

# Canterbury Earthquake Recovery Authority

Private Bag 4999  
Christchurch 8140

03 354 2600  
0800 RING CERA



## Building Review and Occupancy Considerations

### 1. Background

The Canterbury Earthquakes have caused significant damage to buildings in the CBD and beyond. Most, but not all, of the non-residential buildings in the city were subject to Level 1 and Level 2 Rapid Safety Evaluations, but these are visual only and are only intended as basic triage ahead of a detailed evaluation. It is conceivable or even probable that some buildings that are otherwise apparently in reasonable condition, may harbour hidden damage of a form that significantly weakens them against future earthquake damage.

Given the current increased likelihood of earthquakes in Canterbury, this represents a significant hazard to building users. With high public concern over building safety, providing a measure of reassurance to the public is a significant part of the recovery process. Although absolute safety can never be guaranteed, a consistent and thorough process will at least provide some level of assurance.

The CER Act (2011) (S29 and S51) enables the Chief Executive of CERA to request 'structural survey' or at least to obtain copies of existing building reports. It is assumed that the intention of this was to provide a means of ensuring that building owners take steps to verify a reasonable level of building safety by completing an appropriate level of review, beyond the L1/L2 reviews.

Initial letters have been sent out under S29/S51 to the building owners affected by the Restart project in Cashel Street. A programme for the future roll-out of the report requests needs to be confirmed, along with appropriate communication and stakeholder engagement.

A further consideration is the action to be taken on receipt and review of the reports. All Building Consenting activities are administered by the CCC, but the review of the Detailed Engineering Evaluations is to be completed by CERA engineers. The purpose of the review is:

1. To establish that a suitable process has been followed that will identify if there is hidden damage or critical structural weaknesses in a building, and;
2. That buildings are not being occupied where it is inappropriate to do so.

Once the review is complete, both owners and the CCC will be formally advised that CERA has accepted the reviews. Reports will be forwarded to the CCC for their building records.

## 2. Review Process

The Detailed Engineering Evaluations will be required generally to follow the procedure outlined in the Engineering Advisory Group Detailed Engineering Evaluation Procedure, Part 2 (DEEP). This document is currently available to be downloaded from the Structural Engineering Society (SESOC) website at [www.sesoc.org.nz](http://www.sesoc.org.nz). Reports are to be prepared by the building owners' consulting engineers and should be completed by, or under the supervision of, a Chartered Professional Engineer (CPEng) (structural).

In addition to the DEEP, the SESOC website also has a Standardised Report Form (SRF). This is a spreadsheet which collects data in a format that can be readily interrogated and added to a database being collated by the CCC. The form also contains a building capacity estimator using the NZ Earthquake Engineering Society (NZSEE) Initial Evaluation Procedure (IEP). The IEP process was developed for identifying potential Earthquake Prone Buildings (EPBs), and may be sufficient for the purposes of evaluating many buildings, particularly low-risk and/or undamaged smaller structures.

Reports may be requested by the Chief Executive under S29 or S51 as appropriate (occupied or unoccupied respectively). Standard letters have been prepared requesting the reports, and have so far been sent to a limited number of owners in the Restart vicinity. This reporting programme now needs to be extended further. A prioritisation of reporting is required so that the most critical sites are considered as soon as possible.

The question of how many buildings must be reviewed needs addressing also. Although it could be argued that smaller buildings are of no major concern, the fact remains that with the exception of the CTV and PGC buildings, most of the collapses causing serious injury and death were of low-rise construction. Also that, by definition, the extent or severity of hidden damage cannot be known. Therefore unless there is a requirement for buildings to be checked, the damage will not be found before a potentially damaging earthquake.

Conversely, residential buildings in individual ownership are likely to be thoroughly inspected by the owners and their advisers or insurers. These buildings therefore do not need to be reviewed through this process. The most convenient definition for those buildings that should be reviewed is probably that used for the EPB legislation, i.e. excluding only residential structures unless the building comprises two or more stories and contains 3 or more household units. This is broadly all non-residential structures, extended to include apartment buildings.

An alternative relaxation of this would be to exclude smaller buildings provided that they are of relatively recent construction, for example, post-1965. This approach may however still leave some potentially dangerous buildings unreviewed. A better solution may be to consider reducing the level of review and reporting for lower risk buildings – refer the next section.

**Recommendation:** All buildings shall be reviewed except residential structures unless of two or more stories and containing three or more household units.

### 3. Prioritisation

Matters to be considered in the prioritisation are:

1. Usage. The NZ Loadings Standard (AS/NZS1170) divides buildings into importance levels according to usage. For example, emergency facilities fall into the highest general category, IL4. Buildings containing large numbers of occupants, or high value occupancies such as schools are in the next category, IL3. All other general use buildings that are occupied in any way are IL2. Due to some discrepancies in the identification process, it is recommended that all school buildings and shopping centres of significant size are added to IL3 for the purposes of the review process.
2. The degree of known damage. Buildings that have been given Red or Yellow placards have at least some measure of damage, indicating that there is a high likelihood of further hidden damage. It is therefore prudent to complete a full review prior to undertaking repair work.
3. Age is a significant factor in determining risk. Although it is not always the case, it is generally accepted that more recently designed buildings should perform better in earthquake, as they have been subject to specific earthquake design requirements.
4. Size. Although this may have little bearing on the design processes followed, the larger the building, the more people that are at risk in the event of poor performance.
5. The level of reporting should be specific to the nature of the risk. Requiring a greater level of investigation than is warranted by the nature of the risk could incur unnecessary expense to owners. For lower risk buildings a simple summary report of the form provided in the SRF only.

A recommended reporting prioritisation is appended to this paper. Note that the reporting dates provided are a recommended latest date only. Many owners may find that an earlier date will be to their advantage, for example if they are applying for a Building Consent for alterations, in which case the CCC may request confirmation that the reports have been provided.

**Recommendation:** A proposed sequence of report submission dates is appended in Appendix A below. This needs to be communicated to owners via letters, but should also be communicated more widely through an advertising campaign.

### 4. Occupancy

The question of which buildings to occupy requires careful consideration in light of both the recovery process and the need to determine an acceptable level of risk. While the recovery process should otherwise encourage early occupation and restoration of normal business, the risk of further damaging earthquakes raise the question of what level of risk may be accepted.

The Canterbury Earthquake Building Orders, 2010,2011 (OIC) broadened the definition of Dangerous Buildings to include what had previously been identified as Earthquake Prone Buildings. Although this is understood to have been intended to facilitate the demolition

process, it has implications for occupancy. Owners and their advisers may have increased liability in the event of building failure, should they have allowed the occupation of Dangerous Buildings.

This contradicts the CCC Earthquake Prone Building Policy, under which most buildings currently have up to 30 years to upgrade their buildings. There is no requirement to vacate such buildings in the interim.

Therefore, the question is whether buildings should be vacated if they are considered to be Dangerous Buildings, as defined by the OIC. Given the potential liability as noted above, there is a clear issue for owners and advisers. However if all buildings were to be vacated simply because they were earthquake prone, it would be counter-productive for the recovery. Moreover, this problem exists all over the country, although the OIC is only effective in Canterbury.

A possible line of delineation between dangerous and simply earthquake prone may be the level of damage suffered. In the event of buildings being earthquake prone and having suffered significant damage, it is reasonable to assume that further damage could result from shaking of moderate intensity. However, if a building has been subject to intense shaking and has not suffered significant damage, even if considered earthquake prone, it clearly has reserves of strength that may limit future damage.

It is however entirely conceivable, if not commonplace, that EPBs have been through the earthquakes without significant damage, particularly where the buildings are beyond the 12-15km radius from the epicentre of the major earthquakes, where the damage levels have typically dropped off. However, given that this area (typically west of the CBD) is typically on better ground, it is less damage prone in general. Hence although there are no guarantees that such buildings will not be damaged in future earthquakes, there may be a reasonable level of risk, given the alternative of vacating otherwise undamaged buildings.

It is recommended therefore that the level of existing damage be taken into account when determining a policy for occupation.

A pragmatic approach would be to allow occupancy of damaged buildings only if the inhabited portion of the building can be demonstrated to have capacity in excess of 33%NBS, and not be threatened by any unoccupied portions of the building. Interim repairs may be used to accomplish this, provided that the building will be required in time to comply in full with the CCC EPB policy as if it were still earthquake prone.

A proposed repair and strengthening strategy is appended in Appendix B, that has been discussed with the CCC. The assessment of 'low' or 'high' damage for the purposes of this strategy is in accordance with the DEEP.

**Recommendation:** Buildings that have been damaged may be occupied only if they have capacity in excess of 33%NBS. Partial occupancy may be acceptable, if the occupied portion is not threatened by the remainder of the building. Notwithstanding that interim occupancy has been allowed, the building will still in time need to comply with the CCC EPB policy.

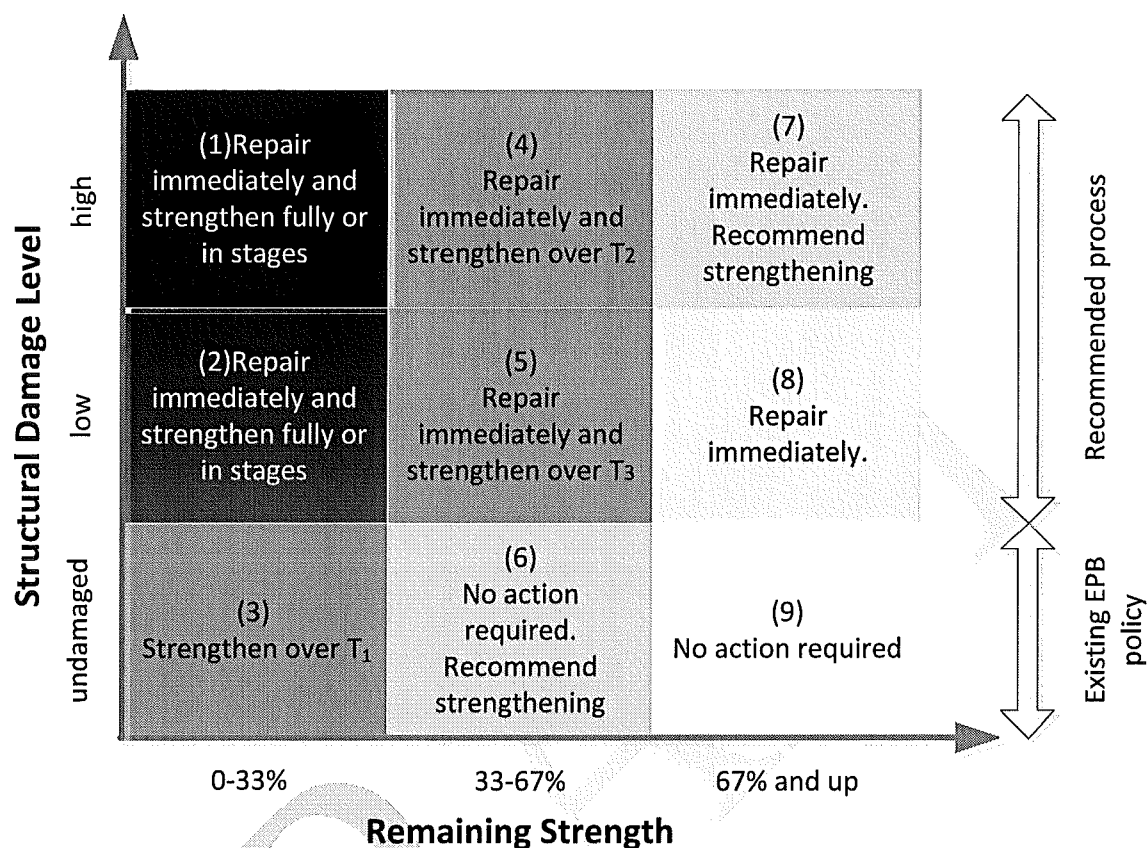
## Appendix A - Recommended Building Assessment Schedule

BUILDING IMPORTANCE CLASSIFICATION (TO AS/NZS1170) (4)	PLACARD STATUS (1)	AGE	NO OF STOREYS (2)	TYPE OF ASSESSMENT (5)	LATEST DATE FOR ASSESSMENT TO BE LODGED (3)
IL 4	All placards	All		DEEP	31 January, 2012
IL3 Plus shopping malls >10,000m <sup>2</sup> total floor area including parking Plus schools	All placards	All		DEEP	31 January, 2012
Remaining IL2 buildings	Red Placard	All		DEEP	31 January, 2012
	Yellow Placard	All		DEEP	31 January, 2012
	Green Placard	Pre 1965	1	SRF/IEP	June 30, 2012
			2 or more	DEEP	June 30, 2012
		1965 to 1976	2	SRF/IEP	June 30, 2014
			3 or more	DEEP	June 30, 2013
		Post 1976	2	SRF/IEP	June 30, 2016
			3 or more	DEEP	June 30, 2013

Notes:

1. Placard status should be reviewed and changed if necessary prior to assessment.
2. Note that two storeys may include mezzanines, if they exist.
3. Or sooner if required by CERA.
4. For IL3 or 4 buildings, reducing the importance level of the building may allow greater timeframes, subject to change of use criteria being met.
5. DEEP is a full report in general compliance with the Detailed Engineering Evaluation Procedures, available at [www.sesoc.org.nz](http://www.sesoc.org.nz). SRF/IEP is the Standardised Report Form with an Initial Evaluation Procedure. This is also available at [www.sesoc.org.nz](http://www.sesoc.org.nz). A DEEP should include the SRF/IEP report format.

## Appendix B - Proposed Timeframes for Repair and Strengthening



### Notes to Figure:

- 1,2: Depending on the nature of the damage, it may be possible to repair and strengthen isolated damaged elements immediately (to 67% minimum) in order to increase the capacity of the building to >33%NBS. This will allow interim occupation, subject to agreement with the BCA.
- 3: Times for strengthening (T<sub>1</sub>) are to be determined in accordance with the BCA EPB policy.
- 4: A building with high levels of damage throughout is unlikely to be able to be partially repaired in order to facilitate interim occupancy. A period for strengthening, (T<sub>2</sub>) is to be agreed with the BCA.
- 5: A building with low levels of damage may be repaired in order to allow interim occupancy, with agreement of the BCA. Timeframe T<sub>3</sub> may vary according to whether the building has had structural work performed in order to achieve interim occupancy.
- 6: Although strengthening is not required under existing EPB policies, these buildings are still considered earthquake risk buildings, and owners are advised to consider strengthening.
- 7,8: Although buildings with capacity >66%NBS are not considered to be earthquake risk buildings, the level of damage may be considered indicative of the overall performance of the building. This should be considered when determining a long-term strategy for the building.
- 9: No action required, although further upgrading may be achievable if desired.

Recommended timeframes are a matter of TA policy. At this time in Christchurch, only policies for earthquake prone buildings have been determined, according to building occupancy, as per Table 1: Time limits for strengthening to CCC EPB policy below. Suggestions are included in the table for revised timeframes. Note that for the purposes of

this table, the building occupancy categories are from the EPB policy, and are slightly different to the building occupancy classifications from NZS1170. It is however recommended to simplify this by using the standard AS/NZS1170 Importance Level classifications.

Table 1: Time limits for strengthening to CCC EPB policy

Times (years)	Building Occupancy Category		
	IL4	IL3+	IL2
Existing policy	15	20	30
T <sub>1</sub>	2	4	8
T <sub>2</sub>	2	4	8
T <sub>3</sub>	2	4	8

Note: Figures in brackets are recommendations only. Note that IL4 buildings include post-disaster facilities which should be strengthened as nearly as is practicable to 100%NBS

DRAFT