

**COMMISSION RESUMES ON THURSDAY 15 MARCH 2012 AT 12.37 PM****HOTEL GRAND CHANCELLOR****CONTINUED FROM 18 JANUARY 2012**

5

**MR ZARIFEH**

Sir, this is the final witness in the hearing that we had earlier in the year in relation to the failure of the Hotel Grand Chancellor – Mr Andrew Lind – and Your Honour will recall that the reason we couldn't have Mr Lind's evidence taken was because the video link broke down. He was in Queenstown at the time.

10

**MR ZARIFEH CALLS****ANDREW LIND (AFFIRMED)**

15

**JUSTICE COOPER**

Before you start can I just thank you for the flexible stance that you have adopted in coming along today. We couldn't hear your evidence originally through no fault of yours and I think you were co-operating at that stage whilst on holiday so thank you for that and thank you for being flexible about the timing of your evidence today. We appreciate that.

20

**EXAMINATION: MR ZARIFEH**

Q. Mr Lind, your full name is Andrew Gordon Lind?

A. It is.

25 Q. You reside here in Christchurch?

A. I do.

Q. And you're a civil and structural engineer?

A. I am.

30 Q. And you're a chartered professional engineer, civil and structural, and a chartered engineer in the UK?

A. I am.

Q. And I think you have some over 18 years of post-graduate experience working predominantly in the United Kingdom but also in New Zealand?

A. Yes.

5 Q. At the time of your inspection of the Hotel Grand Chancellor I think you had been working at Powell Fenwick Consultants as a senior structural engineer for some three years?

A. That's right.

10 Q. Now you have provided the Commission with a letter dated 1 December 2011 which was in response to some questions that I wrote to you, correct?

A. Yep.

15 Q. And we've also got a copy of your report, Powell Fenwick report, dated 28 September 2010 on your inspection of the Hotel Grand Chancellor and also another follow-up inspection on 1 October that was reported by letter of 18 October?

A. Yeah.

Q. And we also have a copy of a Powell Fenwick document which is a schedule of damage and repairs recommended dated 26 January 2011 which I think was completed by you. It's initialled by you?

20 A. That's right.

Q. I don't want to go through all of that documentation but I just want to cover the main points and you can expand where necessary. Firstly, your reporting letter of 28 September set out what you were asked to undertake and that was namely to provide a visual structural assessment, to advise on repairs, and identify any further investigations that should be undertaken based on the observed damage. Is that correct?

25

A. That's right yeah.

30 Q. Were you aware that following the 4 September earthquake, I think the next day from memory, Mr Haverland from Structex had inspected the building?

A. I was. I spoke with Steve Martin, the manager, and he mentioned that that inspection had already taken place. I asked for a copy of the report

actually but Steve couldn't locate it at the time so he was going to forward that on.

Q. Right, and did you ever get that?

A. No I didn't. I never saw it.

5 Q. Did that affect your inspection or not, not having it?

A. Not really. It's always useful to know whether, I think Steve informally told me that Gary had found no issues with the building.

Q. Were you aware of the Council placarding of the building following the 4 September earthquake?

10 A. I was aware the system was in place in Christchurch, yeah, and that the building had been placarded, yeah.

Q. But were you aware what the placard was?

A. It was green, yes.

Q. Did you see that or not?

15 A. Can't recall. I think so, yes.

Q. Now I just wanted you to describe what the level of your inspection was on the 23<sup>rd</sup> of September?

A. Ah, the level inspection I guess is gonna always be guided by what you anticipate the damage to the building is going to be and also then what you observe, so the observations indicated that there was very minor structural damage, if at all any. It hadn't really affected the capacity to the building. In terms of assessing what I was anticipating with the building I didn't have the structural drawings so I hadn't been able to kind of assess the building's structure in detail. The only other thing that probably coloured my vision a little was just the time period of the building. I assumed it was a long-time period building and I was aware that some of the long-time period buildings may have been affected by the soft soil amplification and long-time period of the earthquake.

20

25

Q. Were you aware of the general structure of the building and how it was constructed?

30

A. I had limited understanding. I asked to have a look at the structural drawings and I went to the workshop that they have in the building and we looked through the drawings they had. They were largely

mechanical plant and electrical drawings and a couple of architectural drawings which didn't really give me a clear indication of how the building was working structurally. I assessed that the podium structure was a shear wall system and then there was a concrete frame for the main hotel sitting on top of that.

5

Q. All right so you knew the basic structure of it?

A. Yeah.

Q. You said in your letter of 1 December 2011 that the owner's representative, I presume that was Mr Martin?

10

A. Yeah.

Q. Was to make further enquiry to obtain structural drawings but these had not been sourced prior to the February event. So was that from the Council to get structural plans?

A. They were going to try and get them from the architect I think at the time because that was the name we saw on the architectural drawings and they were going to enquire, chase the architect, see whether he could confirm who had done the original structural design.

15

Q. All right, why did you want the plans or the drawings?

A. Primarily because it just gives you a better understanding of the structure, so as you can understand it, probably to have a look at the stair detail which I didn't have a fully understanding of, how the stair detail was working.

20

Q. Right, and not having them did that limit you in the level of inspection that you were carrying out?

A. It doesn't limit the inspection. It limits the overall understanding of the building and identifying any key issues with it. I think my view was that while it's always useful to have the drawings it probably would have been going beyond my remit to have done the sort of analysis required to understand the building in the sort of detail that would have determined any issues with it.

30

Q. You know what I mean by level 2 assessment?

A. I do, yeah.

Q. How would you describe your inspection and assessment in those terms. Was it a level 2 or...?

5 A. No, I'd say it was a little more than level 2. We were taking linings off and having a look at the beam column joints. We subsequently went up and down in the lift shaft just because the lift shafts did expose structure so it's easier to see. We had guys abseiling down the outside of the building to have a good look at everything.

Q. Sorry, you had people abseiling?

A. Yeah. That was Goldmans. I think there was a report provided.

10 Q. So they abseiled down the side looking for what, for damage?

A. Looking for any damage, yeah, yeah.

Q. Was that something that you instigated or...?

15 A. It was. That's in my first report on the 28<sup>th</sup> of September. I suggested they undertake a series of further inspections, one of which was the abseiling. I guess my primary concern was with concrete panels and secondary structural elements and bits of glass that might be prone to falling off.

20 Q. Okay, do you think that the level of your inspections, at level 2+ if I can put it that way, was appropriate given the height of the building and the way it was constructed?

25 A. Yeah I think for a larger building I think it's appropriate to do a little more inspection. And I guess particularly because of this long-time period issue which was not apparent immediately in the days after the earthquake but once you got the, once the data was available from GNS then certainly that was a concern of mine.

Q. Why was that?

A. Just because there was a, the spectral accelerations for the earthquake seemed to have a time period above code and therefore you can get

1247

30 some resonant effect with the earthquake movement in a tall building which this is one of them but I guess there was concern in my mind about that that there might be some, might be a bigger effect on the building that may have been allowed for in the original design.

Q. Right. When did you get the information from GNS, do you recall?

A. No I can't recall exactly, would have been before, before I did the inspection of that building. I think probably within the one to two weeks. I think the data's available almost instantly if you know where to look for that.

5

Q. All right. And just looking ahead and the Commission is looking at lessons that can be learnt from these buildings and the assessment of them, you said that the plans didn't limit you but ideally do you think that having plans for a building like this would be better?

10 A. Undoubtedly it would be better to have the building as probably to my mind a, what's asked for in some larger buildings is a design features report which just gives the overall structural system and any areas of particular interest in the structure, how it's working under earthquake loading and gives a time period and a that's kind of a one or two page summary of a building structure.

15

Q. Is that something done by the design engineer at the construction?

A. Often it is yes. Sometimes the council request it just to help them to understand what's going on with the, particularly a big building like that.

Q. Right. And is that something that you have to go and get a hard copy from the council usually?

20

A. Well typically they're not available.

Q. Okay. So you're suggesting that that would be useful?

A. Yes that would be something, yes asking for something that is useful yes. Having drawings in a simple design features report or structural summary of a building would be very beneficial I think.

25

Q. And what it would enable you to assess critical structural weaknesses pretty quickly?

A. Maybe not structural. It would just enable you to assess the building and focus your efforts quickly.

30

Q. All right. Just talking a bit more about the level of your inspection, you said you removed some wall linings. Just tell us a bit about that?

A. That was just to look at the beam column joints. There was already damage in some areas of gib so when we did the inspection we walked

around with some of the guys from Fletchers Construction and they cut through the gib linings and just exposed those beam column joints for us.

5 Q. Right. And were you able to see any damage or any significant damage to those?

A. There was no significant damage. There was very fine hairline cracking indicating that there had been some yielding potentially starting at one of those points.

Q. Right. And did that concern you?

10 A. No I thought it was very, at the very low end of any sort of damage to the building.

Q. Right. You talked in your letter of 1 December of all the areas that you inspected and I won't go through them but you essentially looked at all the main structural features if that's the right word.

15 A. As I understood them at that time yes.

Q. Including the basement and lower floor where you said loading would be expected to be high in the walls?

A. Yes.

Q. And would that include the shear walls?

20 A. It would. I, in terms of the sheer wall that failed I wouldn't because of my potentially limited understanding of how the building was working and the way the loads were travelling I hadn't identified that wall as a key or a critical wall as it were.

Q. You had not?

25 A. No. And it was strapped and lined so you couldn't actually see the wall structure itself.

Q. Did you observe any damage?

A. No I didn't. There was very little damage at the lower levels of the building.

30 Q. And your report of 28 September you said on the second page "*based on the above observed damage there was no concern for the structural stability or strength of the structure which appears to have performed*

*well under the earthquake*". Was that a general, your general conclusion then after your inspection?

5 A. Yes absolutely. There was little even under the some of the sort of minor elements where it was flexible it didn't look like there had been a lot of movement in the building.

Q. When you inspected it did you take into account the fact that there were aftershocks being experienced at that time and likely to continue?

10 A. I did yes, but based on the fact that the building had come through sort of a larger event I was expecting aftershock sequence to be generally of a lower order.

Q. And we've heard a lot about the damaged base test or assessment that engineers conduct and is it fair to say that's what you were applying?

A. Fundamentally it was damaged based yes.

Q. When you say some fundamentally, did it differ at all?

15 A. Well as I said you had to make the assessment on the building based on how much investigation is justified based on what damage you see. So I saw very little damage so we only did a fairly modest amount of investigation. We didn't start stripping linings off every wall, so yes it would align with the damaged based assessment.

20 Q. And if you had seen indicators or damage what would you have done?

A. Well yes and it's a, each step of the way if you see a bit of damage then obviously then you've got to have, you're then justified in causing a lot of economic cost in ripping off wall linings and investigating things a lot more thoroughly and at that stage you would probably start saying that you would need the drawings to make any assessment of a building of that scale.

25 Q. Okay. But it didn't get to that point where you thought that was necessary?

A. No.

30 Q. You talked about a reinspection on the 1<sup>st</sup> of October.

A. Yes.

Q. Why did you do that?

- 5 A. That was one of the items that I'd identified in the 28<sup>th</sup> of September report. I said there were a number of things which I wanted checking which was the concrete panel connections all around the building, primarily in the carpark actually which Fletchers undertook, and then one of them was just gib damage around one of the, in the conference room. They called me back when they cut through that and exposed all they called me back to have a look at that.
- Q. So there was damage or cracks to the gib. You wanted to look behind it.
- 10 A. I wanted to understand what was going on behind it yes.
- Q. And when you did that from your report 18 October you found no damage behind that of any concern?
- A. No there was no structural issue. It looked like there had been a movement between some of the steel frame and roofing frame for the conference centre and the concrete column and they were just, they were independent structures actually at that point.
- 15 Q. Right. After visiting on the 1<sup>st</sup> of October did you have any involvement that in 2010? I'm thinking more of Boxing Day aftershock, after that.
- A. In 2010 I can't remember when I reinspected the building. I did reinspect the building after the Boxing Day but I don't know the date of that. I don't, I've lost my notes.
- 20 Q. All right. Because we haven't got any document reporting on that.
- A. No it wasn't a formal request. It was just can you come and just check the building and make sure you're happy with it.
- 25 Q. From Mr Martin?
- A. I think so yes.
- Q. And I appreciate you haven't got your notes but can you recall whether there was any concerns?
- A. No I had no concerns. I wrote up the notes. We probably spent, we looked round the building. We reinspected the areas where I'd looked at before in terms of the beam columns and there was no visible change at all, and then there was probably more time spent in the carpark which is a seismically separate part of the structure and there were a few
- 30

issues in there which were being looked at and also I was walking round with the guys from Fletchers who had also done all the panel connection inspections at that point. We were looking around at those just anywhere they had found damage.

5 Q. And how long roughly did you spend on after Boxing Day looking at it? Can you recall?

A. Be a morning, two to three hours, takes a long time going around a building.

Q. How long would you have spent in the September visit?

10 A. I think I spent probably a good two hours walking around with everyone and then probably another two hours walking around and then in the workshop trying to look through the drawings so probably five, five hours something like that I should think.

Q. And then in October was that a shorter visit?

15 A. That would have been a short visit. As I say there was a, there was another visit when I went in and looked at the lift shafts as well and rode up and down on the top of the lift just looking at the lift shaft structure.

Q. So inside the lift?

A. Inside the lift yes.

20 Q. And any damage observed? Anything seen?

A. No, nothing.

Q. The document dated 26 January which is a schedule of the damage and suggested repairs, was that completed, presumably it was completed on 26 January, was that as a result of all of your inspections?

25 A. That was –

Q. In terms of damage.

A. That's a standalone document of the damage I've seen when I done the inspection after Boxing Day.

1257

30 Q. Okay. The final issue I just wanted to get your comment on was you mentioned the stairs.

A. Yep.

Q. And in your report of 28 September at the bottom of the first page you said, *“An uneven landing surface under the floor lining was exposed to reveal the concrete cover to the landing that had spalling away from the top of the stair unit connection.”*

5 A. Yeah.

Q. *“This is considered to be because the stair unit had not slid sufficiently at the base. This defect was observed to be typical at a number of landings. The floor linings will need to be lifted at every level to confirm the extent of damage and a concrete patch repair undertaken.”* Right?

10 A. Yeah.

Q. So just, firstly, can you tell us, was, were the floor linings lifted at every level to confirm that?

A. They were, yep and I observed those on one of my return visits. I can't remember which one.

15 Q. And what did you observe?

A. I observed basically that the stair units span from floor to floor and at the top there's a, there's a steel stud that comes out of the precast stair unit and lands on a small nib on the landing and then there's a, there's a very thin layer of concrete which sits on top of that and that shattered off so it was a kind of, probably only 5 or 10 mm of concrete, particularly in the one where there was unevenness and that just spalled off, off the top. So I didn't really have any concern in terms of what it had done in terms of the structure. I, I wanted, I just asked for all the linings to be lifted off so that I could have a look at all of them.

25 Q. Okay. And you'd said in that report that it was a failure to slide?

A. I did. Yep.

Q. What I wanted to refer you to and see if you wanted to comment on it was Mr Thornton, Adam Thornton's done a report as I think you're aware for the Department of Building and Housing on the failure of the building and in a section, paragraph 5.3, headed “Damage Prior to the February Event” he discusses damage that was observed prior to the event which was based on your reports –

30

A. Yeah.

Q. – and I presume Mr Haverland's as well and he says, "*There is no suggestion that significant structural damage occurred either in September or December.*" You'd agree with that presumably?

A. Yep.

5 Q. "*There is also little or no evidence to suggest that significant problems could have been identified as a result of the earlier events.*" Then he goes on to say, "*The possible exception to this was the damage at a number of stair landings. This was interpreted as a failure to slide,*"  
10 *which is presumably a reference to your letter, "rather than a minor compression failure resulting from a lack of provision for stair flight shortening as a result of inter-storey drift. In any event subsequent analysis and observation suggests that the resulting stair failure occurred only as a consequence of the failure of the shear wall D5, D6."*  
Now do you want to make any comment about that?

15 A. Yeah. So there is a difference there. So I've made a statement saying that it was, that it hadn't been able to slide where my understanding of what Adam's saying is that the stair actually didn't have any provision for shortening and couldn't have slid to allow compression. When I  
20 looked at the detail on the site it looked like there would have been, the stair had been dropped into place and then the top of it had been dry packed tightly into place and then at the bottom there was a soft board behind the, behind the steel stud that was supporting it which my understanding when I observed that was that it would have allowed the  
25 steel stud to have compressed that soft board without smashing the concrete and that probably my view is now that it probably didn't actually flex very far at all. That there probably wasn't that much movement in those, in some of those stair landings at the time.

Q. Right.

A. It was probably just, just under the vibration of the building, generally  
30 vibration, it just shattered the top of that cover concrete off the top of the steel stud at the top.

#### **QUESTIONS FROM COMMISSIONER FENWICK:**

- Q. Thank you for a very complete description. I'm now going to ask the impossible questions I'm afraid.
- A. Great.
- Q. You commented about some fine diagonal cracking in the columns.
- 5 A. Yep.
- Q. Now I'm interested to know in which direction those cracks were. Did they run high from the west to the east or high from the east to the west or were they in the north south columns, direct?
- A. It wasn't in the columns. It was in the beams.
- 10 Q. Sorry in the beam column joint.
- A. The cracks were in the beam column joints and they would have been travelling in the east-west direction going from the top in the west down to the east.
- Q. Yes and they started high in the west and dropped down towards the east, that way?
- 15 A. Yes, yep where, where the column was adjacent. So it would have been travelling down like that.
- Q. Right. That's excellent. Were there any cracks, perhaps a single crack in the beams adjacent to the columns, and if so on which side of the column?
- 20 A. Sorry I was just talking about, what I just described was the beam, a crack in the –
- Q. Sorry you've described to me the beam column joint.
- A. Yeah.
- 25 Q. I was now moving onto the beams.
- A. The beam only, yep.
- Q. The beams only. So you've got your column and your beam coming out of it. I was wondering – did you see any cracks in the, in the beams at the column face?
- 30 A. Sorry when I'm talking about the beam column joint I'm talking about the beam directly adjacent to the column. So there was no crack actually at the joint. It was adjacent to the joint in the, in the beam.
- Q. It was in the beam?

- A. Yes.
- Q. Not in the beam column joint?
- A. Yes.
- Q. Okay. Right and it was running in that, that angle. Okay so I just need  
5 to change my notes to make sure I've got that. I assumed it was in the  
actual joint itself.
- A. No, no.
- Q. Right. So it was east to west. Sorry, west to high west dropping to the  
east.
- 10 A. Yeah.
- Q. Now this may have been repaired when you got there but there was a  
report of damage to the windows.
- A. Yes.
- Q. Did you know which floors and which side those of the building that  
15 damage was on – I'm sorry, I know it's impossible to ask you a year  
afterwards what happened but.
- A. I think it was on the west but I'd be quite uncertain of that.
- Q. West side?
- A. Yeah.
- 20 Q. And you can't remember the approximate levels?
- A. No I can't, no. I think, that information would be available from Fletchers  
I'm sure if you were keen to get that.
- Q. Thanks. We have got other information on that but I'm not sure that the  
sides are identified but that's great.
- 25 A. Okay.
- Q. Now another impossible question about the stairs and you pointed out  
there was some failure to slide or spalling there.
- A. Yeah.
- Q. Now those stairs of course were –
- 30 A. Scissored, yep.
- Q. That's right. Which one, don't worry about the level, but which ones  
were the, was it on both of them or was it on one which perhaps  
descended from the west to the east or from the east to the west? If

you don't know just let me know but if you can recall which way they were it could be very helpful.

A. I can't recall. It was on a number of landings. The worst one was probably, it would have been at the bottom of one of the stairs.

5 Q. This is just above the level 14 was it, when you're talking about the bottom because –

A. Sorry, yes it would have been, yes.

Q. – there would have been the walls and then you have the –

A. Yeah, yeah.

10 Q. – moment testing frame.

A. So the damage sort of occurred at the bottom of the, of the main frame and I would say it was at the bottom, it was where one of the, at the bottom of one of the stair flights.

15 Q. But you can't remember which direction? Look I'm asking impossible questions I realise that.

A. Yeah I'd be again, yeah, not categorical but I think the, I would say it's probably the stair that was going from, that was scissoring up so it was low in the, on the west side and moving up to the east.

Q. All right.

20 A. Does that make sense?

Q. But you're not, not 100% sure on that?

A. No I'm not, no.

25 Q. Right. Now you had a look at all the structural walls, not just the one that got damaged but you looked around the structural walls at the base, the very big one, the T-shape, the I-shaped wall?

A. No I had a general look around and most of those walls are covered so you couldn't actually see that much in terms of what was really going on and that was probably where riding up in the lift shaft was the only thing that gave me any, you know, a real look at the actual structure behind it.

30 Q. Yes, yes.

A. And I'd made the decision that it wasn't justified to rip linings off to have a look given the low level of damage.

Q. Yep, yep. Well you've been surprisingly helpful. Thank you very much.

A. Low expectations I think.

**QUESTIONS FROM COMMISSION CARTER – NIL**

**JUSTICE COOPER TO MR LIND:**

5 Q. If we want to pursue the location of window damage is there somebody at Fletchers who you think would be the best person to talk to? Can you give us a name?

A. I think the chap was Graeme but I can't remember, no, I can't remember his name. I can get a name for you.

10 Q. Could you and let Mr Zarifeh know?

A. Yeah I can forward that one, yep.

Q. Thank you very much. All right. Well as I said before we're grateful for your flexibility and thank you for your evidence.

**WITNESS EXCUSED**

15 **COMMISSION ADJOURNS: 1.07 PM**