#### **Invercargill CBD Project**

Resource Consent Hearing Seismic Assessments March 2019









**1. BMC** - experience / expertise / Graham McDougall & Andrew Marriott

2. CBD Seismic Assessments - scope / methodology

**3. Govt Life (Dee & Esk)** - Strengthening vs heritage values?

4. Other Buildings – Overview / Summary

5. Façade Retentions – Temple Chambers (NZI) & others



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Access design , Heritage building advice

**Demolition design & supervision** 





Numerous Invercargill assessment & strengthening jobs





#### Numerous Dunedin & Otago assessment & strengthening jobs









All types of 'New builds'







### Andrew Marriott / Graham McDougall

- **1. Directors BMC**
- **2. Chartered Professional Engineers**
- **3. 35+ years in structural practice**
- 4. Specialist focus on earthquake assessments
- 5. Up to date with latest EPB Methodology / seminars etc
- 6. Andrew recognized by HNZ as 'go to' Heritage Engineer (Member ICOMOS)



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#### 2 x DSA, 20 x ISA (Comp) Heritage + 14 x IEP Non-Heritage



# **EPB** methodology

- **1.** TA identifies potentially EQP (Priority) buildings
- 2. Owner engages engineer to carry out assessments ('Seismic Assessment of Existing Buildings Technical Guidelines')
- 3. TA assesses engineers Reports & decides/accepts if EQP, issues EQP Notice (Register)

**16 x 'EQP Notices' issued by ICC** (80% of EQP identified Bldgs)

# Assessment methodology (ISA/IEP)

- **1. ISA EPB methodology review and template establishment**
- 2. Research & Review of available drawings
- 3. Geotechnical desk top study
- 4. Internal / External Inspection process
  - 2 x inspection teams (3 per team) + builder support
  - > Determination of wall thicknesses / structural system / MagiPlan capture
- 5. 3 x Authors, 1 x Specialist analyst, 2 x Reviewers / Approvers

# Assessment methodology (DSA)

- **1.** DSA EPB methodology review and template establishment
- 2. Research & Review of available drawings (ID hot spots)
- **3. Detailed intrusive Inspection process** 
  - 1 x inspection team per building + builder support
  - > Determination of wall thicknesses / connections / testing (bricks mortar concrete)
- 4. Detailed analysis (Seismic Assessment of Existing Buildings, Tech Guidelines July 2017, C5-C8, 1 x analyst per building + 1 x Review engineer)
- 5. Report = 1 x Author + 1 x Reviewer + 1 x Approver



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Computer Frame analysis showed CSW Flexural capacity of primary members & spalling concrete @ 10 - 45%NBS Structurally connected One relies on the other 'Siamese twins'

Concrete strengths 6 - 20 MPa = Poor (NBS 30-40MPa)

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	122	8 KK N			
Project: Concrete Quality Assurance					
Location:	Old Govt Life & Southland Times				
Client:	Batchelar McDougall Consulting				
Contractor:	Batchelar McDougall Consulting et al				
Sampled by :	Batchelar McDougall Sub-Contractor				
Date sampled :	23 December 2017				
Sampling method :	Rotary Core Drill of Various Diameter's				
Sample Conditioning	Tested as Received				
Source -	Corner I	Tel: & Dec Street	Inversarill		
Grada :	Circa 1928 8. January 2018				
Date received:					
Date received.	o sanuar	J 2010		Bendenst Nex	6 IBMC1 1660
				Lab Bachlan	CUL
				Client Ref No:	29 Esk Street
Lab asferment as		40/1	Test	Results	40/4
Lab reterence no		40/1	40/2	40/3	40/4
Chem rescrence no		Level 2 Column	Level 2 Beam	Level 2 Floor	Level 3 Floor
Date made		1928	1928	1928	1928
Date tested		2018	2018	2018	2018
Age of material	(sears)	90	90	90	90
Average diameter	(mm)	94.2	94.4	68.6	68.6
Length	(mm)	185.0	120.0	123.5	115.5
Mass of cylinder in air	(g)	3019	1954	1094	1037
Design strength	(MPa)	-			10000
Density	(kg/m*)	2400	2390	2430	2470
Height diameter ratio		1.96	1.27	1.80	1.68
Compressive strength	(MPa)	7.0	9.5	12.5	12.5
Adjusted compressive stress	(MPa)		*8.5	*12.0	*12.0
Number of ends capped		Two	Two	Тию	Two
Defects prior to capping		Irregularities	Irregularities	Irregularities	Irregularities
				-	
		Comme	nts		
Tast Mathods			Notes		
Companyion, N2S 3112 : 1988, Pt 2 Section 6			*15/D outside 2:1, 'D' facts	x applied	
Density, NZS 3112 : 1986, Pt 3 Ecolori 5					
Capping NZS 3112 . 1986, Pt 2 Section 4 (a	mendixest No 2 23	00)			
December 1 and 1		Sampling is not cover	d by IANZ Accredi	itation. Results apply	only to sample tested
IANZ Approved Signatory Designation : Laboratory Date : 22 January 1	Manager 1018	nus report may only	ACCREDITED LABO	Tests indicate ord accredite ordifield the indicate of the indicate accreditation	el an I anu cope vey'n
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CONCRETE COMPRESSION

OPUS



Durability Tests
Marine aggregate
Carbonated
Low covers
Low & variable
durability



# **Old Govt Life Building**

- **1.** Analysis determined seismic capacity **10 20%NBS**
- 2. Poor concrete strengths, low & unreliable durability
- 3. All Heritage features to the facades are concrete with spalling
- 4. Considered 'not able' to be repaired/strengthened
- 5. Untenanted for 35 years (except retail ground floor)
- 6. 5 storey, 2 x building forms, 90 yr old building, designed pre Napier EQ (modern buildings designed for 50yr life).



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# **Other Buildings Summary**

- **1.** Initial Seismic Assessments = **10 25%NBS** capacity
- **2. Critical Structural Weaknesses** 
  - a) 'Soft' storey (street level) or poor lateral load resistance
  - b) No seismic gaps
  - c) Parapet / chimney vulnerability
  - d) Structural materials in poor condition (mostly brick, timber floors)
- **3. Very difficult to strengthen to 100%NBS insitu**
- 4. For most, Façade Retentions difficult / expensive



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### **Templeton - Esk**

JAYS

layJays)

JAY JAY

JavJavs

# Not original heritage parapet

Scogrees Mobile

#### sass ca

# Not original heritage at this level

## NZI - Esk

May

# Not original heritage parapet

# Not original heritage at this level

### Thompsons - Kelvin (originally intended)

Cast iron columns to remain and/or structure required at this level

beautyboyond.co.nz

Beauty Beyond

PHONE: 2141262

MAINSTAY

### Fairwether - Tay (originally intended)

TERIOCK9.8V

89 . 2

BROSIA

LIVE

SIGNU

Cast iron columns to remain and/or structure required at this level

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DEM



# Bonsai (Quest) - Esk

FIF

# aurant Japa

# Southland Times

-11

## **Bank of NSW**

TREESENSE TREES

Queenstown

INTEL

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## **Façade Retention**

1. Nearly always 'possible'

2. Very significant added cost to any new build

3. Significant repairs and partial reconstruction to facade

4. Small elements compromises New Build objectives

