| | Page 1 | | Page 3 |
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| 1 | Monday, 14 January 2019 | 1 | COMMISSIONER HANSFORD: And maybe if we could look it - |
| 2 | (10.02 am) | 2 | I don't know, something like 25 January; bring it as |
| 3 | MR PENNICOTT: Good morning, sir. | 3 | up-to-date as we possibly can. |
| 4 | CHAIRMAN: Good morning. | 4 | MR BOULDING: It may well even be the case that we could |
| 5 | MR PENNICOTT: Sir, you will see around the room this | 5 | take it up to 29 January. We will see what can be done |
| 6 | morning that there are some perhaps unfamiliar faces to | 6 | and we will update it as much as we possibly can. |
| 7 | you. That is because we are starting the structural | 7 | COMMISSIONER HANSFORD: Thank you very much. |
| 8 | engineering expert evidence this morning, and I think, | 8 | CHAIRMAN: Good. |
| 9 | although I haven't counted, that most if not all of the | 9 | MR PENNICOTT: Sir, before we get to Prof Au good |
| 10 | structural engineering experts are in the room. | 10 | morning; we'll be with you shortly, Prof Au could |
| 11 | CHAIRMAN: Yes. | 11 | I just mention this. I think it's a matter that has |
| 12 | MR PENNICOTT: As you know, Prof McQuillan is sat next to | 12 | been drawn to the Commission's attention, but there have |
| 13 | me, I can see Mr Southward is there, and I think | 13 | been some enquiries from the media, and in particular |
| 14 | Dr Glover is at the back as well, and at the moment | 14 | the Apple Daily, in relation to questions concerning the |
| 15 | Prof Au is in the witness box. | 15 | potential lack of independence of certain experts who |
| 16 | CHAIRMAN: Yes. | 16 | have produced reports for the Commission on behalf of |
| 17 | COMMISSIONER HANSFORD: Mr Pennicott, before we move on to | 17 | various parties. |
| 18 | structural matters, can I just raise one matter of | 18 | In particular, my understanding is that so far as |
| 19 | project management which is residual from last week. | 19 | Leighton are concerned, Mr Scott Allan from COWI and |
| 20 | MR PENNICOTT: Of course. | 20 | I understand it's pronounced with a V although it's |
| 21 | COMMISSIONER HANSFORD: This probably directed mainly to | 21 | spelt with a W Mr Allan from COWI, there's a question |
| 22 | Mr Boulding. You will recall that Mr Huyghe's evidence | 22 | mark regarding his independence that has been raised in |
| 23 | and his expert report had an appendix D, which was MTR's | 23 | fact by China Technology and the Apple Daily. |
| 24 | update on their progress made on Turner & Townsend's | 24 | Likewise, the Apple Daily has raised some concerns |
| 25 | report. | 25 | with regards to Mr Southward, and also, I understand, |
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which could impair their independence and no reasonable

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| 1 | COWI and Mr Scott Allan first, followed by Tony Gee and | 1 | observer could form the impression otherwise or could |
| 2 | Mr Nick Southward. | 2 | suggest otherwise based on the facts I have just |
| 3 | In relation to COWI, the position is this. COWI had | 3 | described. |
| 4 | no involvement in the development and delivery of the | 4 | I now move on to the question about Tony Gee and |
| 5 | work at Hung Hom Station. COWI's work now. COWI is | 5 | Partners. Tony Gee and Partners had no involvement in |
| 6 | a catchphrase to describe the expert, but what I'm now | 6 | the development and delivery of the work at Hung Hom |
| 7 | going to describe is the precise set-up. COWI's work in | 7 | Station. In media reports, it has referred to |
| 8 | relation to the provision of the expert report for the | 8 | engagements that were completed by Tony Gee and Partners |
| 9 | Commission is being delivered by COWI UK Ltd. in | 9 | many years ago. In particular, Tony Gee and Partners |
| 10 | particular by Mr Scott Allan and his team based in | 10 | completed its work in relation to the Saadiyat Island in |
| 11 | Glasgow. | 11 | Abu Dhabi, the Brisbane Gateway in Australia, the Ampang |
| 12 | That work has been undertaken independently of COWI | 12 | Elevated Expressway project in Malaysia and the MTR's |
| 13 | Hong Kong Ltd and COWI Singapore Ltd. | 13 | Airport Express viaduct projects many years ago. |
| 14 | There's a project known as the Hong Kong Express | 14 | Tony Gee and Partners performed a discrete role for |
| 15 | Railway twin bored tunnel project under Lam Tsuen Park. | 15 | Leighton in relation to the HAECO hangar at the |
| 16 | COWI Hong Kong was employed by the main contractor for | 16 | Hong Kong International Airport. That was completed |
| 17 | that project, Kier-Kaden-OSSA JV. COWI Hong Kong did | 17 | about eight years ago. |
| 18 | not have a contractual relationship with MTRC. The | 18 | With the exception of the work in relation to the |
| 19 | relevant people from COWI who worked on that project had | 19 | expert report produced for this Commission, Tony Gee and |
| 20 | limited contact with MTRC and they do not recall having | 20 | Partners is not performing any work for Leighton or any |
| 21 | any contact with the sub-contractor, Tak Cheong Civil | 21 | of the other parties before the Commission, and Mr Nick |
| 22 | Engineering Ltd. | 22 | Southward and his team who prepared the expert report |
| 23 | COWI Hong Kong completed its work on that project | 23 | have no connection to any of the parties before this |
| 24 | before COWI UK was engaged for the present matter by | 24 | Commission. |
| 25 | those instructing me, O'Melveny & Myers on behalf of | 25 | In the light of media enquiry, Tony Gee and Partners |
| | Page 6 | | Page 8 |
| 1 | Leighton. | 1 | had conducted further conflicts check beyond what was |
| 2 | There's another project in Singapore called | 2 | usually required and wishes to disclose for the record |
| 3 | Singapore Deep Tunnel Sewerage System. The relevant | 3 | that in the year 2015, a Mr Jonathan Gray from its UK |
| 4 | work on this Singapore project was delivered by COWI | 4 | office was seconded to Leighton for seven days, on the |
| 5 | Singapore and COWI Hong Kong Ltd. COWI's work on that | 5 | 1. 2. 4 and 7 to 10 December 2015 as a principal |
| 6 | project, the Singapore project, was completed before | 6 | engineer for SCL1112. Tony Gee and Partners was not |
| 7 | COWI UK was engaged for the present matter. | 7 | responsible for Mr Gray's work during this period of |
| 8 | Mr Scott Allan and his team who prepared the report | 8 | secondment for seven days. |
| 9 | for this Commission were not involved in the Hong Kong | 9 | Likewise, we submit that neither Mr Southward nor |
| 10 | Express Railway project or the Singapore project. With | 10 | Tony Gee could be subject to any conflict of interest or |
| 11 | the exception of the present case, COWI is not | 11 | anything which could impair their independence, and no |
| 12 | performing any work for Leighton or the other parties to | 12 | reasonable observer could suggest otherwise, based on |
| 13 | the Commission. Mr Scott Allan and his team who | 13 | the facts I have mentioned. |
| 14 | prepared the expert report have no connection to any of | 14 | Could I add two points: first, this Commission is |
| 15 | the parties to the Commission. | 15 | not comparable to a conventional civil trial where |
| 16 | COWI A/S is an international consulting group, | 16 | a lay, untrained judge when I say untrained, I mean |
| 17 | specialising in engineering, environmental science and | 17 | untrained in the expert discipline in question may |
| 18 | economics, based in Denmark. It has been involved in | 18 | need to rely upon experts solely in order to be educated |
| 19 | more than 50,000 projects in 175 countries and has | 19 | on technical points. In that scenario, it may be that |
| 20 | approximately 6,400 employees, including engineers, | 20 | the court would be more vigilant to check the |
| 21 | biologists, geologists, economists, surveyors, | 21 | independence of the expert and to decide what weight to |
| 22 | anthropologists, sociologists, architects, and we | 22 | place on the expert. But in this case, the Commission |
| 23 | respectfully submit that Mr Scott Allan and his team are | 23 | has its own independent expert, and one member of the |
| | | | |

respected expert in the field. In the circumstances, we

| | Page 9 | | Page 11 |
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| 1 | respectfully submit that whatever facts or matters one | 1 | as you will see, sir, when Dr Glover comes to give |
| 2 | may raise in respect of Mr Scott Allan/COWI or | 2 | evidence, it will be clear from the way he deals with |
| 3 | Mr Southward/Tony Gee should be regarded as a kind of | 3 | matters and his demeanour in the box that you can rely |
| 4 | disqualifying feature so as to rule them out completely. | 4 | upon his evidence as being totally independent. |
| 5 | As a corollary to the point I have just made, | 5 | CHAIRMAN: Yes. Thank you. |
| 6 | I respectfully submit and suggest that insofar as the | 6 | MR PENNICOTT: Sir, can I thank both Mr Shieh and |
| 7 | Commission remains under any lingering doubt about | 7 | Mr Boulding for those observations |
| 8 | possible lack of independence, those are matters which | 8 | CHAIRMAN: Sorry, Mr Pennicott, I'm just wondering as to |
| 9 | could only, if at all, go to the weight to be placed on | 9 | process, whether other parties may wish to be heard and |
| 10 | the evidence given by the expert and not amount to any | 10 | then you come at the end. |
| 11 | disqualifying feature so as to rule them out completely | 11 | MR PENNICOTT: I'm happy for that. I don't know if anybody |
| 12 | at this juncture. | 12 | else wishes to say anything. |
| 13 | These are the matters I wish to say in respect of | 13 | CHAIRMAN: I would like to double-check that. |
| 14 | the queries made about the two experts on behalf of | 14 | MR PENNICOTT: Please do. That may well be appropriate. |
| 15 | Leighton. | 15 | Thank you very much. |
| 16 | CHAIRMAN: Thank you. | 16 | CHAIRMAN: All right. We will hear from the Commission |
| 17 | MR PENNICOTT: Sir, could I | 17 | perhaps Mr Connor? |
| 18 | MR BOULDING: Sorry. | 18 | MR CONNOR: Thank you. There is nothing from Atkins on this |
| 19 | MR PENNICOTT: You go first. I suggest you do. | 19 | topic, sir. |
| 20 | MR BOULDING: Sir, Professor, MTR and Dr Glover welcome this | \$ 20 | CHAIRMAN: Thank you very much indeed. |
| 21 | opportunity to dispel any suggestion that Dr Glover's | 21 | From the government? |
| 22 | evidence to the Commission will not be completely | 22 | MR KHAW: Nothing from the government. |
| 23 | independent. In order to achieve that, I've been | 23 | MR SO: Nothing from China Tech. |
| 24 | authorised by both Dr Glover and the MTR to make the | 24 | CHAIRMAN: Intrafor, at the back? |
| 25 | following statement to you. It's hoped the media are | 25 | MR COHEN: Nothing, sir. |
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| | Page 10 | | Page 12 |
| 1 | Page 10 | 1 | Page 12 |
| 1 | Page 10 listening. | 1 | Page 12 CHAIRMAN: Fang Sheung? |
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| 1 | parties should be independent and the word | 1 | will see and you may have seen already, if you have read |
| 2 | "independent" was used. | 2 | the reports, there are indeed many points of agreement |
| 3 | The media has enquired as to whether the Commission | 3 | between the experts. They have achieved an agreement |
| 4 | has, as it were, fleshed out the meaning of the word | 4 | which we'll be looking at shortly. And certainly there |
| 5 | "independent". The answer to that is no, it hasn't, but | 5 | is a lot of common ground between Prof McQuillan, |
| 6 | I am about to do so. | 6 | Dr Glover and Mr Southward, that's for sure, as well as |
| 7 | Sir, really it comes to many of the points that | 7 | the other experts. |
| 8 | have been mentioned by both Mr Shieh and Mr Boulding | 8 | So, sir, for all those reasons, I hope that the |
| 9 | the reason why the word "independent" was inserted | 9 | media will be satisfied with the explanations that have |
| 10 | before the words "expert evidence" in the rules was to | 10 | been given and in my submission they certainly should. |
| 11 | ensure, essentially, that the various involved parties | 11 | CHAIRMAN: Yes. Thank you. |
| 12 | didn't seek to adduce expert evidence from their own | 12 | It is, in our view, quite proper that the |
| 13 | employees, from their own staff. That was really the | 13 | independence of experts should have been raised as |
| 14 | reason why the word "independent" was there and we | 14 | a matter for consideration by the Commission, especially |
| 15 | didn't want the government producing a senior engineer | 15 | bearing in mind the very real public interest in |
| 16 | from the government, MTR producing a senior engineer | 16 | ensuring structural integrity of the station. |
| 17 | from MTR, and Leighton and all the other parties | 17 | That said, the Commission has looked at the reports |
| 18 | likewise; we wanted people who were independent, that is | 18 | provisionally. It has looked at the curriculum vitae of |
| 19 | independent from the parties. What does that mean? | 19 | Mr Allan, Mr Southward and Dr Glover. And, for the |
| 20 | It's always a question of degree, but certainly it is | 20 | reasons already put forward, it has no doubt whatsoever |
| 21 | not the case, it is not the law in Hong Kong, that | 21 | that they will give entirely independent expert |
| 22 | simply because there is some historic commercial | 22 | evidence. |
| 23 | relationship between the organisation that the expert | 23 | It needs to be said that none of the parties |
| 24 | works for and the party that he is now giving expert | 24 | represented legally today have stood up to make any form |
| 25 | evidence on behalf of, or indeed any of the other | 25 | of objection or to even obliquely suggest that the |
| | | | |
| | Page 1/ | | Page 16 |
| | Page 14 | _ | Page 16 |
| 1 | Page 14 parties that are here, is sufficient to question of | 1 | Page 16 evidence of a particular expert should be viewed with |
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Examination-in-chief by MR CHOW

Prof Au, would you mind to give your professional

Q. Thank you. You can now sit down.

| 1 | Sir, I mention that because I reiterate this point, | 1 | address as well? |
|----------------|---|----------------------------|---|
| 2 | that this Commission will reach its findings in its | 2 | A. You mean the physical address of my university? |
| 3 | report on the evidence, and the expert evidence in | 3 | Q. Yes, please. |
| 4 | particular, that it hears in this room and not through | 4 | A. It's department of civil engineering, the University of |
| 5 | any media organisation or those who have felt it | 5 | Hong Kong, Pok Fu Lam Road, Hong Kong. |
| 6 | necessary to comment to the media over the last few | 6 | Q. I understand that you have prepared an expert report to |
| 7 | weeks. So I just thought it would be appropriate to | 7 | assist the Commission. |
| 8 | make that absolutely clear, that it is the evidence that | 8 | A. Yes. |
| 9 | is to be heard over the next coming days that is vital | 9 | O. And your report should be in front of you. |
| 10 | to this Commission and its findings. | 10 | A. Yes. |
| 11 | Sir, with that, I will sit down and hand over to | 11 | O. Can Lask you to take a look at page 1. |
| 12 | Mr Khaw, who is going to call the first expert, that is | 12 | A. Yes. |
| 13 | Prof Au, unless you wish to say anything. | 13 | O The report runs all the way up to page 17 Can you just |
| 14 | CHAIRMAN: Might I just add to what you have just said | 14 | quickly flip through the report |
| 15 | Mr Pennicott You would need to be both blind and deaf | 15 | A Yes |
| 16 | not to appreciate that the issue of the structural | 16 | $\Omega_{\rm res}$ and confirm this is your expert report? |
| 17 | integrity of the Hung Hom project has raised very real | 17 | A Ves indeed |
| 17 | concerns in the media and therefore among members of the | 17 | A. After page 17, we should see a copy of your CV: all |
| 10 | Hong Kong public. That the modie should express its | 10 | vight? |
| 20 | appearing is guite proper in an open democratic society | 20 | |
| 20 | and is in all respects to be appourged | 20 | A. 105. |
| 21 | However, that asid, this Commission has a mondate | 21 | Q. Call I ask you to go back to page 2. |
| 22 | However, that said, this Commission has a mandate | 22 | A. Ies. |
| 23 | unto liseli. That mandate is not to come to a decision | 23 | Q. Would you commit that the signature that we see on this |
| 24 | based on any popular concern. It is a mandate to be | 24 | page is your signature? |
| 25 | reached upon the evidence put before it, while not | 25 | A. res. |
| | Page 18 | | Page 20 |
| 1 | ignoring any concerns that may be there and, where | 1 | O. Insofar as your report refers to facts, would you |
| 2 | necessary, putting those concerns to the experts who | 2 | confirm that those facts are true to the best of your |
| 3 | will appear. That will certainly be done during the | 3 | knowledge and belief? |
| 4 | course of this week. So we are not ignoring what is out | 4 | A. Yes, indeed. |
| 5 | there in the public domain, but our mandate is very | 5 | O. Insofar as you express any opinion in your report, would |
| 6 | limited. It is clear, it is absolute, and we will | 6 | you also confirm that they are your honest opinion? |
| 7 | pursue that mandate and only that mandate. Thank you. | 7 | A. Yes. |
| 8 | (Discussion off the record) | 8 | O. We understand, on 18 December last year, there was |
| 9 | Yes. Mr Khaw. | 9 | a meeting among experts from various parties |
| 10 | MR KHAW: Just to echo what Mr Pennicott said in his last | 10 | A Yes |
| 11 | sentence. I will also sit down because I will let | 11 | Ω At the end of that meeting a document was signed and |
| 12 | Mr Chow discuss the structural matters with Prof Au | 12 | that is the joint expert memorandum. Do you recall |
| 13 | CHAIRMAN: Thank you | 13 | that? |
| 14 | MR CHOW: Good morning Chairman and Prof Hansford With | 14 | ΔV_{PC} |
| 15 | the permission of the Commission, the government would | 15 | A. I understand that for obvious reasons some of the |
| 16 | like to call our structural engineering expert | 16 | Q. I understand that, for obvious reasons, some of the |
| 17 | | 10 | matters that you raised during the meeting were not |
| 10 | Prof Francis Au from the University of Hong Kong, to | 17 | recorded in writing |
| | Prof Francis Au from the University of Hong Kong, to | 17 19 | recorded in writing |
| 10 | Prof Francis Au from the University of Hong Kong, to give evidence, who has actually been sitting in the witness how for some time | 17 18 | recorded in writing A. Correct. |
| 19 | Prof Francis Au from the University of Hong Kong, to give evidence, who has actually been sitting in the witness box for some time. | 17 18 19 | recorded in writing A. Correct. Q because the joint memorandum is meant to contain |
| 10 19 20 | Prof Francis Au from the University of Hong Kong, to give evidence, who has actually been sitting in the witness box for some time. Good morning, Prof Au. Sorry to have kept you | 17 18 19 20 | recorded in writing A. Correct. Q because the joint memorandum is meant to contain areas of agreement between the experts. |
| 19 20 21 | Prof Francis Au from the University of Hong Kong, to give evidence, who has actually been sitting in the witness box for some time. Good morning, Prof Au. Sorry to have kept you waiting this morning. | 17 18 19 20 21 | recorded in writing A. Correct. Q because the joint memorandum is meant to contain areas of agreement between the experts. A. Yes. |

Page 17

Q. -- in which you set out your comments on various matters

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document --

A. Yes.

5 (Pages 17 to 20)

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| | Page 21 | | Page 23 |
|--|--|---|--|
| 1 | mentioned in the joint expert memorandum. | 1 | MR CHOW: Of course. |
| 2 | A. Yes. | 2 | CHAIRMAN: Because if we are given a copy, Prof Hansford |
| 3 | Q. You also recall that; right? | 3 | will be able to speed-read that very easily. I will be |
| 4 | A. Yes. | 4 | able to read it at a more plodding pace. But I think |
| 5 | Q. Can I ask you to go to bundle G20, page 15046. | 5 | between us, without having to adjourn for a quarter of |
| 6 | A. Yes. | 6 | an hour or something like that, we will be able to catch |
| 7 | Q. The document is entitled, "Additional comments on the | 7 | up as we proceed. Thank you very much. |
| 8 | joint expert memorandum of 18 December 2018" | 8 | MR CHOW: Right. I will make sure that a hard copy will be |
| 9 | A. Yes. | 9 | prepared, perhaps during the break. But from my |
| 10 | Q by you, and the document actually contains three | 10 | recollection |
| 11 | pages. | 11 | COMMISSIONER HANSFORD: Sorry, actually, can we have it |
| 12 | A. Yes, correct. | 12 | quicker than the break? |
| 13 | Q. The last page is 15048. | 13 | CHAIRMAN: We would like it now. Thanks. |
| 14 | A. Yes. | 14 | MR CHOW: Yes. I'm sure colleagues from the Department of |
| 15 | Q. Do you confirm this is the document that you have | 15 | Justice will be doing it right now. |
| 16 | produced? | 16 | CHAIRMAN: All right. Thank you. |
| 17 | A. Indeed, yes. | 17 | MR CHOW: May I just add that from my recollection, we |
| 18 | Q. Would you also confirm that insofar as this document | 18 | should not find anything surprising from this document. |
| 19 | contains any facts, they are true facts to the best of | 19 | They are I believe all covered by Prof Au in his expert |
| 20 | your knowledge and belief? | 20 | report, perhaps even more in detail. |
| 21 | A. Yes. | 21 | The next point I would like to move on to is |
| 22 | Q. And to the extent that it contains opinions, they are | 22 | Prof Au, we know that after you have produced your |
| 23 | your honest opinions as well? | 23 | expert report, there were further results from the |
| 24 | A. Yes. | 24 | opening-up exercise. |
| 25 | Q. You would also adopt the contents of these additional | 25 | A. Yes. |
| | Page 22 | | Page 24 |
| 1 | comments as part of your evidence to this Inquiry? | 1 | Q. Did you have a chance to look at the latest results of |
| 2 | A. Yes. | 2 | the opening-up? |
| 3 | Q. Thank you. | 3 | A. Yes. |
| 4 | CHAIRMAN: Sorry, could I just ask we have no knowledge | 4 | O Can Lask whether these further results from the |
| 5 | | - | Q. Call I ask whether these further results from the |
| 5 | of this document at this moment. | 5 | opening-up exercise would in any way affect your opinion |
| 6 | of this document at this moment. COMMISSIONER HANSFORD: I've not seen this document either. | 5 6 | opening-up exercise would in any way affect your opinion expressed in your report? |
| 6 7 | of this document at this moment. COMMISSIONER HANSFORD: I've not seen this document either. Can I also | 5 6 7 | opening-up exercise would in any way affect your opinion expressed in your report?A. Actually, the results reinforce my belief that there is |
| 6 7 8 | of this document at this moment. COMMISSIONER HANSFORD: I've not seen this document either. Can I also CHAIRMAN: It seems to me it's not merely two paragraphs and | 5 6 7 8 | opening-up exercise would in any way affect your opinion expressed in your report?A. Actually, the results reinforce my belief that there is a real need to continue the opening-up process to find |
| 6 7 8 9 | of this document at this moment. COMMISSIONER HANSFORD: I've not seen this document either. Can I also CHAIRMAN: It seems to me it's not merely two paragraphs and perhaps we do need to have some knowledge of it. | 5 6 7 8 9 | opening-up exercise would in any way affect your opinion expressed in your report?A. Actually, the results reinforce my belief that there is a real need to continue the opening-up process to find out more, because actually the results are sort of |
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| | Page 25 | | Page 27 |
|---|---|---|--|
| 1 | CHAIRMAN: supervision and/or inspection, which may be | 1 | interaction and structural fire engineering and so on. |
| 2 | that if there hasn't actually been any form of | 2 | I work both on the theoretical side of research as well |
| 3 | connection of rebar to coupler, that may go to issues of | 3 | as the experimental part of research. For example, in |
| 4 | adequacy of oversight. | 4 | the laboratory, we fabricate specimens of structures and |
| 5 | A. Right. | 5 | we load test them to failure, to find out more, to learn |
| 6 | CHAIRMAN: That's one question. The next question is if | 6 | more about their behaviour. So we try to observe the |
| 7 | there has been a level of failure to connect at all, | 7 | phenomena before failure, including for example the |
| 8 | does that go to structural integrity? | 8 | cracking, crushing, buckling of components or materials |
| 9 | A. Yes. | 9 | and in some fire tests we even observe explosive |
| 10 | CHAIRMAN: And your answer would be | 10 | spalling of concrete. |
| 11 | A. Of course that would affect. | 11 | So from that experience I knew that there are |
| 12 | CHAIRMAN: The structural integrity of the work? | 12 | certain limitations in the calculations, so the reality |
| 13 | A. It depends on the amount of couplers unconnected. | 13 | can be different, so that's why there is a need to do |
| 14 | CHAIRMAN: Yes. Good. Thank you. | 14 | research. From our research findings we also publish |
| 15 | COMMISSIONER HANSFORD: Thank you very much. | 15 | papers to propose new theories or propose new methods of |
| 16 | CHAIRMAN: Thank you, Mr Chow. | 16 | calculation. I have published over 150 journal papers |
| 17 | COURT REPORTER: Excuse me, I don't want to speak out of | 17 | and over 90 conference papers. I have given over 20 |
| 18 | turn, but please wait until the question has finished | 18 | invited and keynote lectures. I have won a few research |
| 19 | before you answer, because I need to get the question on | 19 | awards. |
| 20 | the record. | 20 | Perhaps I could |
| 21 | WITNESS: Understood. | 21 | MR PENNICOTT: The next page. |
| 22 | MR CHOW: Prof Au, I understand, to better assist the | 22 | A. All right. So I start from fundamentals. I believe all |
| 23 | Commission, you have prepared a short PowerPoint | 23 | of us know what a force is. If we apply a force at |
| 24 | presentation to summarise your main points set out in | 24 | a distance from a pivot, we are creating a moment. |
| 25 | your expert report. | 25 | Next, please. There are materials which are brittle |
| | Page 26 | | Page 28 |
| 1 | A. Yes. | 1 | or easily broken, including glass, porcelain and |
| 2 | Q. If you are ready, I will hand over the floor to you, but | 2 | concrete. There are some other materials which are |
| 3 | after you finish I will still come back because | 3 | ductile, they can be easily deformed without breaking, |
| 4 | I understand you would like to respond to a few matters | 4 | |
| 5 | raised by the other experts in their expert reports So | - | including copper and steel. |
| 6 | raised by the other experts in their expert reports. So | 5 | Next, please. To help you understand what happens |
| | that we will do later on. But now, if you are ready | 5 6 | Next, please. To help you understand what happens to a concrete structure, the left diagram shows a plain |
| 7 | that we will do later on. But now, if you are ready with your PowerPoint presentation, you can start now. | 5 6 7 | Next, please. To help you understand what happens to a concrete structure, the left diagram shows a plain concrete beam, that is a beam constructed entirely of |
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engineering, concrete structures, vehicle-bridge

| | Page 29 | | Page 31 |
|---|---|---|--|
| 1 | another, and then there are later on the contract | 1 | Now, this additional amount of reinforcement is not |
| 2 | requirements. | 2 | useless. It also provides ductility, serviceability, |
| 3 | Very often, proprietary products are used in | 3 | and so on. Actually, in our department, a few |
| 4 | a contract and then the supplier's requirement has to be | 4 | colleagues, including myself, have worked on the |
| 5 | satisfied as well. | 5 | ductility of concrete structures. The compression |
| 6 | In the design process, engineers normally consider | 6 | reinforcement helps to enhance the ductility of the |
| 7 | a lot of loading combinations and then they carry out | 7 | cross-section. |
| 8 | structural analysis and design. In addition, there are | 8 | Here are two papers published over ten years ago. |
| 9 | certain miscellaneous rules laid down in various design | 9 | Then, again, depending on the outcome, there could |
| 10 | codes, for good reasons. | 10 | be further increase of random sample size, to help us |
| 11 | Next, please. The MTRCL has submitted a holistic | 11 | understand further the workmanship, and the sequence of |
| 12 | proposal to the government which has been accepted. It | 12 | the actual opening-up may also be revealed. |
| 13 | describes a sampling approach to well, for two | 13 | Next, please. The case of the lower slab or NSL |
| 14 | purposes, including the verification of as-built record | 14 | slab is a bit different, actually quite different. Now, |
| 15 | and the workmanship. I believe that this opening-up | 15 | because of the water pressure acting upwards on the |
| 16 | process is necessary and pragmatic. | 16 | bottom of the NSL slab, bottom reinforcement is normally |
| 17 | The binomial statistics approach adopted is | 17 | under tension adjacent to the diaphragm wall. We also |
| 18 | considerable acceptable, simply classifying the outcome | 18 | know that it is impractical to open up the bottom |
| 19 | as compliant or non-compliant. However, for those | 19 | reinforcement for verification, so therefore the random |
| 20 | outcomes which are non-compliant, ie for couplers' | 20 | samples of the top couplers will be very useful to let |
| 21 | non-engagement with the threads, follow-up investigation | 21 | us have a better understanding of the workmanship of all |
| 22 | for strength, elongation, et cetera, is necessary. | 22 | the couplers in this NSL slab. |
| 23 | From the outcomes of the opening-up process, after | 23 | Also, in the rare case of future dewatering in the |
| 24 | completion of it, it can be reviewed if there is a need | 24 | vicinity, the top reinforcement may also take tension. |
| 25 | for further opening-up. For the non-destructive test of | 25 | Next, please. |
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| | Page 30 | | Page 32 |
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| | Page 33 | | Page 35 |
|----------------|--|----------------------|--|
| 1 | the east diaphragm wall. If we look at an assembly of | 1 | Because of that bending moment, it would create some |
| 2 | the coupler, we understand that the coupler is essential | 2 | tension in the top reinforcement; the slab is having |
| 3 | to ensure that the assembly is an integral component | 3 | a quite long span, and then the bending moment is also |
| 4 | that can take force. Similarly, the connection between | 4 | quite large, and because of that there is a need for |
| 5 | the slabs and the diaphragm wall are very important | 5 | a large tension to take up that moment. |
| 6 | connections. Lunderstand that rigidity has been | 6 | But on the right side of the connection, in |
| 7 | assumed in the analysis so far. So in case the | 7 | comparison the bending moment is smaller and so the |
| , 8 | connection is defective, then that would affect the | 8 | tension acting on the free body is also smaller |
| 9 | internal forces and in the extreme case it may even | 9 | Next please. If you look at the left diagram now |
| 10 | affect the stability. So these are things that have to | 10 | in this case, the platform is fully loaded by people and |
| 11 | be followed up | 11 | trains So obviously the bending moment and forces |
| 12 | Next please. To help you understand more what | 12 | acting on the interface shown in the ton-right diagram |
| 12 | happens at the connection $-$ now the left diagram shows | 12 | are all larger, in particular the bending moment and |
| 14 | a cross section of the station. In particular, we would | 14 | shear force |
| 14 | like to focus on the connection between the upper slob | 14 | So if you look in the bottom right diagram the |
| 15 | and the disphragm well over there, and the ten right | 15 | tonsion soused by the bonding moment must be larger as |
| 10 | diagram shows on enlarged view of thet | 10 | well, and because of that the shear farms acting on the |
| 1/ | If you look at the left diagram it is not looded | 1/ | hottom of the vallow free hody must be larger. In other |
| 10 | If you look at the left diagram It is not loaded, | 10 | bottom of the years traine to develope that the |
| 19 | so it is just a platform slab over there, so the | 19 | words, what I am trying to demonstrate is that the |
| 20 | platform slab is just supporting its own weight, and you | 20 | Internal force inside the connection varies with the |
| 21 | can If you refer back to the top-right diagram | 21 | the larger the fame and the stress inside the |
| 22 | how, you can see that on the left of the connection, | 22 | the larger the force and the stress inside the |
| 23 | face of connection. On the right of the connection | 23 | Structure. |
| 24 | there is also a documented former and a handling momented | 24 | Next, please. Now, here shows the emarged |
| 25 | there is also a downward force and a bending moment. | 25 | connection detail of one of the versions. The |
| | Page 34 | | Page 36 |
| 1 | There may also be a very small horizontal force. | 1 | connection is something that is very important, |
| 2 | Now, the yellow part of the concrete which has been | 2 | connecting the slab and the diaphragm wall, enabling it |
| 3 | cast afterwards is enlarged in the bottom-right diagram. | 3 | to transfer the forces between them. Because of the |
| 4 | This is what we call a free body diagram. This is | 4 | change of the design of the connection, there is |
| 5 | a simplified version of the free body diagram that is | 5 | an additional construction joint. This is just one of |
| 6 | very often used by engineers to understand what happens | 6 | them. There are more complicated construction joints. |
| 7 | to various parts of a structure. So you can see that on | 7 | In addition, there are some other cross-sections which |
| 8 | the right of that yellow block there is a tensile force | 8 | may cause concern. There is a need to check the |
| 9 | acting sorry, on the left there is a tensile force | 9 | stresses inside the connection, to ensure that it can |
| 10 | acting, and then on the right there is a smaller tensile | 10 | act as an integral component in the structure. |
| 11 | force acting. To ensure equilibrium or balance of | 11 | Next, please. |
| 12 | force, there is a need for a shear force at the bottom, | 12 | COMMISSIONER HANSFORD: Sorry, if I can just interject, |
| 13 | the horizontal force at the bottom; okay? So this is to | 13 | Prof Au. You say there's a need to check the stresses |
| 14 | ensure equilibrium, it would always behave like this. | 14 | inside the connection. |
| 15 | Next, please. | 15 | A. Right. |
| 16 | MR CHOW: Prof Au, can I pause you here. Can we just stay | 16 | COMMISSIONER HANSFORD: How long would that take? How long |
| 17 | in slide 13. | 17 | is an exercise to check the stresses inside the |
| 18 | A. Yes. | 18 | connection? How long would that take? |
| 19 | Q. Earlier, you mentioned about the tensile force on the | 19 | A. I think for someone who understands the behaviour of |
| 20 | right is smaller than the tensile force acting on the | 20 | beam-column joints, it's very simple. But the |
| 21 | č | 21 | problem |
| | left side of the free body. Could you elaborate a bit | 21 | • |
| 22 | left side of the free body. Could you elaborate a bit further why we have a difference in the magnitude of | 21 22 | COMMISSIONER HANSFORD: Are you talking about one day, one |
| 22 23 | left side of the free body. Could you elaborate a bit further why we have a difference in the magnitude of this force between the two sides of the free body? | 21 22 23 | COMMISSIONER HANSFORD: Are you talking about one day, one week? |
| 22 23 24 | left side of the free body. Could you elaborate a bit further why we have a difference in the magnitude of this force between the two sides of the free body?A. Yes. So if you refer back to the top-right diagram, | 21 22 23 24 | COMMISSIONER HANSFORD: Are you talking about one day, one week?A. I think half a day. The problem is that very often, the |

25

A. I believe for those couplers that have not been

connected, of course it cannot develop any strength.

a concern of excessive crack width over there and the

groundwater may get into the reinforcement, and so on.

24

| | Page 37 | | Page 39 |
|--|---|---|--|
| 1 | postgraduate level, and very often such courses are not | 1 | I think the important point is there is a need to assess |
| 2 | compulsory, so I'm not surprised that some engineers may | 2 | through statistical method the possible, let's say, |
| 3 | have no knowledge of the behaviour of beam-column | 3 | percentage of such occurrence, so that when I think |
| 4 | joints. | 4 | that is stage 3 of the holistic assessment so that |
| 5 | Having said this, there are certain requirements for | 5 | there is something to base upon to evaluate the strength |
| 6 | the design of beam-column joints in the Concrete Code, | 6 | of the structure. |
| 7 | but that is only for the more regular beam-column | 7 | CHAIRMAN: Okay. Thank you. |
| 8 | joints, there is a formula, and so people simply use | 8 | A. So the honeycombing area of the slab should be repaired, |
| 9 | that formula to find out the required amount of | 9 | and there is also a need to evaluate the effect on the |
| 10 | reinforcement. That's it. But then if some people try | 10 | overall structure, because very often the honeycombing |
| 11 | to alter that, take away something, that would be more | 11 | areas are in the most congested area where the |
| 12 | complicated, and I'm afraid not everyone is capable of | 12 | reinforcing bars are lapping, and so these reinforcing |
| 13 | doing that. | 13 | bars are not effective anymore, and how these |
| 14 | COMMISSIONER HANSFORD: I understand. So, basically, you | 14 | ineffective reinforcing bars are going to affect the |
| 15 | are telling me that it's about half a day for someone | 15 | structural performance I believe there is a need to |
| 16 | who's properly qualified to do that? | 16 | assess. |
| 17 | A. Yes. | 17 | There have been some calculations performed to |
| 18 | COMMISSIONER HANSFORD: Understood. And somebody properly | 18 | assess the structural utilisation factor. I believe the |
| 19 | aualified would include vourself, would it? | 19 | structures have been assumed to be intact, no problem at |
| 20 | A. Yes. Well, actually, I have two PhD students having | 20 | all, no defective couplers, no honeycombing whatever. |
| 21 | worked on the research of beam-column joints. | 21 | Now, it is too early to conclude. I believe more |
| 22 | COMMISSIONER HANSFORD: Who could do this sort of work? | 22 | calculations should be conducted. |
| 23 | A. I think practising engineers under the instruction of | 23 | Next, please. |
| 24 | someone who knows the behaviour of beam-column joints. | 24 | COMMISSIONER HANSFORD: Sorry, what sort of calculations |
| 25 | That's it. | 25 | Prof Au? |
| | Page 38 | | Page 40 |
| 1 | COMMISSIONER HANSEORD. Thank you | 1 | A For example, if we know that there is a cortain |
| 2 | COMMISSIONER HANSFORD. Hank you. | | |
| | A All right Here is a list of issues that we need to | 2 | nercontage of counters which are found to be defective |
| 2 | A. All right. Here is a list of issues that we need to | 2 | percentage of couplers which are found to be defective, |
| 3 | A. All right. Here is a list of issues that we need to look at. From the outcomes of the opening process so | 1 2 3 | percentage of couplers which are found to be defective, and well, there are two aspects. The first aspect is |
| 2 3 4 5 | A. All right. Here is a list of issues that we need to look at. From the outcomes of the opening process so far, over one-third of the couplers are defective. I'm afraid the effects can't be ignored. In particular | 1 2 3 4 5 | percentage of couplers which are found to be defective, and well, there are two aspects. The first aspect is on strength, which a lot of people have been talking |
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| | Page 41 | | Page 43 |
|---|--|---|--|
| 1 | Now, I'm not saying that it must be unacceptable but | 1 | CHAIRMAN: are you talking about doing that away from the |
| 2 | we need to do calculation with some scientific basis, | 2 | work site, I mean away from |
| 3 | let's say on the percentage of defective couplers, to | 3 | A. Yes, inside a laboratory. |
| 4 | find out how serious it is or whether it is still | 4 | CHAIRMAN: So you would take the couplers and you would |
| 5 | acceptable. There is still a chance that it may be | 5 | conduct a series of tests at different thread |
| 6 | acceptable. | 6 | engagement? |
| 7 | COMMISSIONER HANSFORD: You talked about possible | 7 | A. I understand that some tests have already been carried |
| 8 | strengthening. | 8 | out using similar couplers, not those couplers taken |
| 9 | A. Yes. | 9 | from the works, so they have used similar couplers with |
| 10 | COMMISSIONER HANSFORD: But that would only be required | , 10 | some partial engagement of the threads and then they did |
| 11 | presumably, if the structure was found to be inadequate? | 11 | some tests. And actually, in my report, I have also |
| 12 | A. Yes. But I need to add that to assess whether | 12 | included a table showing the results from that test |
| 13 | a structure is adequate or not, strength is of course | 13 | report. But the results are not enough. The samples |
| 14 | something very important, but in addition to that | 14 | are not enough. And then they have to carry out more |
| 15 | ductility, serviceability and other things should also | 15 | tests in addition to finding out the strength, other |
| 16 | be considered. | 16 | performance attributes should also be found out. |
| 17 | COMMISSIONER HANSFORD: Okay. Thank you. | 17 | COMMISSIONER HANSFORD: Why are the samples not enough |
| 18 | A. All right. So if I | 18 | A. What I mean is if you look in my report, so in that |
| 19 | CHAIRMAN: Sorry, what does "serviceability" mean? | 19 | table, there are results of I think 100 per cent |
| 20 | A. "Serviceability" means okay, in design of | 20 | engagement, I can't remember, 80 per cent, 60 per cent, |
| 21 | a structure, we need to consider two types of limit | 21 | 50 per cent, whatever. Now, the strange thing is that |
| 22 | state, what we call okay, let's call them conditions. | 22 | the maximum strength occurs at 60 per cent engagement |
| 23 | The first condition is what we call serviceability limit | 23 | but not more. It's very strange. So I believe the |
| 24 | state; that is the working condition. Let's say, in | 24 | results are having a very large variability. And so, |
| 25 | this room, all of us are sitting over here, so there | 25 | for example, for the case of 60 per cent engagement, |
| | Dage 42 | | D 44 |
| | Page 42 | | Page 44 |
| 1 | rage 42 | 1 | Page 44 |
| 1 | would be loading coming from the furniture, from the | 1 | Page 44 I would believe, let's say, ten samples like this should be tested. For every percentage engagement, there |
| 1 2 3 | would be loading coming from the furniture, from the people over there, the self-weight of the floor over here, and if we try to calculate the stresses based on | 1 2 3 | Page 44 I would believe, let's say, ten samples like this should be tested. For every percentage engagement, there should be more samples tested, so that we can find out |
| 1 2 3 4 | would be loading coming from the furniture, from the people over there, the self-weight of the floor over here, and if we try to calculate the stresses based on that that is what we call the serviceability limit | 1 2 3 4 | Page 44 I would believe, let's say, ten samples like this should be tested. For every percentage engagement, there should be more samples tested, so that we can find out the mean value, we can find out the standard deviation |
| 1 2 3 4 5 | would be loading coming from the furniture, from the people over there, the self-weight of the floor over here, and if we try to calculate the stresses based on that, that is what we call the serviceability limit state or the working condition | 1 2 3 4 5 | Page 44 I would believe, let's say, ten samples like this should be tested. For every percentage engagement, there should be more samples tested, so that we can find out the mean value, we can find out the standard deviation, to understand how variable the results can be |
| 1 2 3 4 5 | would be loading coming from the furniture, from the people over there, the self-weight of the floor over here, and if we try to calculate the stresses based on that, that is what we call the serviceability limit state or the working condition. | 1 2 3 4 5 6 | Page 44 I would believe, let's say, ten samples like this should be tested. For every percentage engagement, there should be more samples tested, so that we can find out the mean value, we can find out the standard deviation, to understand how variable the results can be. |
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| | Page 45 | | Page 47 |
|----------------|---|----------------------|--|
| 1 | They still have some strength. So the purpose of doing | 1 | "The diagram illustrates why no tension or shear can |
| 2 | this is to let us have a better estimate of the | 2 | occur at the interface." |
| 3 | available strength and then the possible deformation, so | 3 | A. Yes. |
| 4 | that in future, when further calculations are carried | 4 | O. Do you have any response to this statement? |
| 5 | out, we can be more realistic: we try to model the | 5 | A. Yes, indeed. Now, actually, I believe that the amount |
| 6 | situation of the structure better. | 6 | of compression acting on that construction joint is very |
| 7 | CHAIRMAN: Thank you. How long do you think that would | 7 | low. It is very low. That is because now, to |
| 8 | take? | 8 | understand how much compression exists there, we need to |
| 9 | A. I think doing the tests would take, let's say, a few | 9 | look at the two sides the left side and the right side |
| 10 | weeks if the couplers are around if the bars are | 10 | of the rectangle enclosed by the red dashed line but |
| 11 | around I think perhaps one to two weeks that could | 11 | then inside it's blue |
| 12 | he done | 12 | We need to look at this diagram. So here is |
| 12 | COMMISSIONER HANSEORD: Why would it take so long? | 12 | there is a small rectangle in blue, that is the concrete |
| 14 | A Lithink first of all Lunderstand that the industry | 14 | cast afterwards. To find out how much compressive force |
| 14 | has been sort of experiencing a change in the use of the | 14 | is acting on the construction joint, we need to look at |
| 15 | rainforming here because proviously we were using grade | 15 | the downword shoon force opting on this next of the free |
| 10 | 460 but now paople are using 500. So if we really want | 10 | hady on the right (indicating) as well as the devenuend |
| 1/ | 400 but now people are using 500. So if we rearry want | 1/ | body on the right (indicating), as well as the downward |
| 18 | to find out the kind of reinforcing bars used at that | 18 | shear force acting on the left of the free body |
| 19 | time, I don't know whether we really can find them, but | 19 | (indicating). |
| 20 | even though we can't find them I think anything, let's | 20 | Actually, for someone who understands strut-and-tie |
| 21 | say grade 500, and if we can carry out similar tests, | 21 | action in a concrete structure, actually most of the |
| 22 | that would help us understand better. | 22 | downward forces will be acting on the bottom part, and |
| 23 | CHAIRMAN: Thank you. | 23 | so the upper part would have relatively small. There |
| 24 | MR CHOW: Thank you, Prof Au. | 24 | may still be some compression but it will not be very |
| 25 | Prof Au, on the basis of your report, it appears to | 25 | small. But the major concern is that there would be the |
| | Page 46 | | Page 48 |
| 1 | me that the main difference between your opinion and the | 1 | shear force. So as shown in two slides of my |
| 2 | opinions from experts of the other parties is that you | 2 | presentation. So the major concern will be the shear |
| 3 | say the internal stresses in the connection have to be | 3 | force at the construction joint (indicating). |
| 4 | checked properly and numerically; is that right? | 4 | So that is a potential weakness. So I believe there |
| 5 | A. Yes. | 5 | are two possibilities. If the strength of the |
| 6 | Q. That is really the main difference between you and the | 6 | construction joint is good enough, spending half a day |
| 7 | other experts. | 7 | to check it, I think it would be easier to verify that |
| 8 | A. Yes, indeed. | 8 | numerically than to argue that it is not necessary to do |
| 9 | Q. Can I ask you to go to part of Mr McQuillan's report. | 9 | so. If it is not strong enough, there is a real need to |
| 10 | You will find that in I believe it's tab 3 of the same | 10 | do calculations to find out the feasibility of |
| 11 | bundle. | 11 | strengthening and the extent of strengthening. |
| 12 | A. Yes. | 12 | So I think there is a need to check numerically the |
| 13 | O. Paragraphs 99 and 100 at pages 41 and 42. | 13 | forces and the stresses. |
| 14 | A. Yes. | 14 | COMMISSIONER HANSFORD: Prof Au, that's the numerical |
| 15 | \mathbf{O} . Do you need to read the paragraphs again? | 15 | testing that you consider can be done in half a day |
| 16 | A. Yes. | 16 | A. Oh, yes. |
| 17 | O. The diagram that we see on top of page 42, that is right | 17 | COMMISSIONER HANSFORD: by someone qualified to do it? |
| 18 | above paragraph 100 | 18 | A. Yes. |
| 19 | A Right | 19 | COMMISSIONER HANSFORD: Thank you |
| 20 | $\Omega_{\rm reg}$ is a similar diagram that we have seen earlier | 20 | MR CHOW: Prof Au, a follow-up question: have you got all |
| 21 | A Yes | 21 | the data and design parameters for you to carry out such |
| 22 | · · · · · · · · · · · · · · · · · · · | | |
| | 0 your free body diagram | 2.2 | checking? |
| 23 | Q your free body diagram. A Yes | 22 23 | checking? A. No. I don't. No. I don't. But then, actually now. |
| 23 24 | Q your free body diagram. A. Yes. Q. In paragraph 100 Mr McQuillan made the following | 22 23 24 | checking? A. No, I don't. No, I don't. But then, actually now, so a very simple calculation can be done: okay? Well. |
| 23 24 25 | Q your free body diagram.A. Yes.Q. In paragraph 100, Mr McQuillan made the following statement: | 22 23 24 25 | checking? A. No, I don't. No, I don't. But then, actually now, so a very simple calculation can be done; okay? Well, assuming now, we can work out the forces I'm |

| | Page 49 | | Page 51 |
|---|--|---|---|
| 1 | sorry, I will do that again. | 1 | say, on Thursday or something like that and let us have |
| 2 | So the important part is this connection | 2 | the results of the test, would you be able to do that? |
| 3 | (indicating). So if we can find out the bending | 3 | A. I'm not sure because I do have lectures, and so on. |
| 4 | moments, shear forces and so on at this cross-section | 4 | CHAIRMAN: Yes, I appreciate that. All right. So all else |
| 5 | (indicating), and then similar forces and moment here | 5 | being equal and assuming you have the time? |
| 6 | (indicating), similar forces and moment there | 6 | A. Yes. |
| 7 | (indicating), I think it would be very simple; just | 7 | CHAIRMAN: Good. I just wanted to get an idea of the |
| 8 | a few hours, one can do that. So that is the basic | 8 | feasibility. Thank you. |
| 9 | principle of the design of beam-column joints. But | 9 | COMMISSIONER HANSFORD: I think you also said that this |
| 10 | I haven't done that myself. | 10 | could be done by PhD students under your supervision. |
| 11 | But then perhaps I could add that some rough | 11 | A. Yes, why not. Yes. I think for someone who knows the |
| 12 | calculations have been worked out, but then it is not to | 12 | basics of structural engineering, that would be fine. |
| 13 | say that everywhere it is not satisfactory but then | 13 | CHAIRMAN: All right. Thank you. |
| 14 | there may be some concerns somewhere. The other thing | 14 | MR CHOW: Just now, you also mentioned that you have done |
| 15 | that I may add is that checking the stresses at | 15 | some rough checking and there were some concerns; is |
| 16 | construction joint is a standard practice in the design | 16 | that your evidence? |
| 17 | of composite bridges, bridges comprising precast beams | 17 | A. Okay. Now, so the government actually has engaged |
| 18 | and in situ slab, at the interface it is a regular, | 18 | another firm to do some checking in parallel, under the |
| 19 | standard practice to check the stress over there. So | 19 | supervision of myself and another colleague in my |
| 20 | I don't think it is difficult. | 20 | department, so they already have done some calculations. |
| 21 | COMMISSIONER HANSFORD: Mr Chow, we are going to hear from | 21 | Apparently, there is some concern somewhere. |
| 22 | all the other experts this week, of course, but if this | 22 | Now, of course, what they have used may not be |
| 23 | exercise needs to be done, it would seem to me that we | 23 | exactly those that the designer has used; okay? But, |
| 24 | should do it rather quickly. | 24 | well, if the designer checks that again, they are in |
| 25 | MR CHOW: Prof Hansford, it all depends on the answer of | 25 | a better position to check it. It shouldn't be too |
| | | | |
| | Page 50 | | Page 52 |
| 1 | Page 50 Prof Au to my next question. | 1 | Page 52 difficult. |
| 1 2 | Page 50 Prof Au to my next question. COMMISSIONER HANSFORD: Ah. | 1 2 | Page 52 difficult. CHAIRMAN: Sorry, you have to help me here, because that |
| 1 2 3 | Page 50 Prof Au to my next question. COMMISSIONER HANSFORD: Ah. MR CHOW: Prof Au, can you explain to us what you mean by to | 1 2 3 | Page 52 difficult. CHAIRMAN: Sorry, you have to help me here, because that seems very vague to me. So whoever's done this has |
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13 (Pages 49 to 52)

| | Page 53 | | Page 55 |
|--|--|--|--|
| 1 | CHAIRMAN: All right. Thank you. | 1 | a layperson, it's a little bit fuzzy, and that's simply |
| 2 | MR CHOW: Lastly, can I ask you to go to Mr Southward's | 2 | my lack of comprehension because a number of tests have |
| 3 | report in tab 5. | 3 | been suggested quite quickly, one upon the other. All |
| 4 | A. Yes. | 4 | right. Would that help? |
| 5 | O. Page 40 of 83, under section 14.2 | 5 | MR KHAW: We will be able to supply the Commission with such |
| 6 | A. Yes. | 6 | information after Prof Au finishes his evidence. |
| 7 | O do you see the second-last paragraph from the bottom | 7 | CHAIRMAN: That's what I'm saying. |
| 8 | of the page? | 8 | Quarter of an hour. Thank you. |
| 9 | A. Yes. | 9 | (11.30 am) |
| 10 | O. Mr Southward basically says the platform slab and | 10 | (A short adjournment) |
| 11 | diaphragm wall structures would be treated as | 11 | (11.52 am) |
| 12 | superstructure. | 12 | Examination by MR PENNICOTT |
| 13 | Do you have any response to that? | 13 | MR PENNICOTT: Sir, good morning. |
| 14 | A Now I don't think that is the common use of the term | 14 | Prof Au, good morning. As you have probably |
| 15 | So if we consider a building with a basement supported | 15 | realised. I'm one of the counsel to the Commission, my |
| 16 | on piles now obviously the basement is not part of | 16 | name is Ian Pennicott, and I have a few questions for |
| 17 | the superstructure. I think the part of the building | 17 | you but first of all thank you very much for coming |
| 18 | above ground level can be termed superstructure | 18 | along to give evidence to the Commission |
| 19 | Anything below can't be called superstructure. I think | 19 | Sir can Liust confirm that the pieces of paper you |
| 20 | if we call that a basement fine. I have no objection | 20 | were given earlier are numbered G15046 to 48? |
| 20 | Well certain parts of that may be part of the | 21 | CHAIRMAN. They are |
| 21 | foundation, but I don't think that can be called | 21 | MR PENNICOTT: Thank you Liust wanted to double-check |
| 22 | a superstructure | 22 | with the baste with which that was done you have been |
| 23 | a superstructure. | 23 | given the right pieces of paper |
| 24 | A. I think the term "substructure" is fine really | 24 | Prof Au will confirm this what happened and I'm |
| 23 | A. I unitk the term substructure is fine, fearly. | 25 | Tor Au win comminuus what happened, and Thi |
| | Page 54 | | Page 56 |
| 1 | MR CHOW: Prof Au, I have no more questions. | 1 | not making any complaint about this because I'm about to |
| 2 | WITNESS: Thank you. | 2 | ask Prof Au questions about it, is that following the |
| 3 | MR CHOW: I have no more questions for you, Prof Au. What | 3 | expert meeting, we received a letter from the |
| 4 | is going to happen is counsel for the Commission may | 4 | government, with Prof Au's additional comments |
| 5 | have questions for you, and after that there may be | 5 | attached we can see they are dated 22 December |
| 6 | further questions from various lawyers acting for | 6 | four days after the meeting, so we've had them for some |
| 7 | different parties, and meanwhile Mr Chairman and | 7 | time and I apologise if they haven't been brought to |
| 8 | Prof Hansford may also ask you questions. After that, | 8 | your attention, but I'm well aware they have been there |
| 9 | if necessary, I will also have a chance to ask you a few | 9 | for some time. |
| 10 | more questions by way of wrap-up. | 10 | Prof Au, that's how it happened, as I understand it; |
| 11 | So, if you are ready, please remain seated and take | 11 | is that right? |
| 12 | questions from the other counsel. | 12 | A. (Nodded head). |
| | - | | |
| 13 | Mr Chairman, I understand | 13 | Q. Good. Prof Au, can we look at the very first page of |
| 13 14 | Mr Chairman, I understand CHAIRMAN: Perhaps | 13 14 | Q. Good. Prof Au, can we look at the very first page of your report, please, which is in bundle ER1 at tab 7. |
| 13 14 15 | Mr Chairman, I understand CHAIRMAN: Perhaps MR PENNICOTT: Sir, before we do that, a coffee would be | 13 14 15 | Q. Good. Prof Au, can we look at the very first page of your report, please, which is in bundle ER1 at tab 7. You set out there your instructions and the matters upon |
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| 1 | A. Yes. | 1 | A. Sorry, which one? |
| 2 | Q. I'll come to that in a moment. | 2 | Q. Paragraph 44. |
| 3 | Could I ask you, please, to look at the joint | 3 | A. Right. |
| 4 | statement that was signed by the experts on 18 December. | 4 | Q. "Accordingly the BD currently does not have any specific |
| 5 | Sir, it will be found in ER1 as an attachment to | 5 | design and construction requirements in respect of |
| 6 | Prof McQuillan's report at appendix XI. It's at | 6 | seismicity but requires compliance with the ductility |
| 7 | page 117, the internal numbering of Prof McQuillan's | 7 | requirements of the code, including couplers. In other |
| 8 | report. | 8 | words, code-compliance is deemed to provide some |
| 9 | Prof Au, could we look at the first item, towards | 9 | inherent structural resilience against seismic events." |
| 10 | the bottom of that page | 10 | As I understand it, you agree with all that, |
| 11 | A. Yes. | 11 | Prof Au; is that correct? |
| 12 | Q which is there's a heading, "General code | 12 | A. So are you referring to the second sentence? |
| 13 | requirements"; do you see that? | 13 | Q. I am. Well, first and second sentences. |
| 14 | A. Yes. | 14 | A. Yes. |
| 15 | Q. The first bullet point is that: | 15 | Well, my understanding is that MTRC was designing |
| 16 | "All agreed there was no requirement for ductility | 16 | the structure to comply with their in-house design |
| 17 | couplers." | 17 | manual as well. That in-house design manual requires |
| 18 | Do you see that? | 18 | the seismic resistance design, and apparently that was |
| 19 | A. Yes. | 19 | submitted to the Buildings Department, as far as |
| 20 | Q. As I understand it, that's the first point upon which | 20 | I understand, and the Building Authority accepted that. |
| 21 | you have made some additional comments. | 21 | And the requirement is the use of ductility couplers |
| 22 | A. Yes. | 22 | somewhere; right? |
| 23 | Q. So if we could take page 15046 in bundle G20. | 23 | Q. Okay. That's what Prof McQuillan says a bit further on: |
| 24 | A. Yes. | 24 | "I note, however, that MTRCL do include specific |
| 25 | Q. You say: | 25 | seismic design requirements and loading in their |
| | Page 58 | | Page 60 |
| 1 | "The discussion on the use of ductility couplers was | 1 | performance specifications" |
| 2 | mainly on seismic design of structures. I have raised | 2 | And the reference is given. I think that's the same |
| 3 | the point in the meeting that, in general, ductility is | 3 | reference you have given us in your report. |
| 4 | a desirable quality of all structures, irrespective of | 4 | A. Yes. |
| 5 | whether a structure is designed for seismic resistance | 5 | Q. So, as I understand it, in relation to those three |
| 6 | or not." | 6 | paragraphs in the requirement for ductility couplers, |
| 7 | And then you make the point that the MTRC proposals | 7 | there is no difference in fact between yourself and |
| 8 | required certain zones to be ductile. | 8 | Prof McQuillan? |
| 9 | A. Yes. | 9 | A. So you are referring to this particular paragraph only? |
| 10 | Q. Then you have also referred to the Code of Practice | 10 | Q. Paragraphs 42, 43 and 44, 44 in particular. |
| 11 | which also has ductility requirements in it. | 11 | A. 44? |
| 12 | A. Yes. | 12 | Now, 44 is okay, but there is certain requirement |
| 13 | Q. Have you had the chance to read Prof McQuillan's report? | 13 | from the BD regarding the use of the ductility couplers. |
| 14 | A. Yes. | 14 | Yes. So that is my understanding, that BD requires the |
| 15 | Q. Could I ask you, please, to look at paragraphs 42 to 44 | 15 | use of ductility couplers somewhere; okay? |
| 10 | of that report. | 16 | Q. Yes. |
| 1/ 10 | A. Yes. $\mathbf{D} = \mathbf{A} \cdot \mathbf{r}^{T} \mathbf{r}$ | 1/ | A. Because according to the older code, that was not |
| 10 | Q. Again, here we see Prof McQuinan has referred to the | 18 | anowed unless ductifity couplers are used, and that is |
| 19 | that are get out in that Code of Practice. He's | 19 | a specific sort of requirement in accepting the design, |
| 20 | referred to an information note from the government and | 20 | as 1al as 1 Kilow. |
| 21 | then says this. | 21 | L do ask myself the question: why did you all agree |
| | then says this. | | i do ask mysen die question, why die you all agree |
| 23 | "Accordingly the BD currently does not have any | 23 | that there is no requirement for ductility couplers? |
| 23 24 | "Accordingly the BD currently does not have any specific design and construction requirements in respect | 23 24 | that there is no requirement for ductility couplers? A. Yes. |

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| 1 | all, 89.1 and 89.2 of Prof McQuillan's report at | 1 | Pause there for the moment before I ask the |
| 2 | page 38. | 2 | question. Could you also, please, look at paragraph 4.6 |
| 3 | A. Well, actually, I need to add that the reason why | 3 | of Dr Glover's report, which is in tab 6 at page 4, |
| 4 | I submitted later on the additional comments was that | 4 | internal number. |
| 5 | I found the record was not accurate. Actually, I wasn't | 5 | A. Yes. |
| 6 | given sufficient information before that date, there | 6 | Q. 4.6, and then it's bullet point 4. I presume, Prof Au, |
| 7 | wasn't any agenda, and the meeting started at 11.00 and | 7 | you have had a chance to look at Dr Glover's report as |
| 8 | it went on until 2.30 in the afternoon. | 8 | well. What Dr Glover says is: |
| 9 | Actually, in the meeting, I raised objection to many | 9 | "Due to the disproportionately stiffer and stronger |
| 10 | points already; okay? | 10 | EWL slab (3,000 millimetres deep) relative to the |
| 11 | Q. Prof Au, we have to be a bit careful here. These were | 11 | diaphragm walls (1,200 millimetres thick), it would be |
| 12 | without-prejudice discussions that took place between | 12 | impossible to develop ductile behaviour in the slab or |
| 13 | the five experts, and I don't want to get into | 13 | its connection to the walls since the wall would have |
| 14 | a discussion about what was said by whom. All I'm | 14 | failed structurally under ultimate load conditions long |
| 15 | interested in is what was signed at the end of the day | 15 | before the rebar in the slab would have reached its |
| 16 | and you put your name to along with the other experts. | 16 | yield stress, ie the slab connection would remain in the |
| 17 | Do you understand? | 17 | elastic range. This is clearly demonstrated by" |
| 18 | A. I understand, but actually, at that time now, that | 18 | Then Dr Glover refers to an appendix in his report. |
| 19 | was a very lengthy meeting and I wasn't given any idea | 19 | A. Yes. |
| 20 | how long that meeting would be, and I was starving, and | 20 | Q. So do you agree with paragraph 89.2 of Prof McQuillan's |
| 21 | then if I raised further objection, the meeting will | 21 | report and that bullet point at paragraph 4.6 of |
| 22 | prolong. Probably it would end at evening time, | 22 | Dr Glover's report? |
| 23 | dinnertime or whatever. I don't think it is a proper | 23 | A. No. |
| 24 | record. | 24 | Q. What do you disagree? |
| 25 | Q. You could have refused to sign it, Prof Au, but you | 25 | A. Okay. |
| | Page 62 | | Page 64 |
| 1 | didn't? | 1 | Q. Why do you disagree, rather? |
| 2 | A. Yes, I know. I also knew that I would be given a chance | 2 | A. Let me explain, using something people can understand. |
| 3 | to qualify the record well, provide additional | 3 | Actually, in one of my first few slides, I mentioned |
| 4 | comments. | 4 | that in the structural design, we do structural analysis |
| 5 | Q. Can I suggest we do it this way. Could you just bear | 5 | based on some of the load combinations, some of the load |
| 6 | with me, please, and go to paragraphs 89.1 and 2 of | 6 | cases, and then we try to find out the forces, whatever, |
| 7 | Prof McQuillan's report, where he says this: | 7 | provide reinforcement, whatever. In addition to that, |
| 8 | "The following summary facts inform my opinion: | 8 | there are certain rules of detailing whatever that we |
| 9 | 1. There is no requirement for the structures to be | 9 | have to follow, for good reason. |
| 10 | specifically designed for seismicity provided the design | 10 | Let me cite an example. When I drive on the road, |
| 11 | is code-compliant in respect of the ductility and bottom | 11 | I obey all the road signs, so the road signs are there |
| 12 | steel continuity clauses." | 12 | for good reasons. I may not be aware of certain dangers |
| 13 | Do you agree with that? | 13 | ahead of me, but I obey the road signs. Coming back to |
| 14 | A. Now, so by code-compliant are you referring to the | 14 | the technical question, there are certain requirements |
| 15 | Concrete Code 2004? | 15 | for detailing. It's right that if you just look at the |
| 16 | Q. Yes. | 16 | load cases that you have considered, under normal |
| 17 | A. Yes, agree. | 17 | circumstances, that load, which is the self-weight of |
| 18 | Q. Right. Then, secondly, he says this: | 18 | the structure, live load, the weight of the people, |
| 19 | "2. The geometry of the connection between the EWL | 19 | trains, whatever, it's true that over there, that slab |
| 20 | slab and the east D-wall, however, precludes any | 20 | is very stiff and then the diaphragm wall is more |
| 21 | ductility. The structural 'plastic' deformation which | 21 | flexible, whatever, yes. But the problem is providing |
| 22 | might occur during seismic activity will develop lower | 22 | the reinforcement over there, providing ductility |
| 23 | down the D-wall Ductile-grade counters are not | 22 | couplers over there also serves certain purposes |
| | down the D-wan. Ducthe-grade couplets are not | 23 | coupiers over mere, also serves certain purposes. |
| 24 | therefore required where used in the EWL slab to D-wall | 23 | I can give you some examples. |

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| 1 | carry out fire design for that, for structural fire. | 1 | interface was required for code compliance." |
| 2 | Considering certain scenarios for fire, if there is | 2 | You agree with that? |
| 3 | a fire breaking out above the upper platform slab and | 3 | A. No. Now |
| 4 | it's confined somewhere, and then let's say the top part | 4 | O. Sorry, Prof Au, but why did you sign it? |
| 5 | of the slab is heated to let's say 800 degrees Celsius, | 5 | A. That actually wasn't too appropriate, but then if |
| 6 | and perhaps before that, it is going to heat up the top | 6 | I decline to sign then it is going to prolong the |
| 7 | part of the slab, and there is a so-called thermal | 7 | meeting. |
| 8 | bowing. So the top part of the slab is trying to | 8 | The problem with that meeting is I wasn't provided |
| 9 | expand, and this is going to reverse the bending moment. | 9 | with sufficient data, so |
| 10 | So the bottom part of the slab reinforcement may be | 10 | Q. When were you first instructed, Prof Au? |
| 11 | in tension, maybe. This is just one example. | 11 | A. Earlier but then |
| 12 | If the fire goes on and then somehow the top | 12 | Q. When were you first instructed on behalf of the |
| 13 | reinforcement is affected, let's say the top | 13 | government to give expert evidence? |
| 14 | reinforcement is heated to 600 or 700 degrees Celsius, | 14 | A. Probably sometime in December. I can't remember |
| 15 | the strength would be substantially affected. So even | 15 | exactly. |
| 16 | the bending resistance would come down to a very low | 16 | Q. Beginning of December? |
| 17 | value. If there is sufficient reinforcement at the | 17 | A. I can't remember exactly. I need to check. |
| 18 | bottom, well anchored, possessing good ductility, then | 18 | The problem is there wasn't any agenda and now, |
| 19 | it is going to save the structure. That is what we call | 19 | I expressed certain reservations regarding certain |
| 20 | catenary effect. So the floor may tend to deflect | 20 | points, but unfortunately, even though I raised it |
| 21 | a lot, but then it will be hanging like a net. That is | 21 | several times, it wasn't accurately recorded, and at |
| 22 | what we call catenary effect. | 22 | that time I found myself almost the only dissenting |
| 23 | CHAIRMAN: And the spelling? | 23 | voice, I think for much of the time. |
| 24 | A. C-A-T-E-N-A-R-Y, like a cable. So the bottom | 24 | Q. Could you look at paragraph 2, please, of the joint |
| 25 | reinforcement is also useful. | 25 | statement. |
| | Page 66 | | Page 68 |
| 1 | Now, it is not a requirement to consider that load | 1 | A. Yes. |
| 2 | case, but I don't agree that such rules cannot be | 2 | Q. So we are over the page now to 118. That says: |
| 3 | well, need not be followed. | 3 | "All agreed that irrespective of the code |
| 4 | MR PENNICOTT: I put what I thought, by reference to those | 4 | requirement the EWL slab does not, in theory, rely on |
| 5 | paragraphs, Prof Au, was a relatively straightforward | 5 | steel at the interface, at the bottom, for flexure and |
| 6 | proposition which is clearly expressed by Dr Glover and | ~ | |
| 7 | | 6 | shear capacity." |
| 0 | Prof McQuillan that in the event of seismic activity, | 6 7 | shear capacity." In other words, as I understand it, at the bottom of |
| 0 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put | 6 7 8 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression |
| o 9 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and | 6 7 8 9 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful |
| 8 9 10 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility | 6 7 8 9 10 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? |
| 8 9 10 11 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's | 6 7 8 9 10 11 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in |
| 8 9 10 11 12 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that | 6 7 8 9 10 11 12 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should |
| 8 9 10 11 12 13 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first? | 6 7 8 9 10 11 12 13 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not |
| 8 9 10 11 12 13 14 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first?A. I agree with you, only for the seismic load case. | 6 7 8 9 10 11 12 13 14 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not everything. We have to consider other things, ductility |
| 8 9 10 11 12 13 14 15 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first?A. I agree with you, only for the seismic load case.Q. Okay. All right. | 6 7 8 9 10 11 12 13 14 15 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not everything. We have to consider other things, ductility and other things. There would be other scenarios which |
| 9 10 11 12 13 14 15 16 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first? A. I agree with you, only for the seismic load case. Q. Okay. All right. The second bullet point in the joint statement | 6 7 8 9 10 11 12 13 14 15 16 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not everything. We have to consider other things, ductility and other things. There would be other scenarios which may not be included in the standard loading cases. |
| 9 10 11 12 13 14 15 16 17 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first? A. I agree with you, only for the seismic load case. Q. Okay. All right. The second bullet point in the joint statement A. I beg your pardon? | 6 7 8 9 10 11 12 13 14 15 16 17 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not everything. We have to consider other things, ductility and other things. There would be other scenarios which may not be included in the standard loading cases. Now, if we follow those requirements, then the |
| 9 10 11 12 13 14 15 16 17 18 16 | Prof McQuillan that in the event of seismic activity, which we know is a low possibility in Hong Kong, to put it in layman's terms, the D-walls would go first and therefore the fact that there were or were not ductility couplers in the slab was neither here nor there. That's the basic proposition. Firstly, do you agree with that basic proposition: the walls would go first? A. I agree with you, only for the seismic load case. Q. Okay. All right. The second bullet point in the joint statement A. I beg your pardon? Q. Can we go back to the joint statement, please, if you | 6 7 8 9 10 11 12 13 14 15 16 17 18 | shear capacity." In other words, as I understand it, at the bottom of the EWL slab it is in compression A. Now, we are to be very careful Q "yes" or "no"? A. Wait a minute, I have to qualify that. At that time in the meeting, I have mentioned several times we should not be just talking about strength. Strength is not everything. We have to consider other things, ductility and other things. There would be other scenarios which may not be included in the standard loading cases. Now, if we follow those requirements, then the structure would be safer. |
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17 (Pages 65 to 68)

| | Page 69 | | Page 71 |
|--|---|--|---|
| 1 | paragraph 89 of Prof McQuillan's report, page 38. | 1 | detail and provided more steel across the interface" |
| 2 | A. Yes. | 2 | Now, subject to the bit in brackets we are going to |
| 3 | Q. Where he says: | 3 | look at in a moment, I understand you agree with that |
| 4 | "To satisfy code requirements, part of the bottom | 4 | first proposition, subject to what's in brackets? |
| 5 | steel requires to be continued into the east D-wall." | 5 | A. No. Actually, in the meeting, I pointed out several |
| 6 | Do you agree with that sentence? | 6 | times that there was a need to check the stresses at the |
| 7 | A. The first sentence? | 7 | construction joints. |
| 8 | Q. Yes. | 8 | Q. Okay. I said "subject". Now, the bit in brackets is |
| 9 | A. Right. | 9 | this: |
| 10 | Q. "This should be equivalent to 50 per cent of the EWL | 10 | " (subject to a review of the internal stresses |
| 11 | slab top tension steel (at the D-wall connection)." | 11 | at the top-of-wall construction joint relating to the |
| 12 | Do you agree with that sentence? | 12 | 'first change' and its rebar detailing)." |
| 13 | A. Yes, agree. | 13 | A. Well, are you talking about the second change or the |
| 14 | Q. "The approved design was therefore conservative in that | 14 | first change? |
| 15 | all four layers of bottom steel were continued through | 15 | Q. I'm just looking at what has been agreed, signed up to |
| 16 | into the D-wall when 50 per cent would have sufficed." | 16 | and recorded in paragraph 3 of the joint statement, |
| 17 | Do you agree with that? | 17 | because I can't do anything else. It says: |
| 18 | A. Yes, agree. | 18 | " (subject to a review of the internal stresses |
| 19 | Q. "89.4: | 19 | at the top-of-wall construction joint relating to the |
| 20 | "The bottom of the EWL slab at each D-wall is always | 20 | 'first change")." |
| 21 | in compression." | 21 | Which we all know is all to do with missing U-bars. |
| 22 | Do you agree with that? | 22 | Do you agree? |
| 23 | A. Not necessarily. I think for those load cases | 23 | A. Now, the problem is so you are talking about the |
| 24 | considered in the regular design, yes, possible, but | 24 | first sentence; okay? So the problem is so there are |
| 25 | then there may be extreme events that may happen and | 25 | two issues. The first one is the first change, but |
| | Page 70 | | Page 72 |
| 1 | we now, I think just for that, yes. So for the | 1 | apparently this is mainly related to the second change. |
| 2 | regular loading cases considered, yes, in compression. | 2 | Now I am aware that the shance has increased the amount |
| 2 | | | Now, I am aware that the change has increased the amount |
| 5 | But then there may be some other events which we may not | 3 | of continuous reinforcement at the top, but the problem |
| 4 | have foreseen, then if you provide reinforcement over | 2 3 4 | of continuous reinforcement at the top, but the problem is when there is a change, it also introduces a weakness |
| 5 4 5 | have foreseen, then if you provide reinforcement over there, that would be safer. | 2 3 4 5 | of continuous reinforcement at the top, but the problem is when there is a change, it also introduces a weakness at the construction joint, that of the part of the |
| 5 4 5 6 | But then there may be some other events which we may not have foreseen, then if you provide reinforcement over there, that would be safer.O. All right. Then can I ask you, please, to look at | 2 3 4 5 6 | of continuous reinforcement at the top, but the problem is when there is a change, it also introduces a weakness at the construction joint, that of the part of the concrete that is hacked away. Now, that can be the |
| 3 4 5 6 7 | But then there may be some other events which we may not have foreseen, then if you provide reinforcement over there, that would be safer.Q. All right. Then can I ask you, please, to look at paragraph 3 of the joint statement I'm sorry to keep | 2 3 4 5 6 7 | of continuous reinforcement at the top, but the problem is when there is a change, it also introduces a weakness at the construction joint, that of the part of the concrete that is hacked away. Now, that can be the weakest link of the revised detail. |
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| | Page 73 | | Page 75 |
|----|---|----|---|
| 1 | or has been caused by the second change, not by the | 1 | MR PENNICOTT: Well, they are referred to in |
| 2 | first change. So at that meeting I was referring to | 2 | Prof McQuillan's report and elsewhere. |
| 3 | another | 3 | COMMISSIONER HANSFORD: Okay. |
| 4 | MR BOULDING: Sir, I hesitate to intervene. My learned | 4 | MR PENNICOTT: And also in Prof Au's report. |
| 5 | friend Mr Pennicott has already made the point that this | 5 | CHAIRMAN: We would just like to discuss a couple of things, |
| 6 | witness is going in to, we would say, inadmissible | 6 | if we could. We will let you know when we are ready. |
| 7 | without-prejudice discussions. He's signed off | 7 | It shouldn't be more than four or five minutes. |
| 8 | an agreement, we can see his signature, and in my | 8 | MR PENNICOTT: Certainly. |
| 9 | respectful submission that should be the end of the | 9 | (12.23 pm) |
| 10 | matter. The idea that by rehearsing everything that was | 10 | (A short adjournment) |
| 11 | said before or allegedly said before and seeking to | 11 | (12.28 pm) |
| 12 | undermine this agreement is, in my respectful | 12 | MR PENNICOTT: There are one or two participants missing, |
| 13 | submission, not only outrageous but contrary to every | 13 | but never mind. |
| 14 | rule of law concerning evidence that I've ever known. | 14 | CHAIRMAN: Thank you very much. We just wanted to have |
| 15 | Once one has an agreement, one has an agreement, unless | 15 | a brief discussion about this matter. We are very |
| 16 | there's a principle of non est factum or something such | 16 | concerned that the methodology by which |
| 17 | as that. | 17 | a without-prejudice agreement was reached should now |
| 18 | I'm most concerned that I've been instructed to make | 18 | become subject to discussion. |
| 19 | this point because I don't quite know where we are | 19 | The fact is the agreement was reached, and I think |
| 20 | going. | 20 | in respect of expert evidence it's open, Professor, to |
| 21 | MR PENNICOTT: Sir, on this particular point, where we are | 21 | you to say, "Since reaching that agreement I have |
| 22 | going is this, that we know as a matter of fact that | 22 | certain personal reservations." That I think is |
| 23 | because of the reservation that was put in the | 23 | a matter that we believe you can discuss, and you can |
| 24 | brackets and we know that that was put in by Prof Au; | 24 | discuss matters that may concern you as a consequence of |
| 25 | there's no issue about that what then happened was | 25 | that agreement; for example, Atkins carrying out certain |
| | Page 74 | | Page 76 |
| 1 | Atkins went away and did a load of calculations to meet | 1 | mathematical calculations. |
| 2 | the point that's in brackets, and that's where I was | 2 | But to go into the methodology and what was said, |
| 3 | going with the next question, because then what happened | 3 | how it was said, who agreed to what during the course of |
| 4 | was Prof Au comes along with his report and criticises | 4 | that very lengthy meeting I think would not assist |
| 5 | the Atkins calculations, as I understand it. That goes | 5 | anybody at all. The fact is, from what we can see, that |
| 6 | back to the point that you were discussing with Prof Au | 6 | we had a group of eminent engineers who spent a deal of |
| 7 | this morning as to, first of all, did Atkins do the | 7 | time together, debating the issue, as we encouraged, so |
| 8 | right calculations; if they did the right calculations, | 8 | they were free to say what they wished to say, they were |
| 9 | are there errors in those calculations; if so, do we | 9 | free to put their reservations in, and to enter into no |
| 10 | need to start the calculation process again? And that's | 10 | doubt very robust argument when necessary, and they did |
| 11 | all against the backdrop, as I understand it, of | 11 | come to an agreement to which all of them put their |
| 12 | Prof McQuillan, Dr Glover and Mr Southward all saying, | 12 | signature. I think that's an important issue, and |
| 13 | "Actually, you don't need to do any calculations because | 13 | equally important, of course, Professor, if you have |
| 14 | there's no shear stresses involved in any event." | 14 | since had concerns, that's another matter. |
| 15 | So I'm just trying to work out what has happened as | 15 | Thank you. That's the reason we wanted to have a |
| 16 | a consequence of the bit in brackets. Unfortunately, to | 16 | brief discussion. |
| 17 | get to the bit in brackets, you have to look at the rest | 17 | Mr Pennicott. I don't know how that assists or does |
| 18 | of it as well. You can't just look at it in isolation. | 18 | not assist vou. |
| 19 | I have to say I'm doing my best not to get into | 19 | MR PENNICOTT: It assists in some ways and doesn't in |
| 20 | a discussion about what was said or not said at the | 20 | others. in the sense that I am trying my best to avoid |
| 21 | agreement, and I agree with Mr Boulding in principle | 21 | getting into a debate with Prof Au as to what or wasn't |

21agreement, and I agree with Mr Boulding in principle

24

25

22 that an expert's agreement is an expert's agreement. 23

said at the meeting, and let's try to avoid that going COMMISSIONER HANSFORD: Mr Pennicott, not that I need to 23 forward, as it were. understand them all myself, but have we seen Atkins' 24 On the other hand, I am trying to unravel, if I can, calculations? 25 the one express reservation that I know Prof Au had,

19 (Pages 73 to 76)

| | Page 77 | | Page 79 |
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| 1 | which is the bit in brackets in paragraph 3, because | 1 | why no tension or shear can occur at the interface. |
| 2 | there clearly was a reservation in those words and | 2 | However, at paragraph 101, it's recorded by |
| 3 | I have no problem with that and I imagine nobody else | 3 | Prof McQuillan that: |
| 4 | has a problem with that. | 4 | "Atkins subsequently produced design calculations |
| 5 | So what I was endeavouring to do was to, as it were, | 5 | for the first and second changes which demonstrate" |
| 6 | identify for the Commission what followed on from that | 6 | And then bullet point, bullet point, and several |
| 7 | reservation. | 7 | more bullet points. The reference is given there. |
| 8 | CHAIRMAN: That's fine. | 8 | Those calculations were provided on 31 December, so, as |
| 9 | MR PENNICOTT: And that's fine. The only problem that we | 9 | I say, postdating the joint statement. If one looks at |
| 10 | then ran into was that it appears, if I've understood | 10 | the covering letter to the calculations that's at |
| 11 | Prof Au's position correctly, that he's now saying, | 11 | J6/4556, if we can get that up on the screen; this is |
| 12 | actually, when it says "the first change", in his mind | 12 | Mr Blackwood writing on 31 December, the Commission |
| 13 | it really should say "the second change", or perhaps | 13 | having requested the calculations: |
| 14 | both, I don't know. | 14 | "We refer to your email of 19 December 2018 |
| 15 | A. May I I think there is some inaccuracy in the part | 15 | requesting calculations to demonstrate that the internal |
| 16 | within brackets. As far as I know, the first change is | 16 | stresses at the construction joint are within |
| 17 | related to the omission of the L-bar and U-bars. It | 17 | acceptable limits for the 'first change' necessitated by |
| 18 | doesn't create any additional construction joint. | 18 | the missing U-bars at the top of the D-wall. Similar |
| 19 | Q. Correct. | 19 | calculations in relation to the 'second change' were |
| 20 | A. Now, it says "subject to a review of the internal | 20 | also requested. |
| 21 | stresses at the top-of-wall construction joint relating | 21 | The requested calculations for both the 'first |
| 22 | to the 'first change'" | 22 | change' and 'second change' are enclosed." |
| 23 | So the construction joint is not caused by the first | 23 | So, sir, to answer your question, both have been |
| 24 | change but by the second change. It's inaccurate. | 24 | supplied. That's where we've got to. |
| 25 | Q. That's why I say I think what is now being said by | 25 | However, as I understand it, Prof Au has |
| | Page 78 | | Page 80 |
| 1 | Prof Au is that this is related to the second change. | 1 | reservations about those calculations. |
| 2 | The construction joints, I agree with Prof Au, clearly | 2 | Is that right, Prof Au? |
| 3 | can only relate to the second change | 3 | A. Yes. |
| 4 | A. Yes. | 4 | CHAIRMAN: About both or? |
| 5 | Q not the first change? | 5 | A. About both. |
| 6 | CHAIRMAN: All right. Good. So that's looking back on the | 6 | MR PENNICOTT: Prof Au, when you were having a discussion |
| 7 | agreement, that is a patent error, in your view, | 7 | with Prof Hansford earlier this morning, and he was |
| 8 | a common error, and you are saying it should relate to | 8 | asking you about some calculations that could be done, |
| 9 | the second change? | | |
| 10 | | 9 | as I understand it the focus will be on those |
| 11 | MR PENNICOTT: Well | 9 10 | as I understand it the focus will be on those calculations, the Atkins calculations, and to your way |
| | MR PENNICOTT: Well COMMISSIONER HANSFORD: Just as a consequence of that, car | 9 10 111 | as I understand it the focus will be on those calculations, the Atkins calculations, and to your way of thinking at least I'm not sure everybody else |
| 12 | MR PENNICOTT: Well COMMISSIONER HANSFORD: Just as a consequence of that, car I just ask a question: was the additional work done by | 9 10 111 12 | as I understand it the focus will be on those calculations, the Atkins calculations, and to your way of thinking at least I'm not sure everybody else agrees with you but if your criticisms of those |
| 12 13 | MR PENNICOTT: Well COMMISSIONER HANSFORD: Just as a consequence of that, car I just ask a question: was the additional work done by Atkins related to the second change or the first change? | 9 10 111 12 13 | as I understand it the focus will be on those calculations, the Atkins calculations, and to your way of thinking at least I'm not sure everybody else agrees with you but if your criticisms of those calculations are accepted, then essentially what you are |
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| | Page 81 | | Page 83 |
|---|---|---|---|
| 1 | mentioned some other consultants engaged by the | 1 | sophisticated one. |
| 2 | government, but I'm afraid perhaps you could tell us | 2 | COMMISSIONER HANSFORD: Sorry, is that half a day the same |
| 3 | a bit more about those calculations? Have they been | 3 | as what you said just now, which was a few days? |
| 4 | done? Are they available? Do they address this | 4 | A. Something like that, yes. Well |
| 5 | particular point that we are looking at? | 5 | COMMISSIONER HANSFORD: Which? Is it half a day or a few |
| 6 | A. Let me qualify my earlier statement. I'm not aware of | 6 | days? |
| 7 | any calculations submitted to perhaps COI or the | 7 | A. The problem is there are so many design variations, so |
| 8 | government from, let's say, MTRC or Atkins or whatever. | 8 | there is a need to check each and every one. So what |
| 9 | But then the other firm that is assisting Highways | 9 | they have done is just to check a few of them; okay? |
| 10 | Department has done some checking. | 10 | But to check all the design variations, perhaps it would |
| 11 | Q. Who are they? | 11 | take a few days or whatever. |
| 12 | A. Mannings. | 12 | CHAIRMAN: Okay. The Commission's concern is structural |
| 13 | Q. Do you know whether they have done some calculations on | 13 | integrity. |
| 14 | this particular topic that we are debating at the | 14 | A. Yes. |
| 15 | moment? | 15 | CHAIRMAN: Safety. |
| 16 | A. Yes. | 16 | A. Yes. |
| 17 | Q. They have? Okay. | 17 | CHAIRMAN: That's the public's concern. So if it's going to |
| 18 | CHAIRMAN: Have you seen those calculations? | 18 | require esoteric mathematical calculations over several |
| 19 | A. Yes. | 19 | months, then that's what it will require, but I think |
| 20 | CHAIRMAN: What is your view of them? | 20 | you are saying, as interesting as that may be, one |
| 21 | A. Well, actually, in some of the design variations, there | 21 | doesn't need to go into that area |
| 22 | may be problem. | 22 | A. No, not really. |
| 23 | CHAIRMAN: Sorry, my fault. Do you agree with the accuracy | 23 | CHAIRMAN: more simple calculations will be sufficient |
| 24 | of those calculations, mathematically? | 24 | A. Yes. |
| 25 | A. Okay. Actually, we have gone through a certain learning | 25 | CHAIRMAN: to ensure safety or to ensure that it is safe? |
| | | | |
| | Page 82 | | Page 84 |
| 1 | Page 82 curve, because those engineers were not too familiar | 1 | Page 84 A. Yes. |
| 1 2 | Page 82 curve, because those engineers were not too familiar with that. So actually, in the process, we were | 1 2 | Page 84 A. Yes. CHAIRMAN: Okay. Thank you. |
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| | Page 85 | | Page 87 |
|---|---|---|---|
| 1 | further or if the Commission does, because there is this | 1 | discussing are reasonably clear, and that's this, that |
| 2 | overarching point, sir, that you may hear from other | 2 | the top mat of steel in the EWL slab is in tension and |
| 3 | experts to say you really don't need to trouble yourself | 3 | essentially that's the critical rebar and the |
| 4 | about these calculations for reasons they will give. | 4 | connections with which we are concerned. There may be |
| 5 | CHAIRMAN: I appreciate that, but from my point of view | 5 | others but that's the really important one? |
| 6 | MR PENNICOTT: But obviously we've got Prof Au here and we | 6 | A. Yes. |
| 7 | need to get his views, I understand that. | 7 | O. So far as the top of the west diaphragm wall is |
| 8 | CHAIRMAN: Myself and Prof Hansford need to know what the | 8 | concerned, because of its different design and |
| 9 | position is for the various expert parties. | 9 | configuration, vertical couplers, we are not concerned |
| 10 | MR PENNICOTT: Correct. | 10 | with the top of the west diaphragm wall? |
| 11 | CHAIRMAN: And my understanding is that Prof Au is saying | 11 | A. Agree. |
| 12 | there are some calculations that can be done within | 12 | Q. So far as the top of the east diaphragm wall is |
| 13 | a limited period of time, subject to the base data being | 13 | concerned, essentially, because of the second change |
| 14 | made available, and that base data should already be | 14 | A. Yes. |
| 15 | available, even though it may need to be checked. So | 15 | O the vast majority of the top of the east diaphragm |
| 16 | these calculations and the results of them will confirm | 16 | wall, I think something like 95 per cent or so, does not |
| 17 | the view already held that the structures do have | 17 | have couplers in the top rebar, because it now has |
| 18 | an integrity that makes them safe. | 18 | through-bars? |
| 19 | A. Yes. | 19 | A. Yes. |
| 20 | CHAIRMAN: That's what you are looking for; you are looking | 20 | Q. Therefore, in terms of couplers at the top mat of rebar, |
| 21 | for confirmation? | 21 | we are only talking about a small number of panels or |
| 22 | A. Yes. | 22 | sections? |
| 23 | CHAIRMAN: That's my understanding of the professor's | 23 | A. Yes. |
| 24 | position at this moment in time. So it's feasible and | 24 | Q. And it's those that, as I understand it, and, Professor, |
| 25 | could be done before we have to bring out our report. | 25 | your understanding as well, are being focused on so far |
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| | Daga 96 | | Daga 99 |
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| | Page 89 | | Page 91 |
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| 1 | different factors in mind; do you agree? | 1 | a maximum value at 60 per cent. |
| 2 | A. Yes. | 2 | Q. So to assist the Commission, Prof Au, as I understand |
| 3 | O. Because it's not just a question of whether the couplers | 3 | it, what you are saying is, "Okay, I've seen these tests |
| 4 | are screwed in sufficiently, it is also rather important | 4 | that have been done by BD, BOSA and CASTCO back in |
| 5 | to know where those couplers are? | 5 | November 2018. I see what they say, but I don't think |
| 6 | A. Yes. | 6 | those tests are sufficiently robust or sufficient in |
| 7 | O. As I understand it and perhaps you can help me with | 7 | number"? |
| 8 | this, Prof Au in your PowerPoint slides this morning, | 8 | A. Yes. |
| 9 | you referred I think to one-third of the couplers | 9 | COMMISSIONER HANSFORD: Just to help me, Mr Pennicott you |
| 10 | being I'm not sure what word you used | 10 | refer to BD, BOSA and CASTCO. |
| 11 | "problematic" | 11 | MR PENNICOTT: Yes. |
| 12 | A. Over one-third. | 12 | COMMISSIONER HANSFORD: Is that three lots of tests? |
| 13 | O. Over one-third non-compliant couplers, over one-third? | 13 | MR PENNICOTT: No. BD, CASTCO and BOSA did these joint |
| 14 | A. Yes | 14 | tests back in November. |
| 15 | O. As I understand it, your definition of "non-compliant" | 15 | COMMISSIONER HANSFORD: Thank you very much. |
| 16 | is less than 37 millimetres: is that right? | 16 | MR PENNICOTT: It was an exercise that was done by the three |
| 17 | A. Yes. Yes. I think that is the criterion used in the | 17 | parties. I think the BD, rather like the Commission, |
| 18 | holistic proposal: right? | 18 | has asked BOSA to assist it on occasions, and |
| 19 | 0 37 millimetres engagement into the coupler? | 19 | I understand that BOSA invited BD to be present at the |
| 20 | A Yes | 20 | tests, and so forth. We have the results, we've seen |
| 21 | O Okay It's against that criteria that you've reached | 21 | the table. I think it's just about in everybody's |
| 21 | your one-third assessment or over one-third assessment? | 22 | expert report refers to the table that BOSA came up |
| 22 | A I think that is the result published on the net | 23 | with. |
| 23 24 | Ω And that figure one-third is simply by reference to | 24 | COMMISSIONER HANSFORD: So the testing laboratory was |
| 2 4 25 | the 37 millimetre figure that government are using and | 25 | CASTCO? |
| 25 | the 37 minimetre righte that government are using, and | 20 | |
| | Page 90 | | Page 92 |
| | | | 1 460 92 |
| 1 | does not take into account the tests that have been done | 1 | MR PENNICOTT: Correct, that's right, sir. The independent |
| 1 2 | does not take into account the tests that have been done at the various percentages of engagement that you | 1 2 | MR PENNICOTT: Correct, that's right, sir. The independent laboratory was CASTCO. |
| 1 2 3 | does not take into account the tests that have been done at the various percentages of engagement that you discussed briefly this morning? | 1 2 3 | MR PENNICOTT: Correct, that's right, sir. The independent laboratory was CASTCO. So you have Prof Au's position. As I understand it, |
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| | Page 93 | | Page 95 |
|---|---|---|--|
| 1 | 6.22 millimetres; do you see that? | 1 | A. Yes. |
| 2 | A. Yes. | 2 | Q is that there are 14 results in total, three of which |
| 3 | Q. And number 22, where one has an engagement length of | 3 | are under 37 millimetres sorry, four of which are |
| 4 | 9.4. | 4 | under 37 millimetres but one only just? |
| 5 | A. Right. | 5 | A. Right. |
| 6 | Q. So they are completely out of kilter with all the other | 6 | Q. Okay. But if one looked at if one applied the |
| 7 | results. | 7 | strength requirement derived from the tests that we were |
| 8 | A. Oh, yes, right. | 8 | discussing earlier |
| 9 | Q. And I think not shown on this sheet is another piece of | 9 | A. Right. |
| 10 | rebar | 10 | Q and you looked at 35 and 36 millimetres, rather than |
| 11 | A. Yes. | 11 | 37, they would all pass? |
| 12 | Q near the West Wall, I understand, which is not | 12 | A. Strength, yes. |
| 13 | connected at all and is not shown on this sheet. So, on | 13 | Q. All right. |
| 14 | one view, we have 68 results, but 68 is not shown on | 14 | Prof Au, can I just ask you this. You have looked |
| 15 | here. | 15 | at a lot of evidence, a lot of material, for the |
| 16 | A. (Nodded head). | 16 | purposes of preparing your report and coming to give |
| 17 | Q. Thank you. Okay. | 17 | your evidence today. |
| 18 | Can I just ask you, first of all, to focus on the | 18 | A. Yes. |
| 19 | NSL, that's the lower slab, and you will see that there | 19 | Q. Taking your academic hat off for one moment and applying |
| 20 | are five results at 32 to 36; do you see that? | 20 | some engineering judgment, practical engineering |
| 21 | A. Yes. | 21 | judgment, and perhaps, dare I say, some practical |
| 22 | Q. And save for number 36, which is 0.64 out, they are all | 22 | engineering common sense, but based on all that evidence |
| 23 | compliant with the 37 millimetre criteria? | 23 | that you've seen and heard, including the evidence of |
| 24 | A. I beg your pardon, are you referring to 36? | 24 | your fellow experts, do you agree that the most likely |
| 25 | Q. Number 36, yes. It's 36.36. | 25 | position is that the EWL slab is safe for its intended |
| | | | |
| | Page 94 | | Page 96 |
| 1 | Page 94 A. Yes. | 1 | Page 96 purpose? |
| 12 | Page 94 A. Yes. Q. So it hasn't quite achieved 37, it's 0.64 off? | 1 2 | Page 96 purpose? A. Well, now, I think some more investigations should be |
| 1 2 3 | Page 94 A. Yes. Q. So it hasn't quite achieved 37, it's 0.64 off? A. Yes. | 1 2 3 | Page 96 purpose? A. Well, now, I think some more investigations should be done, such as checking of the stresses. But my |
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| | Page 97 | | Page 99 |
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| 1 | A. Yes. | 1 | locations of the structure, which will help to assess |
| 2 | MR PENNICOTT: And it's a "maybe" required in terms of | 2 | the structural performance." |
| 3 | additional work or reinforcement? | 3 | What sort of long-term structural health monitoring |
| 4 | A. Yes. | 4 | system did you have in mind? |
| 5 | Q. I asked the question specifically in relation to the EWL | 5 | A. Well, actually, in Hong Kong, the first structural |
| 6 | slab, and would you agree the same applies as far as the | 6 | health monitoring system was installed on the Lantau |
| 7 | NSL slab is concerned, probably even more so because | 7 | Link, Tsing Ma Bridge and so on, over 20 years ago. The |
| 8 | there seemed to be, with respect, a lot less problems | 8 | system consists mainly of accelerometers, displacement |
| 9 | with the NSL slab? | 9 | sensors, temperature sensors, whatever. I think for |
| 10 | A. I think that is reasonable because of the order of | 10 | this particular station, probably some displacement |
| 11 | construction, the workers should have gone through the | 11 | sensors and accelerometers will be sufficient. I don't |
| 12 | learning curve so when they came to the NSL slab they | 12 | think we need a very extensive monitoring system. |
| 13 | should be more experienced. So I'm glad to see that the | 13 | I think just placing certain instruments at certain key |
| 14 | results for the NSL slab are better than those for EWL | 14 | locations, to provide data, I think that would boost the |
| 15 | slab. | 15 | confidence of the public. |
| 16 | O. Right. | 16 | COMMISSIONER HANSFORD: And fibreoptics or would that be too |
| 17 | CHAIRMAN: All right Could we approach it more on | 17 | much? |
| 18 | an engineering basis rather than "workmen getting | 18 | A. Well, actually, it is very common. I think using |
| 19 | hetter"? I don't mean to say that in a disparaging or | 19 | fibreoptic sensors for measurement of strength. I think |
| 20 | condescending way, but it may be we don't know what | 20 | we did that over ten years ago. It's not too expensive. |
| 21 | our findings will be that the standard of workmanship | 21 | COMMISSIONER HANSFORD: And you would be advocating that |
| 21 | remained the same or perhaps even got worse. So I'm | 22 | here as part of what you regard is sensible long-term |
| 22 | a hit concerned as to dealing with a result on | 23 | structural health monitoring system? |
| 23 | a bit concerned as to dealing with a result of | 24 | A. Yes. I think it would be cheaper than doing a loading |
| 24 | compalling avidance that that was taking place | 25 | test |
| 25 | compenning evidence that that was taking place. | 25 | |
| | Page 98 | | Page 100 |
| 1 | COMMISSIONER HANSFORD: So, therefore, it would be helpful | 1 | CHAIRMAN: And in fact, just so we can confirm that, the |
| 2 | if the answer was revisited, ignoring the possibility of | 2 | agreed expert memorandum, paragraph 5, actually says: |
| 3 | learning curve. | 3 | "All agreed that a load test was unnecessary because |
| 4 | A. I agree. | 4 | it would yield no meaningful result" |
| 5 | COMMISSIONER HANSFORD: So perhaps Mr Pennicott can ask you | 5 | And then, and I emphasise: |
| 6 | the question again. Could we have the question based | 6 | " and long-term monitoring would be a better |
| 7 | upon engineering? | 7 | approach to allay public safety concerns." |
| 8 | A. Apparently, from the findings of the opening-up, it | 8 | A. Yes. |
| 9 | supports that kind of, well, argument. So the NSL slab | 9 | CHAIRMAN: So presumably a very doable, presumably |
| 10 | results are better. | 10 | financially feasible way of putting in monitoring things |
| 11 | MR PENNICOTT: Yes. | 11 | to ensure public safety and that people can have |
| 12 | CHAIRMAN: Okay. Good. | 12 | confidence in using that station in the future? |
| 13 | Is that an opportune moment? | 13 | A. Yes. |
| 14 | MR PENNICOTT: Sir, it is, and subject to any thoughts over | 14 | CHAIRMAN: Thank you |
| 15 | lunch, I have probably finished for now. | 15 | MR PENNICOTT: Sir. if I can say, just to add to that, that |
| 16 | COMMISSIONER HANSFORD: Is there time for one question from | 16 | is one thing that clearly the Commission's expert |
| 17 | me? | 17 | Prof McOuillan also agrees with: see paragraph 113 of |
| 18 | CHAIRMAN: Yes. | 18 | his report where he says. |
| 19 | COMMISSIONER HANSFORD: Prof Au, in your paragraph 8.1 of | 19 | "To allay public concern the FWL slab should |
| 20 | your witness statement, it's your last paragraph, your | 20 | have more sensitive instrumentation eq |
| 21 | very last paragraph, your witness statement. you refer | 21 | a fibreontic system installed |
| 22 | to well, you say: | 21 | have its structural performance monitored in |
| 23 | "It may be desirable to install a long-term | 22 | terms of deflection " |
| 24 | structural health monitoring system to monitor the | $\frac{23}{24}$ | So that point is certainly agreed and puts a hit of |
| - · | | | so that point is cortainly agreed and puts a bit of |
| 25 | variations of displacements and deformations at key | 25 | flesh on the bones of paragraph 5 |

| | Page 101 | | Page 103 |
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| 1 | CHAIRMAN: Yes. Thank you very much. Good. It's 10 past | 1 | A. Yes. |
| 2 | one. | 2 | Q. Prof Au, I see that you have a hard copy in front of |
| 3 | Sorry, Mr Chow. | 3 | you. |
| 4 | MR CHOW: I hope I'm going to be helpful to the Commission. | 4 | A. Yes. |
| 5 | Just now, my learned friend Mr Pennicott referred to the | 5 | COMMISSIONER HANSFORD: Hold on, Mr So. We don't have it in |
| 6 | test results carried out by CASTCO and BOSA. My | 6 | front of us yet. |
| 7 | instruction is BD did not or was not part of the test. | 7 | MR SO: Thank you. |
| 8 | BD only witnessed the test. Subsequent to that, what is | 8 | Prof Au, this is appendix VI, as you can see, of the |
| 9 | more important is that subsequent to that, there was | 9 | QSP. |
| 10 | correspondence between the Buildings Department and | 10 | A. Yes. |
| 11 | BOSA. I will probably take Prof Au to those | 11 | Q. Can I trouble you to C116, that you can see paragraph 5 |
| 12 | correspondence. In fact one of those correspondences | 12 | of that. |
| 13 | has been referred to by Prof Au in one of his slides. | 13 | A. Yes. |
| 14 | If I may at this point give the Commission the page | 14 | Q. If that can be blown up a bit. |
| 15 | references, just in case the Commissioner, sir, you have | 15 | Sorry, I'm afraid there is a technology issue. |
| 16 | time over lunch time to take a look at those | 16 | CHAIRMAN: It's done now. Thank you. |
| 17 | correspondences because that is highly relevant to the | 17 | MR SO: In paragraph 5, there mentioned if you focus on |
| 18 | interpretation and the validity of the test results. | 18 | paragraph 5(b), there is a mention of static tension |
| 19 | The first letter is from the Buildings Department to | 19 | test. |
| 20 | BOSA dated 28 December and it's bundle H26 from | 20 | A. Yes. |
| 21 | page 45479 to 45481. And then we have the response from | 21 | Q. I believe that is the test actually being done currently |
| 22 | BOSA on 7 January this year, same bundle, H26, 45640 to | 22 | by the collaborative effort of BOSA and the laboratory; |
| 23 | 45643. Then we have a further letter from the Buildings | 23 | correct? |
| 24 | Department to MTRC dated 10 January 2019 at bundle H26, | 24 | A. I believe so. |
| 25 | 45853. | 25 | Q. If you can focus on paragraph (a), there is |
| | Page 102 | | Page 104 |
| 1 | I hope that will make the position clearer. | 1 | an experiment on permanent elongation, and in |
| 2 | COMMISSIONER HANSFORD: I think that's useful, Mr Chow, and | 12 | paragraph (c) there is a static compression test. |
| 3 | I'm sure our Secretariat will provide us with copies of | 3 | A. Yes. |
| 4 | those over the lunch break. | 4 | O. And in paragraph (d) there is a cyclic tension and |
| 5 | MR CHOW: That's what I expected, if I may. | 5 | compression test. |
| 6 | CHAIRMAN: Thank you all very much. 2.30. | 6 | A. Yes. |
| 7 | (1.11 pm) | 7 | O. Professor, are those tests that you have referred to |
| 8 | (The luncheon adjournment) | 8 | there further tests that should be taken in order to |
| 9 | (2.30 pm) | 9 | ascertain the full picture of the couplers? |
| 10 | MR SO: Good afternoon, Mr Chairman. Good afternoon, | 10 | A. Yes, correct. |
| 11 | Professor. There are some questions from China | 11 | Q. If you can go back to the same document, paragraph 5(b), |
| 12 | Technology. | 12 | there it mentioned the tensile strength of the bar, and |
| 13 | CHAIRMAN: Yes. | 13 | there is a mention of grade 460. |
| 14 | Cross-examination by MR SO | 14 | A. Yes. |
| 15 | MR SO: Good afternoon, Professor. I represent China | 15 | Q. And, as you have just mentioned to us this morning, |
| 16 | Technology. | 16 | those are the common types of tensile strength bars used |
| 17 | I heard you this morning on no less than one | 17 | at the time when the Hung Hom Station was actually |
| 18 | occasion that you have mentioned that when looking | 18 | built? |
| 19 | | 10 | A. Correct. |
| 1 | into the strength of the thread, you would have to carry | 19 | |
| 20 | into the strength of the thread, you would have to carry out more tests; correct? | 19 20 | Q. So one expects, if a test is to be conducted in terms of |
| 20 21 | into the strength of the thread, you would have to carry out more tests; correct?A. Are you referring to the couplers? | 20 21 | Q. So one expects, if a test is to be conducted in terms of the tensile strength, then a reasonable test specimen |
| 20 21 22 | into the strength of the thread, you would have to carry out more tests; correct?A. Are you referring to the couplers?Q. Yes. | 19 20 21 22 | Q. So one expects, if a test is to be conducted in terms of the tensile strength, then a reasonable test specimen would be using the grade 460 threads; correct? |
| 20 21 22 23 | into the strength of the thread, you would have to carry out more tests; correct?A. Are you referring to the couplers?Q. Yes.A. Yes. | 19 20 21 22 23 | Q. So one expects, if a test is to be conducted in terms of the tensile strength, then a reasonable test specimen would be using the grade 460 threads; correct?A. Yes, correct. |
| 20 21 22 23 24 | into the strength of the thread, you would have to carry out more tests; correct?A. Are you referring to the couplers?Q. Yes.A. Yes.Q. I wish to take you to one document. That is in | 19 20 21 22 23 24 | Q. So one expects, if a test is to be conducted in terms of the tensile strength, then a reasonable test specimen would be using the grade 460 threads; correct?A. Yes, correct.Q. Can I bring you to your expert report, which is at |

| | Page 105 | | Page 107 |
|--|---|---|--|
| 1 | A. Yes. | 1 | A. Because normally, in a laboratory, there should be some |
| 2 | Q. In paragraph 2.4, you have referred to the experiment in | 2 | qualified people, including the authorised signatory, |
| 3 | which the test results were actually incorporated in | 3 | and so on, that should be looking at all these tests, |
| 4 | page 44521 to 44525; correct? | 4 | and I believe now, the other strange thing is that |
| 5 | A. Yes. | 5 | the number 900 has been typewritten, whereas the other |
| 6 | Q. So far, we haven't taken a look at the actual test | 6 | numbers have been handwritten. It looks strange. So it |
| 7 | report itself. We are often referred to the table. Can | 7 | looks like the worksheet has been designed for testing |
| 8 | I just trouble you to go to the actual test result that | 8 | of assemblies having strength of 900 Megapascals. |
| 9 | was actually produced by CASTCO. It is in bundle H26. | 9 | Q. But as you have just told us, Prof Au, these tests |
| 10 | This time, I want you to focus on page H44526. | 10 | should be for grade 460 instead? |
| 11 | MR PENNICOTT: That's H25. | 11 | A. Yes, of course. |
| 12 | MR SO: I do apologise. It should be bundle H25. Thank | 12 | Q. Can I then trouble you to go to H45861. This is |
| 13 | you. If that could be blown up slightly. Yes, thank | 13 | a photograph which shows the specimen itself and also it |
| 14 | you. | 14 | was typewritten with the test results on it. |
| 15 | Prof Au, this is page H44526. | 15 | A. Yes. |
| 16 | A. Yes. | 16 | Q. You have told us earlier this morning, and I don't need |
| 17 | Q. I understand that this particular page of the report was | 17 | to trouble you to go to the transcript it was in |
| 18 | not included in your expert report. | 18 | [draft] page 43 of today's transcript, when |
| 19 | A. Yes, I believe so. | 19 | Prof Hansford asked, "Why are the samples not enough?", |
| 20 | Q. If we can focus on the box that writes, "Specified yield | 20 | and you said there was a strange thing in that the |
| 21 | strength of bar", where it writes "900 Megapascals". | 21 | maximum strength occurs at 60 per cent engagement but |
| 22 | A. Yes. | 22 | not more, and you say that's very strange. |
| 23 | Q. Can you kindly explain why in this test a grade 900 bar | 23 | Can you kindly explain more about what is the |
| 24 | was used? | 24 | strange thing about that? |
| 25 | A. I believe that is mainly to test the strength of the | 25 | A. Well, in coupler, having different lengths of |
| | Page 106 | | Page 108 |
| 1 | coupler itself | 1 | angagement, normally people would avaest that the longer |
| 1 2 | O Bight | 1 2 | the length engaged the higher the strength but |
| 2 | Q. Night. | - | the length engaged, the ingher the strength, but |
| 5 | A. DECAUSE III HIE UHEL CASES, VELV UHEH HIE LEHHUICHISI | 3 | actually it is not proportional because I have recently |
| 4 | have themselves broke | 3 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper |
| 4 | bars themselves broke. | 3 4 5 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper described a very sophisticated finite element analysis |
| 4 5 6 | bars themselves broke.Q. So, in other cases, they would not use the grade | 3 4 5 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper described a very sophisticated finite element analysis by advocates showing all the variation of strasses in |
| 4 5 6 7 | bars themselves broke.Q. So, in other cases, they would not use the grade 900 bars? | 3 4 5 6 7 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper described a very sophisticated finite element analysis by advocates showing all the variation of stresses in the threads or whatever. Actually not all of the |
| 4 5 6 7 | bars themselves broke.Q. So, in other cases, they would not use the grade 900 bars?A. No.Q. They would use grade 460 here? | 3 4 5 6 7 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper described a very sophisticated finite element analysis by advocates showing all the variation of stresses in the threads or whatever. Actually not all of the threads are taking actual loading. So the first four |
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| 4 5 6 7 8 9 10 | bars themselves broke. Q. So, in other cases, they would not use the grade 900 bars? A. No. Q. They would use grade 460 bars? A. Yes, correct. Q. You have told us this morning, in answering to prof Hansford's question, it might take some time to be a solution. | 3 4 5 6 7 8 9 10 | actually it is not proportional, because I have recently read a paper offered to me by a colleague, and the paper described a very sophisticated finite element analysis by advocates showing all the variation of stresses in the threads or whatever. Actually not all of the threads are taking equal loading. So the first few threads are taking a lot higher loading. That's why, when we have different lengths of angagement some of them look guite similar, but the |
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| | Page 109 | | Page 111 |
|----------------|---|---|---|
| 1 | engagement. It may be caused by the large variation, | 1 | Q. Paragraph 3: |
| 2 | but it looks strange. So that's why just testing one | 2 | "In response to paragraph 2(a)(i) of your letter, |
| 3 | sample definitely is not enough. | 3 | please note that our couplers are designed to the |
| 4 | COMMISSIONER HANSFORD: Prof Au, the structural elements | 4 | specifications provided in our manual as per your |
| 5 | here are not slender, are they; they are bulky? | 5 | enclosure at appendix A, and for a 40mm diameter type 2 |
| 6 | A. Yes, correct. | 6 | coupler, the threaded length is 40mm. Please note this |
| 7 | COMMISSIONER HANSFORD: And you said just now that if they | 7 | threaded length includes 2mm chamfer at the tip and 2mm |
| 8 | are bulky, it may not be an issue? | 8 | exit thread at the tail", et cetera. |
| 9 | A. Correct. | 9 | Prof Au |
| 10 | MR SO: Just to pause there, Prof Au, when you just | 10 | A. Yes. |
| 11 | mentioned cyclic loading, that's the cyclic loading we | 11 | O I want to cast your mind then to another piece of |
| 12 | have just seen in the OSP: correct? | 12 | document you have been shown this morning by my learned |
| 13 | A. Correct | 13 | friend Mr Pennicott This is the document at OU314 |
| 14 | Ω In light of this photograph and in light of the test | 14 | Can I trouble the Secretariat to blow it up at the |
| 15 | sheets I have just given to you, would it be a fair | 15 | ton, where we have the titles of the columns |
| 16 | comment to say at least on the face of these | 15 | Drof Au all along in the phased array test, we are |
| 10 | workshoets, we cannot be sure the threads that were | 17 | tosting the angegement length |
| 17 | softwally tooted for these readouts were 460 grade | 1/ | testing the engagement length. |
| 10 | actually tested for these readouts were 400 grade | 10 | A. Tes. |
| 19 | urreads? | 19 | Q. we know that from BOSA's response that in the end of the |
| 20 | A. well, I don't know, but now, I think it is reasonable | 20 | coupler there is something called a 2mm chamfer at the |
| 21 | for people to cast doubt on it, because the worksheet | 21 | end. |
| 22 | used doesn't appear to be for general purpose. I think | 22 | A. Yes, correct. |
| 23 | the major problem is with the very strange trend of the | 23 | Q. That 2mm chamfer is, if I put it graphically, is 2mm |
| 24 | results. I think that is a major problem. I find that | 24 | chamfer and then the couplers, the threadings and then |
| 25 | very strange. | 25 | the 2mm tail; is that correct? |
| | Page 110 | | Page 112 |
| 1 | Q. In any event, you would accept that there were nowhere | 1 | A. Yes. |
| 2 | whatsoever mentioned in this worksheet that the threads | 2 | Q. And that 2mm chamfer, structurally speaking, is of no |
| 3 | being tested are grade 460 threads; correct? | 3 | structural function; can I say that? |
| 4 | A. Well, the worksheet appears to have something scribbled | 4 | A. Well, it is not having the full structural function. |
| 5 | there. I'm not sure whether that's 460 | 5 | Perhaps it has a little bit. |
| 6 | Q. We can take a look at that, Prof Au. H44521 and if you | 6 | Q. But when we are talking about the phased array result, |
| 7 | wish, 44522 and 44523. | 7 | that engagement length would have included that 2mm |
| 8 | A. So that is a signature the initial, probably. That | 8 | chamfer; correct? |
| 9 | is not 460. It looks very strange. | 9 | A. Yes, correct. |
| 10 | O. But there was certainly nothing there saying it was 460? | 10 | Q. Can I suggest that if we merely look at the engagement |
| 11 | A. Yes. correct. | 11 | length, when we are talking about the 37mm where we |
| 12 | O. Thank you | 12 | call the passing benchmark, should we actually add in |
| 13 | Now I want to move to another issue that I want to | 13 | that 2mm chamfer or should we deduct that 2mm chamfer? |
| 14 | discuss with you I know this report was prepared by | 14 | A. Well, now, it actually depends on the acceptance |
| 15 | you on 7 January 2019 this year: correct? | 15 | criteria of the supplier. So if the supplier has |
| 16 | Δ Ves | 16 | spelled out certain acceptance criteria and we know that |
| 17 | O I want to show you a letter that was sent by BOSA to the | 17 | this chamfer is already there. I would be happy to |
| 18 | Buildings Department This was at bundle H26 H45858 | 18 | accent that But having said that what is the effect |
| 10 | Prof Au have you had an opportunity in reading this | 19 | of the chamfer on the strength of the coupler assembly? |
| 19 20 | letter before you come to give evidence? | 20 | I think that can be reflected in the test results |
| 20 | A Ves I should have read that because I can recognize | 20 | • Thank you very much |
| ∠1 22 | "butt to butt" "loose" those terms | $\begin{vmatrix} 21\\ 22 \end{vmatrix}$ | COMMISSIONER HANSEORD: Sorry in what say Drof Au can it |
| 22 22 | oun-to-outt, toose, these terms. | | COMMISSIONER HAINSFORD. SOILY, III WIIAUSAY, FIOLAU, CAILI |
| | O Thank you very much. I want you to east your eve to | 23 | be reflected in the test results? |
| 23 24 | Q. Thank you very much. I want you to cast your eye to | 23 24 | be reflected in the test results? |
| 23 24 25 | Q. Thank you very much. I want you to cast your eye to paragraph 3 in particular. A. Yes | 23 24 25 | be reflected in the test results?A. In the test results, the bars, the couplers, already have certain chamfers, the threads, and so on. So, when |

| 1 we test it, then the result should have already taken 1 M R S0: If we go to page 2 into account the features. 2 COMMISSIONER HANSFORD: I see. 2 4 A. So, in that case, I would have accepted that, provided 4 M R S0: Thank you, When you were actually engaged to 6 COMMISSIONER HANSFORD: I see. - - - 7 MR S0: Thank you, When you were actually engaged to - - - - 9 attention that in SC1, project there were certain - | | Page 113 | | Page 115 |
|--|--|--|---|--|
| 2 imm account the features. 2 COMMISSIONER HANSFORD: No, on the page you are on, ind 3 COMMISSIONER HANSFORD: I see. 3 25. 4 MR SO: "Again, Mr Ip, are you awas of that type of 4 7 MR SO: Thank you. When you were actually engaged to 5 remedial work measare having been carried out? 7 MR SO: Thank you. When you were actually engaged to 7 Answer: This oncy, yot, Ithink at the time we did 7 MR SO: Thank you. When you were actually engaged to 7 antention that in SCI, reprise three were certain 9 8 complete this expert report, was it brought to your 9 compary and ack other it could be done this way. At 10 practices of planting dowels into the diaphragm walls? 10 the end, drilling was done to add the T2S turn. That's 13 A. have seen some of the diaphragm walls. 13 MR SO: Thank you, vert. 13 14 applies to some of the diaphragm walls. 15 Cond Mission MR CONNOR 14 20 And do you understand that when planting dowels, the 15 Cross-examination by MR CONNOR 14 apaplies to atmascript of our hearing, plage 40. | 1 | we test it, then the results should have already taken | 1 | MR SO: If we go to page |
| 3 COMMISSIONER HANSFORD: 1 see. 3 25. 4 A. So, in that case, would have accepted that, provided 4 MR SO: "Again, Mr Ip, are you sware of that type of 6 COMMISSIONER HANSFORD: 1 see. 6 Answer: This one, see, 1 think at the time we did 7 COMMISSIONER HANSFORD: 1 see. 6 Answer: This one, see, 1 think at the time we did 9 attention that in SCL project three were certain 6 company and asked whether it could be done this way. At 10 practices of planting dowels into the diaphragm walls? 1 the remedial measure that was taken at the end." 12 Q. Yes. 10 the remedial measure that was taken at the end." 13 A. Do you mean at the bottom? 11 the remedial measure that was taken at the end." 13 Q. A the do you understand that when planting dowels, they in tho ad vare of. 13 MR Aody 1p. 14 applies to some of the diaphragm valls. 10 Good adreono, Proid Au. Im 'Mixeent Connor, 14 A Yes. 10 A. Right. 14 Represent Akins (China 1 Ad, and I have a few questions 15 a Yes. 2 Can I bring you to page 40, incol for the benefic of 2 3. A Yes. <td>2</td> <td>into account the features.</td> <td>2</td> <td>COMMISSIONER HANSFORD: No, on the page you are on, line</td> | 2 | into account the features. | 2 | COMMISSIONER HANSFORD: No, on the page you are on, line |
| 4 A. So, in that case, I would have accepted that, provided 4 MR SO: "Again. Mr Ip, are you aware of that type of 5 In that it's proved by test results. 5 remedial work measure having been current of our? 7 MR SO: Thank you, When you were actually engaged to complete this expert report, was it brought to your 6 attention that in SCI, project there were certain 7 9 attention that in SCI, project there were certain 9 company and asked whether it could be done this way. At 10 practices of planting dowels into the diaphragm walls? 10 the erad, dial measure that way like at the end." 12 Q. Ves. 12 COMMISSIONER HANSFORD: These, you, That's helpful. 14 applies to some of the diaphragm walls. 13 MR SO: Thank you, you, That's helpful. 14 applies to some of the diaphragm walls. 14 questions. 15 15 Q. And do you understand that when planting dowels, they 15 Coose examination by MR CONNOR 16 applies to some of the diaphragm walls. 14 questions. 16 20 Mr Andy Ip. 21 Q. Could sol have tear was at the end." 12 Q. Could sol have tear was at the end." 21 Q. | 3 | COMMISSIONER HANSFORD: I see. | 3 | 25. |
| 5 COMMISSIONER HANSFORD: I see. 5 remedial work measure having been carried out? 6 COMMISSIONER HANSFORD: I see. 6 Answer: This one, yes. I hink at the time we did 9 attention that in SCL project there were certain 9 submit whw call TQ Flockhinal query], that is the 9 attention that in SCL project there were certain 9 company and sked whether it could be dore this wurk. At 10 the remedial mesure that was taken at the col." 10 the remedial mesure that was taken at the col." 12 Q. Yes. 10 the remedial mesure that was taken at the col." 12 13 A. Do you mean at the bottom? 11 the remedial mesure that was taken at the col." 12 14 applies to some of the diaphragm valls. 13 MK SO: Thank you. wire and TAB shelfoll. 15 Q. And do you understand that when plaining dowels, they 16 MK CONNOR: Thank you, wire not." 16 MK CONNOR: Thank you, wire not." 16 MK CONNOR 16 16 MK CONNOR: Thank you, sit. 17 Good atherono, pol Au. In 'M 'nemotionon, 10 10 A. Yes. 17 A. Tust in the diaphragm valls, sust for the henering, rege 40. 10 A. | 4 | A. So, in that case, I would have accepted that, provided | 4 | MR SO: "Again, Mr Ip, are you aware of that type of |
| 6 COMMISSIONER HANSFORD: I see. 6 Answer: This one, yes. I hink at the time we did 7 MR S0: Thank you. When you were actually engaged to 7 submit what we call TQ Itechnical query], that is the 9 attention that in SCL project there were certain 9 complete this capert report, was it brought to your 11 A. Do you mean at the bottom? 11 the end, diffilling was done out dot the T2 bar. That's 12 Q. Yes. 12 COMMISSIONER HANSFORD: Thate you. That's helpful. 13 A. Inave scen some sketches of that. I think perhaps that 14 questions. 14 applies to some of the diaphragm walls. 14 HANSFORD: Thate you. That's helpful. 15 Q. Yes. 16 MR CONNOR: Thank you, yrun cht, Professor, I have no further 14 applies to some of the diaphragm walls. 15 Good altermoon, Prof Au. I'na Vincent Connor, 16 Q. Can I bring you to taranscript of our hearing. It is 19 for you this afternoon. 12 A. Yes. 22 Can I bring you to page 40, line I 6 onwards. 23 A. Yes. 23 A. Yes. 24 Q. You note in that report, in the first line after the 24 optimal in recorrect alkins Chima Ling, and Projessor, in respect of the diaphragm wall, in 3 24 Q. That is when Mr Andy Ip | 5 | that it is proved by test results. | 5 | remedial work measure having been carried out? |
| 7 MR SO: Thank you. When you were actually engaged to 7 submit what we call TQ [technical query]; that is the 8 complete this expert report, was it brought to your 8 engineering department submitted backet it could be done bits way. At 10 practices of planning dovels into the diaphragm walls? 10 the end, drilling was done to ad the twis way. At 11 A. Do you mean at the bottom? 10 the end, drilling was done to ad the twis way. At 12 Q. Yes. 11 the renedial measure that was taken at the end." 13 A. I have seen some sketches of that. I think perhaps that ageitors to some of the diaphragm walls. 13 16 are in substitution of what we call T40 bars? 16 MR CONNOR: Thank you, sir. 16 are in substitution of what we call T40 bars? 16 MR CONNOR: Thank you, sir. 17 A. That' not aware of. 18 NF Chairman and Professor, this is the evidence of 18 Q. Canl bring you to page 40, line 16 onwards. 21 Q. Fust is when Mr Andy Ip. 22 Q. That is when Mr Andy Ip was being examined by coursel 24 Q. That is when Mr Andy Ip was being examined by coursel 24 Q. You not in that report, in the first line after the 25 12 | 6 | COMMISSIONER HANSFORD: I see. | 6 | Answer: This one, yes, I think at the time we did |
| 8 complete this expert report, was it brough to your 9 engineering department submitted that to the consultant 9 attention that in SCL project there were certain 9 company and asked whether i could be done this way. At 10 practices of planting dowels into the diaphragm walls? 11 11 11 11 11 12 Q. Yes. 11 11 11 12 Q. Yes. 11 | 7 | MR SO: Thank you. When you were actually engaged to | 7 | submit what we call TQ [technical query], that is the |
| 9 attention that in SCL project there were certain 9 company and asked whether it could be done this way. At 10 practices of planning dovels into the diaphragm walls? 10 the end, drilling was done to add theta was taken at the end." 12 Q. Yes. 10 the end, drilling was done to add theta was taken at the end." 13 A. I have seen some sketches of that. I think perhaps that applies to some of the diaphragm walls. 14 applies to some of the diaphragm walls. 13 MR SO: Thank you very much. Professor. I have no further 14 applies to some of the diaphragm walls. 14 Gastranon. POFessor. I have no further 15 Q. And do you understand that when planning dowels, they 15 Cross-examination by MR CONNOR 16 mare in substitution of what we call T40 burs? 16 MR CONNOR: Thank you, sir. 17 Good afterinoon. Prof Au. In Vincent Connor. 18 17 For down this afterinoon. 21 Mr Andy Ip. 2 Can I bring you to page 40, line 16 onwards. 23 3. Yes. 22 Can I bring you to page 40, line 16 onwards. 23 3. Yes. 4. Q. Yes. 4. Q. You note in that report, in the first line after the 2 9. You one in that report, in th | 8 | complete this expert report, was it brought to your | 8 | engineering department submitted that to the consultant |
| 10 practices of planting dowels into the diaphragm walls? 10 the end, drilling was done to add the T25 bar. That's 11 A. Do you mean at the bottom? 11 the remedial measure that was taken at the end." 12 Q. Yes. 11 A. Thave seen some sketches of that. I think perhaps that 13 MR SO: Thank you very much, Professor. I have no further 11 applies to some of the diaphragm walls. 13 MR SO: Thank you very much, Professor. I have no further 12 Q. Yes. 16 are in substitution of what we call T40 bars? 16 17 A. That I'm not aware of. 17 Goad afternoon. Prof Au. I'm Vincent Connor, 18 13 Q. Can I bring you to at transcript of our hearing. It is 17 Good afternoon. Prof Au. I'm Vincent Connor, 14 questions. 18 Tepresent Advins China Ld. and I have a few questions 15 Cara I bring you to page 40, line 16 onwards. 21 Q. Could you have before you, please, your report, which is 15 Cara I bring you to page 40, line 16 onwards. 22 A. Yes. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 24 Q. You note in that report, in the first line after the 25 < | 9 | attention that in SCL project there were certain | 9 | company and asked whether it could be done this way. At |
| 11 A. Do you mean at the bottom? 11 the remedial measure that was taken at the end." 12 Q. Yes. 11 the remedial measure that was taken at the end." 12 Q. Yes. 12 COMMISSIONER HANSPORD: Thank you. That's helpful. 13 A. I have seen some sketches of that. I think perhaps that 13 M. Show some of the diaphragm walls. 14 applies to some of the diaphragm walls. 13 M. Show you much. Professor. I have no further 14 apstitution of what we call T40 bars? 16 M. CONNOR: Thank you, sir. 17 A. That I'm not aware of. 16 M. CONNOR: Thank you, sir. 18 Q. Can I bring you to a transcript of our hearing. It is 19 for you this afternoon. 20 Mr Chairman and Professor, this is the evidence of 10 A. Right. 12 21 Mr Andy Ip. 21 Q. Could you have before you, please, your report, which is 22 22 Can I bring you to page 40, line 16 onwards. 23 A. Yes. 24 Q. You oote in that report, in the first line after the 23 A. Yes. 24 Q. You oote in that report, in the first line after the 25 word 'instructions'= | 10 | practices of planting dowels into the diaphragm walls? | 10 | the end, drilling was done to add the T25 bar. That's |
| 12 Q. Yes. 12 COMMISSIONER HANSFORD: Thank you. That's helpful. 13 A. I have seen some sketches of that. I think perhaps that 13 MR S0: Thank you very much, Professor. I have no further 14 applies to some of the diaphragm walls. 13 MR S0: Thank you very much, Professor. I have no further 14 applies to some of the diaphragm walls. 16 MR CONNOR 16 16 are in substitution of what we call T40 bars? 16 MR CONNOR 16 17 A. That Fm not aware of. 17 Good aftermoon, Prof Au. I'm Vincent Connor, 18 17 in Day 20 of the hearing, page 40. 19 for you this aftermoon. 20 20 Mr Chairman and Professor, this is the evidence of 21 Q. Could you have before you, please, your report, which is 21 Q. That is when Mr Andy Ip was being examined by counsel 2 FEU/7 in the bundle. 23 A. Yes. 2 everyone and for completemess, it reads: 2 Q. That is when Mr Andy Ip was being examined by counsel 2 Q. That is went for Au. I'm Vincent Connor, 1 A. Yes. 2 Q. U note in that report, in the first line after the 2 2 Q. That is went Mr Andy Ip | 11 | A. Do you mean at the bottom? | 11 | the remedial measure that was taken at the end." |
| 3 A. Have seen some sketches of that. I think perhaps that 13 MR SO: Thank you very much, Professor. I have no further 14 applies to some of the diaphragm walk. 14 questions. 15 Q. And do you understand that when planting dowels, they 16 Cross-examination by MR CONNOR 16 A. That I'm not aware of. 17 A. That I'm not aware of. 18 17 A. That I'm not aware of. 18 MR CONNOR: Thank you, sir. 18 Q. Can I bring you to a transcript of our hearing. It is 19 for you this afternoon. 20 Mr Chairman and Professor, this is the evidence of 21 Q. Could you have before you, please, your report, which is 22 Can I bring you to page 40, line 16 onwards. 22 ER1/7 in the bundle. 23 23 A. Yes. 24 Q. You note in thar report, in the first line after the 25 26 for the Commission, when he was asked about planting 24 Q. You note in thar report, in the first line after the 27 everyone and for completeness, it reads: 7 A. Yes. 2 2 2 everyone and for act (T40) was beat to the instructions" 2 2 - that you "have | 12 | 0. Yes | 12 | COMMISSIONER HANSFORD: Thank you. That's helpful. |
| 14 applies to some of the diaphragm walls. 14 questions. 15 Q. And do you understand that when planting dowels, they 15 Cross-examination by MR CONNOR 16 are in substitution of what we call T40 bars? 16 MR CONNOR. Thank you, sir. 17 A. That Tm not aware of. 17 Good aftermoon, Prof Au. Tm Vincent Connor, 18 Q. Can I bring you to a transcript of our hearing. It is 19 in Day 20 of the hearing, page 40. 20 A. Right. 20 Mr Chairman and Professor, this is the evidence of 20 A. Right. 21 Q. Could you have before you, please, your report, which is 21 Mr Andy Ip. 20 Sa Yes. 23 A Yes. 24 Q. That is when Mr Andy Ip was being examined by coursel 24 Q. You note in that report, in the first line after the 25 represential for Completeness, it reads: 24 Q. Yes. 24 Q. You note in that report, in the first line after the 25 Page 116 1 dowels in the diaphragm walls. Just for the bearts of the sinter was at the correct level but 3 A. Yes. 2 Q. wout the narrate eight issues at that point; do you see 6 that? 6 some instances the starter bar was | 13 | A. I have seen some sketches of that. I think perhaps that | 13 | MR SO: Thank you very much. Professor. I have no further |
| 1 approximation of the sumption sumption of the sumater sumption of the sumption of the sumption | 14 | applies to some of the diaphragm walls | 14 | questions. |
| 11 are in substitution of what we call T40 bars? 12 A. That I'm not aware of. 13 Q. Can I bring you to a transcript of our hearing. It is 14 are in substitution of what we call T40 bars? 15 in Day 20 of the hearing, page 40. 16 Mr Chairman and Professor, this is the evidence of 20 Mr Chairman and Professor, this is the evidence of 21 Mr Andy Ip. 22 Can I bring you to page 40, line 16 onwards. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 25 for the Commission, when he was asked about planting 26 everyone and for completeness, it reads: 27 when the starter bar was a the correct level but 28 instances the face of the diaphragm walls. Just for the benefit of 29 everyone and for completeness, it reads: 20 everyone and for completeness, it reads: 21 miteded alignment and one additional T25 starter bar 22 matter bar was at the correct level but 23 adjacent to the face of the diaphragm walls, lins 24 Q. You mentioned, I think, in response to questions from 21 are concerning the diameters bar. 22 matter bar was a lunderstand, T40 and T25 23 adjacent to the existing T40 starter bar. 24 A. Yes. 25 adjacent to the existing T40 starter bar. 26 would it be structurally anything componnising by using 27 A. Yes. 29 adjacent to the existing T40 starter bar. 31 adviser, but then later on - well, the date wasn't too 31 a CoMMISSIONER HANSFORD: The sort, stually, before we movel. 32 COMMISSIONER HANSFORD: Because I think Mr Ip goes on to say 34 COMMISSIONER HANSFORD: Because I think Mr Ip goes on to say 34 COMMISSIONER HANSFORD: Because I think Mr Ip goes on to say 34 COMMISSIONER HANSFORD: Because I think Mr Ip goes on to say 34 COMMISSIONER HANSFORD: Because I think Mr Ip goes on to sa | 15 | Ω And do you understand that when planting dowels, they | 15 | Cross-examination by MR CONNOR |
| 10 and in advancement of a mark of all interpreterment of a and all interpreterment or all interpreterment all intermeterment or all interpreterment or all inte | 16 | are in substitution of what we call T40 hars? | 16 | MR CONNOR: Thank you sir |
| 11 A link lim to hand of a link of the learing, page 40. 20 Mr Chairman and Professor, this is the evidence of 21 Mr Andy Ip. 22 Can I bring you to page 40, line 16 onwards. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 25 for the Commission, when he was asked about planting 26 Page 114 27 Page 114 28 Page 114 29 Page 114 20 Owells in the diaphragm walls. Just for the benefit of 20 everyone and for completeness, it reads: 21 dowels in the diaphragm walls. Just for the benefit of 21 dowels in the diaphragm walls. Just for the benefit of 29 everyone and for completeness, it reads: 20 everyone and for completeness, it reads: 20 everyone and for completeness, it reads: 20 everyone and for completeness, it reads: 21 dowels in the diaphragm walls. 22 more the diaphragm walls. 23 dowel is the tatter bar was at the correct level but 24 dowel alignment and one additional T25 starter bar. 25 diffield and fixed using Hilt chemical resin HIT-RES00 20 A. Yes. 21 a r25 starter bar to substitute a T40 bar? 23 A. Yes. 24 A. Yes. 25 Q. Would it be structurally anything compromising by using a T25 starter bar to substitute a T40 bar? 26 A. Ves. 27 A. Yes. 28 Q. Would it be structurally anything compromising by using a T25 starter bar to substitute a T40 bar? 25 berg that a T40. New, I thak if it is really 26 A. Right? 27 A. I dow'l fully understand whether? 28 Q. Would it be structurally anything compromising by using 39 Q. Would it be structurally anything compromising by using 30 A. Would it be structurally anything compromising by using 31 A. Idow'l fully understand whether? 31 A. Idow'l fully understand whether? 32 A. Ye | 17 | A That I'm not aware of | 17 | Good afternoon Prof Au I'm Vincent Connor |
| 10 9 Curr Unify 10 | 18 | O Can I bring you to a transcript of our hearing. It is | 18 | I represent Atkins China Ltd and I have a few questions |
| In Day 200 Mr Chairman and Professor, this is the evidence of 21 Mr Andy Ip. Can I bring you to page 40, line 16 onwards. A. Yes. Q. That is when Mr Andy Ip was being examined by counsel 25 for the Commission, when he was asked about planting Page 114 dowels in the diaphragm walls. Just for the benefit of 2 everyone and for completeness, it reads: "When the starter bar was at the correct level but 4 installed in the incorrect direction (that is not 4 instances the starter bar (140) was bent to the 6 instances the starter bar (1 | 10 | in Day 20 of the hearing name 40 | 19 | for you this afternoon |
| 20 Mr Andy Ip. 21 Q. Could you have before you, please, your report, which is 21 Q. That is when Mr Andy Ip was being examined by counsel 22 ERL/7 in the bundle. 23 A. Yes. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 24 Q. You note in that report, in the first line after the 25 for the Commission, when he was asked about planting 25 word "instructions" Page 114 1 dowels in the diaphragm walls. Just for the benefit of 2 Q. You note in that report, in the first line after the 2 everyone and for completeness, it reads: 2 Q that you "have been instructed to provide your 3 "When the starter bar was at the correct level but 3 opinion in respect of the following issues". 4 installed in the incorrect direction (that is not 5 Q. You mentioned, I think, in response to questions from 9 adjacent to the face of the diaphragm wall), in 5 Q. You mentioned, I think, in response to questions from 9 adjacent to the cavisting T40 starter bar." 1 A. Yes. 1 at Yes. 1 A. It's very complicated because at the very beginning <td>20</td> <td>Mr Chairman and Professor, this is the evidence of</td> <td>20</td> <td>A Right</td> | 20 | Mr Chairman and Professor, this is the evidence of | 20 | A Right |
| 21 Can I bring you to page 40, line 16 onwards. 22 Can I bring you to page 40, line 16 onwards. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 25 ER/7 in the bundle. 24 Q. That is when Mr Andy Ip was being examined by counsel 26 ER/7 in the bundle. 23 A. Yes. 25 for the Commission, when he was asked about planting 26 Word "instructions" Page 114 1 dowels in the diaphragm walls. Just for the benefit of 26 that you "have been instructed to provide your 2 everyone and for completeness, it reads: 20 that you "have been instructed to provide your 3 "When the starter bar was at the correct level but 30 opinion in respect of the following issues". 4 installed in the incorrect direction (that is not 5 Q. You then narrate eight issues at that point; do you see 6 some instances the starter bar (T40) was bent to the 6 that? 7 A. Yes. 8 Q. You mentioned, I think, in response to questions from 9 adjacent to the existing T40 starter bar." 9 Mr Pennicott this morning that you received instructions 10 noverming the diamet | 20 | Mr Andy In | 21 | O Could you have before you please your report which is |
| 22 Can Point of barge 40, mile Polonwards. 22 A. Yes. 23 A. Yes. 24 Q. That is when Mr Andy Ip was being examined by counsel 25 A. Yes. 24 Q. You note in that report, in the first line after the 25 for the Commission, when he was asked about planting 25 word "instructions" Page 114 1 dowels in the diaphragm walls. Just for the benefit of 1 A. Yes. 2 everyone and for completeness, it reads: 2 Q that you "have been instructed to provide your 3 "When the starter bar was at the correct level but 3 opinion in respect of the following issues". 4 installed in the incorrect direction (that is not 5 Q. You then narrate eight issues at that point; do you see 6 some instances the starter bar (T40) was bent to the intended alignment and one additional T25 starter bar." 9 Mr Pennicott this morning that you received instructions 10 Now, Prof Au, insofar as I understand, T40 and T25 11 A. It's very complicated because at the very beginning 12 A. Yes. 11 A. It's very complicated because at the very beginning 12 A. Yes. 11 A. It's very complicated beca | 21 | Con Line you to page 40 line 16 onwords | 21 | ER $1/7$ in the bundle |
| 2) N. Tes. D. The Tes. 2) Q. That is when Mr Andy Ip was being examined by counsel 24 Q. You note in that report, in the first line after the 25 for the Commission, when he was asked about planting 24 Q. You note in that report, in the first line after the 25 for the Commission, when he was asked about planting 24 Q. You note in that report, in the first line after the 26 devise in the diaphragm walls. Just for the benefit of everyone and for completeness, it reads: 2 Q | 22 | A Vec | 22 | A Ves |
| 24 Q. That is when Minist Min Anlay ip was being examined by contract 25 word "instructions" Page 114 Page 114 1 dowels in the diaphragm walls. Just for the benefit of 1 A. Yes. 2 everyone and for completeness, it reads: 2 Q that you "have been instructed to provide your 3 "When the starter bar was at the correct level but 3 opinion in respect of the following issues". 4 installed in the incorrect direction (that is not 5 Q. You then narrate eight issues at that point; do you see 6 some instances the starter bar (T40) was ben to the 5 Q. You then narrate eight issues at that point; do you see 6 some instances the starter bar." 9 Mr Pennicort this morning that you received instructions 10 Now, Prof Au, insofar as I understand, T40 and T25 10 in December. Do you recall when? 11 are concerning the diameters of bars; right? 11 A. It's very complicated because at the very beginning 12 A. Yes. 11 A. It's very complicated because at the very beginning 12 a T25 starter bar to substitute a T40 bar? 14 clear. Later on, I was asked to so I was invited to | 23 | A. 105. O That is when Mr Andy In was being eventined by counsel | 23 | You note in that report in the first line after the |
| Page 114 Page 114 Page 114 Page 116 1 dowels in the diaphragm walls. Just for the benefit of 1 A. Yes. 2 everyone and for completeness, it reads: 2 Q that you "have been instructed to provide your 3 "When the starter bar was at the correct level but 3 opinion in respect of the following issues". 4 installed in the incorrect direction (that is not 4 A. Yes. correct. 5 perpendicular to the face of the diaphragm wall), in 5 Q. You then narrate eight issues at that point; do you see 6 some instances the starter bar (T40) was bent to the 6 that? 7 intended alignment and one additional T25 starter bar 7 A. Yes. 8 drilled and fixed using H0 starter bar." 9 Mr Pennicott this morning that you received instructions 10 Now, Prof Au, insofar as I understand, T40 and T25 11 A. It's very complicated because at the very beginning 12 A. Yes. 11 A. It's very complicated because at the very beginning 12 A. Yes. 12 I was invited by the Highways Department to act as 13 Q. Would it be structurally anything compromising by using | 24 25 | Q. That is when Mi Andy ip was being examined by couriser | 24 | word "instructions" |
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| | Page 117 | | Page 119 |
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| 1 | came in December? | 1 | A. Well, now, normally, yes, but then in case there are |
| 2 | A. Yes, I believe so. | 2 | problems for example, I understand that the expert |
| 3 | Q. But that you had some involvement prior to that point, | 3 | reports from various parties contain the strength |
| 4 | giving some advice to the Highways Department? | 4 | utilisation factors and there are variations, and in |
| 5 | A. Yes. | 5 | some cases fairly large variations. |
| 6 | Q. Thank you. That's helpful. | 6 | Q. Let's come to the perceived problems in just a moment, |
| 7 | So, in fairness to you, and I say that given the | 7 | if we may. |
| 8 | depth of the questions that you've received so far, you | 8 | A. Yes. |
| 9 | don't come to this Commission of Inquiry with the | 9 | Q. Before proceeding further, you will recall you were |
| 10 | benefit of many months or indeed years | 10 | asked some questions by Mr Pennicott in particular as |
| 11 | A. No, no. | 11 | regards the joint statement. |
| 12 | Q of involvement in the design of these structures that | 12 | A. Yes. |
| 13 | we've been discussing? | 13 | Q. Which you agreed just before Christmas. If you would be |
| 14 | A. You mean design of the structure of the station? | 14 | good enough to have in front of you the expert report of |
| 15 | Q. Indeed. | 15 | Prof McQuillan, which is ER3, and in particular the |
| 16 | A. I wasn't involved. | 16 | appendix XI, where the agreed expert memorandum is set |
| 17 | Q. No. | 17 | out, from page 117 onwards; do you see that? |
| 18 | A. No. | 18 | A. Yes. |
| 19 | Q. Nor do you come with months or years of involvement in | 19 | Q. In particular, if you turn to page 118, article 3, I'd |
| 20 | checks or calculations | 20 | like to ask you a question about that. |
| 21 | A. Of this structure? | 21 | A. Yes. |
| 22 | Q. Of that structure, yes. | 22 | Q. In view of our discussions this morning and the comments |
| 23 | A. No. | 23 | from the Commissioners, you will understand that to some |
| 24 | Q. And listening carefully to your evidence, as I have been | 24 | extent we will for legal purposes regard this as |
| 25 | so far, would I be right in really assessing this of | 25 | a document upon which the Commissioners will have views |
| | Page 118 | | Page 120 |
| 1 | what you are sharing with us | 1 | in due course. But we did understand, I think, from you |
| 2 | A. Yes. | 2 | that the words in brackets in section 3, part 3 of this, |
| 3 | Q that your primary concern in this report and the | 3 | were derived from your own concern; yes? |
| 4 | evidence that you've given to the Commissioners so far | 4 | A. I believe that is the concern not only of me but also of |
| 5 | is less about, shall we say, a criticism of what has | 5 | the government. |
| 6 | been done by way of checking and calculation so far, but | 6 | Q. We are only asking you questions just now, Professor. |
| 7 | more a view that more needs to be done to satisfy your | 7 | A. Yes, it's my concern, it's my concern. |
| 8 | personal interest and concerns? | 8 | Q. So if we can stick to your concerns at this stage. |
| 9 | A. Not my personal interest and concern, no. | 9 | The paragraph I have in mind is the second |
| 10 | Q. Then if I adjust that last part: but that is principally | 10 | paragraph. |
| 11 | your view; it is that what has been done is okay, but | 11 | A. Yes. |
| 12 | more needs to be done to satisfy concerns as to the | 12 | Q. "All agreed that the change from couplers to |
| 13 | integrity of the structure that we have discussed? | 13 | through-bars in the top of the east D-wall was a better |
| 14 | A. Yes, correct. | 14 | detail and provided more steel across the interface" |
| 15 | Q. And so to the extent we have heard evidence already from | 15 | And then there follow some words in brackets: |
| 16 | those who have had an in-depth involvement in | 16 | " (subject to a review of the internal stresses |
| 17 | calculations and checking, and indeed we may hear more, | 17 | at the top-of-wall construction joint relating to the |
| 18 | because of the limited nature of your involvement, you | 18 | 'first change' and its rebar detailing)." |
| 19 | ·····, j··· | | |
| | would obviously respect those views of such persons? | 19 | Then it goes on to say: |
| 20 | would obviously respect those views of such persons? A. Yes, in terms of the involvement, yes, they have been | 19 20 | Then it goes on to say: "Notwithstanding, all agreed the outcome would not |
| 20 21 | would obviously respect those views of such persons?A. Yes, in terms of the involvement, yes, they have been involved much longer, it's true, yes. | 19 20 21 | Then it goes on to say: "Notwithstanding, all agreed the outcome would not show the construction joint to be problematic." |
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| 20 21 22 23 24 | would obviously respect those views of such persons?A. Yes, in terms of the involvement, yes, they have been involved much longer, it's true, yes.Q. And as far as they have an involvement in the detail of the checking of the calculations, you would, to a very | 19 20 21 22 23 24 | Then it goes on to say: "Notwithstanding, all agreed the outcome would not show the construction joint to be problematic." Do you see that? A. Yes. |
| 20 21 22 23 24 25 | would obviously respect those views of such persons?A. Yes, in terms of the involvement, yes, they have been involved much longer, it's true, yes.Q. And as far as they have an involvement in the detail of the checking of the calculations, you would, to a very large extent, as we all do, defer to them and rely on | 19 20 21 22 23 24 | Then it goes on to say: "Notwithstanding, all agreed the outcome would not show the construction joint to be problematic." Do you see that? A. Yes. Q. So the part I'm asking you about is that which appears |

| | Page 121 | | Page 123 |
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| 1 | about this, and the purpose of my question, and perhaps | 1 | structure." |
| 2 | as much for your comfort as it is for the learned | 2 | Do you see that? |
| 3 | Commissioners, is not to question what's set out here, | 3 | A. Yes. |
| 4 | but do we understand that with the benefit of reflection | 4 | Q. You go on to say: |
| 5 | that your evidence to the Commission is that in fact | 5 | "If the slab-wall joint cannot perform as a rigid |
| 6 | your concern as expressed in those brackets was | 6 | joint as expected, the internal forces may be different |
| 7 | not particularly with regard to the first change but | 7 | from those predicted from structural analysis based on |
| 8 | with regard to the second change? | 8 | the rigid joint assumption." |
| 9 | A. No. Actually, in the meeting, I raised both. | 9 | A. Yes. |
| 10 | Q. Yes. | 10 | Q. "In particular, the mid-span bending moments in the |
| 11 | A. I raised both. So that is shown in one of well, | 11 | slabs will increase." |
| 12 | I think the third figure of my report, showing different | 12 | A. Yes. |
| 13 | cross-sections. The labelled cross-sections I raised | 13 | Q. "If the slab-wall joint is improperly detailed and/or |
| 14 | both. So one of the cross-sections is a potential | 14 | poorly constructed, the stiffness of the slab-wall joint |
| 15 | problem arising from the first change, and I believe | 15 | will be reduced. In this unfortunate case, not only |
| 16 | that has caused the error of mixing the two together. | 16 | will the mid-span bending moments in the slab increase, |
| 17 | So the additional construction joint has been caused by | 17 | but the structural stability of the station may also be |
| 18 | the second change. | 18 | affected, eg excessive side-sway of station structure." |
| 19 | Q. Yes. | 19 | Do you see all of that? |
| 20 | A. So actually I raised two concerns. | 20 | A. Yes. |
| 21 | Q. And today what is your position? | 21 | Q. Just against this background and we'll come to look |
| 22 | A. Still | 22 | at these words in a little bit more detail, Professor |
| 23 | Q. Do you remain concerned about both changes? | 23 | I'd like to just understand this. It's not your |
| 24 | A. Yes. | 24 | position that when one designs a structure such as the |
| 25 | O So when I proceed to ask you some questions about the | 25 | one under discussion, that one needs to design for |
| | Q: Bo when I proceed to usk you some questions about the | | one under discussion, that one needs to design for |
| | Page 122 | | Page 124 |
| 1 | Page 122 calculations and the checks that you see as being | 1 | Page 124 extreme events, beyond those that the codes require, is |
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| | Page 125 | | Page 127 |
|--|---|--|--|
| 1 | a structure of that which is under discussion, one | 1 | A. Yes. |
| 2 | doesn't have to start designing for things that are not | 2 | Q. And if it were to come about, then significant distress |
| 3 | allowed for within there? | 3 | would self-evidently be apparent from the slab |
| 4 | A. Correct. I hope that you understand my point. What I'm | 4 | concerned? |
| 5 | saying is that there are certain rules laid down by the | 5 | A. I believe so. |
| 6 | design codes, such as provision of certain reinforcement | 6 | Q. There would, for example, be cracking on the top of the |
| 7 | that normally is not required because of the | 7 | joint? |
| 8 | calculations. | 8 | A. Now, the problem is |
| 9 | Now, I can give you one example. | 9 | Q. Sorry, if you could caveat that, and I will come back to |
| 10 | Q. Please do. One will be fine, thank you. | 10 | you explaining your problem, but if we can deal with |
| 11 | A. Okay, just one. Very often, the provision of | 11 | this point by point there would be cracking visible |
| 12 | reinforcement provided at locations not deemed necessary | 12 | on top of the joint? |
| 13 | may help in providing certain robustness. Actually, one | 13 | A. Not necessarily. The problem is |
| 14 | of my awards, in the year 2016, was from a paper on the | 14 | Q. Okay, please |
| 15 | robustness of concrete bridges. So it would help. | 15 | A in the joint there are certain parts, primarily the |
| 16 | Q. Where you describe in this paragraph, the sentence | 16 | reinforcement, taking tension, and concrete is taking |
| 17 | beginning "If the slab-wall joint cannot perform as | 17 | compression. The problem with concrete well, relying |
| 18 | a rigid joint as expected, the internal forces may be | 18 | a lot on the compression of concrete is that the |
| 19 | different from those predicted from structural analysis | 19 | behaviour is brittle, just like two of my slides showing |
| 20 | based on the rigid joint assumption" | 20 | brittle failure and ductile failure. |
| 21 | A. Yes. | 21 | So the problem with the joint is that in case |
| 22 | Q your statement there is not based upon any particular | 22 | anything goes wrong, it could be brittle, so we may not |
| 23 | evidence that has been put before you that the slab is | 23 | be able to see anything prior to its failure. |
| 24 | behaving in that way? | 24 | Q. So your position is side-sway, as you alert us to as |
| 25 | A. No. It's a structural engineering sort of concept. | 25 | being an example of what might arise here, would have to |
| | Page 126 | | Page 128 |
| 1 | Q. To what extent does your view of that possible | 1 | arise as a result of excessive and unusual |
| 2 | norformance of the clob demand upon for evenues, the | | |
| 2 | performance of the stab depend upon, for example, the | 2 | circumstances? |
| 3 | nature of a hinge within the structure? | 2 3 | circumstances? A. It would be unusual, yes. |
| 2 3 4 | nature of a hinge within the structure? A. Could you say that again? | 2 3 4 | circumstances? A. It would be unusual, yes. Q. But one would not necessarily see evidence in the form |
| 2 3 4 5 | a hinge within the structure?A. Could you say that again?Q. The nature of a hinge within the structure. | 2 3 4 5 | circumstances?A. It would be unusual, yes.Q. But one would not necessarily see evidence in the form of cracking of the concrete until it happened? |
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| | Page 129 | | Page 131 |
|--|---|--|---|
| 1 | is satisfied that this risk of extreme failure arising | 1 | A. Yes. The second concern is that the detail right now is |
| 2 | from unusual forces is excluded? | 2 | not one of those standard details, because of the first |
| 3 | A. Sorry, I beg your pardon. | 3 | change. So the problem is that there can be some |
| 4 | O. Let me break that down a little bit. | 4 | critical shear planes within the joint, and I think |
| 5 | A. Yes. | 5 | there is a need to change sorry, a need to check the |
| 6 | O. And, sir, in asking this question, I'm not at all | 6 | stresses along such critical shear planes. There may be |
| 7 | ignoring the Chairman's point of this morning that it | 7 | several. |
| 8 | may be helpful after Prof Au's evidence to have a list | 8 | Q. Again, that check that you've just described is within |
| 9 | of those tests, et cetera, that he considers may be | 9 | the simple category that you described to the professor? |
| 10 | helpful, but if you will permit me it's probably | 10 | A. Yes, simple. |
| 11 | important as we go through on a point-by-point basis to | 11 | Q. Thank you very much. |
| 12 | understand where he's coming from in terms of those | 12 | COMMISSIONER HANSFORD: So, therefore, that's all part of |
| 13 | likely checks and tests. Thank you. | 13 | the same numerical process that you've referred to? |
| 14 | So if I break that down a little bit, Professor, in | 14 | A. Yes. Now, the reason why I feel that there is a need to |
| 15 | fairness to you. | 15 | check is that because of the first change, because of |
| 16 | A. Yes. | 16 | the omission of the L-bars, U-bars or whatever now, |
| 17 | Q. In the situation that you have described in 6.4.1.1 | 17 | if you look up those design manuals for structures, |
| 18 | A. Yes. | 18 | normally there would be such details. If we omit some |
| 19 | Q and in particular to anticipate and to deal with, and | 19 | of these bars, that's not to say it must be |
| 20 | indeed confirm that your concerns are not well placed as | 20 | unacceptable, but then one has to check whether or not |
| 21 | regards, for example, excessive side-sway of the | 21 | there are problems. |
| 22 | structure arising, what checks or calculations do you | 22 | MR CONNOR: Thank you. |
| 23 | commend or require be carried out to satisfy us that | 23 | Professor, does that answer the question you had in |
| 24 | this is not going to happen? | 24 | mind? |
| 25 | A. I'm going to recommend, okay, certain checks. So, | 25 | COMMISSIONER HANSFORD: Yes. |
| | Page 130 | | Page 132 |
| 1 | first check all the stresses along the additional | 1 | MR CONNOR: Thank you |
| 2 | construction joints. And the other concern is that the | 2 | When you describe and forgive me because I'm |
| 3 | detail can I go on please? | 3 | a layman for these purposes asking you the question |
| 1 | Ω Ves. If we just take it slowly your first thing is | 4 | critical shear planes, can you explain what it is that |
| - 5 | check all the stresses along the additional construction | 5 | you say has to be checked and how? |
| 6 | ioints sorry if I may just pause there. To make | 6 | A May I draw it over here please (indicating whiteboard)? |
| 7 | sure that Lat least understand that these are those | 7 | CHAIRMAN: Sure, absolutely, |
| 8 | additional joints that arise from the so-called "second | 8 | COURT REPORTER: You need to speak into the microphone |
| 9 | change"? | 0 | the set of |
| 10 | | 9 | though. Can it move? |
| 11 | A. Yes. | 9 10 | A. (Drawing on the whiteboard) Now, here is one example. |
| | A. Yes.O. I know you have more to say so I will come back to that. | 9 10 11 | A. (Drawing on the whiteboard) Now, here is one example. I'm not saving this is the only critical shear plane. |
| 12 | A. Yes.Q. I know you have more to say so I will come back to that in a moment, but in response to questions from the | 9 10 11 12 | A. (Drawing on the whiteboard) Now, here is one example.I'm not saying this is the only critical shear plane.Note that there are several layers of very big bars, 40, |
| 12 13 | A. Yes.Q. I know you have more to say so I will come back to that in a moment, but in response to questions from the professor earlier on. I think perhaps before lunch, the | 9 10 11 12 13 | A. (Drawing on the whiteboard) Now, here is one example. I'm not saying this is the only critical shear plane. Note that there are several layers of very big bars, 40, 50 millimetres, whatever. Then they are supposed to be |
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25

Q. But that's for the future. Initially, for these checks,

can you help us with precisely the codes and standards

| | Page 133 | | Page 135 |
|---|--|----|---|
| | 1 on this joint. So that is within the joint. | 1 | which would require to be referred to to provide the |
| | 2 Now, we need to check the stress over here, whether | 2 | checks and the numerical calculations that you have |
| | 3 it is excessive or not; okay? So that is the major | 3 | described as necessary? |
| | 4 problem. In case the original design has been just | 4 | A. Yes, this is a difficult question. So what people |
| | 5 marginal, in case, adding another construction joint is | 5 | normally do is to when they do the design, they would |
| | 6 going to harm it further. So the problem is if we have | 6 | look at a certain region, what people call the D region. |
| | 7 two changes, two possible weakening, the total effect | 7 | I mention that. Then people normally use the |
| | 8 may not be just the sum of the two. It may be more. | 8 | strut-and-tie model, to arrive at the arrangement of |
| | 9 That's why if we are aware of any of these possible | 9 | reinforcement satisfying that the concrete can take the |
| 1 | 0 weaknesses, we have to check. | 10 | stresses, whatever, without problems. |
| 1 | 1 MR CONNOR: Thank you very much. | 11 | Now, if we, let's say, modify something, and then we |
| 1 | 2 COMMISSIONER HANSFORD: Just as a question of process, it's | 12 | try to do a back analysis to check whether it is okay or |
| 1 | 3 very useful to have these drawings on these flip charts. | 13 | not, it is not that simple. It would be very involved; |
| 1 | 4 Is there a way we can bring these into evidence; will we | 14 | okay? |
| 1 | 5 be taking photographs of these and then including them | 15 | Now, using this approach, if the stress turns out to |
| 1 | 6 somewhere in the bundles? | 16 | be very low, there is no problem, but then if it is |
| 1 | 7 MR PENNICOTT: We can do that, sir. | 17 | higher, then just doing that would not be sufficient. |
| 1 | 8 COMMISSIONER HANSFORD: Thank you. | 18 | So normal design codes would not tell you how much |
| 1 | 9 MR CONNOR: Thank you very much. Thank you for that helpful | 19 | is acceptable in this rather unusual scenario. |
| 2 | 0 explanation, Professor. | 20 | COMMISSIONER HANSFORD: So what would? If normal design |
| 2 | Again, so I understand, at the very least, the two | 21 | codes would not tell you what is acceptable, what would |
| 2 | 2 areas of checking and calculation that you've described, | 22 | tell you what's acceptable? |
| 2 | 3 can you help the Commissioners with against what | 23 | A. People normally there are some standard situations, |
| 2 | 4 standards or codes these checks are to be carried out? | 24 | normal beam-column joints like that so a beam and |
| 2 | 5 Because you will understand that the idea of numerical | 25 | a column like that. So for this very standard case, |
| | Page 134 | | Page 136 |
| | 1 checks and calculations and so on is a little bit | 1 | people can refer to the Code of Practice, and there is |
| | 2 lacking in detail, with no disrespect. So precisely | 2 | a formula for people to work out the required amount of |
| | 3 what codes and standards do you say must be applied in | 3 | reinforcement. |
| | 4 relation to the checks that are to be carried out? | 4 | But for some other more complicated cases, then it |
| | 5 A. This is a very difficult question. So that is why | 5 | would be difficult and people would have to do the |
| | 6 normally engineers would follow standard details. At | 6 | design from first principles, and normally people would |
| | 7 the joints, they have certain bars, L-bars, U-bars, | 7 | try to, first of all, come up with the forces, look at |
| | 8 whatever. If they follow such details, then normally | 8 | what happens inside the connection and then provide |
| | 9 there would be no problem, but if they modify, they omit | 9 | sufficient reinforcement. |
| 1 | 0 something, it would be very difficult. | 10 | If we reduce some of the reinforcement, if we omit |
| 1 | 1 Now, the major now, if we do that, that's | 11 | some of the bars, would that be acceptable? This |
| 1 | 2 simplified check. If we discover that the stresses are | 12 | question is more difficult to answer. Then people can, |
| 1 | 3 very low, no problem. But then if they are high, let's | 13 | for example, use three-dimensional finite element to do |
| 1 | 4 say 5 megapascals, the next question is what is the | 14 | that. Even for a reinforcing bar we are not treating |
| 1 | 5 acceptance criteria. There is no simple answer. | 15 | that as a bar but a lot of small elements, volumes, it's |
| 1 | 6 Q. Let's pause at that point, because I don't want us to | 16 | very complicated. Normally, people doing research, |
| 1 | 7 get too far ahead of ourselves. You have described to | 17 | postgraduate level, would do that, so things would take |
| 1 | 8 the Commissioners the simple tests that may be done, and | 18 | several months or whatever. It would be very |
| | 9 you quite rightly say, of course, if certain things are | 19 | complicated. |
| 2 | found as a result of those, then there's, if you will | 20 | MR CONNOR: Professor, if I may. |
| 2 | excuse the colloquial expression, a deeper dive that may | 21 | COMMISSIONER HANSFORD: Thank you. |
| 2 | have to be done in that regard. | 22 | MR CONNOR: You will forgive me if I push you a little bit |
| | | | |

- 24 A. Yes.
- 25~ Q. Because we are not in the complicated area yet. We are

34 (Pages 133 to 136)

Day 40

| | Page 137 | | Page 139 |
|---|---|---|--|
| 1 | not in the many months of sophisticated calculations. | 1 | evidence and we are none the wiser about what it is that |
| 2 | We are in the simple zone in terms of these. If you | 2 | he thinks is required, and then out of discussion we get |
| 3 | cannot help us with this, please just say, but I would | 3 | a list. I don't know how long that list will be. |
| 4 | like to come away from your evidence, subject to the | 4 | I don't know if it will be in the simple zone or the |
| 5 | learned Commissioners allowing me to do so, with | 5 | sophisticated. |
| 6 | an understanding of what you demand. | 6 | CHAIRMAN: I see your point. |
| 7 | A. I'm not demanding. | 7 | MR CONNOR: I think you both have it. |
| 8 | O. Well, I'm sorry, you are. | 8 | Professor? |
| 9 | A. I'm just raising certain concerns. | 9 | COMMISSIONER HANSFORD: I think we do, but my understanding, |
| 10 | O. Professor, bear with me. If you say that the checks and | 10 | unless I've missed something my understanding is that |
| 11 | calculations carried out by others who have been steeped | 11 | the only calculations and tests that Prof Au has been |
| 12 | in this design and construction for months and years are | 12 | suggesting today have been, one, related to the stresses |
| 13 | not acceptable but you want more things done you do | 13 | in the construction joints at the top detail of the |
| 14 | have to say to us what precisely it is that you require | 14 | diaphragm wall, and two, further tests relating to |
| 15 | to be done, and if you are not in a position to do so | 15 | partially engaged couplers. |
| 16 | then simply say that and we can move on to another | 16 | I have not registered any other tests or |
| 17 | question | 17 | calculations that Prof Au is suggesting Perhaps I can |
| 17 | A Now allow me to say so. So far, I'm not aware of any | 18 | iust check: am I right? |
| 10 | design colculations of the joint wars submitted. I may | 19 | A Well actually there could be some potential weakness |
| 19 | have overlooked something | 20 | as shown in the vertical red line over there (indicating |
| 20 | D I'm not testing you on your memory here sir. I'm | 20 | the whiteboard) |
| 21 | Q. The not testing you on your memory here, sir. The | 21 | COMMISSIONED HANSEODD: But that's also related to the |
| 22 | asking you a question. You ve told the professor this | 22 | change in detail at the ten of the diaphragm well? |
| 23 | morning that you believe there is a series of simple | 23 | A Vac |
| 24 | checks that should be carried out. You have told us | 24 | A. ICS. |
| 25 | we'll check along the shear planes, that we'll look at | 25 | COMMISSIONER HANSFORD: Therefore the point 1 m making is |
| | D 100 | | D 110 |
| | Page 138 | | Page 140 |
| 1 | Page 138 the new design details and we'll look at the second | 1 | Page 140 what I understood is that you are recommending further |
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| | Page 141 | | Page 143 |
|--|--|---|---|
| 1 | introduced by breaking out part of the completed | 1 | against the D-wall." |
| 2 | diaphragm wall may create potential surfaces of | 2 | Do you see that? |
| 3 | weakness, they should be checked by proper structural | 3 | A. Yes. |
| 4 | calculations to ensure that the internal stresses | 4 | Q. Do you not recognise and agree |
| 5 | generated at these joints would not be excessive." | 5 | A. I don't agree. Well, actually, in my presentation this |
| 6 | Just pausing at that point, I think that aligns with | 6 | morning, there were two slides showing why we have shear |
| 7 | your last response to Prof Hansford? | 7 | stresses, and when there is a change in the loading the |
| 8 | A. Yes. | 8 | internal forces, the stresses will all change. So, in |
| 9 | Q. "Apparently, no such calculations have been provided by | 9 | particular, over this additional construction joint, |
| 10 | MTRCL to the Building Authority so far. If the stresses | 10 | there would be shear forces. There would be. |
| 11 | at the actual locations of construction joint are | 11 | Q. Professor, you have helped with that view already. But |
| 12 | excessive, remedial works may be needed." | 12 | the short position is this, is it not, that the clamping |
| 13 | Just pausing at that point and to test it you | 13 | action as described by Prof McQuillan is exactly what is |
| 14 | will recall this morning that Mr Pennicott referred you | 14 | to be expected, given the make-up of the slabs that he |
| 15 | to Prof McQuillan's opinion, and in particular | 15 | has described? The weight of the structure is such that |
| 16 | paragraphs 98 and those following it. For the | 16 | the vertical forces which are being deployed create |
| 17 | reference, this is ER3. | 17 | a bending moment which compresses the slabs. It is |
| 18 | A. Yes. | 18 | reinforced to a very, very large extent, and therefore |
| 19 | Q. In Prof McQuillan's report at paragraph 98 and in those | 19 | the risk of anything of the type that you are concerned |
| 20 | paragraphs following it, he's dealing there with the | 20 | with arising is simply not realistic. |
| 21 | amended EWL slab to east D-wall connection, and he goes | 21 | A. No, it's incorrect. It's incorrect. We always look at |
| 22 | on in paragraph 98, he talks about, in his opinion, | 22 | the mechanics and find out the forces. That is not the |
| 23 | the amended detail, as represented by the first change | 23 | correct way. |
| 24 | to second change, is superior. You have given your view | 24 | Q. So you take the view that therefore what Prof McQuillan |
| 25 | on that already. | 25 | has described ignores the likelihood or at least the |
| | Page 142 | | Page 144 |
| 1 | Then at paragraph 99 he says the following: | 1 | risk that something might arise? |
| 2 | "Intuitively, and from experience, the shelf joint | 2 | A. I believe so. |
| 3 | is superior to the butt joint in terms of its ease of | 3 | Q. And by that "something", we see the application of |
| 4 | construction and rigidity." | 4 | forces such that there is some significant distress that |
| 5 | He then goes on to make reference to a schematic | 5 | will be found within the structure? |
| 6 | diagram below, which illustrates, as he says in line 4 | 6 | A. Now, the |
| 7 | | | |
| | onwards, "how the trimmed-down D-wall is encapsulated | 7 | Q. Please answer the question. Prof McQuillan has got it |
| 8 | onwards, "how the trimmed-down D-wall is encapsulated and 'clamped' by the EWL slab bending away in one | 7 8 | Q. Please answer the question. Prof McQuillan has got it wrong and actually you say that because of the evidence |
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| 8 9 10 | onwards, "how the trimmed-down D-wall is encapsulated and 'clamped' by the EWL slab bending away in one direction, the OTE bending away in the opposite direction, and the self-weight of the integral 'block' | 7 8 9 10 | Q. Please answer the question. Prof McQuillan has got it wrong and actually you say that because of the evidence that you have given to this Commission, there is a risk, perhaps no higher than that; there will be a failure in |
| 8 9 10 11 | onwards, "how the trimmed-down D-wall is encapsulated and 'clamped' by the EWL slab bending away in one direction, the OTE bending away in the opposite direction, and the self-weight of the integral 'block' of reinforced concrete (coloured in blue) which bears | 7 8 9 10 11 | Q. Please answer the question. Prof McQuillan has got it wrong and actually you say that because of the evidence that you have given to this Commission, there is a risk, perhaps no higher than that; there will be a failure in the slab? |
| 8 9 10 11 12 | onwards, "how the trimmed-down D-wall is encapsulated and 'clamped' by the EWL slab bending away in one direction, the OTE bending away in the opposite direction, and the self-weight of the integral 'block' of reinforced concrete (coloured in blue) which bears down on the top-of-wall construction interface. The | 7 8 9 10 11 12 | Q. Please answer the question. Prof McQuillan has got it wrong and actually you say that because of the evidence that you have given to this Commission, there is a risk, perhaps no higher than that; there will be a failure in the slab?A. I'm not saying that there will be a failure. I am just |
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| | Page 145 | | Page 147 |
|---|---|---|---|
| 1 | understand that. So if we provide some tendons and do | 1 | Q. I think I can probably help you with that, Professor, |
| 2 | post-tensioning, then there will be clamping action, but | 2 | because that's not the point. |
| 3 | if we just cast it in situ, there won't be any clamping | 3 | If you have regard to the letter which accompanied |
| 4 | action that is useful. | 4 | these, which I think you will find in exhibit J6/28; do |
| 5 | Q. Thank you. Just going back to your comment of a moment | 5 | you have that? |
| 6 | ago, so we understand the extent of this risk that | 6 | COMMISSIONER HANSFORD: Can we have it on the screen? |
| 7 | troubles you, I think you say at best here of course it | 7 | MR CONNOR: Yes. |
| 8 | depends upon the tests that you have told the | 8 | That is a letter, which is at J6/28 from Atkins to |
| 9 | Commissioners should be carried out, but as you say: | 9 | the solicitors for the Commission. |
| 10 | " it depends on the magnitude. It may not be | 10 | MR PENNICOTT: That's it. |
| 11 | very big. I think there may be marginal problems over | 11 | MR CONNOR: Thank you very much. |
| 12 | there. So I'm not expecting" | 12 | MR PENNICOTT: We looked at this this morning. |
| 13 | You are not expecting much, are you? | 13 | MR CONNOR: Yes, quite right, Mr Pennicott. This is to |
| 14 | A. Not really. If we have to check we have to check. | 14 | Lo & Lo: |
| 15 | There may be certain issues over there, so the | 15 | "We refer to your email of 19 December 2018 |
| 16 | horizontal shear stresses may exceed what we normally | 16 | requesting calculations to demonstrate that internal |
| 17 | accept. Well, in the normal design process, when the | 17 | stresses at the construction joint (cut-down wall top |
| 18 | horizontal shear stresses are exceeded, then we need to | 18 | interface) are within acceptable limits for the 'first |
| 19 | provide additional reinforcement, perhaps in the form of | 19 | change' necessitated by the missing U-bars at the top of |
| 20 | some additional dowel bars or whatever. It's quite | 20 | the D-wall. Similar calculations in relation to the |
| 21 | common. | 21 | 'second change' were also requested. |
| 22 | Q. Okay. Moving on then to paragraph 6.4.3.3 in this | 22 | The requested calculations for both the 'first |
| 23 | paragraph, you refer to the submission of calculations | 23 | change' and 'second change' are enclosed." |
| 24 | by Atkins, and these are the calculations to which you | 24 | Do you see that? |
| 25 | have made some reference in your evidence already. Do | 25 | A. Yes. |
| | | | |
| 1 | Page 1/6 | | Page 1/8 |
| | Page 146 | | Page 148 |
| 1 | Page 146 you see that? | 1 | Page 148 Q. Then you will see, if you go on to the next page, |
| 1 2 | Page 146 you see that? A. 6.4.3.3? | 1 2 | Page 148 Q. Then you will see, if you go on to the next page, please, J6/28.1, which again I think Mr Pennicott took |
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| | Page 149 | | Page 151 |
|----------------|---|----------|---|
| 1 | A. Yes. | 1 | Q. We understand what your position is on this, but your |
| 2 | Q. So it didn't arise from a concern, it arose from | 2 | position, firstly, as I understand it, is that there is |
| 3 | a question that had been posed of Atkins to provide some | 3 | a range of simple checks that you would like to have |
| 4 | calculations? | 4 | done |
| 5 | A. Yes. | 5 | A. Yes. |
| 6 | Q. Thank you. So what you then go on to say, returning to | 6 | Q and your position is that this should be done now for |
| 7 | your report, if you look at the second sentence, is: | 7 | all of the amended joint details? |
| 8 | "In Atkins' report only some calculations for | 8 | A. Yes. |
| 9 | a typical slab-wall joint are provided" | 9 | Q. How many of those are there, sir? |
| 10 | And you go on to say: | 10 | A. Well, there are so many. If you look at the drawings, |
| 11 | " it is certainly not enough." | 11 | there are many, many different details, or some details |
| 12 | If we pause at that point, the typical slab-wall | 12 | with very complicated construction joints. |
| 13 | joint that Atkins address in their report, J6/4557 and | 13 | COMMISSIONER HANSFORD: Sorry, when you say there are "many. |
| 14 | those pages following it, are indeed the same as those | 14 | many", are we talking about five? |
| 15 | that you address in your figure 6.4.3.3.1; is that | 15 | A. No, more than that. |
| 16 | right? | 16 | MR PENNICOTT: Four basic ones. |
| 17 | A. Yes. | 17 | COMMISSIONER HANSFORD: Is four "many, many"? |
| 18 | Q. So in fact both you and Atkins | 18 | A. Well, the drawings show many, but then some of them may |
| 19 | A. Sorry, are you referring okay. So are you referring | 19 | be having similar characteristics, perhaps a bit |
| 20 | to this? | 20 | different to reinforcement. In terms of the shape, |
| 21 | Q. I'm referring to the figure that is set out at the | 21 | I think they can be categorised into just a few. |
| 22 | bottom of page 11 of your report. | 22 | MR CONNOR: Precisely. So what you are requiring is not |
| 23 | A. Yes. Yes. | 23 | "many, many" checks to be done; you would like four |
| 24 | Q. So when you say that Atkins have provided some | 24 | types of detail looked at? |
| 25 | calculations for a typical slab-wall joint, it is the | 25 | A. It depends. It depends. |
| | Page 150 | | Page 152 |
| 1 | same typical slab-wall joint that you yourself focus on | 1 | Q. What does it depend on? |
| 2 | in your report; okay? | 2 | A. Because for a certain shape, there may be different |
| 3 | A. Yes. | 3 | reinforcement, and then for different cases, yes, |
| 4 | Q. Your complaint about this typical slab-wall joint | 4 | of course, there is a need to check. |
| 5 | well, you say "it is certainly not enough" do | 5 | Q. Professor, please can we hone this down to |
| 6 | I understand really that where you are coming from there | 6 | an understanding of what your position is. You have |
| 7 | is in your professional view, to become comfortable with | 7 | said in this report, lodged for the purposes of the |
| 8 | the concerns that you express in your report, you wish | 8 | learned Commissioners, that: |
| 9 | to see more construction joint details covered by | 9 | "Calculations must be carried out on all design |
| 10 | calculations similar to this one? | 10 | variations of slab-wall joint to ensure their safety." |
| 11 | A. Yes. | 11 | A. Yes. |
| 12 | Q. So it is not a criticism of the use of that as a typical | 12 | Q. Are we speaking now of four or five? |
| 13 | detail; it is that you would like to see them all | 13 | A. Actually it depends on the final design that is adopted |
| 14 | covered? | 14 | by the contractor. So if there are many, then there is |
| 15 | A. I think to ensure safety it is necessary to check all of | 15 | a need to do many checks. |
| 16 | them. | 16 | Q. Professor, subject to such direction from the learned |
| 17 | Q. I understand what your sentiment is there, Professor, | 17 | Commissioners as they choose to give me, I am pressing |
| 18 | but simply so we understand it | 18 | you a little bit here to help us, and it doesn't help |
| 19 | And is that series of checks, if carried out in | 19 | us, with respect, if you simply raise another conundrum |
| 20 | respect of the other slab-wall joints, within the | 20 | from a question that otherwise needs to be answered. |
| 21 | category of simple checks that you described to the | 21 | We have said to you, I have said to you, we are |
| - | Commissioners this morning? | 22 | talking about four typical details that might be |
| 22 | | | |
| 22 23 | A. I think simple checks should be done first. If there is | 23 | considered in these simple checks. Another view might |
| 22 23 24 | A. I think simple checks should be done first. If there is problem or if there is doubt, then either one goes for | 23 24 | considered in these simple checks. Another view might be that there are five. Do you agree that that is in |

| | Page 153 | | Page 155 |
|---|--|---|--|
| 1 | A. I have seen many different details but I am not yet in | 1 | at the top of page 12. |
| 2 | a position to classify them into just several. | 2 | A. Yes. |
| 3 | Q. Thank you. If we have a look at a drawing which is | 3 | Q. Do you have that? |
| 4 | B25487, in B19. | 4 | A. Yes. |
| 5 | MR PENNICOTT: That's it. | 5 | Q. It's there that you refer, in the first sentence, to |
| 6 | MR CONNOR: Thank you very much. Thank you, Mr Chairman and | 6 | "Atkins attempts to calculate the horizontal shear |
| 7 | Mr Pennicott. | 7 | stress", and you go on to refer to the calculation which |
| 8 | So, Professor, you have in front of you | 8 | was used. |
| 9 | A. Yes. | 9 | You recognise the calculation, I take it? |
| 10 | Q there B25487. Does this help you in assisting the | 10 | A. Yes, this one? |
| 11 | learned Commissioners on the number of details which | 11 | Q. Yes. When you read the report, you recognised the |
| 12 | would sensibly be checked as part of the simple checks | 12 | calculation that had been deployed? |
| 13 | that you are commending? | 13 | A. Yes. |
| 14 | A. Perhaps, let's say, in this structure, how many well, | 14 | Q. And you recognised it as one which was used, as you put |
| 15 | different types of slabs are there; okay? So probably, | 15 | it, "for evaluation of shear stresses in a homogeneous |
| 16 | even for the design of the slab, there may be many | 16 | beam under shear due to flexure at elastic state"? |
| 17 | different types. | 17 | A. Yes. |
| 18 | Now, in this drawing now, there are several | 18 | Q. You accept, do you not, that part of the assessment of |
| 19 | types, but the detail may appear at different locations, | 19 | shear, that that is a perfectly proper equation to use? |
| 20 | and at different locations the bending moment, shear | 20 | A. Yes. |
| 21 | force, whatever, may be different. | 21 | Q. Your point is that you would like more done? |
| 22 | Now, of course, if one tries to look at all of them | 22 | A. Well, now, I believe that what the designer or whoever |
| 23 | and tries to come up with the most critical one, just do | 23 | is trying to do is to find out the horizontal shear |
| 24 | one check, fine, and if it is found to be acceptable, | 24 | stress inside the joint. But that equation doesn't give |
| 25 | fine. But then if that is not the case, then there will | 25 | the shear stress inside the joint. It is within the |
| | | | |
| | Dago 154 | | Dago 156 |
| | Page 154 | | Page 156 |
| 1 | Page 154 be many different cases. | 1 | Page 156 beam, outside the joint. |
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| | Page 157 | | Page 159 |
|---|--|---|---|
| 1 | Now, in order to find out what's going on within the | 1 | O equation? Well, why do you mention it, Professor? |
| 2 | connection, we have to know a lot. The bending moments | 2 | A. I'm just saying that even for calculation of the shear |
| 3 | at the two sides actually, the most important would | 3 | stress in the beam, it is not correct. |
| 4 | be the bending moment rather than the shear force, the | 4 | O. So 6.19 of the Concrete Code you cite at the end of that |
| 5 | vertical shear force that is totally wrong. | 5 | paragraph doesn't help us at all? |
| 6 | Q. It is not wrong, Professor. It is a start. Your view | 6 | A. No. |
| 7 | is that more needs to be done; is that right? | 7 | Q. Why do you refer to it then? |
| 8 | A. No. | 8 | A. It's just to show that this original equation that he |
| 9 | Q. You say it's wrong, full stop? | 9 | has used is inappropriate. It is not used at all in the |
| 10 | A. It's wrong. So what he has calculated is the shear | 10 | design of reinforced concrete structures. |
| 11 | stress inside the beam, not within the connection, and | 11 | Q. So, as far as 6.19 of the Concrete Code is concerned, |
| 12 | that is only for the elastic state. | 12 | you would accept that it's not an alternative to address |
| 13 | Q. So what should he do? | 13 | your concern because it also assesses the shear across |
| 14 | A. Sorry? | 14 | the whole section? |
| 15 | Q. What should he do? | 15 | A. Equation 6.19 is for calculation of shear stress within |
| 16 | A. Well, I think he has to learn beam-column joint theory. | 16 | the beam. |
| 17 | It's totally wrong. | 17 | Q. Yes. |
| 18 | Q. Let us put your personal assessment to one side because | 18 | A. I think probably I need to explain. Let's say if that |
| 19 | what I'm really asking you is, if it's not that | 19 | is a beam (holding a marker pen) and if let's say this |
| 20 | equation, what equation is it, Professor? | 20 | is well, the connection (holding a water bottle), |
| 21 | A. Well, are you trying to ask me to again explain to you? | 21 | what that equation let's say the equation that that |
| 22 | Q. No, I'm asking you a very straight question, Professor. | 22 | designer has used to calculate would be the shear stress |
| 23 | You say wrong equation used. I ask you what one should | 23 | within this (indicating marker pen) at elastic state. |
| 24 | it be then? | 24 | But it is not acceptable. To evaluate the shear stress |
| 25 | A. There is no simple equation. We have to look at the | 25 | of that at the ultimate limit state, we have to use |
| | Decc. 159 | | D 160 |
| | Fage 156 | | Page 160 |
| 1 | free body go to the basics go to the first principles | 1 | 6.19. to find out what's over here (indicating water |
| 1 2 | free body, go to the basics, go to the first principles. | 1 2 | Page 160 6.19, to find out what's over here (indicating water bottle), to find out the horizontal shear stress over |
| 1 2 3 | free body, go to the basics, go to the first principles. Actually there is a section in the Concrete Code on beam-column joint, but the problem is that it only gives | 1 2 3 | Page 160 6.19, to find out what's over here (indicating water bottle), to find out the horizontal shear stress over there sorry, these two equations would not help. |
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| | Page 161 | | Page 163 |
|---|---|---|---|
| 1 | Now, if we look at this free body, in particular the | 1 | If I try to hold like this the 10 kilograms (holding |
| 2 | horizontal balance of force or equilibrium it is | 2 | water bottle away from body) I don't think I can hold |
| 3 | possible for us to work out the horizontal shear force | 3 | it for ten minutes because of this distance. That is |
| 4 | or horizontal shear stress. | 4 | what we call eccentricity. This is going to create |
| 5 | So neither of the equations would help. We have to | 5 | a moment. So in addition to the axial force. I have to |
| 6 | consider this equilibrium. | 6 | carry that moment as well. |
| 7 | O. Okay. Let's come to look at that in a moment. Just so | 7 | The problem is there is a need to check the strength |
| 8 | we have it for the record, you don't see the equation | 8 | of the part of the pink part of the concrete above |
| 9 | being deployed by Atkins as relevant at all to helping | 9 | the diaphragm wall. |
| 10 | the assessment | 10 | O. Very good. But that last part of your evidence I think |
| 11 | A. It's irrelevant. | 11 | reveals really where you come from on this, consistent |
| 12 | O. In your view? | 12 | with what you have said earlier on this afternoon. |
| 13 | A. Yes. | 13 | namely this, that you do not guarrel with the |
| 14 | O. And you do not even see it as part of the exercise? | 14 | proposition that, if I put it this way, it might be the |
| 15 | A. Sorry? | 15 | case that the pink down-stand part of the OTE wall acts |
| 16 | O. Part of the exercise of assessing and reporting upon the | 16 | as a shear key to help resist the horizontal shear |
| 17 | structure in the way that Atkins were asked to do. | 17 | stress at the additional construction joint; it's simply |
| 18 | A. So this part of the calculation has calculated something | 18 | that you want more evidence that that's so. |
| 19 | else, not something within the connection. | 19 | A. Let me explain. |
| 20 | Q. You then move on to talk about, as you say, the free | 20 | Q. Sorry, we'll come to your explanation in a moment. |
| 21 | body. | 21 | Please answer my question, under direction, if need be, |
| 22 | A. Yes. | 22 | from the learned Commissioners. If you go back to my |
| 23 | Q. In 6.4.3.5, which is the next paragraph of your report, | 23 | question you say it might be the case that the pink |
| 24 | that is where you refer to Atkins' report in the lower | 24 | down-stand part of the OTE wall acts as a shear key to |
| 25 | half of the page 3 of 5. | 25 | help resist the horizontal shear stress at the |
| | | | |
| | Page 162 | | Page 164 |
| 1 | Page 162 | 1 | Page 164 |
| 1 | Page 162 A. Yes. | 1 | Page 164 additional construction joint, but you want more |
| 1 2 3 | Page 162 A. Yes. Q. " to a cross-sectional diagram of the revised joint (which is reproduced below) claiming that the pink | 1 2 3 | Page 164 additional construction joint, but you want more evidence of that. Is that so? Do I understand you |
| 1 2 3 | Page 162 A. Yes. Q. " to a cross-sectional diagram of the revised joint (which is reproduced below) claiming that the pink down stand part of OTE well can act as a cheer leav to | 1 2 3 | Page 164 additional construction joint, but you want more evidence of that. Is that so? Do I understand you correctly? |
| 1 2 3 4 5 | Page 162 A. Yes. Q. " to a cross-sectional diagram of the revised joint (which is reproduced below) claiming that the pink down-stand part of OTE wall can act as a shear key to help resist the horizontal shear stress at the | 1 2 3 4 5 | Page 164 additional construction joint, but you want more evidence of that. Is that so? Do I understand you correctly? A. The problem is whenever we look at a structural component, we always look at the weakest part, because |
| 1 2 3 4 5 | Page 162 A. Yes. Q. " to a cross-sectional diagram of the revised joint (which is reproduced below) claiming that the pink down-stand part of OTE wall can act as a shear key to help resist the horizontal shear stress at the additional construction joint " | 1 2 3 4 5 | Page 164 additional construction joint, but you want more evidence of that. Is that so? Do I understand you correctly? A. The problem is whenever we look at a structural component, we always look at the weakest part, because the strength is governed by the weakest part |
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| | Page 165 | | Page 167 |
|---|--|---|--|
| 1 | Commissioners you don't agree with that. | 1 | maybe are issues which go beyond that limit of |
| 2 | A. No. | 2 | marginality. |
| 3 | Q. But it is the case, I have to put to you, Professor, | 3 | Does that make any sense? |
| 4 | that Prof McOuillan is right, the proposition from | 4 | MR CONNOR: It absolutely does, sir, and I think it maybe |
| 5 | Atkins is right, and in fact no calculation is actually | 5 | just allows me to clarify with Prof Au where he is on |
| 6 | required, given how self-evident the position is | 6 | that, but I think we have it already that really, |
| 7 | applying these engineering principles? | 7 | Professor, as far as the assessment of the marginality, |
| 8 | A. It is similar to the case when we are talking about | 8 | as we put it, of that risk is concerned, we go back to |
| 9 | a chain. If there is a weak link in the chain, no | 9 | the simple checks that you discussed with Prof Hansford, |
| 10 | matter how we claim now, the strength is governed by | 10 | because, as I understand your evidence, if those are |
| 11 | the weakest link. Actually, it violates the basic | 11 | carried out, and if the results are as one would hope |
| 12 | principles of mechanics. | 12 | and expect, then we are within hopefully the area of |
| 13 | COMMISSIONER HANSFORD: Sorry, in what way? | 13 | what would be acceptable to you and other experts. |
| 14 | A. Well, we always look at free bodies. We always look at | 14 | A. Mmm. |
| 15 | equilibrium. So if we isolate a certain part as a free | 15 | MR CONNOR: Thank you, if that helps. |
| 16 | body, we have to satisfy ourselves that equilibrium can | 16 | CHAIRMAN: That does. Thank you. |
| 17 | be satisfied, strength is there. Otherwise well. | 17 | MR CONNOR: Thank you. We were just looking if I may, |
| 18 | I think it's just I think for an engineer that | 18 | sir just at that last sentence of 6.4.3.5, where you |
| 19 | understands the basic well, the basic behaviour of | 19 | were saving: |
| 20 | a joint like this, and when the engineer looks at the | 20 | "Apparently, the top reinforcement has not been |
| 21 | free body, then the engineer should be able to | 21 | designed to resist the combined tension and bending |
| 22 | understand what is happening to that part. | 22 | moment. It is uncertain if the horizontal shear |
| 23 | So actually, there would be a lot of tension, and | 23 | resistance at the additional construction joint and the |
| 24 | there must be shear, must be, because so one argument | 24 | bearing resistance at the down-stand can indeed act |
| 25 | that I put forward earlier is that the stresses depend | 25 | together but not fail progressively. It should be |
| | | | |
| | D 166 | | D 160 |
| | Page 166 | | Page 168 |
| 1 | Page 166 on the loading applied. It is not possible, it is | 1 | Page 168 demonstrated by calculations and/or experiments." |
| 1 2 | Page 166 on the loading applied. It is not possible, it is impossible, to have zero shear stress there all the | 1 2 | Page 168 demonstrated by calculations and/or experiments." Just a short question there. Would I be right in |
| 1 2 3 | Page 166 on the loading applied. It is not possible, it is impossible, to have zero shear stress there all the time. There may be one instance but then when you vary | 1 2 3 | Page 168 demonstrated by calculations and/or experiments." Just a short question there. Would I be right in understanding, just looking at your diagram, |
| 1 2 3 4 | Page 166 on the loading applied. It is not possible, it is impossible, to have zero shear stress there all the time. There may be one instance but then when you vary the loading, obviously that will change; there will be | 1 2 3 4 | Page 168 demonstrated by calculations and/or experiments." Just a short question there. Would I be right in understanding, just looking at your diagram, 6.4.3.5.1 |
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| 1 2 3 4 5 6 7 8 | Page 166 on the loading applied. It is not possible, it is impossible, to have zero shear stress there all the time. There may be one instance but then when you vary the loading, obviously that will change; there will be some shear stresses. MR CONNOR: Using your word of earlier on, Professor, the risk of that is marginal in the circumstances. A. Well | 1 2 3 4 5 6 7 8 | Page 168 demonstrated by calculations and/or experiments." Just a short question there. Would I be right in understanding, just looking at your diagram, 6.4.3.5.1 A. Yes. Q of course what we have here, if I'm right, Professor, is a strut-and-tie configuration? A. No. |
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| | Page 169 | | Page 171 |
|---|---|---|--|
| 1 | A. Okay. So which part are you talking about? The pink | 1 | A. Yes, still, of course. |
| 2 | nart or the white nart? | 2 | O But I think you told us already you told Prof Hansford |
| 3 | O. In the pink part, where you have a circle with a blue | 3 | this afternoon and you told Mr Pennicott I think this |
| 4 | arrow pointing to it, to the left. | 4 | morning, that as far as the Concrete Code is concerned |
| 5 | A. Yes | 5 | in these regards, it of course is in terms of |
| 6 | O. Are you with me? | 6 | beam-column joints of greater relevance in terms of |
| 7 | A. The problem is when we look at the white part, that is | 7 | those columns that we find in buildings rather than in |
| 8 | not well, in this case, in this argument, this is not | 8 | large civil engineering projects? |
| 9 | the critical part. The critical part is the pink part | 9 | A. Now, well |
| 10 | above the diaphragm wall. | 10 | O. Do you recall that evidence? |
| 11 | Now, there are other problems associated with the | 11 | A. Well, actually |
| 12 | white part of the connection which we have discussed | 12 | O. Sorry, let's unpack it a little bit, Professor. Do you |
| 13 | earlier. | 13 | recall your evidence? |
| 14 | O. Yes, we have discussed that. | 14 | A. Can you say that again, please? |
| 15 | A. Yes. | 15 | O. Yes, of course. So you told Prof Hansford this |
| 16 | O. So you don't agree that subject to there being | 16 | afternoon and I think you told Mr Pennicott this |
| 17 | sufficient anchorage that goes into the D-wall, that the | 17 | morning |
| 18 | combination of those horizontal forces and those | 18 | A. Yes. |
| 19 | vertical forces, the creation then of the diagonal force | 19 | O that as far as the application of the Concrete Code |
| 20 | into the joint, together with the T40 bars that we see | 20 | is concerned, its relevance insofar as columns and the |
| 21 | along to the left-hand side of the pink area, all | 21 | joints required within them is greater in relation to, |
| 22 | adequately | 22 | shall we say, structures which are more slight in their |
| 23 | A. No. | 23 | nature than heavy diaphragm walls and slabs which are |
| 24 | Q will deal with the forces being deployed on that | 24 | heavily reinforced in civil engineering projects? |
| 25 | structure? | 25 | A. Well, the slab and wall joint here behaves like |
| | | | |
| | Page 170 | | Page 172 |
| 1 | Page 170 | 1 | Page 172 |
| 1 | Page 170 A. The major O. Sorry is that no? | 1 | Page 172 a beam-column joint, although it is not the standard ture of beam column joint |
| 1 2 3 | Page 170 A. The major Q. Sorry, is that no? A. No | 1 2 3 | Page 172 a beam-column joint, although it is not the standard type of beam-column joint. |
| 1 2 3 | Page 170 A. The major Q. Sorry, is that no? A. No. | 1 2 3 | Page 172 a beam-column joint, although it is not the standard type of beam-column joint. Q. The Concrete Code, section 6.8, is of very limited application in a situation such as we have here, where |
| 1 2 3 4 5 | Page 170 A. The major Q. Sorry, is that no? A. No. Q. Or no subject to the calculations and/or experiments that you would like to have done? | 1 2 3 4 5 | Page 172 a beam-column joint, although it is not the standard type of beam-column joint. Q. The Concrete Code, section 6.8, is of very limited application in a situation such as we have here, where we have a structure. Professor, that is adequately. |
| 1 2 3 4 5 | Page 170 A. The major Q. Sorry, is that no? A. No. Q. Or no subject to the calculations and/or experiments that you would like to have done? A. Okay, was, you are right. Now, but the problem is | 1 2 3 4 5 | Page 172 a beam-column joint, although it is not the standard type of beam-column joint. Q. The Concrete Code, section 6.8, is of very limited application in a situation such as we have here, where we have a structure, Professor, that is adequately reinforced to deal with all the forces being deployed |
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43 (Pages 169 to 172)

| | Page 173 | | Page 175 |
|----------------------|--|----------------------|---|
| 1 | circumstances that even you have just described, hardly | 1 | A. Last couple of hours? |
| 2 | fair; do you agree? | 2 | O. I know it won't feel that way but this afternoon. |
| 3 | A. Well, the same principles should be applied, the same | 3 | A. Well, I |
| 4 | principles. | 4 | Q. Let me unpack it to help you. |
| 5 | Q. Let us assume that the principles being deployed have | 5 | A. Yes. |
| 6 | taken full account of the fact that this is a heavily | 6 | O. You told the learned Commissioners that you haven't |
| 7 | structured, heavily reinforced, heavy structure in | 7 | carried out any of these simple calculations yet, you |
| 8 | itself, and for all the reasons covered by Atkins and | 8 | haven't looked at coming up with the simple tests, but |
| 9 | for all the reasons covered by Prof McQuillan in his | 9 | you think Mannings have; yes? |
| 10 | report, there is no significant risk of there being | 10 | A. Well, Mannings actually did the work under the |
| 11 | shear in the nature that you describe. | 11 | supervision of a colleague and me, yes. |
| 12 | A. I don't agree. | 12 | Q. What was their brief? |
| 13 | Q. You do not agree with that | 13 | A. I think you have to ask the Highways Department. That |
| 14 | A. We have to check. | 14 | is to help in coming up with certain background |
| 15 | Q. Thank you. Just to close on that, what I understand, | 15 | calculations to help us understand more about the |
| 16 | from the dialogue that we had between the Commissioners | 16 | structure. |
| 17 | and Mr Chow and yourself this morning, that the checks | 17 | Q. Perhaps we should unpack it a little bit because I think |
| 18 | that you consider we ought to require, the simple | 18 | you told the Commission earlier that your involvement as |
| 19 | checks, are going to be capable of being pulled together | 19 | an expert and the preparation of your report really |
| 20 | by you in a table and advised to this Commission so that | 20 | began in December. |
| 21 | we know what it is you say needs to be done and how long | 21 | A. Yes. |
| 22 | it should take and who is going to do it; am I right? | 22 | Q. When did the Mannings work take place? |
| 23 | A. I can probably recommend a textbook and a certain | 23 | A. Probably late November to December. |
| 24 | section, so that people can follow. | 24 | Now, the problem is, at the very beginning, it's |
| 25 | COMMISSIONER HANSFORD: Actually, sorry, Prof Au, a textbool | 25 | very unclear, and then when I was sort of confirmed to |
| | Dago 174 | | Page 176 |
| | | | Tage 170 |
| 1 | might be of interest, but I think we need somebody to do | 1 | be asked to appear over here, I think that was sometime |
| 2 | the calculations, because I don't think we can be relied | 2 | in December, but then in the adviser capacity, I have |
| 3 | on to follow the textbook properly. | 3 | also made suggestions. |
| 4 | A. Well, that is a fairly advanced one, but that was | 4 | Q. Let me deal with this briefly, because it may be it can |
| 5 | written by Park and Paulay who are experts. | 5 | be dealt with very briefly. |
| 6 | MR CONNOR: I may not thank you for an advanced textbook or | 6 | A. Okay. |
| 7 | this, Prof Au, but I appreciate, Professor and | 7 | Q. You talk about problems; let me share a problem with |
| 8 | Mr Chairman, that we are straying here into dialogue | 8 | you. |
| 9 | that perhaps counsel will have with you. | 9 | A. Yes. |
| 10 | But perhaps if I can close the point in this way. | 10 | Q. The problem here is that you've told us that Mannings |
| 11 | If it be the case, Prof Au, that government agrees on | 11 | have carried out some calculations which might be |
| 12 | a suggestion by the learned Commissioners that there | 12 | relevant and might be similar to those which you have |
| 13 | should be produced a very clear list of the tests, the | 13 | discussed with the Commissioners already you |
| 14 | calculations, the numerical working-out that you say | 14 | understand? |
| 15 | heeded to be done, within the context of the simple | 15 | A. Yes. |
| 10 | checks, if that is to be produced, that we understand is | 10 | Q. And you have ninted that the fact that maybe having |
| 1/ | something to which you will willingly contribute? | 17 | carried those out, the results have not been terribly |
| 18 | A. That is something that is extra. Of course, if time | 18 | helpful. Do you remember? |
| 19 | anows, I will be happy to do that. | 19 | A. well, some of them, yes. |
| 20 | Q. You mentioned Mannings in response to questions I think | 20 | Q. Against that background, that is why I am asking you |
| 21 | just before functione. | 21 | what is to be done under your direction, what have they |
| 22 | | · • • | |
| 22 | A. Yes. O. Can you halp the Commission with their brief and what | 22 | applied in terms of codes of standards, and what have |
| 22 23 24 | A. Yes.Q. Can you help the Commission with their brief and what they have looked at in relation to the calculations we | 22 23 24 | they found. But in fairness to you, if you can't help |
| 22 23 24 25 | A. Yes. Q. Can you help the Commission with their brief and what they have looked at in relation to the calculations we have been looking at in the last couple of hours? | 22 23 24 25 | they found. But in fairness to you, if you can't help the Commissioners with this, then we can draw a line |

| | Page 177 | | Page 179 |
|---|---|---|---|
| 1 | important, I think, that you clarify it. | 1 | because you have to also consider potential problems |
| 2 | A. They have done some work to countercheck the strength | 2 | caused by the new construction joint; correct? |
| 3 | utilisation factors, but the problem is that they don't | 3 | A. Correct, yes. |
| 4 | have all the background data, so they just work from the | 4 | Q. That, if I understand you correctly, is the horizontal |
| 5 | raw data, whatever. They also did some work on the | 5 | joint |
| 6 | joints, the connections, and then they did find some of | 6 | A. Yes. |
| 7 | the joints to be problematic. | 7 | Q between the concrete poured at the place where the |
| 8 | So that's why we are of the view that it is better | 8 | D-wall was chipped off; correct? |
| 9 | to carry out further checking. Now, what they have used | 9 | A. Yes. |
| 10 | are reasonable, but then whether they are really | 10 | Q. That would be the horizontal joint? |
| 11 | accurate, we are not 100 per cent sure. | 11 | A. Right. That's one of the cases, because there are some |
| 12 | Q. So, as I understand, your point is that they don't have | 12 | other, more complicated cases. |
| 13 | the base data and if you want to come up with accurate | 13 | Q. Right. Before I go further, I know you are a very |
| 14 | results, you need to have that? | 14 | distinguished professor, accustomed to teaching very |
| 15 | A. Yes. | 15 | learned people, but I wish you to understand there is |
| 16 | Q. And that's the base data that Atkins will have? | 16 | a public interest dimension in this hearing. |
| 17 | A. Now | 17 | A. Yes. |
| 18 | Q. Sorry, that is the base data that comes from the | 18 | Q. And you are not only addressing people who know what you |
| 19 | designer? | 19 | are talking about. |
| 20 | A. Yes. | 20 | A. Yes. |
| 21 | Q. So if we want to have the right answer, we had better | 21 | Q. So sometimes it may not be entirely helpful to address |
| 22 | get that data? | 22 | professors and doctors. In particular, you have to |
| 23 | A. It would be better, but an experienced engineer will be | 23 | remember there are journalists outside who are not as |
| 24 | able to come up with some typical parameters which are | 24 | learned as you are who may, some of them, genuinely want |
| 25 | useful. Okay? | 25 | to understand what's going on and write something about |
| | Page 178 | | Page 180 |
| 1 | | | |
| 1 | Q. But you have nothing of detail in this regard to share | 1 | it. You understand what I am saying? |
| 1 2 | Q. But you have nothing of detail in this regard to share with us this afternoon? | 1 2 | it. You understand what I am saying? A. Yes. |
| 1 2 3 | Q. But you have nothing of detail in this regard to share with us this afternoon?A. No. So that's why I am not saying that certain details | 1 2 3 | it. You understand what I am saying?A. Yes.Q. Could I respectfully ask that when you give answers, try |
| 1 2 3 4 | Q. But you have nothing of detail in this regard to share with us this afternoon?A. No. So that's why I am not saying that certain details are unacceptable, but just propose whatever parties to | 1 2 3 4 | it. You understand what I am saying?A. Yes.Q. Could I respectfully ask that when you give answers, try your very best I know it may be quite some time ago, |
| 1 2 3 4 5 | Q. But you have nothing of detail in this regard to share with us this afternoon?A. No. So that's why I am not saying that certain details are unacceptable, but just propose whatever parties to follow up with checking. | 1 2 3 4 5 | it. You understand what I am saying?A. Yes.Q. Could I respectfully ask that when you give answers, try your very best I know it may be quite some time ago, but try your very best to imagine that you are speaking |
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| | Page 181 | | Page 183 |
|---|---|---|--|
| 1 | from the left, through the EWL, and get connected by | 1 | trained in engineering how this structure is ever going |
| 2 | couplers to the blue bit in the middle. | 2 | to break because of what you call the shear force in |
| 3 | A. Right. | 3 | that notional line between burgundy and blue. Forget |
| 4 | Q. And on the right-hand side of the blue bit, again, there | 4 | about diagrams, forget about equation; just describe |
| 5 | will be couplers; right? | 5 | physically how it's going to break at the line. |
| 6 | A. Yes. | 6 | A. You mean the horizontal line? |
| 7 | O. And then connected to the OTE on the right-hand side; | 7 | O. Correct. |
| 8 | correct? | 8 | A. Well, if the shear strength is really insufficient and |
| 9 | A. Yes. | 9 | so much below the shear force applied there, then the |
| 10 | O. If you look at this, you agree that on this depiction, | 10 | upper part of the concrete is going to slide towards the |
| 11 | it correctly shows two construction joints vertically? | 11 | left, and then the other thing is the part well, the |
| 12 | A. Yes. | 12 | down-stand part of the OTE whatever is going to perhaps |
| 13 | O. Can you turn to the next page then. | 13 | fail in flexure. There will be bending failure, yes. |
| 14 | A. Yes. | 14 | O. You mean the burgundy part on the right-hand side |
| 15 | O. This is a depiction of the change the of the | 15 | A. Yes, could fail in flexure, depending on well. |
| 16 | situation after change number 2: right? | 16 | of course, one has to do checking. |
| 17 | A. Yes. | 17 | O. Thank you. But I'm sure academics thrive in asking |
| 18 | O. We have seen different attempts to present this change. | 18 | questions, but if you look at the previous page, again. |
| 19 | but since Tony Gee, and in particular Mr Nick Southward | 19 | if you forget about the colouring |
| 20 | is my expert so I'm using this diagram presented in his | 20 | A. Yes. |
| 21 | report: all right? | 21 | O if you forget about the colouring, it's one lump of |
| 22 | A. Yes. | 22 | concrete? |
| 23 | O. What I am going to ask you is this. Even though, as | 23 | A. Yes |
| 24 | depicted, you can see the joint | 24 | O. So for an outsider, for a layman, the shape of that lump |
| 25 | A. Yes. | 25 | of concrete, between this and the next page, is again. |
| | | - | |
| | D 193 | | D 194 |
| | Page 182 | | Page 184 |
| 1 | Page 182 Q the horizontal joint | 1 | Page 184 forgive my loose language, roughly similar? |
| 1 2 | Page 182 Q the horizontal joint A. Right. | 1 2 | Page 184 forgive my loose language, roughly similar? A. Yes. |
| 1 2 3 | Page 182 Q the horizontal joint A. Right. Q meaning the horizontal line between the burgundy part | 1 2 3 | Page 184 forgive my loose language, roughly similar? A. Yes. Q. So if there is a force, a very strong force, pulling the |
| 1 2 3 4 | Page 182 Q the horizontal joint A. Right. Q meaning the horizontal line between the burgundy part on top and the blue part in the bottom | 1 2 3 4 | Page 184 forgive my loose language, roughly similar? A. Yes. Q. So if there is a force, a very strong force, pulling the whole thing to the left, if it doesn't fail, if it |
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| | Page 185 | | Page 187 |
|---|---|---|---|
| 1 | you accept that? | 1 | Q. Because we know that concrete was poured there. But |
| 2 | A. Yes, indeed. | 2 | after concrete is poured, that is one lump of concrete; |
| 3 | Q. So that is why I am asking. So what you are saying is | 3 | do you accept that? |
| 4 | if a force looking at the diagram at page 28, what | 4 | A. Yes. |
| 5 | you are saving is if you apply a strong enough force by | 5 | O. So there should not be any sliding because it is not two |
| 6 | pulling the burgundy part on the left, you pull that to | 6 | blocks of concrete, it is one piece of concrete: do you |
| 7 | the left | 7 | accept that? |
| 8 | A. Yes | 8 | A. I can tell you, in Hong Kong, there are many composite |
| 9 | $\Omega_{}$ it may be that the right-hand side part of the | 9 | bridges. Island Eastern Corridor and I think Canal Road |
| 10 | burgundy structure will bend or fail or crack: that is | 10 | Flyover they are composite bridges and they are |
| 11 | what you mean? | 11 | constructed by precast beams together with in situ slab. |
| 12 | A Actually when you look at that if you are really | 12 | okay? One lump of concrete. But we still need to check |
| 13 | serious in exploring the possible failure modes so | 13 | the horizontal shear stress. That is a must |
| 14 | actually there are many possible failure modes | 14 | O Yes But whether you need to as a matter of caution or |
| 15 | Eailure along the horizontal construction joint | 15 | as a matter of |
| 16 | (indicating diagram on page 28) is a possibility and | 15 | Δ No it is a requirement |
| 17 | then perhaps some cracking over here (indicating) is | 17 | A. No, it is a requirement. A. I'm talking about structural safety. |
| 10 | another possibility. Some creaking over there is | 17 | A. Vas it is related to structural safety too |
| 10 | another possibility alway? Some shoer arealing over | 10 | A. Tes, it is related to structural safety too. |
| 19 | another possibility; okay? Some shear cracking over | 19 | Q. But that is why I wanted to know now that nonzontal |
| 20 | nere is also a possible failure mode. | 20 | A New clear So if this herizontal construction is in tic |
| 21 | So we have to check all this to find out which one | 21 | A. Now, okay. So it this horizontal construction joint is |
| 22 | would be the failure mode to appear first. So all these | 22 | very strong, indeed it acts as a whole piece, then there |
| 23 | are possibilities. | 23 | will be a certain distribution of internal forces. In |
| 24 | Q. You mentioned the first possibility, that is to say you | 24 | case it is very weak and sliding starts to occur over |
| 25 | pointed at that norizontal line on the left? | 25 | there, then the internal forces will be different and |
| | | | |
| | Page 186 | | Page 188 |
| 1 | Page 186 A. Yes. | 1 | Page 188 certain parts may be overstressed, perhaps leading to |
| 1 2 | Page 186 A. Yes. Q. That's got nothing to do with the vertical line. Can | 1 2 | Page 188 certain parts may be overstressed, perhaps leading to some other modes of failure. |
| 1 2 3 | Page 186 A. Yes. Q. That's got nothing to do with the vertical line. Can you hold up that sheet for me? | 1 2 3 | Page 188 certain parts may be overstressed, perhaps leading to some other modes of failure. So there is no simple answer. |
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| 1 2 3 4 5 | Page 186 A. Yes. Q. That's got nothing to do with the vertical line. Can you hold up that sheet for me? A. Yes. Q. You first of all pointed at that vertical line on the | 1 2 3 4 5 | Page 188 certain parts may be overstressed, perhaps leading to some other modes of failure. So there is no simple answer. Q. Can I ask you how there could be sliding on this configuration, by coming back to a point put to you |
| 1 2 3 4 5 6 | Page 186 A. Yes. Q. That's got nothing to do with the vertical line. Can you hold up that sheet for me? A. Yes. Q. You first of all pointed at that vertical line on the left-hand side between the burgundy and the blue; is | 1 2 3 4 5 6 | Page 188 certain parts may be overstressed, perhaps leading to some other modes of failure. So there is no simple answer. Q. Can I ask you how there could be sliding on this configuration, by coming back to a point put to you previously, because there was clamping on both sides by |
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| | Page 189 | | Page 191 |
|---|---|---|---|
| 1 | A. That normally will be accompanied by some other | 1 | So that is possible. |
| 2 | cracking. There can be some other cracking. | 2 | Q. As I say, applying strong enough force, I'm sure cracks |
| 3 | Actually, in the behaviour of reinforced concrete | 3 | can appear everywhere, but I'm saying cracks or failures |
| 4 | beams, very often there are cracks appearing just at the | 4 | caused by the appearance of that notional line in the |
| 5 | middle, shear crack. Engineers will understand that. | 5 | middle. |
| 6 | Shear cracks normally would appear at the middle not | 6 | A. Yes. |
| 7 | the flexural cracks, the cracks caused by bending it | 7 | Q. I'm suggesting that that by itself doesn't cause any |
| 8 | would start from the bottom but shear cracks will be | 8 | failure. |
| 9 | appearing at the centre of a beam. Say a beam like that | 9 | A. Well, one has to check. Now, we are discussing that |
| 10 | (demonstrating with hands), normally the shear cracks | 10 | qualitatively. We need to quantify what is going to |
| 11 | will be closer to the supports. | 11 | happen. So we have to do calculations. |
| 12 | So having a crack somewhere at the middle is nothing | 12 | Q. You see, but as I've told you when I started my |
| 13 | new. It's quite common actually. We actually see a lot | 13 | questioning, for laymen and for the public to be able to |
| 14 | of such cases in our laboratory. | 14 | visualise or understand why we are concerned about this, |
| 15 | Q. You are saying that there could be a crack | 15 | they have to be able to visualise how that added joint |
| 16 | A. Yes. | 16 | contributes to any failure, because there's no point |
| 17 | Q caused by, you know, a bad joint, appearing where | 17 | saying if you apply a strong enough force the whole |
| 18 | that horizontal line is now appearing? | 18 | thing collapses. It may well do. But you can't blame |
| 19 | A. Possible, yes. | 19 | it on that joint. Do you understand my point? |
| 20 | Q. Only there, without Professor, let me just suggest to | 20 | A. I understand your point. |
| 21 | you again from a layman's point of view what I have in | 21 | Q. What you are saying is there is something about that |
| 22 | mind and see what you say about it. | 22 | joint in the revised design that is causative of |
| 23 | A. Yes. | 23 | something bad, and I want to explore with you to explain |
| 24 | Q. After chipping off the top part of the D-wall, and after | 24 | to laymen how qualitatively that would happen. |
| 25 | concrete is poured on top of you know the way the | 25 | A. Okay. Let's say now I get a few sheets of paper. |
| | Page 100 | | |
| | rage 190 | | Page 192 |
| 1 | revised design is done? | 1 | Page 192 Now, you can imagine that so now we have a few sheets |
| 1 2 | revised design is done? A. Yes. | 1 2 | Page 192 Now, you can imagine that so now we have a few sheets of paper. If I bend it, it's very easy, but if I put |
| 1 2 3 | revised design is done? A. Yes. Q. Concrete is poured monolithically? | 1 2 3 | Page 192 Now, you can imagine that so now we have a few sheets of paper. If I bend it, it's very easy, but if I put glue between them, it would be stiffer. We can imagine |
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| | Page 193 | | Page 195 |
|--|---|--|--|
| 1 | MR SHIEH: Because doing the best I can, again, as a layman, | 1 | requirement under the Code of Practice for Structural |
| 2 | if you pull the whole thing to the left | 2 | Use of Concrete" |
| 3 | A. Yes. | 3 | Then you gave the reference to the code; do you see |
| 4 | Q and what you are saying is if that joint between the | 4 | that? |
| 5 | burgundy and the blue is not, let's say, glued properly | 5 | A. Yes. |
| 6 | and there is sliding, then it could somehow drag the | 6 | Q. H8/2818. |
| 7 | right-hand side burgundy together with it | 7 | A. Yes. |
| 8 | A. Yes. | 8 | Q. So can I ask you to look at H8/2818. |
| 9 | Q and therefore all kinds of things can happen to the | 9 | A. Yes. |
| 10 | right-hand side burgundy? | 10 | Q. That's the first page of the Concrete Code. |
| 11 | A. Yes. | 11 | A. Yes. |
| 12 | Q. Again forgive me. If the right-hand side burgundy is as | 12 | Q. If I ask you to look at 2821. |
| 13 | thin as a hair-pin, then I can understand if you have | 13 | A. Yes. |
| 14 | a little bit of sliding then the vertical hair-plain | 14 | Q. That's the foreword. |
| 15 | will break. But if you, again using language of my | 15 | A. Yes. |
| 16 | learned friend for Atkins, take off a scholar's hat and | 16 | Q. Look at the penultimate paragraph. |
| 17 | put on a common-sense hat, looking at this depiction, is | 17 | A. Yes. |
| 18 | it really realistic to suggest that, oh, with the chunk | 18 | Q. It says: |
| 19 | of because basically you are saying that the OTE slab | 19 | "Although this Code of Practice is not a statutory |
| 20 | would crack? | 20 | document, the compliance with the requirements of this |
| 21 | A. Well, it is possible. If something happens, let's say | 21 | Code of Practice is deemed to satisfy the relevant |
| 22 | if it fails at the construction joint, then there can be | 22 | provisions of the Buildings Ordinance and related |
| 23 | some other cracks. It is not surprising at all, if it | 23 | regulations." |
| 24 | occurs. | 24 | Do you see that? |
| 25 | Q. We have had enough discussion about qualitative | 25 | A. Yes. |
| | Page 194 | | Page 196 |
| 1 | layman-like matters. I may revisit it tomorrow morning | 1 | Q. First of all, I wish you to confirm that it is indeed |
| 2 | but can I just move on to another small topic. | 2 | your understanding that it is not a statutory document; |
| 3 | I can see that it's 5.10. I know we started | 3 | correct? |
| 4 | a little bit late but I am going to move on to the next | 4 | A. Correct. |
| 5 | topic so maybe it would be an opportune moment. | 5 | Q. So no statute actually says that Buildings Department or |
| 6 | CHAIRMAN: Prof Hansford has a conference call at 5.30. | 6 | whatever department, Highways Department, can promulgate |
| 7 | I don't know how counsel feel. I'm more than happy to | 7 | a code which must be complied with; it's not statutory? |
| 8 | continue on to, say, 5.20. I don't know if that | 8 | A. Correct. |
| 9 | achieves anything for you Mr Shieh | 9 | |
| 10 | achieves anything for you, wir Shiefi. | | Q. It actually only has the status of a "deemed to satisfy" |
| 11 | MR SHIEH: Yes, I can finish probably the next topic, if not | 10 | Q. It actually only has the status of a "deemed to satisfy" document, in the sense that if you do what the code |
| 12 | MR SHIEH: Yes, I can finish probably the next topic, if not the one after next, and then maybe I'll call it a day | 10 11 | Q. It actually only has the status of a "deemed to satisfy" document, in the sense that if you do what the code requires you to do, then basically the government can't |
| 13 | MR SHIEH: Yes, I can finish probably the next topic, if not the one after next, and then maybe I'll call it a day and then see if I have anything else after the evening | 10 11 12 | Q. It actually only has the status of a "deemed to satisfy" document, in the sense that if you do what the code requires you to do, then basically the government can't make life difficult for you, they can't reject, because |
| 14 | MR SHIEH: Yes, I can finish probably the next topic, if not the one after next, and then maybe I'll call it a day and then see if I have anything else after the evening adjournment. If not, then maybe | 10 11 12 13 | Q. It actually only has the status of a "deemed to satisfy" document, in the sense that if you do what the code requires you to do, then basically the government can't make life difficult for you, they can't reject, because you are deemed to have satisfied the requirements? |
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| 15 16 | MR SHIEH: Yes, I can finish probably the next topic, if not the one after next, and then maybe I'll call it a day and then see if I have anything else after the evening adjournment. If not, then maybe CHAIRMAN: Let's do that. Good. Thank you. MR SHIEH: Can I ask you to look at your report, at paragraph 3.1.1. | 10 11 12 13 14 15 16 | Q. It actually only has the status of a "deemed to satisfy" document, in the sense that if you do what the code requires you to do, then basically the government can't make life difficult for you, they can't reject, because you are deemed to have satisfied the requirements? A. Right. Q. Whatever requirements there are. A. Right. |
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49 (Pages 193 to 196)

| | Page 197 | | Page 199 |
|--|---|--|--|
| 1 | an alternative design which doesn't follow that, but | 1 | that our discussion takes place within the context of |
| 2 | then it is the responsibility of the competent person to | 2 | the Foundation Code promulgated by the Buildings |
| 3 | demonstrate that it is not inferior to the requirements | 3 | Department |
| 4 | over here. | 4 | A. Right. |
| 5 | There are two possibilities. First, in respect of | 5 | Q which is in the middle of page 40 of the report. |
| 6 | a certain requirement, it is exactly the same. Second, | 6 | A. Yes. |
| 7 | it exceeds it. And because of that, in a sense, it is | 7 | Q. "That part of a building, building works, structure or |
| 8 | mandatory, because it would very often be more costly, | 8 | street in direct contact with and transmitting loads to |
| 9 | more time-consuming, to come up with an alternative | 9 | the ground." |
| 10 | design which doesn't comply with that but which can | 10 | Do you see that? |
| 11 | provide the same or even better performance. | 11 | A. Yes. |
| 12 | Now, if we are talking about a very large project | 12 | Q. Can you look at the diagram on the next page. |
| 13 | and a certain part of the structure is repetitive, many, | 13 | A. Yes. |
| 14 | many times, that may be worthwhile. So I think, in this | 14 | Q. That describes, again pictorially, the way what we call |
| 15 | sense, saying that the requirements here are mandatory | 15 | the box will look; right? |
| 16 | is reasonable. | 16 | A. Yes. |
| 17 | Q. "Mandatory" has one meaning. "Compulsory" must follow. | 17 | Q. You know what I mean by "the box"? |
| 18 | But you are not in any way suggesting that the | 18 | A. Yes. |
| 19 | requirements must be followed? | 19 | Q. "The box" is that part enclosed by the burgundy? |
| 20 | A. Now, I understand that the requirements are set down | 20 | A. Yes. |
| 21 | over here. You can come up with alternatives which are | 21 | Q. That's the box. The top burgundy is EWL; the bottom |
| 22 | not inferior to what is required here. | 22 | burgundy is NSL. |
| 23 | Q. Thank you. I think I know what you mean. I'm not going | 23 | A. Yes. |
| 24 | to get bogged down in the meaning of "mandatory". We | 24 | Q. Do you see that? |
| 25 | can all form our own conclusions. | 25 | A. Yes. |
| | Page 198 | | Page 200 |
| 1 | My next point that I want to explore with you before | 1 | COMMISSIONER HANSFORD: I think it's magenta in mine, for |
| 2 | we break for the day is the question about foundation. | 2 | the NSL. |
| 3 | A. Yes. | 3 | MR SHIEH: The box, yes. |
| 4 | Q. Can I ask you to look at the page in Mr Southward's | 4 | I will move on relatively quickly. The point |
| 5 | report, tab 5, at page 40, which you were asked to look | 5 | I would put to you is that the foundation for the |
| 6 | at by Mr Chow when he examined you in-chief this | 6 | purpose of the definition of the code that we have |
| 7 | morning. You remember you were asked questions about | 7 | looked at is the D-wall below the NSL slab, because it |
| 8 | whether or not the D-wall amounted to foundation; do you | 8 | is that part of the D-wall which transmits load to the |
| 9 | remember that? | 9 | ground and which supports the box on top of it. Do you |
| 10 | A. Yes. | 10 | accept that suggestion? |
| 11 | Q. That discussion as to whether or not the D-wall amounted | 11 | A. If you are talking about the middle part, yes, but then |
| 12 | to part of the foundation takes place in a certain | 12 | the east and the west diaphragm walls I would consider |
| 13 | | 10 | them as foundation as well. They are also taking |
| 14 | context? | 15 | them as foundation as well. They are also taking |
| 15 | A. Yes. | 13 14 | loading. They are transmitting the loading to the |
| | A. Yes. Q. Because obviously, if you simply look at the word | 13 14 15 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the |
| 16 | A. Yes. Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, | 13 14 15 16 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the |
| 16 17 | A. Yes.Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context? | 13 14 15 16 17 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations. |
| 16 17 18 | A. Yes.Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context?A. Right. | 13 14 15 16 17 18 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations. Q. But there's a little bit of a conundrum I need you to |
| 16 17 18 19 | A. Yes. Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context? A. Right. Q. You apply to university, there's a foundation course, | 13 14 15 16 17 18 19 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations.Q. But there's a little bit of a conundrum I need you to help us. You know about hit and miss? |
| 16 17 18 19 20 | A. Yes. Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context? A. Right. Q. You apply to university, there's a foundation course, but obviously we are not talking about that kind of | 13 14 15 16 17 18 19 20 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations.Q. But there's a little bit of a conundrum I need you to help us. You know about hit and miss?A. Yes. |
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| 16 17 18 19 20 21 22 | A. Yes. Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context? A. Right. Q. You apply to university, there's a foundation course, but obviously we are not talking about that kind of foundation; right? A. Yes. | 13 14 15 16 17 18 19 20 21 22 | loading. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations. Q. But there's a little bit of a conundrum I need you to help us. You know about hit and miss? A. Yes. Q. You know the hit and miss panels in this case? A. Yes. |
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| 16 17 18 19 20 21 22 23 24 | A. Yes. Q. Because obviously, if you simply look at the word "foundation", it can carry different shades of meaning, depending on context? A. Right. Q. You apply to university, there's a foundation course, but obviously we are not talking about that kind of foundation; right? A. Yes. Q. I don't think we need to actually bother you about why there is a need to touch upon the meaning of the word | 13 14 15 16 17 18 19 20 21 22 23 24 | loading. They are transmitting the loading to the ground. They are transmitting the loading to the ground. They are in contact with, well, the ground, the soil. The east and west, yes, they are also part of the foundations. Q. But there's a little bit of a conundrum I need you to help us. You know about hit and miss? A. Yes. Q. You know the hit and miss panels in this case? A. Yes. Q. So even within the D-wall, not all the panels are in direct contact with the bedrock or the soil? |

| | Page 201 | | Page 203 |
|----------|---|----|--------------------------------------|
| 1 | If you are talking about the hit panel, then it is sort | 1 | INDEX |
| 2 | of touch being the bedrock. The miss would not be | 2 | PAGE |
| 3 | touching. But at the back, it still in contact with | 3 | PROF AU TAT KWONG, FRANCIS (sworn)18 |
| 4 | soil. | 4 | Examination-in-chief by MR CHOW18 |
| 5 | The other thing is that what we assume in | 5 | Examination by MR PENNICOTT55 |
| 6 | calculation may not be exactly the same as its | 6 | Cross-examination by MR SO102 |
| 7 | behaviour; okay? So it's true that probably in | 7 | Cross-examination by MR CONNOR115 |
| 8 | calculation we assume all the loading to be taken by the | 8 | Cross-examination by MR SHIEH178 |
| 9 | hit panels. However, those miss panels may also take | 9 | |
| 10 | some loading because underneath there is still soil, | 10 | |
| 11 | although the loading carried by that may not be as big | 11 | |
| 12 | as those hit panels. | 12 | |
| 13 | So I would consider all of them part of the | 13 | |
| 14 | foundation. | 14 | |
| 15 | MR SHIEH: Would it be an appropriate moment to take the | 15 | |
| 16 | adjournment now? | 16 | |
| 17 | CHAIRMAN: Yes, it would. | 17 | |
| 18 | MR SHIEH: I would wish to reflect on whether I need to test | 18 | |
| 19 | Prof Au any further, but I have covered most if not all | 19 | |
| 20 | the topics I wish to explore with him. | 20 | |
| 21 | CHAIRMAN: Good. | 21 | |
| 22 | COMMISSIONER HANSFORD: Mr Chow is on his feet. | 22 | |
| 23 | CHAIRMAN: Sorry, Mr Chow, I didn't see you behind Mr Shieh, | 23 | |
| 24 | the imposing figure of Mr Shieh there. | 24 | |
| 25 | MR CHOW: Because he is much grander. I just want to flag | 25 | |
| | Page 202 | | |
| 1 | up at this point that I understand Prof Au has some | | |
| 2 | teaching commitments tomorrow afternoon. I don't | | |
| 3 | anticipate that we will need to go into tomorrow | | |
| 4 | afternoon, but I just think perhaps it is good for us to | | |
| 5 | flag it up at this stage. | | |
| 6 | CHAIRMAN: All right. I'm sure, Professor, we will be able | | |
| 7 | to let you go in good time to go back to your students. | | |
| 8 | WITNESS: Thank you. | | |
| 9 | CHAIRMAN: Could I mention one thing, and I omitted to | | |
| 10 | mention it earlier for the luncheon adjournment. Even | | |
| 11 | though you are an expert, you are giving evidence at the | | |
| 12 | moment, and when you are giving evidence you are | | |
| 13 | an island unto yourself; do you understand? | | |
| 14 | WITNESS: I understand. | | |
| 15 | CHAIRMAN: You are not allowed to discuss matters with other | | |
| 16 | people. They can't come up to you and say, "Oi, what | | |
| 17 | about this, what about that?" | | |
| 18 | WITNESS: I understand that. | | |
| 19 | CHAIRMAN: I thought you did but I forgot to mention it | | |
| 20 | earlier. | | |
| 21 | we will adjourn until tomorrow morning at 10 am. | | |
| 22 | (5.21 pm) | | |
| 25 24 | (J.21 pill) (The begring adjourned until 10.00 am the following day) | | |
| 24 25 | (The nearing aujourned until 10.00 and the following day) | | |
| 23 | | | |