

Brief of evidence of Martin Laurence Crundwell

I, **MARTIN LAURENCE CRUNDWELL** of Nelson, Civil and Structural Engineer, state:

1. I hold a Bachelor of Engineering (Civil) that I received in 1977. I am a Chartered Professional Engineer and a member of the Institute of Professional Engineers of New Zealand. I have been employed as a civil and structural engineer by Opus International Consultants and its predecessor since 1978. Between 1978 and 1979 I practiced as a graduate civil engineer. Between 1980 and 1990 I practiced as a structural and civil engineer. Since 1990 I have predominantly practiced as a civil engineer but have also done some work as a structural engineer. I am based in Opus's Nelson office.
2. Between 27 September and 15 October 2010 I was on secondment to the Christchurch City Council for the purpose of the Council's response to the 4 September earthquake. I was initially involved in cordons and then building inspections.
3. In October 2010 I was directed by Council staff to inspect the staircase at 91A Cashel Street. I attempted to complete this inspection on 14 October. A Council "Enforcement Team Notices Coversheet" provided to me set out my instructions for the inspection **[WIT.CRU.0001.7]**.
4. I do not recall what other information I was given before my inspection, but it is likely that I had a copy of the most recent Level 2 Rapid Assessment report **[BUI.CAS91.0007.1-3]** by Paul Guile of 12 October based on his inspection carried out two days before my inspection.
5. The coversheet of Paul Guile's report refers to photographs having been taken **[BUI.CAS91.0007.21 – 24]** which appear to show the crack in the stairwell. I do not recall seeing the photos. However, the sketch in Paul Guile's Level 2 assessment also identifies the location of the stairwell crack.
6. When I arrived at the site I determined that 91A Cashel Street must have been the address of occupants of the first and/or second storey of the building as the ground floor was occupied by '123 Mart'.

7. I had a building inspector assistant with me who had made arrangements for access. I do not recall who he was, but he was assigned by the Council. I had understood that building access was to be provided by a building representative, but this representative did not arrive. I recall my assistant making at least one phone call to resolve the access issue to no avail. I was therefore not able to access the stairwell or the upper interior/ exterior of the building. However, we remained on site and tried to discover what we could from the ground outside of the building and from the balcony of a building opposite 91 Cashel.
8. I took a series of photographs on site [WIT.CRU.0001.8 - 20]. These indicate that I carried out a visual inspection of the exterior.
9. The photo sequence begins with the Cashel Street frontage [WIT.CRU.0001.9] where the building presented as concrete. I observed an inset glazing facade that masked the structural form of the building. The apparent span of beams behind the facade at second floor level and capping the building at roof level implied the existence of units such as concrete beams perhaps similar to the one supporting the shop front canopy.
10. The first two site photos [WIT.CRU.0001.9 and .10] covered the eastern and western sides of the building, where I discovered an old vertical crack in the western side wall. This did not present as a crack resulting from horizontal earthquake displacement.
11. I believe that I then returned to studying the front of the building. I found an exposure of brickwork on the front face of the building [WIT.CRU.0001.11] and so determined that the building was at least partially unreinforced masonry with a plaster finish.
12. Given the presence of unreinforced masonry I gave further consideration to the vertical crack in the eastern wall. I surmised that the vertical cracking pattern could be what was now showing up as a vertical crack in the eastern stairwell. If the crack had translated through the wall to the outside then I might observe it from the outside, but I knew that the wall was obscured from view from the street by the neighbouring building.

13. I then decided to try to find out more about the eastern face of the building. I had two options. I inspected the building at the ground floor being the 123 Mart at 91 Cashel Street. I then observed 91 Cashel Street from the first or second floor balcony of a building on the opposite side of the street.
14. Although 123 Mart was closed, we managed to locate a 123 Mart employee and asked if we could observe the side walls from the inside of the building on the ground floor. However, the shop walls were lined, obscuring my view.
15. From the building on the opposite side of the street we were able to gain a better view of the eastern wall [WIT.CRU.0001.12 - 15]. Here I discovered exposed brickwork on the edge of a parapet toward the rear of the building. But even with the camera on full zoom I could still see no crack in the side wall.
16. In order to check the same wall from the rear of the building, the 123 Mart employee showed us through the store to the rear of the building, and from the carpark I observed the north and eastern walls [WIT.CRU.0001.16 - 20]. The exposed brickwork appeared to be adjacent to the base of a removed chimney, which I noted in my report, saying “parapet crushed by falling chimney?”.
17. After my inspection I completed a Rapid Assessment Form – Level 2 [BUI.CAS91.0007.7-9]. My usual practice was to complete these forms on site.
18. In my report I noted the type of construction as unreinforced masonry.
19. I recorded Overall Hazards/Damage [BUI.CAS91.0007.7] as:
 - Cracks (vertical) in west + east walls*
 - Other minor crazing/cracking (could be old)*
 - Chimney removed (earlier hazard)*
20. I noted under Structural Hazards/ Damage [BUI.CAS91.0007.8] that the parapet had been damaged by the falling chimney(s), and vertical cracks in the wall diaphragm as moderate risk. I noted minor failures in parapets as a moderate risk.

21. Under General Comment I noted the failure to gain access to complete my assignment. I noted the similarity of position of the vertical cracks in the eastern and western walls. I noted other cracks in the street frontage at the joint between the walls and horizontal members, and brickwork exposed beneath plaster. I noted that I had to do a lot of work to find these exposures and I recommended a careful examination of the photographs that I took. I stated:

How building works structurally not clearly understood and requires further study.

22. I included a sketch [BUI.CAS91.0007.9] of a suspected external hairline crack in the eastern wall inferred by the author of the earlier 12 October Level 2 report. I showed the location of the vertical crack (full height of visible portion) in the western wall and noted that it may be old. In the recommendations on that page I noted that the suspected mechanism of the crack on the western and eastern wall was the same. I indicated cracks and exposed brickwork on the facade face. Further potential cracks in the facade were sketched as part of my attempt to understand how hidden beams might be working. This sketch was based on my hypothesis, not actual observations.
23. I did not rate the observed vertical crack in the western wall as a significant seismic risk as it appeared to be old. The stairwell crack indicated only hairline movement and had not necessarily translated through the wall. I therefore went to the front sheet and ticked the box calling for a detailed engineering evaluation by a structural engineer in order to develop the investigation further. I understood this would draw further study from Council procured engineers in the short term.
24. Based on my limited inspection I concluded that the building fell into the light damage/ low risk category G2 (meaning occupiable but repairs were required). I noted that an "Eng report to advise how to repair" was required as a follow up to the requirement for further study.
25. I noted that the existing placard designation was Green (Inspected) and affirmed this status based on my inspection. I did not rate my additional findings as a significant risk in terms of immediate safety. The previous full inspection was based on internal and external access, which carried some weight. I had found no justification to upgrade the classification to Yellow, so continued the Green G2 designation pending further study.

26. Under the 'Recommendations for Repair and Construction or Demolition' section of my report I briefly set out the difficulties I had in inspecting the property and recommended the application of the BETT Advisory [WIT.CRU.0001.21] as a further means to ensure that the building owner would consider their responsibilities and employ their own structural resources to study the problem in detail in the medium term. I noted:

"Request – CPEng engineers report to requirements of BETT Advisory of 12 Oct 10 as attached."

27. When I returned to the Council's office I submitted my Level 2 report [BUI.CAS91.0007.7-9] attaching the BETT Advisory [WIT.CRU.0001.21], and downloaded the photographs to Council administration staff for transfer to the server. I completed an Enforcement Team Notices Coversheet [BUI.CAS0007.10] where I noted further actions for the BETT Administration team and outlined the site dangers for passing on to Operation staff. I also placed a sticky note on a copy of my photograph of the Council coversheet which I gave to the Council saying [WIT.CRU.0001.22]:

"Requires Level 2.

Note – could not access stairwell where crack is".

28. I returned to Nelson the day after my inspection and had no further involvement with Canterbury earthquake issues until after 22 February. I continued to liaise with Council BETT staff from Nelson by telephone but I do not recall any further communications specifically about 91 Cashel Street.

Dated 19 January 2011

Martin Crundwell

Attachments:

WIT.CRU.0001.7: CCC Enforcement Team Notices Coversheet of 12 October 2010

WIT.CRU.0001.8 - 20: Crundwell photographs

WIT.CRU.0001.21: BETT Advisory with handwritten date 12 October 2010

WIT.CRU.0001.22: Photograph of CCC cover sheet with attached "post-it" note

CHRISTCHURCH CITY COUNCIL ENFORCEMENT TEAM NOTICES COVERSHEET	Christchurch City Council
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Address :	<i>91 A Castel St.</i>		
Date :	<i>12/10/2010</i>	Time:	<i>10.40</i>

Building Evaluation Transition Team - Actions

Level 1 / 2 Assessment Sheet completed (attached)	<input checked="" type="radio"/> Yes / No
Photos taken and attached:	<input checked="" type="radio"/> Yes / No
Previous Existing Placard – RED YELLOW <input checked="" type="radio"/> GREEN UNKNOWN	
New Status (please circle – RED YELLOW <input checked="" type="radio"/> GREEN)	

Further Action required: (Instruction for Administration)	<input checked="" type="radio"/> Yes / No
<i>• Hairline crack full height of external wall in stair case - requires investigation by engineer (structural)</i>	

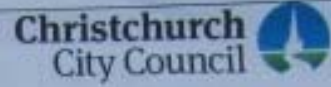
No further Action required – Information entered by Data Hub - File

Notice Required to be completed by Operation NOTICE staff	<input checked="" type="radio"/> Yes / No ^
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Text: Fully outline what the danger is and / or work required:

Completed by (print name): *Paul Gule*

CHRISTCHURCH CITY COUNCIL
ENFORCEMENT TEAM
NOTICES COVERSHEET



Address : *41 A Cashel St*

Date : *12/10/2010*

Time: *10.40*

Building Evaluation Transition Team - Actions

Level 1 / 2 Assessment Sheet completed (attached)

Yes / No

Photos taken and attached:

Yes / No

Previous Existing Placard - RED YELLOW GREEN UNKNOWN

New Status (please circle - RED YELLOW GREEN

Further Action required:
(Instruction for Administration)

Yes / No

• Hairline crack full height of external wall in stair case - requires investigation by engineer (structural)

No further Action required - Information entered by Data Hub - File

Notice Required to be completed by Operation NOTICE staff

Yes / No

Txt: Fully outline what the danger is and / or work required:

Completed by
(print name): *Paul Gule*

























CHRISTCHURCH CITY COUNCIL BUILDING ASSESSMENT CERTIFICATION REQUIREMENTS

Before Council will accept that the building is satisfactory for occupancy it will be necessary for you to obtain certification from your Chartered Professional Engineer practicing in structural engineering that:-

- * the building is not dangerous in terms of Section 121 (1) of the Building Act (attached)
- * the building is not a risk to adjacent buildings and public assessable areas such as roads, footpaths and other areas that the public generally has access to.
- * the building is structurally adequate for normal occupancy.

The certification should be accompanied with a structural engineering assessment that includes what damage has occurred to the building, what repairs if any that have been made, the basis of ascertaining the building is not dangerous in terms of the Building Act and photos of the building that show the general structural condition of the building.

121 Meaning of dangerous building

- (1) A building is dangerous for the purposes of this Act if, -
- (a) in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause –
 - (i) injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property; or
 - (ii) damage to other property; or
 - (b) in the event of fire, injury or death to any persons in the building or to persons on other property is likely because of fire hazard or the occupancy of the building; or
 - (c) there is a risk that the building could collapse or otherwise cause injury or death to any person in the building as a result of an earthquake that generates shaking that is less than a moderate earthquake*; or
 - (d) there is a risk that other property could collapse or otherwise cause injury or death to any person in the building; or
 - (e) a territorial authority has not been able to undertake an inspection to determine whether –
 - (i) the building is dangerous under paragraph (a); and
 - (ii) the territorial authority or the chief executive, as the case may be, is required to exercise powers under section 124 or 129 as modified by this order.

This Section shows how the Canterbury Earthquake (Building Act) Order 2010 (**Order**) interacts with this Section of the Building Act 2004 (**Act**).

The modifications made to the Section by the Order are in red.

* A moderate earthquake is defined in Section 7 of the Building (Specified Systems, Change the use, and Earthquake-prone Building) Regulations 2005.

Requires Level 2.
Note - could not
access stairwell
where crack is.

CHRISTCHURCH CITY COUNCIL

ENFORCEMENT TEAM
NOTICES COVERSHEET

Address : 91 A Coastal St

Date : 12/10/2010

Time: 10-40

Building Evaluation Transition Team - Actions

Level 1 / 2 Assessment Sheet completed (attached)

Yes / No

Photos taken and attached:

Yes / No

Previous Existing Placard - RED YELLOW GREEN UNKNOWN

New Status (please circle - RED YELLOW GREEN)

Further Action required:
(Instruction for Administration)

Yes / No

• Hairline crack full height of external
wall in stair case - requires
investigation by engineer (structural)

No further Action required - Information entered by Data Hub - File

Notice Required to be completed by Operation NOTICE staff

Yes / No

Txt: Fully outline what the danger is and / or work required:

Completed by
(print name): Paul Gale