**Appendix 1:**

**List of people mentioned in this**

**Volume**

**Acronyms used in this appendix**

ARCE Alan M Reay Consulting Engineer

ARCL Alan Reay Consultants Limited

BE Bachelor of Engineering

BSc Bachelor of Science

CPEng Chartered Professional Engineer

CCC Christchurch City Council

DBH Department of Building and Housing

ERSA Elastic response spectra analysis

IPENZ The Institution of Professional Engineers New Zealand

Hons Honours

ME Master of Engineering

MSc or MS Master of Science

NLTHA Non-linear time history analysis

NZFS New Zealand Fire Service

NZSEE New Zealand Society for Earthquake Engineering

PhD Doctor of Philosophy

SESOC Structural Engineering Society New Zealand

USAR Urban Search and Rescue

**Margaret Aydon** worked for King’s Education and was on level 4 of the CTV building when it collapsed.

**Andrew Ayers** is a member of USAR and carried out a visual inspection of the CTV building after the Boxing Day earthquake.

**David Bainbridge** visited level 6 of the CTV building after the September earthquake and gave evidence about damage he observed.

**Geoffrey (Geoff) Banks** carried out the engineering design that resulted in the installation of drag bars between the floor and the north wall complex on levels 4, 5 and 6. He has a BE (Hons), is a CPEng, a member of IPENZ, and is a former director of ARCL. He now runs his own engineering consultancy.

**Neil Blair** was a director and shareholder of Prime West Corporation, a property development company incorporated in

1983. Mr Blair, on behalf of Prime West Corporation, engaged Williams Construction to build the CTV building in 1986.

**Bryan Bluck** was the CCC’s Chief Buildings Engineer at the time the CTV building was permitted and constructed. He had a BE, and was a registered engineer and a member of IPENZ. He is now deceased.

**Dr Brendon Bradley** was instructed by counsel for ARCL to provide expert evidence on concrete and ground motions. He holds a PhD in civil engineering and is a member of NZSEE and other professional bodies. He operates his own consultancy firm, Bradley Seismic Limited, which provides research and consultancy services in seismic hazard and risk analysis and structural and geotechnical seismic response analysis. He also lectures at the University of Canterbury in a number of areas including structural dynamics, engineering mechanics and mathematics, geotechnical earthquake engineering and seismic hazard and risk analysis.

**Derek Bradley** is a senior engineer for Compusoft Engineering Limited and was involved in carrying out a NLTHA

of the CTV building for the Royal Commission. He was also a member of the NLTHA Panel. He has a BE Civil (Hons), is a CPEng, and is qualified as an international professional engineer.

**Marie-Claire Brehaut** worked for King’s Education and provided evidence about damage to the CTV building after the September earthquake.

**Michael Brooks** was the Managing Director of Williams Construction when construction of the CTV building commenced in 1986.

**Peter Brown** was working for CTV at the time of the September and February earthquakes and gave evidence about damage to the building after the September earthquake.

**Graeme Calvert** is a former CCC building officer who was part of the team that carried out the Level 2 Rapid

Assessment of the CTV building on 7 September 2010.

**Elizabeth (Liz) Cammock** works for Relationships Aotearoa and was on level 6 of the CTV building when it collapsed.

**Bruce Campbell** is the Director of Bruce Campbell Roofing, the company that was undertaking the weatherproofing of the west block wall on 21 and 22 February 2011. He provided evidence of the condition of the wall prior to the collapse.

**Professor Athol Carr** was engaged by the Royal Commission to act as a facilitator for the NLTHA and ERSA expert panels. He has an extensive background in the development and teaching of structural analyses. He is Professor Emeritus in the Department of Civil and Natural Resources Engineering at the University of Canterbury and has a PhD in engineering from the University of California, Berkeley. He is a fellow of IPENZ, a member of SESOC, a life member of NZSEE, and a member of the American Society of Civil Engineers. He is a member of the Faculty of the ROSE School (Centre of Postgraduate Training and Research in Earthquake Engineering and Engineering Seismology) at the University of Pavia, Italy, where he teaches a course in structural dynamics and earthquake engineering analysis, focusing on NLTHA.

**David Coatsworth** carried out an engineering assessment of the CTV building after the September earthquake. He is

a senior associate of CPG New Zealand and has practised as an engineer specialising in civil and structural engineering for approximately 40 years. He has a BE (Hons), is a CPEng, an international professional engineer and a member

of IPENZ.

**Dr Barry Davidson** is the Director of Compusoft Engineering Limited which carried out a NLTHA of the CTV building for the Royal Commission. He was also a member of the NLTHA Panel. He has a PhD in engineering, is a fellow of IPENZ and the NZSEE, and a life member and a past president of SESOC. He has 28 years of experience teaching and researching in structural engineering, specialising in structural dynamics, finite element theory and earthquake engineering.

**Dr Andrew Dickson** is a technical director with the civil structures section of Beca Infrastructure Limited. At the request of counsel assisting, he carried out an assessment of the tension capacities of the steel drag bars installed in the CTV building in 1991 between the floor slabs and north wall complex on levels 4, 5 and 6. He has a PhD in civil engineering and is a member of IPENZ, NZSEE, SESOC and the New Zealand Concrete Society.

**William (Bill) Dray** is a civil engineer working in the engineering services team of the building operations unit of the

CCC. He has a BE and is a member of SESOC and the Building Officials Institute of New Zealand.

**John Drew** was the building manager of the CTV building at the time of its collapse and moved his medical centre

(The Clinic) into the building in January 2011.

**Alan Edge** is the Director and Chief Executive Officer of Southern Demolition & Salvage Limited. He was asked to assist with provision of equipment to the rescue effort at the CTV building site on the afternoon of 22 February 2011.

**Shane Fairmaid** worked at ARCE as a draughtsman between 1981 and 1986.

**David Falloon** is the Principal of Falloon & Wilson Limited, who were engaged to do the structural engineering aspects of a fit-out of the building in 2000. He gave evidence in relation to the installation of an internal staircase between levels

1 and 2. He has a BE and is a member of IPENZ.

**David Flewellen** is a former CCC building officer who was part of the team that carried out the Level 2 Rapid

Assessment of the CTV building on 7 September 2010.

**Leonard Fortune** was on a scissor lift working for Bruce Campbell Roofing on the weather proofing of the west block wall of the CTV building when it collapsed.

**Graham Frost** was on the CTV site from the evening of 23 February 2011 in his role as a USAR support engineer for the NZFS. His primary role in the days after the collapse was to assist in recognising and minimising the risks to USAR and police teams while performing their work. He has a BE (Civil), and has worked as a construction and structural engineer since 1978. He is the Chief Engineer for the Fletcher Construction Company, a fellow of IPENZ, and a member of the American Society of Civil Engineers. He is now a contracted USAR engineer.

**Robert Gaimster** is the Chief Executive Officer of the Cement and Concrete Association of New Zealand (CCANZ). He presented the CCANZ submission regarding the concrete testing section of the Hyland/Smith report. He has a BE (Civil) from Portsmouth Polytechnic/University and is a chartered civil engineer with the Institution of Civil Engineers (UK). He also has an Advanced Diploma in Concrete Technology and is a member of the Institute of Concrete Technology (UK).

**Stephen (Steve) Gill** witnessed the collapse of the CTV building from the roof of the Les Mills building (to the west of the CTV building).

**Ronald (Ron) Godkin** worked for King’s Education and was on level 4 of the CTV building when it collapsed.

**Stephen Grenfell** witnessed the collapse of the CTV building from Madras Street (to the east of the CTV building).

**Euan Gutteridge** witnessed the collapse of the CTV building from the south-east corner of the Cashel and Madras

Street intersection.

**Douglas Haavik** is a consultant engineer specialising in concrete and concrete materials, based in California. He has an MSc in civil engineering from the University of California, Berkeley. He is a registered civil engineer in California, a member of the American Concrete Institute, the American Society of Civil Engineers, and the International Concrete Repair Institute. He was instructed by Buddle Findlay on behalf of ARCL to provide independent expert advice on concrete-related issues relevant to the collapse of the CTV building.

**David Harding** worked for ARCE as a structural engineer between 1978 and 1980 and between 1985 and 1988. His qualifications and experience are discussed in detail in section 2.1 of this Volume of the Report.

**John Hare** identified the non-complying connections between the floors and the north wall complex of the CTV building in January 1990. At the time of his involvement with the building he was a senior engineer for Holmes Consulting Group. He is now a director of that company. He has a BE (Civil) (Hons), is a member of IPENZ and NZSEE, and is the President of SESOC. He is also a licensed professional engineer in California. He is currently acting Principal Engineering Adviser to the Canterbury Earthquake Recovery Authority.

**Malcolm Harris** works for CTV and provided evidence about damage to the building after the September earthquake.

**Thomas (Tom) Hawker** worked for CTV and witnessed the collapse of the CTV building from the middle of Cashel

Street (to the south of the building).

**John Henry** was employed by ARCE as a structural engineer from 1984 to 1985. During this period he designed Landsborough House, which is discussed in sections 2.1 and 6.2 of this Volume. Between 1992 and 1995 he was employed by the CCC as an engineer, later becoming Building Control Engineer and Building Consents Manager. He has a BE (Hons) from the University of Canterbury and is a CPEng.

**Dr Robert** (**Rob) Heywood** is a forensic structural engineer from Brisbane, Australia who was at the CTV building site from the morning of 24 February 2011, acting as a USAR support engineer for the NZFS. He has a PhD in engineering, and was a principal researcher and senior lecturer at the School of Civil Engineering at the Queensland University of Technology from 1985 to 1998. He is a registered professional engineer in Queensland, a chartered professional engineer and is registered with the National Professional Engineers Register in Australia. He is a fellow of the Institution of Engineers Australia, and a member of the American Society of Civil Engineers and the International Association of Bridge and Structural Engineers.

**Peter Higgins** is the Southern Regional Manager for Construction Techniques Limited. He gave evidence of his observations of the CTV building in February 2011 while inspecting it in order to provide an estimate for crack repairs.

**Marie Holland** is a former CCC building officer who carried out a Level 1 Rapid Assessment after the Boxing Day earthquake.

**William T. Holmes** was engaged by the Royal Commission to peer review the Hyland/Smith and DBH Expert Panel reports. He is a Principal with Rutherford and Chekene, Consulting Engineers in San Francisco and has 45 years of practical experience in all aspects of designing structures, particularly designing for protection from earthquakes. Mr Holmes’ experience includes post-earthquake reconnaissance and analysis, fragility and retrofit standards for unreinforced masonry and concrete buildings, development of seismic standards for both new and existing buildings, research and development of seismic technology, and performance-based seismic engineering. He has a MS in structural engineering from Stanford University, is a registered civil and structural engineer in California, and a registered professional engineer in Tennessee.

**Terence (Terry) Horn** worked at ARCE as a draughtsman between 1985 and 1995.

**Lionel Hunter** is the sole Director and a shareholder of Madras Equities Limited, which owned the CTV building.

**David Hutt** is a CCC officer who was seconded to the Royal Commission for the duration of the Inquiry and retained full access to the CCC electronic systems. At the request of counsel assisting, he searched CCC records for any other buildings in Madras Street built between 1985–1986. He is a team leader of building consents at the CCC, and has been a building officer since 1993.

**Dr Clark Hyland** is a Director of Hyland Consultants Limited and co-author of the Hyland/Smith report. Dr Hyland also prepared the site investigation and materials test report for the CTV building. He has a PhD in civil engineering from The University of Auckland, has been a registered engineer since 1989, and a CPEng since 2004. He has been involved in the formulation of New Zealand Standards and joint Australia/New Zealand Standards for steel structures.

**Russell Ibbotson** is a former Director and shareholder of Madras Equities Limited and acted as the manager of the

CTV building from 1990 until March 2010.

**Maryanne Jackson** works for CTV and escaped from the CTV building during the February earthquake.

**Dr Murray Jacobs** is a consulting engineer with over 35 years of experience in the design of structures in Auckland.

He was called by counsel assisting to give expert evidence on whether the CTV building complied with the Christchurch

City Bylaw No 105 (1985) and the relevant Standards when the building permit was issued on 30 September 1986. He has a PhD in engineering and is a member of IPENZ, a CPEng, and an international professional engineer.

**William (Bill) Jones** was the original construction site foreman for the CTV building and was employed by Williams

Construction and then Union Construction for the project.

**Robert (Rob) Jury** is the Technical Director of structural engineering with Beca Carter Hollings and Ferner and was a member of the DBH Expert Panel. He has an ME, and is a CPEng, and a fellow of IPENZ and NZSEE. He was a member of the committee that developed the Loadings Standard (including earthquakes) (NZS 4203:1992) and the current Earthquake Loadings Standard (NZS 1170.5).

**Brian Kehoe** and his colleague **Terrence Paret** are Associate Principal and Senior Principal, respectively, of Wiss, Janney, Elstner Associates Inc in California. Mr Kehoe and Mr Paret prepared a joint statement of evidence and Mr Kehoe appeared at the hearing. At the request of CPG New Zealand Limited, they reviewed the damage assessment performed by Mr Coatsworth on the CTV building after the September earthquake and were asked to provide an expert opinion as to whether the assessment undertaken by Mr Coatsworth was appropriate and whether his conclusions and recommendations were properly made. Mr Kehoe has an MSc in civil engineering, and is registered as a civil engineer in California, a professional (civil) engineer in Oregon, and a structural engineer in California, Hawaii, Oregon, and Utah. His areas of practice are earthquake engineering, structural evaluation, repair and rehabilitation design. Mr Kehoe is a steering committee member of ASCE-41 (Seismic Evaluation and Rehabilitation of Existing Buildings) and sits on the American Concrete Institute’s committee ACI-374 for Performance-Based Seismic Design of Concrete Buildings (among other committees). He was a member of the American Society of Civil Engineers reconnaissance team which visited Christchurch after the September and February earthquakes. Mr Paret has an MSc in structural engineering, and has professional affiliations with a number of American organisations including the American Society of Civil Engineers, the Earthquake Engineering Research Institute, the Seismological Society of America, and the Structural Stability Research Council. His practice areas include structural performance evaluation, repair and rehabilitation design, seismic risk assessment and seismic repair and retrofit design.

**Geoffrey Jones** is the Manager of Opus International Consultants’ (Opus) Materials Testing Laboratory in Christchurch, which carried out concrete testing for the Hyland/Smith report. Mr Jones has 42 years of experience as a laboratory technician undertaking mechanical testing of aggregates, soils, bitumen and concrete. He holds a Technicians Certificate (Civil) and is a Registered Engineering Associate.

**Stephen Kissell** is a service technician for Otis Elevator Company Limited. He provided access to a lift shaft in the CTV building on 18 February 2011 so that it could be inspected by Mr Graeme Smith. He provided evidence of his observations during that visit.

**Nilgun Kulpe** works for Relationships Aotearoa and was on level 6 of the CTV building when it collapsed.

**Douglas Latham** is a Structural Engineer for ARCL. He has a BE (Hons) and is a graduate member of IPENZ. He was involved in the collection of concrete samples from the CTV building debris at the Burwood landfill and prepared evidence as to the methodology of the sampling and chain of custody. He also carried out an ERSA analysis of the CTV building.

**Phillippa Lee** worked for The Clinic as a receptionist and was on level 5 of the CTV building when it collapsed.

**Stephen McCarthy** was the Environmental Policy and Approvals Manager for the CCC at the time of the earthquakes. He is now the Resource Consents and Building Policy Manager. During the state of emergency following the September earthquake he was one of the Building Evaluation Managers in the Christchurch City Emergency Operations Centre. He has worked for the CCC since 1 May 2006 and has 36 years of experience working for local government, including 16 years in building control. He has a degree in applied science and a postgraduate diploma in management from Massey University.

**Dr Graeme McVerry** is an engineering seismologist with GNS Science. He was a member of the ERSA and NLTHA expert panels convened by the Royal Commission. He has a PhD in Applied Mechanics and has been involved in research and consulting on seismic hazard assessment for over 20 years.

**Dr James Mackechnie** peer reviewed the concrete testing methodology used for the Site Examination and Materials

Tests report prepared by Dr Hyland. He has a PhD and is a CPEng. He is an adjunct senior fellow in the Department

of Civil and Natural Resources Engineering at the University of Canterbury and a council member of the New Zealand

Concrete Society. He is also employed by Allied Concrete as its South Island Plant Engineer.

**Professor John Mander** is the Inaugural Zachry Professor in Design and Construction Integration I, at the Zachry Department of Civil Engineering, Texas A&M University. He was instructed by Buddle Findlay, on behalf of ARCL, to provide expert evidence to the Royal Commission on issues relevant to the CTV building, including: a review of the key findings of the DBH investigation; the results of new investigations commissioned by ARCL into ground motions, concrete tests and columns tests; an analysis of column performance; and alternative collapse hypotheses. He has a PhD in civil engineering, is a member of a number of organisations, including the American Society of Civil Engineers, the American Concrete Institute, the Earthquake Engineering Research Institute, NZSEE, and is a fellow of IPENZ.

**Kendyll Mitchell** and her two children were in the reception area of Relationship Services on level 6 of the

CTV building when it collapsed.

**Murray Mitchell** is a senior structural engineer with Opus. He reviewed structural drawings for the CTV building in

1998/1999 when Opus was considering leasing the building and identified an issue with the connections between the floors and the north wall complex. He has a BE (Hons) and has 42 years of experience as a civil and structural engineer. He is a member of IPENZ and a past member of SESOC.

**Daniel Morris** owned Knock Out Concrete Cutters Limited between 1991 and 2000.

**Peter Nichols** worked as a structural checking engineer for the CCC from 1978 until 1984 and subsequently became the Riccarton Borough Engineer. He has a BE (Civil). He also observed the CTV building during construction and had a conversation with Mr Bluck about it.

**Dr Arthur O’Leary** is a retired structural engineer with 40 years of experience in the design and design management of commercial buildings with emphasis on earthquake engineering. He was called by the CCC to provide expert evidence on the Standards that applied when the building permit for the original construction of the CTV building was issued, the Hyland/Smith and Expert Panel reports and the peer review by Mr William T. Holmes. He has a PhD in civil engineering, and was a CPEng, and on the New Zealand register of the International Professional Engineers Register up until his retirement. He is a fellow of IPENZ and NZSEE, and a member of SESOC.

**John O’Loughlin** is a consulting engineer based in Christchurch with 42 years of experience in the engineering profession. He was asked by the CCC to provide expert evidence from the perspective of a practising structural engineer about the nature of the structural review undertaken by the CCC during the permit stage and whether the CCC engineers were in a position to identify the areas of non-compliance identified in the Hyland/Smith report. He has a BE (Hons), was a CPEng and an international professional engineer until December 2010, and is a member of IPENZ.

**Leo O’Loughlin** has worked for the CCC as a building officer since 1983. He received the original permit application for the CTV building, and gave evidence of the processes that applied to permit applications at that time.

**Leonard Pagan** is a quantity surveyor employed by Rawlinsons Limited. He accompanied Mr Coatsworth and Mr Drew on the engineering assessment of the CTV building in October 2010 and prepared a cost estimate for repairs.

**Professor Nigel Priestley** was Deputy Chair of DBH Expert Panel and provided expert evidence to the Royal Commission at the request of counsel assisting. He has been involved in the seismic performance of structures for more than 45 years. He has a PhD and has been a faculty member at the University of Canterbury, a Professor of Structural Engineering at the University of California, San Diego, Co-director of the European School for Graduate Studies in Reduction of Seismic Risk (the “ROSE” School). He has emeritus status at the University of California, San Diego and the ROSE School. He has also worked as a structural consultant. He is an honorary fellow

of the Royal Society of New Zealand, fellow of the American Concrete Institute, fellow and past president of the NZSEE, and a fellow of IPENZ.

**Dr Alan Reay** is a structural engineer, was the Principal of ARCE and is a Director of ARCL. His qualifications and experience are discussed in section 2.1 of this Volume.

**Phillip Reynish** is the Managing Director of Reynish Decorators Limited, the firm carrying out painting on level 5 of the

CTV building in January and February 2011. He provided evidence of his observations of the building during this time.

**Trevor Robertson** is the Senior Principal of Sinclair Knight Merz working in the role of Principal Structural Engineer

(NZ). He was instructed by DLA Phillips Fox, counsel for Holmes Consulting Group Ltd, to provide expert evidence

on issues relevant to the ethical, conduct and reporting obligations owed by engineers. He is a member of the IPENZ Ethical Complaints Investigating Committee. He has BE (Civil) (Hons), is a CPEng, a fellow of IPENZ, a member of SESOC and NZSEE and is registered as an international professional engineer.

**Matthew Ross** witnessed the collapse of the CTV building from the south-east corner of the Cashel and Madras

Street intersections.

**Anthony (Tony) Scott** was the Quantity Surveyor and Project Development Manager for Williams Construction and then Union Construction during the design and construction of the CTV building.

**Professor Robin Shepherd** is a consulting engineer in New Zealand and California, and is Emeritus Professor of Civil Engineering at the University of California. He was instructed by Buddle Findlay on behalf of ARCL to provide expert evidence on forensic engineering practice, the evolution of seismic design standards, cumulative earthquake damage, seismic excitation of the building site, and dynamic analyses including NLTHA. He has a PhD in engineering and holds a number of professional memberships including the American Society of Civil Engineers, of which he is a fellow and life member, the Institution of Civil Engineers (London) of which he is a fellow, and is a fellow and life member of NZSEE.

**Gerald Shirtcliff** was the Construction Manager for Williams Construction and Union Construction during the construction of the CTV building.

**Russell Simson** is one of three CCC building officers who was part of the team that carried out the Level 2 Rapid

Assessment of the CTV building on 7 September 2010.

**Timothy (Tim) Sinclair** is a geotechnical engineer with Tonkin & Taylor Limited, where he is a principal. Tonkin & Taylor Limited produced a report on the geotechnical conditions of the CTV building site for the DBH for use in the production of the Hyland/Smith report. His qualifications include a Master of Arts in engineering science and a Masters in soil mechanics. He has over 40 years in practice and is the firm’s principal expert in geotechnical earthquake engineering and seismic hazard assessment and is also a specialist in soil dynamics and machine foundations. He is a CPEng and

a fellow of IPENZ.

**Ashley Smith** is the Principal of StructureSmith Limited and co-authored the Hyland/Smith report with Dr Hyland. He has an ME from The University of Auckland, has been a practising structural engineer since 1981, and a CPEng since 2010. He has been the project engineer on significant buildings located in Auckland (up to 41 storeys), and his areas of specialist expertise include structural engineering analysis and design and earthquake engineering.

**Paul Smith** is a draughtsman who has worked for ARCL since November 1987. He is now a Director of that company.

**Graeme Smith** of Concrete Repair and Protection Limited carried out inspections and prepared an estimate for repair of the damage caused to the CTV building following the September earthquake. He has a BE (Civil) and has worked in the concrete repair industry since 1994.

**Penelope Spencer** worked for CTV and witnessed the collapse of the CTV building from the middle of Cashel Street

(to the south of the CTV building).

**Wayne Strachan** worked at ARCE as a draughtsman between 1979 and 1988.

**Tony Stuart** is a structural engineer with Compusoft Engineering and was involved in the NLTHA of the CTV building carried out for the Royal Commission. He was also a member of the NLTHA Panel. He has a BE (Hons) and is a member of NZSEE and SESOC.

**Richard Sullivan** is a structural engineer who assisted the CCC in carrying out rapid assessments of buildings in the Christchurch Central Business District after the September earthquake. He was involved in the Level 1 Rapid Assessment of the CTV building on 5 September 2010. He has a BE (Civil) and is a member of IPENZ and a CPEng.

**Graeme Tapper** was the Assistant Buildings Engineer at the CCC at the time the CTV building was permitted. He assessed the CTV building for compliance with the structural aspects of Bylaw 105. He was a registered engineer and a member of IPENZ. He is now deceased.

**Patricia Tapper** is the widow of Graeme Tapper.

**Simon Thomas** worked for CTV and prepared evidence about the damage to the CTV building after the September earthquake.

**John Trowsdale** worked as a USAR support engineer after the February earthquake. He was at the CTV building

site from the evening of 22 February 2011 and was asked to give evidence about his observations of the state of the building and its elements after the collapse. He has a BE (Civil) (Hons), is registered as an international professional engineer, and is a CPEng and a member of IPENZ.

**Arthur Tyndall** is a structural engineer who provided evidence about a post-earthquake inspection that he carried

out on the CTV building after the June 1994 “Arthur’s Pass” earthquake. He has a BE, is registered as an international professional engineer, and is a CPEng and a fellow of IPENZ.

**Christopher (Chris) Urmson** is a structural engineer employed by ARCL. He has an MSc and is a graduate member of IPENZ. He was involved in the collection of column samples from the CTV building remains at the Burwood landfill and observed testing of samples.

**Pieter Van den Berg** operates a building company, Standstill & Seymour Builders Limited/Ltd, and provided a quotation for cladding of the west wall and gave evidence about his observations of the building at that time.

**Peter Van der Zee** is a CCC building officer who carried out the Level 1 Rapid Assessment after the September earthquake.

**Jo-Ann Vivian** is the National Practice Manager for Relationships Aotearoa, based in Wellington. She visited the CTV

building after the Boxing Day earthquake.

**Peter Wilding** is the National Manager of Fire Investigation and Arson Reduction for NZFS, and gave evidence about the processes followed for investigation of the fire after the collapse.

**Alun Wilkie** was the architect for the CTV building.

**Grant Wilkinson** was the Project Director for the assessment of the CTV building undertaken by Holmes Consulting Group in 1990, and reviewed the assessment and report of Mr Hare. He has a BE (Hons), is a fellow of IPENZ, a CPEng and a member of NZSEE. He has worked as a consulting structural engineer since 1984 and is the Managing Director of Ruamoko Solutions, a consulting structural engineering firm.

**Michael Williams** witnessed the collapse of the CTV building from the Inland Revenue building (to the south of the

CTV building).

**Appendix 2: Chronology**

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| Early 1986 | Mr Neil Blair of Prime West Corporation Limited (Prime West) engages Williams Construction Limited (Williams Construction) to submit a design-build proposal for an office building at 249 Madras Street |
| February 1986 | Monthly time records of Alan M Reay Consulting Engineer (ARCE) show first time recorded for Dr Alan Reay for the CTV building – 2 hours |
| March 1986 | Monthly time records show first time recorded for Mr David Harding on the CTV  building design (22 hours) |
| 3 April 1986 | Mr Michael Brooks and Mr Anthony Scott of Williams Construction submit architectural drawings and structural sketches for the building to Mr Blair, with a preliminary cost estimate of $2,450,000 plus GST |
| May 1986 | Prime West approves Williams Construction instructing Alun Wilkie Associates and ARCE to prepare drawings for permit and construction |
| 23 May 1986 | Date on gravity calculations for CTV building |
| 10 June 1986 | Date on seismic calculations for CTV building |
| 18 June 1986 | Date of Soils and Foundations Report for “Proposed Development –  249 Madras Street” |
| 26 June 1986 | Date on foundation calculations for CTV building |
| 7 July 1986 | Date of invoice for computer charges of $163.09 for June 1986 from University of  Canterbury to ARCE ‘File 2503’ (CTV) |
| 17 July 1986 | Application for building permit for CTV building filed with Christchurch City Council  (CCC) |
| 26 August 1986 | CCC file indicates CTV structural drawings received |
| 27 August 1986 | Letter from Mr Graeme Tapper of the CCC to ARCE regarding CTV building permit application |
| 1 September 1986 | Mr David Harding writes “rec’d 1/9/86” on the letter from Mr Tapper |
| 5 September 1986 | Document Transfer Form sent from ARCE (signed by Mr Harding) to CCC (Mr Tapper) |
| 10 September 1986 | Mr Tapper signs off on CTV building permit application |
| 30 September 1986 | CCC issues building permit for the CTV building |
| October 1986 | Formal building contract signed by Prime West |
| 16 October 1986 | CCC building inspection record reads (first recorded CCC inspection):  *Founds (sic)…Set out by Surveyor OK Steel to Finish Engineer Due* |
| 11 December 1986 | CCC inspection:  *Founds (sic)…Last of Found (sic) beams* |
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| 18 February 1987 | CCC inspection:  *1st Floor…OK* |
| 8 March 1987 | CCC inspection:  *Shear Wall… Ok Gantry Up* |
| 31 March 1987 | CCC inspection:  *Shear Wall…Preparing/Proparing (sic) 2nd Frame* |
| 1 May 1987 | Union Construction Limited (Union Construction) begins trading |
| 17 August 1987 | Letter from Mr Bryan Bluck of CCC to Williams Construction regarding *“recent inspection”* and refers to the building nearing completion. |
| 20 August 1987 | CCC Inspection:  *Fixing Gib wrong Card Left New foreman* |
| September 1987 | Assignment of CTV contract from Williams Construction to Union Construction |
| 9 October 1987 | CCC Inspection:  *Foreman to prove Front Cols on site and fill Block Work 1st/2nd West End* |
| 16 October 1987 | CCC Inspection:  *No Contact from site so visited found peg cols to be removed. Foreman advised*  *Col 200 on Street. Survey peg set at 3m from Kerb* |
| 11 January 1988 | CCC Inspection:  *Cols removed. Boxing ready to pour* |
| 22 February 1988 | CCC Inspection (last recorded CCC inspection):  *Finishing Handrails & Hardware* |
| 24 January 1990 | Holmes Consulting Group (HCG) engaged by Buddle Findlay and Schulz Knight Consultants Limited to prepare a structural report on the CTV building for the Canterbury Regional Council |
| 26 January 1990 | Mr John Hare of HCG views ARCL’s file on the CTV building |
| 29 January 1990 | Mr Hare visits Mr Bluck at CCC to discuss the CTV building |
| 30 January 1990 | Mr Hare visits CTV building with Mr Banks for inspection |
| 31 January 1990 | HCG provides draft report to Schulz Knight Consultants, that identifies “a vital area of non-compliance” in the connection of the floors to the north wall complex |
| 1 February 1990 | Dr Reay and Mr Geoffrey Banks meet with Mr P W Young of KPMG Peat Marwick  (receivers of Prime West)  Mr Banks, on behalf of ARCL, advises insurer that their own review of the drawings confirmed the apparent lack of ties to two walls |
| 2 February 1990 | Letter from Mr Banks to Mr Grant Wilkinson of HCG regarding proposed remedial work |
| 14 February 1990 | Further discussion between Mr Banks and Mr Hare |

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| 9 April 1990 | Mr Banks completes Annual Report on status of claim for the Consulting Engineers Advancement Society (CEAS) and records “[w]e are still investigating whether there is a deficiency, and if so, details of remedial work” |
| 21 December 1990 | Settlement of purchase of CTV building by Madras Equities Limited  (Madras Equities) |
| 4 February 1991 | Article appears in Christchurch newspaper *The Press* reporting that the CTV  building has been sold |
| 9 April 1991 | Following the receipt of legal advice, Mr Peter Smith of CEAS authorises ARCL  to inform the new owner of the CTV building about the floor connection issue |
| 30 September 1991 | Letter from Mr Russell Ibbotson of Madras Equities to Mr Banks recording their discussions on or about 11 September 1991 that “there may be a engineering design fault omission” in the CTV building |
| 1 October 1991 | CCC issues building permit for fit-out work for ANZ Bank tenancy of the CTV building, that includes converting part of level 1 from car parking to office space and installation of concrete block walls on level 1 |
| 15 October 1991 | Letter from Mr Banks to Mr Ibbotson, recording that “a limited amount of additional reinforcing work is required in order to provide the seismic strength to meet the current New Zealand Standards” |
| 16 October 1991 | Mr Ibbotson advises Mr Banks that the quotation for the remedial work is accepted and instructs ARCL to proceed |
| 17 October 1991 | Letter from Mr Banks to Mr Ibbotson confirming that “the proposed remedial work will give the floor to wall connection the seismic strength required by the current New Zealand loadings code, NZS 4203:1984” |
| 24 October 1991 | Letter from Mr Banks to CEAS advising that the remedial work was underway |
| 4 March 1992 | Mr Banks fills out an Annual Report on status of claim recording that the remedial work had been completed, at a cost of $4,483.50 plus GST and that the building was occupied |
| 10 May 2000 | CCC issues building consent for fit-out work for Christchurch Television (CHTV) that includes cutting a penetration in the floor of level 2 so that an internal stair could be installed |
| 16 May 2001 | Design Edge Limited filed building consent application (on behalf of Madras Equities) with CCC for a fitout on level 3 (Going Places), indicating building will undergo a change of use |
| 24 August 2010 | Application lodged with CCC for consent to demolish building at 213 Cashel Street to the west of the CTV building |
| 4 September 2010 | September earthquake |
| 5 September 2010 | Level 1 Rapid Assessment of CTV building |
| 7 September 2010 | Level 2 Rapid Assessment of CTV building carried out by Mr Calvert, Mr Flewellen and Mr Simson |
| 29 September 2010 | Inspection of CTV Building by Mr Coatsworth. Mr Leonard Pagan (Quantity  Surveyor with Rawlinsons Ltd) and Mr John Drew also present |
| 6 October 2010 | David Coatsworth reports to Mr Drew |
| 12 October 2010 | Building consent for demolition of 213 Cashel Street granted by CCC |
| 12 October 2010 | Mr Drew requests CCC property file for CTV building |

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| 19 October 2010 | Mr Coatsworth returns to inspect the CTV Building at Mr Drew’s request |
| 22 October 2010 | CCC advises Mr Drew CTV property file is available to view |
| 21 December 2010 | CTV property file returned to storage |
| 26 December 2010 | Boxing Day earthquake |
| 27 December 2010 | Level 1 Rapid Assessment and Urban Search and Rescue rapid visual survey of the  CTV building |
| January 2011 | The Clinic moves into the CTV building |
| 5 January 2011 | Jo-Ann Vivian requests CCC inspection of CTV building |
| 7 January 2011 | Jo-Ann Vivian cancels CCC inspection of CTV building after speaking to Mr Drew |
| 31 January 2011 | Mr Drew requests property file for CTV building from CCC |
| 1 February 2011 | CCC advises Mr Drew that the property file for the CTV building is available to view |
| 2 February 2011  22 February 2011 | CCC records show the property file for the CTV building was returned to storage  The CTV building collapses as a result of the February earthquake |