IN THE MATTER OF
THE CANTERBURY EARTHQUAKES ROYAL COMMISSION

BRIEF OF EVIDENCE OF RHYS COLLIN SMITH

Dated 16 December 2011

Solicitors:
Williams & Co
Christchurch

Kerry Williams

Counsel instructed:
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1. My full name is Rhys Collin Smith**,** I am a Structural Engineer living in Christchurch.

Background

2. Upon competing my school studies, I took up a position at O'Loughlin Taylor Spence Limited ("the company") and also studied architectural drafting at Christchurch Polytechnic. I obtained my NZ Certificate in Architectural Drafting in 1990. In 1992 I went to the UK and continued to work in drafting for structural engineering companies in London.

3. I completed an Honours degree in Civil Engineering at University College London in June 2000. I took up employment as a structural engineer with WSP Group, a large multi-disciplinary international engineering firm from 2000 until August 2009 when I returned for family reasons to New Zealand. I re-joined the company at that time.

4 September 2010 earthquake

4. At the time of the first earthquake, I was on a holiday break in the UK. I was returning to New Zealand on the Monday morning following the earthquake in any event. I literally "hit the ground running" with numerous instructions to inspect client buildings at the request of the building's insurers or building owners. There was a huge amount of work confronting the company. At the same time, the premises from which we operated were damaged and we were unable to gain access to the building.

5. There was no predetermined formal process that we were working to. Our instructions were invariably the same; *please check the building to see what damage it has suffered and advise whether it is safe for the occupiers to return to it.* We approached it on that basis.

194 Hereford Street (Joe's Garage) ("the building")

First inspection on 10 September 2010

6. By email dated 9 September 2010, Alastair Miles, of Miles Construction Limited, a tenant on the first floor of the building and builder for the owner, made contact with me. He is also a close personal friend. The email is produced as **RCS1**. He had earlier telephoned me with the instructions. I was aware from a brief discussion with John O'Loughlin that the company had completed some earthquake strengthening for the building some years earlier. Alastair confirmed that in his email.

7. I inspected the building on 10 September 2010 for earthquake damage. I recorded my findings on a standard company site instruction sheet, which is produced as **RCS2** (2 pages).

8. I refer later in my evidence to the formal report I prepared and sent to the owners of the building, Joe's Garage Hereford Street Limited ("Joe's Garage") dated 18 January 2011. In that report I describe the construction of the building as I determined it and I refer to that report.

9. I also described the strengthening which had been done as at 18 January 2011, which I again refer to.

10. As noted above, I did not have access to our premises at the time of the inspection so was unable to refer to the plans that we would have had in company files. By the time I completed the report on 18 January 2011, I had regained access to the files and therefore the plans.

11. My record of 10 September 2010 details the damage I observed. I also took photos of the damage which I produce as **RCS3**.

12. I have numbered the photos 1 to 11 and detail below what I identified in each photo:

    Photo 1: General view of the front (north) elevation. The wall was constructed from unreinforced brick masonry (URM) and had lightly reinforced concrete bond (or ring) beams that ran full width over each level of windows. The wall was plastered on the outside and exposed on the inside.

    Photo 2: Close-up of the upper left corner of the wall. There was a crack starting from the edge by the rainwater overflow and ran diagonally up to the right through to the top of the parapet.

    Photo 3: General view of the rear (south) wall. The two storey section was double skin cavity URM and the lower wall to the right was solid double brick. Behind the lower wall was a service yard which housed a self contained coolstore.

    Photo 4: Close-up of the central upper area of the rear wall showing hairline cracks in the wall.

    Photo 5: Close-up of the right upper area of the rear wall showing hairline cracks in the wall.

Photo 6: Close-up of the upper return wall over the service yard showing hairline cracks in the wall.

Photo 7: Close-up of the upper southeast corner showing hairline cracks in the wall.

Photo 8: Close-up of the junction of the lower wall with the main rear wall showing vertical crack.

Photo 9: A view of the walls in the southeast corner of the service yard. The east end of the wall had been reconstructed by the builders of No. 186.

Photo 10: Shows where builders of No. 186 have fitted a flashing over the gap between the buildings without allowing for differential movement.

Photo 11: Shows a vertical crack in the wall over the west side of the service yard.

13. There was an issue in relation to the building which in my view required immediate attention, which was the stability of the front left (north) parapet.

14. The second page to RCS2 is the design detailing I completed for Miles Construction to carry out. I note section "X-X" in the drawings of 10 September 2010. The drawing is accurate with the exception that the ceiling was actually level with the top of the reinforced concrete beam. Also the "roof plan" is drawn as hipped (or a hip roof) whereas in fact it was a mono slope roof. I did not climb up onto the roof at the time.

15. As above, I thought that the danger from the building related to the north parapet. Once that was tied back, as detailed, I regarded the building as being satisfactory to occupy. That is recorded on my worksheet. There were no other serious signs of structural damage and it was apparent that the earlier earthquake strengthening work which had been carried out, and as described in the brief of Mr O'Loughlin which I have read, was successful.

Second inspection on 14 September 2010

16. On 14 September 2010 I carried out a follow-up inspection to check that the works which I had requested following the first inspection had been carried out. I produce as **RCS4** my site instruction dated 14 September 2010 in relation to the building. I went on to the roof to check the north parapet restraints and I was satisfied that they had been installed correctly and were satisfactory. While I was on the roof I checked the other parapets where visible. I noted some loose bricks at the top rear of the south parapet. They were not of concern to me. That is

because the loose bricks, if they were to fall anywhere, would have only fallen a short distance on to the roof adjacent.

17. The third bullet point records *"monitor cracks to south wall – east façade needs better connection to south wall"*. I did not consider that the cracking in the outside wall brickwork was of significant concern because it is a double skin brick wall and I had checked the interior surface of that wall and there was no cracking. I was satisfied that the strengthening work which had been carried out was sufficient to maintain the structural integrity of that wall.

18. As recorded in the site instruction record of 14 September 2010, I regarded the building as satisfactory to occupy.

19. The final bullet point notes that if there was an aftershock of magnitude greater than 5, then the building should be evacuated and a further engineering inspection carried out to ensure that the building remained safe. This was a standard notation which we had agreed as a company we would include on our reports to ensure that there were on-going inspections in the event of a significant aftershock.

Third inspection on 27 September 2010

20. I reinspected the south wall of the building on 27 September 2010 and took further photographs which I produce as **RCS5**. I have labelled those photos 1 to 7 and describe what is in each photo further below:

Photo 1: Close-up of the left end of the front parapet showing plates of temporary restraints. A vertical crack was evident to the right of these.

Photo 2: Close-up of the front parapet showing the central set of plates of the temporary restraints

Photo 3: View of south end of the Liverpool St (west) frontage taken for the record. There was no damage evident.

Photo 4: Close-up of the upper left side of the rear wall recording extent of cracks.

Photo 5: Close-up of the left side of the rear wall at first floor recording extent of cracks.

Photo 6: Close-up of the upper right side of the rear wall recording extent of cracks. A horizontal crack ran along the line of the strengthening bolts and there were some cracks higher up in the parapet.

Photo 7: Close-up of the junction of the lower wall with the main rear wall showing vertical crack. The length of the crack has increased since previous inspection.

21. The reason I had returned to inspect the building on 27 September is that I had been contacted by Alastair Miles who had noticed a new crack in the north parapet which had formed, as a consequence of further aftershocks, between the restraints which had been installed, as illustrated in photograph 1.

22. On 6 October I received a telephone call from Alastair Miles. He was concerned about the movement at the join between the east wall and the bond beam of the north wall. I asked Alastair to take a photo of the area and send it to me. **RCS6** is his covering email and the attached photos of the area of concern to him.

Fourth inspection on 14 October 2010

23. I reinspected the building on Thursday 14 October 2010. **RCS7** is my email to Alastair Miles of 15 October 2010, referring to the 14 October inspection and attaching a structural inspection report (2 pages). This was as a consequence of the observation Mr Miles had noted of the new crack in the north parapet following aftershocks. The site instruction on page 1 under "Observations and Comment" notes that the front parapet had moved in-between previously installed restraints. The structural solution noted was to extend the restraints to join them together and add a diagonal brace and an additional tieback, as detailed. This was intended as a temporary solution to the front parapet issue. I was satisfied that it would provide the necessary strength as an interim solution. However, my intention was to consider a permanent solution which would not have been so obvious from the front, to retain the character of the building, or to consider rebuilding the parapet.

24. The site instruction also records that further work was required in relation to the front bond beam and wall, which was still moving out with the aftershocks.

25. At page 2 of 2 of the report I provided a detail in relation to the rear parapet which was potentially unstable above the existing restraint line. The solution was to fit a flat strap at an angle just below the capping and to bolt it through. I noted that the contractor was to provide access first to investigate the roof framing to check if it was feasible to tie back into. It is also recorded that I was to meet with CCC to get a steer on the extent of strengthening required for the back wall.

26. On the same day I sent a further email to Alastair Miles, **RCS8**, as I realised the earlier site instruction did not cover the bond beam at the front pulling out at the east end.

27. The email indicates that by that date we had access to the original strengthening drawings. As noted, the drawings indicated that brackets should have been fixed from the roof level framing into the back of the walls to restrain them. At that stage, I had not been into the roof space, but I concluded given the damage that either the brackets were not fitted on the north façade, or if they were, they had been ineffective. I noted that the steel frames that I had discussed with Alastair Miles would be a permanent solution, however in the short term to stop movement to the beam, a bracket would be required as detailed in the sketch dated 15 October 2010 which accompanied the email.

Fifth inspection on 29 October 2010

28. On 29 October I inspected the building again. I had been advised that the roof space had been opened up so that I could have a look. This enabled inspection inside the roof adjacent to the south wall. I took a series of photos which I produce as **RCS9** and I refer to each photo numbered 1 to 10 below:

Photo 1: View of southeast corner of roof where roofing removed to enable inspection of strengthening.

Photo 2: View of southwest corner of roof where roofing removed to enable inspection of strengthening.

Photo 3: Shows strengthening PFC fixed to back of south parapet. PFC can be seen to run at slope of the roof and support the steel purlins. The purlins do not appear to be bolted to the cleats provided on the PFC.

Photo 4: Close-up of a purlin cleat showing bolts missing.

Photo 5: Close-up showing cracked bricks on the inside leaf of the parapet. The weak lime-based mortar had been shaken out and can be seen lying on the PFC.

Photo 6: View inside the southwest corner of the parapet.

Photo 7: View showing the end connection of the PFC restraining the west parapet.

Photo 8: Close-up of typical fixing of the PFC restraint into the parapet brickwork.

Photo 9: General view of the roof space looking northwest at back of the west parapet.

Photo 10: View of the temporary restraints installed at the rear of the north parapet.

29. **RCS10** is an email from Alastair Miles to David Ralfe, the loss adjuster for McLarens Young International, confirming that the earthquake making safe measures which I had detailed had been completed.

Sixth inspection on 28 December 2010

30. Following the Boxing Day earthquake I reinspected the building for any additional damage. I took another series of photographs on that day which I produce as **RCS11**. There are 14 photos which I describe as follows:

Photo 1: Close-up viewed at an angle toward the east end of the north parapet. Pieces of plaster have fallen off at the cracks.

Photo 2: Straight-on view of Photo 1.

Photo 3: View of the plates to the central north parapet recording no noticeable change to the cracks.

Photo 4: Close-up of the right side of the front bond beam showing minor cracking of the plaster above and below the beam.

Photo 5: Shows some minor cracks in the brick panel to the right of the front door.

Photo 6: Shows a vertical crack in the end of the wall below the window to the left of the front door.

Photo 7: Shows where the bottom left corner of the front window frame had moved inward by approx. 15mm.

Photo 8: Close-up of horizontal crack at first floor window level in the far left front URM column.

Photo 9: Close-up of a hairline horizontal crack in a front URM column at ground floor window sill level.

Photo 10: View of upper left side of rear wall recording minor increase of cracking. End of the temporary parapet restraint strap can be seen.

Photo 11: View of the junction of the lower wall with the main rear wall showing minor increase in vertical crack

Photo 12: View of upper centre of rear wall recording minor degradation to horizontal crack. Temporary parapet restraint strap can be seen.

Photo 13: View of back of front upper bond beam showing minor movement between beam and ceiling.

Photo 14: Shows a vertical crack in the back of the front upper bond beam.

31. **RCS12** is an email exchange between Joe's Garage and me in relation to the Boxing Day earthquake. My email of 6 January 2011 notes the main points to be aware of following the further damage.

18 January 2011 report to Joe's Garage

32. **RCS13** is the covering email to Joe's Garage attaching the company report dated 18 January 2011. As noted in Mr O'Loughlin's brief, the report details the construction of the building and summarises the existing strengthening, to which I refer. I summarise the earthquake damage to the building on page 2 (refer).

33. In the "Discussion" section, I note the previous strengthening work and deal with three options for addressing the damage. Option A related to repairing the cracks using Helifix bars, or something similar, to return the walls to their pre-earthquake condition and to strengthen or rebuild the parapets in lightweight construction. As noted on page 3 of the report, I had had preliminary discussions with CCC and, as I thought would be the case, they would not accept the option for a building already strengthened to 33% NBS. That is because in their damaged state, the URM walls' strength is less than 33% NBS. I agreed with this.

34. The second option noted was to repair and strengthen the walls to 67% NBS or as close as reasonably practicable to that and to rebuild the parapets in lightweight construction.

35. The third option was the same for the façades but to rebuild the south and cool room area walls in reinforced concrete block.

36. My view was that Option B was the best way to minimise disruption to the tenants whilst at the same time reducing the likelihood of similar damage in a future earthquake. I noted that the option would not guarantee that damage would not occur and that Joe's Garage's insurer would need to be in agreement with the approach, as opposed to the more comprehensive Option C. Attached to the report are drawings of the building where I have noted the cracks and damage I observed.

37. By email dated 20 January 2011 from Joe's Garage, Steve Ward of that company asked me to proceed with Option B, including sketches for pricing and CCC approval, **RCS14**.

38. I had a further email exchange with Alastair Miles on 20 January 2011, **RCS15**. Alastair said that he had noticed further cracks to the Hereford Street/Liverpool Street corner where the column meets the ring beam. The email attached photos

which are also produced. Having reviewed the photos, I concluded that there appeared to be some shear movement between the concrete and brick. My view was that it was not a real concern, but would be addressed in the proposed remedial strengthening which was then underway.

39. Before the Option B remedial strengthening work could be implemented, the 22 February event happened.

40. I note that completely independently of the company, and without any consultation with us, the CCC carried out their own inspection of the building after the 4 September earthquake. The building was "green stickered". I do not know what process they were following at that time to arrive at that conclusion but in any event, it accorded with my own view that after the September event, because of the strengthening work which had been carried out in 2005/2006 and the further interim measures I implemented, that the building was safe to occupy.

22 February 2011 earthquake

41. The damage to the building is graphically shown on CTV footage taken from the opposite side of the building in Liverpool Street. I have provided a link to "YouTube" which shows the damage to the building at the time of the earthquake. The sequence of damage to the building is self-evident from the video footage. However, my observations are that the footage shows the massive forces the building was subjected to.

42. Secondly, the south wall collapsed from the top eastern end and peeled away.

43. The whole west parapet, despite the strengthening, collapsed.

Friday 25 February 2011

44. John Spence and I were tasked to carry out emergency inspections after the 22 February event. We were instructed in the first instance to inspect our clients' buildings. This was under the authority of Civil Defence.

45. **RCS16** is a bundle of photos of the damaged building. As I recall the first photo is the only one I took on that occasion. I believe that the remainder of the photos were taken on a subsequent day. That is because in the first photo two-thirds of the bond beam is lying intact in the foreground of the photo. Whereas in photo 4 it has been broken in two and a "red sticker" is on the front entrance window.

46. The photos are relatively self-evident. However, there are a couple which I refer to.

47. Photo 11 shows the standard detailing from the Earthquake Society recommendations. The damage shows that the standard solution to parapet restraint simply failed in the force of this earthquake.

48. Photo 5 illustrates the failure of the upper east wall in the north bay. This wall supported the bond beam.

Response to questions

49. Counsel Assisting the Commission, Mr Zarifeh, had previously written to the company with a series of questions. Through Mr O'Loughlin's brief and my own, we have endeavoured to answer the matters raised. There are some matters raised not specifically responded to in the narrative above which I now address.

50. Mr Zarifeh asked what the company's understanding was as to what was required of us in relation to the inspections I carried out. RCS1 is the email from Alastair Miles dated 9 September 2010 requesting an inspection. Our view of the instruction was to inspect the building for earthquake damage, advise on any immediate making safe requirements and state if the building could be reoccupied. The requested report was to identify any deficiencies in the building structure and advise the owner on what would be required to remedy these.

51. I was also asked whether or not I had given consideration to the impact of the 4 September earthquake and subsequent aftershocks on the structural integrity of the building and its ability to withstand further aftershocks being diminished. That was most certainly taken into account, as discussed in my brief. I looked at the strengthening frames and systems and their connections to the URM structure and there was no apparent degradation to those systems. However, there was degradation to parts of the original building which I instructed to be repaired.

52. Counsel also asked whether I considered information from GNS or any other source about the likelihood, location or extent of further aftershocks. Yes, in as much as I read articles in the media by GNS and other sources to generally keep abreast of the research into the seismic activity. Given the time that has since elapsed and the high volume of information being released I do not recall the exact content of these articles. My considerations were typically based on my general knowledge concerning the probability of further aftershocks after such a significant earthquake.

53. Counsel Assisting also asked whether I was aware that GNS had advised *"of the possibility of an aftershock approximately 1 magnitude less than the 4 September 2010 earthquake"* and if so, to provide details of that knowledge of that possibility and whether it was taken into account in carrying out the

inspection/assessments. In response, I was not specifically aware of the GNS advice on "1 magnitude less", but I was aware of the general media comments, from reported expert sources, to the effect that there was no clear consensus on what the level of future aftershocks would be or where they would occur. I had heard Professor Furlong make comments to that effect. If GNS made the comment referred to, it could only have been referring to the Greendale fault whereas as I understand it the 22 February event was a different fault which unleashed a series of extraordinary forces which I had not contemplated and which any unreinforced masonry building, whether strengthened or not, would struggle to withstand.

54. Counsel also asked whether in reaching any conclusions in relation to the building, we gave consideration to information from CCC relating to building standards or the inspection of buildings following an earthquake. We did so to the extent that we referred to the Earthquake Prone Buildings Policy 2010 issued by CCC.

55. Counsel asked whether we took consideration of information from any other person or body relating to building standards or the inspection of buildings following an earthquake. We did to the extent that I attended Canterbury Structural Group forums and engaged in general discussions with colleagues and peers in the profession.

56. Finally, in response to Counsel's questions, we are not aware of any other inspections or assessments being carried out on the building, other than CCC.

57. This statement is true to the best of my knowledge and belief and was made by me knowing that it may be used as evidence for the purposes of the Canterbury Earthquakes Royal Commission of Inquiry.

Dated this 16th day of December 2011.

Rhys Collin Smith

RCS 1

Rhys Smith

From: Alastair Miles [alastair@milesconstruction.co.nz]
Sent: Thursday, 9 September 2010 14:09
To: Rhys Smith
Subject: 194 Hereford St

Hi Rhys

Just confirming we would like John and or yourself to undertake an inspection of 194 Hereford St. John did the earthquake strengthening a few years ago and the building to appears in good nick. Just a couple of cracks in the plaster and one through the parapet. We just need a good report to enable the tenants to return etc

Please let me know when

Many thanks

Kind Regards,
Alastair Miles
Director

MILES
CONSTRUCTION

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ph 03 379 6997
fax 03 379 6999
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RC S 2

SITE INSTRUCTION - PAGE 1 of 2

Contract **194 HEREFORD STREET**

Date 10.09.10 No. 1

File: 3502/32

PROGRESS

- Post-Earthquake Inspection - 2 storey R.C. frame with URM double skin panels and parapet. Strengthened with steel portal frames circa 2006.

INSTRUCTIONS & COMMENT

- Cracks to rear (South) parapet at roof level, horizontal at roof level (lower of). ✓
- Cracks to junction of light well wall and main building. ✓
- Front left (North) parapet has diagonal crack from top of r.c. beam through parapet. ✓
- Vertical crack to parapet and mid span in North. ✓
- East end of parapets have moved closer to adjacent building.
- West elevation - 2 vertical cracks to decorative corbel at North end.
- Majority of cracks only reportedly appeared after Tuesday's 5.1 aftershock.
- Tie front parapet back with RHS angle brackets, as detailed, to make safe.
- Satisfactory to occupy after above make safe measure.
- Evacuate if aftershock of 5 or more and wait for re-inspection by Engineer.

.../2

COPIES TO:

A No Variation
B Contract Variation

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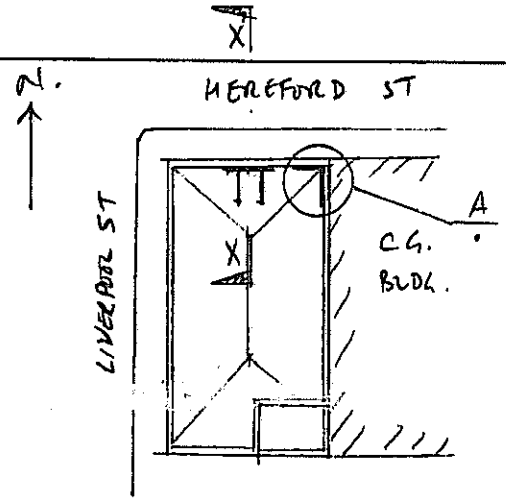
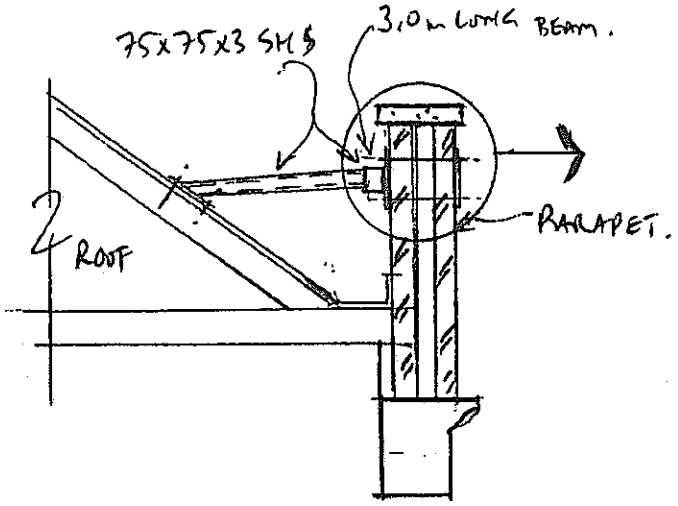
SITE INSTRUCTION - PAGE 2 of 2

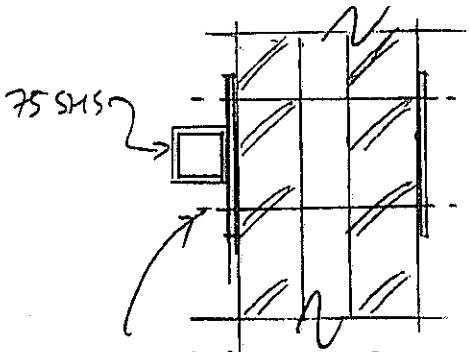
Contract **194 HEREFORD STREET** Date 10.09.10 No. 1
File: 3502/32



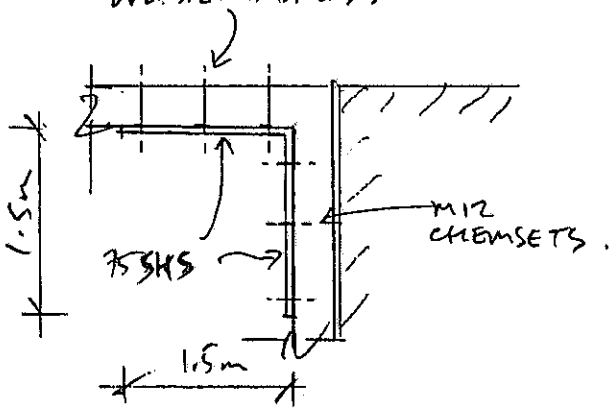
ROOF PLAN.
(NTS)



SECTION X-X
(NTS)



100mm WIDE PLATES @ 750 CRS WITH 2-M12 BOLTS WITH OVERSIZE WASHERS.



DETAIL A. (NTS)

R C SMITH

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Joe's Garage

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Exhibit RCS3

Photos taken 10/09/2010

Photo 1

Photo 2

Exhibit RCS3

Photos taken 10/09/2010

Photo 3

Photo 4

Exhibit RCS3

Photos taken 10/09/2010

Photo 5

Photo 6

Exhibit RCS3

Photos taken 10/09/2010

Photo 7

Photo 8

Photo 9

Exhibit RCS3

Photos taken 10/09/2010

Photo 10

Photo 11

RCS 4

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SITE INSTRUCTION

Contract **194 HEREFORD STREET** Date 14.09.10 No. 2
File: 3502/32

PROGRESS

- Post-Earthquake Inspection - Follow-up.

INSTRUCTIONS & COMMENT

- Parapet restraints (North) installed and OK.
- Loose bricks at top of South parapet not of concern - Make good at some stage.
- Monitor cracks to South wall - East facade needs better connection to South wall.
- Satisfactory to occupy.
- Evacuate if aftershock >5 and await engineer's inspection.

R C SMITH

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Joes Garage
James Whelan

A No Variation

Exhibit RCS5

Photos taken 27/09/2010

Photo 1

Photo 2

Exhibit RCS5

Photos taken 27/09/2010

Photo 3

Photo 4

Photo 5

Exhibit RCS5

Photos taken 27/09/2010

Photo 6

Photo 7

RCS 6

Rhys Smith

From: Alastair Miles [alastair@milesconstruction.co.nz]
Sent: Wednesday, 6 October 2010 11:43
To: Rhys Smith
Subject: 194 hereford St
Attachments: 06.10.10#1.jpg; 06.10.10.jpg

Hi Rhys

Photo's attached of north east corner

Kind Regards,
Alastair Miles
Director

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RCS7

Rhys Smith

From: Rhys Smith
Sent: Friday, 15 October 2010 12:26
To: 'Alastair Miles'
Cc: chief@lonestar.co.nz
Subject: Joes Garage 194 Hereford St
Attachments: Hereford St 194 (3502.32) - SI 03.pdf

Alastair

Please see instruction attached following yesterdays site inspection.

Give me a call if any questions.

Regards

Rhys Smith BEng(Hons) NZCD(Arch)
Associate - Senior Engineer | O'Loughlin Taylor Spence Ltd |
Penthouse | St Elmo Courts | 47 Hereford Street |
PO Box 2373 | Christchurch 8140 |
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STRUCTURAL INSPECTION REPORT- PAGE 1 of 2

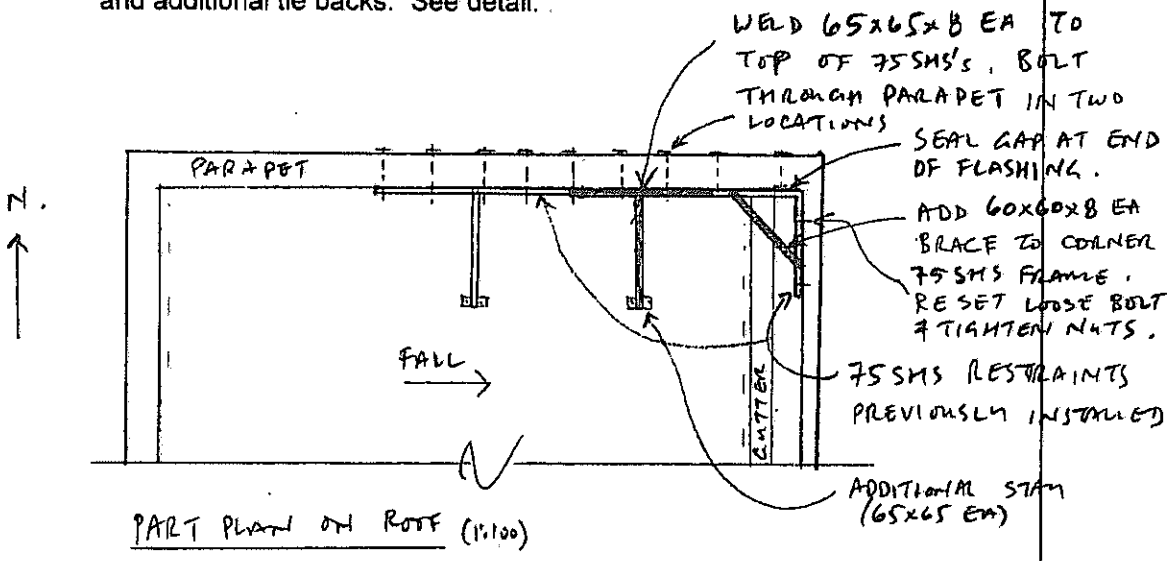
Contract **194 HEREFORD STREET, JOE'S GARAGE** Date 14.10.10 No. 3
File: 3502/32

OVERVIEW

- Post-Earthquake Inspection - Follow-up inspection.

OBSERVATIONS & COMMENT

- Front parapet - Parapet has moved in between previously installed restraints. Extend restraints to join them together, add a diagonal brace and additional tie backs. See detail:



- Front bond beam (and wall) still moving out with aftershocks - restraints on original strengthening details not working. Steel frame to be fitted to back of bond beam and tied back to first portal frame. Engineer to provide further details.

.../2

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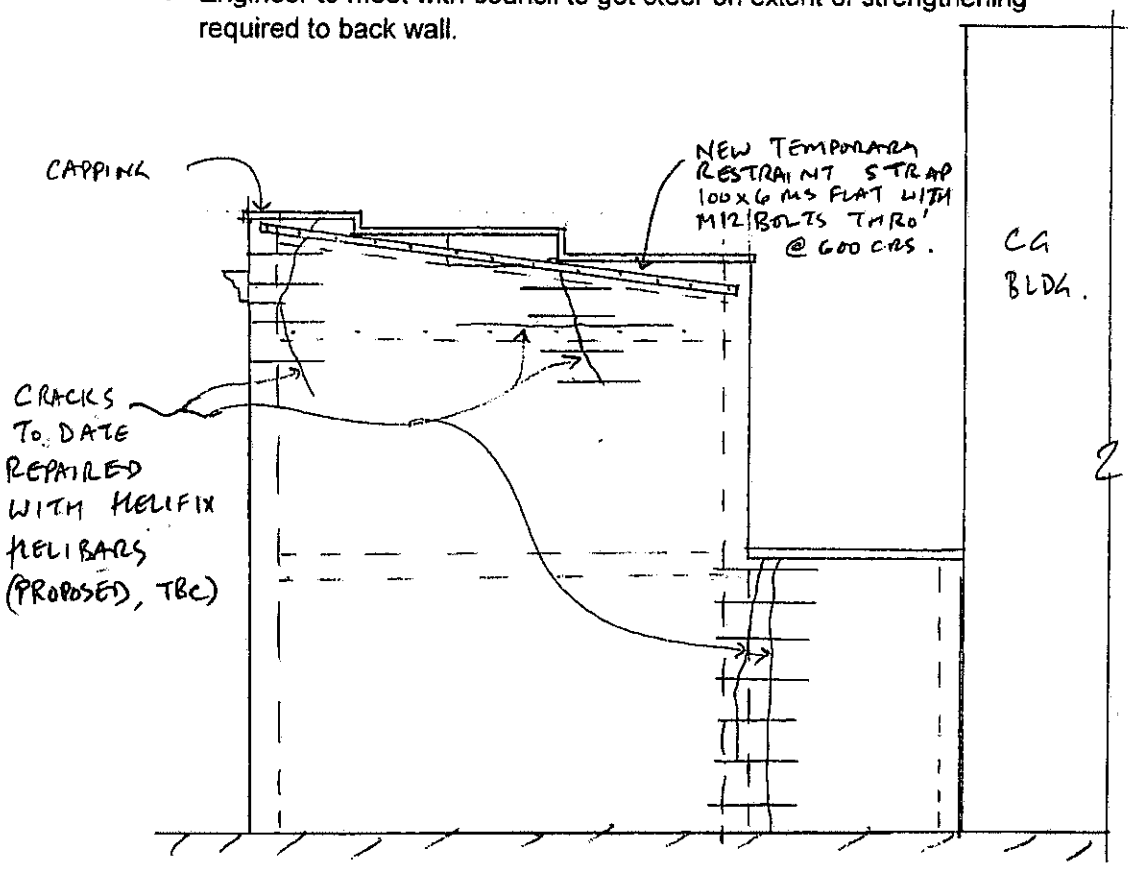
STRUCTURAL INSPECTION REPORT- PAGE 2 of 2

Contract **194 HEREFORD STREET, JOE'S GARAGE** Date 14.10.10 No. 3
File: 3502/32

OBSERVATIONS & COMMENT

- Rear parapet - Unstable above existing restraint line (at ceiling level). Fit flat strap at angle just below capping and bolt through - Provide access first to investigate roof framing to check if feasible to tie back into (Open up roofing or ceiling).

- Engineer to meet with council to get steer on extent of strengthening required to back wall.



R C SMITH

COPIES TO: Miles Construction
Joe's Garage Hereford St Ltd

A No Variation
B Contract Variation

RCS8

Rhys Smith

From: Rhys Smith
Sent: Friday, 15 October 2010 13:01
To: 'Alastair Miles'
Cc: 'chief@lonestar.co.nz'
Subject: RE: Joes Garage 194 Hereford St
Attachments: OTS3502-32-SK01 RC beam restraint.pdf

Al

My site instruction didn't cover the bond beam at the front pulling out at the east end.

The original strengthening drawings indicate that brackets should have been fixed from the roof level framing into the back of the walls to restrain them. Either these were not fitted on the North façade or the have been ineffective.

The steel frames we discussed to resolve this would be a permanent solution however in the short term to help stop the movement to the beam (caused by aftershocks) a bracket will be required as per detail attached.

Give me a call if any questions.

Regards

Rhys Smith BEng(Hons) NZCD(Arch)
Associate - Senior Engineer | O'Loughlin Taylor Spence Ltd |
Penthouse | St Elmo Courts | 47 Hereford Street |
PO Box 2373 | Christchurch 8140 |
T 03 379 2734 | F 03 379 1642 | M 022 61 51 223 |

From: Rhys Smith
Sent: Friday, 15 October 2010 12:26
To: 'Alastair Miles'
Cc: chief@lonestar.co.nz
Subject: Joes Garage 194 Hereford St

Alastair

Please see instruction attached following yesterdays site inspection.

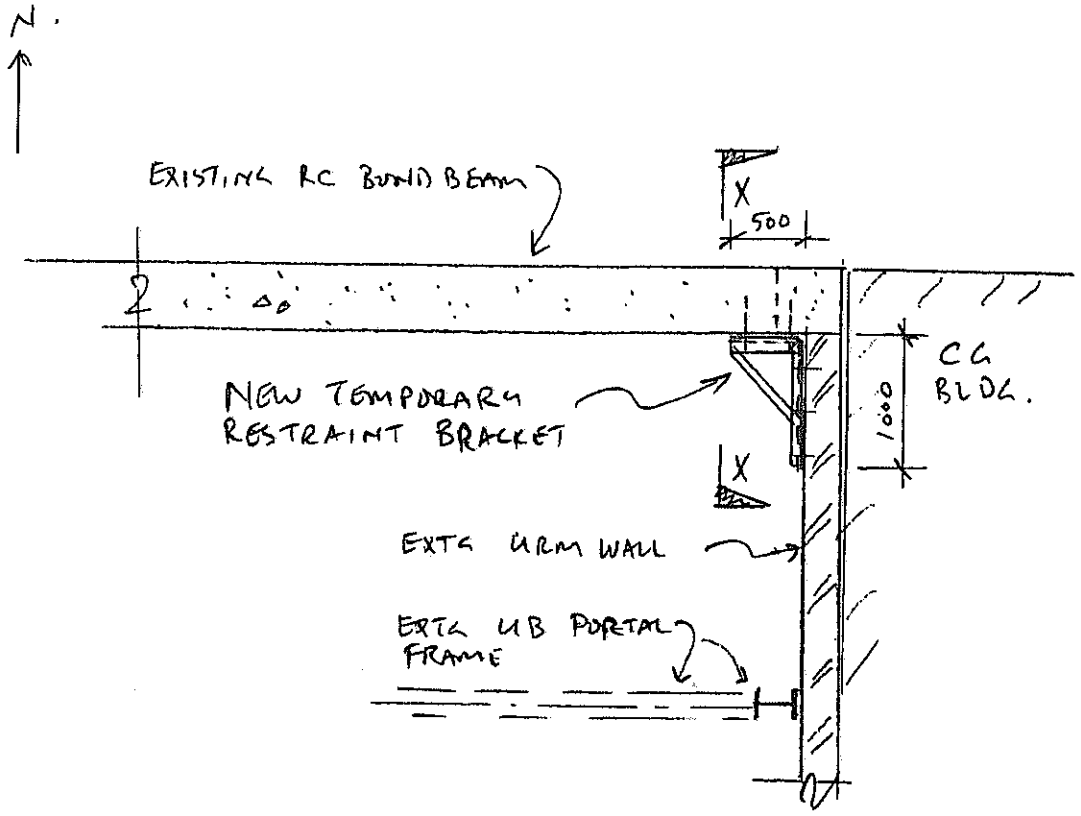
Give me a call if any questions.

Regards

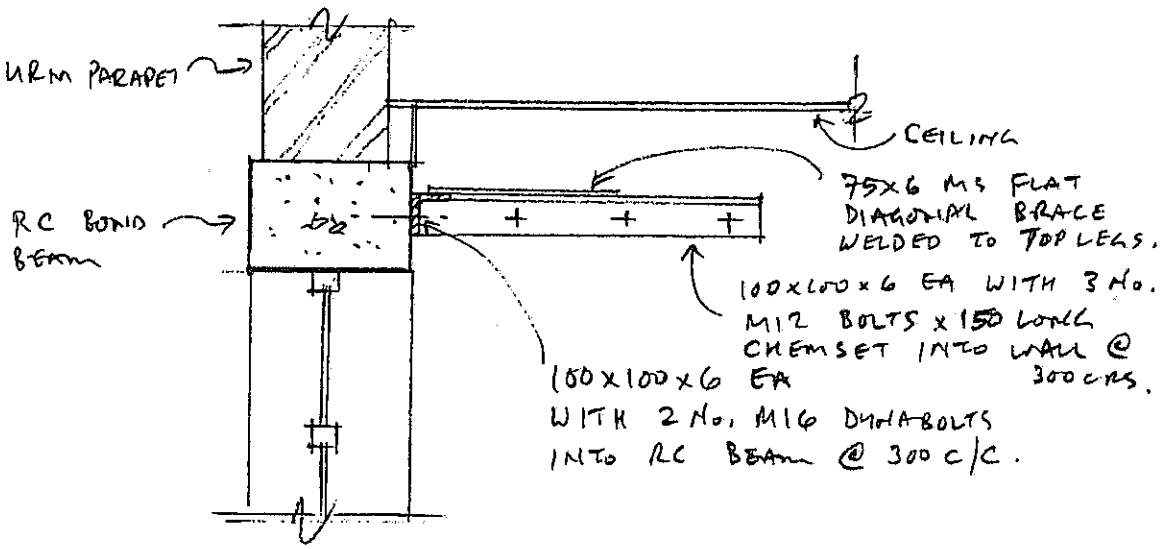
Rhys Smith BEng(Hons) NZCD(Arch)
Associate - Senior Engineer | O'Loughlin Taylor Spence Ltd |
Penthouse | St Elmo Courts | 47 Hereford Street |
PO Box 2373 | Christchurch 8140 |
T 03 379 2734 | F 03 379 1642 | M 022 61 51 223 |

O LOUGHLIN TAYLOR SPENCE LTD
CONSULTING ENGINEERS
St. Elmo Courts, 47 Hereford St. Box 2373
Tel. 379-2734 Fax 379-1642 CHRISTCHURCH

JOB NAME: 194 HEREFORD ST		PAGE NO.: SK01
SECTION: TEMP RESTRAINT		
JOB No.: 3502/32	DESIGNED: RCS	
DATE: 15.10.10	CHECKED:	



PART PLAN AT RC BEAM LEVEL OVER FIRST FLOOR WINDOWS. (NTS).



SECTION X-X (1:20)

Exhibit RCS9

Photos taken 29/10/2010

Photo 1

Photo 2

Exhibit RCS9

Photos taken 29/10/2010

Photo 3

Photo 4

Photo 5

Exhibit RCS9

Photos taken 29/10/2010

Photo 6

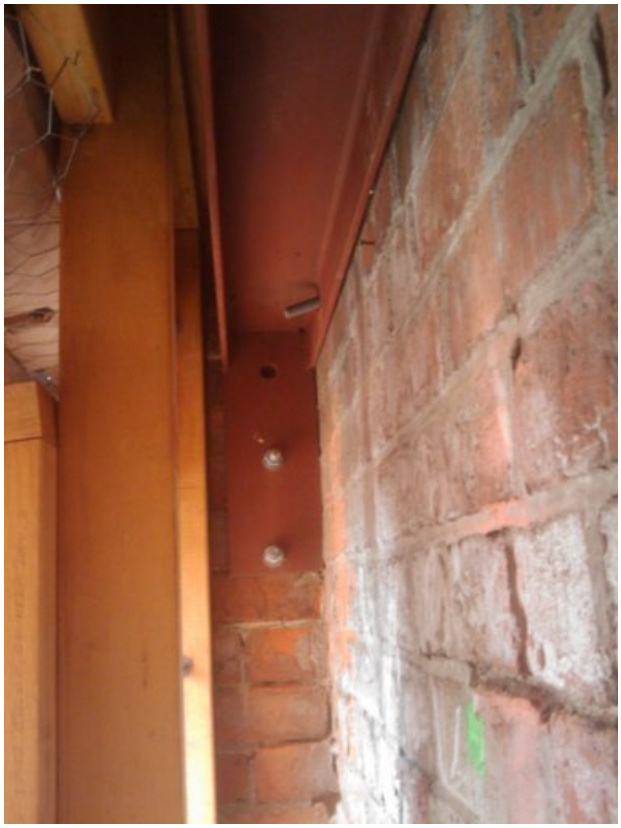


Photo 7

Photo 8

Exhibit RCS9

Photos taken 29/10/2010

Photo 9

Photo 10

RCS 10

Rhys Smith

From: Alastair Miles [alastair@milesconstruction.co.nz]
Sent: Friday, 5 November 2010 10:40
To: 'David Ralfe'
Cc: Rhys Smith
Subject: 194 Hereford St - EQ works

Attachments: Scan5917.pdf

Scan5917.pdf (216 KB)

Hi David

We can confirm that the EQ works as detailed by Oloughlin Taylor Spence have been completed. Please see attached our summary of costs. This will be invoiced to Joes Garage Hereford St ltd today

Many thanks

Kind Regards,
Alastair Miles
Director

Miles Construction Ltd
194 Hereford Street
PO Box 36680
Merivale
Christchurch

mb 0274 648007
ph 03 379 6997
fax 03 379 6999
www.milesconstruction.co.nz

-----Original Message-----
From: info@milesconstruction.co.nz [mailto:info@milesconstruction.co.nz]
Sent: Friday, 5 November 2010 9:23 a.m.
To: alastair@milesconstruction.co.nz
Subject: Attached image data

Exhibit RCS11

Photos taken 28/12/2010

Photo 1

Photo 2

Photo 3

Exhibit RCS11

Photos taken 28/12/2010

Photo 4

Photo 5

Photo 6

Exhibit RCS11

Photos taken 28/12/2010

Photo 7

Photo 8

Photo 9

Exhibit RCS11

Photos taken 28/12/2010

Photo 10

Photo 11

Photo 12

Exhibit RCS11

Photos taken 28/12/2010

Photo 13

Photo 14

RCS12

Rhys Smith

From: Rhys Smith
Sent: Thursday, 6 January 2011 10:50
To: Steve Ward; Shane Hausler
Cc: Alastair Miles; stewart@harrison-qs.co.nz; Chief - James Whelan; Tim Whelan
Subject: RE: Boxing Day Quake - Hereford St Report

Hi Steve

Yes, I inspected the building for additional damage following the Boxing Day earthquake. The main points to be aware of are:
1. Swaying action of the front of the building has popped the west front window frame in. Not a structural concern.
2. Cracks on south wall have lenthened and widened slightly in places. Both front and rear walls will require strengthening and repairs.
3. Some new hairline cracks in west wall - probably due to flexure and of no immediate real concern. No much change to parapets.

Could not access Miles Construction offices to inspect - will make arrangemnts with Al to do so asap.

I will send you a more detailed report on letterhead next week when back in the office. In the meantime the building remains safe to occupy. We need to arrange a time to meet to discuss your options re strenthening. The council still requests 67% NBS or as close as practicable - hopefully the steel frames in the main part will provide most of this and it will just be the end walls that require attention.

Kind regards

Rhys

From: Steve Ward [mailto:stevew@lonestar.co.nz]
Sent: Wed 05/01/2011 14:25
To: Rhys Smith; Shane Hausler
Cc: Alastair Miles; stewart@harrison-qs.co.nz; Chief - James Whelan; Tim Whelan
Subject: Boxing Day Quake - Hereford St Report

Hi Rhys,

I understand you were in the other day to (assess and) do a report on the Hereford St damage. Could you update me on how that's progressing please?

Kind regards,

Steve Ward.
Director,
Joe's Garage Hereford Ltd.

RCS13

Rhys Smith

From: Rhys Smith
Sent: Wednesday, 19 January 2011 17:12
To: 'Steve Ward'
Cc: Tim Whelan; Alastair Miles; stewart@harrison-qs.co.nz; Chief - James Whelan
Subject: 194 Hereford St - Structural Report
Attachments: Report01 to Joes Garage Hereford St Ltd re 194 Hereford St.pdf

Steve

Please see report attached for 194 Hereford Street as discussed.

Kind regards

Rhys Smith BEng(Hons) NZCD(Arch)
Associate - Senior Engineer | O'Loughlin Taylor Spence Ltd |
177 Papanui Road | Merivale | 1st Floor, off Office Road |
PO Box 2373 | Christchurch 8140 |
T 03 379 2734 | F 03 379 1642 | M 022 61 51 223 |

O'Loughlin Taylor Spence Ltd
CONSULTING ENGINEERS

177 Papanui Road
Merivale
P.O. Box 2373
Christchurch 8140
Telephone 03 379-2734
Fax 03 379-1642
Email: consultants@ots.co.nz

J.S. O'Loughlin BSc BE (Hons) MIPENZ
J.S. Spence BE (Hons) MIPENZ C.P. Eng.

3502/32/RCS

18 January 2011

Joe's Garage Hereford Street Limited
194 Hereford Street
Christchurch

Attention: Steve Ward

Dear Sirs

194 HEREFORD STREET, CHRISTCHURCH
EARTHQUAKE DAMAGE AND OUTLINE SCOPE OF REPAIR

Following the Canterbury earthquake on 04 September 2010 we inspected the above property and have continued to monitor its condition after subsequent aftershocks including the Boxing Day earthquake. Temporary restraint systems were designed and fitted to make safe the earthquake damaged elements of the building.

Construction:
The building consists of a two storey commercial structure fronting Hereford and Liverpool Streets. Thought to have been built in the 1930's, the original construction was unreinforced masonry (URM) with lime based mortar. The building was strengthened and rebuilt internally in 2005/6 with the external walls and associated foundations being the only original structural elements retained. The external walls are a combination or double, triple and cavity brick construction. The north and west facades have reinforced concrete bond beams over the window and door openings at ground and first floor. The ground floor is a new reinforced concrete slab, the first and (unused*) second floors are timber framed. * The building was designed and constructed to allow for a future penthouse at 2nd floor level. The roof is profiled metal sheet on cold rolled steel purlins supported on dwarf walls from the second floor.

Existing Strengthening:
The external walls are laterally strengthened in the east-west direction using steel portal frames which also support the new floors and roof. The portal frames were designed for more than 80% of the design code which when designed in 2004 was NZS4203 (forerunner to the current code). Without the penthouse in place the design capacity of the portal frames is greater than the recommended 67% NBS (current code i.e. NZS1170-5:2004).
The existing parapets had been tied back to the new roof with steel channels anchored into the back of them. All the perimeter walls have been tied into the timber floor diaphragms at first and second floor.

.../2

Earthquake Damage to Structure:

- The north parapet has vertical and diagonal cracks as shown in Figure 1 of the Appendix. The parapet has been temporarily tied back for the east two thirds to the roof plane to prevent falling outward.
- At ground floor the north east window has been pushed inward at it bottom east corner. This was caused by the east-west sway of the north façade in the Boxing Day earthquake.
- Cracks at the ends of the lower masonry panels under the north façade windows. Refer to Figure 1.
- Various cracks in the south wall as shown in Figure 2. This is a cavity wall and the lime mortar is degraded to the extent that the bricks on the inner side of the parapet are loose and falling into the cavity at the roof level.
- Opening up and lengthening of historical cracks where the lower south wall of the cool room area joins the main building. It is likely that this crack was originally caused by the construction process of the new Calendar Girls building to the east.
- Various cracks in the south and west walls around the cool room area. These are cavity walls which had new ties installed across them during the strengthening.
- The first floor bond beam in the north façade has pulled away from the east wall. A temporary tie bracket has been installed in this corner to prevent further movement.
- Minor flexural cracks to URM columns and panels in west façade as shown on Figure 3.
- A flashing between the north facades of 194 and 196 Hereford Street has been dislodged in the Boxing Day Earthquake. This flashing was fitted after the September earthquake presumably by the builders of the new premises at no. 196. There is an approximately 50mm gap between the buildings and this is to allow for the independent movement of each building however the flashing had not been designed to allow for any movement.

Discussion:

The previous strengthening work carried out to the URM walls was sufficient to provide at least 33% NBS which was the minimum requirement at the time and although there is some damage now they have withstood a moderate earthquake. There are several options for addressing the damage:

a) Repair the cracks using Helifix bars or similar so as to return the walls to pre-earthquake condition and strengthen or rebuild the parapets in light-weight construction;
b) Repair and strengthen the walls to 67% NBS or as close as reasonably practicable. Rebuild the parapets as a) above;
c) As b) above for the facades but rebuild the south and cool room area walls in reinforced concrete block.

.../3

I have had preliminary discussions with the City Council and they would not accept option A for a building already strengthened to 33% NBS as they argue that in their damaged state the URM walls' strength is less than 33% NBS.

Option B may be the best way to minimise disruption to tenants whilst at the same time reducing the likelihood of a similar extent of damage in a future seismic event. I would emphasise that it does not guarantee that damage will not occur and therefore your insurer would need to be in agreement with this approach (as opposed to option C).

If you are in agreement with the above then I recommend we develop option B into an outline scope with preliminary sketches sufficient to price. I would also suggest we present this to the Council to get their assurance that it would be sufficient to get building consent.

Please advise how you wish us to proceed and do not hesitate to contact me if you have any queries

Yours sincerely

Rhys C Smith BEng(Hons)
Associate – Senior Engineer

John Spence CPEng
Director

CC: James Whelan, Tim Whelan, Alastair Miles, Stuart Harrison

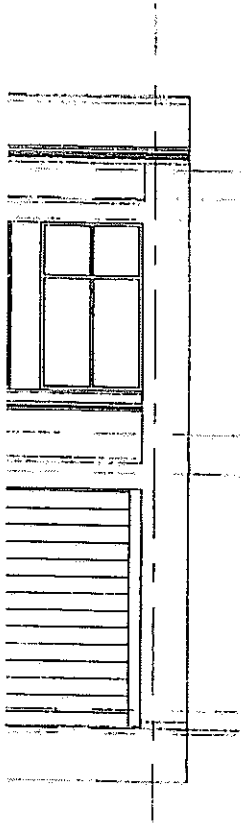
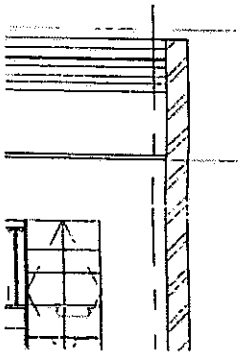
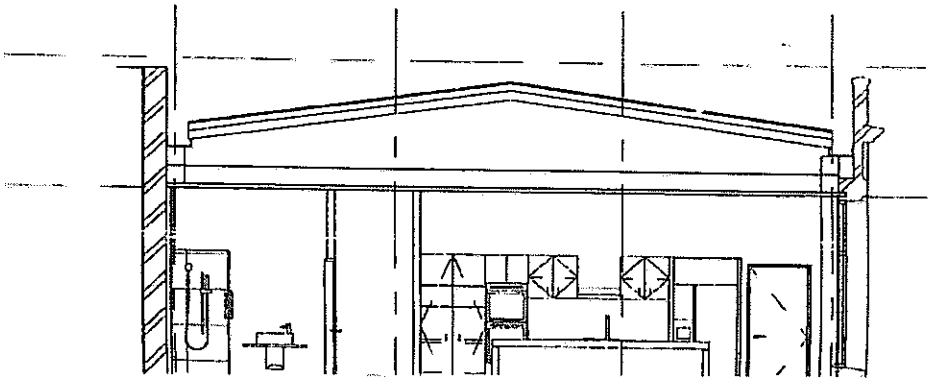


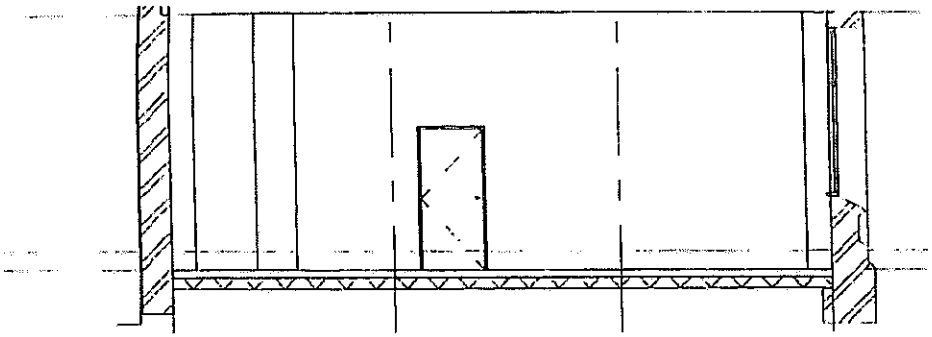
FIGURE 1.

(3) NORTH ELEVATION
1 : 100





194 HEREFORD ST.
OTS/3502/32
RCS 18.01.11



(B) SECTION B-B
1 : 100

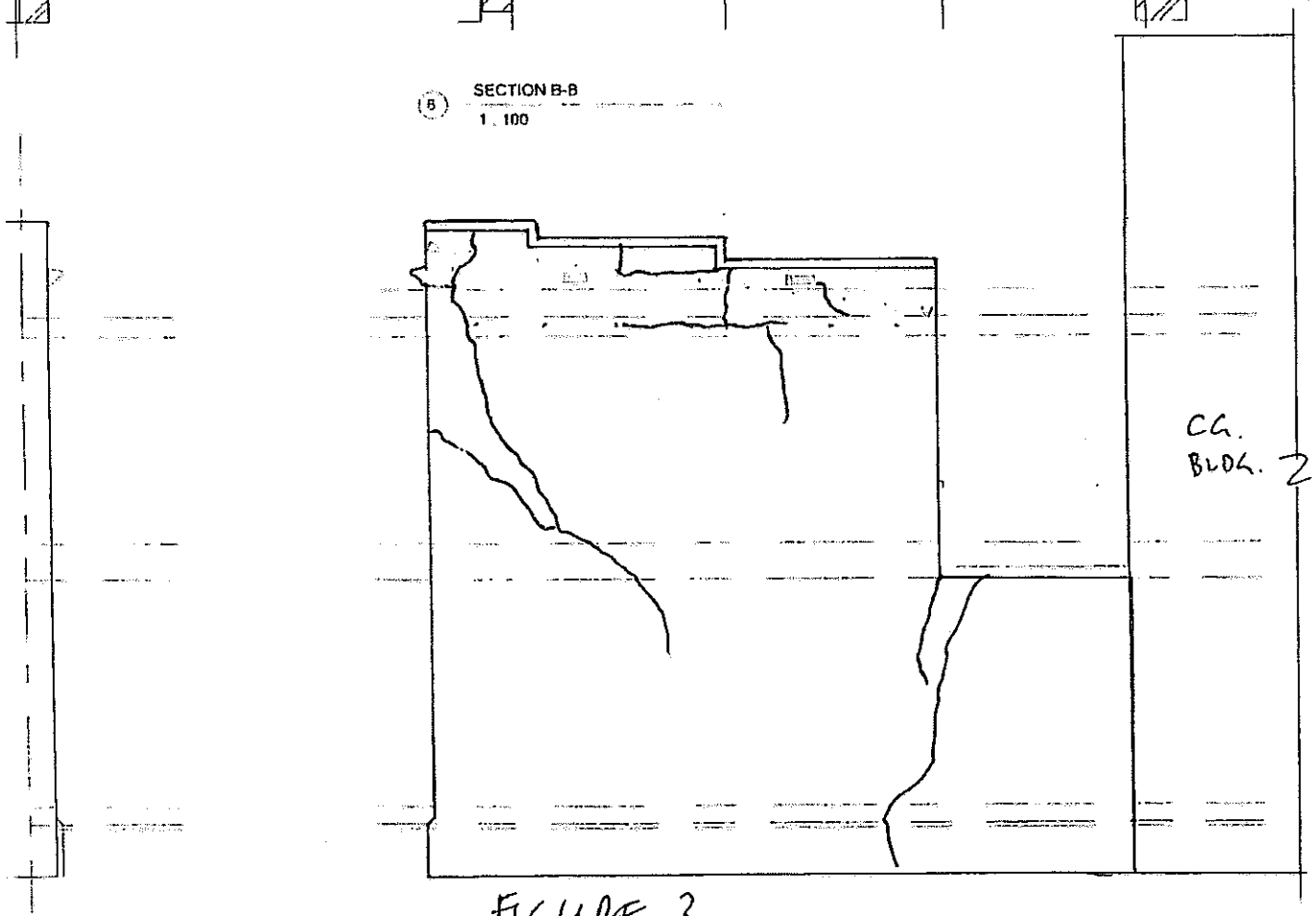


FIGURE 2

(A) SOUTH ELEVATION
1 : 100

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Date	Rev. No.	

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SHEET TITLE
ELEVATIONS

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RICHARD PROKO LTD

PHONI
FAX
MOBIL
EMAIL

2ND FLR 47 HEREFORD ST CHRISTC

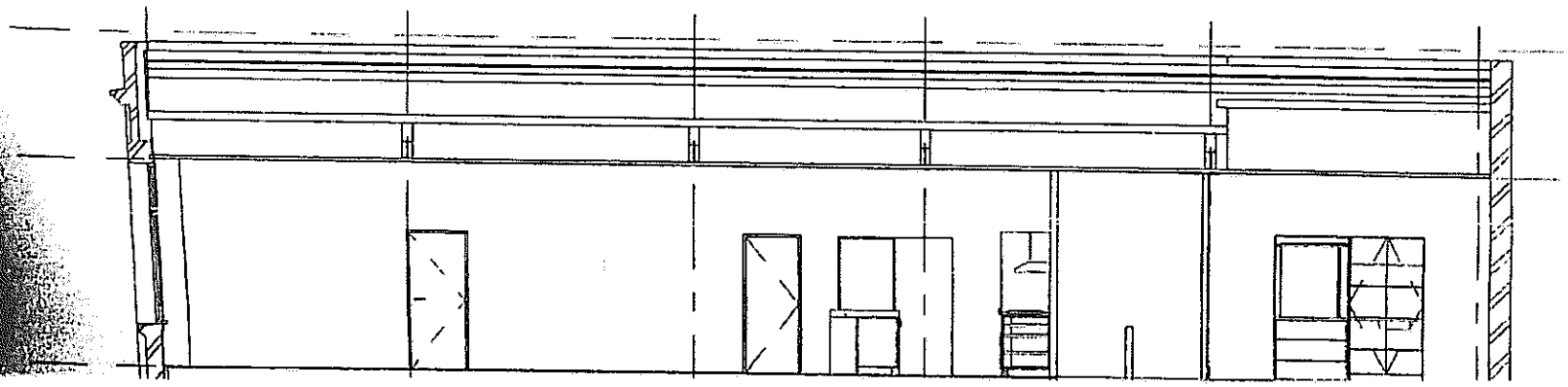
SHEET NO SHE

A103

DO NOT SCALE, A2 SHEETS ON

FIGURE 3.

(2) WEST ELEVATION
1 : 100



(3) NO
1 :

RCS14

Rhys Smith

From: Steve Ward [stevew@lonestar.co.nz]
Sent: Thursday, 20 January 2011 07:36
To: Rhys Smith
Cc: Tim Whelan; Alastair Miles; stewart@harrison-qs.co.nz; Chief - James Whelan
Subject: Re: 194 Hereford St - Structural Report
Attachments: Report01 to Joes Garage Hereford St Ltd re 194 Hereford St.pdf

20.01.11

Hi Rhys,

Thank you for your 18 Jan 2011 structural report on 194 Hereford St.

Could you please proceed with option B preliminary repair skope, including sketches for pricing and Council approval.

I will discuss the report with our Insurance broker Craig Armstrong as well. As you point out in your second last paragraph, the Insurer will need to be in agreement with this.

Regards,

Steve.

RCS15

Rhys Smith

From: Rhys Smith
Sent: Thursday, 20 January 2011 10:14
To: 'Alastair Miles'
Cc: 'Steve Ward'; 'Chief - James Whelan'; craig.armstrong@FMRrisk.co.nz
Subject: RE: 194 hereford St

Thanks for the photos Al. It does just appear to be some shear movement between the concrete and brick. Not a real concern right now but will address this movement in the remedial strengthening proposal.

Kind regards

Rhys Smith BEng(Hons) NZCD(Arch)
Associate - Senior Engineer | O'Loughlin Taylor Spence Ltd |
177 Papanui Road | Merivale | 1st Floor, off Office Road |
PO Box 2373 | Christchurch 8140 |
T 03 379 2734 | F 03 379 1642 | M 022 61 51 223 |

From: Alastair Miles [mailto:alastair@milesconstruction.co.nz]
Sent: Thursday, 20 January 2011 08:13
To: Rhys Smith
Cc: 'Steve Ward'; 'Chief - James Whelan'; craig.armstrong@FMRrisk.co.nz
Subject: 194 hereford St

Hi Rhys

Had a quick look out the building. Appears to be more cracks to the Hereford St / Liverpool st corner where column meets ring beam – May note be anything but attached are photos for you to have a look at – let me know your thoughts

Kind Regards,
Alastair Miles
Director

MILES CONSTRUCTION

Miles Construction Ltd
194 Hereford Street
PO Box 36680
Merivale
Christchurch

mb 0274 648007
ph 03 379 6997
fax 03 379 6999
www.milesconstruction.co.nz

Exhibit RCS15

Photos received 20/01/2011

Photo 1

Photo 2

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 1

Photo 2

Photo 3

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 4

Photo 5

Photo 6

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 7

Photo 8

Photo 9

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 10

Photo 11

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 12

Photo 13

Photo 14

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 15

Photo 16

Photo 17

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 18

Photo 19

Photo 20

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 21

Photo 22

Photo 23

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

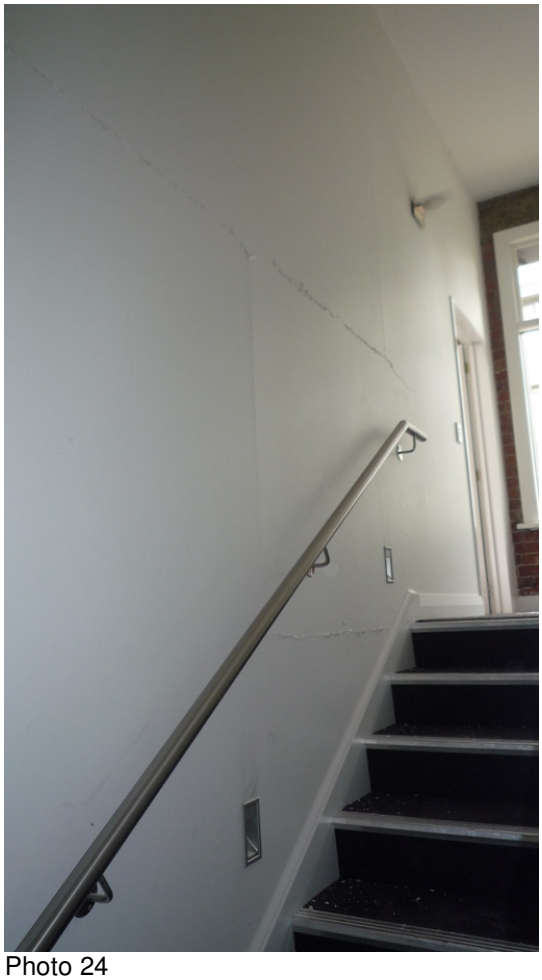


Photo 24

Photo 25

Photo 26

Exhibit RCS16

Photos taken after 22 Feb 2011 Earthquake

Photo 27

Photo 28

Photo 29