# History of earthquake strengthening in Gisborne

Ian Petty
Gisborne District Council

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# Earthquakes History for Gisborne and Evolution of Earthquake Risk and Prone Building Policies

## Some background

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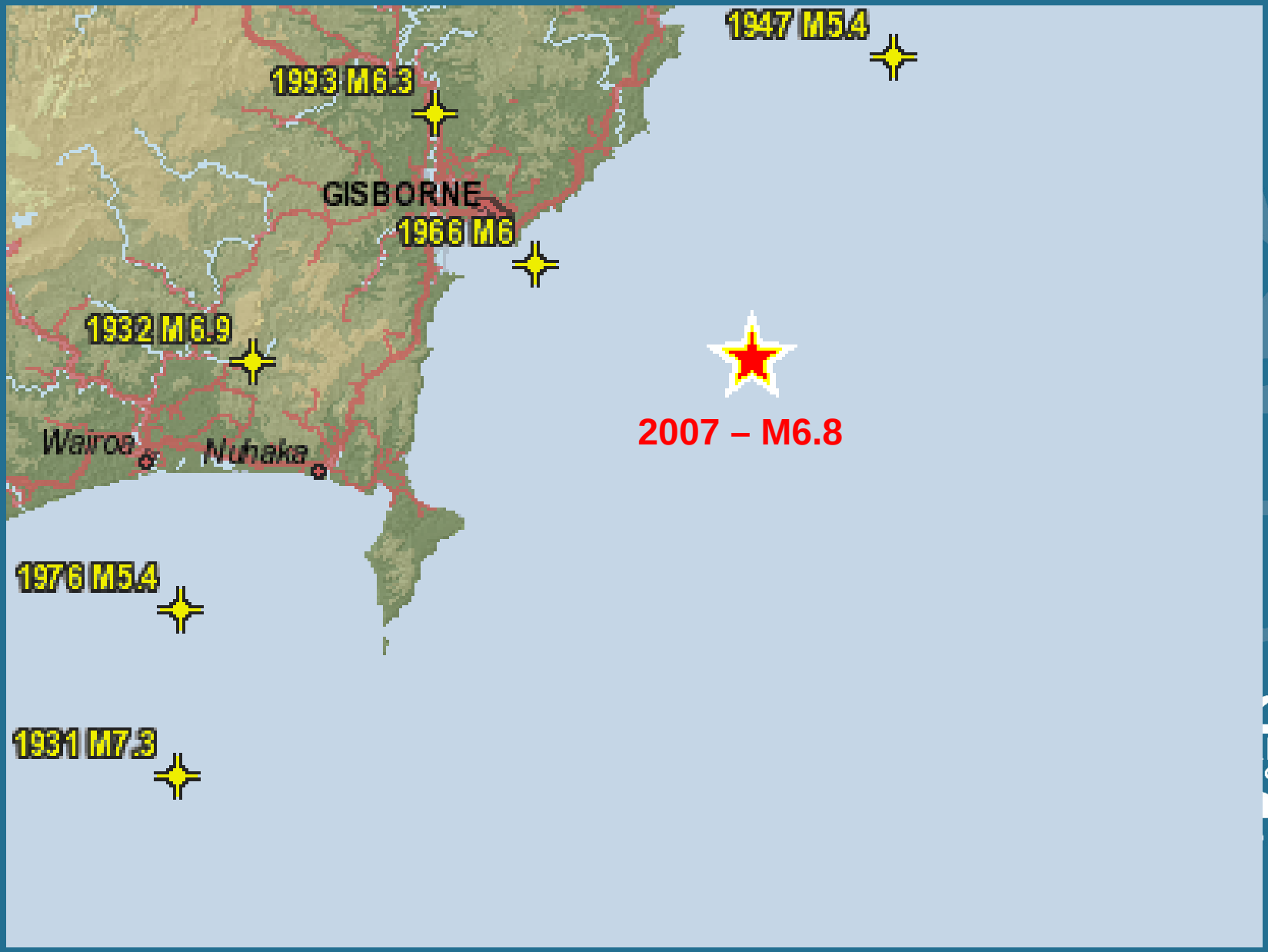
# Earthquakes in Gisborne



# Resultant Changes in buildings

C 1916


2008

# Resultant Changes in buildings

90 years difference

# The History of Earthquake Strengthening in Gisborne

There has been three main legislative requirements for earthquake strengthening:-

Section 624 of the Local Government Act 1974

Section 66 of the Building Act 1991

Section 131 Building Act 2004

Gisborne has had earthquake strengthening regimes under each Act.

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# The History of Earthquake Strengthening in Gisborne

Each change in legislation changed the rules. In effect a seesaw of changes, from reasonably strict under the Local Government Act, to a more lenient view under the ’91 Building Act, to a more measurable criteria in the ’04 Act.

The Canterbury earthquakes may precipitate another legislation change by the Government.

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# The Local Government Act

Following the magnitude 6.3 Gisborne earthquake of 1966 that caused widespread damage in the city the Gisborne City Council got ministerial consent to invoke the emergency provisions of s.624 of the LGA to remove severely damaged brick buildings in the City

The Post Office and the Gisborne Opera House were two of these buildings.

In 1983 a survey identified 140 potential earthquake risk buildings in the city.

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# The Local Government Act

In March 1989 the City Council invoked the full powers of s.624 LGA requiring the owners of earthquake risk buildings to remove the danger by demolition or strengthening.

Buildings were earthquake **risk** if they would "*suffer damage in a moderate earthquake likely to constitute a danger to persons*".

That wording is significantly different to that of the subsequent Building Act 1991 provisions.

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# The Local Government Act

Buildings were required to conduct ‘interim strengthening’ of the most at risk features with full strengthening by a later date.

Timeframes were based on the recommendations of the New Zealand Society for Earthquake Engineering’s (NZSEE) recommendations in their guideline book.

Strengthening was required to meet half NZS1900 Chapter 8 with a recommendation to try for two thirds – a very low strengthening level.

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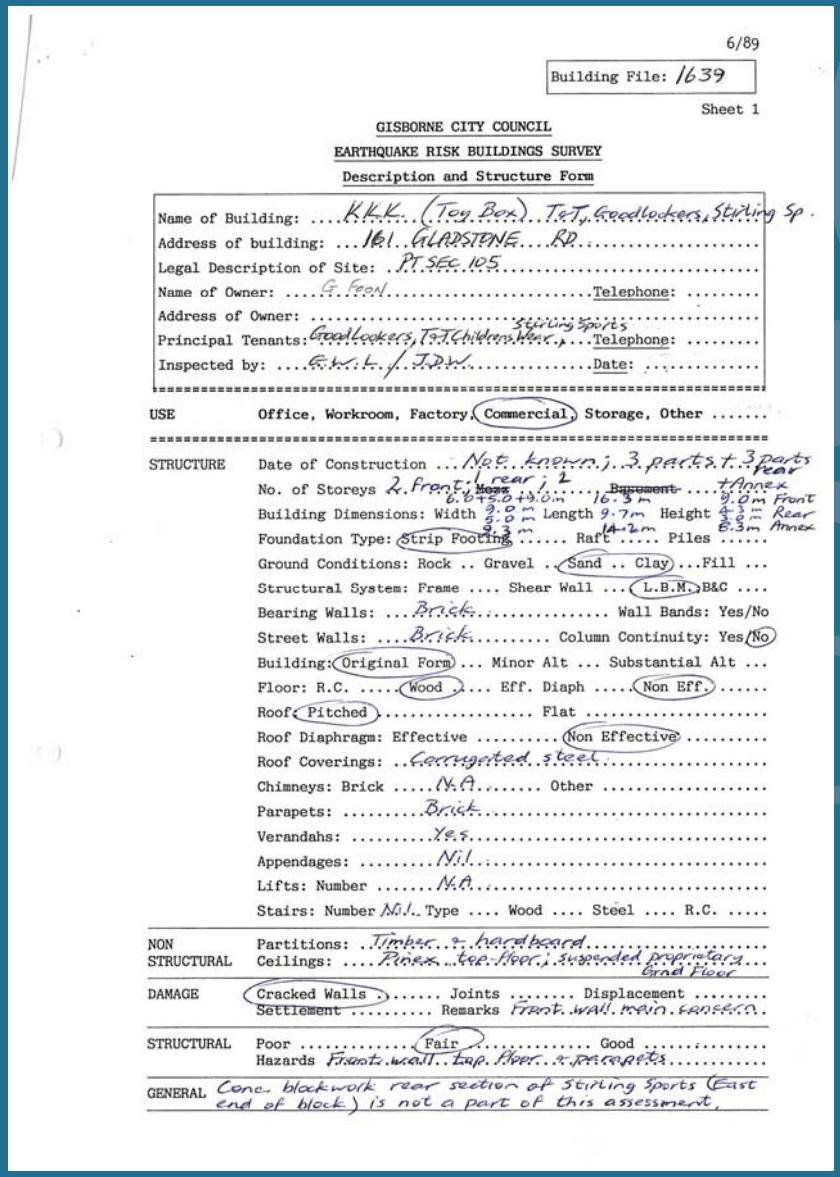
# The Local Government Act

- The buildings were ‘scored’ on structure and occupancy using check sheet forms from the book.
- Buildings were required to conduct ‘interim strengthening’ of the most at risk features with full strengthening by a later date.
- In my view this system was fundamentally flawed as it based an up to 30 year strengthening timeframe on the current use and occupant density.



6/89

Building File: 1639

Sheet 1

GISBORNE CITY COUNCIL

EARTHQUAKE RISK BUILDINGS SURVEY

Description and Structure Form

Name of Building: K.K.K. (Toy Box) T&T, Goodlockers, Stirling Sp.
Address of building: 161 GLADSTONE RD
Legal Description of Site: PT SEC 105
Name of Owner: G. FOON Telephone:
Address of Owner:
Principal Tenants: Goodlockers, T&T Childrens Wear, Stirling Sports Telephone:
Inspected by: G.W.L. / J.D.W. Date:

USE: Office, Workroom, Factory, (Commercial), Storage, Other

STRUCTURE
Date of Construction: Not known; 3 parts + 3 parts rear
No. of Storeys: 2 Front; 1 rear; 2 ~~Base~~ ~~Basement~~ +Annex
Building Dimensions: Width 6.0+5.0+3.0 m, 9.0 m, 9.0 m, 9.3 m; Length 9.7m, 16.3m, 14.2m; Height 9.0 m Front, 4.3 m Rear, 6.3m Annex
Foundation Type: (Strip Footing) Raft Piles
Ground Conditions: Rock Gravel (Sand) (Clay) Fill
Structural System: Frame Shear Wall (L.B.M.) B&C
Bearing Walls: Brick Wall Bands: Yes/No
Street Walls: Brick Column Continuity: Yes (No)
Building: (Original Form) Minor Alt Substantial Alt
Floor: R.C. (Wood) Eff. Diaph (Non Eff.)
Roof: (Pitched) Flat
Roof Diaphragm: Effective (Non Effective)
Roof Coverings: Corrugated steel
Chimneys: Brick N.A. Other
Parapets: Brick
Verandahs: Yes
Appendages: Nil
Lifts: Number N.A.
Stairs: Number Nil Type Wood Steel R.C.

NON STRUCTURAL
Partitions: Timber & hardboard
Ceilings: Pinex top floor; suspended proprietary Grnd Floor

DAMAGE
(Cracked Walls) Joints Displacement
Settlement Remarks Front wall main transom

STRUCTURAL
Poor (Fair) Good
Hazards Front wall, Exp. floor & parapets

GENERAL Conc. blockwork rear section of Stirling Sports (East end of block) is not a part of this assessment.

# The Local Government Act

- The work was done by ex Council Chief Building Inspector and City Design Engineer.
- A sample of 10 of the first assessments were peer reviewed for methodology and end result by Opus in Hawke Bay.

6/.

Building file: 1639.

Sheet

GISBORNE CITY COUNCIL

EARTHQUAKE RISK BUILDINGS SURVEY

Structural Points Rating Form

Name of Building: KKK/TOY BOX etc (2 bldgs) Main Block/Annex

Address of Building: 161 Gladstone Rd

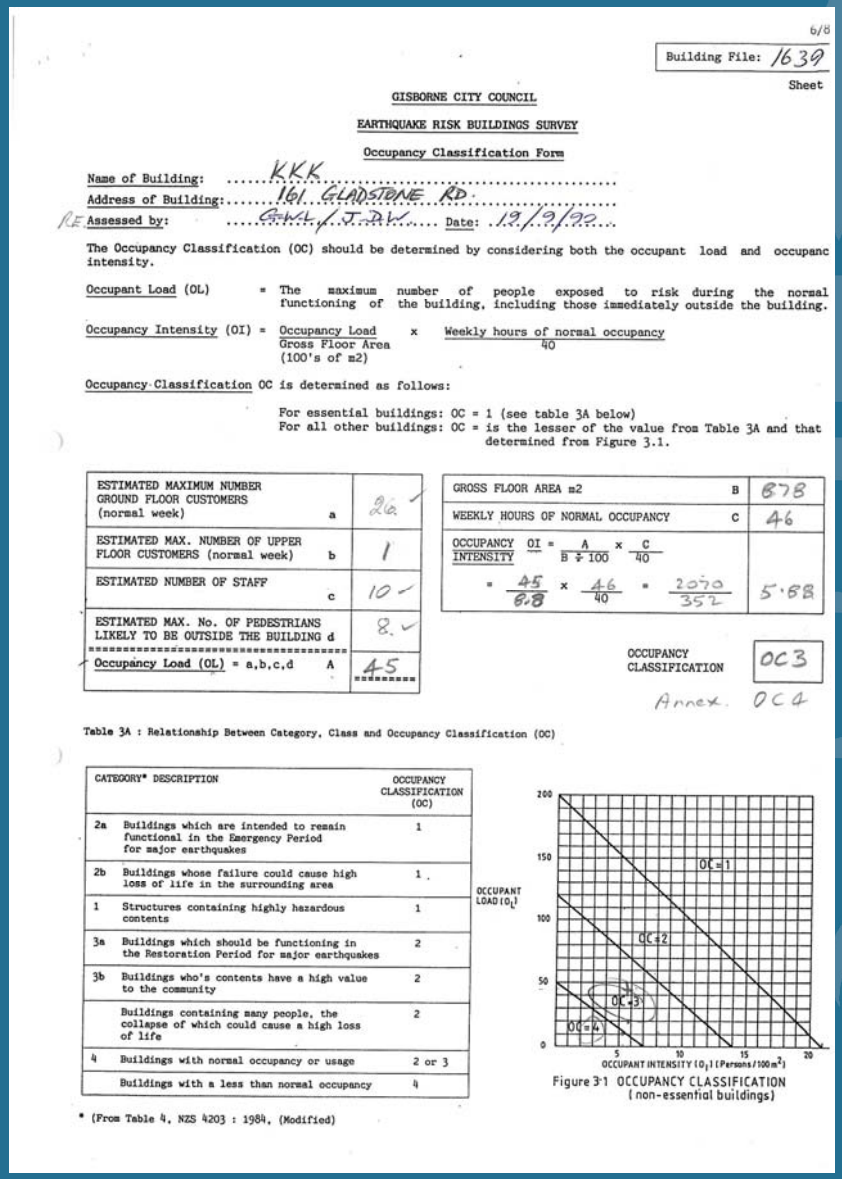
Assessed by: G.W.L./J.D.W. Date: 12/9/22

| | PENALTY POINTS | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | |
| Structure and continuity | Good continuous structural system of reinforced concrete. Reinforced masonry or steel | Unreinforced masonry with reinforced concrete wall bands at floor and at roof | Unreiforced masonry or concrete without full wall bands but tied at corners or tied with steel rods | Unreinforced concrete or masonry without ties or concrete bands | 3/2 |
| Structural Condition | Structure well made and materials in sound condition<br>SATISFACTORY | Poor workmanship or minor deterioration of materials<br>FAIR | Clear evidence of deterioration of materials and rusting or loosening of connections<br>POOR | Widespread obvious deterioration of mortar and spalling of concrete<br>SERIOUS | 1/1 |
| No. of storeys OR height of external wall | One<br>Up to 6 metres | Two<br>6 metres to 9 metres | Two to Four<br>9 metres to 15 metres | More than Four Stories or greater than 15 metres height | 1/1 |
| Structural Damage | No damage evident<br>NONE | Settlement cracking but no evidence of cracking due to earthquake<br>SETTLEMENT | Some minor cracking attributable to earthquake<br>MINOR | Considerable cracking due to earthquake<br>SEVERE | 3/2 |
| Shear walls or Frames | Cross walls or rigid frame support at less than 6m. centres<br>WELL SUPPORTED | Generally supported by crosswalls or rigid frames but some areas with walls 9m. long<br>PARTIALLY SUPPORTED | Long walls generally but horizontal floor or roof diaphragms at 4 to 5 m centres vertically<br>NOT SUPPORTED VERTICALLY | Long high walls without lateral support (exceeds 12m. long by 5m. high)<br>NOT SUPPORTED IN EITHER DIRECTION | 2/2 |
| Diaphragms | Concrete slab or equivalent adequately tied to walls (supported on framing which itself is designed to with stand earthquake)<br>EFFECTIVE | Concrete slab or equivalent (supported on framing which itself is designed to withstand earthquake)<br>EFFECTIVE | Heavy timber section designed with engineering connections and well tied into the exterior wall<br>PARTIALLY EFFECTIVE | Light timber with carpenters connections at framing and at outer walls<br>NON EFFECIVE | 3/3 |
| Soil and Foundations | Rock<br>EXCELLENT | Well graded firm sands or gravels or firm clays and silts<br>GOOD | Soft clays and silts loose sands well graded or firm fill OR Good soil with foundations having little continuity<br>FAIR | Uniform sands or loose fill material or reclamation OR Fair soil with foundations having little continuity<br>POOR | 2/2 |
| Eccentricity or Slenderness | No major eccentricity | Building U or L shaped OR Building has one face extensive glass facades | Building has eccentric stiffness, AND/OR weakness in one direction AND/OR 2 faces extensive glass facades with no compensating bracing | Severe eccentricity AND/OR weakness in one direction AND/OR 3 faces extensive glass facades with no compensating bracing | 1/0 |
| Soft Storey Effect (Flexible Storey) | All storeys of similar stiffness (top storey need not be as stiff) Similar materials | Building has 1 or 2 intermediate or lower storeys with more openings and windows | Lower floor has little stiffness relative to rest of building | Severe soft storey Minimal stiffness in lower storey (due to extensive glass, openings, and/or large storey height) | 1/0 |

TOTAL POINTS 17/13

# The Local Government Act

- Buildings had to be able to withstand a ‘moderate earthquake’.
- A moderate earthquake was defined as *“an earthquake that would subject a building to seismic forces one half as those specified in NZS 1900 Chapter 8: 1965”.*



6/8

Building File: 1639

Sheet

GISBORNE CITY COUNCIL

EARTHQUAKE RISK BUILDINGS SURVEY

Occupancy Classification Form

Name of Building: KKK

Address of Building: 161 GLADSTONE RD.

RE Assessed by: GWL / JDW Date: 19/9/92

The Occupancy Classification (OC) should be determined by considering both the occupant load and occupanc intensity.

Occupant Load (OL) = The maximum number of people exposed to risk during the normal functioning of the building, including those immediately outside the building.

Occupancy Intensity (OI) = $\frac{\text{Occupancy Load}}{\text{Gross Floor Area (100's of m2)}} \times \frac{\text{Weekly hours of normal occupancy}}{40}$

Occupancy Classification OC is determined as follows:

For essential buildings: OC = 1 (see table 3A below)
For all other buildings: OC = is the lesser of the value from Table 3A and that determined from Figure 3.1.

| | | |
|---|---|---|
| ESTIMATED MAXIMUM NUMBER GROUND FLOOR CUSTOMERS (normal week) | a | 20 |
| ESTIMATED MAX. NUMBER OF UPPER FLOOR CUSTOMERS (normal week) | b | 1 |
| ESTIMATED NUMBER OF STAFF | c | 10 |
| ESTIMATED MAX. No. OF PEDESTRIANS LIKELY TO BE OUTSIDE THE BUILDING | d | 8 |
| Occupancy Load (OL) = a,b,c,d | A | 45 |

| | | |
|---|---|---|
| GROSS FLOOR AREA m2 | B | 878 |
| WEEKLY HOURS OF NORMAL OCCUPANCY | C | 46 |
| OCCUPANCY INTENSITY $OI = \frac{A}{B \div 100} \times \frac{C}{40}$ $= \frac{45}{8.8} \times \frac{46}{40} = \frac{2070}{352}$ | | 5.88 |

OCCUPANCY CLASSIFICATION OC3

Annex. OC4

Table 3A : Relationship Between Category, Class and Occupancy Classification (OC)

| CATEGORY* | DESCRIPTION | OCCUPANCY CLASSIFICATION (OC) |
|---|---|---|
| 2a | Buildings which are intended to remain functional in the Emergency Period for major earthquakes | 1 |
| 2b | Buildings whose failure could cause high loss of life in the surrounding area | 1 |
| 1 | Structures containing highly hazardous contents | 1 |
| 3a | Buildings which should be functioning in the Restoration Period for major earthquakes | 2 |
| 3b | Buildings who's contents have a high value to the community | 2 |
| | Buildings containing many people, the collapse of which could cause a high loss of life | 2 |
| 4 | Buildings with normal occupancy or usage | 2 or 3 |
| | Buildings with a less than normal occupancy | 4 |

* (From Table 4, NZS 4203 : 1984, (Modified)



Figure 3·1 OCCUPANCY CLASSIFICATION (non-essential buildings)

# The Local Government Act

- The scoring system gave a result with two time frames – one for the most at risk features, one for the whole building.
- For this example building, which was in two parts, we have a 10/20 and 20/30 timeframe.

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Sheet 4

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EARTHQUAKE RISK BUILDINGS SURVEY

Timescale for Upgrading Form

Name of Building: KKK / TOY BOX etc

Assessed by: G.W.K. / J.D.W. Date: 19/9/90

Circle numbers applicable and years to interim secure and strengthen.

| SUMMARY: | | Main | Annex |
|---|---|---|---|
| | Years to Interim Secure | 10 | 20 |
| | Years to Strengthen | 15 | 30 |

Table 1 - Modified Timescale for Interim Securing and Strengthening*

| NUMERICAL STRUCTURAL RATING (Modified) | BUILDING CONDITION | RECOMMENDED TIME FOR INTERIM SECURING AND STRENGTHENING — OCCUPANCY CLASSIFICATION 1 | 2 | 3 | 4 | |
|---|---|---|---|---|---|---|
| 22 and over | I | 2 | 3 | 7 | 10 | Secure |
| | | 3 | 4 | 10 | 15 | Strengthen |
| 16-21 | BA | 3 | 6 | 10 | 15 | Secure |
| | | 5 | 8 | 15 | 20 | Strengthen |
| 11-15 | A | 4 | 8 | 12 | 20 Above | Secure |
| | | 6 | 10 | 20 | 30 | Strengthen |
| 10 and under | AA | 5 | 10 | 15 | 25 | Secure |
| | | 8 | 15 | 25 | 35 | Strengthen |

*Time in years from date of notification by Local Authority.

I Inferior
BA Below Average
A Average
AA Above Average

# The Local Government Act

There were also multiplication factors given for each part of a building.

- 1 for the structure as a whole
- 2 for infill panels
- 4 for parapets.

The part of this that is surprising is that the loading for NZS 1900 was 0.12g.

Therefore for a structure .5 x 0.12 x 1.0 = 0.06g strengthening design level.

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# The Local Government Act

The scary thing about all of this was the fact that the '66 earthquake that precipitated the use of s.624 had a ground acceleration spectra of 0.28g – or almost 5 times the level we were strengthening our buildings to.

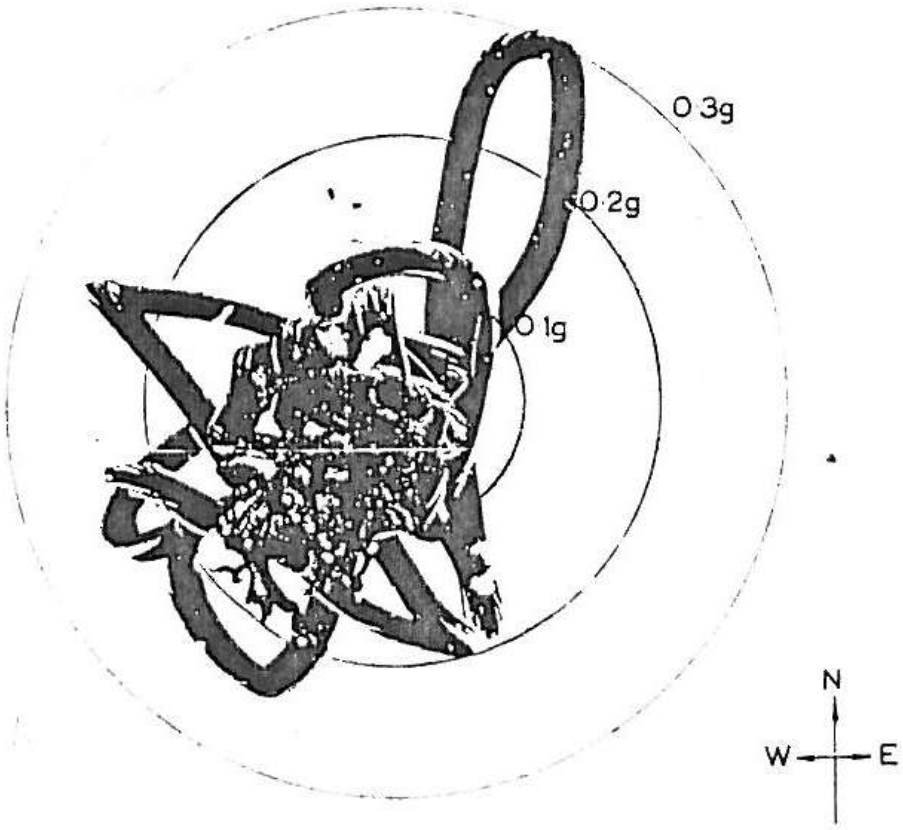


FIG 3.1. Acceleration record of Gisborne earthquake from scratch-plate accelerometer. (Magnification, ×50.)

# The Local Government Act

The other issue that makes little sense was that the definition of a moderate earthquake was still based on NZS 1900, a loading code that had already been redundant since 1976 when the much more robust NZS 4203 came into force.

NZS 4203 had a design level approximately 4 times greater than NZS 1900.

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# The Building Act 1991

The enactment of the ’91 Building Act changed the rules for earthquake strengthening. S. 624 LGA was repealed and BA91 took over.

Strengthening was also limited to:-

**66. Buildings which are deemed to be earthquake prone**-(I) Subject to subsection (2) of this section, a building shall be deemed to be earthquake prone for the purposes of this Part of the Act if, having regard to its condition and to the ground on which it is built and because of its **construction being either wholly or substantially of unreinforced concrete or unreinforced masonry**, the building will have its ultimate load capacity exceeded in a moderate earthquake and thereby would be likely to suffer **catastrophic collapse causing bodily injury or death** to persons in the building or to persons on any other property or damage to any other property.

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# The Building Act 1991

The two Acts had vastly different definitions of building "danger".

The Local Government Act 1974 earthquake risk criteria:-

"*suffer damage in a moderate earthquake likely to constitute a danger to persons".*

And the Building Act 1991 earthquake prone criteria:-

*"suffer catastrophic collapse causing injury or death".*

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# The Building Act 1991

Because of the change to the ‘test’ many buildings evaluated as Earthquake Risk under the LGA were not Earthquake Prone (EQP) under the Building Act.

Interim strengthening that was a Local Government Act requirement was also lost in our policies at this time.

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# The Building Act 1991

The now Gisborne District Council re evaluated all the buildings that had been earthquake risk and notified some owners that their buildings, while assessed as EQR were not EQP.

Thankfully all the records were retained.

Somewhat out of context, but worth a mention at this stage. These buildings are now included in our earthquake prone building policy as Category 4 buildings.

Category 4 buildings were given 10 years to strengthen from 2008 so are all due to be either strengthened or demolished by 2018.

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# The Building Act 1991

The definition of a moderate earthquake was unchanged from the LGA to BA91.

Consequently the strengthening was still based on New Zealand Standard 1900 Chapter 8 – Structural Loading code – as discussed this was a very low standard compared to the post ’76 NZS 4203 and the current NZS 1170.

The GDC still encouraged 66% while only legally being able to enforce 50%.

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# The Building Act 1991

One good thing that came out of the Building Act was section 46 which stipulated the changes that a building must undergo if it went from one use to another i.e. retail shop to bar/restaurant.

***46. Change of use of buildings, etc …***
*(2) The use of the building shall not be changed unless the territorial authority is satisfied on reasonable grounds that in its new use the building will-*
*(a) Comply with the provisions of the building code for means of escape from fire, protection of other property, sanitary facilities,* ***and structural*** *and fire· rating behaviour, and for access and facilities for use by people with disabilities.... ****as nearly as is reasonably' practicable to the same extent as if it were a new building***

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# The Building Act 1991

The Gisborne District Council would accept at least 66% of the current loading code, NZS 4203, as meeting the ***'as near as reasonably practicable'*** test.

We therefore ended up with a dichotomy of design levels.

0.06g for the buildings on the earthquake strengthening schedule, and

Approximately 0.4g for buildings undergoing a change of use.

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# A Point to Remember Strengthening Works!

Two thirds 4203 – NZS 1900 strengthening required by policy and 4203 level set by negotiation.

Two thirds 4203 – NZS 1900 strengthening required by policy; 4203 by change of use.


Two thirds 4203 – strengthening required by change of use.

Two thirds 4203 – strengthening required by change of use.

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# Even NZS 1900 Strengthening!

# The 2004 Building Act

The 2004 Building Act required all Councils to prepare an Earthquake Prone Building Policy. The GDC based their policy closely on the model 'Quaketown' policy prepared by the Department of Building and Housing.

The requirement was still that buildings must be able to withstand the forces of a moderate earthquake but thankfully moderate had been redefined.

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# The 2004 Building Act

A moderate earthquake is defined as:-

*"an earthquake that would generate shaking at the site of the building that is of the same duration as, but that is one-third as strong as, the earthquake shaking that would be designed to design* ***a new building at that site****".*

The big difference in BA04 is that the definition of 'moderate' is tied to a new building and therefore to the current loading code. The common term now is new building standard (NBS). There is no longer a reliance on a redundant standard and any changes automatically become the new criteria.

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# The 2004 Building Act

The level of earthquake strengthening in Gisborne has always been to try and achieve two thirds of the standard. Unfortunately this was not the current standard but NZS 1900 Chapter 8.

While this is a fairly low requirement the two thirds was embedded in the consciousness of our building owners.

It was also the level recommended by the NZSEE and recommended in the DBH guideline.

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# The 2004 Building Act

The proposed strengthening levels were therefore set at two thirds of the current code to ensure the strengthening would be above any future Government policy changes and to future proof the buildings for any 'change of use'.

That was the level in the documents that went out for consultation, we expected that it would be accepted.

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# The 2004 Building Act

Little else differed from the Quaketown model policy.

The Quaketown model policy was silent on interim strengthening.

One point to remember. While the Act required councils to have an earthquake prone building policy and that the guidelines recommended two thirds NBS there was no legal stipulation of what level buildings should be strengthened to.

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# The 2004 Building Act

The Act merely states that Councils must have a policy and that notices must require building owners to ‘reduce or remove the danger’.

This has resulted in a variety of policy levels throughout New Zealand – from just over 33%, so a building is no longer EQP or to ‘as near as reasonably practicable to NBS but not less than 67%’.

There were also a mixture of passive and active approaches.

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# The 2004 Building Act

## Passive:-

Basically a ‘do nothing’ option.

Earthquake strengthening is triggered by an application to do substantial building work.

Substantial may be defined by a dollar value or % of capital value.

## Active

Gisborne’s type of policy.

Buildings assessed for comparative risk and given timeframes of varying lengths.

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# The 2004 Building Act

The general feeling among councils now is ‘watch this space’ in anticipation of an amendment to the Building Act to either raise the level of what is an EQP or stipulate the level of strengthening that must be achieved.

Hopefully the Gisborne 67% has future proofed us to some of these changes.

The passive option may also disappear.

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# Changes brought about by the 2007 earthquake

## A policy revision

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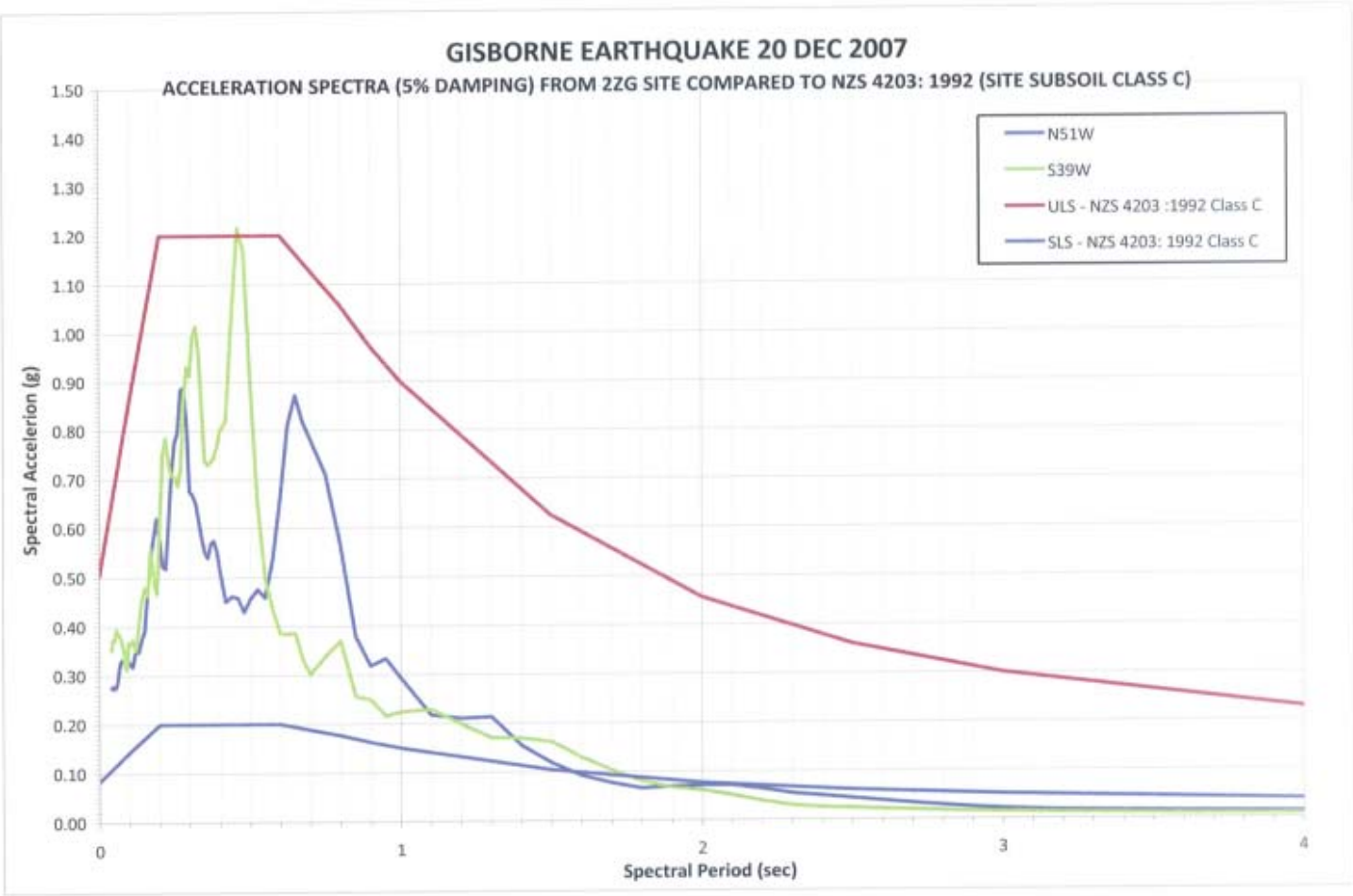
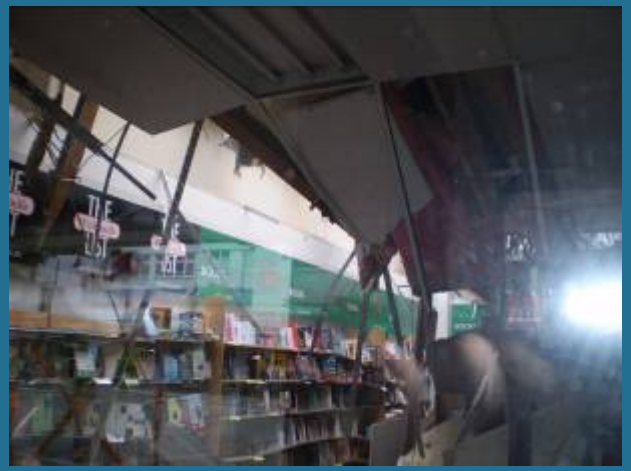
# Ground Accelerations



# A Quick Look
# Earthquake Damage in Gisborne



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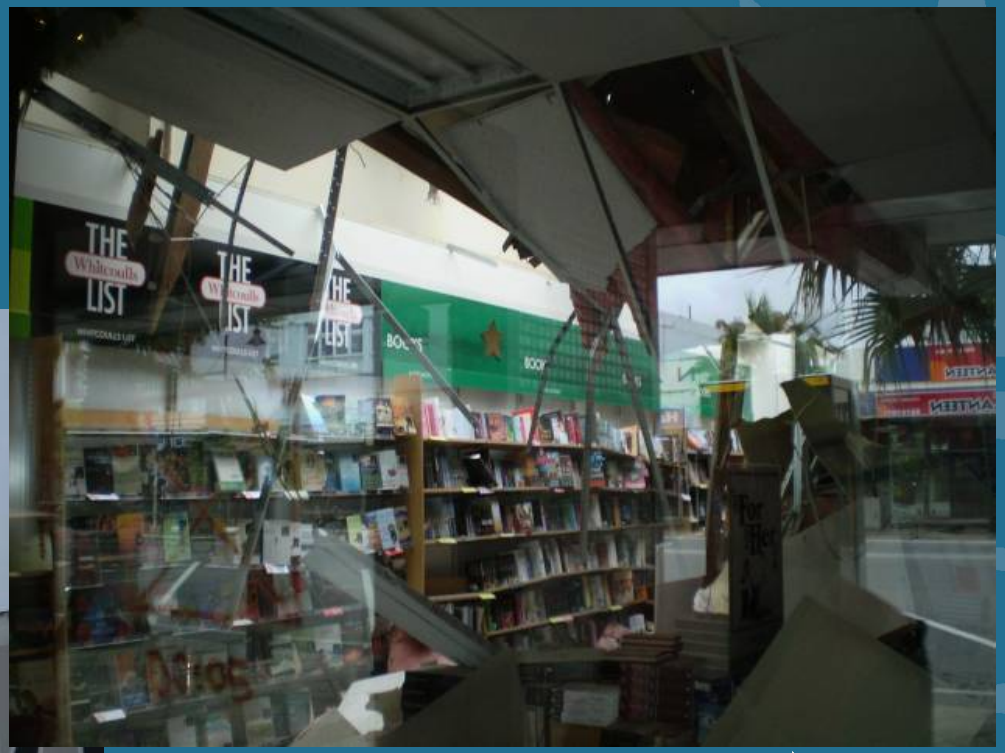


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# A Quick Look
# Earthquake Damage in Gisborne


# A Quick Look
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# A Quick Look
# Earthquake Damage in Gisborne


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# A Quick Look
# Earthquake Damage in Gisborne


# Earthquake Damage in Gisborne

Much of the damage was due to parapet collapse.

This either damaged the building the parapets were on or caused severe collateral damage to neighbouring buildings.

The lesson for us was to try and prevent this happening again, and in a short timeframe.

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# Earthquake Damage in Gisborne

Earthquake Prone Building Policies must be reviewed within 5 years of adoption and then every 5 years. The Act states “at intervals of not more than five years”.

The GDC had noted some anomalies in its policy and determined to review that policy in light of the learnt lessons.

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# Important Changes

The reinstatement of Interim Strengthening.

The damage caused by parapets was avoidable. Parapets are relatively easy to tie back and/or strengthen.

This work can usually be done without any business interruption.

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# Important Changes

The reinstatement of Interim Strengthening.

A new category of building has been inserted into our policy. This is:-

*Buildings built prior to 1976 with parapets – 2 years to strengthen. This building category is a subset of all other earthquake prone building categories.*

These buildings have all had EQP building notices that expire in February 2012.

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# Important Changes

Repairing Damaged Buildings

There is an anomaly in the Building Act. Buildings are dangerous if 'in the ordinary course of events (excluding earthquakes) …'.

Thus if a building is substantially weakened by an earthquake but not at risk under wind or gravity loads you cannot issue a dangerous building notice.

However this building may still be subject to damage in a very mild earthquake such as an aftershock.

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# Important Changes

## Repairing Damaged Buildings

We have added a clause to our policy which allows for the reclassification of an earthquake prone building after an event.

For example a building that may still have 15 years left before they must strengthen can have that time adjusted to a much shorter timeframe.

While it can be argued that the Act allows this a specific clause makes the change in timeframe easier.

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# Important Changes

Rural Churches

Rural churches have been given a separate building category. Many small churches are only used very sporadically (maybe one Sunday a month).

A full strengthening requirement would mean many would become disused and perhaps fall into disrepair.

Nevertheless these buildings are an important part of the historic fabric of the district.

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# Rural Churches

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# Important Changes

Rural Churches - 2

The policy states that churches will be dealt with on a case by case basis considering earthquake risk, occupancy, and historic and social importance.

The level of work required will be agreed between the BCA and the building owners.

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# Important Changes

Classifying Ground Conditions

The structural loading codes as defined in New Zealand Standard 1170 are dependent on the underlying ground conditions.

Buildings that are earthquake prone on Class D – Deep or Soft Soil sites, may not be on Class C soils, which are firmer.

We therefore classified the soils in the CBD as Class D Soils as per a GNS assessment unless proved otherwise.

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# Other Lessons

Defending your Policy

The two thirds current code requirement has caused a great deal of dissension, primarily from insurers.

We obtained a legal opinion on our policy, which stated it was defensible.

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# Lessons from the Canterbury Earthquakes

## Revising our policy - yet again

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# Lessons from the February 2011 Christchurch Earthquake

The February Christchurch earthquake destroyed a large number of URM buildings as well as causing the collapse of some ‘newer’ buildings and severe damage to others.

This earthquake was well over the ULS curve with peak ground accelerations approaching 2g.

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# Lessons from the February 2011 Christchurch Earthquake

The event has been given a return period of 2500 years. The ULS curve is based on a 500 year event.

The fact that there were not more building collapses is a testament to our building design and our regulatory environment.

Notwithstanding that comment there are building of similar construction to some of the newer damaged or collapsed buildings in Gisborne

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# Proposed Changes to our Policy

These buildings are currently classed as Category 6 buildings in our policy.

Cat 6 buildings are building built prior to 1976 but not URM or partial URM and with an importance level less than 3 as defined by NZS 1170.

They must have a notice served on the owners by December 2011 and then have 25 years to either prove they are not EQP or strengthen the building.

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# Proposed Changes to our Policy

Twenty five years is a long time given the frequency of > M6 earthquakes in our region.

A timeframe of 10 to 15 years was proposed for these buildings.

The Environment and Policy Committee approved 10 years in the consultation report.

The other problematic buildings are the ones strengthened to 50% or 66% of NZS 1900. This level may be as low as .06g.

Possible changes could be a reassessment with a similar timeframe.

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# Proposed Changes to our Policy

Heritage buildings. At the moment they have a special category in our policy that allows a longer time frame for strengthening than for other buildings of similar age and construction.

It was proposed that this is removed. All buildings of similar age and construction should have identical earthquake strengthening criteria.

A heritage brick will kill or injure just the same as any other brick!

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# Proposed Changes to our Policy

Changes to an Earthquake Prone Building Policy must go through the special consultative procedure as required by the Local Government Act.

Building owners, heritage professionals, structural engineers, and insurers were all expected to have some comment on these proposals.

All were specifically notified.

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# Summary

Earthquake strengthening has been subject to three separate Acts:-

The Local Government Act 1974 – a ‘suffer damage’ test and then 50% of NZS 1900 strengthening which could be in two parts.

The ’91 Building Act – a ‘catastrophic collapse’ test and then 50% of NZS 1900 strengthening – tempered by a change of use requirement that was more stringent.

The ’04 Act – 33% of NBS test – silent on required level of strengthening – up to each Council to set a level.

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# Summary

The event of December 2007 raised a number of issues in regard to building damage and strengthening.

We resolved to review our policy as soon as workload allowed.

Parapet damage had occurred in most of our older buildings, even the EQR ones that had been removed from the register in 1992.

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# Summary

The Christchurch event of February 2011 has raised more issues in regard to building damage and strengthening.

Christchurch had a passive approach to strengthening. The Government cannot afford another Christchurch so it is expected that there will be significant legislative changes.

However as this journey through time has shown, Governments can sometimes make strange decisions i.e. the back pedalling between the LGA and 91 Act.

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# Overall Rationale

The over arching principle of the earthquake prone building policy in Gisborne is:-

"Gisborne city has suffered M6 or greater earthquakes at an average time period of eighteen years since 1932, with the shortest time span being fourteen years and the longest twenty seven. The overall goal of this policy is to have a city resilient to this strength earthquake or higher before the occurrence of the next event.
While the occurrence of earthquakes is sporadic the closeness of the average and shortest time spans indicates that there is a probability that the city could experience another earthquake before 2025 (2007 + 18). It is therefore the intent of the Council, through the implementation of this policy, to have all buildings that are earthquake prone as defined by the Building Act 2004, strengthened by the end of 2022."

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# Main Policy Features

The policy revolves around an underpinning premise that a building is ‘potentially earthquake prone’. A building owner is required to either provide an IEP proving that it isn’t, or strengthen it.

Relatively frequent earthquakes have made the implementation of Gisborne’s Earthquake Prone Building Policy easier. Most people can remember two significant earthquakes.

The lack of response to policy changes from the building owners has been surprising, but is perhaps a refection of the point above.

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# Main Policy Features

Attempt 100% NBS – minimum of 67%.

All buildings in the central business district built prior to 1976 have been identified.

The policy makes no differentiation between single and multi floored buildings.

All buildings of the same importance level, regardless of use, are treated the same.

All unreinforced masonry and partial unreinforced masonry will be strengthened or demolished by 2018.

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# Main Policy Features

No special timeframes for heritage buildings.

Parapets have been identified on all central business district buildings. Notices have been served and the work is almost complete.

Timeframes have been shortened to ten years from service of notice.

Buildings strengthened to NZS1900 have been added to the policy as another building category with a ten year time frame.

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# Recommendations on possible changes to the Act.

Remove the passive option.

Stipulate the minimum level of strengthening.

Leave the TA timeframe discretion alone.

Change section 112 and 121 of the Building Act.

Don't take the Building Consent Authority out of the process for the building consent and inspection process for commercial buildings.

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# Lastly

**Strengthening works**. Some buildings with only rudimentary NZS 1900 strengthening escaped major damage in Gisborne. The buildings strengthened to two thirds NZS 4203 were essentially undamaged.

We weren't as prepared as we could be. There will be another earthquake in Gisborne, our policy changes should remove most of the risk from a moderate earthquake, and perhaps save lives in a more extreme event.

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# Thanks

The Gisborne District Council would like to thank the Royal Commission for the opportunity to present at these hearings.

The Council has been attempting to pass on the learning from their own experience with earthquake damage since 2007. It sincerely hopes that some of their experience, joined with the submissions from other Councils and structural engineering professionals results in changes to the Building Act that will clarify many of the issues that have been raised during these proceedings.

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