Section 3: Methodology

3.1 Establishment of the Canterbury Earthquakes Royal Commission

The Royal Commission of Inquiry into Building Failure Caused by the Canterbury Earthquakes was formally constituted on 11 April 2011. Its appointment was notified in the *New Zealand Gazette* on 14 April. A sitting High Court judge, Justice Mark Cooper, was appointed to be the chairperson of the Commission. A month later two other Commissioners, eminent engineers Sir Ron Carter and Professor Richard Fenwick, were appointed and the Terms of Reference were finalised. The Commissioners met for the first time in Christchurch on 4 May 2011.

Later that month, in consultation with Justice Cooper, the Solicitor-General appointed Mr Stephen Mills QC and Mr Mark Zarifeh as counsel assisting the Royal Commission. At the request of some bereaved families for government-funded legal representation, a third counsel, Mr Marcus Elliott, was appointed in August 2011. Mr Elliott was appointed as counsel assisting the Commission, but with a particular focus on representing the interests of bereaved families and those who were injured.

Executive Director Ms Justine Gilliland was appointed at the end of April. A Royal Commission office was established in Christchurch staffed with a project manager, an administration and information management team, legal analysts, policy analysts, a senior communications advisor, a family and community liaison officer, a structural engineer and hearings staff.

3.2 Terms of Reference

The full Terms of Reference are included in Appendix 1. The following is an overview of their requirements and discusses matters which emerged and required specific attention.

The Royal Commission's Terms of Reference were wide ranging and required the Royal Commission to investigate two major areas:

1. Buildings in the Christchurch central business district (CBD), an area bounded by the four avenues (Fitzgerald, Deans, Moorhouse and Bealey) and Harper Avenue. While the Commission's principal focus was on the effects of the Canterbury earthquakes, the Royal Commission was also required to consider the wider implications of these events for the rest of the country. In considering the effects in the Christchurch CBD, the Royal Commission was required to look specifically at what factors led some buildings to fail severely, why the failure of buildings caused extensive injury and death, and why buildings differed in the extent to which they failed and caused injury or death. That meant looking at, among other things, the characteristics of buildings that may have led to failure (for example, age, location, and whether buildings conformed to earthquake risk best-practice). The Royal Commission was required to include the Canterbury Television (CTV) building, the Pyne Gould Corporation (PGC) building, the Forsyth Barr building and the Hotel Grand Chancellor building, but was otherwise left to decide which buildings it should investigate.
2. The adequacy of current legal and best-practice requirements for the design, construction and maintenance of buildings in central business districts in New Zealand.

The Terms of Reference required the Royal Commission to make both interim and final recommendations upon or for—

(a) any measures necessary or desirable to prevent or minimise the failure of buildings in New Zealand due to earthquakes likely to occur during the lifetime of those buildings; and

(b) the cost of those measures; and

(c) the adequacy of legal and best-practice requirements for building design, construction, and maintenance insofar as those requirements apply to managing risks of building failure caused by earthquakes:

The Terms of Reference also contained specific exclusions. The Royal Commission was not permitted to inquire into, determine, or report in an interim or final way upon:

(a) whether any questions of liability arise; and

(b) matters for which the Minister for Canterbury Earthquake Recovery, the Canterbury Earthquake Recovery Authority, or both are responsible, such as design, planning, or options for rebuilding in the Christchurch City CBD; and

(c) the role and response of any person acting under the Civil Defence Emergency Management Act 2002, or providing any emergency or recovery services or other response, after the 22 February 2011 aftershock.

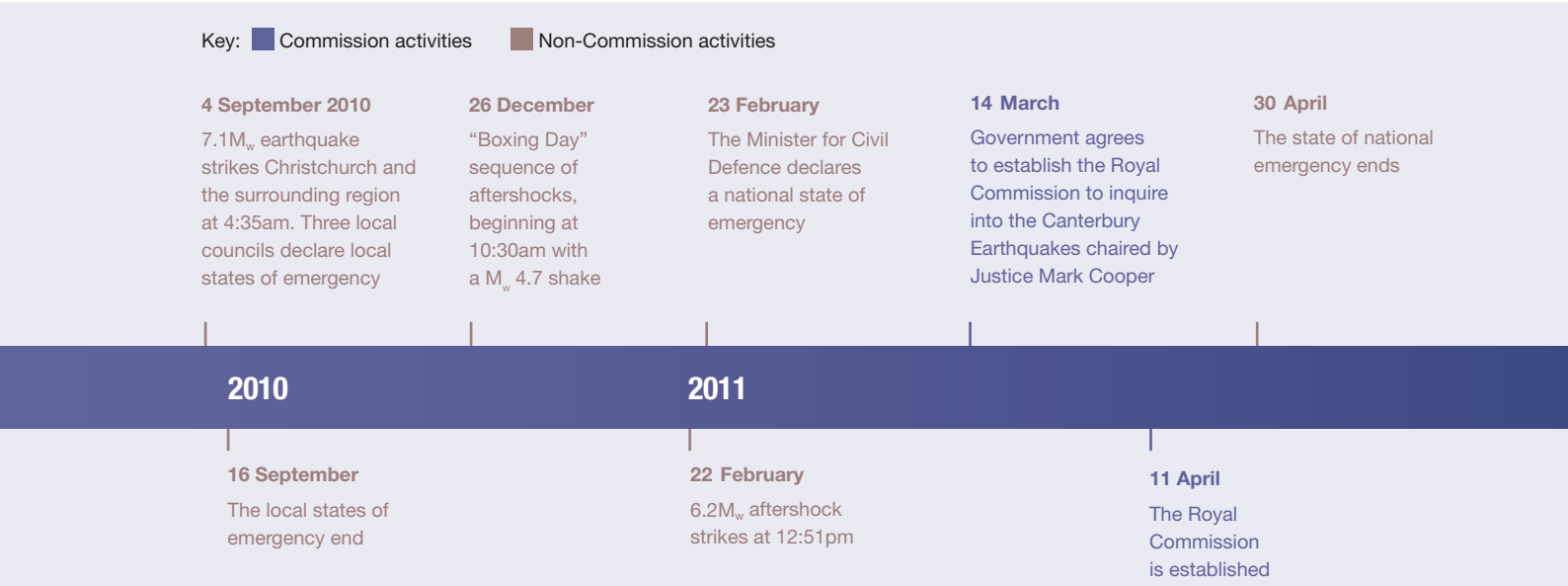
The interpretation of exclusion (c) was tested on 6 March 2012 when Justice Cooper publicly heard an application from counsel for bereaved family member Mr Srecko (Alec) Cvetanov. Mr Cvetanov's wife Dr Tamara Cvetanova survived the collapse of the CTV building but died before she could be rescued. Mr Cvetanov requested that the Royal Commission investigate the search and rescue response. The application was opposed by counsel assisting the Royal Commission on the basis that the Commission did not have jurisdiction to address this issue. Justice Cooper delivered a reserved decision finding that the Royal Commission did not have jurisdiction to investigate. The Coroner's office subsequently confirmed it would investigate the deaths in the CTV building in the hours following the collapse.

The failure of five buildings outside the CBD claimed the lives of six people, as noted in section 4.1 of Volume 4. Although the Terms of Reference did not require the Royal Commission to inquire into the failure of these suburban buildings, it decided to do so, relying on its power to examine matters it considered to be sufficiently linked to its principal inquiries. These buildings were commercial premises in Riccarton Road in Riccarton, Coleridge Street in Sydenham and Worcester Street in Linwood and a residential property in Bishop Street, St Albans (see Figure 2 in section 4 of Volume 4).

3.2.1 Issues arising under the Terms of Reference

Early in our Inquiry, the Royal Commission identified six principal issues that were to be considered. A Notice of Issues was published on the Royal Commission website in June. The issues were:

- **Seismicity**. The Terms of Reference required the Royal Commission to understand the nature and severity of the Canterbury earthquakes, the susceptibility of land to liquefaction as a result of earthquakes, and the nature and extent of earthquake risk that should be provided for in the construction and maintenance of buildings, both in Christchurch and throughout New Zealand.



- **Consideration of a representative sample of buildings** in the Christchurch CBD. The content of the representative sample was to be determined having regard to the obligations to consider why some buildings failed severely, why the failure of some caused extensive injury and death, why buildings differed in the extent to which they failed and why some did not fail. Under this issue, the Royal Commission also investigated the subsurface conditions in the CBD, particular features of buildings that contributed to failures, the extent of compliance of the buildings with relevant building controls, and the inspection and remediation processes followed after the September and December 2010 and February 2011 earthquakes and aftershocks.
- **Legal and best-practice requirements** for the design, construction and maintenance of buildings, including those that were or should be considered as earthquake-prone. This included the existing and desirable form of legislative provision for the inspection of buildings and remedial actions following earthquakes. The Royal Commission also considered the respective roles of central and local government, the building and construction industry and the significant inputs of volunteers (in the drafting and amendment of relevant New Zealand standards) in developing and enforcing legal and best-practice requirements.
- **Change of New Zealand design standards/codes of practice** over time and appropriate future controls for new and existing buildings
- **Development of technical expertise** in the design and construction of earthquake-resistant buildings.
- **Future measures** for existing and new buildings.

3.3 The Royal Commission's approach to the issues

Commissions of Inquiry are often conducted by inviting submissions from interested parties and considering what they might be prepared to tell the Commission, supplemented where appropriate by questioning from counsel assisting, with findings based on evidence from one or more hearings.

The Royal Commission decided that, because of the breadth of the investigation required by the Terms of Reference, this approach alone would not be adequate. It would risk some relevant issues being covered incompletely, or even not at all. There would be a risk also that the Royal Commission would not be presented with differing opinions on some important issues, because in the absence of clear disputes arising plainly or by necessary implication from the Terms of Reference itself, persons having rival opinions might not be aware of what others were saying to the Royal Commission.

Accordingly the Royal Commission developed and implemented its own approach to the investigation of the principal issues, which had the elements discussed below.

4 May
The Commissioners meet for the first time in Christchurch

2 July
Expressions of interest open

14 July
Potential representative building sample list is published

22 July
Expressions of interest close

24 August
Mr Marcus Elliott is appointed as counsel assisting with a focus on bereaved families and injured

13 June
6.0M_w aftershock at 2:20pm

15 July
A delegation of bereaved families and officials from China visits

9 August
First technical report published

30 September
The results of the DBH technical investigation into the PGC, Forsyth Barr and Hotel Grand Chancellor buildings are received

3.3.1 Expressions of interest

Section 4A of the Commissions of Inquiry Act 1908 sets out which persons (including organisations) are entitled to be heard by the Royal Commission:

Persons are entitled to be heard if they are parties to the inquiry, or satisfy the Commission that they have an interest in the inquiry apart from any interest in common with the public. Persons who satisfy the Commission that any evidence given before it may adversely affect their interests must be given an opportunity during the inquiry to be heard in respect of the matter to which the evidence relates. Every person entitled, or given an opportunity, to be heard may appear in person or be represented by a lawyer or agent.

In addition to identifying affected and interested parties, the Royal Commission concluded there would be other people and organisations who might wish to participate in the Inquiry, for example, because they had been or may have been affected in some relevant way by the Canterbury earthquake sequence or might have information of relevance to the Inquiry.

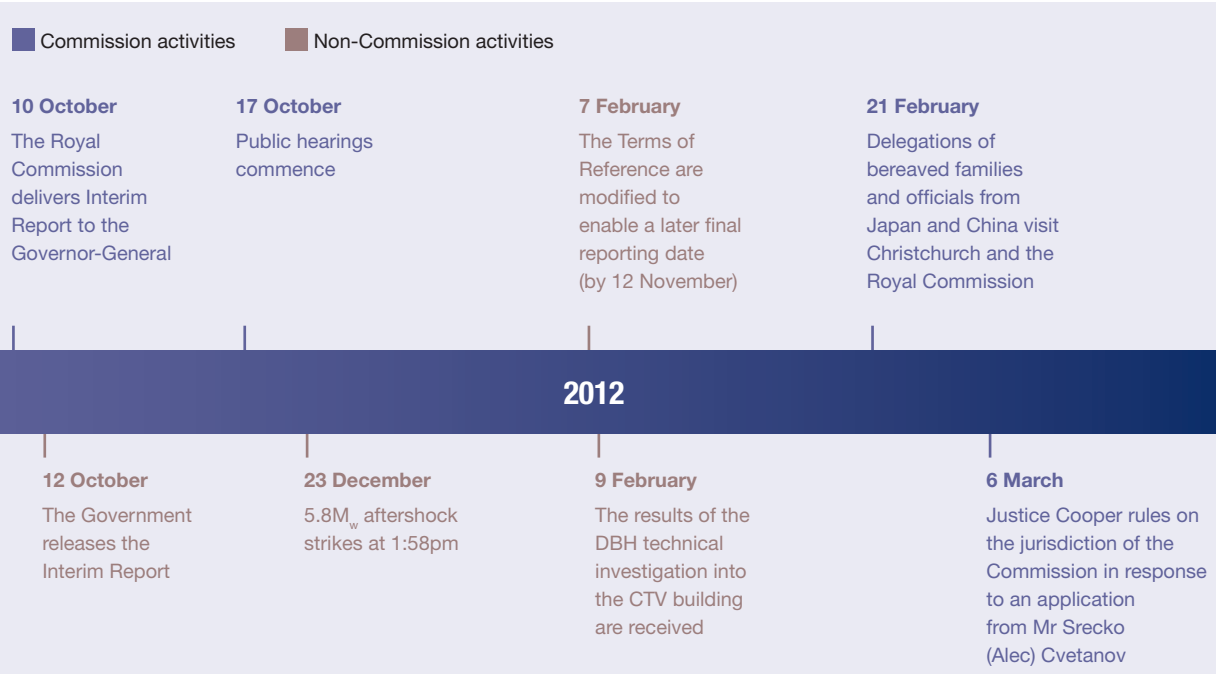
To identify these people and organisations, and what part of the Inquiry they wanted to contribute to and in what manner, on 2 July 2011 the Royal Commission called for public expressions of interest in relation to each of the identified principal issues. Public notices were placed in four major metropolitan papers: the *New Zealand Herald, Dominion Post, The Press* and *Otago Daily Times*. In addition, notices were placed in the following regional daily newspapers: *Northern Advocate, Bay of Plenty Times, Waikato Times, Gisborne Herald, Wanganui Chronicle, Taranaki Daily News, Manawatu Standard, Hawke's Bay Today, Nelson Mail, Timaru Herald, Southland Times, Greymouth Star, Marlborough Express* and *Hokitika Guardian*. People or organisations were requested to register with the Royal Commission and indicate if they wished to meet with the Royal Commission, provide a written submission, participate in public hearings or communicate information to the Royal Commission.

The Royal Commission received 80 expressions of interest by the 22 July 2011 deadline. They were from people who were trapped in buildings as a result of the February 2011 earthquake, building owners and tenants, persons with professional knowledge about matters arising in the Inquiry, learned societies, the Auckland Council, the Christchurch and Wellington City Councils, Local Government New Zealand and the former Department of Building and Housing (DBH) (now the Ministry of Business, Innovation and Employment or MBIE). Other individuals and organisations came forward with information as the Inquiry progressed. Some organisations that did not respond were contacted by the Commission if it was thought that their views may be of value.

The Royal Commission also advised persons bereaved in the February earthquake that they would be regarded as affected parties, and advised of the progress of the Commission's work (unless they preferred not to be) without the need for them to lodge expressions of interest.

3.3.2 Expert advice

On the principal issues the Royal Commission commissioned advice in the form of reports from people and organisations within New Zealand who had appropriate expertise. The Royal Commission also adopted a policy that advice received would generally



be peer reviewed by eminent overseas experts. The expert advisers and peer reviewers contracted by the Royal Commission are listed in Appendix 3 of this Volume, in Appendix 2 of Volume 1 and Appendix 3 of Volume 4 of the Report. The reports were published on the Royal Commission's website. Details of the reports can also be found in the relevant Volumes of this Report dealing with the subject matter covered in the reports.

3.3.3 Consultation

The Commission sought submissions from those who had lodged expressions of interest and from a wide variety of other parties the Royal Commission identified as having relevant contributions, including local government, educational institutes and engineers.

3.3.3.1 Technical reports

The Royal Commission sought submissions on each of the expert reports. The submissions received were analysed and published on the Royal Commission's website.

3.3.3.2 Memorandum about issues raised

The Royal Commission sought input from Structural Engineering Society New Zealand (SESOC) and other engineers on a memorandum about issues identified in two expert reports – "Stairs and Access Ramps between Floors in Multi-storey Buildings", by Professor Desmond Bull and "Preliminary Observations from the Christchurch Earthquakes" by John Hare. This process is discussed in more detail in section 3.4 of the Royal Commission's Interim Report, delivered in October.

3.3.3.3 Draft SESOC practice note

The Royal Commission also published a draft SESOC practice note "Design of Conventional Structural Systems Following Canterbury Earthquakes", called for submissions on it and then held a technical workshop to discuss the issues raised. This input was considered when formulating the findings and recommendations reached in Volume 2.

3.3.3.4 Discussion papers

To seek further information and comment, prior to some of the public hearings, discussion papers were published and written submissions were sought from invited parties. The discussion papers refined the issues, canvassed options to address identified problems, and outlined the main areas of common view or debate in order to ensure that the hearings were as focused and effective as possible. Submitters were asked to consider the extent of the identified issues in practice, provide evidence and analysis underpinning the issues/problems, and to describe the pros and cons of options to address the problems.

Three discussion papers were published on the topics of:

- building management after earthquakes;
- training and organisation of the engineering profession; and
- roles and responsibilities.

The submissions received helped refine the issues and draw out options for addressing them ahead of the hearings.

15 April
Technical workshop about draft SESOC practice note held

21 June
"Training and organisation of the engineering profession" and "Building management after earthquakes" discussion papers are published

29 June
The Royal Commission delivers Volumes 1–3 of its Final Report to the Governor-General

11 July
"Roles and Responsibilities" discussion paper is published

25 July
Officials from Toyama city in Japan attend the CTV building hearing

23 August
The Government releases Volumes 1–3 of the Final Report

12 September
Public hearings finish

10 October
The Royal Commission delivers Volume 4 of its Final Report to the Governor-General

23 October
The Terms of Reference are modified to enable a later final reporting date (by 30 November)

29 November
Part three of the Final Report is delivered to the Governor-General. The Commission of Inquiry is complete

Figure 14: Children of St. Teresa's school sing at opening of Royal Commission hearings on 17 October 2012 (source: *The Press*/Fairfax Media)

3.3.4 Department of Building and Housing technical investigation

The Terms of Reference envisaged that the Royal Commission would receive and take into account the results of a separate technical investigation conducted by the former Department of Building and Housing into the failure of the CTV, PGC, Forsyth Barr and Hotel Grand Chancellor buildings. Early in its Inquiry, the Royal Commission decided that the results of the DBH investigations would be peer reviewed by eminent Californian structural engineer Mr William T. Holmes, be contestable, and the subject of individual hearings in our Inquiry process. In order for the results of the DBH investigation to be properly contestable in the Royal Commission's own Inquiry, the results needed to be available to affected and interested parties prior to the hearings.

When the DBH technical investigation was established, it was expected that the results would be available by 31 July 2011. However, that proved to be overly optimistic. The DBH consultants' and expert panel's reports about three of the four specified buildings were made available on 30 September 2011. The results of the investigation into the CTV building were not available until 9 February 2012.

It was therefore not possible to schedule hearings on the four specified buildings in the order that might have been ideal and the Royal Commission decided to defer scheduling hearings in respect of some issues relevant to the Inquiry, which logically had to be addressed after the hearings on the failure of these four buildings.

These issues included the management of buildings after earthquakes, the training and organisation of the engineering profession and the roles and responsibilities of those in the building and construction sector.

3.3.5 Public hearings

Public hearings were conducted on an issue-by-issue basis. They began on 17 October 2011 with a simple opening ceremony that included singing and kapa haka by St Teresa's School children and a blessing/karakia by Reverend Gray of Ngāi Tahu and Father Antoine Thomas of St Teresa's Parish. Justice Cooper welcomed a large contingent of bereaved family members and acknowledged their loss with the words: "Welcome to this Inquiry in which we will find out the reasons why people died in the tragic earthquake of 22 February. We begin by acknowledging the families of those who died and your suffering. We express our deepest sympathy to you." The acknowledgment was translated into the other seven languages spoken by those who died. Mr Elliott then read out the names of all those who died due to building failures. This was followed by two minutes of silence. At the start of each hearing about a building that caused loss of life, Justice Cooper acknowledged those who died in that particular building and their families and the injured.

The hearing about seismicity and New Zealand's seismic landscape began in the afternoon of 17 October (see Volume 1). The following week a one-day hearing was held about the soil conditions in Christchurch (see Volume 1).

Figure 15: A hearing underway at St Teresa's church hall in Christchurch

In November, the Royal Commission commenced a hearing about policies for earthquake-prone building types, including unreinforced masonry buildings (see Volume 4) and the failure of the PGC building (see Volume 2).

The PGC hearing ran into December and the 2011 hearing programme concluded with the first of 19, usually one-day, hearings about other building failures that had caused loss of life (see Volume 4). The CTV building (see Volume 6) was the subject of a later, separate hearing.

After the Christmas break the hearings programme resumed in January 2012 with a two-day hearing about the Hotel Grand Chancellor building (see Volume 2), followed by more hearings about other buildings whose failure caused loss of life. These hearings continued into March, interrupted by a two-day hearing about the Forsyth Barr building (see Volume 2). In March a hearing about new building technologies (see Volume 3) was also held followed by the final hearings about other buildings whose failure caused loss of life.

The hearings programme was then adjourned for three months to enable the Commission to meet the date set to deliver the first part of the Final Report and to continue the investigation and preparation for the hearing into the failure of the CTV building. The CTV hearing began on 25 June and it was by far the longest hearing, taking 32 days including closing submissions (see Volume 6). The final three hearings were held in September 2012. They canvassed systemic issues regarding the engineering profession, building management after earthquakes, and roles and responsibilities (see Volume 7).

Because many public buildings and convention centres, were closed due to earthquake damage, the hearings were held at St Teresa's Hall in Riccarton. Carpet, furniture, computers, internet, microphones and heating were installed to equip it as a hearing venue and Canterbury Arts and Heritage Trust artist Mr Wayne Seyb provided the finishing touches by kindly agreeing to display his paintings of earthquake-damaged Christchurch buildings in the hall.

To facilitate open communication, people who wished to give evidence and/or make submissions were required to provide them in electronic form in advance of the hearings. In the interests of fairness, evidence and other information the Royal Commission had received about the CTV building and other buildings whose failure caused loss of life was made available on a confidential basis to affected and interested parties prior to the hearing, via a secure online document

Figure 16: Canterbury artist Wayne Seyb with one of his works at the hearings venue

access system. Evidence was published for the general public on the Royal Commission's website once it had been presented in evidence at a hearing.

In total, the Royal Commission held hearings for 82 days, hearing evidence and submissions in person and via video link from other places in New Zealand and overseas. Witnesses included technical experts, eye witnesses, injured people, engineers, building inspectors, property owners, property managers, local and central government officials and others. The technical experts in many cases participated in expert discussion panels. Offsite Ministry of Justice transcribers produced 10,877 pages of official transcripts, which were published on the Royal Commission's website. A summary setting out the Royal Commission's hearing topics and the dates of the hearings is in Appendix 4 of this Volume.

3.3.6 Representative sample

The requirement that the Royal Commission analyse a representative sample of buildings required a different approach to other issues addressed in the Inquiry. A full description of the approach to the representative sample of buildings is explained in section 1 of Volume 2. In summary, a 'long list' of buildings of potential interest was created. Information and existing reports were then sought about these buildings from a range of people and organisations, and technical reports were commissioned. The long list was eventually reduced to 15 buildings, which were fully assessed.

The studied buildings are expected to be of interest to structural engineers in New Zealand and internationally, to improve knowledge of building performance in earthquakes now and in the future. Reports and other information about the studied buildings are available on the Royal Commission's website for a limited time and are discussed in Volume 2. Once they are no longer available on the website they will be available from Archives New Zealand.

3.4 Records management

By its very nature the Inquiry generated vast quantities of information. More than 6,000 documents were logged in the Royal Commission's Inquiry database including reports, photos, emails and letters, statements, drawings, presentations, invoices, articles, video clips, forms, work files, microfiche scans, handwritten notes and sketches, minutes, interviews, lists and schedules. All records were logged and assigned an ID number according to their content, and meta-data was added for search purposes.

As part of the study of the representative sample of buildings, building records for approximately 200 buildings were obtained from the Christchurch City Council or viewed on their system and assessed for relevance. Documentation was also sourced from building owners and engineers for many of these buildings. The availability of records varied widely. A very large amount of documentation was available about some buildings. For example, the Royal Commission received over 20,000 pages of documentation about the CCC civic offices in Hereford Street. After assessment, relevant documents were tracked in a separate buildings database.

A third database was established to record next of kin details and contact the Royal Commission had with bereaved families. As many family members as wished to be were on the Royal Commission's communications database to receive information. The list expanded from 216 to 350 as people took the opportunity to be kept informed of the Royal Commission's work.

At the end of the Inquiry originals of all documentation and evidence acquired in the course of the Inquiry are being transferred to Archives New Zealand for archiving. Some of the material is also being harvested by the University of Canterbury CEISMIC Canterbury Earthquake Digital Archive and published on the earthquake-related research material website http://www.ceismic.org.nz/ to ensure people have easy access to it in perpetuity.

3.5 Communications

Due to the scale of damage to the Christchurch CBD and subsequent loss of life, the Royal Commission anticipated high levels of public interest in the Inquiry from around New Zealand and the world. The Commission also wished to conduct a transparent and accessible Inquiry, and was mindful of the significant number of persons from overseas who lost close family members and friends in the February earthquake.

In conjunction with the Department of Internal Affairs, the Royal Commission's website http://canterbury.royalcommission.govt.nz/ was developed as the major communications channel because of its ability to make information available to anyone in the world at any time. At the time of writing in October 2012, the website had been visited more than 137,000 times since October 2011 and more than half a million pages of content had been viewed.

Early on in the Inquiry the Commission decided to web-enable the Inquiry database to simplify and speed up the document publishing process. More than 1200 of the Inquiry database records were web-

published, including reports, photos, emails and letters, statements, drawings and presentations. During the hearings, evidence was published within minutes of being presented, giving people timely access to information. At the time of writing, the document library had been viewed more than 50,000 times and a wide range of material had been viewed and downloaded. The reports prepared for the Department of Building and Housing on the CTV building collapse were among the most frequently accessed documents published by the Commission.

To cater for people who were interested in the hearings but could not attend personally, the Royal Commission live streamed the proceedings on the internet. Three high definition webcams were installed to record the Commissioners, counsel and witness stand. The footage was mixed in real time and web-cast on the Commission's website with information about who was speaking at the time. The Commission's hearings were the biggest and longest live stream broadcast undertaken in New Zealand to date with more than 500 hours streamed and nearly two terabytes of data downloaded by viewers. The majority of the traffic was from New Zealand but there was also interest from the US, Australia and Japan. The first day of the CTV building hearing on 25 June 2012 saw the highest usage of the Commission's website with almost 5,000 people visiting the site, mostly to watch the live feed of the morning session.

To overcome international time differences and make the hearings accessible at any time, the Royal Commission also recorded the entire live stream, edited it into approximately 15 minute videos and published the videos on the Commission's website. The videos were published throughout each hearing day in the website video library with website links to the appropriate hearing timetable, evidence presented by each witness and related reports. Each video was also linked to the appropriate written transcript once it was available. A search tool enabled website users to search for videos by date, topic, building and witness. In total, 1866 videos were published and linked to 1200 documents. At the time of writing people from 132 countries had viewed the videos 73,588 times. The videos have also been watched more than 2000 times since the hearings finished. The Department of Internal Affairs will continue to manage the Royal Commission website now the Inquiry is over. It is likely eventually to be archived by Archives New Zealand.

The Royal Commission recognised that the news media would also play an important role in keeping the public informed about its work. Regular media statements were issued to keep the media informed of the Inquiry progress and interviews were granted with the Royal Commission as required. Prior to the hearings, the media were requested to register with the Royal Commission and invited to attend two background media briefings. Such was the level of interest from the Japanese media that a Japanese-only media conference was held in February 2012. There was only room for one television camera operator and press photographer in the actual hearing room. The Royal Commission thanks TVNZ, Mediaworks and *The Press* for providing their footage and photographs to other media throughout the hearings. Reporters worked from a portable media centre provided outside the hearings venue. Media who could not attend the hearings personally also watched via the live stream from around New Zealand and the world. The Royal Commission believes there has never been a more accessible Royal Commission process.

Figure 17: Volunteers translate Justice Cooper's condolences to bereaved families at the opening of the hearings

3.6 Bereaved families, injured and tenants

From the time it was established, the Royal Commission endeavoured to assure bereaved, seriously injured people and other surviving occupants of failed buildings that there would be a thorough inquiry, and that they would be kept informed if they wished to be. People's needs differ greatly when grieving. Accordingly, the Royal Commission's approach was to ask people what they needed rather than making assumptions, and to provide information to them before it was released publicly.

The Commission communicated directly with all bereaved families, including overseas families, throughout the Inquiry. Contact began early in the Inquiry when Justice Cooper wrote to all known family members and invited them to meet with him individually or in a group. Many families took up this offer over a period of several months. They included families from Japan and China. Efforts were also made to contact injured people and building tenants although this was more difficult because of a lack of a centralised list.

The Ministry of Foreign Affairs and Trade arranged a briefing for foreign missions and kept them informed at key points during the Inquiry, particularly about the release of reports.

Ms Kate Collins was appointed as the Royal Commission's Family and Community Liaison Officer. Her role was to act as the first point of contact with the Royal Commission for bereaved families, injured people and survivors of failed buildings that the Royal Commission was investigating. She sent regular email updates to all bereaved families to keep them informed of Inquiry progress. Face-to-face briefings were organised prior to and during the PGC and CTV hearings including meetings with visiting overseas bereaved families. The Royal Commission particularly acknowledges the assistance of Chinese volunteer Mr Cai Qunliang (Liam) and Ms Susan Urakami of the Toyama College of Foreign Languages in Japan in organising these meetings and providing language support. Teleconferences were held for those living outside Christchurch.

Chinese and Japanese bereaved families specifically requested language support to enable them to follow our investigation into the failure of the CTV building where 28 Japanese and 23 Chinese language students died. The Commission responded by translating key documents and communications into Chinese and Japanese as resources allowed, and made these available via the online document access system. The Royal Commission acknowledges the support of embassies that helped their citizens gain access to the system. At the request of next of kin, section 9 of Volume 6, which summarises the Commission's conclusions about the causes of the CTV building collapse, is also translated into Simplified Chinese, Japanese, Thai and Korean documents that are published separately.

Ms Collins attended all hearings about buildings that caused loss of life and was available to liaise between families, injured people, tenants, survivors and Mr Elliott. She organised on-site counselling support as needed.

A memorial board was available at the Royal Commission's hearings venue, where families and community members could place photos, mementos and messages acknowledging the deceased and their friends and families. The children of St Teresa's School decorated this space and wrote messages of support.

Figure 18: Memorial board at Royal Commission hearings venue

Ms Collins' role also included arranging practical support for families, for example, referrals to psychotherapists and counsellors and advocating on behalf of those applying for grants to help raise children after the loss of a partner. She also organised facilitated support groups for bereaved families, and then handed these over to the Red Cross to provide ongoing assistance beyond the life of the Royal Commission. To provide continuity, Ms Collins also attended events organised by other organisations such as Coronial Services and the former DBH.

As noted earlier, families of those who died, the injured and tenants were given the status of affected parties for the hearings related to buildings that caused their death or injury. This conferred certain rights, including the right to access evidence, on a confidential basis, prior to the hearings. In this way they had the opportunity to be prepared for the evidence that would be presented at the hearing and be well informed. It is thought that this enabled them to engage more effectively in the hearing process. The status of affected party also gave them the right to be represented by counsel at the relevant hearing and to suggest to counsel assisting additional documents or witnesses that ought to be called. As affected parties, families were also invited to contribute to a closing submission for the CTV hearing presented by Mr Elliott on behalf of bereaved families and those who were injured.

Mr Elliott kept bereaved families and the injured informed of details of the investigation at group briefings and, upon request, individually. Bereaved families and injured were invited to have input into Mr Elliott's questioning of witnesses. He often prefaced his questioning with "the bereaved families would like to know…" Almost without exception bereaved families, tenants and the injured chose not to engage their own counsel. One CTV bereaved family member exercised her right to make a closing statement.

The Royal Commission wished to acknowledge in this Final Report, all those who lost their lives due to building failure. Biographical information was sought from bereaved family members and short biographies on those who died, based on the information received, were published in the following Volumes of the Final Report:

- Volume 2 section 2: PGC building fatalities;
- Volume 4 section 4.3: Individual unreinforced masonry buildings that caused fatalities; and
- Volume 6 Introduction: CTV building fatalities.

The Royal Commission is grateful to all the families for generously sharing their memories and also wishes to acknowledge the Japanese and Chinese embassies for language support and *The Press* for providing additional information.

3.7 Reporting requirements

It was necessary for the Royal Commission to run parallel work streams in order to prepare its Reports progressively as various aspects of the Inquiry were completed.

3.7.1 Interim Report

It was important that the reasons for the severity of the damage to buildings were understood as soon as possible to facilitate new building work in Christchurch. The Terms of Reference accordingly specified that an Interim Report was to be provided by 11 October 2011. As the Inquiry was then only part-way through, and there had been no opportunity to hear and test evidence on any issues, the Interim Report consisted largely of preliminary views.

The Interim Report, which was delivered to the Governor-General in Wellington on 10 October 2011, nevertheless contained 15 recommendations covering seismicity, geotechnical considerations, the general performance of unreinforced masonry buildings, design practice and new building technologies. It focused on measures that the Royal Commission recommended should be implemented in Christchurch as it rebuilt following the earthquakes, but also dealt with matters that required early attention in New Zealand as a whole. The Report was released by the Government on 12 October 2011.

3.7.2 Final Report

The Terms of Reference required the Royal Commission to deliver a Final Report by 11 April 2012. Delays in receiving the results of DBH's technical investigation into the four named buildings soon made it plain that the Royal Commission was not going to be able to achieve this deadline.

In February 2012 the Governor-General agreed to an extension to the reporting date. To enable decisions about the central city rebuild to be made as soon as possible, it was agreed that the Final Report would be delivered in stages. Part one, to be delivered by 29 June 2012, would contain recommendations to inform early decision-making about the Christchurch CBD's recovery from the Canterbury earthquakes. It consisted of three Volumes, which were delivered to the Governor-General in Auckland on the due date. The Volumes were:

- Volume 1: Summary and recommendations in Volumes 1–3: Seismicity, soils and the seismic design of buildings (112 pages);
- Volume 2: The performance of Christchurch CBD buildings (236 pages); and
- Volume 3: Low-damage building technologies (39 pages).

Part one contained 70 conclusions and recommendations based on the Royal Commission's consideration of the performance of the representative sample of Christchurch central business district buildings, as well as the Commission's analysis of many of the technical expert reports it had received and insights gained through the public hearings held to date. It also set out the Commission's findings on the PGC building. It was released by the Government on 23 August 2012.

The modified Terms of Reference required the remainder of the Final Report to be delivered on or before 12 November 2012. Part two of the Final Report was delivered to the Governor-General in Wellington on 10 October 2012. It consisted of:

- Volume 4: Earthquake-prone Buildings (240 pages).

It contained reports on the individual buildings whose failure caused death (excluding PGC and CTV). Part two contained a further 35 recommendations as well as conclusions about unreinforced masonry and other earthquake-prone buildings. At the time of writing, it was yet to be released by the Government.

When the Terms of Reference were modified, planning for the CTV hearings was still in its preliminary stages. At this time it was thought the hearing would take a few weeks and that the 12 November deadline would be achievable. However the eventual length of the hearing meant a short second extension was required to enable the Commission to deliver a quality report. In October the Governor-General agreed to extend the reporting date to 30 November 2012.

The remainder of the Final Report consists of this Volume and two others. These three Volumes are:

- Volume 5: Summary and recommendations in Volumes 5–7, Christchurch, the City and approach to this Inquiry;
- Volume 6: CTV building; and
- Volume 7: Roles and responsibilities.

Appendix 1: Terms of Reference

Royal Commission of Inquiry into Building Failure caused by Canterbury Earthquakes

Elizabeth the Second, by the Grace of God Queen of New Zealand and her Other Realms and Territories, Head of the Commonwealth, Defender of the Faith:

To The Honourable MARK LESLIE SMITH COOPER, of Auckland, Judge of the High Court of New Zealand; Sir RONALD POWELL CARTER, KNZM, of Auckland, Engineer and Strategic Advisor; and RICHARD COLLINGWOOD FENWICK, of Christchurch, Associate Professor of Civil Engineering:

GREETING:

Recitals

WHEREAS the Canterbury region, including Christchurch City, suffered an earthquake on 4 September 2010 and numerous aftershocks, for example—

(a) the 26 December 2010 (or Boxing Day) aftershock; and

(b) the 22 February 2011 aftershock:

WHEREAS approximately 180 people died of injuries suffered in the 22 February 2011 aftershock, with most of those deaths caused by injuries suffered wholly or partly because of the failure of certain buildings in the Christchurch City central business district (CBD), namely the following 2 buildings:

(a) the Canterbury Television (or CTV) Building; and

(b) the Pyne Gould Corporation (or PGC) Building:

WHEREAS other buildings in the Christchurch City CBD, or in suburban commercial or residential areas in the Canterbury region, failed in the Canterbury earthquakes, causing injury and death:

WHEREAS a number of buildings in the Christchurch City CBD have been identified as unsafe to enter following the 22 February 2011 aftershock, and accordingly have been identified with a red card to prevent persons from entering them:

WHEREAS the Department of Building and Housing has begun to investigate the causes of the failure of 4 buildings in the Christchurch City CBD (the 4 specified buildings), namely the 2 buildings specified above, and the following 2 other buildings:

(a) the Forsyth Barr Building; and

(b) the Hotel Grand Chancellor Building:

WHEREAS it is desirable to inquire into the building failures in the Christchurch City CBD, to establish—

(a) why the 4 specified buildings failed severely; and

(b) why the failure of those buildings caused such extensive injury and death; and

(c) why certain buildings failed severely while others failed less severely or there was no readily perceptible failure:

WHEREAS the results of the inquiry should be available to inform decision-making on rebuilding and repair work in the Christchurch City CBD and other areas of the Canterbury region:

Appointment and order of reference

KNOW YE that We, reposing trust and confidence in your integrity, knowledge, and ability, do, by this Our Commission, nominate, constitute, and appoint you, The Honourable MARK LESLIE SMITH COOPER, Sir RONALD POWELL CARTER, and RICHARD COLLINGWOOD FENWICK, to be a Commission to inquire into and report (making any interim or final recommendations that you think fit) upon (having regard, in the case of paragraphs (a) to (c), to the nature and severity of the Canterbury earthquakes)—

Inquiry into sample of buildings and 4 specified buildings

(a) in relation to a reasonably representative sample of buildings in the Christchurch City CBD, including the 4 specified buildings as well as buildings that did not fail or did not fail severely in the Canterbury earthquakes—

(i) why some buildings failed severely; and

(ii) why the failure of some buildings caused extensive injury and death; and

(iii) why buildings differed in the extent to which—

(A) they failed as a result of the Canterbury earthquakes; and

(B) their failure caused injury and death; and

(iv) the nature of the land associated with the buildings inquired into under this paragraph and how it was affected by the Canterbury earthquakes; and

(v) whether there were particular features of a building (or a pattern of features) that contributed to whether a building failed, including (but not limited to) factors such as—

(A) the age of the building; and

(B) the location of the building; and

(C) the design, construction, and maintenance of the building; and

(D) the design and availability of safety features such as escape routes; and

(b) in relation to all of the buildings inquired into under paragraph (a), or a selection of them that you consider appropriate but including the 4 specified buildings,—

(i) whether those buildings (as originally designed and constructed and, if applicable, as altered and maintained) complied with earthquake-risk and other legal and best-practice requirements (if any) that were current—

(A) when those buildings were designed and constructed; and

(B) on or before 4 September 2010; and

(ii) whether, on or before 4 September 2010, those buildings had been identified as “earthquake-prone” or were the subject of required or voluntary measures (for example, alterations or strengthening) to make the buildings less susceptible to earthquake risk, and the compliance or standards they had achieved; and

(c) in relation to the buildings inquired into under paragraph (b), the nature and effectiveness of any assessment of them, and of any remedial work carried out on them, after the 4 September 2010 earthquake, or after the 26 December 2010 (or Boxing Day) aftershock, but before the 22 February 2011 aftershock; and

Inquiry into legal and best-practice requirements

(d) the adequacy of the current legal and best-practice requirements for the design, construction, and maintenance of buildings in central business districts in New Zealand to address the known risk of earthquakes and, in particular—

(i) the extent to which the knowledge and measurement of seismic events have been used in setting legal and best-practice requirements for earthquake-risk management in respect of building design, construction, and maintenance; and

(ii) the legal requirements for buildings that are “earthquake-prone” under section 122 of the Building Act 2004 and associated regulations, including—

(A) the buildings that are, and those that should be, treated by the law as "earthquake-prone"; and

(B) the extent to which existing buildings are, and should be, required by law to meet requirements for the design, construction, and maintenance of new buildings; and

(C) the enforcement of legal requirements; and

(iii) the requirements for existing buildings that are not, as a matter of law, "earthquake-prone", and do not meet current legal and best-practice requirements for the design, construction, and maintenance of new buildings, including whether, to what extent, and over what period they should be required to meet those requirements; and

(iv) the roles of central government, local government, the building and construction industry, and other elements of the private sector in developing and enforcing legal and best-practice requirements; and

(v) the legal and best-practice requirements for the assessment of, and for remedial work carried out on, buildings after any earthquake, having regard to lessons from the Canterbury earthquakes; and

(vi) how the matters specified in subparagraphs (i) to (v) compare with any similar matters in other countries; and

Other incidental matters arising

(e) any other matters arising out of, or relating to, the foregoing that come to the Commission's notice in the course of its inquiries and that it considers it should investigate:

Matters upon or for which recommendations required

And, without limiting the order of reference set out above, We declare and direct that this Our Commission also requires you to make both interim and final recommendations upon or for—

(a) any measures necessary or desirable to prevent or minimise the failure of buildings in New Zealand due to earthquakes likely to occur during the lifetime of those buildings; and

(b) the cost of those measures; and

(c) the adequacy of legal and best-practice requirements for building design, construction, and maintenance insofar as those requirements apply to managing risks of building failure caused by earthquakes:

Exclusions from inquiry and scope of recommendations

But, We declare that you are not, under this Our Commission, to inquire into, determine, or report in an interim or final way upon the following matters (but paragraph (b) does not limit the generality of your order of reference, or of your required recommendations):

(a) whether any questions of liability arise; and

(b) matters for which the Minister for Canterbury Earthquake Recovery, the Canterbury Earthquake Recovery Authority, or both are responsible, such as design, planning, or options for rebuilding in the Christchurch City CBD; and

(c) the role and response of any person acting under the Civil Defence Emergency Management Act 2002, or providing any emergency or recovery services or other response, after the 22 February 2011 aftershock:

Definitions

And, We declare that, in this Our Commission, unless the context otherwise requires,—

best-practice requirements

includes any New Zealand, overseas country's, or international standards that are not legal requirements

Canterbury earthquakes

means any earthquakes or aftershocks in the Canterbury region—

(a) on or after 4 September 2010; and

(b) before or on 22 February 2011

Christchurch City CBD

means the area bounded by the following:

(a) the 4 avenues (Bealey Avenue, Fitzgerald Avenue, Moorhouse Avenue, and Deans Avenue); and

(b) Harper Avenue

failure

in relation to a building, includes the following, regardless of their nature or level of severity:

(a) the collapse of the building; and

(b) damage to the building; and

(c) other failure of the building

legal requirements

includes requirements of an enactment (for example, the building code):

Appointment of chairperson

And We appoint you, The Honourable MARK LESLIE SMITH COOPER, to be the chairperson of the Commission:

Power to adjourn

And for better enabling you to carry this Our Commission into effect, you are authorised and empowered, subject to the provisions of this Our Commission, to make and conduct any inquiry or investigation under this Our Commission in the manner and at any time and place that you think expedient, with power to adjourn from time to time and from place to place as you think fit, and so that this Our Commission will continue in force and that inquiry may at any time and place be resumed although not regularly adjourned from time to time or from place to place:

Information and views, relevant expertise, and research

And you are directed, in carrying this Our Commission into effect, to consider whether to do, and to do if you think fit, the following:

(a) adopt procedures that facilitate the provision of information or views related to any of the matters referred to in the order of reference above; and

(b) use relevant expertise, including consultancy services and secretarial services; and

(c) conduct, where appropriate, your own research; and

(d) determine the sequence of your inquiry, having regard to the availability of the outcome of the investigation by the Department of Building and Housing and other essential information, and the need to produce an interim report:

General provisions

And, without limiting any of your other powers to hear proceedings in private or to exclude any person from any of your proceedings, you are empowered to exclude any person from any hearing, including a hearing at which evidence is being taken, if you think it proper to do so:

And you are strictly charged and directed that you may not at any time publish or otherwise disclose, except to His Excellency the Governor-General of New Zealand in pursuance of this Our Commission or by His Excellency's direction, the contents or purport of any interim or final report so made or to be made by you:

And it is declared that the powers conferred by this Our Commission are exercisable despite the absence at any time of any 1 member appointed by this Our Commission, so long as the Chairperson, or a member deputed by the Chairperson to act in the place of the Chairperson, and at least 1 other member, are present and concur in the exercise of the powers:

Interim and final reporting dates

And, using all due diligence, you are required to report to His Excellency the Governor-General of New Zealand in writing under your hands as follows:

(a) not later than 11 October 2011, an interim report, with interim recommendations that inform early decision-making on rebuilding and repair work that forms part of the recovery from the Canterbury earthquakes; and

(b) not later than 11 April 2012, a final report:

And, lastly, it is declared that these presents are issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second constituting the office of Governor-General of New Zealand, dated 28 October 1983*, and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand.

In witness whereof We have caused this Our Commission to be issued and the Seal of New Zealand to be hereunto affixed at Wellington this 11th day of April 2011.

Witness Our Trusty and Well-beloved The Right Honourable Sir Anand Satyanand, Chancellor and Principal Knight Grand Companion of Our New Zealand Order of Merit, Principal Companion of Our Service Order, Governor-General and Commander-in-Chief in and over Our Realm of New Zealand.

ANAND SATYANAND, Governor-General.

By His Excellency's Command—

JOHN KEY, Prime Minister.

Approved in Council—

REBECCA KITTERIDGE, Clerk of the Executive Council.

**SR 1983/225*

Modifications to Reporting Requirements and Powers of Royal Commission of Inquiry into Building Failure Caused by Canterbury Earthquakes

Elizabeth the Second, by the Grace of God Queen of New Zealand and her Other Realms and Territories, Head of the Commonwealth, Defender of the Faith:

To The Honourable MARK LESLIE SMITH COOPER, of Auckland, Judge of the High Court of New Zealand; Sir RONALD POWELL CARTER, KNZM, of Auckland, Engineer and Strategic Adviser; and RICHARD COLLINGWOOD FENWICK, of Christchurch, Associate Professor of Civil Engineering:

GREETING:

WHEREAS by Our Warrant, dated 11 April 2011, issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second constituting the office of Governor-General of New Zealand, dated 28 October 1983, and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand, we nominated, constituted, and appointed you, the said The Honourable MARK LESLIE SMITH COOPER, Sir RONALD POWELL CARTER, KNZM, and RICHARD COLLINGWOOD FENWICK, to be a Commission to inquire into and report (making any interim or final recommendations that you think fit) upon certain matters relating to building failure caused by the Canterbury earthquakes:

AND WHEREAS by Our said Warrant you are required to report finally to His Excellency the Governor-General of New Zealand not later than 11 April 2012:

AND WHEREAS it is expedient that the time and other requirements for reporting under Our said Warrant should be modified as hereinafter provided:

NOW, THEREFORE, We do by these presents require you to report and make final recommendations (required and otherwise) on the matters in Our said Warrant as follows:

(a) not later than 29 June 2012, on matters that would inform early decision-making on rebuilding and repair work that forms part of the recovery from the Canterbury earthquakes;

and

(b) at any time before 12 November 2012 on any other matter, if you are able to do so; and

(c) not later than 12 November 2012, on all matters on which you have not otherwise reported:

AND WHEREAS it is expedient that the powers conferred by Our said Warrant be modified, We do by these presents declare that the powers are exercisable by the Chairperson, or a member deputed by the Chairperson to act in the place of the Chairperson, despite the absence of 1 or 2 of the persons appointed to be members of the Commission, so long as at least 1 other member concurs in the exercise of the powers:

AND it is declared that nothing in these presents affects any act or thing done or decision made by the Commission or any of its members, in the exercise of its powers, before the making of these presents:

And We do hereby confirm Our Warrant dated 11 April 2011 and the Commission constituted by that Warrant, except as modified by these presents:

And, lastly, it is declared that these presents are issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second constituting the office of Governor-General of New Zealand, dated 28 October 1983, and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand.

In Witness whereof We have caused these presents to be issued and the Seal of New Zealand to be hereunto affixed at Wellington this 7th day of February 2012.

Witness Our Trusty and Well-beloved Lieutenant General The Right Honourable Sir Jerry Mateparae, Chancellor and Principal Knight Grand Companion of Our New Zealand Order of Merit, Principal Companion of Our Service Order, Governor-General and Commander-in-Chief in and over Our Realm of New Zealand.

[L.S.]

LT GEN SIR JERRY MATEPARAE, Governor-General

By His Excellency's Command-

JOHN KEY, Prime Minister.

Approved in Council-

REBECCA KITTERIDGE, Clerk of the Executive Council.

Further Extension of Time Within Which Royal Commission of Inquiry into Building Failure Caused by Canterbury Earthquakes May Report

Elizabeth the Second, by the Grace of God Queen of New Zealand and her Other Realms and Territories, Head of the Commonwealth, Defender of the Faith:

To The Honourable MARK LESLIE SMITH COOPER, of Auckland, Judge of the High Court of New Zealand; Sir RONALD POWELL CARTER, KNZM, of Auckland, Engineer and Strategic Adviser; and RICHARD COLLINGWOOD FENWICK, of Christchurch, Associate Professor of Civil Engineering:

GREETING:

WHEREAS by Our Warrant, dated 11 April 2011[1], issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second constituting the office of Governor-General of New Zealand, dated 28 October 1983[2], and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand, we nominated, constituted, and appointed you, the said The Honourable MARK LESLIE SMITH COOPER; Sir RONALD POWELL CARTER, KNZM, and RICHARD COLLINGWOOD FENWICK, to be a Commission to inquire into and report (making any interim or final recommendations that you think fit) upon certain matters relating to building failure caused by the Canterbury earthquakes:

AND WHEREAS by Our said Warrant you were required to report finally to His Excellency the Governor-General of New Zealand not later than 11 April 2012:

AND WHEREAS by Our Warrant, dated 7 February 2012[3], the time within which you were so required to report finally was extended to 12 November 2012:

AND WHEREAS it is expedient that the time and other requirements for reporting under Our said Warrant should be extended as hereinafter provided:

NOW, THEREFORE, We do by these presents extend, until the end of 30 November 2012, the time within which you are required to report finally on all matters on which you have not otherwise reported:

And We do hereby confirm Our Warrant dated 11 April 2011 and the Commission constituted by that Warrant, save as modified by these presents:

And, lastly, it is declared that these presents are issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second constituting the office of Governor-General of New Zealand, dated 28 October 1983, and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand.

In Witness whereof We have caused these presents to be issued and the Seal of New Zealand to be hereunto affixed at Wellington this 23rd day of October 2012.

Witness Our Trusty and Well-beloved Lieutenant General The Right Honourable Sir Jerry Mateparae, Chancellor and Principal Knight Grant Companion of Our New Zealand Order of Merit, Principal Companion of Our Service Order, Governor-General and Commander-in-Chief in and over Our Realm of New Zealand.

[L.S.]

Lt Gen Sir JERRY MATEPARAE, Governor-General.

By His Excellency's Command—

Rt Hon JOHN KEY, Prime Minister.

Approved in Council—

REBECCA KITTERIDGE, Clerk of the Executive Council.

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1 *New Zealand Gazette*, 14 April 2011, No 51, page 1201
2 SR 1983/225
3 *New Zealand Gazette*, 9 February 2012, No. 14, page 345

Appendix 2: Expert advisors

Dr Christopher Allington, Managing Director, Holmes Solutions LP, Christchurch

David Brunsdon, Kestrel Group, Wellington

Athol Carr, Professor Emeritus, Department of Civil and Natural Resources Engineering, University of Canterbury

Dr Barry Davidson, Director, Compusoft Engineering Limited, Civil, Structural and Mechanical Engineers, Auckland

Dr Andrew Dickson, Technical Director, Civil Structures Section, Beca Infrastructure Limited, Auckland

Graeme Frost, Chief Engineer, Fletcher Construction Company, Auckland

John Henry, Associate, Eliot Sinclair and Partners Limited, Christchurch

Dr Robert Heywood, Principal, Heywood Engineering Solutions Pty Ltd, Queensland

Dr Clark Hyland, Director, Hyland Consultants Limited

Institution of Professional Engineers New Zealand (IPENZ)

Dr Murray Jacobs, Consulting Engineer, Auckland

Dr James Mackechnie, Adjunct Senior Fellow, Department of Civil and Natural Resources Engineering, University of Canterbury

New Zealand Society for Earthquake Engineering (NZSEE)

Nigel Priestley, Emeritus Professor, University of California at San Diego and Emeritus Co-director of the ROSE School

Gerard Willis, Enfocus Limited, Auckland

International peer reviewers/experts

William T. Holmes, Principal, Rutherford and Chekene, Consulting Engineers, San Francisco

Bret Lizundia, Principal, Rutherford and Chekene, Consulting Engineers, San Francisco

Appendix 3: Submitters and witnesses

Submissions received: Local government management of earthquake risk	
Person or organisation	**Paper**
Christchurch City Council	*Response by the Christchurch City Council to Enfocus report "Management of Earthquake Risk by Canterbury Regional Council and Christchurch City Council"*
Environment Canterbury	*Environment Canterbury's response to the Royal Commissions report on the Management of Earthquake Risk by Canterbury Regional Council and Christchurch City Council*
Malcolm Flain	*Submission*
Ministry of Business, Innovation and Employment (including submissions by the former Department of Building and Housing)	*Department of Building and Housing submission to the Royal Commission for the Canterbury Earthquakes on the management of earthquake risk by Canterbury Regional Council and Christchurch City Council*

Submissions received: Building management after earthquakes	
Person or organisation	**Paper**
Brian Andersen	*Submission by email on 13 December 2011 regarding Street Address Records and Confusion in Emergency Response*
Auckland Council	*Discussion Paper: Building Management After Earthquakes*
Christchurch City Council	*Submissions on the process and authority for building assessment after earthquakes (stickering/placarding) (Issue 3(e)) and related issues*
	Submissions on the Discussion Paper: Building Management after Earthquakes
Bronwyn Dewar	*Submission by email on 15 December 2011 regarding Confusion of status of buildings safe to occupy*
Dunning Thornton	*Submission to the Canterbury Earthquakes Royal Commission: Building Management after Earthquakes*
Malcolm Flain	*Further submission from Malcolm Flain*
Nigel Harwood	*The Placarding of Buildings and Barricade Location (The Perspective of a Volunteer Chartered Engineer)*
Institution of Professional Engineers New Zealand	*Discussion Paper: Building Management After Earthquakes: Submission to Canterbury Earthquakes Royal Commission*

Submissions received: Building management after earthquakes	
Person or organisation	**Paper**
Dr Marion Irwin	*Dr Marion Irwin Canterbury Earthquakes Royal Commission Submission*
Guy Marriage	*Submission to: Canterbury Earthquakes Royal Commission*
Ministry of Business, Innovation and Employment (including submissions by the former Department of Building and Housing)	*Department of Building and Housing submission to the Royal Commission for the Canterbury Earthquakes on Building Assessments after Earthquakes*
	Ministry of Business, Innovation and Employment Submission on the Discussion Paper: Building Management after Earthquakes
Ministry of Civil Defence and Emergency Management	*Ministry of Civil Defence and Emergency Management Submission on the Canterbury Earthquakes Royal Commission Discussion Paper: Building Management after Earthquakes*
New Zealand Historic Places Trust	*Submission of New Zealand Historic Places Trust Pouhere Taonga to Canterbury Earthquakes Royal Commission discussion papers*
New Zealand Society for Earthquake Engineering	*Building Management After Earthquakes: Submission to the Canterbury Earthquakes Royal Commission*
New Zealand Society for Risk Management	*Evidence to the Canterbury Earthquakes Royal Commission: Submission by the New Zealand Society for Risk Management in Respect of the Discussion Paper: Building Management after Earthquakes*
Structural Engineering Society New Zealand	*Building Management after Earthquakes: Submission to the Canterbury Earthquakes Royal Commission*

Submissions received: Education and training of engineers and organisation of the profession	
Person or organisation	**Paper**
Paul Baker	*Education of Engineers*
Beca	*Submission Concerning Training and Professional Development of Graduate Structural Engineers*
Derek Bradley	*Submission by letter on 31 January 2012 regarding The Training of Engineers and Organisation of the Engineering Profession*
David Brunsdon	*Integrating Professional Engineering within Emergency Management Planning and Response in New Zealand*
Cement and Concrete Association of New Zealand	*Submission to the Canterbury Earthquakes Royal Commission on Discussion Paper: Training and Education of Engineers and Organisation of the Engineering Profession*
Chartered Professional Engineers Council	*Submission to the Canterbury Earthquakes Royal Commission*
Department of Geological Sciences, University of Canterbury	*Education of Structural and Geotechnical Engineers at the University of Canterbury*
	The Education of Engineers; Submission to the Royal Commission: Response to the Discussion Paper: Training and education of engineers and organisation of the engineering profession
Matt Furness	*Submission – Training and Education of Engineers and Organisation of the Engineering Profession*
Institution of Professional Engineers New Zealand and the Association of Consulting Engineers New Zealand (joint submission)	*Discussion Paper: Training and Education of Engineers and Organisation of the Engineering Profession: Submission to Canterbury Earthquakes Royal Commission*
C. Lund & Son Ltd	*Submission to the Canterbury Earthquakes Royal Commission: Education and Training in the Construction Industry*
	Submission by letter on 23 July 2012 in response to the Discussion Paper; Training and Education of Engineers and Organisation of the Engineering Profession
Guy Marriage	*Submission to: Canterbury Earthquakes Royal Commission*
Ministry of Business, Innovation and Employment (including the former Department of Building and Housing)	*Department of Building and Housing submission to the Royal Commission on the training of engineers and the organisation of the profession*
	Ministry of Business, Innovation and Employment Submission on the Discussion Paper: Training and Education of Engineers and Organisation of the Engineering Profession

Submissions received: Education and training of engineers and organisation of the profession	
Person or organisation	**Paper**
Peter Morgan	*Submission to the Canterbury Earthquakes Royal Commission, on the role of professional societies in the engineering sector*
New Zealand Concrete Society	*Submission by the New Zealand Concrete Society to the Canterbury Earthquakes Royal Commission*
New Zealand Historic Places Trust	*Submission of the New Zealand Historic Places Trust Pouhere Taonga to the Canterbury Earthquakes Royal Commission discussion papers*
Carl O'Grady	*Report to the Canterbury Earthquakes Royal Commission. July 2012. Discussion paper: training and education of engineers and organisation of the engineering profession*
Opus International Consultants	*Submission Re: Discussion Paper on Training and Education of Engineers and Organisation of the Engineering Profession*
John Scarry	*A Submission to the Canterbury Earthquakes Royal Commission: Training and Education of Engineers and Organisation of the Engineering Profession*
Structural Engineering Society New Zealand	*Training and education of engineers and organisation of the engineering profession: Submission to Canterbury Earthquakes Royal Commission*

Submissions received: Roles and responsibilities	
Person or organisation	**Paper**
The Architectural Centre Incorporated	*Architectural Centre submission on The Canterbury Earthquakes Royal Commission Discussion Paper: Roles and Responsibilities*
Building Officials Institute of New Zealand	*Submission to Canterbury Earthquake Royal Commission Aug 2012*
Brian Carter	*Roles and Responsibilities*
Cement and Concrete Association of New Zealand	*Submission to the Canterbury Earthquakes Royal Commission on Discussion Paper: Roles and Responsibilities*
Claire Chambers	*A Submission to the Canterbury Earthquakes Royal Commission: Roles and responsibilities – An Architect's Perspective*
Christchurch City Council	*Submission on the Discussion Paper: Roles and Responsibilities*

Submissions received: Roles and responsibilities	
Person or organisation	**Paper**
Environment Canterbury	*Submission by letter on 12 August 2012 regarding the Discussion Paper: Roles and Responsibilities*
Ian Fraser	*Submission by email on 13 August 2012 regarding the Discussion paper: Roles and Responsibilities July 2012*
Hamilton District Council	*Submission to the Commission's Discussion Paper on Roles and Responsibilities*
Dr David Hopkins	*Roles and Responsibilities: Submission by Dr David C Hopkins, Consulting Engineer, Wellington*
Institution of Professional Engineers New Zealand and the Association of Consulting Engineers New Zealand (joint submission)	*Discussion Paper: Roles and Responsibilities: Submission to the Canterbury Earthquakes Royal Commission*
International Accreditation New Zealand	*Submission by email on 14 August 2012*
Local Government New Zealand	*Submission to the Canterbury Earthquakes Royal Commission In the matter of Discussion Paper: Roles and Responsibilities*
Guy Marriage	*Submission to Canterbury Earthquakes Royal Commission*
Ministry of Business, Innovation and Employment	*The Ministry of Business, Innovation and Employment Submission on Discussion Paper: Roles and Responsibilities*
New Plymouth District Council	*Submission by email on 10 August 2012*
New Zealand Concrete Society	*Submission by the New Zealand Concrete Society to the Canterbury Earthquakes Royal Commission*
New Zealand Construction Industry Council	*CERC Discussion Paper: Roles & Responsibilities in the Building & Construction Industry*
New Zealand Geotechnical Society	*Canterbury Earthquakes Royal Commission: NZGS Submission on Discussion Paper: Roles and Responsibilities*
New Zealand Institute of Building Surveyors	*Roles and Responsibilities in the Building and Construction Industry*
Queenstown Lakes District Council	*Queenstown Lakes District Council Submission to Canterbury Earthquake Royal Commission Aug 2012: Topic: Roles and Responsibilities in New Zealand's building controls and regulatory system*
John Scarry	*Submission to the Canterbury Earthquakes Royal Commission: Roles and Responsibilities*
Standards Council	*Royal Commission of Inquiry into Building Failure Caused by the Canterbury Earthquakes: Standards Council – Submission on Discussion Paper: Roles and Responsibilities*

Submissions received: Roles and responsibilities	
Person or organisation	**Paper**
Structural Engineering Society New Zealand	*Roles and Responsibilities: Submission to Canterbury Earthquakes Royal Commission*
Stuart Thomson	*Submission by letter on 6 August 2012*
Waikato Building Consent Group	*Submission to: Canterbury Earthquakes Royal Commission On: Discussion Paper: Roles and Responsibilities*
Waimakariri District Council	*Submission to the Canterbury Earthquake Royal Commission on its Discussion Paper: Roles and Responsibilities*
Wellington City Council	*Wellington City Council submission on the Royal Commission 'Discussion Paper: Roles and Responsibilities'*

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
Margaret Aydon	Building occupant (Level 4)	26 June 2012
Andrew Ayers	Urban Search and Rescue	Written statement
David Bainbridge	Witness to the damage after the September earthquake	26 June 2012
Geoffrey Banks	Director, Structex Harvard	16 August 2012, 17 August 2012
Neil Blair	Former Director, Prime West Corporation	Written statement
Dr Brendan Bradley	Lecturer, Department of Civil and Natural Resources Engineering, University of Canterbury	24 July 2012, 25 July 2012, 26 July 2012, 15 August 2012
Derek Bradley	Senior Engineer, Compusoft Engineering	25 July 2012, 26 July 2012, 13 August 2012, 14 August 2012
Marie-Claire Brehaut	Witness to the damage after the September earthquake	26 June 2012
Michael Brooks	Formerly of Williams Construction	8 August 2012
Peter Brown	Witness to the damage after the September earthquake	26 June 2012
Graeme Calvert	Former Senior Building Support Officer, Christchurch City Council	28 June 2012
Elizabeth Cammock	Building occupant (Level 6)	25 June 2012
Bruce Campbell	Witness to the collapse of the CTV building	26 June 2012

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
Athol Carr	Emeritus Professor, Department of Civil and Natural Resources Engineering, University of Canterbury	25 July 2012, 26 July 2012
David Coatsworth	Senior Associate, Structural Engineers, CPG New Zealand	4 July 2012
Michael Collins	Loss Adjustor, Cunningham Lindsey	Written statement
Barry Davidson	Director, Compusoft Engineering	25 July 2012, 26 July 2012, 13 August 2012, 14 August 2012
Dr Andrew Dickson	Technical Director, Auckland Civil Structures, Beca	Written statement
William Dray	Civil Engineer, Engineering Services Team, Christchurch City Council	Written statement
John Drew	Director, EGT Holdings Limited and Company Director, New Regent Medical Centre	2 July 2012
Alan Edge	Witness to the collapse of the CTV building	26 June 2012
Shane Fairmaid	Project Manager, Ruby Views	15 August 2012
David Falloon	Falloon & Wilson Limited	25 July 2012
David Flewellen	Former Building Inspector, Christchurch City Council	28 June 2012
Leonard Fortune	Witness to the collapse of the CTV building	26 June 2012
Graeme Frost	Urban Search and Rescue	27 June 2012
Robert Gaimster	Chief Executive Officer, Cement and Concrete Association of New Zealand	15 August 2012
Stephen Gill	Witness to the collapse of the CTV building	26 June 2012
Ronald Godkin	Building occupant (Level 4)	25 June 2012
Stephen Grenfell	Witness to the collapse of the CTV building	26 June 2012
Euan Gutteridge	Witness to the collapse of the CTV building	26 June 2012
Douglas Haavik	Consulting Engineer, Costa Mesa, California	15 August 2012

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
David Harding	Harding Consulting Engineers Limited	30 July 2012, 31 July 2012, 7 August 2012, 14 August 2012, 15 August 2012
John Hare	Director, Holmes Consulting Group	15 August 2012
Malcolm Harris	Witness to the damage after the September earthquake	26 June 2012
Thomas Hawker	Witness to the collapse of the CTV building	26 June 2012
John Henry	Associate, Eliot Sinclair and Partners Limited	1 August 2012, 2 August 2012, 13 August 2012, 14 August 2012
Dr Robert Heywood	Queensland Taskforce 1 Urban Search and Rescue	27 June 2012
Peter Higgins	Southern Regional Manager, Concrete Techniques Limited	2 July 2012
Marie Holland	Former Building Inspector, Christchurch City Council	2 July 2012
William T. Holmes	Principal, Rutherford & Chekene, Consulting Engineers, San Francisco	10 July 2012
Terry Horn	Estimator, Kingston Building	6 August 2012
Lionel Hunter	Director, Madras Equities Limited	Written statement
David Hutt	Team Leader, Building Consents, Christchurch City Council (seconded to the Canterbury Earthquakes Royal Commission)	Written statement
Dr Clark Hyland	Director, Hyland Fatigue and Earthquake Engineering (author of the Department of Building and Housing's technical investigation into the collapse of the CTV building)	5 July 2012, 9 July 2012, 10 July 2012, 25 July 2012, 26 July 2012, 13 August 2012, 14 August 2012, 15 August 2012
Russell Ibbotson	Retired chartered accountant	17 August 2012
Maryanne Jackson	Receptionist, Canterbury Television	Written statement
Dr Murray Jacobs	Director, Murray Jacobs Limited	9 August 2012, 13 August 2012
Richard Johnson	Former Chairman, Canterbury Regional Council	Written statement

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
Geoffrey Jones	Manager, Materials Testing Laboratory, Opus International Consultants	Written statement
William Jones	Foreman for the CTV building	8 August 2012
Robert Jury	Manager, Wellington Structural, Beca (member of the former Department of Building and Housing's Expert Panel)	10 July 2012, 25 July 2012, 26 July 2012
Brian Kehoe	Associate Principal, Wiss, Janney, Elstner Associates, Illinois	4 July 2012, 5 July 2012
Stephen Kissell	Service Technician, Otis Elevator Company Limited	2 July 2012
Nilgun Kulpe	Building occupant (Level 6)	25 June 2012
Douglas Latham	Structural Engineer, Alan Reay Consultants Limited	26 July 2012, 13 August 2012, 14 August 2012
Phillippa Lee	Building occupant (Level 5)	25 June 2012
Stephen McCarthy	Environmental Policy and Approvals Manager, Christchurch City Council	3 July 2012, 6 August 2012, 7 August 2012
Dr James MacKechnie	Adjunct Senior Fellow, Department of Civil and Natural Resources Engineering, University of Canterbury	15 August 2012
John Mander	Zachry Professor of Design and Construction Integration 1, Department of Civil Engineering, Texas A&M University	23 July 2012, 24 July 2012, 25 July 2012, 26 July 2012, 15 August 2012, 16 August 2012
Kendyll Mitchell	Building occupant (Level 6)	25 June 2012
Murray Mitchell	Senior Structural Engineer, Opus International Consultants	Written statement
Daniel Morris	Formerly of Knock Out Concrete Cutters	5 July 2012
Peter Nichols	Retired structural engineer	6 August 2012
Robert Officer	General Manager, AML Limited	Written statement
Dr Arthur O'Leary	Retired structural engineer	9 August 2012, 13 August 2012, 14 August 2012
John O'Loughlin	O'Loughlin Taylor Spence Limited	Written statement

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
Leo O'Loughlin	Building Consent Officer, Christchurch City Council	7 August 2012, 14 August 2012
Leonard Pagan	Quantity Surveyor, Rawlinsons Limited	3 July 2012
Nigel Priestley	Emeritus Professor, University of California at San Diego and Emeritus Co-director of the ROSE School	11 July 2012, 12 July 2012
Dr Alan Reay	Alan Reay Consultants Limited	12 July 2012, 16 July 2012, 31 July 2012, 1 August 2012, 7 August 2012, 15 August 2012, 17 August 2012
Phillip Reynish	Managing Director, Reynish Decorators Limited	2 July 2012
Trevor Robertson	Senior Principal, Sinclair Knight Merz	16 August 2012
Matthew Ross	Witness to the collapse of the CTV building	27 June 2012
Anthony Scott	Retired quantity surveyor	8 August 2012
Robin Shepherd	Emeritus Professor, Civil and Environmental Engineering, University of California, Irvine	16 July 2012, 25 July 2012, 26 July 2012
Gerald Shirtcliff	Former construction manager for the CTV building	8 August 2012
Russell Simson	Building Consent Officer, Christchurch City Council	28 June 2012
Timothy Sinclair	Principal, Tonkin & Taylor	25 July 2012
Ashley Smith	Director, Structure Smith Limited (author of Department of Building and Housing's technical investigation into the collapse of the CTV building)	5 July 2012, 9 July 2012, 10 July 2012, 25 July 2012, 26 July 2012, 9 August 2012, 13 August 2012, 14 August 2012
Graeme Smith	Concrete Protection and Repair Limited	2 July 2012
Paul Smith	Director, Alan Reay Consultants Limited	6 August 2012
Judith Smitheram	Administrator, Relationships Aotearoa	Written statement

Witnesses who appeared at the hearing for the Canterbury Television building (25 June–16 August 2012; 5–7 September 2012)		
Person	**Organisation**	**Hearing**
Penelope Spencer	Witness to the collapse of the CTV building	26 June 2012
Wayne Strachan	Former draughtsman at Alan Reay Consultants Limited	6 August 2012
Tony Stuart	Structural Engineer, Compusoft Engineering	25 July 2012, 26 July 2012
Richard Sullivan	Principal, RD Sullivan & Associates	Written statement
Patricia Tapper	Widow of Graeme Tapper, the Christchurch City Council structural checking engineer who reviewed the structural aspects of the building permit for the CTV building	2 August 2012
Simon Thomas	Administrator, Steelbro Limited	Written statement
John Trowsdale	Support Engineer, Urban Search and Rescue	Written statement
Arthur Tyndall	Witness to the collapse of the CTV building	26 June 2012
Chris Urmson	Structural Engineer, Alan Reay Consultants Limited	Written statement
Pieter Van den Berg	Managing Director, Standstill and Seymour Builders Limited	2 July 2012
Peter Van der Zee	Building Consent Officer, Christchurch City Council	28 June 2012
Jo-Ann Vivian	National Practice Manager, Relationships Aotearoa	2 July 2012
Peter Wilding	National Manager, Fire Investigation and Arson Reduction, New Zealand Fire Service	17 August 2012
Alun Wilkie	Director, Wilkie Bruce Registered Architects Limited	30 July 2012, 15 August 2012
Grant Wilkinson	Managing Director, Ruamoko Solutions Limited	16 August 2012
Michael Williams	Witness to the collapse of the CTV building	26 June 2012

On 7 September 2012, Marwa Alkaisi, a bereaved family member, addressed the Royal Commission at the close of the hearing for the Canterbury Television building.

Witnesses who appeared at the hearing for building management after earthquakes (3–4 September 2012)		
Person	**Organisation**	**Hearing**
David Brunsdon	Director, Kestrel Group	3 September 2012, 4 September 2012
Ken Gledhill	GNS Science	3 September 2012
John Hamilton	Director, Ministry of Civil Defence and Emergency Management	4 September 2012
John Hare	Structural Engineering Society New Zealand	4 September 2012
Bret Lizundia	Principal, Rutherford & Chekene, Consulting Engineers, San Francisco	3 September 2012
Stephen McCarthy	Environmental Policy and Approvals Manager, Christchurch City Council	4 September 2012
Peter Mitchell	General Manager, Regulation and Democracy Services, Christchurch City Council	4 September 2012
Esther Newman	Sisirc Consulting Limited	4 September 2012
Tony Sewell	National President, Property Council of New Zealand	4 September 2012
Peter Smith	New Zealand Society for Earthquake Engineering	4 September 2012
Mike Stannard	Chief Engineer, Building and Housing Group, Ministry of Business, Innovation and Employment	4 September 2012
Richard Toner	Chief Building Officer, Wellington City Council	4 September 2012
Peter Wood	Emergency Management Advisor, Hazard Risk Management and Analysis, Ministry of Civil Defence and Emergency Management	4 September 2012

Witnesses who appeared at the hearing for the education and training of engineers and organisation of the profession (10 September 2012)	
Person	**Organisation**
Derek Bradley	Senior Engineer, Compusoft Engineering
Andrew Buchanan	Professor of Timber Design, Department of Civil and Natural Resources Engineering, University of Canterbury
Win Clark	The Executive Officer, New Zealand Society for Earthquake Engineering
Dr Andrew Cleland	Chief Executive, Institution of Professional Engineers New Zealand
John Gardiner	Manager, Determinations, Building and Housing Group, Ministry of Business, Innovation and Employment
Stuart George	Structural Engineering Society New Zealand
Joanne McGregor	C. Lund & Son Ltd
Peter Millar	Business Development Manager, New Zealand and Australia, Tonkin & Taylor
Dr David Prentice	Chief Executive and Managing Director, Opus International Consultants
David Sheppard	President, New Zealand Institute of Architects
Mark Spencer	General Manager, Building Structures, New Zealand, Beca

Witnesses who appeared at the hearing for roles and responsibilities (11–12 September 2012)		
Person	**Organisation**	**Hearing**
Derek Bradley	Senior Engineer, Compusoft Engineering	12 September 2012
Pieter Burghout	Chief Executive, New Zealand Construction Industry Council	11 September 2012, 12 September 2012
Debbie Chin	Chief Executive, Standards New Zealand	11 September 2012, 12 September 2012
Dr Nicki Crauford	Deputy Chief Executive, Institution of Professional Engineers New Zealand	11 September 2012, 12 September 2012
Geoff Hallam	Programme Manager, Inspection Bodies Accreditation, International Accreditation New Zealand	12 September 2012
Nicholas Hill	Chief Executive, Building Officials Institute of New Zealand	12 September 2012
David Kelly	Director, Canterbury Rebuild and Recovery, Building and Housing Group, Ministry of Business, Innovation and Employment	11 September 2012, 12 September 2012
Peter Laurenson	Manager, Building, Lakes Environmental (Queenstown Lakes District Council)	12 September 2012
John Lumsden	Chair, Standards Council	11 September 2012, 12 September 2012
Dr Peter Mumford	Director, Economic Development Group, Ministry of Business, Innovation and Employment	11 September 2012, 12 September 2012
Simon Pickford	Manager, Customer and Regulatory Services, New Plymouth District Council	12 September 2012
John Scarry	Structural engineer	11 September 2012
Frances Sullivan	Senior Policy Analyst, Local Government New Zealand	12 September 2012
Adam Thornton	Structural Engineering Society New Zealand and Institution of Professional Engineers New Zealand	12 September 2012

Appendix 4: Hearings Schedule

Date	Topic
17–20 October 2011	Seismicity
25 October 2011	Soils and ground conditions
7–15 October 2011	Unreinforced masonry (URM) buildings and earthquake-prone policies
28 November – 6 December 2011	Pyne Gould Corporation building
12 December 2011	593 Colombo Street
13 December 2011	90 Coleridge Street
14 December 2011	7 Riccarton Road
15 December 2011	391/391A Worcester Street
17–18 January 2012	Hotel Grand Chancellor
23 January 2012	116 Lichfield Street
24 January 2012	89/89A, 91 and 93 Cashel Street
25 January 2012	194 Hereford Street
26 January 2012	200–204 Manchester Street
30 January 2012	32 Cathedral Square
31 January 2012	308 Durham Street
1 February 2012	603 Colombo Street
2 February 2012	605–613 Colombo Street
13 February 2012	595 and 595A Colombo Street
14 February 2012	601/601A Colombo Street
15 February 2012	194 Gloucester Street and 246 High Street
16 February 2012	382 Colombo Street
23–24 February 2012	Forsyth Barr building
27 February 2012	43 Lichfield Street
28 February 2012	265–271 Manchester Street
29 February 2012	753–759 Colombo Street
1 March 2012	738 Colombo Street
12–14 March 2012	New building technologies
15 March 2012	738 Colombo Street (continued) and Hotel Grand Chancellor (continued)
25 June – 9 August 2012	Canterbury Television building
3–4 September 2012	Building management after earthquakes

Date	Topic
5–7 September 2012	Canterbury Television building closing submissions
10 September 2012	Education and training of engineers and organisation of the engineering profession
11–12 September 2012	Roles and responsibilities

Appendix 5: Glossary of terms

A further glossary of terms is contained in Appendix 4 of Volume 1 and Appendix 5 of Volume 4 of our Report.

Arterial route	An important route in a system of roads, railway lines or rivers.
Axial force	The compression or tension force acting along the longitudinal axis of a structural member. If the load on a column is applied through the centre of gravity of its cross-section, it may be called an axial load.
Building Warrant of Fitness	A building warrant of fitness (BWoF) is a statement confirming that the systems specified in the compliance schedule for their building have been maintained and checked in accordance with the compliance schedule for the previous 12 months, and that they perform as required.
Column hoop reinforcement	In concrete columns and piles, a hoop is a circular ring of reinforcement that is placed around the longitudinal reinforcement.
Compression force	The application of compression force to an object causes it to be subjected to compression.
Coupled wall	A coupled wall is formed when two or more cantilever walls are joined by coupling beams at each storey which can transfer shear forces between the walls.
Damping	In structural engineering, damping can be defined as the inherent property of a material and a structure that dissipates energy. The higher the damping of a system, the quicker the vibrations will cease when it is in a displaced position from its rest position.
Deflection	Displacement of a structural element under a load.
Dowel action	The dowel action is the shear force resisted by the reinforcing bars across a crack.
Geospatial data	Geospatial information is information describing the location and names of features beneath, on or above the earth's surface. At its simplest this can mean the basic topographical information found on a map, but also includes different location-related datasets combined into complex layers that show information such as land use and population density.
Gross Domestic Product (GDP)	The total value of goods produced and services provided in a country during one year.
Hypervigilance	A symptom of post-traumatic stress that refers to the experience of being constantly tense and "on guard". A person experiencing this symptom will be motivated to maintain an increased awareness of their surrounding environment, sometimes even frequently scanning the environment to identify potential sources of threat.
Inter-storey drift	The relative displacement of two adjacent floors in a building.
Iwi	The Māori term for an extended kinship group, tribe, nation, people, nationality, race. Often refers to a large group of people descended from a common ancestor.
K/SM factor	A term used to multiply an analysed inter-storey drift obtained from an elastic analysis to give the design drift.
Kāinga	The Māori term for a village, or habitation.
Lateral load resistance system	A structural member such as a wall, or group of members such as a moment resisting frame, that provide lateral force resistance in a building.
Moa	Large extinct flightless birds of several subspecies resembling an emu, formerly found in New Zealand.
Modern and Modernist architecture	A style of architecture that aims to depart significantly from classical and traditional forms, styles and values. It is generally characterised by simplification of form and creation of ornament from the structure and theme of the building.
Neo-Gothic architecture	A style of art and architecture that originated in the nineteenth century, characterised by the revival of medieval Gothic forms. In architecture, it is manifested in pointed arches, vaulted ceilings and mock fortifications.
Orthogonal walls	Walls that are at right angles to each other.

Pā	The Māori term for a fortified village, fort, stockade, screen, blockade, or city.
Party wall	A partition erected between two tenancies in a building.
Pad footing	A pad footing is a type of foundation. Pad foundations are used to support individual or multiple columns, spreading the load to the ground below.
Poisson's ratio	The ratio of the lateral strain to the axial strain in a member when it is subjected to axial load.
Post-modern architecture	A late-twentieth century style of art and architecture that represents a departure from modernism and is characterised by the self-conscious use of earlier styles and conventions and a mixing of different architectural styles.
Pounamu	Greenstone, nephrite jade from New Zealand.
Probative value	A term used mainly within the legal profession that describes having a quality or function of proving or demonstrating something. Affording proof or evidence.
Qualitative analysis	When using this analytic method, data is collected in textual form on the basis of observation. It is not converted into numerical form. This analysis also involves a certain degree of deductive reasoning.
Quantitative analysis	This analytic method usually involves collecting and converting data into numerical form so that calculations can be made and conclusions drawn.
Radial force	A force that is exerted perpendicular to the centre line, or axis, of an object.
Renaissance Revival architecture	The style of architecture that originated in the nineteenth century that is based on the architecture of sixteenth century Renaissance Italy and France, with additional elements borrowed from classical Greek and Roman architecture. Sometimes called Neo-Renaissance, and may include buildings that others classify as Italianate or French Baroque.
Satellite settlement, centre or town	A community or town dependent on a nearby larger town.
Seating	A support ledge for the end of a beam.
Seismic capacity	The ability of a building or other structure to withstand earthquake actions.
Shoring	Shores or props used to support or hold up a structure.
Soffit	The underside of a part of a structural component, such as an arch, beam, stair, slab, etc.
Stirrups	A type of steel reinforcement in concrete beams formed by closed loops of steel bars placed at regular intervals along a beam.
Strip footings	A strip footing is a type of foundation that distributes loads from columns or walls to the foundation soils.
Stripped Classicism architecture	An architectural style that took the typical features and motifs of Classicism but pared them back so that decoration was reduced, but an imposing structure remained. It was an authoritarian style adopted by a number of state organisations, including the American Postal Service and the government of Nazi Germany.
Tension force	The application of tension force to an object causes it be subjected to tensile stress.
Tie forces	A force that ties two structural components together.
Tilt-slab construction	Tilt-up, tilt-slab or tilt-wall is a type of building and construction technique using concrete elements such as walls or columns that are formed horizontally and later "tilted" into the final position in the structure.
Transverse reinforcement	Reinforcement at right angles to the principal axis of a structural member.
Trimmer beam	A timber or metal beam (joist) in a floor or roof structure attached to truncated joists in order to create an opening around a stairwell, skylight, chimney, and the like.
Urupā	The Māori term for a burial ground, cemetery, or graveyard.
Venetian Gothic architecture	A style of architecture that combines the lancet arches of the Gothic period with Byzantine and Arabic influences.
Weka	A New Zealand woodhen, *Gallirallus australis*. A brown-feathered bird streaked with black, with a short bill and heavily built legs and feet, able to run fast but flightless.

Canterbury Earthquakes
Royal Commission
Te Komihana Rūwhenua o Waitaha

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Royal Commission

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