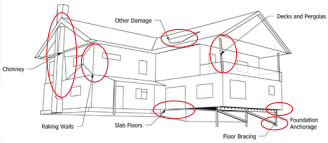
FIELD GUIDE:

RAPID POST DISASTER

BUILDING USABILITY ASSESSMENT – EARTHQUAKES



Ministry of Business, Innovation and Employment (MBIE) – Hīkina Whakatutukī

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This guide replaces the document 'Building Safety Evaluation During a State of Emergency', published by the New Zealand Society for Earthquake Engineering (NZSEE) in August 2009. The experiences from the 2007 Gisborne earthquake, 2009 Padang earthquake, and 2010-2011 Canterbury earthquake sequence have also greatly assisted in updating this document.

Contributors:

- Mike Stannard
- Bruce Galloway
- Dave Brunsdon
- Peter Wood
- Graeme Beattie
- Steve McCarthy
- Richard Toner
- Ann Clark
- Jennifer Nolan
- Albrecht Stoecklein

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2 PREFACE

This Field Guide has been produced to assist building control officials, engineers, architects, property managers and other building professionals to carry out Rapid Building Assessments during a State of Emergency or transition period. At the discretion of a territorial authority (TA), the Field Guide may be used outside a State of Emergency.

This Field Guide is one of a suite of documents developed to promote a nationally consistent approach to rapid building assessments after the recommendations of the Canterbury Earthquakes Royal Commission.

This Field Guide may be downloaded from www.building.govt.nz/post-disaster-building-management.

Generic forms and placards may also be downloaded from these websites.

3 INTRODUCTION AND SCOPE

The objective of the rapid building assessment is to quickly establish the usability of buildings and associated infrastructure where functions may be compromised by a hazard event. Hazard events include earthquake, flood, landslide, rock-fall, volcanic eruption, storm surge, tsunami, explosion, or other event with life safety, residential or business consequences.

The scope of these guidelines covers the rapid assessment of buildings to be carried out during a State of Emergency or transition period declared under the Civil Defence Emergency Act 2002.

The focus of this document is from when the initial impact assessment is completed until the emergency declaration is lifted.

The focus of the rapid building assessment process is on immediate public safety, not the provision of an engineering assessment service to building owners. Quantified assessment of building damage is necessary to determine reconstruction programmes and resource requirements for repair, and to assess how long recovery may take. Such detailed assessment is outside the scope of this document.

4 FIELD SAFETY

4.1 General

After an event that causes widespread damage, many buildings may be dangerous from potential collapse, falling debris, damaged services, unsanitary conditions and other hazards. Rapid building assessment is inherently a dangerous activity. Therefore identifying and mitigating risk is important.

Building assessors must at all times be conscious of their own safety and the safety of their team members. Assessors should be briefed on health and safety issues before starting each shift.

Correct personal protective equipment (PPE) and identification must be used at all times. At a minimum, PPE should comprise a hard hat, high visibility vest, steel-capped boots and a cellphone (or other means of communication). We also highly recommend that assessors carry a torch, safety glasses, dust mask, gloves and bottled water.

In addition to the physical health risks, assessors may also have to deal with distressed home owners and occupants who may be in a bad state, which will add additional mental stress for the assessor.

Assessors should always work in teams, and their movements should be tracked for safety reasons. Each assessment team ideally consists of two technical field staff and a person to interact with the occupants (this may be a non-technical person). For assessing large commercial buildings, a CPEng registered engineer must be a member of the technical staff.

Be sure to recognise when you have reached your own limits. Take care of yourself. Eat well, take regular rests and try to get a good sleep. Watch out for signs of fatigue such as headaches, loss of concentration and focus, increased irritability and similar symptoms of stress. Get extra support when things become overwhelming. You may be able to release your emotions and tension by talking to someone you trust. This can help put things into perspective.

Remember that external help may also be available through the Red Cross, Salvation Army or a Ministry of Social Development representative. Don't wait for a situation to deteriorate. Ask for help early. This will help you and your colleagues, and will lead to a more successful completion of this work. For additional tips on how to effectively work in teams, refer to Section "Working in a Team" on page 83.

Building assessors may be employees of the TA, seconded from other TAs and in the case of engineers and architects contracted to the TA leading the declared State of Emergency. The Controller, on behalf of the TA, is responsible for ensuring that appropriate health and safety steps are being taken in an inherently dangerous situation.

4.2 Field safety tips

In the field, be alert to hazards from the building(s) being assessed, from neighbouring buildings, and from the surrounding environment.

Avoid these situations:

- travelling next to buildings or under canopies – if roads are closed to public traffic, consider travelling down the centre of the road.
- areas where a hazardous substance may be present, or a leak may be possible and cordon the area. Shut off the source, if you can do so safely. If you smell gas, shut off the gas if possible and cordon the area.
- downed power lines and any buildings in contact with them.
- contamination from biohazards such as sewage.

Follow this safety advice:

- **look up** as well as ahead. Be alert to falling debris from buildings or hills.
- evacuate the area if fire breaks out.
- be careful after earthquakes/aftershocks – if you are outside, move away from buildings or other falling hazards. If you are inside, do not run out of the building until the shaking has stopped.
- ensure that you and other team members receive appropriate food and water, eat regularly and take a rest period.

For basic first aid procedures, refer to Section 16 "Simple first aid procedures" on page 88 at the end of this booklet.

4.3 Entry into damaged buildings

Decide whether to enter a damaged building based on the damage you can see, and the risk of further damaging events like aftershocks. Consider USAR markings when you are deciding whether to enter.

Always survey the building exterior completely first if you have to enter the building. Do not enter obviously unsafe buildings. Refer to Section 6.1 "Residential Rapid Assessment" on page 40 and Section 7.1 "Level 1 process" on page 48 for guidance on assessing the risk of a building from the exterior. Section 10 "Assessing Specific Building Types" on page 63 provides guidance on typical areas of structural risk in different construction types. Be familiar with these areas of risk and use your judgement to decide whether it is safe to approach or enter damaged buildings.

When you are entering a building:

- Designate a safety person (if you work in a team of three) to remain outside the building to raise the alarm if necessary.
- Maintain at least one clear exit at all times. If necessary, wedge doors open and establish an exit path clear of debris.
- Treat all services as live, taking care to avoid contact with any exposed wiring.
- Assume that any water encountered may be contaminated by sewerage.
- Wear a safety mask — older buildings may contain asbestos.
- Watch out for tripping hazards.
- Use a torch to illuminate working areas.
- Follow this advice if a large aftershock occurs
  - inside the building, seek shelter under a desk, in a doorway, or beside a wall away from windows ('drop, cover and hold'). Do not exit the building until the shaking has stopped.
  - outside the building, move away from the building towards an open space and away from other buildings or elevated hazards.

For rules about entering buildings that have already been assessed, refer to Section 5.4.6 "Rules about who can access placarded buildings" on page 34.

4.4 Urban Search and Rescue (USAR) markings

Collapsed or partly collapsed buildings may already have been marked by Urban Search and Rescue (USAR) teams. The marking would usually be located on the exterior of the collapsed structure near the point of entry that offers the best visibility. Consider these markings when deciding whether it is safe to enter a building.

USAR markings are always orange spray paint. The marking consists of a 1 x 1 meter square box with the following details:

Inside the box:

- "Go" or "G" if deemed safe to enter; "No Go" or "NG" if it is deemed unsafe to enter
- Team identification
- Date and time start
- Date and time finish.

Outside the box:

- Hazard information (top)
- Missing persons (bottom)
- Live victims rescued (left)
- Dead victims extricated (right).

When the USAR team has completed work on the structure to its capacity, a circle is drawn around the entire marking.

After all work on the structure is completed and it is confirmed there are no more victims, a horizontal line is drawn through the entire marking.

An example of a USAR marking is shown below:

Figure 1: USAR marking

5 BUILDING ASSESSMENT OVERVIEW

5.1 Assessment and evaluation types

A variety of assessments and evaluations are required after an event severe enough to warrant a State of Emergency being declared. Overall impact assessment immediately after an event and the rapid building assessments would be carried out by territorial authorities immediately after declaration of a State of Emergency. Interim use and detailed damage evaluations would be carried out by private owners as part of the longer term recovery.

The assessment and evaluation types are summarised in Table 1:

Table 1: Building assessment and evaluation types

Assessment Type	Implementation	Objective	Description
Rapid Impact Assessment	Undertaken within hours of the event by emergency services and the territorial authority.	To understand the overall impact and extent of affected areas. Leads to a decision on whether to declare a State of Emergency or notify a transition period.	Brief drive-by or aerial assessment of overall damage to areas. Emphasis on identifying extent of damage, priorities for rescue, areas of high impact and resources required. No formal records kept.
Rapid Building Assessment	Carried out during a declared State of Emergency or transition period by mostly volunteer engineers and building officials acting under the authority of the Civil Defence Controller.	To quickly assess the impact of damage observed on the continued use of a building or adjacent property. The emphasis is on public safety.	Brief visual assessments of damage to individual buildings with formal records. Level 1 Assessments involve external inspection only, taking around 20 minutes each. Level 2 Assessments involve both external and internal inspection, taking from 30 minutes to 2 hours each. A Residential Assessment is used for simple residential buildings. Refer to Section 5.3.3 "Rapid assessment types" on page 23 for a detailed description of the each Rapid Assessment type.

Assessment Type	Implementation	Objective	Description
Interim Use Evaluation (IUE)	Conducted either during or after a declared State of Emergency or transition period by engineers contracted by building owners or tenants. (Unlike the Rapid Building Assessment the IUE outcome does not have a legal status.)	To quickly assess the impact of damage observed on the continued use of a building or adjacent property. The emphasis is on public safety.	Essentially similar to a Level 2 Assessment, but the evaluator identifies and observes the vertical and lateral load-resisting systems. Refer to the former Department of Building and Housing's "Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch".
Detailed Damage Evaluation (DDE)	Conducted as part of the recovery phase by engineers contracted by building owners. (Unlike the Rapid Building Assessment the DDE outcome does not have a legal status.)	To determine the full scope of repairs and rebuilds, and resource requirements. Provides confidence in the remaining building stock to assist the recovery.	• Detailed review of existing documentation • Evaluation of capacity • Identification of weaknesses • Observation of damage • Specification of repairs and/or strengthening required.

This Field Guide covers Residential and Level 1 and Level 2 Rapid Building Assessments.

5.2 Your rights and responsibilities

The process of rapid building assessments is led by territorial authority building control, under the direction of the Civil Defence Emergency Management Controller (Local or Group Controller).

The general expectation is that volunteering professional inspection personnel will offer their services for up to three days. If their services are required beyond this period, a contract for service with agreed payment terms should be entered into.

Before undertaking any building assessments, you must be authorised by the Controller. After attending rapid building assessment training you will be on the register of authorised assessors. For each event there will be a Memorandum of Understanding for engineers and architects (see sample Memorandum of Understanding on page 92). Building officials will be employees of the TA or seconded. On the day of the event a short registration process, such as signing in on a list of assessors, will ensure that you are authorised to undertake Rapid Building Assessments for this particular event. This protects your liability exposure.

5.2.1 Civil Defence Emergency Management Act 2002

During a declared emergency, the Civil Defence Emergency Management Act 2002 (CDEM Act) and the associated regulation, the CDEM Plan, provide for TAs to issue and control the use of signs. Examples are building assessment notices such as placards, to secure or make safe dangerous structures, to require the evacuation of any premises or place (including public places) and to prohibit or restrict public access to roads and public places.

The CDEM Act provides protection from liability for any act or omission of the Crown, CDEM Groups (including officers, employees or members of those groups), or other persons, except in cases of bad faith or gross negligence.

5.2.2 Building Act 2004

In case no State of Emergency is declared, the Building Act 2004 allows authorised officers of a TA to enter premises to determine whether a building is dangerous, earthquake-prone, or insanitary. Building owners, occupiers, or persons engaged in building work on the premises must give "all reasonable assistance" to allow an authorised officer to make such inspections. Residential occupiers need to give

permission for entry to a building under the Building Act, unless a case can be made for Section 173 of the Local Government Act to apply.

The Act authorises TAs to erect hoardings, fix warning notices to buildings, and give written notice requiring work to reduce or remove danger or remedy insanitary conditions and prohibit the use of the building. The Act requires TAs to keep information about buildings. This includes records of assessments undertaken.

The Act also provides a statutory defence against prosecutions for actions taken in emergency situations due to natural disasters as long the effects of the action are adequately mitigated or remedied after the event.

Important note: The placards specified in this field guide do not constitute official Building Act notices (under s124 and s125). This may change once proposed changes to the Building Act have been approved. The placards may however fulfil the purpose of warning notices under s124(1)(b).

The current position in advance of legislative change is that there is no satisfactory transition to the Building Act after the State of Emergency is lifted. In Gisborne, all placards issued under the CDEM Act were replaced with Building Act notices on the two days before the lifting of the State of Emergency.

5.2.3 The building owner's responsibilities

Rapid Building Assessments are undertaken by the territorial authorities to provide a rapid indication of the usability and safety of affected buildings and adjacent public spaces. Irrespective of the result and recommendations of the rapid building assessment, it is the building owner's responsibility to ensure that their building is safe before it is reoccupied. It is also the owner's responsibility to ensure that the building does not pose any danger to neighbouring buildings or public spaces.

The building owner may employ people with suitable skills to undertake a detailed evaluation of damage to determine a building's safety. In the case of a large commercial building, this will usually involve one or more structural engineers, preferably Chartered Professional Engineers. In the case of a simple residential building, an experienced builder may be suitable. Refer also to Section 5.4.6 "Rules about who can access placarded buildings" on page 34 regarding the building owner's responsibility for people accessing the building.

5.3 Rapid assessment procedure

The objective of a rapid assessment is to assess the impact of damage observed on the continued use of a building or adjacent property.

Important short-term aims for rapid assessments include:

- safe use of streets adjacent to damaged buildings
- safe occupation of buildings for:
  - continued use, especially emergency facilities
  - minimising impact on commercial activity
  - minimising displacement of people.
- assessing the need for temporary works such as shoring, temporary securing and making safe
- saving property from unnecessary demolition
  - conserving heritage fabric
  - minimising economic impact for the owners and community.

5.3.1 Basic approach

Assessors will observe the nature of damage and assess its impact on the ability of the building (or part) to continue to resist reasonably foreseeable actions.

Rapid assessments are primarily looking for any:

1. threat of overall or partial collapse due to loss of strength, stability, or stiffness of the structural system
2. threat of non-structural elements of a building, that are not part of the structural frame, becoming falling hazards; for example, loose bricks from a chimney, tiles from a roof
3. threat posed by damage to adjacent structures or land
4. other threat to public safety caused by the event, such as biocontamination through leaked sewage.

Assessing usability is based on the damage observed in the context of the event that has occurred. It is accepted that larger events could cause failure. Reasonably foreseeable events that affect the serviceability and structural performance of buildings include:

- normal service loading
- wind or snow loading
- earthquakes of a similar magnitude or less than the original event.

The focus is on applying judgment to assess future risk from damage, based on a minimum of specific knowledge about a building.

Although you are aiming to minimise risk to occupants and the public, you also need to avoid imposing unwarranted hardship on owners and occupants of damaged buildings when deciding on the placarding of buildings.

The assessment teams may also make recommendations for work to be done under urgency where there is a need to demolish or secure the structure to keep the public safe or to protect adjacent property.

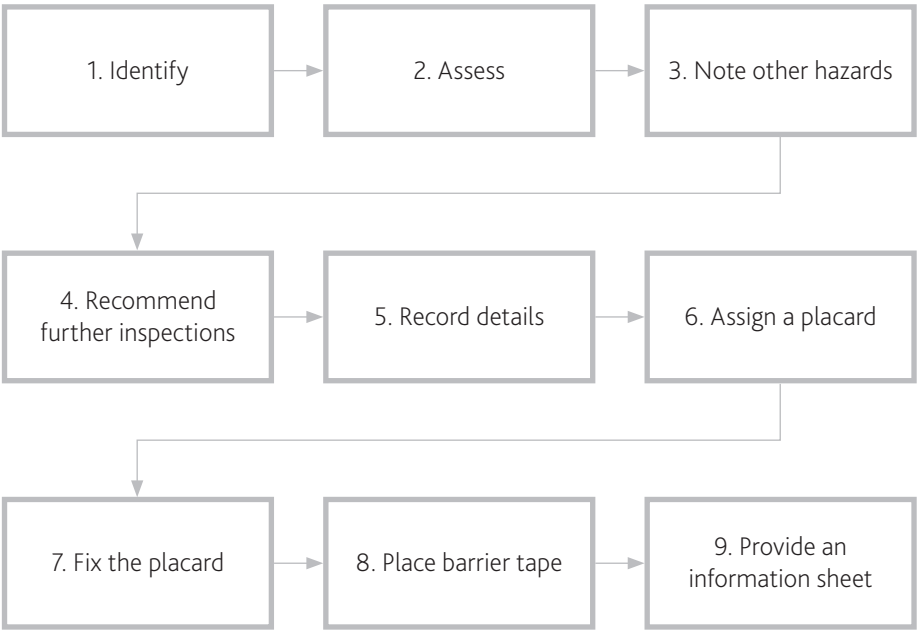


Figure 2: Rapid building assessment steps

At the end of your assessment and if practical, provide an information sheet to the building owner. This explains the placarding system and what the next steps for the building owner are. It informs the building owner of their responsibilities to ensure that the building is safe before reoccupation and that any dangers the building may pose to its surroundings are addressed (refer also to Section 5.2.3 "The building owner's responsibilities" on page 19). The Controller will also provide this information to home owners of all assessed buildings. The information sheets are designed to help you avoid getting involved in discussions with the owner or occupiers because this can be time consuming and unproductive. Your priority should be to assess the buildings allocated to your team.

5.3.2 Preparation and event briefing

Each day before being dispatched you will generally:

- sign in the register
- stock up on forms, placards, handouts and maps
- receive supplies for the day:
  - a personal ID badge – in case you don't have one already; it is important to record this ID on all assessment forms you complete on that day
  - your team ID – this may change every day
  - a list of important contact names and details
  - office supplies (staplers, tape, pens)
  - a food and drink pack for the day
  - the property addresses allocated to your team.

Refer also to Section 14 "Resources required in the field" on page 81.

The Building Response Manager will usually hold a briefing to inform you about the current status of the event and any particular processes to be followed.

5.3.3 Rapid assessment types

Rapid assessments involve the visual observation of damage.

For simple residential buildings, conduct a **Residential Rapid Assessment**. A Residential Rapid Assessment involves an external inspection and, if required, an internal inspection. The internal inspection may be as simple as a look through the windows to check for internal damage.

For non-residential and complex residential buildings, two distinct assessment levels exist: Level 1 assessments generally involve external observation only. Level 2 assessments also include an internal inspection if internal access is safe.

Level 1 Rapid Assessments are suitable for buildings constructed using typical residential construction types. Buildings with typical commercial construction details (unreinforced masonry walls, tilt-up panels, multi-storey buildings, and others) will usually require a Level 2 Assessment. Level 1 Assessments may be undertaken by teams comprising building control officers, structural and civil engineers, architects, experienced building contractors and other suitable experienced building professionals.

Level 2 Rapid Assessments should be conducted on:

- All essential facilities (hospitals, schools, police and fire stations)
- All buildings of 2 or more storeys and containing 3 or more household units
- Any other buildings where the Level 1 Rapid Assessment identifies the need for further and more specific inspection. Level 2 Assessment teams should comprise at least one structural engineer, with input from geotechnical engineers where necessary.

Note that it is not a requirement that a Level 1 Assessment is done before undertaking a Level 2 Assessment. However, always first inspect the building's exterior before entering it.

The table below provides an overview of the Rapid Assessment types.

Table 2: Rapid Building Assessment Types

Building type	Building type description	Rapid Assessment type	See page
Simple residential buildings	Simple design and only residential use	Residential Rapid Assessment	Section 6 on page 40
Complex residential and non-residential buildings	Complex design or non-residential use	Level 1 Rapid Assessment	Section 7 on page 48
		Level 2 Rapid Assessment if required	Section 8 on page 54
Essential facilities and large multi-storey buildings	• hospitals • health care facilities • police and fire stations • jails and detention centres • communication centres • emergency operation centres • buildings designated for welfare centres • buildings of 2 or more storeys and containing 3 or more household units.	Level 2 Rapid Assessment	Section 8 on page 54 and Section 13 "Essential Facilities" on page 79

The outcome of this process is a completed Rapid Assessment form and an appropriate placard.

5.4 Placarding system

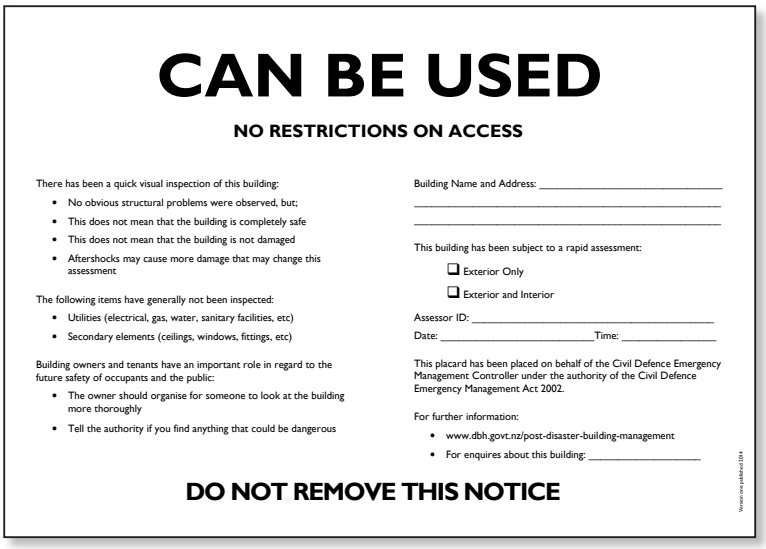
5.4.1 The placards

Rapid Assessments will result in either a white, yellow or red placard corresponding to the observed damage.

Table 3: Rapid Assessment placards

Rapid Assessment placards		
Observed damage	**Rapid Assessment outcome**	**Placard**
Light or no damage (Low risk)	**W** CAN BE USED No ***immediate*** further evaluation required	**CAN BE USED** (WHITE)
Moderate damage (Medium risk)	**Y1** RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY No entry to parts of building with significant damage	**RESTRICTED ACCESS** (YELLOW)
	Y2 RESTRICTED ACCESS – SHORT TERM ENTRY ONLY with or without supervision Entry restricted to removal of contents and securing work	
Heavy damage (High risk)	**R1** ENTRY PROHIBITED At risk from external factors such as adjacent buildings or from ground failure	**ENTRY PROHIBITED** (RED)
	R2 ENTRY PROHIBITED Significant damage	

The placards are shown below:



CAN BE USED

NO RESTRICTIONS ON ACCESS

There has been a quick visual inspection of this building:

- No obvious structural problems were observed, but;
- This does not mean that the building is completely safe
- This does not mean that the building is not damaged
- Aftershocks may cause more damage that may change this assessment

The following items have generally not been inspected:

- Utilities (electrical, gas, water, sanitary facilities, etc)
- Secondary elements (ceilings, windows, fittings, etc)

Building owners and tenants have an important role in regard to the future safety of occupants and the public:

- The owner should organise for someone to look at the building more thoroughly
- Tell the authority if you find anything that could be dangerous

Building Name and Address: _____

_____

_____

This building has been subject to a rapid assessment:

❑ Exterior Only

❑ Exterior and Interior

Assessor ID: _____

Date: _____ Time: _____

This placard has been placed on behalf of the Civil Defence Emergency Management Controller under the authority of the Civil Defence Emergency Management Act 2002.

For further information:

- www.dbh.govt.nz/post-disaster-building-management
- For enquires about this building: _____

DO NOT REMOVE THIS NOTICE

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RESTRICTED ACCESS

❑ **TO PART(S) OF THE BUILDING ONLY**

❑ **SHORT TERM ENTRY ONLY**

❑ Access to be supervised by a person authorised by the issuing Territorial Authority

There has been a quick visual inspection of this building:

- This building has been damaged and its structural safety is questionable
- Enter only at own risk
- Future events may cause more damage that may change this assessment

Description of hazard observed: _____

_____

Restricted areas are: _____

_____

Restrictions on use:

❑ Removal of essential documents/valuables only

❑ Removal of property

❑ Other: _____

_____

❑ Diagram attached showing restricted areas

Building Name and Address: _____

_____

_____

This building has been subject to a rapid assessment:

❑ Exterior Only

❑ Exterior and Interior

Assessor ID: _____

Date: _____ Time: _____

This placard has been placed on behalf of the Civil Defence Emergency Management Controller under the authority of the Civil Defence Emergency Management Act 2002.

For further information:

- www.dbh.govt.nz/post-disaster-building-management
- For enquires about this building: _____

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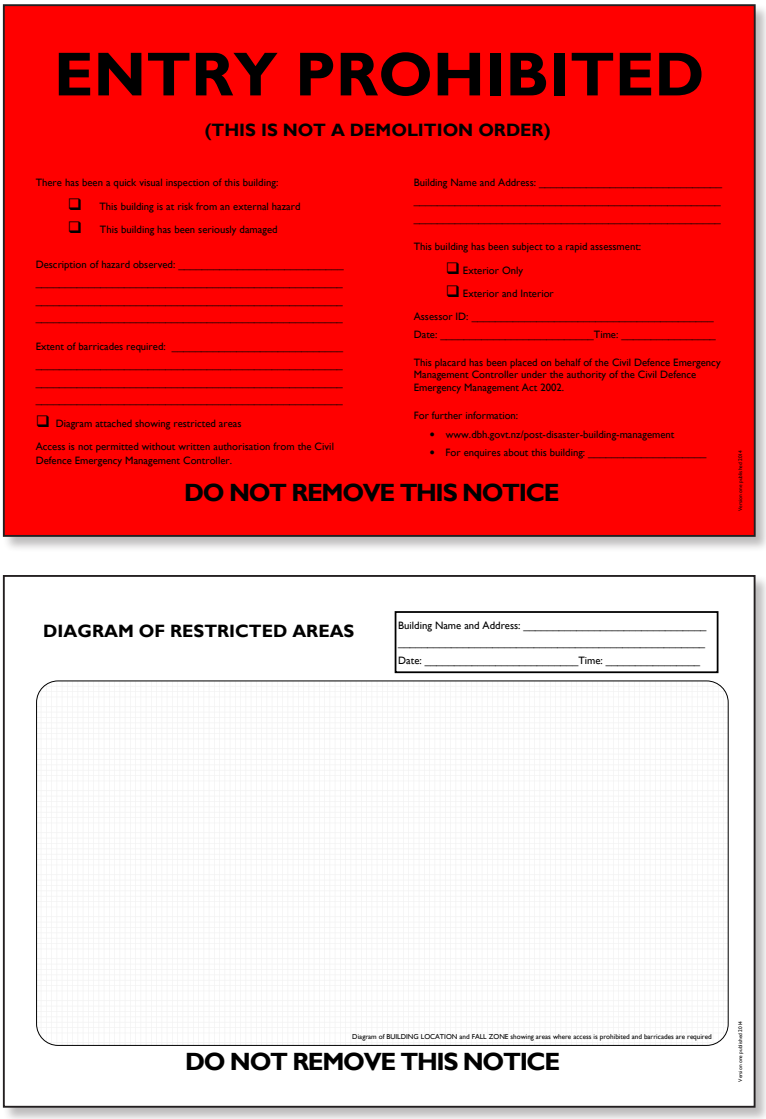

ENTRY PROHIBITED

(THIS IS NOT A DEMOLITION ORDER)

There has been a quick visual inspection of this building:

- ❑ This building is at risk from an external hazard
- ❑ This building has been seriously damaged

Description of hazard observed: _____

Extent of barricades required: _____

❑ Diagram attached showing restricted areas

Access is not permitted without written authorisation from the Civil Defence Emergency Management Controller.

Building Name and Address: _____

This building has been subject to a rapid assessment:

- ❑ Exterior Only
- ❑ Exterior and Interior

Assessor ID: _____

Date: _____ Time: _____

This placard has been placed on behalf of the Civil Defence Emergency Management Controller under the authority of the Civil Defence Emergency Management Act 2002.

For further information:

- www.dbh.govt.nz/post-disaster-building-management
- For enquires about this building: _____

DO NOT REMOVE THIS NOTICE

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DIAGRAM OF RESTRICTED AREAS

Building Name and Address: _____

Date: _____ Time: _____

Diagram of BUILDING LOCATION and FALL ZONE showing areas where access is prohibited and barricades are required

DO NOT REMOVE THIS NOTICE

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Figure 3: Rapid Assessment placards

5.4.2 Placarding criteria

Use this guidance to decide on the placard.

CAN BE USED (white)

A "CAN BE USED" placard indicates that no damage has been observed that increases the risk to public safety for use or occupancy of the building.

This placard means: Occupancy and use is permitted with no restrictions.

In general this requires:

- vertical load capacity not significantly reduced
- lateral load capacity not significantly reduced
- no falling hazards present
- no evidence of ground instability
- main exits and egress ways within the building are useable
- no sewage contamination observed
- no other unsafe conditions observed.

Observed damage that does not increase the risk to public safety might include:

- cracks in plaster on exterior walls that do not create falling hazards
- non-structural elements that have fallen completely so that there is no further falling hazard (such as a chimney)
- loss of services that do not cause a safety risk, for example plumbing or potable water supply.

Even if a building has received a "CAN BE USED" placard it also means that:

- electrical and mechanical equipment, water and energy supplies and sanitary facilities may not have been inspected and
- subsequent aftershocks, landslides or other events may warrant re-inspection and a change to this assessment.

Note that a "CAN BE USED" placard should disregard any temporary repairs; that is, if someone has carried out temporary securing works to enable reoccupation, this would not be enough to lead to a "CAN BE USED" placard. The reason for this is that the placard may stay in place even if someone removed the temporary repairs. So the assessor should assign a "RESTRICTED ACCESS" placard to buildings with temporary securing works, stating that continued use of the building may be permitted, provided that the temporary securing works remain in place.

Note: 'CAN BE USED' does NOT mean safe.

RESTRICTED ACCESS (yellow)

"RESTRICTED ACCESS" can be the most difficult to assign, because it is that grey in-between area. Many buildings will belong in this category.

This placard indicates that the building requires some restriction on its usage. Two types of restrictions are possible:

- Y1 RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY:
  - use restricted to parts of the building only:
    - ~ prohibit entry into certain rooms because of falling hazards that do not threaten the rest of the building
    - ~ prohibit use of water supply if subjected to contamination.
- Y2 RESTRICTED ACCESS – SHORT TERM ENTRY ONLY:
  - no public entry, except on short-term essential business to part or all of the building for emergency purposes. These may include:
    - ~ removal of essential business or legal records (wills from a lawyer's office for example)
    - ~ removal of valuables only
    - ~ removal of property.

In some buildings, the observed damage may pose significant risks for people without appropriate expertise. In those buildings, short-term access may only be permitted under supervision by a person authorised by the territorial authority. This may be a CPEng registered engineer or any other person deemed suitable by the territorial authority.

Restrictions on use must be clearly identified on both the assessment form and the placard. Unsafe areas must be clearly marked off with barricades, barrier tape and signs. Further actions to reduce danger in and around the building may also be identified in the assessment form and placard.

If only parts of the building could be assessed, and the condition of the unassessed parts is unknown, clearly stated this on the forms and placards. In most cases these unassessed areas should be restricted from access and marked and cordoned off accordingly.

ENTRY PROHIBITED (red)

An "ENTRY PROHIBITED" placard indicates that the building or parts of the building are damaged to a degree that may pose a danger for entry and occupation.

This placard means that: Entry to this building is prohibited. Two types of placards are possible:

- R1 – ENTRY PROHIBITED: Damage to external factors pose a significant hazard to the building
- R2 – ENTRY PROHIBITED: This building is severely damaged and poses a hazard

Typical factors that may make a building unsafe include:

Environmental factors

- neighbouring building in danger of collapse
- risk of land slides
- potential for flooding due to damaged dams or levees
- other risk caused by the building's environment such as trees, or sink holes
- gas leaking, severed and exposed power lines
- significant crack(s) in the ground next to or under the building.

Structural factors

- building or storey significantly leaning
- total or partial collapse of walls or roofs
- severe damage to structural columns or beams with large cracks or exposed reinforcing
- severe spalling or buckling of walls, large inter-storey movement apparent
- significant damage to the foundation
- damaged chimneys in danger of collapse or falling bricks
- parapets cracked and in danger of falling.

If a building has an "ENTRY PROHIBITED" placard, it also means that entry may result in risk to health or life.

An "ENTRY PROHIBITED" placard does not necessarily indicate that demolition is required.

5.4.3 Posting of placards

Placards should be filled out using a thin-tip permanent marker pen (biros will fade), and be securely fixed at a clearly visible location near the entrance of the building. If there is more than one entrance to the building, placards should be posted at each entrance. Take a photo of the posted placard as a record.

Use only one placard classification per building. Different occupancies in the same building cannot have different placards.

A "RESTRICTED ACCESS" placard may indicate different restrictions for different parts or services of the building. If an area or service is considered unsafe and should not be entered, barricades or caution tape should be placed to designate the unsafe areas or services.

If a yellow "RESTRICTED ACCESS" placard is posted, it is important that the placard also identifies any areas or services that were not accessible and have not been assessed. Otherwise the reader may assume that these areas are safe.

5.4.4 Changing placards

Sometimes a placard may have to be changed. Only a Building Assessor authorised by the Controller can change a placard.

Some reasons for changing a placard

- To correct an oversight, mistake in judgement, or after a second opinion.
- After a significant aftershock has occurred (Note that a new placard should be placed with a new inspection date, even if the assessment result remains unchanged).
- After a Level 2 Rapid Assessment.
- After an engineering report.

Some reasons for changing to a more restrictive placard

- Previously unobserved damage has been found, or the territorial authority believes that an engineering report or second opinion is warranted.
- Aftershocks have significantly worsened the condition of the building.
- Further degradations of ground stability have been observed.

Some reasons for changing to a less restrictive placard

- The engineer may re-evaluate the building after temporary repair or securing work, and if satisfied that a lower placard could be recommended, may recommend that in writing to the territorial authority.
- The territorial authority may allow this process for smaller buildings, with only the contractor providing the assessment and temporary repair services.
- The territorial authority may allow a placard to be changed to a less restrictive usage after a further evaluation. If the engineer believes that a less restrictive placard could be recommended, they would recommend that in writing to the territorial authority.

After the State of Emergency is lifted, placards can only be replaced by issuing a notice under the Building Act 2004. This will be the case until the currently proposed law changes have been enacted.

5.4.5 Removing placards

A placard cannot be removed during the State of Emergency. It can be changed to a different colour as described in the previous section. The placard can be removed once the building is demolished.

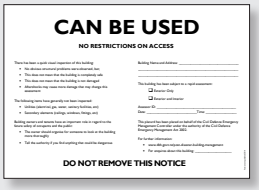
When the State of Emergency is lifted, yellow and red placards may fulfil the purpose of warning notices under s124(1)(b) of the Building Act 2004. They can be removed only by a person authorised by the territorial authority.

Currently no legislation applies to white placards after the State of Emergency is lifted. These rules may change once the proposed changes to the Building Act have been approved.

5.4.6 Rules about who can access placarded buildings

This table outlines the rules about who can access placarded buildings.

Table 4: Access rules for placarded buildings

Event phase	Placard	To access placarded buildings, a person must:
During the State of Emergency	No placard	• be authorised by the Controller* or • have permission from the building owner, occupier or otherwise authorised person
		• be authorised by the Controller* or • have permission from the building owner, occupier or otherwise authorised person
		• be authorised by the Controller* or If access is only permitted under supervision: • any person with permission from the building owner, occupier or otherwise authorised person accompanied by someone authorised by the Controller* If access is permitted without supervision: • any person with permission from the building owner, occupier or otherwise authorised person within the restrictions specified on the placard
		• be authorised by the Controller*

Event phase	Placard	To access placarded buildings, a person must:
After the State of Emergency is lifted	No placard or 	• have permission from the building owner, occupier or otherwise authorised person
		• Yellow and red placards may fulfil the purpose of warning notices under Building Act s124(1)(b). The building owner is responsible for the safety of any person entering the building.

Notes:

*1. The Controller may issue general authorities; for example, to all CPEng registered engineers, or all authorised assessors to enter any placarded building.

2. The Controller may also delegate the task of authorising building access to someone else; for example, the Building Response Manager.

5.5 Cordoning

If a building is assessed as yellow or red, barrier tape may need to be installed to restrict access into a building or restricted area or services. This may include areas that have been identified as fall zones.

Where possible, place barrier tape in a way that minimises the restrictions on passing traffic and pedestrians. Remember that glass can shatter, and heavy items like bricks will spill outwards on hitting the ground.

Some good rules of thumb to consider when deciding on potential fall zones are:

- for brick walls, 1.5 times the height of the wall
- for concrete panels, 1.0 times the height of the panel.

5.6 Reporting and information management

Assessment reports for each building must be entered into a building register. The format of the register may vary between territorial authorities. The register may be computer-based or paper-based. Follow the instructions at your briefing. Entering building assessment results on the register may be a back-office function, so writing clearly on the assessment forms is important.

The information on the placards, on the assessment form and in the building register must be consistent. So repeat the statements on the placards as closely as possible on the assessment form and the register.

Complete forms and documents neatly and accurately. BLOCK CAPITALS are recommended for legibility.

Check that the building identification, such as the building address, is correct.

Completed forms are given to the territorial authority and are likely to be included in the property file.

5.7 Debriefing

When your team returns to the base of operations, you will need to:

- log in that you have returned from the field
- report to your Sector Coordinator (or other designated person)
- submit your assessment forms with any photos taken to the person responsible for preparing the database (or Sector Coordinator)
- discuss any technical or process problems with the Sector Coordinator and/ or the Induction and Technical Coordinator, including the need for additional barricades and consideration of specified buildings for demolition.

Ensure you receive clear instructions about your next involvement (that is, next assignment or stand-down). And take the opportunity to report any welfare concerns you have about yourself or others.

5.8 Building identification

The assessment teams may or may not have maps, aerial photographs, official street addresses, legal descriptors, and any heritage listings.

Commercial buildings may not have street numbers, or may have different numbers from their official address, particularly if a building occupies a corner site or has access from more than one street. Record the official address on the sheet, and record a short name or any observed variance as 'Other ID or access'. If the building has a name, this is helpful for identification.

Use the 'Other ID or access' field to physically describe the position of a building where there is more than one building on a property. For commercial and industrial buildings, it is helpful to record the name of the business that occupies the premises – for example, the prominent tenancy (usually ground floor).

GPS coordinates are particularly useful in this situation. Wherever possible record the GPS coordinates of the building. A useful reference place to record the coordinates is at the building entrance. The preferred GPS format is in decimal degrees to five decimal places with South negative and East positive to suit Google Earth, for example, . -41.11385, 174.84676.

If practical, take a photograph of the building near the entrance where the GPS coordinates were taken, and with the placard posted. This is useful for identification purposes, for future monitoring, and after worsening conditions. If you are taking additional photos, we recommend you always do one of the following things, so that you can later match photos to buildings:

- show the assessment form or placard with the building identification in the foreground of each photo or
- take a photo of the building identification first before taking photos of the building; for example, street view with street number or assessment form.

5.9 Hot topics

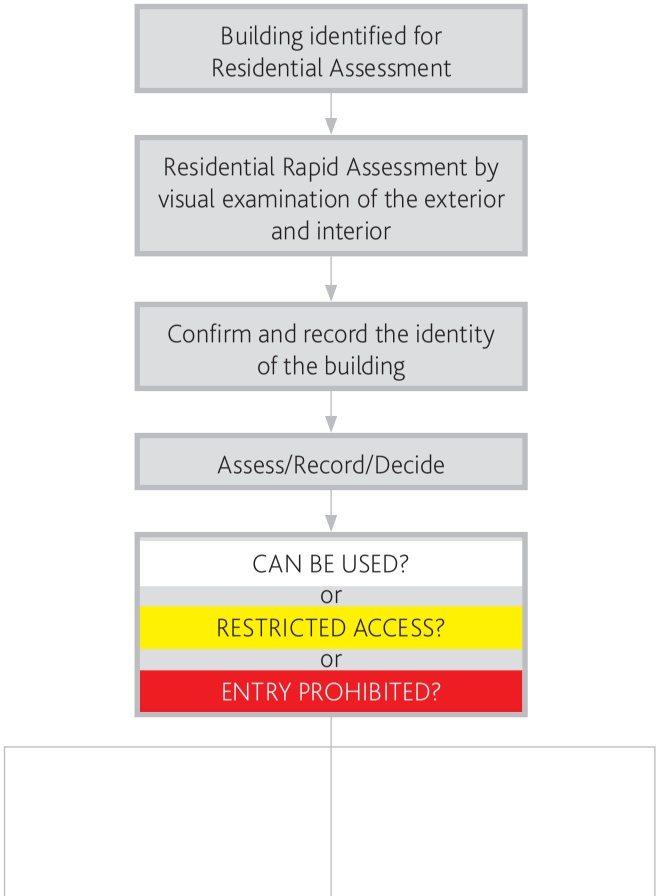
Historic post-disaster experiences of assessing buildings have highlighted a number of recurring issues. Make sure that you:

- write clearly
- give a clear and unambiguous building description. Add general descriptions if necessary; for example, "The big white building on the corner of xxx and yyy street"
- record the building name, if it has one
- use permanent marker pens on placards – ballpoint pens fade with time
- state your assessor ID clearly on the form and placard
- placard all entrances in the same way – some could be on a different street.

6 RESIDENTIAL RAPID ASSESSMENT – SIMPLE RESIDENTIAL BUILDINGS

6.1 Residential Rapid Assessment process

The Residential Assessment process is summarised in Figure 4:



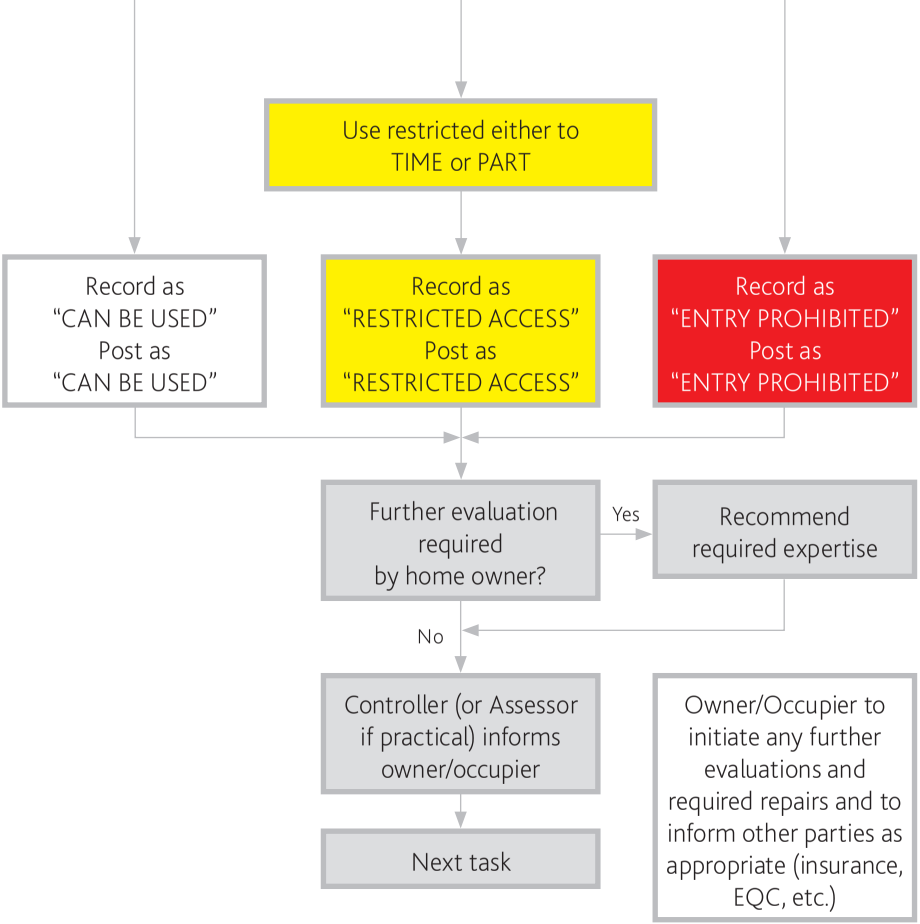


Figure 4: Residential Assessment process

The Residential Assessment typically follows the steps in the order shown below:

A. Observe the building exterior of the building from the street access.
   1. Look out for falling hazards from above.
   2. Inspect whether neighbouring buildings or natural features such as hills, dams or trees pose a hazard.
   3. Identify non-structural hazards such as chemical spills, ripped power lines or gas leaks.
   4. Inspect street level damage to the building structure.
   5. Where possible, look into the building through windows to identify interior damage.
   6. Inspect the ground around the building for slopes or fissures.

B. Walk around the building as far as possible and inspect each elevation.

C. Enter the building for a closer inspection, if required and if entry is safe.

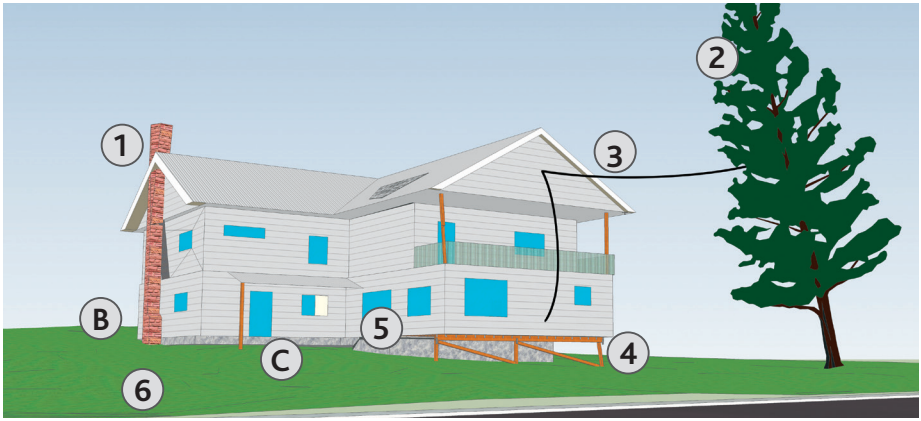


Figure 5: Inspection steps for Residential Building Assessment

In most cases, inspection teams should try to complete a Residential Rapid Assessment in about 20 minutes.

6.2 Residential Assessment observations

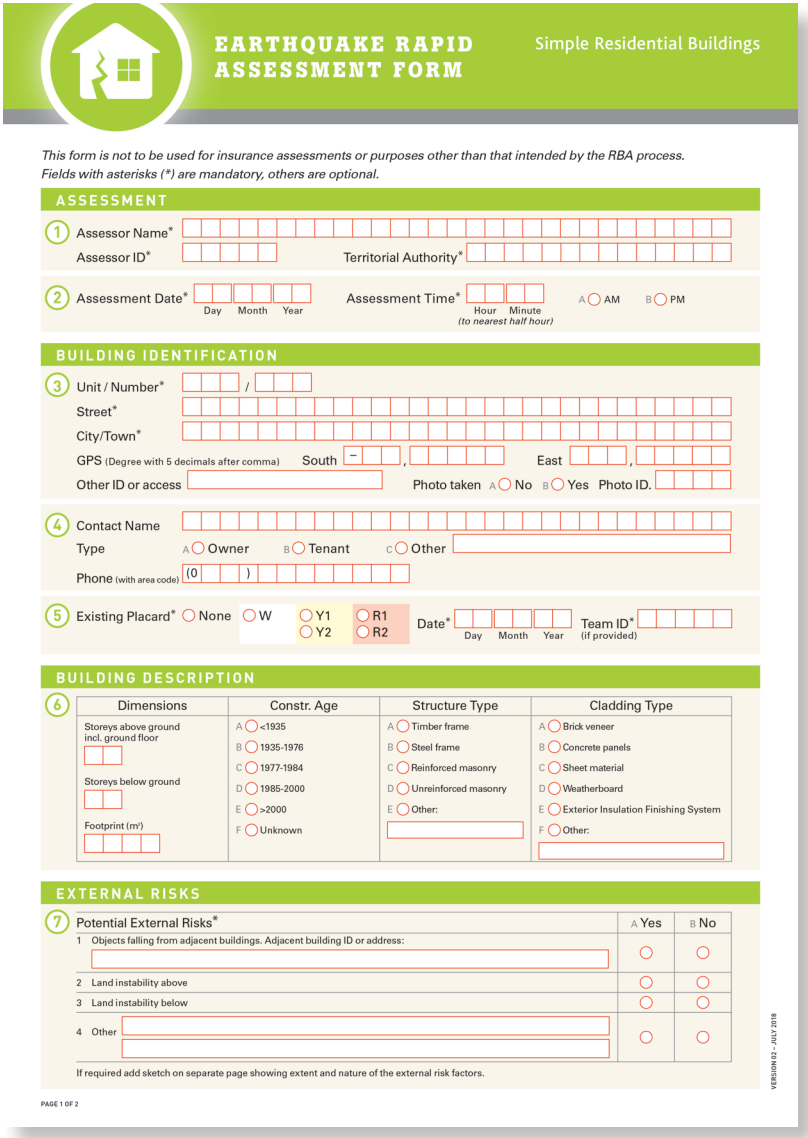
The key criteria (or observed conditions) to look for are:

- collapse, partial collapse, off foundation
- building or storey leaning
- structural damage to vertical system – look for damage to posts, joists, beams and columns
- structural damage to lateral system – look for racking of sheet or strip cladding and disconnections at the top and bottom of studs and posts, and at the base of walls; buckling of steel braces; racking of timber linings. Observe whether significant inter-storey movement has occurred.
- falling hazards – for example, chimneys, overhanging canopies, broken windows, pergolas and balconies
- ground slope movement or cracking – look for ground displacement under or next to the building, or foundation damage
- other hazards present – gas, electricity, sanitary sewer, stormwater or hazardous materials/processes.

If significant interior damage is suspected or visible from the outside, or if not enough of the structural components can be seen from the outside, inspect the interior of the building. Only enter the building if access and exit routes are safe.

6.3 Residential Assessment forms

When the assessment is complete, fill out the Residential Assessment form. The format of this form and a description of the information required follow. The form for earthquake assessments is on the following pages.



EARTHQUAKE RAPID ASSESSMENT FORM

Simple Residential Buildings

This form is not to be used for insurance assessments or purposes other than that intended by the RBA process.
Fields with asterisks (*) are mandatory, others are optional.

ASSESSMENT

1 Assessor Name*
Assessor ID* Territorial Authority*

2 Assessment Date* Day Month Year Assessment Time* Hour Minute (to nearest half hour) A AM B PM

BUILDING IDENTIFICATION

3 Unit / Number* /
Street*
City/Town*
GPS (Degree with 5 decimals after comma) South – , East ,
Other ID or access Photo taken A No B Yes Photo ID.

4 Contact Name
Type A Owner B Tenant C Other
Phone (with area code) (0)

5 Existing Placard* None W Y1 Y2 R1 R2 Date* Day Month Year Team ID* (if provided)

BUILDING DESCRIPTION

6

Dimensions	Constr. Age	Structure Type	Cladding Type
Storeys above ground incl. ground floor	A <1935	A Timber frame	A Brick veneer
Storeys below ground	B 1935-1976	B Steel frame	B Concrete panels
Footprint (m²)	C 1977-1984	C Reinforced masonry	C Sheet material
	D 1985-2000	D Unreinforced masonry	D Weatherboard
	E >2000	E Other:	E Exterior Insulation Finishing System
	F Unknown		F Other:

EXTERNAL RISKS

7

Potential External Risks*	A Yes	B No
1 Objects falling from adjacent buildings. Adjacent building ID or address:		
2 Land instability above		
3 Land instability below		
4 Other		

If required add sketch on separate page showing extent and nature of the external risk factors.

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DAMAGE ASSESSMENT

8

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Overall Hazard*	N/A	A	B	C	D
1 Collapse or partial collapse	◯	◯	◯	◯	◯
2 Building or storey leaning	◯	◯	◯	◯	◯
3 Other:	◯	◯	◯	◯	◯
Structural Hazards*	N/A	A	B	C	D
4 Foundations	◯	◯	◯	◯	◯
5 Floors	◯	◯	◯	◯	◯
6 Walls (raking, frame damage, braces)	◯	◯	◯	◯	◯
7 Roofs and ceilings	◯	◯	◯	◯	◯
8 Diaphragms and bracing	◯	◯	◯	◯	◯
9 Other:	◯	◯	◯	◯	◯

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Non-structural Hazards*	N/A	A	B	C	D
10 Parapets, ornamentation, chimneys	◯	◯	◯	◯	◯
11 Cladding, glazing	◯	◯	◯	◯	◯
12 Ceilings, light fixtures	◯	◯	◯	◯	◯
13 Interior walls, partitions	◯	◯	◯	◯	◯
14 Access/egress (stairs, exits)	◯	◯	◯	◯	◯
15 Fire saftey concerns	◯	◯	◯	◯	◯
16 Utilities (e.g. gas, electricity, sewage)	◯	◯	◯	◯	◯
17 Other:	◯	◯	◯	◯	◯

Comments:

9 Estimated Building Damage — A ◯ None B ◯ 0-10% C ◯ 11-30% D ◯ 31-60% E ◯ 61-100%

SUMMARY

10

Observed Damage	Assessment Outcome*
Light or no damage	W ◯ **CAN BE USED** (From assessment no known dangers)
Moderate damage	Y1 ◯ **RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY**
	Y2 ◯ **RESTRICTED ACCESS – SHORT TERM ENTRY ONLY** Access to be supervised A ◯ Yes B ◯ No
Heavy damage	R1 ◯ **ENTRY PROHIBITED (At risk from external factors)**
	R2 ◯ **ENTRY PROHIBITED (Severe damage to building)**

Assessor Signature*

11 Survey Extent of Building*

Exterior	A ◯	Partial
	B ◯	Complete
Interior	C ◯	Not accessed
	D ◯	Partial
	E ◯	Complete

Geotech Assessment Completed? ◯ Yes ◯ No

SUGGESTED FURTHER ACTIONS

12

Recommended further Assessment*	Safety Cordon*	Barricades*	Urgency of suggested action*
A ◯ None	A ◯ None required	A ◯ None required	A ◯ Standard
B ◯ Level 2 Rapid Assessment (tick below if particular expertise is required)	B ◯ Cordon required	B ◯ Barricades already in place	B ◯ Immediate action required
B1 ◯ Structural Engineer	Describe extent (add diagram on separate sheet if required)	C ◯ Barricades required	
B2 ◯ Geotechnical Engineer		Describe extent (add diagram on separate sheet if required)	
B3 ◯ Other:			
C ◯ Further evaluation to be arranged by building owner:			
D ◯ Welfare visit required? ◯ Yes ◯ No			

Immediate Actions (i.e. cover scarps, connect downpipes)

If required add a sketch on a separate sheet of paper showing building damage, access restrictions or cordoning areas. Identify the building on the sketch and staple the sheet to this assessment form.

Sketch included on separate page? ◯ Yes ◯ No

END OF INSPECTION DATA ENTRY – EMERGENCY OPERATIONS CENTRE USE ONLY

Data entry completed ◯ Yes ◯ No Date ☐☐☐☐☐☐ Day Month Year

Completed by:

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RAPID ASSESSMENT FORM – SKETCH SHEET

Assessor Name*

Assessor ID* Assessment Date* Day Month Year Action Required?* A ○ Yes B ○ No

Unit / Number* / Street*

Show building damage, access restrictions or cordoning areas. Identify the building on the sketch and staple the sheet to this assessment form and add any notes if required.

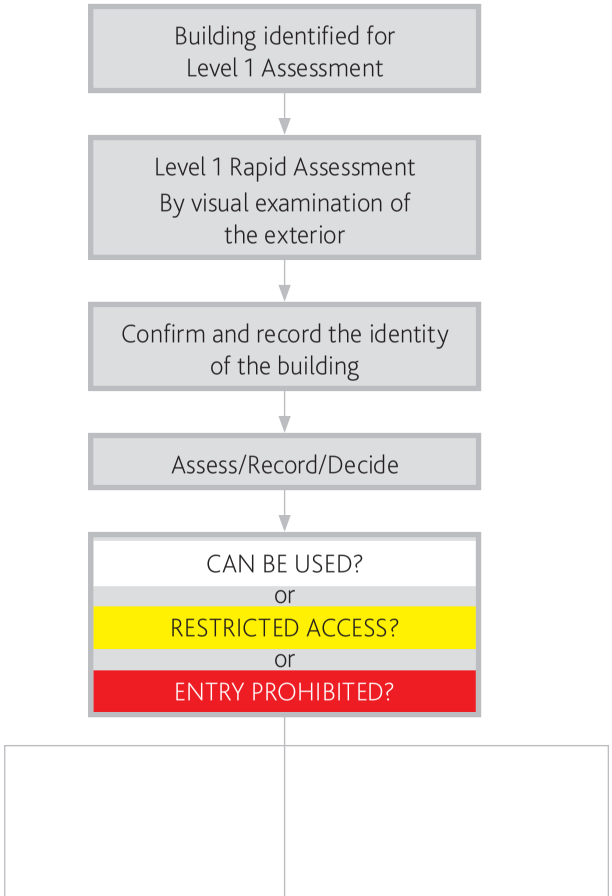
Refer to Section 9 “Instructions on how to complete the assessment forms” on page 60 for guidance on the sections and questions of each form.

Refer to Section 6.2 “Residential Assessment” on page 43 for guidance on typical observations that are covered in Section 8 of the residential form.

7 LEVEL 1 RAPID ASSESSMENT – COMPLEX RESIDENTIAL AND ALL NON-RESIDENTIAL BUILDINGS

7.1 Level 1 process

The Level 1 assessment process is summarised in Figure 6:



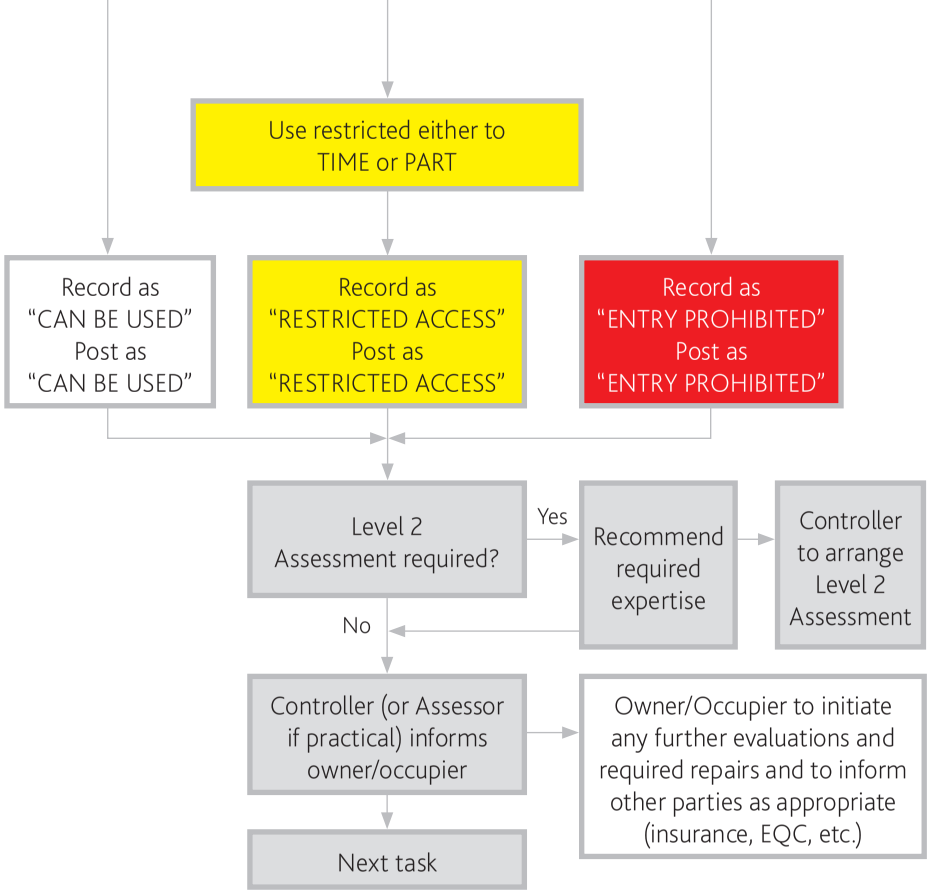


Figure 6: Level 1 Assessment process

The Level 1 Building Assessment typically follows these steps in the order shown below:

A. Observe the building exterior from street access.
   1. Look out for falling hazards from above.
   2. Inspect whether neighbouring buildings or natural feature, such as hills, dams, power lines pose a hazard.
   3. Identify non-structural hazards such as chemical spills, power, gas.
   4. Inspect street-level damage to the building structure.
   5. Where possible look into the building through windows to identify interior damage.
   6. Inspect the ground around the building for slopes or fissures.

B. Walk around the building as far as possible and inspect each elevation

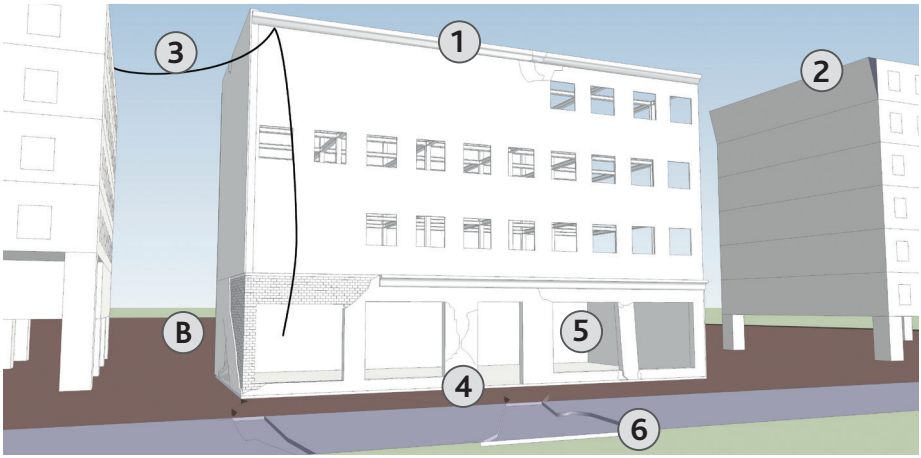


Figure 7: Inspection steps for Level 1 Building Assessment

As a broad rule of thumb, inspection teams should try complete Level 1 Rapid Assessments in about 20 minutes per building.

7.2 Level 1 recommended observations

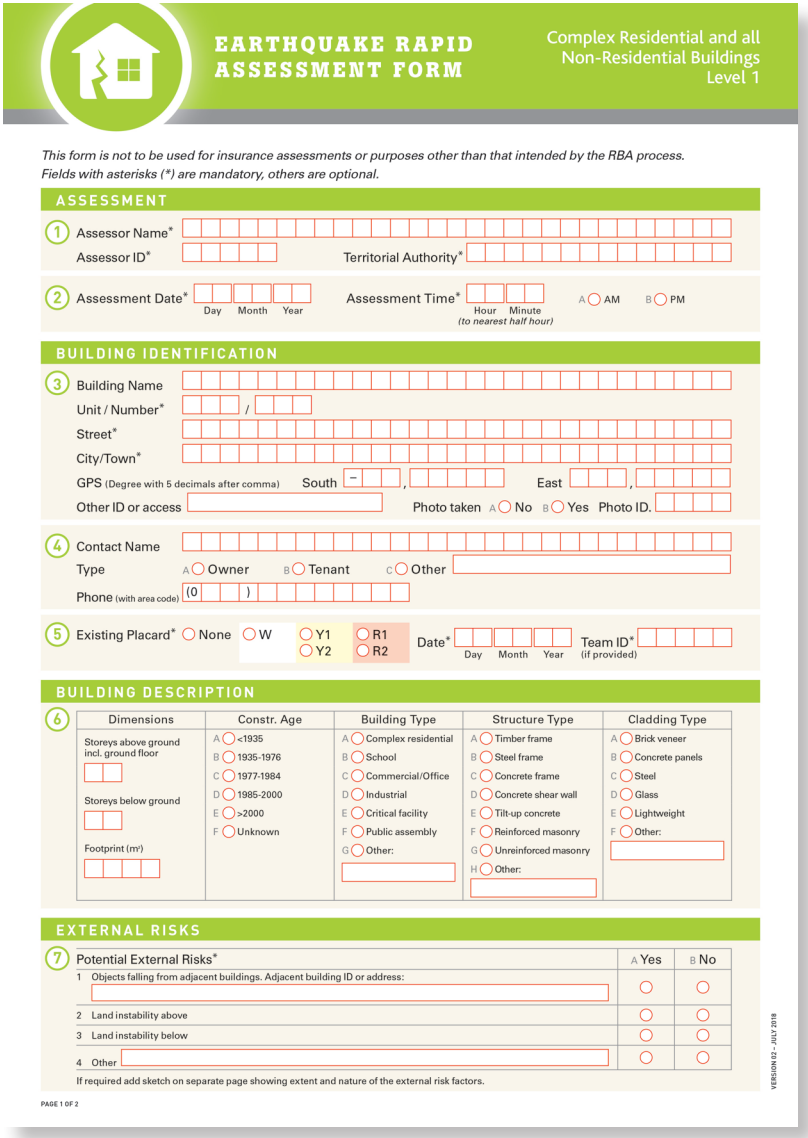
The key structural criteria (or observed conditions) to look for are:

- collapse, partial collapse, off foundation
- building or storey leaning
- structural damage to vertical system – look for damage to beams and columns.
- structural damage to lateral system – observe whether significant inter-storey movement has occurred and look for:
  - concrete spalling and hinging at the top and bottom of columns, and at the base of walls
  - buckling of steel braces or tearing of steelwork paint systems
  - racking of timber linings.
- falling hazards such as chimneys, parapets and overhanging canopies, rooftop plant, or broken windows
- ground slope movement or cracking – look for ground displacement under or next to the building, or foundation damage
- other hazards present – gas, electricity, sanitary sewer or hazardous materials and processes.

A Level 2 Assessment should be recommended if significant interior damage is suspected or visible from the outside, or if not enough of the structural components can be seen from the outside. For example, multi-storey buildings typically need a more detailed internal assessment by structural engineers.

7.3 Level 1 Assessment forms

At completion of a Level 1 Assessment, the Level 1 Assessment form should be filled out. The format of this form and a description of the information required follow. The form for earthquake assessments is shown on the following pages.



EARTHQUAKE RAPID ASSESSMENT FORM

Complex Residential and all Non-Residential Buildings Level 1

This form is not to be used for insurance assessments or purposes other than that intended by the RBA process.
Fields with asterisks (*) are mandatory, others are optional.

ASSESSMENT

1 Assessor Name* / Assessor ID* / Territorial Authority*

2 Assessment Date* (Day Month Year) Assessment Time* (Hour Minute (to nearest half hour)) A ○ AM B ○ PM

BUILDING IDENTIFICATION

3 Building Name / Unit / Number* / Street* / City/Town* / GPS (Degree with 5 decimals after comma) South – , East , / Other ID or access / Photo taken A ○ No B ○ Yes Photo ID.

4 Contact Name / Type A ○ Owner B ○ Tenant C ○ Other / Phone (with area code) (0)

5 Existing Placard* ○ None ○ W ○ Y1 ○ Y2 ○ R1 ○ R2 Date* (Day Month Year) Team ID* (if provided)

BUILDING DESCRIPTION

6

Dimensions	Constr. Age	Building Type	Structure Type	Cladding Type
Storeys above ground incl. ground floor	A ○ <1935	A ○ Complex residential	A ○ Timber frame	A ○ Brick veneer
Storeys below ground	B ○ 1935-1976	B ○ School	B ○ Steel frame	B ○ Concrete panels
Footprint (m²)	C ○ 1977-1984	C ○ Commercial/Office	C ○ Concrete frame	C ○ Steel
	D ○ 1985-2000	D ○ Industrial	D ○ Concrete shear wall	D ○ Glass
	E ○ >2000	E ○ Critical facility	E ○ Tilt-up concrete	E ○ Lightweight
	F ○ Unknown	F ○ Public assembly	F ○ Reinforced masonry	F ○ Other:
		G ○ Other:	G ○ Unreinforced masonry	
			H ○ Other:	

EXTERNAL RISKS

7

Potential External Risks*	A Yes	B No
1 Objects falling from adjacent buildings. Adjacent building ID or address:	○	○
2 Land instability above	○	○
3 Land instability below	○	○
4 Other	○	○

If required add sketch on separate page showing extent and nature of the external risk factors.

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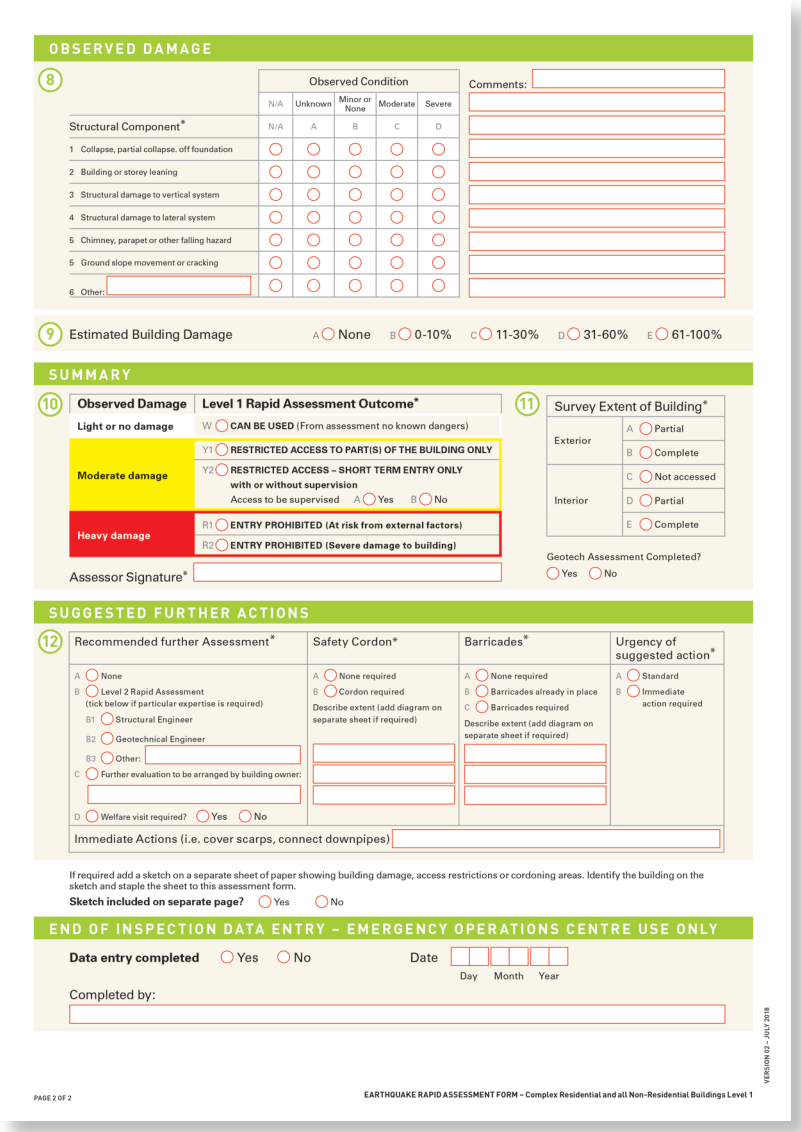

OBSERVED DAMAGE

8

Structural Component*	Observed Condition: N/A	Unknown: A	Minor or None: B	Moderate: C	Severe: D
1 Collapse, partial collapse, off foundation	◯	◯	◯	◯	◯
2 Building or storey leaning	◯	◯	◯	◯	◯
3 Structural damage to vertical system	◯	◯	◯	◯	◯
4 Structural damage to lateral system	◯	◯	◯	◯	◯
5 Chimney, parapet or other falling hazard	◯	◯	◯	◯	◯
5 Ground slope movement or cracking	◯	◯	◯	◯	◯
6 Other:	◯	◯	◯	◯	◯

Comments:

9 Estimated Building Damage — A ◯ None B ◯ 0-10% C ◯ 11-30% D ◯ 31-60% E ◯ 61-100%

SUMMARY

10

Observed Damage	Level 1 Rapid Assessment Outcome*
Light or no damage	W ◯ **CAN BE USED** (From assessment no known dangers)
Moderate damage	Y1 ◯ **RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY**
	Y2 ◯ **RESTRICTED ACCESS – SHORT TERM ENTRY ONLY with or without supervision** Access to be supervised A ◯ Yes B ◯ No
Heavy damage	R1 ◯ **ENTRY PROHIBITED (At risk from external factors)**
	R2 ◯ **ENTRY PROHIBITED (Severe damage to building)**

Assessor Signature*

11 Survey Extent of Building*

Exterior	A	◯ Partial
	B	◯ Complete
Interior	C	◯ Not accessed
	D	◯ Partial
	E	◯ Complete

Geotech Assessment Completed? ◯ Yes ◯ No

SUGGESTED FURTHER ACTIONS

12

Recommended further Assessment*	Safety Cordon*	Barricades*	Urgency of suggested action*
A ◯ None B ◯ Level 2 Rapid Assessment (tick below if particular expertise is required) B1 ◯ Structural Engineer B2 ◯ Geotechnical Engineer B3 ◯ Other: C ◯ Further evaluation to be arranged by building owner: D ◯ Welfare visit required? ◯ Yes ◯ No	A ◯ None required B ◯ Cordon required Describe extent (add diagram on separate sheet if required)	A ◯ None required B ◯ Barricades already in place C ◯ Barricades required Describe extent (add diagram on separate sheet if required)	A ◯ Standard B ◯ Immediate action required

Immediate Actions (i.e. cover scarps, connect downpipes)

If required add a sketch on a separate sheet of paper showing building damage, access restrictions or cordoning areas. Identify the building on the sketch and staple the sheet to this assessment form.

Sketch included on separate page? ◯ Yes ◯ No

END OF INSPECTION DATA ENTRY – EMERGENCY OPERATIONS CENTRE USE ONLY

Data entry completed ◯ Yes ◯ No Date Day Month Year

Completed by:

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PAGE 2 OF 2

EARTHQUAKE RAPID ASSESSMENT FORM – Complex Residential and all Non-Residential Buildings Level 1

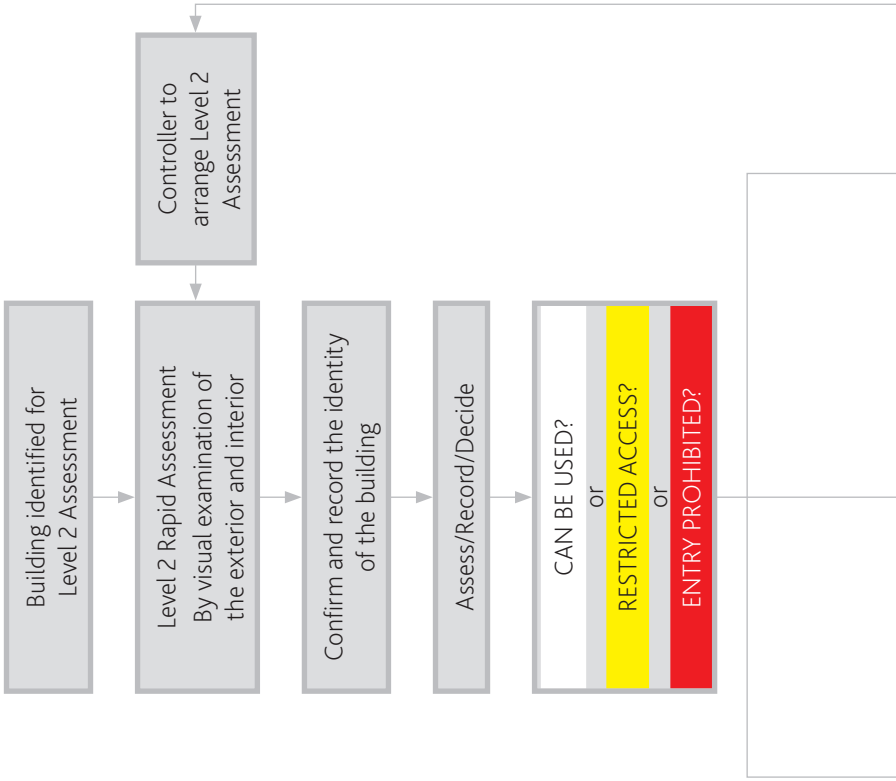
Section 9 "Instructions on how to complete the assessment forms" on page 60 provides guidance on the sections and questions in each form.

Refer to Section 7.2, "Level 1 Recommended observations" on page 51 for guidance on typical observations that are required in Section 8 of the Level 1 Assessment form.

8 LEVEL 2 RAPID ASSESSMENT – COMPLEX RESIDENTIAL AND ALL NON-RESIDENTIAL BUILDINGS

8.1 Level 2 process

The Level 2 Assessment process is summarised in Figure 8:



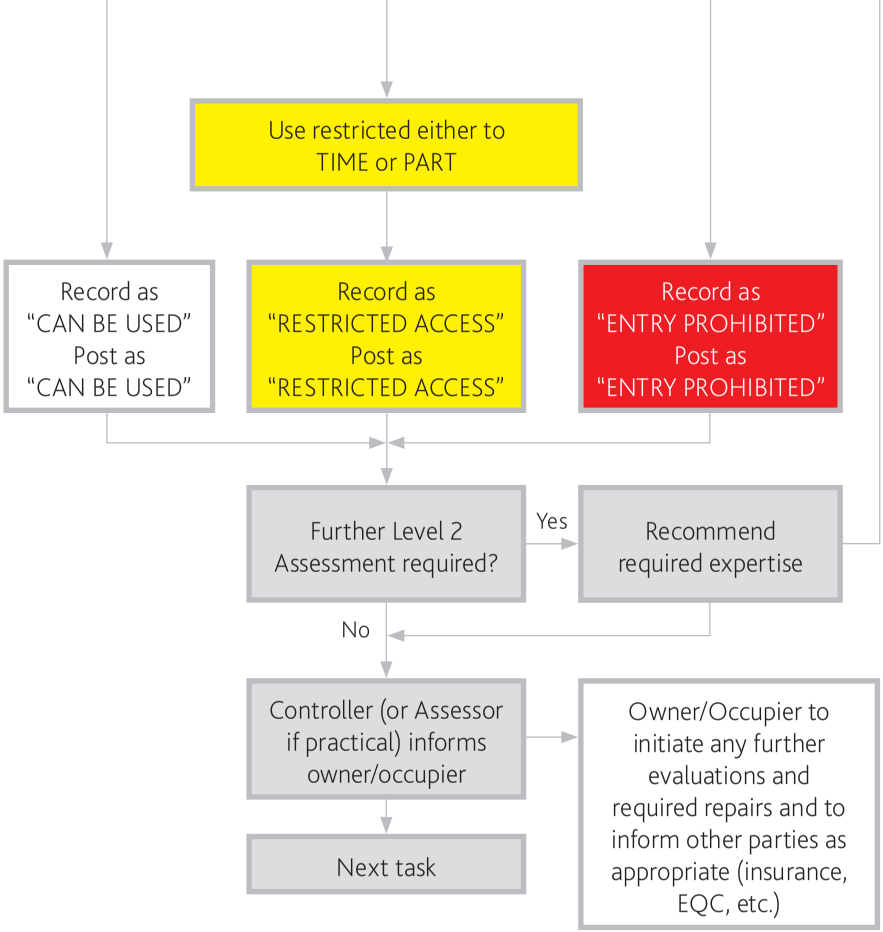


Figure 8: Level 2 Assessment process

A Level 2 Assessment generally involves entry into the building. Before entering the building you must first assess the exterior of the building for damage and hazards (see Section 7.1 "Level 1 process" on page 48). In addition you need to ensure that pathways into and out of the building are safe. Refer to Section "Entry into damaged buildings" on page 12.

The steps to assess the interior of a building will often be case specific, but should always include these steps:

A. Observe the building exterior from street access
B. Walk around the building as far as possible and inspect each elevation
C. Carry out interior observations if safe to do so
    1. Inspect a sample of rooms; for example, lower/middle/upper storeys, centre and corners of the building.
    2. If feasible, lift the ceiling tiles to inspect a sample of structural members that are not normally exposed.
    3. Look in stairwells, mechanical rooms, and other exposed areas as required to view the structural system.
    4. Go into basement spaces to inspect the more exposed structural members.

Inspection teams should allow 30 minutes to 2 hours per building for a Level 2 Rapid Assessments, depending on building size and complexity.

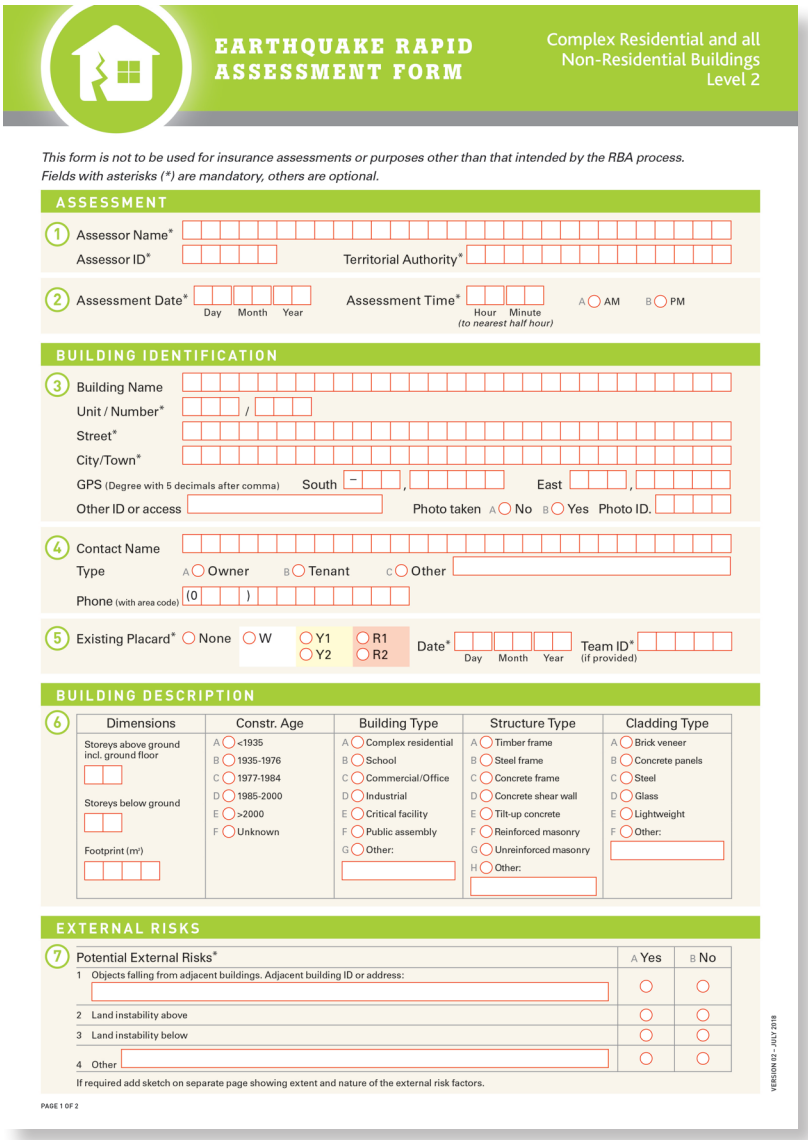
8.2 Level 2 recommended observations

In addition to the observations made during a Level 1 Assessment, the Level 2 Assessment will typically look for the following structural damage:

- basement fractures or uneven settlement
- significant settlement or cracking of foundations
- structural damage to gravity system – look for damage to floor or roof systems, beams and columns
- structural damage to lateral system – observe whether significant inter-storey movement has occurred, and look for:
  - concrete spalling and hinging at the top and bottom of columns, and at the base of walls
  - buckling of steel braces or tearing of steelwork paint systems
  - racking of timber linings
- damage to diaphragms – look for significant cracking of floor slabs and any indication of floor or roof framing that has begun to pull away from its supports
- precast connections – look for:
  - fractured bolts
  - panel cracking or spalling at connections or panels out of alignment
  - separation from interior linings
- non-structural damage to ceilings, partitions, light fixtures, roof-top tanks, HVAC systems (refer to Section 12 "Non-structural Hazards" on page 76)
- other hazards such as:
  - defunct elevators
  - exposure of hazardous materials such as chemical spills and leaks
  - damage to fire protection and detection equipment
  - damage to stairs, jammed doors, or other obstructions to pathways.

8.3 Level 2 Assessment forms

After conducting a Level 2 Assessment, fill out the Level 2 Assessment form. The format of this form and a description of the information you need to write follows. The form for earthquake assessments is on the following pages.



EARTHQUAKE RAPID ASSESSMENT FORM

Complex Residential and all Non-Residential Buildings Level 2

This form is not to be used for insurance assessments or purposes other than that intended by the RBA process.
Fields with asterisks (*) are mandatory, others are optional.

ASSESSMENT

1 Assessor Name* / Assessor ID* / Territorial Authority*

2 Assessment Date* (Day / Month / Year) Assessment Time* (Hour / Minute (to nearest half hour)) A ○ AM B ○ PM

BUILDING IDENTIFICATION

3 Building Name / Unit / Number* / Street* / City/Town* / GPS (Degree with 5 decimals after comma) South – , East , / Other ID or access / Photo taken A ○ No B ○ Yes Photo ID.

4 Contact Name / Type A ○ Owner B ○ Tenant C ○ Other / Phone (with area code) (0)

5 Existing Placard* ○ None ○ W ○ Y1 ○ Y2 ○ R1 ○ R2 Date* (Day / Month / Year) Team ID* (if provided)

BUILDING DESCRIPTION

6

Dimensions	Constr. Age	Building Type	Structure Type	Cladding Type
Storeys above ground incl. ground floor	A ○ <1935	A ○ Complex residential	A ○ Timber frame	A ○ Brick veneer
Storeys below ground	B ○ 1935-1976	B ○ School	B ○ Steel frame	B ○ Concrete panels
Footprint (m²)	C ○ 1977-1984	C ○ Commercial/Office	C ○ Concrete frame	C ○ Steel
	D ○ 1985-2000	D ○ Industrial	D ○ Concrete shear wall	D ○ Glass
	E ○ >2000	E ○ Critical facility	E ○ Tilt-up concrete	E ○ Lightweight
	F ○ Unknown	F ○ Public assembly	F ○ Reinforced masonry	F ○ Other:
		G ○ Other:	G ○ Unreinforced masonry	
			H ○ Other:	

EXTERNAL RISKS

7

Potential External Risks*	A Yes	B No
1 Objects falling from adjacent buildings. Adjacent building ID or address:	○	○
2 Land instability above	○	○
3 Land instability below	○	○
4 Other	○	○

If required add sketch on separate page showing extent and nature of the external risk factors.

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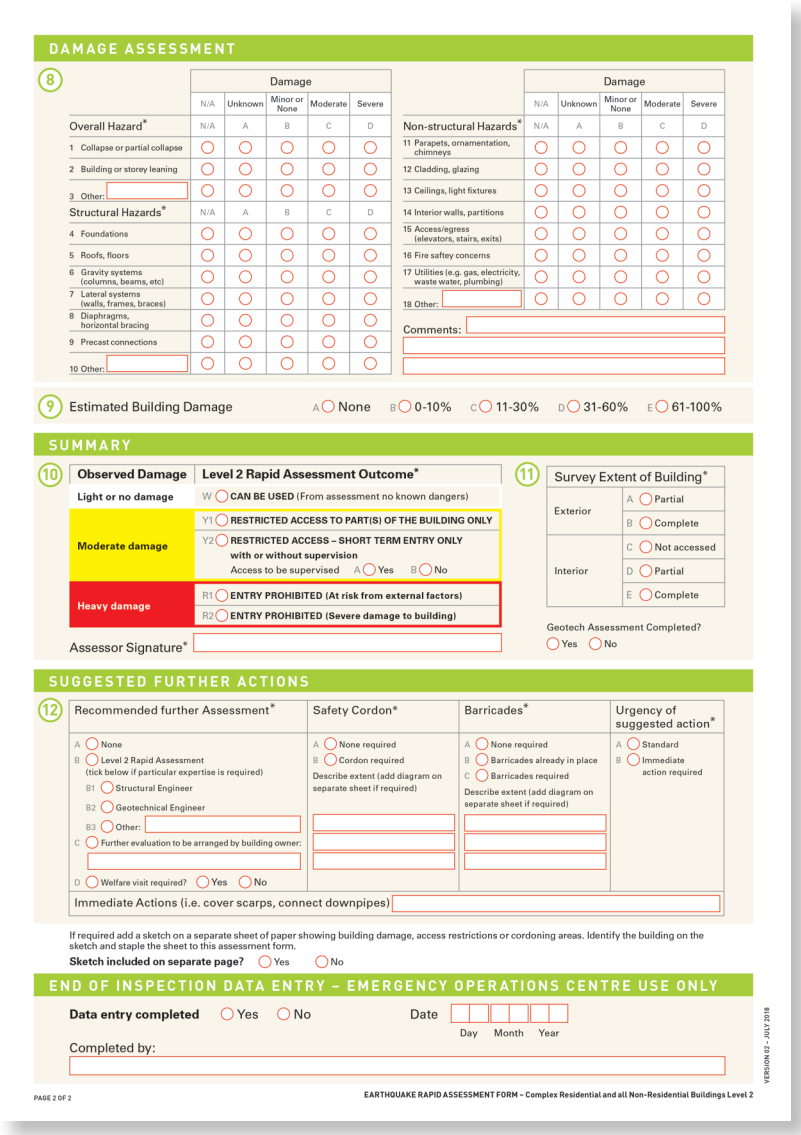

DAMAGE ASSESSMENT

8

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Overall Hazard*	N/A	A	B	C	D
1 Collapse or partial collapse	◯	◯	◯	◯	◯
2 Building or storey leaning	◯	◯	◯	◯	◯
3 Other:	◯	◯	◯	◯	◯
Structural Hazards*	N/A	A	B	C	D
4 Foundations	◯	◯	◯	◯	◯
5 Roofs, floors	◯	◯	◯	◯	◯
6 Gravity systems (columns, beams, etc)	◯	◯	◯	◯	◯
7 Lateral systems (walls, frames, braces)	◯	◯	◯	◯	◯
8 Diaphragms, horizontal bracing	◯	◯	◯	◯	◯
9 Precast connections	◯	◯	◯	◯	◯
10 Other:	◯	◯	◯	◯	◯

	Damage				
	N/A	Unknown	Minor or None	Moderate	Severe
Non-structural Hazards*	N/A	A	B	C	D
11 Parapets, ornamentation, chimneys	◯	◯	◯	◯	◯
12 Cladding, glazing	◯	◯	◯	◯	◯
13 Ceilings, light fixtures	◯	◯	◯	◯	◯
14 Interior walls, partitions	◯	◯	◯	◯	◯
15 Access/egress (elevators, stairs, exits)	◯	◯	◯	◯	◯
16 Fire saftey concerns	◯	◯	◯	◯	◯
17 Utilities (e.g. gas, electricity, waste water, plumbing)	◯	◯	◯	◯	◯
18 Other:	◯	◯	◯	◯	◯

Comments:

9 Estimated Building Damage A ◯ None B ◯ 0-10% C ◯ 11-30% D ◯ 31-60% E ◯ 61-100%

SUMMARY

10

Observed Damage	Level 2 Rapid Assessment Outcome*
Light or no damage	W ◯ **CAN BE USED** (From assessment no known dangers)
Moderate damage	Y1 ◯ **RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY**
	Y2 ◯ **RESTRICTED ACCESS – SHORT TERM ENTRY ONLY with or without supervision** Access to be supervised A ◯ Yes B ◯ No
Heavy damage	R1 ◯ **ENTRY PROHIBITED (At risk from external factors)**
	R2 ◯ **ENTRY PROHIBITED (Severe damage to building)**

Assessor Signature*

11 Survey Extent of Building*

Exterior	A ◯	Partial
	B ◯	Complete
Interior	C ◯	Not accessed
	D ◯	Partial
	E ◯	Complete

Geotech Assessment Completed? ◯ Yes ◯ No

SUGGESTED FURTHER ACTIONS

12

Recommended further Assessment*	Safety Cordon*	Barricades*	Urgency of suggested action*
A ◯ None	A ◯ None required	A ◯ None required	A ◯ Standard
B ◯ Level 2 Rapid Assessment (tick below if particular expertise is required)	B ◯ Cordon required	B ◯ Barricades already in place	B ◯ Immediate action required
B1 ◯ Structural Engineer	Describe extent (add diagram on separate sheet if required)	C ◯ Barricades required	
B2 ◯ Geotechnical Engineer		Describe extent (add diagram on separate sheet if required)	
B3 ◯ Other:			
C ◯ Further evaluation to be arranged by building owner:			
D ◯ Welfare visit required? ◯ Yes ◯ No			

Immediate Actions (i.e. cover scarps, connect downpipes)

If required add a sketch on a separate sheet of paper showing building damage, access restrictions or cordoning areas. Identify the building on the sketch and staple the sheet to this assessment form.

Sketch included on separate page? ◯ Yes ◯ No

END OF INSPECTION DATA ENTRY – EMERGENCY OPERATIONS CENTRE USE ONLY

Data entry completed ◯ Yes ◯ No Date ☐☐☐☐☐☐ Day Month Year

Completed by:

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EARTHQUAKE RAPID ASSESSMENT FORM – Complex Residential and all Non-Residential Buildings Level 2

Section 9 “Instructions on How to Complete the Assessment Forms” on page 60 provides guidance on the sections and questions in each form.

Refer to Section 8.2 “Level 2 Recommended observations” on page 57 for guidance on typical observations that are required in Section 8 of the Level 2 Assessment form.

9 INSTRUCTIONS ON HOW TO COMPLETE THE ASSESSMENT FORMS

These instructions refer to the sections of the form with corresponding numbers. Complete the forms in BLOCK CAPITALS to improve the quality of data entry, minimise revisits and facilitate scanning, which may be an option in a large event.

Fields marked with an asterisk (*) are mandatory; others are optional.

1. Enter your name, your assessor ID and the TA under which jurisdiction you are undertaking the assessment. If more than one person is completing the form use the name and the ID of the team leader.
2. Enter date and time of the assessment. The time only needs to be accurate to the nearest half hour.
3. Identify the building. At a minimum the street number and name are required. Any additional information would improve later identification. Commercial buildings sometimes have names. Enter whether and how many photos you have taken. When taking photos name the files in a way that allows later matching with the building (building name, address, Council register ID, etc.). If access to the building is from multiple addresses or the access is from a different address than the official building address, enter this in the "Other ID or access" field. Please also refer to Section 5.8 "Building Identification" on page 38 for practical ways to identify buildings.
4. If available enter the contact details of the building owner, occupant or building manager. This will usually be the person whom you and/or the Controller will inform about the results of the assessment. This section is not mandatory.
5. Enter details of any existing placards. Complete this section even if your own assessment concludes with the same placarding as the existing one.
6. Enter the building description details. Note that you can select multiple answers. This section is not mandatory.

7. Enter any external risks. Add a brief description if "Other" risks are observed. If the posed risk is due to a neighbouring building, identify the building. Note that this section deals with risks which the environment poses on that building. Any risks which this building poses to the environment (public streets, neighbouring buildings, etc.) are covered in question 8.

8. Enter the damage observed. For each row tick the observed damage. Use the text fields on the right and at the bottom of the table to describe any further observations relevant to the damage affecting the usability of the building. Section 10 "Assessing Specific Building Types" on page 63 provides specific guidance on structural damage observations.

9. Complete the "estimated building damage" table. Tables 8 and 9 do not by default indicate similar damage levels, i.e. you may have identified "severe" damage to a structural element in the building. This would trigger an "ENTRY PROHIBITED" placarding. However, the damage may be easy to repair or mitigate and your "estimated building damage" in table 9 would therefore be only 0-10%. This section is not mandatory.

10. Enter your placarding decision. In general you will apply a white "CAN BE USED" placard only if you have in all of questions in Sections 7 and 8 only identified no or light risks and damage. If in any of the questions you have a "high" structural damage or risk assessment the placard will usually be red "ENTRY PROHIBITED". An "unknown" damage assessment would in most cases prompt a yellow "RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY" or a red "ENTRY PROHIBITED" placard unless it is reasonable to assume that the unknown building elements do not result in any hazards to occupancy (e.g. electricity where no loose wires are observed). Also refer to Section 5.4.2 "Placarding Criteria" on page 28 for guidance on placarding decisions. If you decide on a yellow "RESTRICTED ACCESS" placard it is important that you describe the restrictions in the notes field of the form. As much as practical this text should be the same as the text on the placard. It is important to also note whether and which parts of the building have not been assessed and their damage and risk is therefore unknown.

11. Enter the survey extent for both the exterior and the interior.

12. Recommend any further actions to be undertaken under Civil Defence legislation or by the building owner. Note that only CDEM Assessments are managed by the Controller under the Civil Defence Act. Any other recommendations such as Interim Use Evaluations, Detailed Damage Evaluations or any other "second opinions" are the responsibility of the property owner. The Civil Defence Controller or delegate is the sole authority for placard removal or replacement during the State of Emergency. After the State of Emergency is lifted these accountabilities lie with the TA. If relevant identify what particular expertise is required for further assessments and evaluations. Specify whether cordons or barricades have already been installed or are required. Barricades apply to a specific building whereas cordons restrict access to a street or block of buildings. If appropriate complete a sketch on the separate sketch sheet and staple it to the assessment form. Also complete a sketch on the provided sketch placard and attach it next to the assessment placard. Specify whether further action is urgently required to allow the disaster management team to prioritise. Your urgency assessment may reflect whether any risks are inherent to the current status of the building or are more likely to be triggered by future events, such as aftershocks.

13. Use this space for additional comments that were not yet covered in any other sections. In the case of a red "ENTRY PROHIBITED" placard you can use the space to describe barriers for example. In the case of a yellow "RESTRICTED ACCESS TO PART(S) OF THE BUILDING ONLY" placard describe areas when access is not permitted. In case of a yellow "RESTRICTED ACCESS - SHORT TERM ENTRY ONLY" specify whether access is permitted without supervision or not. If any parts of the building were not assessed specify them here, as well.

If useful add a sketch of the building or building part on the provided sketch sheet to identify risks and access restrictions. Make sure that the sketch clearly identifies the building address and the assessment date so that it can be matched with the assessment form in case they get separated. Staple the sketch to the completed assessment form.

10 ASSESSING SPECIFIC BUILDING TYPES

Legislation on earthquake strengthening is evolving with building developments. Our current building stock consists of a range of buildings with varying earthquake performance. Although the following sections outline typical failure points in different construction types, each building must be assessed individually.

10.1 Timber framed structures

In this type of building, look for:

- chimney separation, collapse or cracking
- house sliding off foundations
- racking of walls
- failure of subfloor bracing.

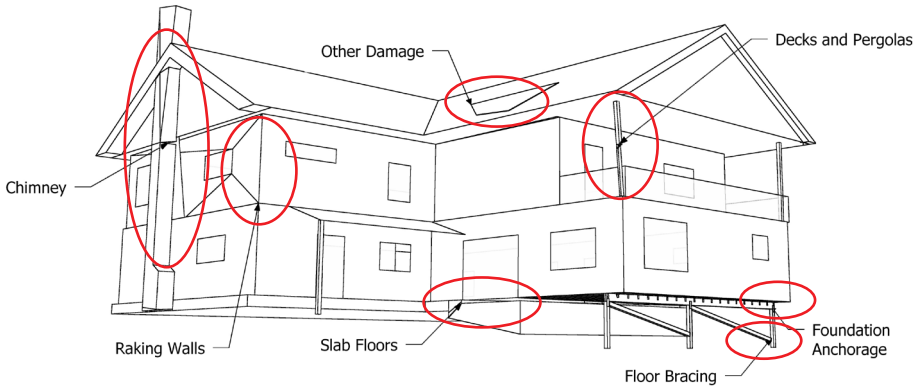

Figure 9: Typical damage areas in timber frame structures

Figure 10 shows a section view of a building with a concrete perimeter wall foundation and a subfloor wall around the crawl space. The ground or first floor framing is supported by the subfloor wall and by posts and bearers inside the crawl space. Above the ground floor, both the exterior and interior walls are covered with sheathing and fitted with diagonal steel bracing straps to provide strength. However, the subfloor is typically braced by diagonal timber struts between the bearers and piles, cantilevered foundation piles or perimeter reinforced masonry walls.

The view on the right in Figure 10 shows the previous house after a moderate or large earthquake force. The earthquake actions overcame the strength of the subfloor bracing, so the whole house fell sideways and down.

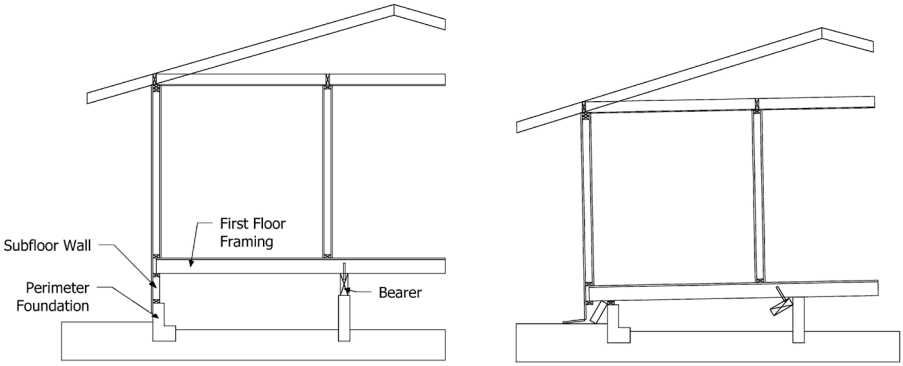

Figure 10: Housing subfloor structure; the view on the right shows the house slipped off the foundations

Figure 11: House fallen off its foundation (source SAP Evaluation Student Manual p34)

10.2 Reinforced concrete or masonry wall construction

In this type of building, look for:

- diagonal shear cracking in piers
- diagonal cracking of walls with spalling of boundary elements
- single horizontal cracks in walls (indicative of non-ductile behaviour)
- floor or roof separation
- combinations of unreinforced masonry partitions with reinforced concrete frames.

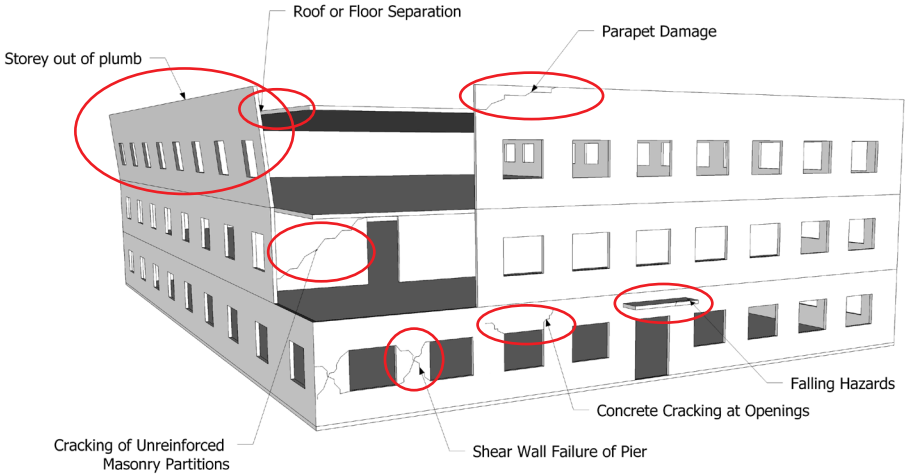

Figure 12: Typical damage areas in reinforced concrete or masonry structures

Figure 12 shows the most probable areas of damage to this type of building with structural walls in an earthquake.

The visible exterior walls on concrete-wall-type buildings are much of the structure of the building. Expect damage in certain places because of the wall configuration, especially in older buildings. One such place is at a soft storey, usually the bottom storey, where there is less continuous wall area than the upper floors. It is often a weak point where more earthquake deformation can occur.

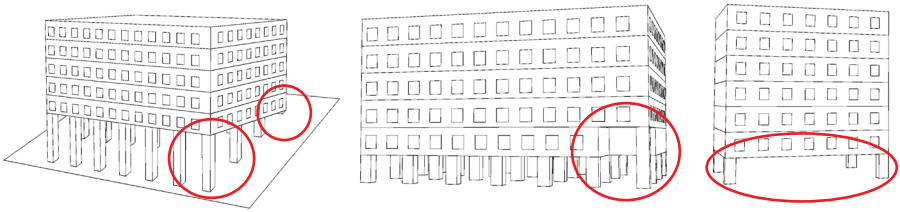

Figure 13: Soft storeys

10.3 Reinforced concrete frame construction

Reinforced concrete-frame buildings have horizontal beams and vertical columns in rectangular bays.

In this type of building look for (Figure 14):

- columns out of plumb or storey leaning
- diagonal shear failure of columns
- buckling of column reinforcement
- diagonal cracking of beam-column joints
- cracking and spalling of end regions of beams
- tearing of floor diaphragms adjacent to hinging beams
- racking of cladding
- cracked infill walls.

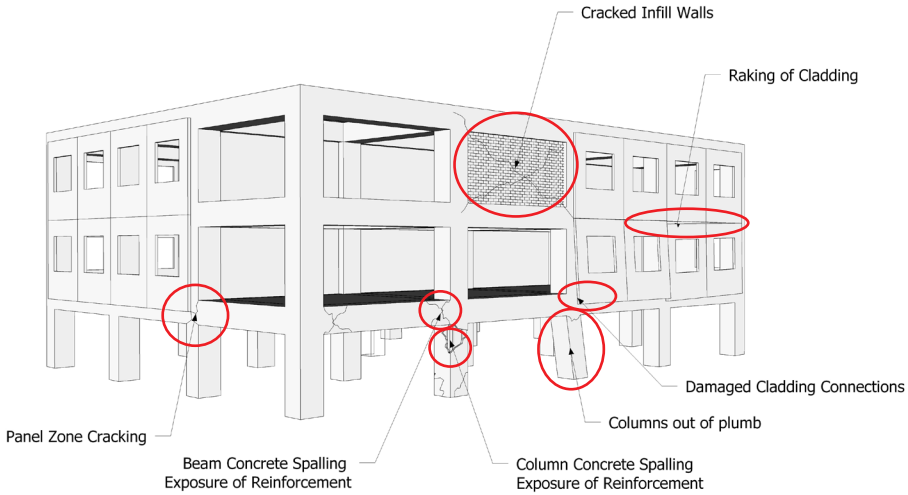

Figure 14: Typical damage areas in reinforced concrete-frame structures

Figure 15: Column hinging top and bottom (left); Top of column hinging failure above suspended ceiling (top); Columns out-of plumb (bottom)

Figure 16: Weak column-strong beam frame collapse (left); Column flexural hinging with concrete crushing and reinforcing steel fracture (centre); Falling hazard from partially detached wall cladding panel (right)

Undesirable behaviour in weak column-strong beams may lead to the collapse of concrete frames. Reinforcing steel may fracture in hinge zones of concrete columns (Figure 16). Wall-cladding panels may detach from structures, particularly at roof level, causing an overhead falling hazard.

10.4 Precast concrete tilt-up structures

Concrete "tilt-slab" buildings have a slab-on-grade concrete floor on which reinforced concrete walls are cast (or poured offsite) and then tilted up and connected to a steel or timber-frame roof structure. Cast-in-place concrete pilaster columns are often placed between wall panels to support the larger roof members.

In this type of building look for (Figure 17):

- fracture or pullout of bolts connecting wall panels to roof structure
- spalling of exterior panel face at cast-in bolt connections
- horizontal cracks at mid-height of wall panels
- outward leaning panels
- wall separation from roof diaphragm
- separation of framing in diaphragm
- diaphragm chord failure in tension.

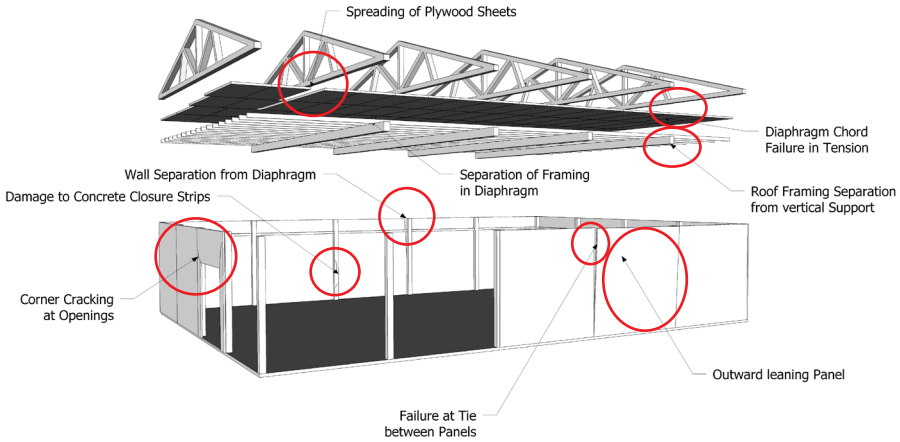

Figure 17: Typical damage areas in reinforced tilt-up slab structures

10.5 Suspended concrete floors

Suspended concrete floors not only support gravity loads, but also act as horizontal diaphragms connecting lateral load-resisting elements such as shear walls and bracing frames.

Cast insitu concrete floors are typical of older structures. While these floors are typically relatively robust, frameless flat slabs have considerable vulnerability to punching shear failure. On insitu concrete floors look out for:

- punching shear failure at columns
- tearing between floor slab and concrete frames.

Precast concrete floors are typical of buildings constructed from the 1980's onwards. Relatively minor damage to these floors can pose a significant hazard due to the lack of redundancy in the load paths. Areas to look out for include:

- any precast unit running parallel and directly adjacent to a frame, or a wall element
- horizontal cracks across the width of the flange on prestressed double-tee units
- tearing at the end seating of prestressed double-tee units
- horizontal cracks running along webs of prestressed hollowcore units
- horizontal cracks running across the width of prestressed hollowcore units (typically within 300-600mm of the end support)
- diagonal flexure-shear cracks in the webs of prestressed hollowcore units
- horizontal cracks through prestressed ribs (particularly at ends of units)
- tearing between floor slab and concrete frames.

Composite concrete floors cast on steel decking are more typical of buildings constructed from the 1990's onwards. These floor systems are typically supported on steel beams and are relatively robust. Look out for tearing between floor slab and frames.

Portions of buildings may be deliberately separated structurally at movement joints that can open up during an earthquake (Figure 18 left). Earthquake design actions transfer through the floor slabs and can lead to their damage, particularly at sharp changes in their shape (Figure 18 centre). At the ends of shear walls, damage may occur in the floor slab or beams connecting them to adjacent walls (Figure 18 right).

Figure 18: Structural movement joint in suspended slab (left); Floor diaphragm damage (centre); Punching shear failure in suspended slab at end of shear wall (right)

10.6 Steel frame structures

Steel structures typically consist of moment-resisting frames, or braced frames to resist lateral loads.

In steel moment-resisting frame structures look for:

- columns out of plumb or storey leaning
- buckling of columns
- buckling of column flanges
- buckling or yielding of beam-column joints
- yielding of end regions of beams (typically observed by flaking of paint)
- tearing of floor diaphragms adjacent to hinging beams
- racking of cladding
- cracked infill walls.

In steel-braced frame structures look for:

- fracture or buckling of braces
- fracture of bolts or welds at brace connections
- yielding or tearing of active links (beams) between braces in EBF's
- buckling of columns.

Figure 19 and Figure 20 show typical damage areas in light-weight and standard steel frame structures.

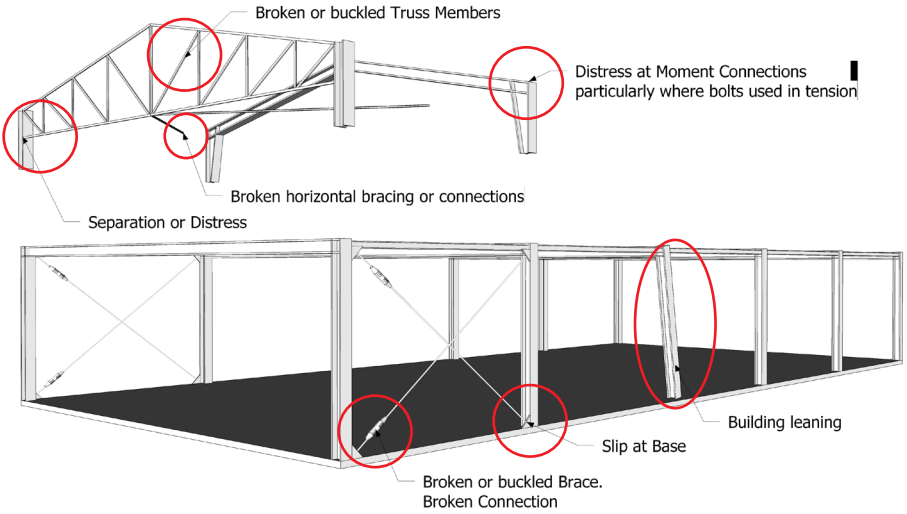

Figure 19: Typical damage areas in light-weight steel structures

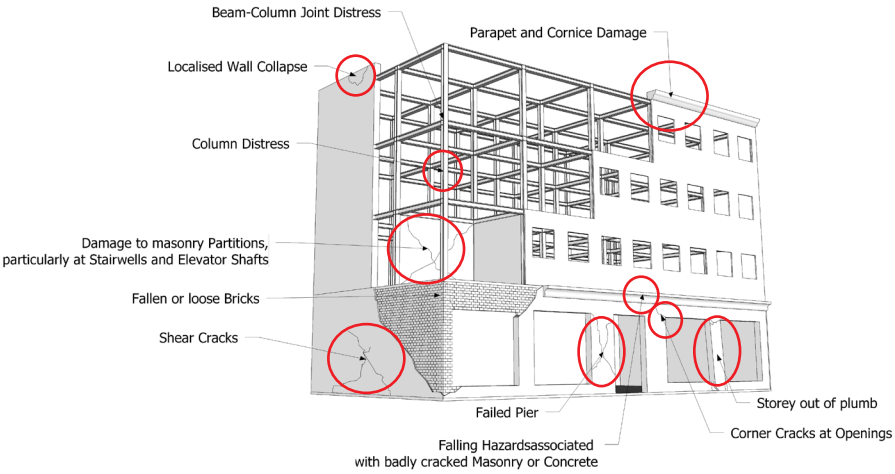

Figure 20: Typical damage areas in steel structures

Welds between steel roof members and concrete supports are often field-welded and can be susceptible to fracture if they are too small or the quality of welding is not adequate (Figure 21, left).

As columns in steel frames flex, their base plates can deform and lift from their pads, stretching the holding down bolts (Figure 21, centre). Connection cleats of bracing members can flex and fracture (Figure 21, right).

Figure 21: Weld failure of rafter attachment to concrete support (left); Base plate deformation (centre); Steel bracing cleat fracture (right)

10.7 Unreinforced masonry (URM) structures

Unreinforced masonry structures typically comprise brick or stone masonry bearing walls, supporting timber floors. Failure is typically the result of out-of-plane failures of the masonry walls, although many URM structures also have a soft storey at ground floor level.

In unreinforced masonry structures look for:

- horizontal cracks along base of parapets
- faceload failure of masonry walls between floor levels
- walls or storey leaning
- separation of floor or roof diaphragms from masonry walls
- pullout of anchor bolts securing masonry walls to timber floors or roof
- diagonal shear failure of masonry piers
- collapsed chimneys.

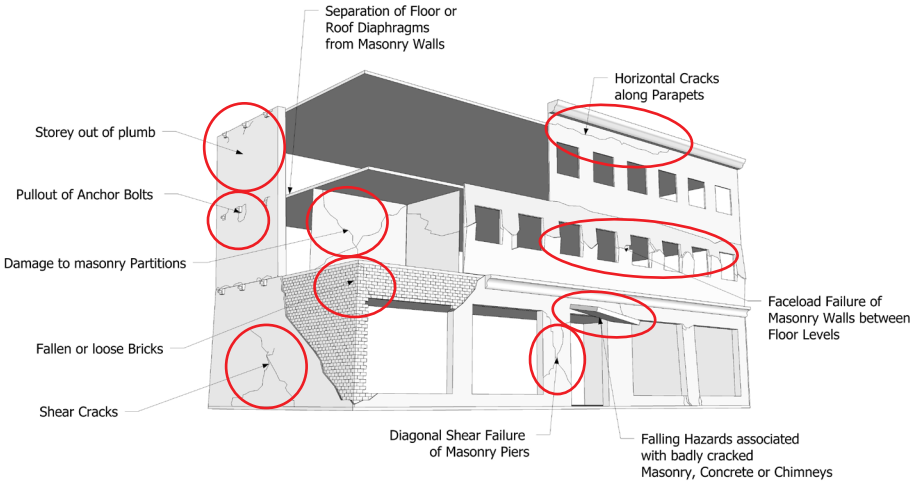

Figure 22: Typical damage areas in unreinforced masonry structures

11 GEOTECHNICAL HAZARDS

Geotechnical conditions such as large settlements, lateral spreading of soil, and liquefaction can severely damage structures including those otherwise resistant to ground shaking. Some typical hazards are shown in Figure 23.

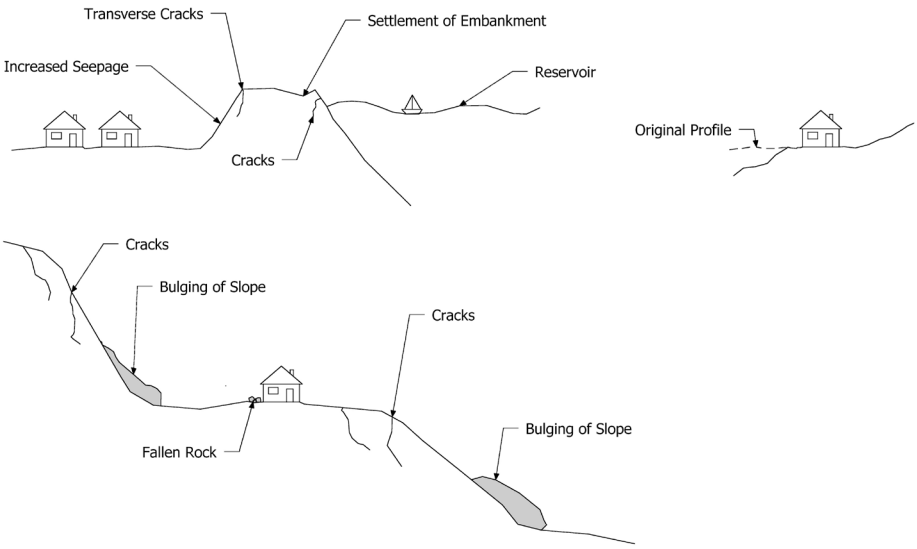

Figure 23: Inspection points for some geotechnical hazards; Top left: Potential slope failure, Top right: Loss of foundation support, Bottom: Unsafe area

Be aware that geotechnical hazards can extend over an area of several buildings or more. Typical indications of damage are:

- fissures
- bulged ground
- vertical ground movement
- rockfall or debris.

In hillside areas, examine the area for landslide displacement or debris encroaching onto the site.

In some cases, geotechnical evaluation can only be undertaken by qualified geotechnical specialists.

12 NON-STRUCTURAL HAZARDS

Non-structural hazards do not generally affect the whole building. They would require a "RESTRICTED ACCESS" placarding with designated unusable zones within the building. These areas should generally be barricaded to prevent entry.

However, where the safety risk is severe and widespread, an "ENTRY PROHIBITED" placarding of the whole building may be warranted.

The following table (Table 5) lists a number of typical non-structural hazards that the building assessor needs to inspect.

Table 5: Typical non-structural hazards

Item	Observation
Parapets, ornamentation and appendages	
	Partially dislodged masonry parapets
	Masonry parapets with cracking (no evidence of reinforcement)
	Concrete parapets with major spalling or severe lean
	Ornamentation/cornice/signs/mansards with support distress or partial dislodgement
	Fallen or damaged veneer or roof tiles
	Damaged or leaning unreinforced chimney
Canopies	
	Partial collapse or lean of canopy
	Failure or incipient failure of support for canopy, awning or marquee
Cladding	
	Falling hazards from damaged glazing
	Broken or damaged cladding

Item	Observation
	Walls with some fallen panels
Ceilings and light fixtures	
	Collapse, partial collapse, or incipient collapse of ceiling
	Pendant fluorescent light fixtures with damaged stems
	Area with some fallen light fixtures or possible falling hazard
Interior walls, partitions, and glazing	
	Collapsed, partially collapsed, or severely cracked partitions
	Cracked masonry or tile partitions (no evidence of reinforcement)
	Demountable partitions separated from supports
	Possible falling glass hazard
Mechanical and electrical equipment	
	Overturning or sliding of gas- or fuel-oil-fired equipment
	Gas or fuel line break or leak
	Broken exhaust pipe
	Overhead piping and ducts with failed supports
	Other mechanical and electrical equipment falling hazard present
Elevators	
	Elevator with protective switch tripped
	Counterweights out of guides
	Damaged guiding member
	Damaged guide rails or brackets
	Equipment anchorage failure

Item	Observation
	Cables out of sheaves
	Door damage
Other	
	Spill of known or suspected dangerous materials
	Leakage of unknown substance from tank, pressure vessel, or piping
	Reticulated services
	Onsite waste disposal systems such as septic tanks
	Friable asbestos release
	Fire protection or detection equipment inoperable
	Solid fuel burners (consider fire hazards)
	Fallen electric lines
	Unsafe condition at stairways, exit ways, or inoperable exit door (placard all the building unusable if all exits are blocked or otherwise unusable)
	Raised access floor with potential for collapse

13 ESSENTIAL FACILITIES

Essential facilities are those facilities most needed by a community after a disaster. Examples include:

- hospitals
- health care facilities
- police and fire stations
- jails and detention centres
- communication centres
- emergency operation centres
- buildings designated for welfare centres.

All essential facilities should be given a Rapid Level 2 Assessment as a priority. It is the owner's responsibility to also undertake a Detailed Damage Evaluation by structural engineers as soon as possible.

All critical, fixed equipment should be checked by appropriate specialist/maintenance personnel because essential facilities must be operational (rather than only usable). Refer to Table 6[1]. Fire protection and elevator systems should be examined by appropriate specialists.

[1] Checklist based on ATC 20-1 field guide

Table 6: Essential facility equipment checklist

Item	Principle concerns
Main boilers	Sliding, broken glass or fuel lines, broken exhaust lines, broken or bent steam and relief lines
Chillers	Sliding, loss of function, leaking refrigerant
Emergency generators	Failed vibration insulation mounts; sliding; broken fuel, cooling, signal, and power lines, leading to loss of function; broken exhaust lines
Fuel tanks	Sliding or overturning, leaks, broken fuel lines
Battery racks	Damaged rack, dislodged batteries, acid spill
Fire pumps	Anchorage failure, misalignment between pump and motor, broken or cracked piping
Fire suppression systems	Inoperable sprinklers and/or inert gas systems
Onsite water storage	Tank or vessel rupture, pipe break
Communications equipment	Sliding, overturning, or toppling, leading to loss of function
Main transformers	Sliding, oil leak, loss of function
Main electrical panels	Sliding or overturning, broken or damaged conduit or electrical bus
Elevators (traction)	Counterweight out of guide rails, cable out of sheaves, dislodged equipment
Other fixed equipment	Sliding or overturning, leading to loss of function (or damage to adjacent equipment)
Special concerns for hospitals and other healthcare facilities	
Radiation equipment	Breach of containment, cobalt contamination
Toxic chemical storage	Spill, fumes in ventilation system
Liquid oxygen tanks	Sliding or overturning, leaks, broken lines
Medical gases	Leaks, broken storage vessels
Air handling units	Leaks, contamination risks

14 RESOURCES REQUIRED IN THE FIELD

Supplied by the TA during the briefing for Building Assessors:

- ☐ Briefing sheets with all necessary information, such as reporting requirements, contact points, communications arrangements
- ☐ Information handouts for occupants – including information on referrals to support agencies
- ☐ Official identification or authorisation – secure clip-on badges, lanyard or similar
- ☐ Forms for Residential and Rapid Level 1 and 2 Building Assessments
- ☐ Placards and duct tape
- ☐ Office supplies
  - A4 foldable clip boards inside plastic bag to protect forms protected from the environment
  - Pens
  - Indelible marker pens – use thin-tip permanent markers for writing placards,
  - Stapler and staples to attached sketches to assessment forms
  - Thumb tacks or plastic sleeves for placards
  - Scissors
  - USB data sticks
- ☐ Security cordoning or barrier tape
- ☐ Street maps
- ☐ Aerial photographs and building-specific information
- ☐ A database for recording information about assessing buildings
- ☐ Communication radios
- ☐ Food

Previously supplied by the TA (assessor needs to bring these):

- ☐ Usability Rapid Building Assessment Field Guide
  (This A5 booklet handed out during training)

Supplied by the assessor:

- ☐ Proof of identity such as organisational ID card or drivers licence
- ☐ Hard hat, high visibility vest, steel-capped boots or shoes
- ☐ Other personal protective clothing such as gloves, dust masks, wet weather gear
- ☐ Mobile phone and charger
- ☐ Electronic camera
- ☐ Torch and batteries
- ☐ Tape measures and claw hammer
- ☐ Binoculars
- ☐ GPS
- ☐ First aid kit
- ☐ Laptop or tablet (if required)
- ☐ Travel pack with sleeping bag, warm clothes, rain jacket, toothbrush and so on.

15 DEALING WITH PEOPLE

15.1 Working in a team

Working in a post-disaster environment will inevitably create tense situations. As conflict is natural especially when tired, overworked and stressed, it has to be viewed as essentially normal.

It is important that the roles within the team are clear from the start. The teams must agree on each team member's responsibility before being deployed in the field. Consider using a checklist to make sure that the various tasks are covered. Typical tasks include:

- assessing various building aspects (Note that for safety reasons assessors should stay together as far as possible, rather than split up. Refer to Section 7.1 "Level 1 process" on page 48.)
- filling out the assessment form
- posting the placards
- placing barrier tape
- taking photos
- communicating with owners or occupants who are present
- entering the building into the register and filing the assessment forms
- communicating with the building owner or occupant if present including leaving information sheets with the owner or occupant or in the letter box
- ensuring that there are enough forms available
- communicating with the emergency operations centre.

If team conflicts arise, these tips[2] may help to resolve them quickly and constructively.

[2] http://www.techrepublic.com/blog/10-things/10-tips-and-tactics-for-dealing-with-conflict

1. Ask questions

Conflict can arise from poor communication – someone didn't say what they meant to say or perhaps misstated what was intended. Before you allow an escalation, ask questions. It won't cause any loss of face, and may bring a quick resolution.

2. Analyse expectations

Conflicts may develop as a result of unmet expectations on one side. If the other party expected something they didn't get or something that didn't happen, the whole conversation can become negative and closed. If a conversation seems to be getting rocky, take a step back and review it with the other person to try to uncover what just occurred.

3. Recognise differing perspectives

Keep in mind that conflict may arise due to people having different perceptions. You, or the other person, saw things differently. This can happen when someone comes from another organisation, background, or culture. It's easy to believe that we all see things the same way and then get derailed unexpectedly.

4. Identify mistakes

Honest and unintended mistakes may result in conflict. Before you let temperatures rise, do a reality check of your understanding with the other person(s). Mistakes, even small ones, can erode credibility – someone made a mistake.

5. Watch out for emotional triggers

Beware of emotions. Fear of someone or somebody, loss of face, whether real or perceived, anger, and surprisingly even excitement can all result in unintended conflict. Your interaction can go downhill.

6. Focus on preventing escalation

Conflict resolutions start with one or both parties making an honest attempt to avoid escalation. Even one person recognising this can bring about an objective review.

7. Take action to control the situation

Escalation-avoidance tactics may involve one or more key steps, including separating the parties, changing the location of the discussion, and signalling empathy to the other involved.

8. Commit to working it out

Take charge of the process by committing to working it out. A powerful impact occurs when one person makes a statement about working out. It can turn down the temperature immediately.

9. De-escalate the conflict

Make a joint statement of the facts at hand, always eliminating exaggerations, embellishments or personalities, which may inadvertently apply judgments and re-create the cycle of escalation.

10. Stay calm

Cooler heads prevail in the most difficult conflicts. Whether you're in a business or personal situation, you can take control of it by keeping calm. And when you're keeping calm, it will be easier for others involved to get back to the task at hand.

15.2 Dealing with affected building owners and occupants

Try not to communicate directly with the building owner or occupant. It can be time-consuming, lead to misunderstandings and distract from your objective to conduct assessments. The territorial authority will provide consumer-friendly information sheets that will answer common questions about placarding and what to do next, and give important emergency support contacts. Information sheets should be left on site (in the letter box for example) or handed to the owner or occupant if present.

If talking to the building occupants is unavoidable, clearly explain the purpose of the placarding, the implications for building owners, and the process for changing the status of placards. Explain possible disaster damage scenarios to building owners. Explain what this means about the building's safety or about health issues around insanitary building conditions and tell them what to do.

Affected building owners and occupants are usually in a state of distress and uncertainty. They may have lost family members or friends. Losing access to their home or business will add significant pressure. Stay rational in your decisions, while showing empathy when communicating with affected people. An effective way to split roles in your team is for one of you to focus on the technical assessment while the other deals with the people involved.

Make sure that you follow the allocated assessment schedule and do not yield to public pressure to reprioritise the order of buildings to be assessed.

As potential first point-of-contact, you may need to refer building occupants to a range of services. The Emergency Operations Centre should have provided you with communication material such as handouts that provide information on services, including:

- food and water supply
- social wellbeing and medical services
- welfare centres and contact for alternative accommodation
- sanitary facilities and requirements, and
- contact details for a call centre to answer further queries.

15.3 Dealing with emergencies

If there are immediate serious dangers to health and life of the public and no appropriate help is available (Urban Search and Rescue, NZ Fire Service, Police, etc.) you may manage the danger situation and also provide first aid if required.

Always put your own safety first.

15.4 Dealing with the media

Building assessors should not give any information to the media. If they approach you, refer them to the Media Liaison Person or a call centre, if one is set up.

16 SIMPLE FIRST AID PROCEDURES

You may come across seriously injured people during your assessment. If no other help is around, you may need to give emergency first aid. You must ensure your own safety before you attend to an injured person.

Building assessors always work in teams. While one team member attends to the injured person, the other should look for help.

16.1 Bleeding

16.1.1 Deep cuts

Deep cuts in the veins produce dark blood that seeps out slowly and steadily. It can be stopped by pressing gently on the wound with a sterile or clean cloth, then applying a clean or sterile bandage.

These wounds may need sewing or glueing, so medical treatment will be necessary after first aid.

16.1.2 Arterial bleeding

Bleeding from an artery can cause death in a few minutes, so urgent first aid is essential. This type of bleeding pulsates and squirts blood as the pulse beats. The blood is often a light red colour.

Arterial bleeding must always be treated by a doctor. To manage bleeding from an artery:

- apply hard pressure on the wound, and keep this up until the patient receives medical treatment
- press with a sterile cloth or just use your hand, if nothing else is available
- put a bandage on the wound if possible – if the blood soaks through the bandage, press harder until bleeding stops
- do not remove the soaked bandages, but place another on top if necessary
- do not attempt to clean the wound.

Make the person lie down, preferably with their head lower than the rest of their body. This will help oxygen get to the brain.

If possible, position the wounded area higher than the rest of their body – to reduce the pressure, and therefore the bleeding.

16.2 Shock

Shock occurs when too little blood circulates to the brain. This means that the brain is not getting enough oxygen, which leads to a feeling of faintness, disorientation and dizziness.

Shock may occur after accidents that cause loss of fluids or blood, or after serious burns.

When the flow of blood in the body is too slow, blood pressure drops and too little oxygen circulates through the body. A person in shock may:

- go pale
- turn sweaty, clammy and cold
- become dizzy
- become anxious or restless
- have a weak, fast pulse
- have low blood pressure
- have slow, weak breathing
- lose consciousness.

What to do if someone is in shock?

1. Lie the person on their back with their feet raised – to help the blood get to the brain.
2. Keep the person warm, comfortable and covered by a blanket if possible.
3. Do not give them anything to drink, because they could choke or may need surgery.
4. If the person vomits or bleeds from the mouth, place them on their side to prevent choking.
5. A person in shock must always be treated by a doctor.

16.3 Breathing difficulties

If someone stops breathing, talk to them or touch them on the shoulder to see if they respond.

In adults, the problem is usually the heart rather than the lungs, so cardiac compressions come first and rescue breaths second.

Do not waste time checking for a pulse, if the patient does not respond.

Cardiac Compressions

1. Place the heel of your hand in the middle of the chest above the breasts, that is the middle of the lower half of the breastbone (not over the ribs or stomach).
2. Place the heel of your other hand on top of the first. Keep your fingers off the chest by locking them together. Apply pressure through the heels of your hands.
3. Keep your elbows straight, and bring your body weight over your hands to make it easier to press down.
4. Press down firmly and quickly with a downwards movement of 4 to 5cm, then relax and repeat the compression.
5. Do this about 100 times a minute (CPR is fast and hard work – you can help your timing and counting by saying out loud 'one and two and three and four…' and so on)
6. Do this 30 times.

Breathing

7. Now open the airway by positioning the head with the chin pointing upward.
8. Pinch the nostrils shut with two fingers to prevent air leaking out.
9. Take a normal breath, and seal your own mouth over the person's mouth, making sure there's a good seal.
10. Breathe slowly into the person's mouth – it takes about two seconds to inflate the chest.
11. Do this twice.
12. Check to see if the chest rises as you breathe into the patient's mouth.
13. If it does, enough air is going in.
14. If there's resistance, try to hold the head back further and lift the chin again.

Repeat

15. Continue with 30 chest compression, then two rescue breaths – and only stop if the victim starts to breath.
16. If you are able to continue do not stop for any other reason, until someone else can take over from you. If possible switch with another person every couple of minutes, without interrupting compressions. If there are two rescuers: one can do breaths and the other compressions.

17 SAMPLE MEMORANDUM OF UNDERSTANDING (MOU) FOR ASSESSORS

Memorandum of Understanding for engineers, geologists and architects volunteering to assist territorial authorities in a state of emergency of transition period.

The purpose of this form is to provide standard agreement conditions for building assessor volunteers to assess the usability of buildings during a state of emergency or transition period. An example of an MOU is provided below.

A The parties Between (name of the CDEM Controller or delegate/or Building Response Manager) And (name of person engaged and their qualifications) Situation Location
B Scope and nature of services i) Rapid Assessment of buildings' usability in the interests of public safety per the MBIE guidelines ii) Or specify below
C Duration of Services Start date until date; or for the maximum period of three days

D Information or Services to be provided by the Territorial Authority

i) The TA will provide the Engineer or Registered Architect with the means of identification to authorise them to undertake this work or they will use the MBIE issued identification as an authorised rapid building assessor

ii) The TA will ensure the Engineer or Registered Architect is provided with appropriate safety equipment and will be supported by at least one other person in the field

iii) The TA will ensure that Engineer or Registered Architect is provided with the standard assessment forms and placards as required

iv) The TA will have procedures in place for tracking deployed Engineers or Registered Architects

v) The TA will ensure that the Engineer or Registered Architect is briefed by the rapid building assessment team before deployment as to the procedures in place

vi) The TA will ensure building owners are advised that detailed damage evaluations are to be subsequently and separately arranged by owners

E Information or Actions binding on the Engineer or Registered Architect

i) The Engineer or Registered Architect will follow the instructions of the Civil Defence Controller or their delegate such as the rapid Building Assessment Manager or Emergency Services personnel or in event of no declared emergency the nominated Building Response Manager

ii) The Engineer or Registered Architect verifies that the qualifications stated in G below and in relation to the prior training are correct

iii) The Engineer or Registered Architect will not operate outside their field of expertise unless under the supervision of another suitably qualified Engineer or Registered Architect

iv) The Engineer or Registered Architect will not pass judgement on any facility which is known to be covered by a priority response agreement unless this is specified under B above

v) The Engineer or Registered Architect will not release confidential information received in the execution of these duties to any other party or for any other purpose save for the Rapid building safety assessment for this event

vi) The Engineer or Registered Architect will not talk to the media or make any public statement unless authorised to do so during or after the work

F Special Conditions (Additional conditions if any to be specified here)

G Prior training

This Engineer or Registered Architect confirms they have attended prior training sessions on post disaster building assessment procedures

Yes/No if Yes specify date of course

H Signed By:

For TA on behalf of the Controller or delegate or Building Response Manager	For Engineer or Registered Architect
Name	Name
Signature	Signature
Date	Date
	Registration #

NOTES TO MEMORANDUM OF UNDERSTANDING

1. The territorial authority and the Engineer or Registered Architect agree that the services are required during a declared state of local or national Emergency or there is a situation which requires rapid building assessment. The legislative base for a declared event is the Civil Defence Emergency Management Act 2002. This agreement relates only to the special case for procuring rapid assessments of usability of structures in the context of public safety or there is a situation which requires rapid building assessment of usability but a State of Emergency is not declared.
2. This Agreement is for provision of engineering or architectural services to a territorial authority for the purpose of assisting in assessment of usability of structures. It does not apply to those personnel working for an Urban Search and Rescue Task Force, or other rescue team.
3. It is understood by both parties that these Services are provided in a voluntary capacity for the duration as specified above, under conditions of a state of emergency or an undeclared event which requires requires rapid building assessment. There will be no remuneration for this work. Expenses incurred for travel and accommodation will be met by the territorial authority.
4. Should work proceed beyond the duration indicated or for purposes other than emergency response, a commercial contract will be signed.
5. The Engineer or Registered Architect shall perform services for assessment of usability of structures in accordance with Rapid Building Assessment Guidelines as produced by MBIE. No other services shall be supplied without express instructions from the territorial authority.

6. In providing the services, the Engineer or Registered Architect shall exercise skill, care and diligence expected of a competent professional. The Engineer or Registered Architect should advise the territorial authority of any training or knowledge they have of the building assessment system as in (5) above.

7. The territorial authority shall assist in providing to the Engineer or Registered Architect the co-operation of other emergency management personnel and equip him/her as appropriate. This includes providing identification and safety equipment, and providing induction in the territorial authority's emergency procedures, as in (D).

8. The territorial authority will ensure that the Engineer or Registered Architect is accompanied by another person (not necessarily an engineer) and that communication and tracking procedures are explained and accepted by the Engineer or Registered Architect and his/her accompanying person(s).

9. The Engineer or Registered Architect undertaking these tasks is aware of the special safety issues associated with entering or approaching the buildings or other structures.

10. The territorial authority shall provide to the Engineer or Registered Architect, any information in its power to obtain which may relate to the services.

11. Neither the Engineer or Registered Architect nor territorial authority will be liable for operating without full information, where it would be impractical to obtain it within the time frame necessary to complete the assessment.

12. The Engineer or Registered Architect is protected from liability under Section 110 of the Civil Defence Emergency Management Act 2002 in respect of his or her services carried out under the direction of the CDEM Controller, including liability for Health and Safety or will be indemnified by the territorial authority in the case of a non-declared event.

13. The Engineer or Registered Architect shall not be considered liable for any loss or damage resulting from any occurrence during the period where the services are undertaken under the direction of the CDEM Controller or delegate or the Building Response Manager for the territorial authority in an undeclared event.

14. The Engineer or Registered Architect will not assume any obligation as the "Client's Agent" or otherwise pursuant to the Health and Safety in Employment Act arising out of this engagement. The territorial authority will be the person who controls the place of work. The Engineer or Registered Architect will act in a considered manner regarding his/her own safety in any area which is, by measure of the emergency situation, a hazardous area.
15. The provisions of the Consumer Guarantees Act 1993 do not apply.
16. Either party may suspend all or part of the services by notice to the other party. It is understood that these services are undertaken under emergency conditions and circumstances as to the Engineer's or Registered Architect's availability, the nature of the situation or the requirements of the controlling authority, may change.
17. This Agreement is governed by New Zealand law; the New Zealand courts have jurisdiction in respect of this Agreement.

18 REFERENCES

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http://www.techrepublic.com/blog/10-things/10-tips-and-tactics-for-dealing-with-conflict (Health and safety tips)

http://www.netdoctor.co.uk/health_advice/facts/firstaid.htm (First Aid Procedures)

19 CONTACTS

You will receive a list of contact details at the daily briefing. Remember to take the list with you.