COMMISSION RESUMES ON 2 FEBRUARY 2012 AT 5.35 PM

200–204 MANCHESTER STREET (ICONIC BAR)
CONTINUED FROM THURSDAY 26 JANUARY 2012

JUSTICE COOPER:

I'm sorry that those waiting for us to resume the hearing on the Iconic Bar case have had a wait but you will understand very well that we can't rush matters so thank you for your patience.

MR ZARIFEH:

Sir there's one witness left to give evidence on this hearing as you'll recall and that's Mr Smith Sir and I call him now.

MR ZARIFEH CALLS
PETER SMITH (SWORN)

Q. Mr Smith you prepared a report in relation to the failure of the building that was situated at 204 Manchester Street and has been referred to as the Iconic Bar dated December 2011 for the Commission?

A. That's correct.

Q. I want to take you through that report and get you to speak to it in effect and just summarise some of the issues and conclusions that you came to. Firstly, can I ask you to, both to remind us but also to tell us a bit about the building and the construction of it so that we can then understand your explanation when you talk about the failure of it.

A. Certainly. The building was, really consisted of two buildings. There was a two-storey building on one lot. That was constructed with unreinforced masonry walls, two-storey height with a parapet. It had a gable end at the, I'll get my orientation, it's the –

Q. The east?

A. The east end isn't it – yes, the east side and alongside that gable wall there was a single-storey building.

Q. Now are you looking at some plans? Can I get them brought up?

A. Yes.

Q. They are BUI.MAN2040012.15.

A. Yes. That drawing shows a section through the two-storey building so it's as you're looking east where the, which is –

Q. The gable end is the east end isn't it?

A. Yeah I'm just looking at the street, the street to the left would be –

Q. It was Gloucester and Manchester.

A. Gloucester isn't it, Gloucester Street. You'll see in that section there are two beams, internal, supporting the ground floor, where I have the cursor at the moment. Originally they were unreinforced masonry walls which formed three tenancies on the ground floor and going back fairly early on in the building's life those walls were removed and concrete frames were provided to open up the ground floor tenancy.

Q. What effect did that have on the structural strength of the building?

A. It, it probably reduced the strength of the building in the east-west direction but it wasn't terribly significant because the concrete frames themselves were reasonably robust.

Q. And when was that done, from the records?

A. About 1947/1949. The building had a timber floor at first floor level and the roof had a series of timber roof trusses which went across, spanning transversely. There was a mezzanine floor within the first floor at one stage in the building.

Q. So that's the two-storey building –

A. Yes.

Q. – on the corner of Manchester and Gloucester?

A. Yes.

Q. And then you said there was a one-storey to the east of that?

A. Yes there was and if you look at the, I think the next plan shows –

Q. Point 16.

A. Yes. So that drawing shows the single storey building. The, I believe that that is the Gloucester Street frontage. That's the rear wall of the building and that's the east wall. What isn't shown on that drawing is the significant height of the two-storey gable end which projected up

quite high above the, the trusses. If we look at that in the centre of the sheet there's a section showing through the building which shows the timber trusses. The two-storey building extended quite, to quite a height above the outside walls and then had a similar pitched roof which the gable end followed before coming back down to the, on the other side. So there was a large brick wall present above the roof of the single-storey building at the junction.

Q. And can we see that in 0006.7. It's 200 sorry. If you take your hand off the mouse. 200 0006.7.

A. Yes if we take the left-hand –

Q. Top one?

A. Top photograph. That's the photo taken after some of the securing works were made following the Boxing Day earthquake, but you'll see that section of wall that has the plywood on it together with the brick below that all extended above the roof of the single-storey building so it was a very high wall.

JUSTICE COOPER:

We can enlarge it but only if you take your hand off the mouse.

EXAMINATION CONTINUES: MR ZARIFEH

A. Yes so that shows the, largely the area behind the plywood is into the roof space of the building. The brick below that level is, that you can see is primarily the first floor of the two-storey building.

Q. And in the February earthquake, just while we're looking at that, what happened to that wall?

A. I believe it largely collapsed outwards and over into the single-storey building.

Q. And Ms Cooney, you'll remember her evidence about bricks coming into the building.

A. Yes there was, just to clarify the, the circumstances of what Amy saw. Her office was in the roof space of the single-storey building. Maybe if we go back to 001216. So in the, there's the roof space of the single

storey building. Her office was in a mezzanine which was approximately in that location, built up into the roof space. She was looking at the west side of the east wall to the two-storey building when out of her office because apparently there was a window that gave a wonderful view into the roof space and I believe that she thought when she gave evidence that she was actually in the roof space of the two-storey building and should have been able to see the works that the contractors were doing

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within the roof space of the two storey building. In fact she was looking at the wall, opposite side of the wall in the single storey roof space.

Q. So which side, which direction was she looking? Which wall?

A. She was looking west on to the west side of the, what was the east wall of the two storey building or the west wall of the single storey building.

Q. And so the bricks that she saw collapsing?

A. She saw bricks in this sort of area, the work that was being done was at a storey above the roof of the single storey building where we saw the plywood.

Q. But still, so bricks from the single storey collapsing? Bricks from the façade of the single storey collapsing?

A. Sorry, she was looking at the works that were going on –

Q. Yes.

A. – and she was looking at the bricks within the single storey roof space, not the two storey roof space.

Q. All right.

A. And I think just following on from that, the bricks that she saw later in the stairwell to her office, and in her office area, came from the collapse of the wall above the roof of the single storey building.

Q. Now you mentioned the removal of those walls. Can you tell us about the seismic restraining system or resisting system in the building?

A. Yes, the two storey building had a grid of steel work within the roof space. I think, have we got a plan of that? Probably in some of the other evidence actually but...

Q. Well just tell us about it then.

A. There was a grid of steel members running through the roof space at approximately three metre centres and around the edges of the roof space there were braces provided to distribute the lateral load from the side walls to the end walls. Essentially in an unreinforced masonry building the weight is primarily in the walls and that's quite different to a concrete building where it's in the floor, so it's important in any strengthening to collect the load from those walls under a face loading and to carry that out to the walls so they carry and plane at the sides of the building and that has to work in both directions.

Q. Right. Now when you talk about that seismic system, is that as built?

A. That was originally strengthened by Holmes Consulting in about the 90s and modified somewhat by Lewis and Barrow in the, later in the 2000.

Q. So when you tell us about the seismic resisting system, are you including the alterations?

A. Yes originally the building had very little of ability to pick up the load, at roof level in particular from the outward, well from the action of the walls acting, falling outwards and to transfer that load to the end walls of the building. Just like a cardboard box, it gains strength from the in-plane not from the outer plane.

Q. Well can we just, can you just tell us a bit, a little bit more about those seismic upgrades? 1993 by Holmes we heard about, and then 2004 we heard about as well?

A. Yes. Yes the building was upgraded in 1993, the seismic co-efficient at that stage was two-thirds of 4203 1984, and it consisted of putting in roof bracing into the building and connecting and improving the floor slab or floor diaphragm at first floor level. There was securing angles placed around the perimeter of the first floor and they provide securing of the gable end wall at the end of the building.

Q. So how was the masonry of the bricks attached to those steel?

A. The system used a steel member fixed to the face of the masonry wall with an epoxy-based fixing into the masonry and that we can see that in some of the photographs.

Q. I'll come back to that. In 2004 we heard from Mr Lewis –

A. Correct.

Q. – about the alterations that they did?

A. Yes.

Q. And as I understood it there was further epoxy fixing of dowels through the brickwork?

A. Yes.

Q. Really adding to the work that had been done in 1993?

A. Yes. They opened up some of the first floor areas to make the building operate as one space and there was changes to the bracing, upgrading the bracing that they undertook as part of that work.

Q. And as I recall it Mr Lewis gave evidence that the strengthening done in 1993 by Holmes was to 67% of the code?

A. Correct.

Q. And that the strengthening work, as I understood it from Mr Lewis' firm undertook in 2004/2005 did not add to the strength of the building so that it would have still have been the same level or approximate level as it had been strengthened to in 1993. Can you explain that to us?

A. Yeah, it had the same strength but it probably had a reduced level of percentage of code strength.

Q. And why is that?

A. Well the codes changed. If we go back to the code they designed it for, the building prior to the change in the co-efficient after the 4th of September earthquake comparative to the code that existed prior to the 4th of September, there was a lateral co-efficient of .54 compared with the subsequent code which increased that to .66. So there was about a 20% increase in code requirement for an elastic responding structure from the 1993 to the time when just immediately prior to the earthquake.

Q. Right.

A. So the building would have had a strength of approximately 56% of current code at the time of the earthquake whereas it had been designed to 67% of a previous code.

Q. And so to the layperson can you just explain in terms of structural strength of a building such as that what that means?

A. It means that the building, first of all you get changes in codes which are constantly being upgraded and while a building might be designed to full code with time it'll slowly reduce below 100% code. In this case the building was designed for two-thirds of the earlier code, it only had 56% of the strength of the current code at the time of the earthquake.

Q. Now I just want to turn to the February earthquake and get you to explain to us how the building failed from a structural point of view?

A. The failure in the February earthquake was quite catastrophic. The external walls simply disintegrated other than the, possibly the west wall, and it, the roof remained supported on internal structure and some external columns but essentially the masonry above first floor level literally disintegrated and you see that from the photos that, if we can have the top one –

Q. There are the photos you've put in your report?

A. Yes.

Q. So it looks in that top photo that it's the upper floor?

A. That's correct, yes.

Q. Right.

A. Everything below first floor appeared to hold together remarkably well.

Q. And can, is there an explanation for that?

A. I think, I do believe that the, one of the fundamental influences of the earthquake was the vertical acceleration and that that had quite catastrophic effects on the upper level walls which were known to be reasonably weak masonry.

Q. Right.

A. What is interesting in these photos is the fixings between the steel work that was placed in the roof to brace the building literally fell out of the masonry. You can see in the corner, look at this, go back to the other one sorry just for a sec? In this photo you can see the areas just on the west wall near the north end, there's some masonry elements hanging from the steel work –

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Q. If we go to .23 we can see a close-up of that.

JUSTICE COOPER:

Q. We actually observed that when we went to see this building in June or July while it was still there and the perilous bits of masonry hanging off some of them and you could see where the others had been before they fell.

A. Yes I think the concern, I would have expected the epoxy fixings to have ended up supporting some elements of the masonry. I was quite concerned when we noted a lot of the masonry or epoxy fixings literally either pulled out or left without masonry fixed to it and the other feature was that the angles that those affixed to – under a face load those fixings are primarily there to transfer shear and to get the loads in plane. They are not particularly effective in picking up the face load because the angle is relatively flexible and in an outward failure of the wall once the connection at the trusses, which was the key area of connection in the out of plane area, once that fails you would expect the progressive failure to occur towards the centre of the angle, but the load applied from each fixing would distort the angle so that you would end up with a bent angle after the failure rather than a straight angle. What concerns me is that the fixings appeared to have simply pulled out or the masonry has disintegrated round the fixings so they really took very little or no load at the time of failure and I think that's an aspect of this failure which we need to understand and probably needs further research because we clearly need to make sure that we hold on to these walls in the out-of-plane direction and clearly that was not successful in this case.

Q. Isn't that why it can be important or might it not be important for these elements of the structure to be placed at an angle to the masonry?

A. That helps because it is possible that they could have been placed into a mortar joint which the wall could simply just rotate off and leave them not adhering to the masonry. It's certainly preferable to, and there's various lines of thought on it but it's certainly preferable to have them at an angle because then you are certain that you are going to penetrate some of the masonry and not end up in a joint.

EXAMINATION CONTINUES: MR ZARIFEH

Q. So is that a more modern approach to have an angle or not?

A. Yes I think current thinking is it's preferable to place them at an angle.

Q. And when you say 'current' over the last how long?

A. I'm not sure the industry has got a consensus but I think generally the view is coming round that they do provide a better fixing at an angle and are more reliable.

Q. So is there still some debate about that?

A. I think there's been quite a lot of debate. The problem is that the industry only ever sees what happens to these fixings when we have a terrible earthquake and it's really come out of the earthquake that people have realised some of these fixings don't work.

Q. Now let's just deal with this issue of fixings while you've raised it on the failure. Can you conclude that it was a problem with the fixing or was it the strength of the earthquake disintegrating the block work in most cases?

A. Unfortunately by looking at pictures I don't think it is possible to determine accurately the cause of the (inaudible 17:59:32) failure. I think the lack of masonry, most of those fixings is of concern. Epoxy fixings can potentially fail because of several causes. If the holes that are drilled to place the epoxy in are not cleaned out properly then it can end up with a loss of bond. If the epoxy isn't mixed properly it is possible that that may not develop its strength. If the temperatures are too low the epoxy will not cure and it will stay as a weak paste almost. Now we've heard evidence to suggest that care was taken in putting those fixings in place. It's unfortunate we haven't got the opportunity of studying fixings and determining with some certainty why those fixings failed in the manner they did. I think certainly the significant vertical acceleration will have been a contributing factor and that I think has helped the fixings that have held on to the masonry it's been a factor in how those have separated from the wall.

Q. I think Mr Lewis said, you remember him referring to the dowels that have got white on them and some with red where there was red brick?

A. Yes. That possibly indicates what they were placed into. Again it's very hard from a photograph to be conclusive.

Q. Right but it doesn't counter what you're suggesting could be a problem?

A. Mmm.

Q. Is that correct?

A. Sorry.

Q. It doesn't counter what you're suggesting is a potential problem?

A. No I don't think. The fact that they failed and didn't hold on to the masonry is the primary concern and they obviously didn't apply any load to the angles that supported them.

Q. Which you'd expect if they had been properly fixed or properly held?

A. Yes.

Q. So you said more research is needed. What other lessons can we take from that for the future?

A. I think we need to carefully review the design criteria for unreinforced masonry, walls particularly in the top storey. I think the challenge is that the Christchurch event was so severe. I am not sure that we are capable of designing buildings for the sort of accelerations that were experienced in Christchurch but I think the industry certainly needs to be reviewing the design loads and also the methods of securing strengthening work to these masonry walls.

Q. And what about, you mentioned vertical acceleration effects?

A. Yes I think that's something which we need to be considering in the design analysis of these elements.

Q. The other matter I wanted to ask you about was in this case we heard evidence you will recall of damage to the east wall. There was a suggestion initially it was the west wall as well but it transpired it was the east gable wall?

A. Yes.

Q. And that resulted in a Building Act Notice issued by the Council?

A. That was after Boxing Day.

Q. After Boxing Day, that's correct, and we heard from Messrs Gordon and Gifford from Lewis and Barrow about the remedial work that was done?

A. Yes.

Q. Firstly I don't know if you've got any comment about the remedial work that was done to meet that damage?

A. We really hadn't enough detail on the connections and the manner of securing that plywood. In principle it seemed a sensible approach to securing that wall and preventing the outward failure of masonry.

Q. In relation to that remedial work we also heard evidence. Firstly we heard evidence that Mr Gordon oversaw the work at the site and that I think he accepted that the work wasn't quite complete when he initially completed a CPEng form and then as it transpired he couldn't do that because he wasn't CPEng registered?

A. Correct.

Q. I presume you wouldn't condone the work not being completed before it's signed off?

A. Absolute. I think especially a place of assembly but in any case the engineer should always be satisfied the work has been completed before signing a statement to that effect.

Q. Is that in your experience what usually happens?

A. I would sincerely hope so.

Q. The other aspect of that was that Mr Gifford who was CPEng registered hadn't gone to the site but clearly had it sounded like a very detailed briefing from Mr Gordon and looked at sketches and I think photographs

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Q. as well is the evidence but in any event hadn't gone to the site and it seemed from a number of witnesses, including those two gentlemen, that that was an accepted practice. Is that correct?

A. Yes, it is often a CPEng engineer will sign off the work of another engineer without necessarily seeing it. It's important to understand and to review the work of the other engineer and you'd need to be satisfied that the work has been done and that it's complete and that you are in a position that you can make that statement.

Q. Right, maybe this is a layperson's view but how can you do that if you haven't actually been to the site and assured yourself of the work that's been done?

A. I think firstly you've got the plans and details of the work that was being undertaken and you've got the opportunity of assessing the adequacy of those. You do have to take staff member's word for the completion of it but you gain confidence in your staff over the years and a junior staff member for instance you wouldn't rely on but once you have confidence that an engineer is checking the work thoroughly you can gain confidence enough to issue such a certificate.

Q. And you don't see anything coming out of that practice and not just confining to this building obviously but in terms of something the Commission needs to consider?

A. It's actually a quality assurance measure some practices run where only the directors of the practice will actually sign off a certificate. It means that they are aware of all of the work that they're signing off and it actually is probably I think very good quality assurance to ensure that the work has been properly done.

Q. All right, thank you.

CROSS-EXAMINATION: MR ELLIOTT

Q. I ask for document BUIMAN200.0004.186 please? Mr Smith, in other reports about other buildings you talk about an outward rotation at the first floor level in some cases but this appears to be a different situation in relation to the north and west walls where you talk about a disintegration?

A. Yes, yes, if you look at the rubble it doesn't appear from the photograph to have been rotation but almost that the mortar has let go and the elements of the wall have just simply fallen as a pile of rubble round the sides.

Q. That's what I was going to ask. So you draw that conclusion from the state of the bricks –

A. Mhm.

Q. – around the base?

A. The only evidence we had in which to judge what occurred.

Q. And just in terms of getting an understanding of what physically happened, are you saying that vertical accelerations may have thrown the lot up and horizontal threw them out simultaneously or?

A. Yes, essentially a lime mortar wall has got very little bond between the each brick and the mortar, it's like sitting in sand almost, so that when you subject that to a vertical acceleration at the same time as this lateral displacement's occurring it really just disintegrates and I think looking at the, where the rubble is lying, is on the photographs, looking at what happened with the fixings around the roof, there is every indication that's what occurred.

Q. I think Mr Lewis commented upon this but the wall in question would have been literally bricks and mortar from the level 1 section there right up with no strengthening inside?

A. Yes, I believe there was no strengthening of that wall –

Q. So –

A. – securing at the top of the wall.

Q. So that the state of the mortar would have been a particularly important feature in terms of the strength of the wall?

A. I think we have evidence throughout Christchurch the vulnerability of the upper floor of unreinforced masonry. It didn't matter whether it was a single storey, two storey, three storey or four storey, it was always the upper storey and I think that's evidence of the vertical acceleration effect.

Q. We heard evidence from Mr Gordon just about the test, if you like, that he was applying when he did his visual assessment of the building and I think he agreed –

A. This is the strengthening work is it? Securing it?

Q. Sorry, he said that he did a site inspection on 28 December 2010?

A. Yes.

Q. Visually assess the exterior, walked around the north, west and south façades, viewed the east façade and he said he noted minor cracks on

the north and west, however the cracking appeared to be historic and he also said, “I'm satisfied that if there had been damage to the west wall following 26 December aftershocks I would have noted that during my inspection,” and I think he agreed, one of my friends will correct me if I'm wrong, but I think he agreed that it was a damage based test that he was using as opposed to the other test whereby one looks at the structural strength of the building and compares it to possible horizontal accelerations. Now of those two tests I think you say in your report that the latter is the better in terms of moving forward?

A. Yes I believe we need to be thinking of having a minimum strength apply to occupancy or approach to these buildings in the likelihood of a significant aftershock. I think we also need to be changing the design criteria for such walls because probably in the future the initial shock will be the one that will cause the damage.

Q. Just finally, BUIMAN200.0034.6. That shows the building obviously in its intact state and I think Mr Lewis agreed that there was plaster on the outside of the north and west walls. That being the case, and if the interior walls were also covered in some way, even applying a damage based test would it be possible to give any consideration to the state of the brick wall in the north and the west?

A. Any cracking of the brickwork will show through the external plaster.

Q. It would?

A. Oh yes, I think almost certainly, so that any, you could observe the condition of the brickwork fairly confidently from the external plaster finish.

Q. What if one was wanting to give consideration to the state of the mortar? Could one do that?

A. One you would need to be destructive and expose some of the mortar to establish the quality of the mortar.

Q. Thank you.

CROSS-EXAMINATION: MR LAING – NIL

CROSS-EXAMINATION: MR MCLELLAN – NIL

CROSS-EXAMINATION: MS MORGAN – NIL

RE-EXAMINATION: MR ZARIFEH - NIL

QUESTIONS FROM THE COMMISSION: NIL

WITNESS EXCUSED

JUSTICE COOPER:

Thank you for all you have done for us over the last two weeks. This now concludes our hearing into the collapse of the Iconic Bar. We will express our conclusions in our report when that is released later this year. Thank you.

COMMISSION ADJOURNS: 6.15 PM