

Assessing and increasing the level of earthquake preparedness in Wellington homes

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ABSTRACT: This paper presents the methodology and findings of two earthquake preparedness pilot surveys conducted in parallel and compares their results with those from previous surveys.

The first survey, a door-to-door audit of 100 homes in Wellington City, ascertained the extent to which householders had seismically restrained tall furniture and other chattels. In the second and parallel survey, 50 homes located in the same suburbs as the door-to-door audit were telephoned. An adult occupant was questioned about what mitigation actions had been taken.

Results from the home audits indicate a very low incidence of household items being intentionally restrained to prevent earthquake damage, and that results from self-reported surveys are overly optimistic. Given householders apparent resistance to media prompting to improve preparedness, two alternative strategies to improve levels of household preparedness are suggested.

1 INTRODUCTION

Since July 2001 the Earthquake Commission (EQC) has stepped up its programme of encouraging householders to mitigate earthquake losses of chattels and damage to their houses. TV and newspaper advertising has impressed the phrase “Fix, Fasten, Forget” on many minds, but the question remains as to how many people have heeded the call and actually restrained items in their own homes.

Previous nationwide telephone surveys and feedback from parents involved in a Hawke’s Bay EQC school trial indicated reasonably high rates of householders restraining items. The results looked so positive that they raised a query about their reliability. Were respondents reporting accurately the earthquake damage mitigation steps they had undertaken? Were some people just assuming mitigation had taken place?

To test the veracity of the telephone survey results and the self-administered feedback via the school trial, EQC commissioned a survey based on actual inspections of homes. These ‘home audits’ comprised visits by researchers to a number of homes to carry out ‘quake safe checks’.

It was further decided that instead of relying on comparison between the results of the home audit and earlier surveys, a number of households in the same areas as the home audit should be surveyed by the ‘traditional’ telephone method as a better control. Due to the small sample sizes these surveys should be considered as pilot studies.

2 HOME AUDITS

2.1 Methodology

The door-to-door household audit involved visits by researchers to houses in areas selected to provide a spread of demographics. Twenty-five houses were visited in each of the following Wellington suburbs: Island Bay, Miramar, Karori, and Newlands. The researchers asked the householders if they would agree to a 'quake safe check' to (a) help EQC understand the incidence and nature of mitigation, and (b) provide householders with an assessment specific to their home.

To increase the public's participation in the survey we wrote to all those who might be surveyed to prepare them for a visit. The intent of the letter was to 'sell' to people the advantages of having their home surveyed, rather than offer a gift or a chance of winning a prize. Additionally, the letter, delivered by hand to all houses likely to be surveyed, was to forewarn and prepare people for a visit in the hope they would be more disposed to inviting the surveyors into their homes.

The next step was to design a survey cum checklist form that was easy to understand and use. It had to be comprehensive, yet clear and concise. During each survey a carbon copy was made so that the original could be left with the householder to provide additional motivation for them to begin or improve their level of earthquake preparedness.

At an early stage of the survey planning it was recognised that senior architectural students would be well suited to do the surveys. These students have a good understanding of earthquake design principles and the effects of earthquake shaking on buildings. So eventually the survey was undertaken by four male and four female students from the School of Architecture, Victoria University of Wellington. For the sake of ensuring personal safety and to improve the chances of them being invited into peoples' homes, each team consisted of a male and female student. Students received a brief training session which included discussion of all items on the purpose designed checklist/survey form, and familiarization with the EQC brochure "Easy Ways to Quake Safe Your Home". This publication was used as the benchmark to determine the extent to which items were restrained. Students were lent fluorescent yellow jerkins and nametags to wear that identified them clearly as being under the auspices of EQC.

Surveys began on Saturday 6th April 2002. Two weekends had been allowed to complete the survey given that we had little idea of what success rate of house entry the students would achieve. Our planning assumed that only one in ten householders would invite the students in. These figures proved to be very conservative as the final rates varied from one in two to one in four (Table 1). We believe the high success rate was due to numerous factors including:

- A very positive perception of EQC as an organisation,
- An awareness of the importance of the issues being surveyed,
- Prior preparation of the public for the visit, and
- A degree of respect commanded by the architectural training of the surveyors and their relationship to Victoria University of Wellington.

Table 1. House visit success rates

Research team no.	Houses entered	Refusals	No answer	Total houses visited
1	25	27	42	94
2	25	6	22	53
3	25	8	5	58
4	25	14	14	53

As well as completing the preparedness checklist/survey form for every house entered, students noted down general comments on their visit to provide a greater depth of feedback. All people who participated in the survey received a copy of “Easy Ways to Quake Safe Your Home”.

2.2 Survey results

2.2.1 House ownership

A concern that a home’s degree of preparedness might be influenced by whether it was owned or rented led to a question about home ownership. Table 2 indicates that 82% of those surveyed were living in their own houses.

Table 2. House ownership information

Suburb	Own home	Rental	% Own home	% Rental
Newlands	18	7	72	28
Karori	19	6	76	24
Miramar	22	3	88	12
Island bay	23	2	92	8

2.2.2 Extent of restraining activities

Table 3 reports results on full and partial restraints and full restraints for all suburbs. A full restraint is defined as one that is the same as, or at least as adequate as that suggested in “Easy Ways to Quake Safe Your Home” whereas a partial restraint is one whose adequacy is less than a full restraint but better than nothing.

In most cases both full and partial restraints had not been installed as per EQC recommendations. In most situations items were restrained more by historical accident than with the intention to prevent earthquake damage. Typical examples include cupboard doors with mechanical rather than magnetic or no latches. These restraints are due their former popularity in what seems a bygone age, rather than a determination to secure cupboard contents as a result of any media campaign raising earthquake risk awareness.

Another example worth mentioning is hot water cylinders. In only one or two cases were steel straps observed. The usual restraint comprised wooden blocking or shelves spaced up the height of the cylinder and fixed to side walls. The purpose of the shelves is primarily to dry clothing. Restraint, in most cases is probably accidental even though it may be effective. So, whereas Table 3 indicates that 24% of hot water cylinders are fully restrained, less than 2% of houses have ‘EQC endorsed’ restraint systems.

2.2.3 Variation of results between suburbs

Based on results for both full and partial restraints and full restraints, there is significant difference between the degree of preparedness of homes in different suburbs. Compared to Miramar and Newlands, preparedness in Karori and Island Bay is two and three and times better respectively.

However, due to the small sample size these findings can at the best be considered indicative. Additional work would be required to definitively indicate an expected relationship between earthquake preparedness and socio-economic factors.

Table 3. Summary for items in various rooms and degree of restraint for all areas

Room and Items		All suburbs			
Lounge/Family	No. houses	No. full and partial restraints	% full and partial restraints	No. full restraints	% full restraints
Tall furniture	73	9	12	6	8
TV	95	2	2	1	1
Stereo	59	3	5	2	3
Free-standing fire	15	3	20	2	13
Pictures and mirrors	78	32	41	5	6
Ornaments	78	6	8	1	1
Ornaments (stored)	30	2	7	0	0
Other	20	3	15	2	10
Kitchen					
Bench top appliances	87	6	7	5	6
Other appliances	66	11	17	7	11
Cupboard contents	87	22	25	14	16
Drawer contents	82	8	10	4	5
Ornaments	53	9	17	5	9
Other items	24	6	25	3	13
Hallways/Other Rooms					
Tall furniture	29	1	3	1	3
Other	40	5	13	2	5
Bedrooms					
Tall furniture	56	3	5	2	4
Other	42	4	10	3	7
Miscellaneous					
Hot water cylinder	80	24	30	19	24
Chimney	45	11	24	8	18

2.2.4 Comments on the restraint of specific items

Tall furniture

Some householders said they had not restrained these items because they didn't want to drill holes in walls and furniture.

TV and stereo

These items were often located quite low and so might not be badly damaged in the event of a moderate earthquake. In all cases full restraints describe built-in items, not designed or built-in specifically for seismic safety, but for interior design stylistic reasons.

Pictures and mirrors

Nail supported items were reported as being not restrained. Proper picture hooks were considered as partial restraints and closed hooks and screwed-on items were classed as fully restrained. Some people noted how difficult it was to try to close hooks behind pictures and mirrors due to a lack of working space. Special plastic closed hooks overcome this problem.

Ornaments

In a few cases adhesive putty and non-slip matting was observed. Shelf lips provided the most common example of partial restraint.

Hot water cylinders

As discussed previously, in only two cases were steel straps observed. Full restraint was usually achieved by wooden blocking or shelves for airing linen and clothing, spaced up the height of the cylinder.

Header tanks

The students reported that 14 householders said they had header tanks, and of those, 36% stated some form of restraint had been provided. In only one case did students observe a tank. Some householders were unaware of any header tank in their house. Because tanks were not observed, this item has been left off the summary tables.

2.2.5 General Comments

Students noted that a number of tenants commented that they didn't want to restrain items if it meant drilling holes into walls etc. and damaging surface finishes. It would be interesting to investigate typical rental agreement forms to see if there is any legal basis for this concern. It seems unfair if landlords can prevent or even discourage tenants from installing specific and modest restraint systems, providing the work is done carefully and is removable.

In general the students were well received by householders. Some people said how they were expecting to be visited. This suggests that EQC's public profile is positive. Most people were genuinely interested in the survey, and when made aware of the consequences of unrestrained items, particularly those that could injure family members, were concerned. They then often sought more information from the students, and said how they intended to do some restraining. In a few cases people stated that they hadn't bothered restraining because their objects were insured.

3 PARALLEL TELEPHONE SURVEY

3.1 Methodology

The Wellington phone book's alphabetic listings for Wellington City were divided into 50 sections. Telephone interviewers started at the top of the left hand column of each page and read down until they encountered a residential address in one of the surveyed suburbs. They placed a call to this number and asked if an adult was available and, if so, whether that person was willing to participate in a short survey. An offer was also made to put them in a draw with a 1 in 5 chance of winning a \$25 voucher as some compensation for their time.

The questionnaire used was designed to model the existing EQC telephone tracking research, thus allowing inferences to be drawn between the door-to-door home audit of actual earthquake mitigation measures, the telephone responses from people in homes close by, and the regular telephone tracking research.

3.2 Survey results

The parallel phone survey rows of Table 4 show responses of people whose homes have the listed items for which earthquake mitigation preparations could have been made. Each respondent was asked first to tell the interviewer what items had been ‘quake safed’, and were then read a list of items and asked to say whether or not each had been protected. As expected, there was a large difference between unprompted and prompted responses, with people seemingly ‘reminded’ of what they had done.

A high percentage of respondents indicated, unprompted, that they had secured header tanks, tall furniture and hot water cylinders. The latter two have been main items featured in recent EQC promotions. Affirmative prompted responses are significantly higher than unprompted responses.

3.3 Comments

Comparison of the self-reported data with the actual data from the home audits indicates that telephone respondents (and parents asked to complete checklists as part of the Hawke’s Bay School Trial) greatly overestimate, are confused about, or both, the extent to which mitigation activities have been completed. It is likely that the true situation is a combination of these factors. Anecdotal evidence for this was gained from a post-survey focus group session with the students carrying out the home audits. There was some comment that people had been interested in mitigation but were unsure about what constituted proper restraint. However, it is unlikely that this would account for the many large discrepancies, particularly with simple concepts such as securing tall furniture, as Table 4 shows. This comparison uses full rather than full and partial restraint figures from the home audit as it is likely that specifically installed restraints would be full, and is based on the total sample in each case.

Table 4. Comparative results for selected items over four surveys (total samples)

Survey	Tall Furniture	Pictures & mirrors	Ornaments	Hot water cylinder
Home audit (full restraints)	6%	5%	1%	19%
Parallel phone survey (unprompted)	22%	6%	8%	16%
Parallel phone survey (total)	32%	38%	22%	40%
Neilsens phone survey (unprompted)	20%	6%	11%	9%
Neilsens phone survey (total)	38%	57%	34%	47%
Hawke’s Bay trial	35%	64%	23%	53%

There is in most cases a large jump in the results after prompting, with the greatest being for pictures and mirrors (6 to 38% in the parallel survey, and 6 to 57% in an earlier Neilsens survey). This indicates that people have forgotten what measures have been taken or what items they have that need to be restrained or, more likely, a form of cognitive dissonance where the researcher is told what the respondent thinks the researcher wants to hear (a sort of fear of being seen as a ‘bad citizen’).

It is particularly interesting to compare the telephone survey results (generally remarkably consistent between both the parallel and Neilsens surveys) with the Hawke’s Bay trial results. The latter asked parents or caregivers to complete a printed form, and this was done after students had talked about and studied at school mitigation measures householders could take. Even with illustrations and instructions to show how to carry out these tasks, parents appear to have grossly overstated the measures taken. It must be noted, however, that no home audit has been made in Hawke’s Bay so the possibility (however unlikely) exists that these figures represent the true state of affairs. However, in most cases the answers given are not significantly higher than those given by Wellington people during over the telephone after prompting.

Comparisons between three survey data sets (home audit, unprompted and prompted parallel telephone survey and Hawke’s Bay) are shown in Table 5. It is surprising to note that the actual

incidence of hot water cylinder and picture/mirror mitigation is higher than many people suspect. However, as mentioned earlier, discussion with the students carrying out the home audits indicates that in almost all cases this was by accident rather than design (hot water cylinders in tight fitting cupboards with fixed shelves tight against them, for example).

In general, the data collected through schools is slightly more inflated than self-reported telephone data, despite the householder having access to printed booklets and instruction sheets showing what properly mitigated items look like (the *How to Shake Safe Your Home* booklet was given to each child to take home).

The Wellington parallel survey data and much larger sample Neilsens results are significantly similar. This indicates that respondents to the Neilsens tracking surveys are over-estimating, misunderstanding, or confused about their level of mitigation by a similar factor to that determined in the Wellington surveys. More work is required to be able to calculate with reasonable certainty what the multiplication factors for each item might be. Table 5 allows direct comparison between all data sets in all four surveys.

Table 5. Degree of preparedness for different items according to various survey results (total samples and where total = prompted + unprompted)

Items	Audit	Parallel (Unp)	Parallel (Pr)	Parallel (Tot)	Neilsen's (Unp)	Neilsen's (Pr)	Neilsen's (Tot)	Hawke's Bay
Tall furniture	6%	26%	12%	37%	20%	18%	38%	35%
Chimney	8%	5%	33%	38%	4%	18%	22%	n/a
Fireplace	2%	8%	24%	32%	n/a	n/a	n/a	n/a
Cylinder	19%	17%	26%	43%	9%	38%	47%	53%
TV	1%	6%	20%	26%	2%	10%	12%	n/a
Stereo	2%	4%	16%	20%	2%	10%	12%	n/a
Ornaments	1%	8%	14%	22%	11%	23%	34%	23%
Pictures	5%	6%	32%	38%	6%	51%	57%	64%
Cabinet doors	14%	4%	29%	33%	1%	19%	20%	31%
Appliances	86%	2%	24%	27%	n/a	n/a	n/a	33%

4 DISCUSSION

Results of the home audit survey suggest that media campaigns that have even included mass distribution of mitigation ideas and methods have not been successful in achieving a significant level of household mitigation, even though they may have raised levels of risk awareness.

Ironically, earthquake insurance itself is a factor encouraging inaction. Incentives for much of the recommended mitigation seem to be insufficiently attractive. It is therefore time to consider alternative strategies. Two ideas are noted below for further investigation and development:

- The fact that the survey teams were so well received suggests extending the idea of door-to-door assessment to include selling restraint hardware suited for the particular items and layout of the home being visited. Another service offered could include arranging for someone else to undertake restraining at another time. A quotation for this work, the cost to be borne by the householder, could be given.

The success of this approach would be enhanced greatly if EQC offered a full refund of any restraining costs paid to such EQC approved assessors and tradespeople. Although an immediate refund, perhaps deducted from the annual EQC insurance premium would be the most attractive option, another approach could be to refund restraining costs at the next EQC

earthquake damage claim.

- Given that some people do not like drilling holes into furniture etc when restraining, another approach is for EQC to work with appliance and furniture manufacturers so that restraint fixings or features are included at the design stage. For example, as far as kitchen furniture is concerned, shelves would come with lips built-in, and all cupboard doors and some drawers would have mechanical latches. Free-standing furniture would come with fixing devices already incorporated, or else included with the item together with a set of installation instructions. A similar approach could be adopted for appliances; supplied restraint devices would be attached to specially designed lugs.

EQC would have to meet with relevant industries to promote this idea. A professional design competition may be one way to launch this initiative. Manufactured goods could be given an 'EQC tick of approval' in order to increase manufacturers' buy-in.

5 CONCLUSIONS

5.1 General

The small sample of the home audit survey means that its results should not be extrapolated across the whole of the Wellington area. However, given the close correlation between the results of the parallel telephone survey and the much larger (20 times bigger sample size) Neilsens, it is very probable that these results are significant. Home audit results indicate that:

- Approximately 80% to 90% of household items are not restrained.
- Many mitigation actions are carried out by default (chimney repairs or replacement with flues have led to their being safe, shelves in hot water cylinder cupboards have prevented movement in at least one plane [note: in depth examination of many cylinders was not possible to ensure that movement in all planes was minimised], and some appliances, particularly TVs and stereos, are in built-in units [note: again, restraint in all planes was not able to be properly determined in many cases]).
- Little restraint activity has been undertaken at all, and most restraints are more accidental than intentional. Alternative methods to increase mitigation actions, such as those discussed above, need further exploration.

5.2 Self-reported survey reliability

- Self-reported incidences of mitigation actions are likely to be tainted by misunderstanding or lack of knowledge of what an effective action is, misreporting, or both. If the latter is true, it could indicate that there is a general feeling that earthquake mitigation measures are important as there seems to be some guilt attached to not having done these tasks.
- Unprompted answers are more likely to be closer to the truth than prompted (action leads to memory).

6 RECOMMENDATIONS

- Further research is required to determine whether these results apply outside Wellington and to determine more accurate multiplication factors for use in estimating actual levels of mitigation from self-reported survey data.
- Professional examination of accidental mitigation actions should be undertaken to test their effectiveness, and determine if they could become accepted alternative methods of mitigation in households.
- To increase mitigation activity alternative approaches should be considered.

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