n^{0.75}$	All Other Frame Structures
$T = 0.09h_n^{0.75}/A_c^{0.5}$	Concrete Shear Walls
$T \le 0.4$ sec	Masonry Shear Walls
-	User Defined (input period)

where h_n = height in m from base to upper most seismic weight or mass. $A_c = \sum A_i(0.2 + L_{wi}/h_n)^2$, 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 on the direction parallel to the applied force, in m with the restriction that l_{wi}/h_n not exceed 0.9

	Longitudinal	Transverse	
Eqn	CSW	CSW	
h_n =	7.8	7.8	m
A_c =	1.0	1.0	m^2
T =	0.42	0.42	s

d)$(\%NBS)_{nom}$ determined from Figure 3.3

Longitudinal	22.39%
Transverse	22.39%

Note 1 For buildings designed proir to 1965 and known to be designed as public buildings in accordance with the code of the time, multiply $(\%NBS)_{nom}$ 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) or 1.2 (Zone B)

Note 2 For reinforced concrete buildings designed between 1976-84 multiply $(NBS)_{nom}$ by 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

	(%NBS)nom -scaled
Longitudinal	**22%**
Transverse	**22%**

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

2.2 Near Fault Scaling Factor, Factor A

If T≤1.5sec, Factor A = 1

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

Longitudinal:	1.0
Transverse:	1.0

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

	Factor A
Longitudinal:	1.0
Transverse:	1.0

2.3 Hazard Scaling Factor, Factor B

a) Hazard Factor, Z, for site Site Area: Z = 0.3
(from NZS1170.5:2004, Table 3.3)

b) Hazard Scaling Factor Pre 1992 = 1/Z

1992/1992+ = Z_{1992}/Z Zone Factor = **0.8**

(where Z_{1992} is the NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))

Factor B: 2.67

2.4 Return Period Scaling Factor, Factor C

a) Building Importance Level 2.0
(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
(shall be less than maximum given in accompanying table 3.2) Max = 6

μ = 1.25 Longitudinal

μ = 1.25 Transverse

b) Ductility Scaling Factor Pre 1976 = k_{μ}

1976/1976+ = 1

	Factor D
Longitudinal:	1.00
Transverse:	1.00

2.6 Structural Performace Scaling Factor, Factor E

a) Structural Performace Factor, S_p
(from accompanying Figure 3.4)

Longitudinal:	0.925
Transverse:	0.925

b) Structural Performace Scaling Factor = $1/S_p$

	Factor E
Longitudinal:	1.49
Transverse:	1.49

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

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

Longitudinal:	89%
Transverse:	89%

Table IEP-3: Initial Evaluation Procedure – Step 3

Building Name: The Argent Building **Ref.** 2150-131322-02
Location: 82 Peterborough Street, Christchurch **By:** MCW
Direction Considered: **Longitudinal**
Date: 20/08/2012

Step 3 - Determination of $(\%NBS)_b$
(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Effect on Structural Performance: SEVERE	SIGNIFICANT	INSIGNIFICANT	Building Score
3.1 Plan Irregularity Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor A 1.0
3.2 Vertical Irregularity Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor B 1.0
3.3 Short Columns Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor C 1.0

3.4 Pounding Potential
(Estimate D1 and D2 and set D = to 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 For Longitudinal Direction 1.0

Table for Selection Factor D1	Severe	Significant	Insignificant
Separation:	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	☐	☐	☑
Alignment of Floors not within 20% of Storey Height	☐	☐	☐

b) Factor D2: - Height Difference Effect
Select appropriate value from Table

Factor D2 For Longitudinal Direction 1.0

Table for Selection Factor D2	Severe	Significant	Insignificant
Separation:	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	☐	☐	☐
Height Difference 2 to 4 Storeys	☐	☐	☐
Height Difference < 2 Storeys	☐	☐	☑

Factor D 1.0

3.5 Site Characteristics - (Stability, landslide threat, liquefaction etc)

	Severe	Significant	Insignificant
Effect on Structural Performance:	☐	☐	☑

Factor E 1.0

3.6 Other Factors
Record rationale for choice of Factor F:
For For < 3 storeys - Maximum value 2.5,
otherwise - Maximum value 1.5. No minimum.

Factor F 1.0

2.7 Performance Achievement Ratio (PAR)
(equals A x B x C x D x E x F)

PAR (Longitudinal): 1.00

Table IEP-3: Initial Evaluation Procedure – Step 3

Table IEP-3 **Initial Evaluation Procedure Step 3 B- Tranverse Direction** **Page 5**

Building Name: The Argent Building **Ref.** 2150-131322-02
Location: 82 Peterborough Street, Christchurch **By:** MCW
Direction Considered: **Transverse**
Date: 20/08/2012

Step 3 - Determination of $(\%NBS)_b$

(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Effect on Structural Performance			Building Score
	SEVERE	SIGNIFICANT	INSIGNIFICANT	
3.1 Plan Irregularity				
Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor A 1.0
3.2 Vertical Irregularity				
Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor B 1.0
3.3 Short Columns				
Effect on Structural Performance:	☐	☐	☑	
Comment:				Factor C 1.0

3.4 Pounding Potential

(Estimate D1 and D2 and set D = to 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 For Transverse Direction 1.0

Table for Selection Factor D1	Severe	Significant	Insignificant
Separation:	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	☐	☐	☑
Alignment of Floors not within 20% of Storey Height	☐	☐	☐

b) Factor D2: - Height Difference Effect

Select appropriate value from Table

Factor D2 For Transverse Direction 1.0

Table for Selection Factor D2	Severe	Significant	Insignificant
Separation:	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	☐	☐	☐
Height Difference 2 to 4 Storeys	☐	☐	☐
Height Difference < 2 Storeys	☐	☐	☑

Factor D 1.0

3.5 Site Characteristics - (Stability, landslide threat, liquefaction etc)

	Severe	Significant	Insignificant
Effect on Structural Performance:	☐	☐	☑

Factor E 1.0

3.6 Other Factors

Record rationale for choice of Factor F:
For For < 3 storeys - Maximum value 2.5,
otherwise - Maximum value 1.5. No minimum.

Factor F 1.0

2.7 Performance Achievement Ratio (PAR)

(equals A x B x C x D x E x F)

PAR (Transverse): 1.00

Table IEP-4: Initial Evaluation Procedure – Step 4

Table IEP-4 **Initial Evaluation Procedure Step 3 B- Tranverse Direction**

Building Name:	The Argent Building	**Ref.**	2150-131322-02
Location:	82 Peterborough Street, Christchurch	**By:**	MCW
		Date:	20/08/2012

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

	Longitudinal	Transverse
4.1 Assessed Baseline $\mathbf{(\%NBS)_b}$ (from Table IEP - 1)	89%	89%
4.2 Performace Achievement Ratio (PAR) (from Table IEP - 2)	1	1
4.3 PAR x Baseline $\mathbf{(\%NBS)_b}$	89%	89%

4.4 Percentage New Building Standard (%NBS) **89%**

(Use lower of two values from Step 3.3)

Step 5 - Potentially Earthquake Prone? **%NBS ≤ 33%** **NO**

(Mark as appropriate)

Step 6 - Potentially Earthquake Risk? **%NBS < 67%** **NO**

(Mark as appropriate)

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade **A**

Evaluation Confirmed by... --- **Signature**

Andrew Thompson **Name**

149819 **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

DRAWINGS