

## Understanding Rubble Ring Foundations

A ring foundation is residential foundation style common in New Zealand. Contemporary ring foundations are made with aggregate and certified cement products. In Canterbury up until the late 1960s, however, rubble was used instead of aggregate, and the cement product was mixed grade, inconsistent, often mixed on site by builders or the homeowners themselves.

'Rubble' is fragments of stone and brick, and includes all sorts of debris found on a building site. When constructing a ring foundation, rubble was placed inside the ring foundation's boxing. Next, a non-certified, variable-standard cement product was poured into the boxing, binding the rubble together. After the boxing was removed, a plaster finish was applied to the exterior of the foundation. Not only did the plaster add an aesthetic finish, it strengthened the ring foundation as the plaster permeated into the rubble cement mix (refer Figure 1).

The purpose of a constructed foundation is to support the load of the superstructure built on top of it -- your home. A foundation's effectiveness is related to its tensile strength. Tensile strength is the measure of the force which can be applied to something before it breaks. "The ability to resist breaking under tensile stress is one of the most important and widely measured properties of materials used in structural applications." (Corrosionpedia, 2018).

Earthquakes are among the most powerful natural forces that can disrupt our lives and our homes. The vibrations of an earthquake, called seismic waves, travel outwards in all directions (University of California, 1995). Ground shaking is the result of the rapid ground acceleration and is the primary way an earthquake affects buildings (Seismic Resilience, n.d.). Ground shaking places rubble ring foundations under a level of stress which often results damage to the foundation. This is because rubble ring foundations generally perform poorly in earthquakes. They often have low tensile strength because of the method of construction and the products used.

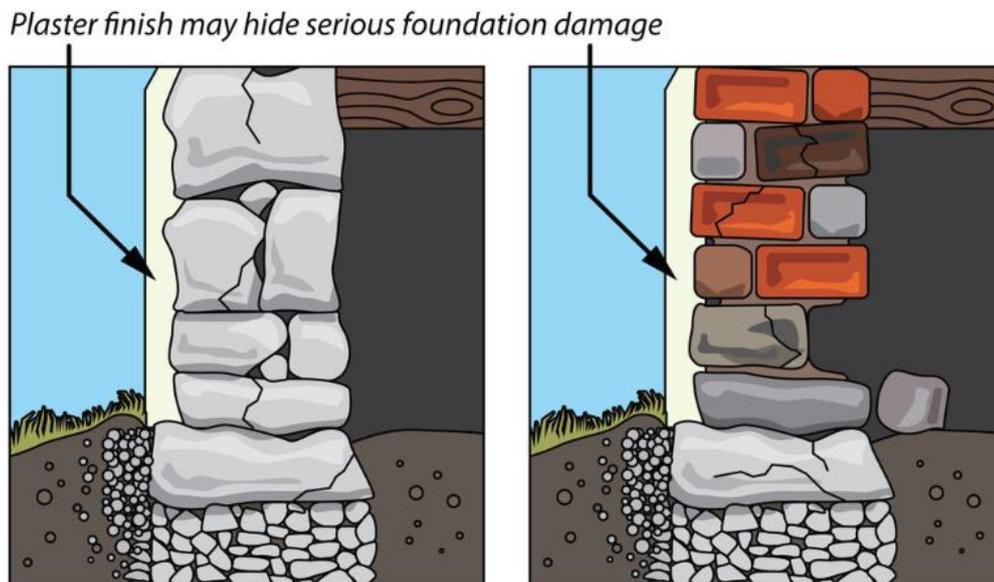


Figure 1 Concept drawing of a rubble ring foundation – not an accurate representation

### ABOUT

Bevan Craig, founder of Underfoot Services, is a Licensed Building Practitioner (LBP) with a Foundations 2 area of practice licence covering concrete and timber pile foundations. Having worked in the field for more than 20 years, he has specific expertise in the assessment and remediation of failed foundation structures.

Working closely with key consultants and members of the EQC, Underfoot Services first identified the issue of river tailings affected by earthquake ground movement. At the time, Bevan was contracted by the EQC to complete the forensic work about river tailing under slabs and how they are affected by ground movement.

## Forensic Rubble Ring Foundation Reports

Many homeowners are overwhelmed and in shock following a major disaster such as an earthquake. Reinstatement standards, the Earthquake Commission Act 1993 (the Act), insurance policy standards, damage assessments, scopes, and repair strategies are concepts that are foreign and stressful. It is not uncommon for homeowners to 'allow the insurance process to happen to them'. Our experience has shown that homeowners who actively participate in the process of identifying earthquake damage, through funding their own reports, tend to be better able to navigate complex and new processes relating to 'proving loss'.

### Start with the Foundation

Understanding the foundation your home is sitting on, and what has happened to it, is a key first step to prove loss. With a rubble ring foundation, if it is damaged and not able to be reinstated to the standard of the Act or your insurance policy, then it is highly likely that some or all of it will need to be replaced. And if a foundation needs to be repaired or replaced, it is a trigger for a series of other reports, designs and decisions, for example, what type of foundation needs to be constructed to meet the Building Code and land type. Proving the damage to the foundation is one of the most important first steps you can take. If the EQC and the private insurers apply the Act and your insurance policy, a report proving foundation damage should sufficiently meet the criteria<sup>1</sup>.

What Do You Get?	The Benefits
<p>Based on the type of report, you will get some, or all, of the following:</p> <ul style="list-style-type: none"><li>• Site Investigation and testing</li><li>• Drawings</li><li>• Compilation of findings</li><li>• Analysis of historical data</li><li>• Analysis of underfloor imagery</li><li>• Peer review</li></ul>	<ul style="list-style-type: none"><li>• Solid evidence about your home's foundation.</li><li>• Knowledge of the state of your home's foundation, enabling you to make informed decisions, such as future insurance risk.</li></ul>

### Hints

1. If you are an **owner at the time of the event**, an Underfoot Services Forensic Assessment can give the EQC clarity if they missed earthquake damage on your home's foundation, or if they provided you with an inadequate repair strategy. Our report can help the EQC and your insurance specialist work out the next steps for you, which may include geotechnical reports, structural-engineering reports, consents and so forth.
2. If you are a **subsequent owner** of an EQC-repaired or cash-settled home and you believe the EQC missed some earthquake damage, an Underfoot Services Forensic Assessment of your foundation can help your insurance specialist progress your claim with the EQC and advise which pathways are available to you.
3. If you own a home with a rubble foundation, it is considered a best practice to have a report on the foundation. This will help you future-proof your investment against insurance risk.
4. If an Underfoot Services Forensic Assessment of your foundation shows that your foundation has substantially failed due to earthquake damage, it is reasonable for you to enter discussions with your insurance specialist to be reimbursed by the EQC for the cost of the report.

<sup>1</sup> Underfoot Services cannot be liable if the EQC or an insurer require additional reporting from homeowners. Their decisions are not something we can control in any way. We recommend you seek independent advice.