Page 1

Friday, 1 February 2013
(10.00 am)
DR NEVILLE ANTHONY ARMSTRONG (on former oath)
THE CHAIRMAN: Dr Armstrong, may I remind you that you continue to testify according to your original oath.
A. Thank you, Mr Chairman. Good morning.
THE CHAIRMAN: Mr Mok.
Examination by MR MOK (continued)
MR MOK: Thank you, Mr Chairman.
Good morning, Dr Armstrong.
A. Good morning, Mr Mok.
Q. You have given me some work to do overnight, and I hope we have produced that right document for your perusal. This is part of the Rules and Regulations for the Classification of Yachts and Small Craft, now paginated as page 4061.
Have you got a copy of this?
A. Yes, I do.
Q. Is this the right document to help us to read the table at page 4066?
A. Could I ask for page 4066 on the screen?
Q. You have a hard copy, right?
A. Unfortunately not paginated, Mr Mok. Oh, yes, it appears to be the right one. Thank you.
Q. Yesterday -- this is the loose end that I wish to deal

Page 2

with now -- you were asking about the definition of "L" on the table. You see column one says "L", "length", and you were wondering what the definition was. You will see, I believe, this on page 4064; that is, section 2, paragraph 2.1.3.
A. Yes, sir.
Q. L equals to length overall plus the length of the waterline divided by 2. Is that correct?
A. Yes.
Q. Is that your understanding?
THE CHAIRMAN: Sorry, which paragraph reference?
MR MOK: It's paragraph 2.1.3 on page 4064.
THE CHAIRMAN: Yes. Thank you.
MR MOK: Overnight, someone assisted me to do a certain calculation which I have to confess is a little bit beyond me, but those calculations appear on page 4068. So if we can have that.
Dr Armstrong, have you had a chance yourself to do some calculation based on this table?
A. Yes. I think these are in line, Mr Mok, with what we discussed yesterday, approximately.
Q. Approximately. So if we just go to the red lines at the end, the result was that if you apply the table and taking "L equals 26.445 metres" using the formula, and then giving a figure of "V", that is velocity, "over the

Page 3

square root of the waterline length", you have the value of 4.81. Applying that, and doing some conversions, then you can come to the thickness of 3.55 metres, more or less.
A. Yes, Mr Mok, I agree. But again, if I may point out, this is taken in isolation and not looking at the rules as a whole.
Q. Sorry?
A. This calculation is taken in isolation, and not all safety factors contained within the rules and regulations are considered.
Q. I understand.
THE CHAIRMAN: Your point is that if you're going to construct a vessel, then you must abide by all the rules within a particular --
A. You must abide by all of the rules contained within individual documents.
THE CHAIRMAN: Not just cherry-pick one from one set of rules and another from another set of rules?
A. Exactly, yes, sir.
MR MOK: But the difficulty we have here, Dr Armstrong, is that if the Blue Book were to be applied, the Blue Book really doesn't contain all the rules. So, for example, the plate thickness is not a matter which is being dealt with in the Blue Book. That is a difficulty.

Page 4

A. It's not dealt with in the Blue Book, but I did wonder where the requirements came from in the 1995 Instructions, and I can only surmise that they must have come about because people were discussing this at the time when Lamma IV was probably being built, because we know that's when the rules were being formulated. So there was obviously some need from somebody to minimise the plating thickness -- sorry, yes, state a minimum for the plating thickness. But I don't know where that came from.
Q. Yes. Again, I think we went through that yesterday. I think you accept that this line of reasoning is a bit of a speculation, because we don't really know.
A. Yes.
Q. Right. Now, going back to my point; that is, if you treat the Blue Book as being the applicable instructions at the time, one difficulty is that the Blue Book actually doesn't contain everything. For example, it doesn't contain the thickness of plating.
A. It contains very little, in fact.
Q. Yes. Because of the gap -- I think we went through this yesterday as well -- one has to borrow from some rules which are well-recognised at the time, including some of the classification society rules?
A. Yes.

Page 5

Q. We also went through yesterday that Lloyd's Register was one of the few organisations that provide rules for small craft at the time?
A. I agree, they were, yes.
Q. Just whilst we are on this point, if I may just complete one small matter by referring to one of the rules in the 1995 Instructions. This is in bundle 8, tab 2. I believe it is rule 4.5, page 1818.
I think this rule has been referred to, which says:
"For a vessel classed with a recognised classification society, the hull construction and machinery installation may be examined by surveyors of that classification society, and the requirements of chapter II 3.2 ..."
If we flip to that page very quickly, that deals with hull thickness, I think, on page 1820, 3.2. Correct?
A. Yes.
Q. Going back to paragraph 4.5:
"... and minimum shaft diameter in chapter IV 3 may be ignored. In such circumstance the vessel shall remain classed if it wishes to continue being licensed. If the vessel is de-classed but intended to continue being licensed, the requirements of these Instructions shall be complied with in full."

Page 6

Do you see that?
A. I see that.
Q. I think this dovetails the remark just made by Mr Chairman, and also by you, that where you apply a particular rule, for example concerning thickness, you have to deal with this in context, in the context of the other rules as well. This is the meaning of the vessel being continued in class. Is that right?
A. Correct, yes.
Q. And your understanding of this rule is that if it is not in class, then instead of referring to those rules, then you have to comply with the rules in the 1995 Instructions?
A. That's certainly how I read it, yes.
Q. Yes. But you would also agree that this rule only applies if the 1995 Instructions apply?
A. It is not in the Blue Book, yes.
Q. Yes. So in the Blue Book, because we don't have as comprehensive a set of rules as the 1995 Instructions, there would be no requirement or indeed it would be impossible to say that if the vessel is not in class, then you need only refer to the rules in the Blue Book, because the Blue Book doesn't contain all the rules.
A. Yes, Mr Mok, again.
Q. So it is an unsatisfactory situation, but there it is; this was the situation at the time when the Blue Book was applied?
A. Yes, it is an unsatisfactory situation but was the situation at the time.
Q. Thank you very much.
Going back to the calculations that we just ran through relating to the Lloyd's Register, do you also agree -- and this is one of the observations by Dr Peter Cheng -- that where you have a thickness value of less than 4 mm, then you have to take 4 mm as the minimum.
Are you aware of that or do you agree with that?
A. No, I don't understand the context of that.
Q. All right. I think going back to the Rules themselves --
A. Ah. There is a minimum thickness.
Q. Yes.
A. I understand.
Q. And the minimum thickness is 4 mm.
A. Is 4 mm.
Q. So where, as in this case, your calculation comes to 3.55 mm, then the minimum requirement was in fact not 3.55 under those rules, but 4?
A. Yes.
THE CHAIRMAN: Where is this provision?
MR MOK: Mr Chairman, this is in one of the reports of

Page 7

Page 8

Dr Peter --
THE CHAIRMAN: No, the basis for the assertion. Where does it have its origin?
MR MOK: It's in the Rules themselves.
THE CHAIRMAN: In which rules?
MR MOK: I'm just looking at Dr Peter Cheng's report.
THE CHAIRMAN: Take your time.
A. If I might help, Mr Mok?
MR MOK: Thank you.
THE CHAIRMAN: Yes, please, Dr Armstrong.
A. Page 4067.
THE CHAIRMAN: Which rules are we looking at?
A. These are the Lloyd's Rules and Regulations for the Classification of Yachts and Small Craft.
MR MOK: Yes. It's note 5.
THE CHAIRMAN: The reference, please?
A. Page 4067.
THE CHAIRMAN: And the paragraph number?
A. It's not in a paragraph, sir. It's in a table, table 3.5.2, "Shell plating". On the top right-hand side on the screen, it says "ts (minimum) ... greater than 3", and there's a formula also related to length.
THE CHAIRMAN: Yes.
A. I believe the "4" is probably coming from the formulation of 0.6 times L, L being the mean of overall

Page 9

and waterline length --
THE CHAIRMAN: Yes, I follow that.
A. -- plus 2.5. But I have not done the calculation.
MR MOK: Can we also go to note 5 of the same page, at the bottom. I think it's the last line of that note.
THE CHAIRMAN: Yes.
MR MOK: Is that the relevant reference?
A. It's the same formulation.
THE CHAIRMAN: But how do we get 4 mm out of that formula?
MR MOK: I think it's 0.06 times the length, which in this case is 26.445 plus 2.55.
Is that how we work this out?
A. I've just done the calculation, Mr Chairman, and it comes out at 4.09.
Q. Thank you. Dr Armstrong, I would like to come to a different topic now, if I may. This concerns the flooding and the interpretation of the plans.
First of all, I believe you have seen this document. It's called Trim & Stability Booklet which was produced by Naval-Consult. I think the relevant page is the calculations concerning the damage stability. This is in the miscellaneous bundle. The document starts at page 111. You see on page 111, "Preliminary Trim & Stability Booklet", and Naval-Consult is the author.
A. Yes.

Page 10

Q. We have heard evidence that some of those calculations at least were produced some time between I believe the second half of 1994, and the beginning of 1995. Have you had a chance to look at this document?
A. I have looked through them, Mr Mok. I have not checked any of the calculations.
Q. I understand. And the only one page that I wish to refer you to is page 141. This is one of the pages from their preliminary stability or damage stability calculation, under the condition that both the steering room and the tank room were flooded. Is that correct?
A. I see that in the headline, yes.
Q. Yes. You also see the numbers there, near the bottom, under the word "Hull". Then you have the steering gear room compartment and the tank room compartment both flooded.
A. Yes.
Q. That's indicated there. And you will see the total displacement, 1.025, and the MT, 72.11.
If you look at the bottom, the draft, forward and aft perpendicular are respectively 0.448 and 1.997 metres?
A. I see that.
Q. Are those figures in line with your own calculations? I know it's not exact, but are they in line with your

Page 11

calculations which you have summarised in your second supplemental report, page 928?
A. Whilst we're looking up the page, Mr Mok, I would say that I would doubt they would be exactly similar, because this calculation uses an assumed weight of the vessel which was not known at that time.
Q. Yes.
THE CHAIRMAN: What is that figure?
A. 53.37 was the estimated weight for the lightship, Mr Chairman.
MR MOK: And what should be the weight in 1996?
A. 48.74. It was lighter.
Q. Right. But I think the point here is, on those conditions -- that is, the two rooms or two compartments being flooded -- the margin line would not be immersed and also the GMT would be all right. Do you agree with that interpretation?
A. I agree the margin line would not be immersed.
Q. Yes.
A. With regard to the GMT, I don't believe it's on this particular page, that I can see. But probably occurs on the next page, 132.
Q. Which figure are we looking at?
A. Yes, I'm looking for it. The last line, "GM at equilibrium".

Page 12

Q. I see.
A. That refers to the GM value once flooding has stopped, and it is well in excess of the minimum.
Q. That's the 1,613 per cent?
A. I'm looking at the last line on page 132.
It's 1,129 per cent.
THE CHAIRMAN: I'm sorry, how are we to interpret that?
A. The GM is required to be more than 0.050, and the value they have calculated is 0.150.
THE CHAIRMAN: Thank you. Just give me a moment, please.
Thank you.
MR MOK: Your own conclusion, with better figures, on page 926, the comparable figure --
THE CHAIRMAN: Just give us a moment, please.
MR MOK: Yes, of course.
THE CHAIRMAN: Yes?
MR MOK: The comparable figure on page 926 of your second supplemental report -- page 928 is what I had in mind, sorry, the table at the bottom. The figure I have in mind is under 1996, "No watertight door; 0.272; Satisfactory"?
A. Yes.
THE CHAIRMAN: Just a moment, please.
"No watertight door; Depth to margin: 0.272; Satisfactory". Is that the column?

Page 13

MR MOK: I believe so.
THE CHAIRMAN: Dr Armstrong, is that what I'm trying to follow?
A. I believe it is.
THE CHAIRMAN: Thank you very much.
Just pause, please. Thank you.
MR MOK: Although the heading of this table is "Tank room only", but where we refer to this particular item, with "no W/T door", this is actually a scenario where both the tank room and the steering gear compartments are flooded?
A. I have a difficulty with the calculation, Mr Mok, in that the drafts that it gives at the bottom of the page suggest that the draft at the forward end is greater than the after end, which indicates that it's going down by the bow -- when the after end is flooded does not seem very satisfactory.
THE CHAIRMAN: So which calculation are you now passing an observation on?
A. I'm referring to page 131, the original calculation done at the early design stages by Naval-Consult.
MR MOK: Sorry, you're looking at page 131?
THE CHAIRMAN: And you're noting that the draft at the bow is 0.948, whereas at the aft end it's 1.194; is that the point?

Page 14

A. Correct, yes. At the forward end it's --
THE CHAIRMAN: So it's bow-down?
A. It's bow-down.
THE CHAIRMAN: Although it's got a flooded tank room?
A. So I was led to believe, yes. Am I looking at the wrong page?
MR MOK: I was looking at page 141. Page 131 is the intact stability, whereas page 141 is damage stability.
A. My apologies. Thank you.
Q. Can we go back to page 141, please. In that condition -- that is, the damage condition relating to both the steering gear compartment and the tank room -- we have the aft and forward drafts set out at the bottom.
A. Yes.
Q. Does that look satisfactory?
A. Yes, it does.
THE CHAIRMAN: So now it's bow-up, stern-down?
A. Now it's bow-up, stern-down.
MR MOK: Then over the page at 142, you also have the GMT there under the damage condition, I believe, at the bottom. The margin there is slightly different, but in line. It's 1,613 per cent.
A. Yes, although I cannot see that it actually tells you the value of the GMT on this page.

Page 15

Q. It doesn't. But assuming that the margin were correct, would you agree that would be ample?
A. Oh, yes. I've always thought the GM value was adequate.
Q. Yes. Thank you. So with that, if we could go back to your report once again on page 928. Under "1996", second line, the point I was making is that although the heading says "Tank room only", but that particular line, with a figure of 0.272, actually relates to the situation where both the tank room and the steering gear compartment are flooded?
A. When you read the line "No watertight door", yes, correct.
Q. That's the condition. And where it says "Satisfactory", what it means is that the margin line is not immersed?
A. Correct, under schedule 1.
Q. Under schedule 1? Thank you.
A. Floodable length.
Q. Schedule 1 of the Rules, the Regulations?
A. Of the Regulations.
Q. Thank you.
A. Whereas the information provided by Naval-Consult is done under schedule 3 of the Regulations. But nevertheless, there should be some similarity.
Q. Yes.
A. I mentioned that the weights are different, but I also

Page 16

note that the centres of gravity are different. And the centres of gravity will change the trim, and changing the trims the distance to the margin line, which is one reason why they are not closer.
Q. Yes.
A. Because one gives me 0.8. The Naval-Consult value is about 0.8 distance to margin line, so that's a margin to the margin line. Whereas my figure is 0.272 in the table.
Q. Yes. And actually, the simple point I would like to make here, Dr Armstrong, is if you look at the Trim & Stability Booklet as the beginning point, and your calculation as the end point, the beginning point and the end point, when we look at this particular condition -- that is, both compartments being flooded -- both calculations indicate that the vessel would be all right in the sense in particular that the margin line would not be immersed?
A. I agree.
Q. That's the point?
A. Both of them show that.
Q. What I wish to look at next is from the Trim & Stability Booklet, it is some indication, is it not, that the designer, if I may call Naval-Consult the designer, might have in mind -- "might" is what I'm emphasising --

Page 17

that the design was such that the steering gear compartment and the tank room should be considered as one compartment. I only say "might". It's consistent, should we say, with that understanding?
A. Insofar as the heading says "Steering & tank room damage" and the requirement was for any one compartment flooding, then yes, I would agree that you might well have that in mind.
Q. Yes. Although I also accept, Dr Armstrong, to be fair, that if they also had in mind the 0.1L rule, the 10 per cent rule, then that indication is not conclusive because even if there was a watertight door, that calculation would still have to be done?
A. Indeed. And I presume this is why it was done.
Q. Yes. So the upshot of this is while those calculations are some indication that they had in mind that there should be one compartment, at the same time this is not conclusive, because of the 0.1L rule?
A. This suggests to me, Mr Mok, that the designer did everything that was required under the regulations in terms of floodable length and damage stability.
Q. Right.
A. Including the 10 per cent L requirement.
Q. Yes. If I may just pause here to just ask you a few questions concerning the 0.1L rule. It's convenient to

Page 18

deal with this here before going further. I believe in your evidence, you said that many other jurisdictions accept a one-compartment standard for this type of vessel, referring to Lamma IV.
A. (Witness nods).
Q. You confirm that?
A. Yes.
Q. My question is, do many jurisdictions also accept a 0.1L rule for this type of vessel?
A. I'm not certain of the answer to that.
Q. All right. On the rationale for the rule, do you agree just by way of summary that this is a commonsense requirement in that a bulkhead which is less than 0.1L is regarded as being too short in terms of distance to withstand flooding from a reasonably sized hole? In other words, where there is a collision, if the length between the end of the vessel and the bulkhead is too short, then that bulkhead might also be damaged?
A. Yes, but there are more than one reasons for putting an aft peak bulkhead in and making it watertight. One of the reasons is to restrict flooding, of course, from the floodable length point of view. When considering the tank room, you mustn't go over the length of the tank room, the floodable length.
In other words, the tank room has a maximum length,

Page 19

which may require you to put a bulkhead at the after end, no matter where the transom is. But from a tank room perspective, you may require a bulkhead quite close to the transom. But when you're looking at the steering gear compartment, you then have to consider, in this particular case that it is destroyed by the collision with a length of more than 10 per cent L. But there are then other reasons also for an aft peak bulkhead that we have discussed concerning restricting flooding from penetrations through the hole, such as the rudder stock.
Q. Yes. If I may summarise you there. You are talking about two different requirements. One of the requirements is a 0.1L, the purpose of which is to ensure that the bulkhead is not too close to the stern, so that it may get damaged in the case of a possible collision.
A. Yes. A hypothetical length of damage of 10 per cent L.
Q. Yes. The other requirement that you just referred to is the need for an aft peak bulkhead. For that, you said the reason was to restrict the flooding in the case of, say, a failure of the ceiling relating to the rudder or the propeller, to prevent that flooding from overflowing to the next compartment?
A. I actually mentioned three reasons, Mr Mok.
Q. All right. I'm sorry about that.

Page 20

A. The third one was that -- let's just consider the tank room in isolation.
Q. Yes.
A. We have a forward bulkhead against the engine room. The tank room has its own floodable length requirements.
Q. Yes.
A. If the tank room is flooded, it must not immerse the margin line.
Q. Yes.
A. This dictates where the after bulkhead is for the tank room. If the aft bulkhead for the tank room is a long way aft, there will be a lot of water in the tank room and the vessel may immerse the margin line. So the tank room has its own floodable length which may well set the bulkhead where it was.
Q. Yes. In other words, there are quite a number of parameters which the designers have to have regard to --
A. Indeed.
Q. -- and in order to fulfil all of them, he has to carefully design the distance and the length of the individual compartments?
A. And indeed the designer should sit down and calculate what is called a floodable length of the ship and use that floodable length information to put the bulkheads where he does. That is the difference between -- if you

Page 21

like, that's at the beginning of the design. Then what happens at the end of the construction is the manufacturer, the builder, then tests the ship through the inclining experiment and produces a damage stability book to prove that it does actually meet those requirements that were spelt out at the early part.
Q. Right.
A. So together they work well. I'm glad you produced this, because I had not seen this information before. It suggests to me that the designer did do due diligence and do the floodable length calculation.
Q. Thank you for that. Just now, I was referring to the rationale for the 0.1L rule. So I'm not referring to the need for the aft peak bulkhead at this juncture.
A. Fine.
Q. So for that rationale or for that reason, you agree, do you not, that the subdivision between a small compartment and its adjacent compartment should then be disregarded where the length of the small compartment is less than 0.1L, when calculating the floodable length, so that the assumption there being both might be flooded because of the smallness or narrowness of the bulkhead in between?
A. Yes, I agree. That's what the rules require.
Q. Yes. Now, that, of course, relates to the calculation

Page 22

of floodable length. But when it comes to the calculation of damage stability, in other words the concept there being if you take the collision or the damage at any point of the ship or along the side of the ship, you will have to assume, for this case of damage, that the extent of the damage should be no less than 0.1L.
A. Correct, yes.
Q. That's the concept?
A. Yes.
Q. Right. So therefore normally, if you place the damage at any arbitrary place and you assume the length or the extent of that damage is no less than 0.1L, the consequence of that assumption is that the flooding that would take place would encompass two compartments. Because you take the damage at an arbitrary point, and then you assume the length of the damage to be not less than 0.1L. So if you place it at an arbitrary point, then it could be placed, say, close to a bulkhead, then the consequence would be on that assumption, there would be two compartments being flooded?
A. Correct. And there is documentation to show that this was seen as being too onerous a requirement for launches, and I understand was a reason why the fax that we have seen crossed out those requirements and replaced

Page 23

it with "one-compartment flooding".
Q. Right.
Because of the natural consequence of that kind of reasoning and because the consequence is that the two compartments would be flooded, if you didn't cross out the relevant bit in the fax, then the person doing the calculation would have to take the basis as being two compartments being flooded?
A. Yes.
Q. And because that was considered to be too onerous, then somehow the department decided that -- and I think you would accept that a lot of other jurisdictions also accepted -- there should be one-compartment flooding for that type of vessel?
A. I'm not sure about other jurisdictions accepting it for a vessel with such a large number of persons on board.
Q. Right. Can we have a quick look at that, because it may assist the Commission on this particular point.
I believe there is a comparison table produced by Dr Peter Cheng. If we may have a quick look at that, in his first report. This is the expert bundle. Let me locate this. I think it's page 716.
I think what Dr Cheng has done is to compile a comparison table of six jurisdictions, including Hong Kong, and under item 3, "Damage Stability", "HK",

Page 24

"One-compartment flowing applied", and then UK applies SOLAS with one-compartment flooding. "Singapore: floodable length and one-compartment flooding is to be fulfilled; Australia: one-compartment flooding condition to be fulfilled; Japan: SOLAS", and China, no such requirement.
So in summary, one-compartment flooding for UK, Singapore, Australia, Japan and Hong Kong. Does that according with your understanding as well?
A. It's fairly close, Mr Mok, yes. I would point out Australia has very recently changed its regulations.
Q. Right.
A. I'm not sure what they now say.
Q. So those requirements, do you agree they are applicable to small craft as opposed to, say, ocean-going vessels?
A. I have no information on which to judge that, Mr Mok.
Q. Sorry?
A. I have no information on which to judge that. This is a table produced by a third party.
Q. I understand. But I'm asking for your experience and understanding.
THE CHAIRMAN: Before we go any further. Has the provenance of these assertions been provided in the report?
MR MOK: I don't believe so, but if the Commission wishes to have it, I think --

Page 25

THE CHAIRMAN: Well, obviously.
MR MOK: Yes.
THE CHAIRMAN: We can't simply accept bare assertions.
MR MOK: No. Of course not. So we'll ask him to prepare that.
THE CHAIRMAN: Thank you.
MR MOK: But from your own knowledge, Dr Armstrong, are you able to say whether or not those requirements in relation to one-compartment flooding are applicable to small craft, or you're not aware of that?
A. Yes. I also made the point that it's a commonly accepted criteria, one-compartment flooding.
Q. Right. And are you also able to say where it is applicable to small craft, whether or not there is any distinction being made based on the number of passengers on board?
A. Yes, there usually is. As you can see on the top line, there are various number of passengers there.
SOLAS, by the way, does not allow one-compartment flooding for larger vessels. It's based on something called criteria of service contained within the watertight subdivision calculation.
Q. Right. So if we look at item 1, under UK, Singapore and so on, those are the requirements -- not requirements, those are the conditions under which these requirements

Page 26

have to be complied with?
A. Do we know the dates of the regulations that are being quoted for each of these countries?
MR MOK: I don't, and that's Mr Chairman's question. We have to provide that. I'm sorry about that.
I think the point there in item 1 is this, that if your vessel falls below these particular parameters, then it seems that perhaps even less regulations are applied to them. Would that be correct? Is that the right way to interpret this?
A. The table is headed "Damage Stability", and I'm not sure what's included in that broad title.
Q. Right.
A. It would not be floodable length calculations, for example.
Q. Right. But I think maybe I can put the question shortly, which is this: for a vessel with 200-odd passengers on board, are you aware of any rules or regulations in any jurisdiction whose requirement is that two-compartment flooding should be complied with?
A. SOLAS, certainly. Which means, in this case -- well, UK and Japan in Dr Cheng's table actually say SOLAS, but one-compartment flooding.
Q. Right. So you're saying that now, where you have a vessel with 200 passengers, SOLAS required the

Page 27

two-compartment flooding rule be applied? Is that the --
A. I can't be specific. I don't know.
MR MOK: Mr Chairman, we just have to provide that information.
THE CHAIRMAN: Unless it's provided, it's of no assistance.
MR MOK: Yes. Thank you.
Coming back now to the rationale of the 0.1L. We have just explored the different concepts of the floodable length on the one hand, and also the damage stability. Do you agree that the 0.1L requirement is as applicable to the concept of damage stability and the one-compartment flooding as it is to the concept of floodable length? In other words, where you have a compartment which is too small and where you have damage at or near that particular compartment, the chances are that two rather than one compartment might be involved, so in order to make sense of the one-compartment flooding rule, you also have to use or adopt the 0.1L rule in order to make it work?
THE CHAIRMAN: This question has become so long I have no idea what the question is.
MR MOK: I will try again.
THE CHAIRMAN: Since I hope that you are trying to provide my fellow Commissioner and I with information we can

Page 28

understand, I'd ask that you try again.
MR MOK: Yes. Mr Chairman, I hope that you forgive me, because this is somewhat technical and we are all, I think, struggling a little bit with these concepts.
Let me try again, or break it down at least.
The 0.1L rule makes sense for the calculation of floodable length?
A. Yes.
Q. The reason being that if a compartment is too small, chances are that the bulkhead may be damaged in a collision which could then mean that that particular compartment is no longer intact?
A. Yes.
Q. Right. I'm suggesting that that rationale applies equally to the calculation of damage stability, because if you look at that calculation on the basis of a random hit on the side of the ship to create a hole there, and if the compartment is too small, then again chances are two compartments might be involved instead of one, so to apply the one-compartment flooding rule, it is necessary and indeed important that the 0.1L rule should also be observed?
A. Yes, I agree the 0.1L rule should apply equally to watertight subdivision/floodable length, and to damage stability.

Page 29

Q. Right. So with that, can I invite you to look at paragraph 60 of your report at page 424. The first report.

In this paragraph, the big paragraph on page 424, you refer to the deleted part of the fax, which is paragraph 1(3)(a) of schedule 3 of the Regulations.

A. (Witness nods).

Q. You're referring to that?

A. Yes.

Q. You have interpreted this in this way. If I may just read after the quotation of the Rule, you say:

"This requirement, as stated previously, is recreated in a document headed LN 325 of 1991 and also LS No. 2 to Gazette No. 31/1991 provided by the Marine Department as being the regulations that were used in 1995. However this whole paragraph has been struck through and replaced by the words '(one-compartment flooding)'."

Then it's the next sentence I wish to draw attention to:

"The consequence of this deletion and replacement was that small compartments with a length of less than 10%L were considered like any other compartment, and were so treated in the so-called damage stability information booklet."

Page 30

Dr Armstrong, I understand this sentence to mean that because of the deletion, the 10 per cent L rule was also deleted? That's my understanding of your sentence. Is this what you intended?

A. Yes, Mr Mok. You commented that I'd interpreted it this way, but the intention was not to really interpret; it was really to note the dilemma that was created by doing this.

Q. Yes.

A. So it was merely an observation that could be interpreted by other people, perhaps, in two different ways.

Q. In other words, what you are noting there is that as a result of the deletion, there is an ambiguity?

A. Yes.

Q. The ambiguity being whether or not the 10 per cent L rule should apply when you are doing the damage stability calculation based on one-compartment flooding?

A. In my opinion, that is the case. You're probably getting there, Mr Mok, but I say that at the end of paragraph 60, the one you were reading from.

Q. You mean on page 425?

A. On page 425, yes.

Q. Where you say:

"It is incorrect to suggest that a compartment with a length of less than 10% L can be ignored, as it is the position of the watertight bulkheads that is important, and they affect the compartments both in front of and behind any small compartments of less than 10%L."

Page 31

A. Which is the point I was trying to make a few minutes ago: the tank room length is also important, and determines where the bulkhead goes.

Q. And you have also heard evidence from the Mardep officers that their interpretation is in line with your observation; in other words, that --

A. Some of the Mardep officers, yes.

Q. Yes. Some of the Mardep officers' understanding is in line with what you just said; that is, you cannot ignore 10 per cent L when you are doing the damage stability calculation?

A. Yes.

Q. So if I may now come back after this diversion on the 0.1L rule, going the back to the plans, if I may. I'd just said that the Trim & Stability Booklet, because it does the calculation on the basis of damaging both the steering gear and the tank room compartments --

THE CHAIRMAN: Are you referring now to the Naval-Consult preliminary estimate?

MR MOK: Thank you, yes. I'm referring back to that.

-- that is some indication, some indication only,

Page 32

that they possibly had in mind there might not be a watertight bulkhead between the two compartments. That is what I was driving at before. But I also said, Dr Armstrong, that that is not conclusive because of the 0.1L rule --

A. Exactly, I understood that.

Q. -- which they might also have in mind at the time?

A. Yes.

Q. But then we also look at other things. For example, we look at the Sections and Bulkheads plan, if I can take you to that now. It's in marine bundle 2, tab 5 at page 205.

What I'm inviting you to do, Doctor, is to compare that with the Sections and Bulkheads plans for what they call the sister ship. In fact it's not, but for the sake of simplicity, I'll just call it "the sister ship"; that is, the Eastern District. That plan, for comparison, appears in, I think --

THE CHAIRMAN: Page 198?

MR MOK: Thank you.

THE CHAIRMAN: I think it begins earlier. Page 194?

MR MOK: Thank you very much. Page 198.

If we may just look at these two side by side. First of all, can I just draw your attention to one feature of these two plans. Both of them have the

Page 33

section B-B at the top right-hand corner.
A. They do.
Q. It's a bit difficult for us to understand, Doctor. Can you explain to us what this particular section is supposed to show?
A. My interpretation, sir, is that it's trying to indicate how the corrugated bulkhead is connected to the side shell.
Q. Or the bottom shell?
A. Or indeed the bottom shell.
Q. Yes. Because you see the reference both on the side and at the bottom, the words "bottom or side" -- what is the "longl"?
A. "Longitudinal". Although the sketch is incorrect for the bottom longitudinal, but the intent is quite clear. The intent is to fit brackets in order to transfer loads between the bulkhead and the shell.
Q. Yes.
A. Those brackets, although small, can be a very important feature.
Q. And this view is a view from the top of the ship?
A. For the side shell, yes. Not for the bottom shell.
Q. For the bottom shell, I don't know how one looks at it.
A. Lying down, actually, Mr Mok.
Q. Well, I think the point I'm making is that this is sort

Page 34

of a general arrangement for this kind of fitting at various places of the ship; that is, where the bulkhead meets the plate?
A. Yes.
Q. And it applies not only to the side plates, where there is such a meeting place, but it also applies to the bottom plate?
A. Correct.
Q. So it's a general arrangement and has no particular reference to any particular part of the ship?
A. No, I could not agree with that, Mr Mok.
Q. Okay.
A. It is clearly referring to the bulkhead at frame 1/2.
Q. Yes.
A. So it's not "any particular place on the ship". It is actually specifically, if you look at the bottom left diagram -- thank you. There. It's actually specifically at the lines that run parallel to the "B-B" mark, a little bit above it and a little bit below it, and there are altogether six locations on the side of the ship.
Q. Yes.
A. And then presumably a similar arrangement, however that might be interpreted, along the bottom of the ship, where it says "B"; "B" meaning "bracket".

Page 35

Q. Sorry, where are you referring to now?
A. That same diagram on the screen, running along the bottom of the ship, close to the bottom plating --
THE CHAIRMAN: Multiple references to "B"?
A. Multiple references to "B".
THE CHAIRMAN: Can we put the cursor on that. Down at the bottom. Take the word "only" and go upwards from there.
A. Thank you, Mr Chairman.
THE CHAIRMAN: That's it. "B" there, "B" there, "B" there, and so on. Is that what you had in mind?
A. Yes, sir.
MR MOK: Those "B"s, it's a reference to the arrangements on fitting; is that so?
A. Those "B"s mean "put a bracket in here to connect the bottom stiffeners, the bottom longitudinals" -- as they're called here -- "to the bulkhead".
It's particularly difficult on a corrugated bulkhead, because there are no stiffeners on a corrugated bulkhead to connect brackets to -- there's just bent plate -- and I presume is the reason why they changed the sectional drawing, which is maybe what you are coming to, Mr Mok.
Q. Can you explain? I think you will explain better than I do. How did they change the drawing?
A. Because of the difficulties of connecting stiffeners

Page 36

that run forward and aft on the ship to a corrugated bulkhead, which is just a flat bulkhead with bends in it, for want of a better description, it is reasonably common practice to put in a standard frame instead, so that you might see on drawing 205, at the bottom left, ignoring the corrugated bulkhead, that this sketch has what is called a frame running around the ship like all the other sections, or similar to the other sections through the ship.
It has a transverse -- I'll call it a girder running across the bottom of the ship -- thank you -- and then up the side of the ship, and then across the top. That girder has a flat bar, and you'll see that designated -- on the bottom of the ship, at the top of the girder, it says "65x6FB". That flat bar is just a flat piece of metal 65 mm wide and 6 m deep that runs around the frame around the bottom, at the sides and across the top. That in effect is the structural member that is common to other locations on the ship where there are frames.
It's then a fairly simple process of manufacturing to weld in the corrugated bulkhead inside that frame. It's a lot easier to manufacture than what was done with the Eastern District No. 1, I think it was called, where you have to cut the corrugated plate to the exact size and then somehow attach brackets to it. It's

Page 37

a manufacturing procedure that requires a different detail, which is obviously done on this plan.
Q. Right. Doctor, let me see if I understand what you just said. It's a bit technical there.
First of all, the meaning of "stiffener".
A stiffener is protrusions which you stick to the plate, if I can just use layman terms, which are evenly spaced? So they are protrusions perpendicular to the plate, in order to give the plate additional strength; is that correct?
A. Broadly speaking, yes. I would emphasise the need to weld them on rather than stick them on, because they need to be an integral part of the plating to be effective.
Q. I'm sorry. As I said, I'm using layman's language.
A. They are not necessarily equally spaced. They can be whatever space you want. But they're intended to stiffen the plate.
Q. Right. And because of this particular protrusion, you may find it difficult sometimes then to also weld the bulkhead onto the plate, because of these, if I may call them, obstacles?
A. You have it exactly correct, Mr Mok. It is difficult to then weld, and the usual way of doing that is to cut large openings to fit them over the stiffeners, but then

Page 38

the bulkhead is no longer watertight.
Q. Yes.
A. So now you have to somehow weld lots of little extra pieces on to make it watertight.
Q. Yes. So the solution that was adopted in Lamma IV, as opposed to Eastern District, is to use what you call a flat bar which basically runs along the side and the bottom and the upper part of the hull in order for the bulkhead to be welded onto?
A. Yes.
Q. So that would simplify the procedure, to eliminate the need to cut through the stiffener in order for that welding to take place?
A. Yes.
Q. Thank you very much. I think the point that I wish to come to is this, that section B-B -- I think the letter "B", as Mr Chairman noted, is found in a lot of places and not just on this particular drawing.
Basically the intention of section B-B is to show how the attachment between the bulkhead and the plate should be done by means of brackets. That's the purpose of the section?
A. Yes, and in the section B-B, you can clearly see in the middle of the diagram, and appearing vertical here, the 65 by 6 flat bar that we are referring to.

Page 39

Q. Sorry, where is that?
A. I find it odd, Mr Mok, that this is a detail that you would put in. The reason for putting it in, in my mind, is to make the bulkhead watertight. So it seems strange to me to go to all this trouble of changing the drawing to make it easier to make a watertight bulkhead, and then to put an opening in it.
Q. I see what you mean.
Doctor, I think another reason for changing the design is to make the fixing easier. I know your point about making it more watertight, but I think another reason or rationale for doing that is to make it easier for the attachment to take place; right?
A. I'll bow to your expertise, Mr Mok.
Q. It's not my expertise, I assure you. I'm struggling with this, as everyone else is.
THE CHAIRMAN: Do you agree with the proposition, there's another reason for doing that?
A. Yes, I was intending to do that, Mr Chairman. I don't honestly know the answer to that. It's a feature that you see on watertight bulkheads, sir, and I see no reason to do it other than to make a watertight bulkhead.
MR MOK: Well, Doctor, to be fair, if let's say you have six bulkheads in the vessels and all need to be fitted to

Page 40

the plate, you would want a uniform solution for that fixture to be done?
A. And indeed on drawing 205, bulkhead 4 and bulkhead 9 are shown in that same similar fashion, yes.
Q. Yes.
A. They're manufactured that way.
Q. So if that is the chosen method of fixing bulkheads to the plate, it makes sense to apply the same method to all of the bulkheads regardless of whether or not you want that particular bulkhead to be watertight or not?
A. I couldn't agree with that, Mr Mok. I would say the easiest way of making bulkhead 1/2, if it wasn't to be watertight, would be just to cut some small holes where the stiffeners were to pass through. It would define the shape that you needed at that section, and it would just be placed there like any other frame. So I think it's extra work that is not needed.
Q. I may be wrong, Doctor, but my understanding of the flat bar is that it's a continuous bar which runs along the top, the bottom and the side of the hull; is that correct?
A. Correct. But why have it there if you can weld it directly to the shell and deck and bottom plating?
Q. Well, we have to ask the designer, don't we. But what I'm suggesting is that it is equally plausible that

Page 41

because that is the chosen solution, since it is a continuous bar, the designer would have chosen to use the same method for all the bulkheads, regardless of --

THE CHAIRMAN: He's answered that question. He disagrees with you.

MR MOK: All right. I'll move on.

THE CHAIRMAN: Is that correct, Dr Armstrong?

A. That's correct, yes. Thank you.

MR MOK: Perhaps I can put the question this way. That solution is applicable to the fixing of bulkhead to the plate, regardless of whether or not it is watertight or not?

A. I'm sorry. I'm not sure which one you're referring to.

THE CHAIRMAN: Your answer is this is an unnecessary amount of work to go to if you're not going to make the bulkhead watertight.

A. Correct.

THE CHAIRMAN: You wouldn't do it like this?

A. Correct.

THE CHAIRMAN: You'd cut through the spacing?

A. Correct.

MR MOK: Right. And the point I wish to make, Doctor, is that where this section is being drawn as it is, the real intention of that section is to present the method of fixing of bulkhead to the side plate or bottom plate?

Page 42

That's the purpose of the section B-B?

A. The purpose of the section B-B is to make it clear to the person manufacturing this part of the vessel what the designer's intent was. And if he has a number of cut plates of a certain size which are brackets, he needs this information to know where to weld them in.

In addition, it provides information to the Marine Department, who are worried about continuity of strength, where the location of brackets transfers strength from a bulkhead in one plane into the side shell or bottom shell in another plane.

If the strength is not transferred in an efficient manner, it will be the origin of cracking. And that is a principal reason why the Marine Department need to see these sorts of plans, and indeed I think there is an example on page 205, right in the middle, where frame 4 -- there is a circle with a star. My interpretation of that is that the Marine officer investigating this has needed some change to the feature in order to transfer the strength more effectively. I think that's the interpretation.

Q. Right. Thank you for that. In order for this particular section to fulfil that purpose and to show those details, the reference to "WT bulkhead" is a piece of information that is not necessary for this particular

Page 43

purpose?

A. I disagree, Mr Mok, because if I was the person fabricating this particular part, and I saw the words "watertight bulkhead", I would know it was important not to weld it in such a way that it was left with parts that weren't fully welded and therefore not watertight.

Q. So in other words, it tells the builder to be more careful at that particular --

A. And usually a little further, to actually adopt different procedures in welding.

Q. Can we now go to the section or the frame at 1/2.

A. Is this for Lamma IV?

Q. Yes, but in comparison.

A. Okay. Thank you.

Q. So what the designer did when it came to this particular frame was that he consciously changed the wording from "WT door" to "access opening".

Do you see that?

A. I see that difference, yes.

Q. The other details inside the hole there remain unchanged?

A. They do.

Q. That seems to be consistent with -- if you read, as I said before, the trim and stability report as some indication that they have in mind the two compartments

Page 44

as being one, and if you'd also look at this plan with the change to "access opening" without the watertight door being referred to, that indication is consistent with an intention that there may need to be no watertight door at that particular place. Do you agree? It's consistent. I'm not saying conclusive.

A. I agree, it is consistent. It's also consistent with 10 per cent damage of the steering gear compartment.

Q. Well, I might just take up that point a little bit. For that consideration to be taken into account, it doesn't really matter whether or not it is a WT door or an access opening without a WT door, because the calculation would be the same?

A. Exactly.

Q. So if I may just go back to the question. You said, yes, it is consistent with an intention of having no watertight door there, but it is also consistent with consideration of 0.1L. I'm just suggesting perhaps that the latter consideration is not really that relevant.

THE CHAIRMAN: Earlier on in your examination you accepted that it was consistent with the same point that Dr Armstrong has just made.

MR MOK: Yes, but the point that Dr Armstrong is now making is the change of the wording here may be because of the 0.1L consideration. That's my understanding of his

Page 45

evidence.
THE CHAIRMAN: But I understood earlier on, when you started this examination, you said that you accepted it. "I accept that if they had in mind 0.1L, even if there was a watertight door, then the calculation had to be done in that way." You accepted that proposition?
A. I did, yes.
MR MOK: Yes, but, Mr Chairman, I'm exploring the change in wording now. Of course I accept that if you start from the consideration of the floodable length calculation, it matters not whether or not you have or do not have a door. But now I'm exploring the question from a different angle, of why there was a change in the wording. So what I'm suggesting is that the consideration of 0.1L is not relevant to the intention of changing the wording, because whether or not you change it or not, you still would have calculated the floodable length in the same way. That's my point. Perhaps I am not making myself clear.
THE CHAIRMAN: If you think there is merit in the point, then pursue it.
MR MOK: Do you agree, Doctor, that perhaps from the point of view of understanding why the change of wording takes place, the consideration of the 0.1L rule is not so relevant?

Page 46

A. I have no knowledge, Mr Mok, on why the wording was changed.
Q. Right.
A. Even if it was changed, there's no implication that it would no longer be watertight. I accept there is no need for it to be watertight, but I can't draw conclusions that it wasn't watertight just because it says "access opening" --
Q. I understand.
A. -- because of the regulation which says "access opening shall be fitted with watertight doors".
Q. I think the regulation or the instruction you're referring to is paragraph 12(v) --
A. It would be.
Q. -- which says that where there is an access opening in a watertight bulkhead, it should be fitted with a watertight closing appliance.
A. Perhaps we could look at that regulation.
Q. Of course.
THE CHAIRMAN: Is that the Blue Book?
MR MOK: It's bundle 8.
A. It's in both books.
Q. Page 1769.
THE CHAIRMAN: Yes.
"When any access opening is fitted in a watertight

Page 47

bulkhead, it is to have an efficient closing appliance."
A. Thank you.
MR MOK: That's what you're referring to?
A. Indeed, and it's in the 1995 Instructions too, I believe.
Q. Right. Whilst we are on this Rule, can I refer you to one reference in your report.
Page 427, paragraph 64. The sentence I'm referring to here is after the middle of the page, where you say:
"The use of the words 'access opening' is not helpful, as it does not signify the presence or absence of a watertight door. It is noted that the Instructions for Survey states 'where any access opening is fitted in a watertight bulkhead, it is to have an efficient closing appliance'. This would suggest to me that the use of the term 'access opening' on a structural drawing of a watertight bulkhead is valid terminology, at least with regard to the use of the Instructions to which it was being built. Under those same Instructions it still needs to have an efficient watertight closing appliance."
Do you see that?
A. I do, yes.
Q. By saying that, you are not suggesting that the designer, when he chose to use the words "access door",

Page 48

would have the instruction -- "access opening", sorry, that he would have in mind that particular instruction in the Blue Book; right? You're not suggesting that?
A. No, I'm not suggesting that.
Q. What you are --
THE CHAIRMAN: I think Dr Armstrong hasn't finished.
A. Thank you. It seemed to me when I first read "access opening", it was not clear what was intended, which is why I said "not helpful", but then I referenced to the Instructions which actually almost define what an access opening is: it needs a watertight door if it's fitted in a watertight bulkhead. And I interpreted this as being a watertight bulkhead, because the drawing says it is a watertight bulkhead. So in that case, the access opening was clearly intended to have a watertight door on it. If that meant that the drawing was changed in order to better comply with statements in the instructions, it's beyond my knowledge, but it could well be the case.
Q. Yes. I think what I'm suggesting is there is no evidence that that change --
A. No.
Q. -- was done, for this reason.
A. No.
Q. Doctor, we have heard evidence from Mr John Lim of

Page 49

Naval-Consult. You've read the transcript of his evidence?
A. I have not, sir, no.
Q. All right. In that case, I may have to take you to it, or at least a part of it. Can I ask you to please look Day 19. The bit I wish to draw your attention to is page 152. At line 19, the question was:
"I think you focused on the words 'access opening'.
Answer: Yes.
Question: Did that indicate to you that that should be an opening instead of a watertight door?
Answer: As what I wrote in my email, that my -- I said my draftsman could be correct at that time, considering that it is a single-compartment flooding.
Question: Yes. With that answer, can I ask you to go back to your other email, dated 18 January 2013, at page 4027. This is question 2 on that email. The question was:
'Was there a mistake of the draftsman to decide the bulkhead 1/2 as watertight in some of the drawings?
In this instance, I would say yes. This could be the result of him modifying existing drawings from a previously built vessel (MV Eastern District No. 1).'
Do you see that?
Answer: Yes.

Page 50

Question: Can I ask you, please, to identify which are those drawings that you are referring to? First of all, can we go back to the same drawing at page 205. This time can we look at the top right-hand corner, section B-B. Do you see on section B-B, there's a reference to 'WT bulkhead'?
Answer: Yes.
Question: Would you consider that to be one of the mistakes referred to in your answer 2 of your email of 18 January?
Answer: Yes.
Question: As it applied to the frame 1/2?
Answer: Correct.
Question: Another one -- can we go back one page on Profile and Deck.
Answer: Yes.
Question: There is a reference or there are references, for example, in the drawing marked 'Centreline profile', you will see the frame 1/2 bears the notation, if I can read it, of 'corrugated WT bulkhead'; correct?
Answer: Yes.
Question: Would you also consider that to be a mistake covered by your answer 2?
Answer: Yes.

Page 51

Question: So, similarly, for example, at the bottom plan on the same drawing; do you see that?
Answer: Correct.
Question: Sorry, we didn't catch your answer.
Answer: Yes.
Question: All right. Can we go now to the drawing called Shell Expansion on page 202.
Answer: Yes.
Question: There is a notation of 'WT bulkhead' where we find the frame 1/2; do you see that?
Answer: Yes.
Question: Would that be covered by the reference to the mistake in your answer 2 as well?
Answer: Yes."
This is the first time you've seen this?
A. Unfortunately, yes, it is.
Q. So it seems that the designer itself is prepared and indeed did admit that there were certain errors because that may explain why there appears to be an unexplained change of wording from "WT door" to "access opening", and would you regard that explanation as being plausible in light of the fact that the trim and stability booklet was done in the way it was?
THE CHAIRMAN: I don't think "plausible" is for Dr Armstrong. You might ask him if it's consistent.

Page 52

MR MOK: If it is consistent, yes, with the Trim & Stability Booklet being done at least partially on the basis that the steering gear and tank room were damaged at the same time, and also by reference to the change of wording, or, if I may say so, deliberate change of wording from "WT door" to "access opening"?
A. It is consistent, Mr Mok, yes. I find it a rather astonishing trail that a draftsman would make a really fundamental error. It's a very basic understanding of drawing that if you change something in one view, you change it in all views.
Q. I think one thing that can be said of this case is there are a lot of features which may not have been expected in the usual course of events.
A. But it's consistent.
THE CHAIRMAN: Nevertheless, you'd categorise it as "an astonishing trail that was left behind", and "a fundamental error in drafting", not to change all the drawings to reflect --
A. It's a basic error in drawing.
THE CHAIRMAN: I think on that note we'll take our mid-morning break. 20 minutes, please.
(11.30 am)
(A short break)
(11.50 am)

Page 53

THE CHAIRMAN: Yes, Mr Mok.
MR MOK: Thank you.
Dr Armstrong, I now come to a different table in your second supplemental report at page 929, please.
This table at the bottom shows the condition where the engine room and the tank room are both flooded.
A. Correct.
Q. And still we are in 1996, and we will see there with the watertight door, 0.378, "Satisfactory"; right?
A. Correct.
Q. What that means is it is satisfactory in the sense that the margin line would not be immersed?
A. With the vessel on level heel, correct, with no list.
Q. Yes. I think earlier on, you did explain the two concepts of margin line as between floodable length and stability calculation --
A. Yes.
Q. -- and I think you said the difference is where there is some sort of heel being taken into account, and in that case there would be a difference?
A. Correct.
Q. But assuming that there's even heel between the left and the right side, there would be no difference?
A. Correct.
Q. The second line there shows that where the engine room

Page 54

and the tank room flooded, but with no watertight door, that scenario basically means that all three compartments are flooded?
A. Correct.
Q. And the vessel would sink?
A. If there is no buoyancy at the back end, the vessel would sink.
Q. Right. But just pausing there. Since we apply the 0.1L formula, so even with that second scenario -- that is, the boat sinking or the ship sinking -- the margin line would still be complied with in that scenario? Sorry, I'll come again. I'm wrong. It wouldn't be.
Perhaps the question is this. Where you say under the second scenario, all three compartments being flooded, the vessel sinks, and then you use the word "Fail". Can I ask you what that word means in this context?
A. Yes. My apologies for not being more explicit. It merely refers to whether the margin line is immersed or not in accordance with the regulations. So it's meant to say "Fails in accordance with the regulations". Schedule 1, in this case.
Q. But that is what I do not understand. Because we use the one-compartment flooding rule. So when we apply the one-compartment flooding rule, you are calculating the

Page 55

floodable length either by reference to the engine room alone, or by reference to the tank room and the steering gear compartment together. In either of those calculations, the calculation would not fail, would it?
A. I understand where you're coming from, Mr Mok. Maybe I should rephrase what I said and say that "Fail" means "Fail to keep the margin line above the water level".
Q. What does that mean? Does that mean it's immersed the margin line, or something different?
A. It means it's immersed the margin line, yes.
Q. Well, I certainly understand if you calculate it on the basis of all three compartments together. That would certainly immerse the margin line, if not the whole ship.
A. Yes, that's what it's saying.
THE CHAIRMAN: Well, it's sunk, so the margin line is definitely immersed, is it not?
MR MOK: Yes, Mr Chairman. I do understand that. I'm just having a little difficulty if one were to apply the one-compartment flooding.
THE CHAIRMAN: That's not what Dr Armstrong was doing. He's corrected that.
MR MOK: Right. That's what I was seeking to clarify, Mr Chairman.
I wish now, Doctor, to come to the question of the

Page 56

aft peak bulkhead. If we may just look at the history of this very, very briefly. First of all, looking at the Blue Book, which we have already. But can we look at it once again. Bundle 8, page 1769. It's instruction 12(iv). It says:
"In all double-ended launches and launches over 70 feet long peak bulkheads will be required at both ends."
A. Yes.
Q. There is no stipulation here of any distance in relation to an aft peak bulkhead, where it should be located in reference to the stern?
A. Correct. There is no reference to that.
Q. The second reference I would like to make is to the -- then we come to the 1995 position. That is the same bundle, page 1821. This is instruction 5.3 of chapter II of those instructions. It reads:
"In all double-ended vessels and vessels over 21.3 metres ..."
That's approximately 70 feet, right?
A. Yes.
Q. "... in length, peak bulkheads will be required at both ends."
A. Correct, yes.
Q. Again, in the 1995 position, there is no mention of any

Page 57

requirement of any stipulated minimum or maximum distance where the aft peak bulkhead should be located?
A. Correct.
Q. If I may now go to the next chronologically, no to Cap 369AM. It's in the legislation bundle. Regulation 7.
THE CHAIRMAN: The Ordinance's name being?
MR MOK: It's a mouthful. It's called the Merchant Shipping (Safety) (Passenger Ship Construction and Survey) (Ships Built On or After 1 September 1984) Regulations.
THE CHAIRMAN: Thank you. Where do we find it?
MR MOK: It's tab 11 of the legislation bundle.
These regulations, as we understand them, apply only to the ocean-going vessels; is that your understanding?
A. That's my understanding.
Q. In regulation 7, if I can just take you first of all to 7(1), which refers to the collision bulkhead --
THE CHAIRMAN: Is there some provision that mandates that they only apply to ocean-going vessels?
MR MOK: I think that's an exercise which my learned friend Mr Shieh --
THE CHAIRMAN: Yes, that's what revived my memory. This was going to be sourced. Has that been achieved yet?
MR SHIEH: It has. Copies will be made available.
THE CHAIRMAN: Thank you.

Page 58

Just give me a moment, please. Thank you.
MR MOK: Regulation 7(1) only applies to collision bulkheads, and it's the same as a fore peak bulkhead, is it?
A. Correct.
Q. If I can just read a part of that. It says:
"Every ship shall be provided with a collision bulkhead which shall be watertight up to the bulkhead deck and shall be fitted at a distance from the ship's forward perpendicular [or] not less than 5 per cent of the length of the ship and not more than 3.0 metres plus 5 per cent of such length."
Just pausing there.
A. Yes, Mr Mok. I think you said "or not less", but it says "of not less".
Q. I'm sorry. But what we see here, and if one goes on to read the rest of this rule, is that it does provide a very specific distance, a minimum and a maximum distance of where this particular bulkhead must be located.
A. Yes, Mr Mok. It's identical to SOLAS.
Q. Yes, which I will come to. But in comparison, the reference to what they call the after peak bulkhead in subparagraph (4), if I can read that now:
"Every such ship shall be provided with a watertight

Page 59

after peak bulkhead and with watertight bulkheads dividing the space appropriated to the main and auxiliary propelling machinery and boilers, if any, from other spaces. Such bulkheads shall be watertight up to the bulkhead deck, provided that the after peak bulkhead may be stopped below the bulkhead deck if the safety of the ship as regards subdivision is not thereby impaired."
A. Correct.
Q. Just pausing there. The reference to requiring watertight bulkheads to divide, say, this machinery space, would it be correct to say that one of the purposes of that requirement is so that where there is a fire or smoke or noxious gas coming from that particular compartment, it would not then affect other compartments?
A. Yes, Mr Mok, that's what I indicated yesterday, I think.
Q. Yes, you did. Then going back to the after peak bulkhead -- this is just another name for aft peak bulkhead, correct?
A. Correct.
Q. What I wish to note is that in contrast to subparagraph (1), there is no specific requirement as to the maximum or minimum distance, in relation to the stern, as to where this particular bulkhead must be

Page 60

located?
A. I agree. I believe that is because you're unlikely to have a collision going astern.
Q. Sorry, I didn't catch that.
A. I believe that is because the collision bulkhead is specified where it is due to many years of experience on how far back damage would occur in a collision scenario.
Q. Yes.
A. But that would not apply to a vessel going astern, because they seldom have collisions going astern. Most vessels are going forward.
Q. Right. We now come to SOLAS, which is in the expert bundle starting at page 956-6. At page 956-7, we have regulation 10. Regulation 10 (1) I believe mirrors our regulation 7(1)?
A. I believe so.
Q. So it provides, in short, for a minimum and maximum distance between the fore peak or collision bulkhead to the forward perpendicular of the ship?
A. Correct.
Q. Yes. Again moving to, now, paragraph 7 of regulation 10, it says:
"An after peak bulkhead, and bulkheads dividing the machinery space, as defined in regulation 2, from the cargo and passenger spaces forward and aft, shall also

Page 61

be fitted and made watertight up to the bulkhead deck."
So that mirrors our regulation 7(4)?
A. Correct.
Q. Again, even in SOLAS you see that contrast there: there is a specific requirement for distancing, whereas there is no requirement in relation to distancing for after peak bulkheads?
A. Correct.
Q. You mentioned in your evidence that in your opinion, the after peak bulkhead should be -- and it's not a fixed thing, I think -- less than 0.1L; that's your opinion?
A. I think I expressed opinion of about 10 per cent.
Q. About 10 per cent?
A. Yes.
Q. I think you also mentioned maybe about 5 to 7 is the norm?
A. I can't recall if I was talking about the aft peak at that stage, but about --
Q. Right. It doesn't matter.
A. I remember saying "about 10 per cent" at some stage.
Q. It doesn't matter. When you refer to that indication of length, you were actually talking about a practice, not a rule or a requirement anywhere?
A. Correct. I know of no such rule.
Q. So if we may put that comment in context, you were

Page 62

talking about -- what you are saying is that in many cases where you would find the aft peak bulkhead, that would be located round about the area of 0.1L from the stern?
A. I would expect it to be less than.
Q. Less than?
A. Yes. About 10 or less than.
Q. And certainly no more?
A. Oh, I wouldn't say "certainly", because there are always exceptions.
Q. I see. Right. What would be those exceptions?
A. May I refer to the particular examples that you provided last night?
Q. Thank you. I was trying to understand them myself.
A. I'm sorry, I don't have a page number.
Q. I thought you might be familiar with those. It's page 4057 of the marine bundle 11.
First of all, Dr Armstrong, Austal is the company that you're working for now?
A. No, sir.
Q. No longer. Sorry. You used to work for?
A. I worked for 12, almost 13 years, yes.
Q. As the chief scientist?
A. Correct.
Q. So, yes. What were you going to refer to?

Page 63

A. This vessel was in fact built by a subsidiary of Austal called Image Marine. It was one of I think five vessels -- four vessels which were built for the Government of Malta as an inshore patrol vessel. I was not involved in the design or construction of this vessel, but I was asked for help in positioning the aft peak bulkhead, as coincidence would have it.
I would refer you to the next page. Maybe first of all, no, if we could scroll down a little on this page, please.
The very bottom picture is a view looking aft on the vessel. You will see there is no deck, or appears to be no deck. But there are doors at the after end. The reason for this, which might become more apparent when we turn over the page, is that there are rails, which you can see in the photograph. There are some rails running away from the camera on which what we call a daughter boat, a rigid inflatable, would be located. And the doors would open and the boat could be launched or recovered.
So there is a sloping deck, sloping in both longitudinal and transverse sense. So there is very little volume in the back end of the vessel.
If we can then scroll down to the drawing it may make it more clear. The drawing at the bottom, or in

Page 64

the middle now, shows just above the propeller on an angle what is meant to be a rubber inflatable boat with an outboard motor on the back. So you can see there is very little volume of the vessel underneath that rubber boat which is launched out the back. But there is buoyancy provided at the sides for floodable length reasons.
On the bottom diagram, you can see the engine room has an aft bulkhead which appears to be the aft peak bulkhead as well. It is not quite, because the aft peak bulkhead on this vessel was stepped. It's not only the bulkhead that runs across the ship to the left of the generators -- just above where the cursor is now -- and you'll see there is a door on the centreline. But then also there is a bulkhead behind that which does not run right across.
If you scroll up to the drawing at the top -- sorry, the second drawing -- you can see in the profile that there is very little volume below the boat, because the sloping deck is below the boat. In fact, there's not even room to stand up there; it's just a crawl space. So the volume of the aft peak was deemed to be sufficient to allow us to move the bulkhead further forward, and I believe, Mr Mok, it's at something like 14 per cent of the length.

Page 65

This was proposed to the surveyor representing the Government of Malta, and that particular gentleman said, "Well, the rules don't apply to ships of war in any case", which you will find in the beginning of SOLAS is correct. So he has the authority to put the bulkhead where he likes. So in this case it was moved forward, but for very good reasons.

Q. Can you help us with the configuration of this bulkhead. Since it doesn't extend all the way to the sides, how is it made watertight there?

A. Thank you. It is made watertight by -- it's difficult to explain without control of the cursor. Having effectively five bulkheads, the major one running fore and -- sorry --

THE CHAIRMAN: Are you looking at the lower deck here?

A. I'm looking at the lower deck plan, thank you, sir. The bulkhead running across the ship, behind the generators, at the after end of the engine room.

THE CHAIRMAN: Left side of the screen.

A. Thank you. That one.

If you then move up a small distance. If you now go aft on the ship, that line represents a continuity of the aft peak bulkhead, but moving longitudinally in this case. And then if you go up with the cursor; that continues to be the aft peak bulkhead. And then turn to

Page 66

the right with the cursor; that is also the aft peak bulkhead. And then move up; that is also the aft peak bulkhead. So the aft peak bulkhead is created by five bulkheads which are consecutively, as we've just gone through, transverse, longitudinal, transverse, longitudinal, transverse.

The access to the after peak space at the sides of the ship are created through watertight manholes which you can probably see on both views here as a dotted line in the lower view, and a more solid construction in the middle view.

MR MOK: Just out of interest, these bulkheads extended from the bottom to the deck; is that right? It seals the vertical space?

A. I can't remember, but almost certainly they would have done.

Q. Thank you very much. And the other one, maybe you would like to comment to.

A. Yes. I think it was a very good example, Mr Mok. Someone --

Q. Just pausing there. I think you were citing this as an example of an exception to what you said was the general practice?

A. I think you were citing it, Mr Mok, in the first place.

Q. I think you pre-empted me.

Page 67

A. Yes, correct. I thought that may have been your question.

Q. Anyway, is that an example of an exception to what you call the general practice of less than 0.1L?

A. I'm not sure "exception" is the correct word, Mr Mok, because it's not, as you have indicated, a strict requirement. But it's an example of where it is more than my rule of thumb.

Q. Right. And the other one --

A. The other one is a vessel --

Q. -- at page 4059.

A. I would also comment, that previous vessel was not a passenger vessel. It was a Government craft and classed as a craft of war.

This vessel (indicates page 4059) is a passenger vessel, up to 36 passengers. It was designed for operation in the waters of Western Australia. It was also built by Image Marine, a subdivision of Austal. I was not involved in the design of this craft either, but I was very much involved in the watertight door issue.

If you scroll down to the bottom -- you may note in the top picture -- I think the only relevance of the top picture, apart from the beautiful scenery, is the fact it has a helicopter. You can also see the sloping aft

Page 68

deck at the after end. So again, it's a design with very little volume at the back end of the boat.

If you can scroll down to the bottom drawings. Thank you.

You can see in the very bottom diagram that the aft peak bulkhead is quite a long way forward.

Q. Where do we see that?

A. It's the solid black line running on the left-hand side of the page. That's the aft peak bulkhead.

Q. Is that watertight? Because I am looking at the --

A. I might come to that, Mr Mok.

Q. Thank you.

A. I think this, from memory, is somewhere between 14 and 15 per cent from the after end. This is watertight. The door was a hinged watertight door. It was accepted by the surveyor doing the plans, and the vessel was constructed and a certificate was granted. The volume of the aft peak is not as large as it might appear here because if you look at the sketch above the one we've just been considering, you can see there are stairs leading down and there is not a lot of volume in this aft space.

The boats above and up on the next deck were launched over the stern, so it was made sloping in order to make it easier to launch them.

Page 69

However, this particular vessel certificate was rescinded because the authorities decided that the hinged watertight door was not adequate and did not meet the regulation. As a result of that, they demanded that the door be replaced by a sliding watertight door with remote operation from the wheelhouse and with alarms in the wheelhouse indicating whether it was open or closed, and also alarms locally so that anybody passing through would know if it was about to be closed. They also required a label to be put on the door saying "To be kept closed at sea at all times".

It was generally understood that nobody was allowed through that door when the vessel was at sea; only when it was at anchor. I think operationally that caused some particular issues.

I then became involved because I was asked to negotiate with the authorities some way around this dilemma of them wanting the door to be sliding, which is extremely difficult to fit, very expensive, very heavy item.

A process of that negotiation, I was able to prove to the satisfaction of the Australian Maritime Safety Authority that the vessel could stay as hinged but it did need remote operation from the wheelhouse, it did need the indicators I've previously suggested, and

Page 70

alarms locally. And the rule was then that it should not be used at sea.

That submission was based on the volume of the after space, and proving that if it was flooded through failure of the rudder stocks, it would not -- and also of course watertight subdivision requirements, the vessel would remain afloat.

Q. So it seems that what you are saying is that as originally designed, that was not to be a watertight bulkhead, but this was challenged?

A. It wasn't designed to be -- it was always designed to be a watertight bulkhead.

Q. Right.

A. It had a hinged watertight door on it.

THE CHAIRMAN: Rather than a sliding door?

A. Rather than a sliding door.

THE CHAIRMAN: Which is the desired option?

A. Correct. And I should have said, because the Australian Maritime Authority thought this was too large a space at the after end, they were saying they wanted a sliding watertight door.

THE CHAIRMAN: That's because you can close a sliding door against an ingress of water but you can't do the same with a hinged door?

A. That is correct. I argued back that if it was hinged

Page 71

the correct way, if the aft peak flooded, then it would close the door. I'm not sure how successful that was.

MR MOK: Just one small detail. Why is it that there are the letters "WTD" in relation to the next bulkhead, whilst there are no letters like this for the after peak bulkhead? Is there any particular reason, or just an omission?

A. I do not know, Mr Mok.

Q. "WTD" I assume refers to "watertight door"; correct?

A. Yes, almost certainly.

Q. Yes.

A. I can assure you that the aft peak bulkhead was indeed watertight.

Q. Thank you.

A. I did actually refer to this particular vessel in evidence about three days ago, but I did not name it.

Q. So now you've given a complete explanation of this.

So the function of an aft peak bulkhead, I think as you explained, is to prevent the spillage of floodwater from the areas which house the propeller shaft and/or the rudders, to other parts of the hull?

A. It is one function, yes.

Q. It's one function. What are the other functions as well?

A. I did talk at some length, Mr Mok, about the origins of

Page 72

the need for an aft peak bulkhead on wooden ships.

Q. Yes, but in modern times.

A. In history.

Q. Yes. In modern times.

A. Of course, there are still many wooden craft around with a similar problem, but that's not relevant to this particular case.

Q. Right.

A. The main requirement is still for most vessels where the propeller shafts go through the bulkhead, and particularly on single-screw ships.

On neither of the examples do the shafts, from what I remember, go through the bulkhead.

Q. Right. In a case where the propeller shaft and the rudders are located close together, then of course the aft peak compartment enclosing them may be of a relatively small volume, because those two items which you mentioned in your report are close together?

A. Yes.

Q. But there are some cases such as the Lamma IV where the propeller shaft and the rudders are located further apart from each other. Would I be correct in saying that there is no rule to determine in that kind of situation whether they must be kept in two separate watertight compartments or a single one? Are there any

Page 73

rules?
A. No, there are no rules. I have -- if I may, Mr Mok. There is another reason for the aft peak bulkhead which was particularly relevant for the example we've just been talking about.
Q. Which one are you referring to?
A. I'm referring to the ship called True North, the Austal 35.
Q. The second one?
A. The second one. One of the difficulties the authorities had with accepting the vessel as it was was that this vessel operated in relatively shallow water because it wanted to take passengers close to the shore. By "relatively shallow water", I mean something less than 15 metres or so. It was seen as a risk that this boat may run into shallow water and thereby push the propellers or the rudders up through the bottom plating and flood the aft peak.
You can see probably in the next sketch down that there is a skeg -- sorry, you need to go up a little. Thank you. Underneath the engines, there is a structure a sort of triangular structure -- if you can go up one. Underneath the engines, there is a structure under the vessel which is intended to protect the propellers and the rudders from grounding. But nevertheless it was

Page 74

felt -- you can see the rudder is supported at the bottom by this structural part of the boat. Underneath the rudder. Thank you.
That is the rudder, and underneath there is a rudder bearing carried by some structure. It was felt that if this boat went aground, there was a real risk of pushing the rudder up through the hull and causing leaks. Because it's also twin-screw, it was seen there was a possibility of the propeller blades being pushed through the shell plating.
I think that argument still applies to something like Lamma IV, if she had gone aground.
Q. So perhaps what you are saying is this, that sometimes, because of the configuration of the vessel in question, you may have to have some special device to protect the rudder area or the propeller area?
A. I'm suggesting that that special device would be called an aft peak bulkhead, Mr Mok.
Q. Sorry, which part are you referring to now?
A. I'm suggesting that if you flood due to damage of the shell plating aft, then you need an aft peak bulkhead to restrict the level of flooding. I was not intending to suggest you could protect it with guards underneath. Yes, you can do that to some extent, but there is still a risk of penetrating the aft hull.

Page 75

Q. Right. Perhaps you can help us with this, on this point. If I may just locate what I was going to refer to.
A. I've recalled another comment from the survey authority on this craft also, Mr Mok: that because the vessel had a helicopter and operated at all times within a few kilometres of shore, that this was seen as an alternative rescue means, in case of incident. But not relevant to Lamma IV.
Q. Yes.
A. Just part of the argument to allow the aft peak bulkhead to be moved.
Q. Yes. What I have in mind is regulation 7(5), legislation bundle --
THE CHAIRMAN: Of which regulations?
MR MOK: The one with the long name. It's --
THE CHAIRMAN: Cap 369?
MR MOK: 369AM.
THE CHAIRMAN: Thank you.
MR MOK: I think it's tab 8, if I am not wrong, of legislation 2.
A. Tab 11, I think.
Q. Tab 11, sorry.
THE CHAIRMAN: Which regulation?
MR MOK: Regulation 7(5), which we have not yet looked at.

Page 76

"The stern gland of every such ship ..."
Can you explain to us what a stern gland is?
A. I will attempt to. It is a feature which usually includes a seal such that where the shaft, the propeller shaft passes through the shell of the ship, water does not leak in around the shaft. It's usually adjustable and can be tightened up in case of leakage.
Q. Is that the same as the mechanical sealing that you were referring to in your report, or a different thing?
A. Essentially, yes, it's the same.
Q. All right. So:
"The stern gland of every such ship shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such a volume that if the tunnel or space is flooded the margin line will not be submerged. The stern tube shall be enclosed in a watertight compartment, the volume of which shall be the smallest compatible with the proper design of the ship."
I think we need a little bit of help here. Can you explain this rule?
A. The paragraph is a reflection of what is in SOLAS.
Q. Regulation 10?
A. Yes, regulation 10 of SOLAS. 10 or 12?
Q. 10.

Page 77

A. And really only applies to large vessels with a single screw, which would have usually a propeller shaft running from an engine which may be well forward, maybe the middle of the ship, running through what is called a shaft tunnel, which is an enclosed small corridor in which is located the propeller shaft. Because this could be quite long, as I say -- when these regulations were formulated, it was common to have the engine room in the middle of the ship. These days, most engine rooms are in the after part of a ship. So I find it to be a rather archaic paragraph with regard to modern design. But the intention is that the stern gland is a weakness through which water can leak and you need the smallest volume possible, compatible with a proper design of a ship.
Q. Yes. It does say "Every such ship" --
A. Yes.
Q. That seems to be a requirement across the board?
A. Except for the first sentence, I think.
Q. Sorry?
A. Except for the first subparagraph, 7(1), which says "Every ship".
Q. I see. And I'm just cross-checking the SOLAS rule to see whether or not it is worded in the same way.
Perhaps we can take a look at it, Mr Chairman, if

Page 78

you don't mind. It is in the expert bundle, page 956-8.
THE CHAIRMAN: Yes.
MR MOK: Perhaps I can just read it out:
"In all cases stern tubes shall be enclosed in watertight spaces of moderate volume. The stern gland shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such volume that, if flooded by leakage through the stern gland, the margin line will not be submerged."
This particular rule seems to cater for the function or the main function that you just explained to us, namely to seal that area where you have the propeller shaft, to prevent flooding in that area from overspilling to other areas?
A. Yes, sir.
Q. Also under this rule there are requirements, for example, as to the volume of this particular space. In one case, in our case, it should be smallest. In the case of SOLAS, it should be a space of moderate volume.
A. Yes. I'm not sure if that defines it very well, but --
Q. It doesn't. But the point I'm seeking to make here is that there is a specific rule concerning this particular function, and even for this particular function, that is defined by volume instead of by distance from the stern.

Page 79

Would you agree with that?
A. Yes. Mr Mok, I understand what you're suggesting. I'm sure we're all aware that this regulation 7 does not apply under the instructions. It is for ocean-going ships.
Q. Correct.
A. So it can only be used for guidance in that particular case, and I'm sure was done so by the surveyors at the time. I'm unable to say how "moderate" or "small" might be interpreted in the case of a small ship.
Q. May I suggest --
A. Volume -- sorry, I was pausing because I was thinking.
Volume is related, of course, to the distance of the bulkhead from the transom. Does that answer your question?
Q. Well, I may be wrong, but what I would wish to suggest is that it is defined by volume because that particular feature may not necessarily be in the norm of a bulkhead. It may be in the form of, say, a box-shape configuration.
A. Absolutely, Mr Mok, and the two examples we've just talked about from the Austal shipyard are examples where the volume was minimised even though the bulkhead was a little further forward than normal due to the fact that the deck was sloped.

Page 80

Q. And in order to serve this function, that volume, whatever structure you use, either in the form of a bulkhead or in the form of a box, needs to be kept within a certain size so that the water to be contained in that box or compartment should be contained?
A. Correct, yes.
Q. And that is why, where you are talking about the protection of the other space from flooding, from this particular area, it's not very helpful to talk about distance from the stern; it is more helpful to talk about volume, because of the different variety which you may use to serve this function?
A. Yes, although that distance and volume are related.
Q. But the distance is only relevant if you have a bulkhead structure?
A. Correct.
Q. And the volume is general, because it applies to all structures?
A. If you could adequately put boxes around the areas that were seen as a risk, for example the stern glands, the propeller shafts and the rudders, then that could be done locally, and you may be able to put the aft peak bulkhead further forward.
Q. And one of the two vessels that you just explained to us gives to us a very good example because there, if we

Page 81

recall correctly, there is a structure surrounding the rudder on the one hand and also another structure surrounding the propeller tube or the stern tube, on the other hand? Is that --
A. I wonder which example you're referring to, Mr Mok?
THE CHAIRMAN: You were describing a skeg, were you not, for the passenger vessel?
A. But the skeg has no volume. The skeg is just a plate, an aluminium plate hanging below the boat. Two, actually.
THE CHAIRMAN: Protecting the propellers and the rudders?
A. Protecting the propeller, supporting the rudders. It does not have a volume.
MR MOK: I think it is the Austal 35 Liveaboard.
A. Yes, the one on the screen.
Q. Yes. It's the third drawing from the top, where you seem to see two structures surrounding on one hand the propeller and the other one, the shaft; is that right?
A. These are not volumes; these are -- the triangular piece, I tried to explain earlier on, that is protecting the shaft and supporting the rudder is just a plate. Quite a thick plate, but it has no volume.
I also notice, Mr Mok, that on frame 25 it does actually say "WTB" for the bulkhead, watertight bulkhead.

Page 82

Q. Thank you. Maybe that solves a mystery.
But I suggest, Doctor, that even though regulation 7 or the SOLAS rules are applicable to ocean-going vessels, reference to those rules are still relevant because in addition to paragraph 5, there is also paragraph 4 -- I'm referring to regulation 7 here -- which does specifically refer to the watertight after peak bulkhead?
A. I agree. I think regulation 7 is applicable and would be used for guidance to the surveyors.
Q. Yes. And would it be correct to say that the matter being specifically catered for, particularly the watertight issue relating to the propeller, is dealt with specifically in paragraph 5?
In paragraph 4, where it talks about the after peak bulkhead, it is not necessarily setting down a rule or requirement that this particular bulkhead should be located at a particular distance from the stern; the matter being dealt with specifically, so far as the protection of the propeller is concerned, is dealt with by paragraph 5?
A. I don't necessarily agree with you, Mr Mok, because subparagraph (5) is somewhat archaic. Most modern ships, the great majority of ships, for example, coming into Hong Kong, ocean-going ships, would have a single

Page 83

screw and would have the propeller coming in on -- a propeller shaft coming in on the centreline, through a gland, into an aft peak compartment and then straight to the engine. There would be no long shaft tunnel. I can't honestly remember the last time I saw a shaft tunnel. And the volume, the minimised volume would be formed by the aft peak.
So I think one has to read both of these subparagraphs together to understand the intent of the aft peak bulkhead.
Q. In the case of Lamma IV, where do we find the area where the propeller shaft penetrates the hull, in which compartment?
A. It comes into the engine room, Mr Mok.
Q. Yes. So it is a different compartment than where the rudder is located?
A. I have not looked at the drawing specifically closely, but I did note in passing that there is a tube which runs down through the bottom of the vessel, and the tube contains the propeller shaft. On the outboard side of that there is a stern gland, and on the inboard side of that there is also a stern gland, or equivalent. So there are two watertight glands, I believe, without looking at the drawing in detail.
Q. Can we look at the General Arrangement plan.

Page 84

A. There is a drawing of the stern tube somewhere, which I'm sure we can find.
Q. Yes. Can we look at that.
A. Marine bundle 2, drawing 229.
Q. Yes.
A. On the top you can probably make out where the vessel is by the location of the bulkheads. The engine is shown dotted on the right-hand side. The line from the engine going towards the left goes through a gearbox, presumably, and then through where the cursor is now, there will be a bearing to support the shaft, which is rotating, of course. And then we come to -- a bit further left, please. This is the end of the propeller tube. Now, the tube, which is where the cursor is now, passes through the bottom of the vessel and contains, to the right of where the cursor is now, a means to provide a watertight seal. You can probably see the words just to the right of the cursor "stuffing box", which is a terminology used by marine designers. It's a way of tightening up the seal.
The stern tube then runs aft to the left of the picture, and you can see the words "stern tube", and is connected to the bottom of the boat by some substantial structure which ends the stern tube. There is then -- sorry, I'm still on frame 3, which is to the right of

Page 85

where the cursor is.
If we now move slightly to the left, that is the shaft with no more stern tube. This is an open rotating shaft, which to the left is then supported by another bearing and eventually holding the propeller.
All of what you see to the left of what is frame 3 is rotating in open water, apart from the support at about frame 1.5 or frame 1.
So the feature you've asked about is the stern tube that runs from frame 3 to frame 5 on this particular drawing, and you can see the risk is if the shaft leaks around the area called the stuffing box, it will leak into the engine room, in this particular case.
Details are given just below the screen. These are details of the seals and the bearings.
Q. Thank you, Doctor. I think this makes the position very clear.
With that, can I invite you to one comment in your evidence. It is Day 26, page 6. Maybe we can start at line 25 of page 6. There you said:
"One has to ask why is that requirement there."
That's a reference to the peak bulkhead at both ends.
"It's perhaps not obvious, but I doubt it's there for watertight subdivision or floodable length reasons

Page 86

because there are already detailed requirements for that.
Question: Yes.
Answer: So it's there for some other purpose.
Question: Yes.
Answer: I can only speculate as to what that purpose is, but I believe one of the possible reasons is because there are other flooding scenarios, such as, for example, what happened with Lamma IV where the engine room and the tank room were flooded, and if that happened the vessel was going to sink, because there was no buoyancy in the after part of the vessel at all. So in that case, the aft peak would provide some buoyancy at the after end, and indeed calculations show that it would have survived in that condition.
So I think whoever wrote the original versions of SOLAS were aware that there were other requirements for buoyancy at the after end other than could be calculated directly with the floodable length calculations."
A. I recall that, yes.
Q. The specific scenario here is that there was no flooding of the after peak compartment, but flooding in the other compartments next to it?
A. Correct.
Q. That is, if I may put it crudely, the opposite of the

Page 87

function that you just described earlier; that is, to protect the other compartments from the flooding that goes into the aft peak compartment?
A. I understand what you're saying.
Q. Yes. Do you agree that has quite a different function?
A. It's quite a different function. It's a hypothesis.
Q. Yes. And you do fairly use the word "speculate" on line 8.
A. I do.
Q. Yes. But you're not aware of any rules or materials to show that the drafter of instruction 12(iv) -- that is, in the Blue Book -- would have had this particular scenario in mind, right? There is no --
A. I have no knowledge of that, no.
Q. May I suggest further that it is in fact unlikely that this drafter had this particular scenario in mind because if he had in mind the purpose of preventing the vessel from sinking, he would have made it plain and beyond doubt that the after peak bulkhead referred to in instruction 12(iv) must be watertight; right? Do you agree with that? If the important function that he had in mind is to prevent the vessel from sinking by providing sufficient buoyancy, then he would have made it clear beyond any doubt that the aft peak bulkhead must be watertight.

Page 88

Can we look at that rule again.
Do you see what I mean?
A. I understand what you mean, Mr Mok. I just have difficulty in expressing --
Q. Page 1769.
A. I would think it was an alternative scenario, that the person who drafted that legislation, and this is pure speculation, of course, was aware of the importance of the paragraphs in SOLAS for the need for a peak bulkhead, and therefore merely copied that across rather than went into the detail you're suggesting as to why it was necessary.
Q. Right. If we can look at page 1769 of bundle 8 again, at regulation 12 of the Blue Book. What I am drawing attention to is references to watertight bulkheads in subparagraph (i), subparagraph (ii) subparagraph (iii) --
A. Could I ask you to hang on a second, Mr Mok.
Q. I'm sorry.
A. Thank you. Marine bundle 8, I think, Mr Mok?
Q. Yes. It's actually tab 1 at page 1769.
A. My apologies. Thank you.
Q. It's okay. I'm drawing attention to references to "watertight bulkhead" in subparagraphs (i), (ii) and (iii), and even (v). But there is no particular

Page 89

reference to "watertight bulkhead" in subparagraph (iv) that we are concerned with.
A. Yes, I note that.
Q. So what I am suggesting simply is this: that if the scenario that you mentioned in your evidence that we just read out --
THE CHAIRMAN: That's the buoyancy point, is it?
MR MOK: The buoyancy point, yes. And the buoyancy, according to this scenario, is to prevent the vessel from sinking in a particular scenario, right, such as the one encountered by Lamma IV. That is the function we are talking about. So my suggestion is, if he did have this function in mind when drafting instruction 12(iv), he would have made it abundantly clear that so far as the aft peak bulkhead is concerned, it must be watertight, in order to provide that buoyancy. But interestingly, this is the only paragraph where the word "watertight" was left out. Do you agree that --
THE CHAIRMAN: Well, there are a number of questions you're asking now.
MR MOK: I'm sorry.
THE CHAIRMAN: So "yes" is going to tell us what, which one of the questions?
MR MOK: Okay.

Page 90

The question is, because of the contrast in the drafting, I'm suggesting that it is unlikely that the drafter would have had this particular scenario, the buoyancy scenario, in mind.
A. My opinion is, Mr Mok, that it has to be read with the words "launches over 70 feet long".
Q. Yes.
A. And I can see of no other reason why you would relate the size of the vessel to the need for peak bulkheads. There is no structural reason. I can think of no other reason at all to put a peak bulkhead in that is not watertight. I know of no definition of peak bulkhead, but I just cannot think of any other reason than to have some watertight integrity there, or gastight integrity.
Q. Yes, Dr Armstrong, that may be the practice and it may be desirable. At the moment, we're simply focusing on the buoyancy scenario. In other words, yes, a watertight bulkhead will help in terms of the function that you earlier explained, that is to prevent the overspillage of floodwater from the compartment to the other compartment. That I understand. But in terms of the buoyancy scenario or explanation, I'm simply suggesting that the buoyancy explanation is unlikely to be the one scenario that he would have had in mind when drafting this particular rule.

Page 91

A. I'm unable to comment on whether he could or not, but I think it is likely or I would not have suggested it.
Q. Right. Well, perhaps you can consider this. If the preservation of buoyancy to prevent the ship from sinking was what he had in mind, there would likely have been some requirement as to the calculation of the volume of that compartment, to allow for adequate buoyancy for that purpose. Do you agree with that?
A. No. I think that would be extremely difficult to do, because we're talking here about an emergency buoyancy somewhere in the vessel. If you flood, in this particular example, the tank room and the engine room, there is no reserve of buoyancy anywhere. However, no matter where you flood on a vessel, if you can have a little bit of buoyancy at the extremities, you've got a chance of surviving. So I believe that was the intention.
Q. So what you are saying here is a commonsense proposition; that is, wherever you have some buoyancy, particularly near the end, it would help the vessel to remain afloat a little, or more as the case may be?
A. Yes, and being at the ends, of course, the moment is the greatest so it has the best effect.
Q. Also bearing in mind that that particular space, according to you, is usually small, so the buoyancy is

Page 92

limited?
A. Yes, although it is interesting that even on modern ships, when I said it's small, it quickly becomes quite large the higher up you go and the bigger the vessel is. So having said it's small, it's small below the waterline but can be large above.
Q. Yes. And maybe this is the last question I'll ask before lunch. In the light of our discussion which was in the context of your evidence, where you said that you could only speculate, may I suggest that perhaps this particular purpose concerning buoyancy is not really served by the instruction 12(iv) but in fact by the general requirement concerning floodable length or the calculation of damage stability, and those requirements are sufficient to cater for the situation of --
THE CHAIRMAN: I think that question is already too long, and we'll reserve it for this afternoon. But let me ask you this: how much more questioning do you have?
MR MOK: Not much at all.
THE CHAIRMAN: I'm going to ask you to bring it to an end quite soon. Dr Armstrong has been giving evidence now for 4.5 days.
MR MOK: Yes. Thank you for the indication.
THE CHAIRMAN: 2.30.
(1.00 pm)

Page 93

(The luncheon adjournment)
(2.30 pm)
THE CHAIRMAN: Mr Pao?
MR PAO: Mr Chairman, over this morning I believe those instructing me have produced to the solicitors for the Commission two ABS certificates, samples, basically, from more recent origin: 2012. One of them has -- it's now in, I believe, the W&G bundle starting from page 97. There are two forms of that: one is they've got a formal certification on the front of those documents; and then the other one, they utilise what the manufacturer of the aluminium alloy supplied by the manufacturer -- and put their certification at the back of that document.
On page 98, you will see the dimensions of the aluminium alloy, which is 5083, about one-third of the way down the page. Alloy: 5083. Temper: H116.
THE CHAIRMAN: Yes.
MR PAO: Then further down, a global specification. The dimensions of it, to layman eyes -- because 6,000 means 6 mm, and then 2,000 means 2,000 mm, and then 6,000 mm --
THE CHAIRMAN: Thank you very much. We'll come back to this later. But thank you, and thank Cheoy Lee for providing it for us.
MR PAO: Thank you.

Page 94

THE CHAIRMAN: Mr Mok.
MR MOK: Dr Armstrong, I have only a few questions left. Maybe first of all I can wrap up our discussion on the aft peak bulkhead in this way. Firstly, insofar as an aft peak bulkhead has the function of preventing a leakage from the rudder or the propeller area into other compartments, do you agree that in summary, from our discussion, there is in fact no requirement that this aft peak bulkhead must be located at a minimum or a maximum distance from the stern?
My reference to "requirement" is a requirement by any rules or regulations.
THE CHAIRMAN: He's agreed with that already.
MR MOK: Yes. Thank you.
THE CHAIRMAN: Have you not?
A. Yes, I have.
MR MOK: Secondly, this function can also be served by other means, a structure such as a box or a gland which protects either of --
THE CHAIRMAN: He's agreed with that as well.
MR MOK: Thank you.
In terms of the distance or the location of the aft peak bulkhead, it may depend sometimes on the location of the rudder and the propeller shaft, and the relative distance between them.

Page 95

A. It could do, yes.
Q. And so far as this safe size or the safe length of that particular compartment, that particular matter is catered for by the usual calculations of floodable length or damage stability calculation?
A. I don't think that is always the case, Mr Mok, because when you override a regulation and write in something like "one-compartment subdivision", I think you have to think about what other effects that might have. Which is why I've suggested that having buoyancy at the very after end is no bad thing in case of accident.
Q. Well, that may be one side effect of it, but that was not the intention, if I may suggest, behind instruction 12(iv) of the Blue Book.
A. 12(iv) being the requirement for peak bulkheads?
Q. For bulkheads at both ends.
A. Bulkheads at both ends. I don't know. I have postulated it was put there for that reason.
Q. Yes. And in relation to the present case, where we find the bulkhead or the aft watertight bulkhead at the aft engine room position, I suggest that this is not in any way a breach of the rules set out in instruction 12(iv).
A. I note you have that opinion. I don't agree with it, though.
Q. Thank you.

Page 96

Just one more matter in your second supplemental report, at page 931, paragraph 18. You said:
"I have never previously seen a ship design in which the aft peak bulkhead was located anywhere other than close to the stern of the vessel."
You're not there talking about any particular distance or any specific location; this is just a general comment?
A. It's a very general comment, yes.
Q. Thank you. With that, may I also invite you to a couple of references to your diagrams. First of all, the one at page 928. This morning we had talked about -- this is the bottom diagram -- the position in 1996. May I quickly come to the position in 1998 referred to in your bottom table.
A. Yes.
Q. Let's deal with the position where you say "Immersed by 0.115". That again deals with the position of the tank room and the steering gear compartment both flooded?
A. Correct.
Q. Yes. And in relation to the word "Satisfactory", what you mean is that it is satisfactory in the sense that the margin line is not immersed?
A. Correct, yes.
Q. And that is against the column where it says "With

Page 97

watertight door"?
A. Correct.
Q. Would it be correct to say that with that particular item, "1.007; Satisfactory", that would not be the case if you do apply the 0.1L rule?
A. Which would be the next line down, Mr Mok. It is headed "Tank room only".
Q. No. The 0.1L rule means that whether or not you have or you do not have a watertight bulkhead, if the distance of that bulkhead from the end of the ship is less than 0.1L, then you do disregard that particular bulkhead, regardless of whether or not there is a watertight door. Is that correct?
A. But this table is headed "Tank room only". So it is only a hole in the tank room of 10 per cent of L, if you like, but not penetrating a bulkhead.
Q. I understand what you are talking about, but I think you would agree that whether or not you call it "Tank room only" or whatever, when you calculate floodable length and if you apply the 0.1L rule, you do have to disregard the bulkhead between the two compartments --
A. No, Mr Mok.
Q. -- because of the shortness.
A. No, I disagree. I'm sorry.
Q. You disagree?

Page 98

A. Yes. The tank room is considered on its own, and the length of the tank room is more than 10 per cent L.
Q. Right.
A. Therefore, a hole of 10 per cent L only damages the tank room under single-compartment subdivision.
THE CHAIRMAN: What in fact was the tank room in terms of a percentage of the length of the vessel?
A. I think it runs from frame 4 to frame 9, Mr Chairman, but I might be wrong.
MR SHIEH: It's 3.5 frames, each frame being 1.25 metres. Arithmetically it would be 4.375 metres.
THE CHAIRMAN: Thank you. And what is that as a percentage of the length of the vessel?
Can we help you? What are you looking for, Dr Armstrong?
A. I have found it, thank you, sir. I was looking for the General Arrangement.
Yes, 4.365, which is --
MR SHIEH: 4.375?
THE CHAIRMAN: We're told it's 3.5 times 1.25, which makes 4.375.
A. Roughly 17 per cent, I make it, sir.
THE CHAIRMAN: Thank you.
MR MOK: Dr Armstrong, can I take you up on your last answer by asking you to refer to at least one representation of

Page 99

that rule in our regulations. That is again Cap 369AM, tab 11 of the legislation bundle.
THE CHAIRMAN: This is the one for ocean-going vessels only?
MR MOK: Correct.
THE CHAIRMAN: Yes.
MR MOK: I don't have the page reference here. It is in the schedule, schedule 1, paragraph 6(6). I will read this rule, but disregarding the irrelevant words.
THE CHAIRMAN: Wait until we have it on the screen, please.
MR MOK: It's paragraph 6(6), internal page 59. I don't know if there's a bundle page number there.
Yes, that's it. At the top. It says:
"Minimum space of bulkheads --
If the distance between two adjacent main transverse bulkheads required by these regulations to be watertight ... is less than ... 0.1L ... only one of these bulkheads shall be regarded as forming part of the subdivision of the ship."
Do you agree that is one representation of the 0.1L rule?
A. Correct, Mr Mok. But the tank room is longer than this, so this does not apply.
Q. Let me have a go. Applying this particular rule, if the distance between two adjacent main transverse bulkheads -- and let's take these two to be the stern,

Page 100

or rather the transom on the one side, and also the bulkhead between the steering gear and the tank room on the other hand, would you agree that applying this rule, what it means is that that particular bulkhead should be disregarded?
A. For the purposes of flooding the steering gear compartment, yes, I would, Mr Mok.
Q. Yes. And when you apply that particular rule, does it mean that you have to do a calculation on the basis of the tank room and the steering gear compartment together?
A. Yes, but I would word that slightly differently to say that you would have to combine the tank room -- sorry, you'd have to combine the steering gear compartment and the tank room, rather than the other way round. Because it's from the perspective of the steering gear compartment.
Q. Right. So looking at it from that point of view, then where you have a watertight door in 1998, it would still be unsatisfactory from that point of view?
A. Correct. But I believe the table shown on page 928 is still correct, because it's seen from the tank room perspective, not the steering gear perspective.
Q. Yes. But looking at the position overall, which would include --

Page 101

A. Oh, yes.
Q. -- looking at it from the position of the steering gear compartment, it would still be unsatisfactory?
A. Correct.
Q. And it would be unsatisfactory on that occasion whether or not there was a watertight door or not?
A. Correct. Overall.
Q. Finally on this line, if we look at the 2005 position, I think the discussion we just had now would apply equally to the position in 2005; correct?
A. Yes.
Q. Here, I have noticed that your calculation is that the margin line is submerged by -- is it 42 mm?
A. Correct.
Q. So it hasn't reached the deck, because the margin line is 76 mm?
A. Correct, yes.
Q. On that scenario, the vessel would not sink, put simply?
A. I can't say that, Mr Mok. It fails the criteria, and the criteria is a limiting criteria, and anything above that, the ship may sink due to waves or other action.
Q. If it may be if one looks at it just on the basis of these figures, it doesn't seem that there is an inherent overwhelming of the margin line to such an extent that that itself would make the boat sink.

Page 102

A. I wouldn't want to be on board, Mr Mok, I'm sorry.
THE CHAIRMAN: It wouldn't be allowed to go to sea, would it, Dr Armstrong?
A. No, it would not, sir.
MR MOK: You told us earlier that that position -- that is, the immersion of 42 mm -- may be corrected by certain adjustments, for example by reducing the ballasts or adding buoyancy boxes at the end.
A. Yes.
Q. Would another way be to, say, adjust the position of the ballast, for example higher or lower or in a different position?
A. It would make no difference to the floodable length at all. It would only affect the GM value. And this is a floodable length calculation, not a damage stability one.
Q. So, for example, the difference between 1998 and 2005, one is immersed by 0.115, the other one is 0.042, even though the ballast is simply raised?
A. It was not because of the ballast being raised, Mr Mok. It was because the boat miraculously reduced in weight for some unknown reason.
Q. Some error?
A. I don't know.
THE CHAIRMAN: It was a 3-tonne difference in weight, was it

Page 103

not?
A. Correct.
MR MOK: So your opinion, in short, is that where you have the same weight, the floodable length would not change regardless of where you put the weight?
A. It would change if the ballast was moved longitudinally, but my understanding was the ballast was only raised. If it was moved further aft, for example, then the margin line would immerse further because the boat would be trimming more.
Q. So what about the other way, if you move it forward?
A. If the ballast was moved forward, yes, the margin line would not immerse as much.
Q. Right. So would it be possible, where you only have a small immersion, say for example of 42 mm, for this ballast to be placed, say, in other parts of the ship in order to correct the position so that the margin line would not be immersed? Is it possible --
A. It would be possible to do that.
Q. Right. My final question on this line is this. Even if any of these measures are adopted, for example adding buoyancy or perhaps the best example would be to move the ballast to a different position, that measure, even if taken, would not have prevented Lamma IV from sinking in the present case, because of the flooding also of the

Page 104

engine room?
A. I can't say that for sure, Mr Mok, because if one looks at page 929, the next page of the same document, where we have "Engine room and tank room flooded", but with some additional buoyancy at the after end, in this case I've said that the steering gear compartment is intact because there is a watertight door, and the vessel remains with the margin line above the water. So it's not immersed. So the answer to your question depends on how much buoyancy you put in those buoyancy boxes.
Q. Doctor, I think we are at cross-purposes. I'm not asking it on the basis of whether or not we need to put additional measures such as a watertight door. All I'm saying is that leaving that access opening open, as it were, but simply moving the ballast to a position where the margin line would not immerse --
A. Sorry, I thought you were talking about --
Q. -- that measure would not have prevented the vessel from sinking?
A. No, correct. Moving the ballast would not have done that.
Q. The only small subject that I wish to take up with you is this. I believe that you said that in terms of lifebuoy, usually it is or should not be shared by two persons. I'm just simply asked you for your experience,

Page 105

that there may be jurisdictions or places where a lifebuoy is contemplated to be shared by two persons; is that correct?
A. Thank you for that comment. You may be right. I may be unaware of that, yes.
Q. Just maybe to jog your memory, I have over the lunch break included two references.
Mr Chairman, this will be my last reference.
THE CHAIRMAN: Yes.
(Handed).
MR MOK: I have to admit that these are somewhat random, but there are two documents here. One is issued by the Queensland Government, and the other one is by the Northern Territory Government. No doubt you are familiar with both of them.
A. I'm aware of both of them.
Q. In relation to the Queensland Government document, can we just look at the first page where it refers to the lifebuoy. That is the first box. You see on the right-hand side of the first box it says:
"Each lifebuoy is expected to provide support for two people."
That, of course, is in relation to this particular type of vessel, 25 metres or longer. Do you see that?
A. Yes.

Page 106

Q. Over the page, it's for another type of vessel, between 15 metres and less than 25. I think the same reference is there to lifebuoy; right? And then also over the page, in relation to less than 15 metres in length, each lifebuoy, again, is to provide support for two people.
In relation to the next document, Northern Territory, there's only one reference. Over the page on page 2, first --
THE CHAIRMAN: Just before you move on, since we're looking at this. That's only one aspect of what Dr Armstrong spoke about, is it not? The other aspect is under the heading "Life jackets":
"Coastal life jacket for 100 per cent of allowable crew and any other people on board."
MR MOK: Yes.
THE CHAIRMAN: That's the other factor Dr Armstrong mentioned. Lifebuoys were for people in the water to be thrown to. Life jackets for every person on board.
MR MOK: Mr Chairman, I'm simply addressing the point of --
THE CHAIRMAN: Well, I'm addressing the other one.
MR MOK: Yes, of course.
If you look at the second document over the page, on page 2, it is stated on the first small line:
"It is assumed a lifebuoy will support two persons."
Do you agree, Dr Armstrong, that it is not unusual,

Page 107

so far as lifebuoys are concerned, that they can be provided to support two persons?
A. I accept that, Mr Mok. May I draw your attention, though, to the fact that the latter document, for example, from the Northern Territories, is for class 2E, which means a vessel operating on a lake or on a river, where quite often the passengers can walk ashore.
Q. Yes.
A. It's not necessarily -- it's certainly not ocean-going. It's smooth waters.
Q. Thank you for that qualification.
COMMISSIONER TANG: Can I ask, what do you mean by "non-passenger vessels", here? Class 2E non-passenger?
A. A passenger vessel --
COMMISSIONER TANG: "Non-passenger", that means it is not licensed to carry passengers?
A. Mr Commissioner, it means a vessel carrying less than 12 passengers.
COMMISSIONER TANG: I see.
A. The definition of a passenger-carrying vessel is one carrying more than 12 passengers.
COMMISSIONER TANG: Thank you. So it doesn't really apply to our case here?
A. This is true. It's not a passenger vessel. Thank you.
COMMISSIONER TANG: Thank you.

Page 108

MR MOK: Mr Chairman, I have finished my questions.
THE CHAIRMAN: Yes.
Again, Dr Armstrong, the provision for life jackets is one for each person, is it not?
A. Generally it is, yes, sir.
THE CHAIRMAN: I'm looking at page 4071:
"One personal flotation device ... (coastal or SOLAS) for each person."
Thank you, Mr Mok.
Mr Yeung, do you have an application?
MR YEUNG: Yes, Mr Chairman. May I have leave to ask two questions arising from the answers given by Dr Armstrong yesterday. Firstly, the question asked by my learned friend Mr Grossman on the relationship of the various persons involved in the survey; and secondly, a question asked by my learned friend Mr Mok on how a surveyor would inspect the plates?
THE CHAIRMAN: Yes. Please do.
MR YEUNG: Thank you.
Examination by MR YEUNG
MR YEUNG: May I have the transcript from Day 27, yesterday, page 22.
Dr Armstrong, against line 4 there you were asked by my learned friend Mr Grossman who asked you to put yourself in the position of a surveyor, and then further

Page 109

down, line 18, he asked a specific question about the thickness of the hull. Further down, against line 22, is your answer:

"There seems to have been some understanding between Mardep and CCS that I don't fully understand, as to what they accepted and what they did not accept. But my understanding of what I've read is that Mardep would accept survey of the structure and would not therefore check it again."

This was your answer given yesterday.

A. (Witness nods).

Q. Now may I have the transcript from Day 17, page 125.

Dr Armstrong, this is part of the testimony given by Mr Fung Wai-man, who is a senior ship inspector, on Day 17. At page 125, line 16, this is the question asked, I believe, by my learned friend Mr Beresford:

"So far as item 8 is concerned ..."

Pausing here, I need to put up another document, sorry, and that would be marine bundle 2, page 265. This is the document referred to in the testimony of Mr Fung on Day 17. Item 8 can be seen on the screen. It's concerned about "Hull Construction Survey (X-Ray Examination) and at the right-most column you can see "HKMD (X-Ray Examination)". So this is the item referred to in the testimony on Day 17.

Page 110

The question again:

"So far as item 8 is concerned, was there a division of labour undertaken on the one hand by the Society, and by the Marine Department on the other hand?

Answer: You can understand it that way.

Question: So can you tell us precisely what was the division of labour; which organisation undertook which part of the responsibilities?

Answer: This Chinese Classification Society [that is CCS] was mainly responsible for the welding and the x-ray examination on the welding; and the examination on the hull structure was done by Marine Department."

With this, maybe it can assist you to better understand the division of labour between the two parties just mentioned.

A. Thank you very much.

Q. So it is clear from this answer that the only area of responsibility for CCS is for the welding and the x-ray examination on the welding?

A. I had forgotten that. Thank you very much.

Q. If I may move on to my second question.

Can I have the transcript from Day 27, that is yesterday, page 71, line 8. Dr Armstrong, you were referred by my learned friend Mr Mok who was showing you the DNV Rules yesterday.

Page 111

Against line 13:

"If you go over the page to 4050 and look at the table -- before we look at the table, you see there is a paragraph 401."

I don't think I need to show you 401 because the whole of 401 was cited against line 17 or line 18.

"It states:

'The surveyor does not inspect dimensions or surface condition of each single plate, section, et cetera. It is the aluminium producer's responsibility that the requirements for dimensional tolerances are satisfied.'"

So this is the passage referred to you under the DNV Rules, paragraph 401.

My question is, is this the general practice adopted by other societies as well, as far as surveyors inspecting the plates are concerned?

A. I do not know for certain that that is the case for all class societies, but my understanding was with Germanischer Lloyd and Det Norske Veritas, that they approved processes and took spot samples. They did not necessarily inspect every single plate.

Q. I believe DNV as well as CCS are both members of the International Association of Classification Societies; is that correct?

A. IACS, yes.

Page 112

Q. Thank you. So it would be proper and acceptable if CCS are to follow the practice as adopted by DNV?

A. I would think so, yes, sir.

MR YEUNG: May I have a moment, Mr Chairman.

THE CHAIRMAN: Yes.

MR YEUNG: I'm advised by those instructing me that the reference I quoted was actually wrong. The actual passage should be on page 70, lines 15 to 22. I'm using the draft that was from yesterday. My apologies. But I think the point is made.

THE CHAIRMAN: Yes, very well.

MR YEUNG: I have no further questions, Mr Chairman.

THE CHAIRMAN: Thank you.

Mr Shieh?

Further examination by MR SHIEH

MR SHIEH: Dr Armstrong, I would like to first of all explore the question about the batteries. To start with, yesterday you were asked the question whether or not if the batteries were submerged, that would result in there being no power supply to the navigation lights. I believe your answer was that you were not expert enough to answer that question.

A. I did say that, yes, sir.

Q. Are you suggesting that there could be factors affecting whether or not in such a scenario, where the batteries,

Page 113

whatever types they are, are submerged, the navigation light power may or may not be disrupted, depending on circumstances?

A. I suspected that and that is why I felt unable to answer at that time, because I'm not sure how batteries would survive when immersed in seawater.

Q. So the reason why you say you are not expert enough is because you are not familiar with the behaviour of batteries when submerged in seawater?

A. When submersed in seawater. However, Mr Shieh, I have discovered something different overnight --

Q. Which is?

A. -- which I think is relevant.

Q. Yes.

A. I was asked by the Chairman to address some electrical issues and during that investigation --

Q. I was about to ask that, but obviously you're in a much better position to actually tell us your discovery.

A. By all means I'll follow your lead on these questions.

Q. Go ahead.

A. During this investigation, I discovered some things that made me suspect that the batteries probably did provide power for some period of time. I wanted to bring this to your attention.

Q. Yes.

Page 114

A. In particular, can I bring to your attention marine bundle 2, drawing 255. This is a drawing of the electrical layout of the vessel. I just want to bring to your attention note 9. It's on the right-hand side. It's quite hard to read. I might read it for you:

"Batteries housed in GRP gastight box and to be vented to open deck with adequate coaming."

I mentioned I'd seen the batteries and they were certainly not in a gastight box when I inspected the vessel, owing to the result of the collision. But here we have a suggestion they were in a gastight box, vented to the open deck, which would suggest to me, Mr Shieh, that they would have continued to provide power for some time until the water was able to penetrate down the vent, or alternatively to breach the gastight box in some way due to items falling down or otherwise reducing the container, the box, to a non-watertight state.

I can show you a reference to a photograph of the batteries if that is of use.

THE CHAIRMAN: Yes, please do.

MR SHIEH: Yes, please.

A. I think the relevant ones are police album IX, picture 515. This is somewhat by way of an introductory photograph, because it will lead to the next one. Thank you. On the right-hand side, against the side of the

Page 115

ship are two boxes. These boxes are irrelevant to what I would like to talk about. They're just in the lower right side. If you can scroll down a little. Thank you.

Sorry, if you can go back to the picture above. Thank you. Just there.

The box in the foreground on the right-hand side looks intact, but the one behind it has lost its door. The door is on the ground below it, if I can use the word "ground". Underneath that door is what I believe to be one of the battery boxes. There is a lot of mud involved.

If you can now picture that and scroll up to the next picture, 514.

This is a similar picture. You can see the water tanks lying in the background, but in the foreground on the right is a better picture of the two boxes which I believe are the battery boxes lying on the ground, on the deck in the engine room.

Q. They're on the port side, are they?

A. They're on the port side. And I think they're the battery boxes, as much as anything because of the colour and size of the cables contained within those boxes. I'm not 100 per cent sure that is what they are, but I'm 99 per cent sure. The fact that there appears to be

Page 116

a rubber seal lying along the top around the periphery also suggests that was a gastight container. So I began to believe it might be possible that these would continue to operate, assuming they weren't hit by Sea Smooth when it came in, and from what I can judge, they were clear of that. Of course they're somewhat damaged now, but I think that was as a result of the sinking.

Mr Chairman, I also have a picture of the switchboard for the navigation lights taken in the wheelhouse.

THE CHAIRMAN: Thank you.

A. I note that -- maybe I could touch on that subject now. I notice that in one of the pictures the circuit-breaker has tripped for the navigation lights, and I do not know when that happened, of course. It may have happened after the vessel was brought ashore, for all I know. But the fact that the circuit-breaker shows red in the photograph indicates to me that there was power to a navigation light at some stage when there was a short-circuit. That could feasibly be a navigation light breaking; I do not know. But I'd just like to bring it to you attention. That photograph can be seen at marine bundle 1, I think it is, page 146.

I'm sorry, could you scroll down. One more. Thank you.

Page 117

The lower black panel --
THE CHAIRMAN: Of page 147?
A. Of page 147 -- is the 24-volt main switchboard. According to the drawings and according to my eyes peering through the poor focus, the second circuit-breaker from the left says "nav lights" underneath. You can probably see there is a colour red. The colour red indicates to me that that circuit-breaker has tripped. I thought it was interesting that that had tripped, although, as I say, I do not know when it tripped.
MR SHIEH: And that is the circuit-breaker for?
A. For the navigation lights.
Q. How would you interpret that, Dr Armstrong?
A. Well, as I say, Mr Shieh, I don't know when it happened. But if it happened before the vessel was recovered, then I would interpret it -- clearly it can only trip when there is power to something that short-circuits. So a possibility is when a light broke, for example, and the seawater then allowed it to arc across the contacts. That would create --
Q. A surge of electrical current?
A. It would create a sufficiently large electrical current to trip the circuit-breaker, which is rated at 1 amp, I think. I am not an expert in electrical matters.

Page 118

I know a dangerous amount. I know enough to be able to design circuits, but I would take advice.
Q. Thank you, Dr Armstrong.
When you started off your explanation as to your discovery about the batteries, you took us to an electrical wiring drawing. In fact I was going to show you another drawing with an entry which may potentially be relevant. Can you look at marine bundle 2, page 172. In the box on the top right-hand corner, note 7 --
THE CHAIRMAN: This is the General Arrangement?
MR SHIEH: This is the General Arrangement, Mr Chairman.
Note 7:
"If batteries fitted in engine room, steel batteries locker with effective air pipe extend above deck to be provided."
A. Yes, sir.
Q. Would it be consistent with what you have seen?
A. Could I refer you to marine bundle 2, page 275.
Q. Yes.
A. I noticed this letter late last night. This is an application from Cheoy Lee to the Marine Department to fit the batteries in GRP boxes. Whilst I could not find a reply to this, there is an implicit reply in the note on the approved electrical drawing, that they can

Page 119

use GRP.
Q. But steel or GRP, it would have afforded some degree of protection?
A. Yes, I believe so. And I think GRP is a better material.
Q. Thank you. Could we now turn back to look at some of the drawings. Could we look at police bundle P(II), page 4966-10.
THE CHAIRMAN: What are we looking at?
MR SHIEH: An electrical wiring drawing.
THE CHAIRMAN: For which vessel?
MR SHIEH: Lamma IV.
THE CHAIRMAN: Doesn't it say "catamaran" at the bottom right?
MR SHIEH: I might have actually made a mistake. It must be a mistaken citation. Could I return to that later.
Mr Beresford is trying to look up the reference I want, but whilst he's doing so, perhaps I'll move on to some other areas.
On the subject of seats, you made a comparison with the way in which seats were mounted on the Sea Smooth. In particular you mentioned this concept of tracks on which seats are mounted.
A. Yes, sir.
Q. Just to visualise what the tracks look like, I was just

Page 120

seeing whether you could help us. Police album II, page 108. Can you see the tracks from this photograph?
A. On the left-hand side of the picture, under the seats, between the people's feet. I did not get down on my hands and knees and inspect it, but I believe that is a track for seats.
Q. Could we look at page 106. It may be clearer. On the left-hand side, are those also tracks?
A. Yes.
Q. How about page 95?
A. Indeed. That's a good illustration.
Q. How would these tracks have worked? How would the mounting process have worked?
A. I don't know on Sea Smooth how it was done. I did not inspect that. But normally they would be attached to the deck in some adequate way, bearing in mind this vessel may have been seen as a high-speed craft.
Q. Thank you.
THE CHAIRMAN: And the advantage of using a track is that you can secure the track where you wish to do so, and then position the seats along the track as is required in the design, without having to secure the seat at that place?
A. Exactly, sir, yes.
MR SHIEH: Dr Armstrong, I have now located the -- could

Page 121

I just continue on the question of seats. Yesterday you were shown an IMO set of guidelines or an IMO code on seats and the force that would be required to detach seats. Could I ask you to look at the Reed Smith Richards Butler bundle, page 1014.

I'm sorry, I seem to be getting all the wrong references. I'll come back to that.

I have now located the electrical wiring diagram, and it is in marine bundle 2, page 317.

This is a drawing which I think my learned friend Mr Richard Zimmern took you through. Do you remember that?

A. I do, sir, yes.

Q. Particularly the bottom drawing, the one at the bottom.

A. Mr Shieh, there may be a better copy of this drawing. Marine bundle 2, I think it's item 257. It is the same drawing but with less black on it, from memory.

Q. Thank you. Because I think the evidence referred to this page, but obviously 257 --

A. It may be page 256 for the particular one, or page 255. Thank you.

Q. The bottom drawing, we can see the two Caterpillars. Those are the engines; correct?

A. Correct, the propulsion engines.

Q. The two batteries that we saw in the photograph just now

Page 122

are the two batteries at the top of the drawing, the port side?

A. Correct.

Q. One having its cover fallen off onto what you call the floor or the ground?

A. Yes.

Q. And that one would be what you think housed the back-up battery?

A. The door was off some other piece of equipment. I was just using that to identify where the batteries were.

THE CHAIRMAN: The door fell off the box which was on the side wall?

A. Yes, and the box was not relevant to the electrical system. The lids to the boxes, I do not know where they are. I think they may have been tidied up amongst the debris removal.

THE CHAIRMAN: From the examination of the photographs, together with this drawing, were those batteries then the auxiliary power batteries?

A. I can tell you that is the case, yes, sir. One of them is used for the engine starting on the port side, and the other one is indeed the emergency source of electrical supply to the emergency cabin lighting.

MR SHIEH: Thank you. Could I now ask you to look at expert bundle 2, page --

Page 123

THE CHAIRMAN: Are we moving to another subject?

MR SHIEH: Yes, we are.

THE CHAIRMAN: When you say "emergency cabin light", did that in any way operate to keep the navigation lights lit?

A. As far as I can ascertain, sir, no, it did not. May I refer to the next particular drawing and illustrate that?

THE CHAIRMAN: Please.

A. The next drawing down, in fact, page 256. Maybe I could ask you to go down to page 257 first.

Very simply put, we can see here up the middle of the page seven little boxes and they are in fact representing the batteries. If you can put a cursor just -- that's it. The lower one is irrelevant because that's the starter battery for the genset. Above that there's the starter batteries for the starboard engine, and then the ones for the port engine, and then above that, the ones for the emergency source of power.

If you take the lines off to the right --

THE CHAIRMAN: From the top ones?

A. From the top one. On the right-hand side, if you can scroll up a little bit, that provides power to the 24-volt switchboard, the left-hand part of which is actually in the engine room but the right-hand part of

Page 124

which is in the wheelhouse, and I will show you a photograph of where that is located.

THE CHAIRMAN: Yes.

A. So on the right-hand side, those are all 24-volt-supplied pieces of equipment in the wheelhouse, for example the wipers, the radars, the VHF. And the top line goes off to the navigation light distribution board. You might be able to see the top line says "to nav light dist board".

THE CHAIRMAN: Distribution?

A. Distribution.

Could I now invite you to go to --

THE CHAIRMAN: Just give me a moment, please. Thank you.

A. If I can invite you to scroll down just a little. Thank you.

You may notice in the middle at the bottom two words saying "spare". Just to the left of that, there is a box with a diagonal line. That is in fact an automatic changeover switch which either allows the emergency lights to be driven by the 24 volts from the generator source, or from the batteries. So that is an automatic changeover for the emergency lights in the wheelhouse and upper deck and lower deck. I just mention that in passing. That is the automation of alternative power supply to cabin lights.

Page 125

If you scroll down a little bit further, please. Thank you. And move a little to the left, and then down just a little more. Thank you.
You see coming in from the left a power supply -- could I ask you a little more to the left, please.
Fine.
That is a power supply to the navigation lights. The navigation lights are on the right of this diagram. The switch with lots of little dots, and above it the words -- I'm not sure what the words are. It looks like "IO6 DP COS', I think it's 10-amp, "DP" for dipole, but I'm not sure. That is fed by two sources which are shown on the left. One says "To 24-volt main switchboard", and that is the normal power supply for the nav lights. I'm sorry, I'll start again.
Look at the upper one, which says "To transformer/rectifier". That is the normal 220-volt electrical supply coming from the main switchboard, which goes through a transformer rectifier to bring it down to 24 volts. That is the normal supply to the nav lights. In case of emergency, you can flick over to the other source, which is the 24-volt main switchboard which comes from the batteries. However, I believe that that switch in the middle of the page saying "10-amp DP COS" is a manual switch, so it does not

Page 126

appear to me to be automated.
I can show you a picture of the switchboard, Mr Chairman, and the switch looks like it's manual to me as well.
THE CHAIRMAN: Perhaps you could show us that.
A. I believe it's marine bundle 1, page 146.
This is the navigation lightboard. It says "navigation light C/ST", and I'm sorry, I don't know what that means.
MR SHIEH: Can we have a close-up.
Can you point out what --
A. Yes, I will run through that, if that's what you'd like, Mr Shieh.
The top row shows a row of lights.
Q. Yes.
A. My understanding is that when there was power to the relevant navigation lights, the relevant light would come on. So from the left, the nameplates tell me that is the masthead light; and then there's a port light; then a starboard light which would be green; and then a stern light, a white light; and then an anchor light, which is white; and then the two on the right are what are called NUC lights, "not under command" lights, and these are two special white lights mounted on the mast.
So if the nav lights were illuminated outside the

Page 127

ship these little telltale lights should come on as well, so that the person in the wheelhouse knew that --
Q. Knew whether the lights were on or off?
A. Knew they were on or off.
Q. So in a way that minimises the risk of somebody forgetting to switch on the lights, because he would be able to see --
A. Indeed, except I will illustrate shortly that they were in a rather poor location for the coxswain to notice them.
Below those tabs you will see a number of switches, you can see they say "Off", and that is the means to switch individual navigation lights on or off.
To the top right is a black circle that has "Buzzer" written against it, and this is an alarm system, usually in case a navigation light is not functioning.
THE CHAIRMAN: What would be the consequence of that? The buzzer would sound?
A. The buzzer would sound, yes, sir.
THE CHAIRMAN: And the light would have gone out?
A. The light would have gone out. The buzzer would have drawn it to your attention, except for, I notice in the bottom right of this picture there is a button which says "Alarm mute", so there was a means for switching the buzzer off.

Page 128

Just below the buzzer in the top right there is a rotary switch which is a dimmer, so you could reduce the brightness of the lights at the top of the panel.
Below that, on the left-hand side, there are seven circuit-breakers which correspond to the seven navigation lights. And then in the middle, a yellow button called "Lamp test", and every day, or whenever, the coxswain should press that button to check that all the lights in this panel all come on, to ensure that the navigation lights are working outside.
I finally got to the point, because the next one along, which is a big black square with "1", "0", "2", is a manual switch which, when in position 1, would use the supply from the transformer rectifier, and the one on the right is marked "batt" for battery. And in between I think is just a neutral position.
THE CHAIRMAN: So to move to the emergency battery, you'd switch manually from "1" to "2"?
A. That is my conclusion.
MR SHIEH: You mean in order for there to be a switch to using the emergency batteries, there had to be a manual task of switching this particular switch?
A. That is how I understand the drawings and the photographic evidence.
Mr Shieh, can I explain my previous comment and show

Page 129

you where this panel is?
THE CHAIRMAN: Yes.
MR SHIEH: Yes. You were saying it was poorly positioned.
A. If you go to marine bundle 1, page 139, which is a few pages previously, somebody in the Marine Department has kindly provided this plan view.
THE CHAIRMAN: Yes. In fact, we have remarked on this bundle of photographs before.
Mr Mok, would you thank whoever put this together in the Marine Department, because this is without doubt the most useful collection of photographs we have amongst the thousands that we've got.
MR MOK: Thank you. I will do that.
A. The relevant items are numbered 13, 14, and 15, and they are on the port side behind the coxswain. The navigation light distribution board is number 13. I can show you a photograph of this if it would be of value.
THE CHAIRMAN: Yes, please.
A. First of all, the view of the coxswain of the panel is illustrated in police album III, page 154. This is obviously the main console on the right. But on the left you'll probably see a fire extinguisher, a red item, and above that is the navigation light panel. So although it is quite close to the coxswain, he would have to turn round to look at it. If you would like to

Page 130

see a detail of the panel, that is shown on police IX, page 547.
THE CHAIRMAN: Yes, please.
A. This shows three panels, in fact. The one on the right is the 220-volt supply to the wheelhouse and deck lights and other 220-volt items, and is irrelevant.
The panel in the middle, the upper part I've just talked through, that's the navigation light panel.
The panel below that is the 24-volt supply distribution board and circuit-breakers. The lower panel would have the red indicator lit. But you can't see it in this photograph.
THE CHAIRMAN: Thank you.
MR SHIEH: Could we go back to the earlier photograph that you showed us, which showed the switch to the emergency battery. Page 146.
A. Marine bundle 1, page 146, yes.
Q. Is there any photograph that you could find that shows us which way the switch has been turned, as depicted here?
A. Well --
Q. Of course it may not depict the way the switch has been switched --
A. The way the switch is orientated, a little faint white line, it's pointing towards batteries, number 2.

Page 131

Q. Turning towards batteries?
A. So coming from that battery on the floor in the engine room.
Q. Emergency battery?
A. The emergency batteries.
Q. Thank you.
Dr Armstrong, I'm leaving the question about the batteries, unless you have any additional information to supplement.
A. No, sir.
Q. I now move to the point where I lost my reference. I've now found it. It's the same page number but a different bundle. It's expert bundle 2, page 1014, which is an extract from the IMO code of practice, I think. Do you remember that?
A. Yes, sir.
Q. Yesterday you were shown this code, and you were asked some questions about it. I think one of your responses was that the IMO code doesn't apply to a vessel like Lamma IV because the IMO doesn't actually allow for fibreglass, because of toxicity and other problems or concerns.
A. There are a number of reasons why it would not apply to these vessels, not the least of which is it starts out with the words "only applies to vessels on

Page 132

an international voyage". But, yes, I did say that it's unusual to have a composite construction for a high-speed craft.
Q. Thank you. Leaving that to one side, if you look at the methodology or the way in which the IMO code dealt with the issue of seat safety -- look at item 4.4.4:
"Seats, lifesaving appliances and items of substantial mass and their supporting structure shall not deform or dislodge under any loads up to those specified in 4.3.4, 4.3.5 and table 4.3.3 in any manner that would impede subsequent rapid evacuation of passengers."
So a rather specific target being identified by the language.
A. Yes.
Q. Then there are tables and paragraphs specified at the back, 4.3.4, 4.3.5 and table 4.3.3. I'm not sure whether we have the tables here. We don't have the tables here. Obviously there are loads being specified by way of tables.
Look at the next page, 1015. "Criteria for testing and evaluation of seats". "Purpose and scope", and then "Static seat tests".
Then at 2.2, for example, we see:
"All seats to which this paragraph applies, along

Page 133

with their supports and deck attachments ..."
And then certain static forces were actually enumerated and specified.
Also in the previous page, 1014, paragraph 4.5.4:
"Seats and their attachments, and the structure in the proximity of the seats, shall be of a form and design, and so arranged, such as to minimise the possibility of injury and to avoid trapping of the passengers after the assumed damage in the collision design condition according to 4.4.1. Dangerous projections and hard edges shall be eliminated or padded."
Leaving aside strict questions about applicability as a matter of law or by the terms of the IMO code, what do you say about a code of practice or criteria set in this rather specific manner, with the objective clearly delineated and with specific breaking strength, put it this way, being identified, rather than to leave it such as "shall be secured"?
A. It will be much more satisfactory for everybody, including the surveyors.
Q. And obviously it's a matter of trying to work out what the numerical figure is?
A. There are a substantial number of difficulties there. There are also difficulties associated with testing.

Page 134

You mentioned some values, criteria for testing of seats. They took several years of refinement and trying to understand how you could apply loads to seats in certain positions, and I think Dr Cheng demonstrated in his evidence that it was difficult to apply loads to the back of the chair because the chair back deformed, rather than applied load to the whole seat. So it can be done, but it's quite a difficult process.
I would also accept that it's quite an expensive process and the cost of the seats is extremely high for a high-speed craft/vessel.
Q. Thank you. When you mentioned the cost of the seat is extremely high for a high-speed craft vessel, you mean therefore such an elaborate scheme of testing might well be worth it, if you are talking about expensive seats?
A. There needs to be a balance struck. I'm only mentioning that there are other factors that would have to be considered. To go from a chair which probably costs a few dollars to one costing several thousand dollars -- I'm talking US dollars -- is a big change.
Q. But do the considerations mentioned in the high-speed craft rules or guidelines have any relevance to vessels generally or a vessel such as Lamma IV? Because it mentions matters such as to avoid injuries, for example, during evacuation.

Page 135

A. Yes, I think it's invaluable and a number of other areas of jurisdiction have adopted these sorts of words, these types of words.
THE CHAIRMAN: For high-speed craft or for all craft?
A. No, for -- well, for all craft within their jurisdiction in national waters.
THE CHAIRMAN: Thank you.
MR SHIEH: We had a little debate yesterday about the applicability of the Blue Book and of the 1995 Instructions. I'm not going to dwell too much or for too long on that, because by and large they provide for similar criteria, except for the hull thickness issue. But just touching on that. Could I ask you to look at -- you mentioned that there could well be -- I mean, you fairly said that it could well be a matter of speculation as to the draftsman might have engaged in let's say a process of consultation or discussion prior to the 1995 Instructions being promulgated in January 1996.
A. Yes.
Q. Now, we haven't actually heard from the draftsman or know the drafting history or heard anything from Mardep about this, although obviously they're in a position to tell us. But leave that to one side. Could I ask you to look at marine bundle 8, to look at the requirements

Page 136

of the two sets of regulations about the sorts of plans that had to be submitted.
Look at marine bundle 8. First of all, the Blue Book requirement as to drawings, page 1787. That's the Blue Book requirement as to the sort of drawings that had to be submitted.
A. Yes, sir.
Q. "Submission of Plans", and you can see "General Arrangement", "Midship Section", "Lines", "Hydrostatic curves", "Boilers", "Propeller", "Oil Fuel", et cetera.
And then please look at the 1995 Instructions equivalent as to plans or drawings required, at page 1860 of the same bundle.
"Drawings approved by classification Society.
The Department accepts drawings of hull construction, machinery ... approved by a recognised classification. One copy of each of those ..."
Sorry, paragraph 1. Please move up.
"Submission of Plans.
The plans and particulars as marked with asterisks in the following tables, for vessels classed or not classed ... are required to be submitted for approval."
And then you can see the table. It actually sets out if your vessel is classed, then you submit so and so, a category of plans, but if you are classed, you

Page 137

submit some other categories of plans, many of which overlap.

The General Arrangement -- and you can see plans such as "Profile, Deck and Bulkhead". Do you see that?

A. Yes.

Q. Moving down. "Shell Expansion". Those are absent, those specific descriptions of drawings are absent from the Blue Book stipulation as to required drawings. You see that, Dr Armstrong?

A. Yes, I see that.

Q. In our case, I think I can safely tell you that the plans were actually submitted I think at the beginning of 1995. I think it's January 1995. I don't think I need to actually turn up the actual page number. They were submitted January 1995.

So what does this -- of course you have seen the drawings that have been submitted. They include, specifically, drawings entitled "Profile, Deck and Bulkhead", "Shell Expansion" and the like, which are specifically required by the 1995 Instructions but not by the Blue Book.

A. (Witness nods).

Q. Does that tell you anything about whether or not plans or ship construction are already designed with a view to specific requirements in the 1995 Instructions? Or

Page 138

would that be a matter of speculation or inference, that you don't think it's within your expertise?

It's something that we will address by way of submissions anyway. But can you help?

I'm just thinking whether or not submission of profile and deck drawings and shell expansion drawings are something so familiar to people in the trade that even without express stipulation, you have to submit anyway. And if so, then the strength of the argument that I have just put forward may well diminish. What do you have to say about that?

Do you see the point I'm getting at?

A. Yes, I'm just not sure how to answer it informatively.

I think much depends, for example, on vessels not classed as to how much ownership of safety is going to be taken by the authority that's signing them off. I'm referring to, for example, stamping drawings as "seen". The 24-volt navigation light drawing is stamped "seen", not "approved", and yet I think those sorts of drawings should be approved. Certainly with a class society, they would take ownership, along with the owner, of course, for safety of the ship. So I think, referring to the two columns in the table, there's a big difference between how people address the risk between class and Mardep as it was in 1995, which is long ago.

Page 139

At the end of the day, it probably doesn't matter how many drawings are submitted if someone is going to just rubber-stamp them with "seen" on them.

I think, of course, it is good to have more drawings with more detail on them.

Q. Dr Armstrong, I'm not talking about the differential between whether or not a vessel is classed as opposed to whether a vessel is not classed. I was drawing your attention to the fact that in our case, we have seen drawings of General Arrangement, we have seen drawings for Profile and Deck, we have seen drawings of Shell Expansion which are specifically named drawings that are named in the 1995 Instructions for the not-classed column, whereas in the Blue Book we don't see any of those descriptions of drawings as being --

THE CHAIRMAN: Perhaps you could have a look at the Blue Book, page 1787, and help us as to item (c). What is encompassed in "Lines"?

A. "Lines" represent the shape of the hull.

THE CHAIRMAN: So do any of the drawings that are stipulated in the 1995 Rules fall within the compass of that description, "Lines".

A. Both sets of them include lines, the 1995 at item A2 and the Blue Book at item (c).

THE CHAIRMAN: Sorry, which of the ones in 1995, spelt out

Page 140

in detail, would fall within lines?

A. Item A2.

THE CHAIRMAN: A2, yes. That's the only one, is it?

A. That's the only one, yes.

MR SHIEH: The potential line of thinking I'm getting at, Dr Armstrong, is if Shell Expansion, Profile, Deck and Bulkhead, these sort of drawings as specifically named are only required in 1995, but not Blue Book, then --

A. No, but they were submitted, of course.

Q. Yes. So the line that I'm trying to get at is, does that provide any inkling towards whether or not people might already be submitting plans with an eye on the precise requirement of 1995?

A. I understand. Indeed, there is very little definition here of what structural plans are required in the Blue Book.

Q. That's why I was suggesting or providing an alternative, as a matter of fairness. If, for example, in the trade, the same kind of plan, Shell Expansion or Profile, Deck and Bulkhead, are already subsumed in some generally described kind of plans in the Blue Book anyway, then it may be one can't read too much into the fact that these 1995-peculiar plans have been submitted in early 1995.

A. It suggests to me, reading through it, that in drafting the 1995 Regulations they were trying to bring it

Page 141

up-to-date with practice.
Q. All right. So it may be that people are submitting these kind of plans and therefore the draftsman of the 1995 Instructions could well be taking that into account in specifying the kind of plans that they want people to submit?
A. Yes, I agree.
Q. Could I then ask you to consider -- it's a very small point -- miscellaneous bundle, page 132. This is the calculation, the preliminary trim and stability booklet calculation done by Naval-Consult in Singapore.
Page 132 contains that reference to GM at equilibrium. What's the GMT requirement under schedule 3, do you remember?
A. Yes. I'm just trying to check whether this is intact stability or damage stability. It is damage stability on page 132, okay.
The requirement for GM is 0.050.
Q. Yes. The reason I ask is that page 142 is damage. Page 142 is "Steering & tank room damage", and the requirement is 0.05. That was the one I think Mr Mok asked you to look at.
A. Correct.
Q. It only puzzles me slightly but you might have corrected yourself, because in answering Mr Mok's question, you

Page 142

say you also want to look at 132, but 132 is not damage stability; it's intact, I think.
A. I think you're right, yes.
Q. So basically we need not concern ourselves with page 132?
A. 132 is intact stability.
Q. Right. Okay. Thank you.
Again on the subject of the difficulties we have over whether it's Blue Book or 1995, you mentioned there is this one-year period, early 1995 until early 1996, where there could be this rather odd situation whereby if you actually look at the text of the rule, it covers -- if you look at the text of the 1995 Regulations, they actually say in terms they apply to new vessels, the keels of which were laid a year ago.
A. Yes.
Q. And there is this conundrum about retrospectivity.
A. Yes.
Q. And Mr Mok was asking you whether it's fair to apply it retrospectively in this manner, when people have actually done work by reference to the pre-existing standard.
A. Yes.
Q. You mention the point that the matter can be raised and subject to mutual negotiations. Do I take you to

Page 143

mean -- I don't want to put words into your mouth, but obviously I'm right, you'll tell me I'm right; if I'm wrong but you can modify it, then tell us. Are you suggesting that since these are all guidelines anyway and not stipulated compulsory law, there's a good deal of discretion in the Marine Department? So it's not a case of all or nothing. It's not a case of either it's entirely retrospective or it's entirely not-retrospective, and it must depend on the particular requirement in question and the way the particular shipbuilder had tried to persuade Mardep, or the way Mardep had tried to persuade the particular shipbuilder?
A. Yes. Thank you. Because ships are quite often different to each other, and because people are always exploring novel ideas, there has always been some area of flexibility in the regulations. Even SOLAS has an exemption clause for anything in SOLAS, as long as a good case can be made for it, and exemptions are sought. It's not easy with SOLAS, but it's not too hard with vessels operating closer to shore. As long as the overall safety of the craft is not compromised, it is quite often possible to balance one safety item against another.
Q. So let's say in principle, if the "new requirement" in the 1995 Instructions are a matter of grave importance,

Page 144

or a recent discovery led to, let's say, the imposition of a very stringent standard, it may well be, you would suggest, that yes, it must apply, even though it might carry a degree of retrospectivity? Whereas for other requirements, depending on its nature or gravity, it could be negotiated around?
A. Yes, and there are plenty of examples of that. New legislation was introduced within about six weeks of the 9/11 disaster, for example, requiring vessels to have AIS. That happened very, very quickly. I might have the timing wrong, but it was certainly very rapid. So there are events that can stimulate very quick changes to the legislation, and of course the AIS example, although at an international level, was applied to all ships.
Q. But it would not be a correct mindset -- I'm not talking about interpretation of law, I'm talking about administering of safety standards. It would not be a healthy or correct mindset to take a rigid line and say, "Oh, it comes into effect in January 1996. Then I only apply to things done after 1996, and I disregard that wording written by whoever, that it applies to new vessels". It won't be a correct mindset to adopt this rigid mentality of not applying it?
A. I have known people who have done that, but by and large

Page 145

there's usually some flexibility.
Q. Thank you. In the questioning concerning the aft peak bulkhead, a good deal of questions were asked about whether or not there is any numerical definition of how far an aft peak bulkhead should be and matters of that sort. That brings me back to I think the evidence that you gave first time round. Let me try to summarise the result of that debate and see whether you would agree with me.
In terms of numerical calculations and GMT or margin line is concerned, they are taken care of by a set of rules concerning floodable length and margin line immersion, 0.1L and all that. If you want to talk about numbers, those are the numbers. But the requirement of aft peak bulkhead being a generally worded concept is unrelated to numbers.
A. Yes.
Q. It has its role to play, otherwise you say you wonder why it's there. Therefore, could it be said that there could be a number of ways in which casualties can occur and things might go wrong, and therefore whilst numerical requirements, calculational requirements could be one form of prescribing standard requirements, the inclusion of a requirement, of a general requirement of an aft peak bulkhead adds a buffer to that?

Page 146

A. Yes, I agree wholeheartedly with that.
Q. And one mustn't be hamstrung by the fact that, "Oh, numbers are there already. Anything above the numbers, we don't need it." Would that be a healthy mentality to matters such as life?
A. I think the numbers are necessary as well.
Q. Yes, but you said not sufficient?
A. But not necessarily the be-all and end-all, I agree.
Q. Because, for example, questions were asked that, "Oh, the aft peak bulkhead would only enclose a volume at the end where buoyancy is limited", but we have seen that buoyancy turn out to be crucial in our case.
A. Yes.
Q. And although, of course, during the floodable length numerical exercise of the matter, people are mandated to do it by reference to one-compartment flooding only, this aft peak bulkhead requirement adds a dimension of safety on top of that one-compartment flooding scenario?
A. Yes.
Q. You would agree with that?
A. Yes, I do.
Q. Coming to the sort of mentality that a prudent inspector should adopt at the time of passing this vessel -- I use that word rather broadly, "passing this vessel" in terms of approving the plans and also signing off on the

Page 147

vessel as built -- the line of questioning put to you appeared to be going along the lines that there were ample reasons not to treat the frame 1/2 as an aft peak bulkhead but to treat the bulkhead between tank and engine as an aft peak bulkhead.
But the question I want to ask you is this. Consider yourself a Marine inspector looking at this vessel in 1996. Seeing that at frame 1/2 there is a bulkhead, seeing that between tank and engine there is a bulkhead, which would you think, as an inspector, would be the natural candidate to be regarded as the aft peak bulkhead as required by the Blue Book? Which would be the more natural candidate?
A. The more natural one for me would be the one at frame 1/2.
Q. So the natural mindset, leaving aside the fact that we now ex post facto try to look backwards and try to see what had happened, the natural mindset would be to say, "Well, this being the aft peak bulkhead as required, see if it's watertight and if not, see why it should not be watertight"?
A. Yes.
Q. Rather than to -- and if no convincing reason can be put forward, then make it watertight?
A. Draw it to someone's attention to make it watertight,

Page 148

yes.
Q. Yes. Rather than to say, "Ah, let's see how we can actually justify making it non-watertight".
A. It's a reasonably trivial task to make it watertight.
THE CHAIRMAN: Because the bulkhead is being constructed in a way that it is watertight, save for the hole that's being put in the bulkhead.
A. Correct. Although there is still the difficulty of 10 per cent L when considered from the steering gear compartment damage.
MR SHIEH: Lastly, could I ask you to look at the question of the rudder stock. Could I ask you to look at marine bundle 2, drawings, page 233. In fact the series of drawings start at page 230.
When Mr Mok asked you questions, he was concentrating on the intrusion of the propeller shaft into the engine room.
A. Yes.
Q. Could I ask you, by reference to these few drawings, to discuss or address the question of the rudder stock intrusion into the steering compartment? Because we can see the rudder stock in a general way at page 230, but I think at page 233 we see it in greater detail.
A. If you could give me a moment, please. I need to understand. Okay, I understand. You're looking for

Page 149

a general explanation of how this works and becomes watertight?
Q. Or the risk that it entails of --
A. The risk that it entails, thank you.
If we look at page 232, in the middle of the diagram, there is a section through the rudder and maybe we can put the cursor a bit lower down. Thank you. There. We have a shaped tapered form which is the rudder.
Q. Yes.
A. It probably is fairly obvious that it rotates about a centreline, which is the centreline of the rudder stock, which is the vertical post that extends outwards from the blade of the rudder. Just above the rudder is the shell of the ship. Just two thin lines, a little bit higher up the cursor -- thank you. I think that's okay. Just there where the cursor was. Can we lift the cursor a little up and a little to the right or left, and up a bit more and to the right, please.
Just above that there are two lines close together, parallel, and that is meant to be the shell plating thickness. So that's the outside of the ship. We have to make that watertight. The rudder stock passes upwards through a bearing which may be some -- it can be various materials. Here it's called a Morse cutlass

Page 150

bearing on the left-hand side of where the cursor was. I don't need to bother you with details of that. It is not a watertight connection, but it is very tight tolerance, shall we say.
On either side of that bearing, there is a hashed tube. So the tube passes up above the ship's plates. That's shown with the diagonal line shading. Item 1. And then on top of that there is a flange, horizontal flange. The whole thing is supported by a girder, which is quite a substantial girder, which is behind the figure "0" with a circle around it, and extending on both sides of the tube, which is marked as "1". You can see it's got a "10" with a wavy line underneath it on the left-hand side, which is indicating the girder is 10 mm thick.
So we have a tube with the rudder stock hanging down through it, and at the moment there's nothing to stop the water coming in and there's nothing to stop it falling out of the ship. So above the tube number 1 is fitted a watertight seal, which I'll go into in a second, to keep the water out. And then above that, you'll see a sort of bridging structure which is carrying another bearing, which holds the rudder and the rudder stock up so it doesn't fall out of the ship. That doesn't play any part in the watertight integrity,

Page 151

so I won't go into details with that. That's marked at item 6, for example, the bearing material.
Above that, almost at the top, you can see an oval shape cut into the rudder stock, and that is for a key to attach the tiller on, which would move the rudder from side to side.
So the only thing I haven't explained, Mr Shieh, is the device that keeps the water out. You can see it dotted in this diagram as a sort of L-shape on either side.
Q. Unnumbered?
A. Unnumbered, yes. The reason it's unnumbered is it's on the next sheet, page 233. Without going into details, you can probably see the rudder stock on the left-hand side. It's coming up -- we can't see -- can see? Can't see the shell plating in this particular drawing, because remember the rudder stock is coming up through a tube. This is called the rudder trunk, and I think, if we can zoom in -- just where the cursor was, very good -- it says "Alum rudder trunk" at the lower part of the upper drawing. Okay. Aluminium rudder trunk. So that is, if you like, an extension of the shell plating.
Above that, there is a stuffing box. In fact it's called that, I see, number 2 on the left-hand side, which is a circular fabrication. I'm not sure what the

Page 152

material is, without looking it up. Possibly aluminium. Then inside that there is some soft packing material, maybe a sort of fibrous rope type of material, and that can be pushed down with item 1, which is called a packing gland, which is pushed down by the forces of the bolt on the right-hand side where the cursor is. But there is a ring of bolts, there's not just one of them. There's a number of them that are spaced around the periphery of that upper gland.
So this complicated arrangement is required to try and keep that watertight. You can see I think there are a number of places where it can leak, for example on the left-hand side, under the number 2 with a circle through it, there is a bolt and an attempt made to keep that watertight by putting in a gasket, and there is the word "gasket" there. And I'm sure you can understand that that is kept watertight by a bolt, not actually a bolt, it's a stud with nut on it, and if the rudder should have a force such as you get from grounding from underneath, it's relatively simple to break the threads on the stud and water is admitted.
Q. Thank you. So that would be the risk involved in this penetration or breach of the underside?
A. Yes. There is one other risk, if I may go back to drawing 232.

Page 153

Q. Yes.
A. And slightly to the left, please. Thank you.
You can see that the rudder is in close proximity to the shell, the top of the rudder. If the vessel should go aground at anything other than 0 speed, there is a risk of bending the shaft and in -- the rudder stock, I should say, bending the rudder stock. If that should happen, then water can escape around the lower bearing. And there is also the risk of the rudder itself penetrating the hull plating. That has been reasonably well recorded as being an event that happens.
Q. Thank you, Dr Armstrong. I said that's the last question, but I have one point for clarification.
Expert bundle 2, page 928 -- this will be the last question -- the table that you compiled in respect of calculations.
Just so that I have it absolutely clear in my mind, in the middle, above "1998", this is, as you say, from the tank room perspective; correct?
A. Yes.
Q. Because tank room longer than 0.1L, so tank room is capable of independent calculation as a floodable one compartment?
A. Correct.
Q. I say "one compartment"; for the purpose of

Page 154

one-compartment flooding?
A. Yes.
Q. So for the purpose of one-compartment flooding, tank room already fulfilled the 0.1L requirement?
A. Correct.
Q. So it is really the 1998, "With watertight door" row which would have counted as the relevant calculation for "Tank room only", one-compartment flooding calculation?
A. Correct.
Q. Now, the row below, "With ballast; 1998; with no watertight door", failing the margin line test, that would actually not have been required for the purpose of one-compartment flooding if you look at it from the perspective of tank room; correct?
A. Yes, correct.
Q. Because tank room already fulfils 0.1.
A. Yes.
Q. That, more appropriately, is a 0.1L plus one-compartment flooding scenario --
A. Yes.
Q. -- if you look at it from the perspective of the steering gear compartment; correct?
A. Correct.
MR SHIEH: Thank you.
Thank you very much, Dr Armstrong. It's been a very

Page 155

long week. I have no further questions for you.
A. Thank you.
THE CHAIRMAN: Just one remaining matter, and that is the issue of the measurement of the foam in the upper deck of Lamma IV. Have you been able to address that, or is someone else going to assist us? That is, to what its actual thickness is.
A. Yes. I do not know, sir, at the moment what arrangement have been made.
THE CHAIRMAN: Mr Shieh, can you help us as to that? There's an outstanding matter, and it is whether or not the foam that's used in the sandwich between the fibreglass on the upper deck floor, if I can call it that, is as designed, which I think is 15 mm --
A. 25, I think.
MR SHIEH: 25.
THE CHAIRMAN: Is it that thickness or not?
MR SHIEH: Yesterday we left it at requesting the police to actually get on board, on the deck to measure it. I'm not sure whether or not that physically --
THE CHAIRMAN: That's being attended to?
MR SHIEH: I hope so. The request has been made in the hearing. I hope it's been attended to.
THE CHAIRMAN: Mr Mok?
MR MOK: I don't know about this, but I'll certainly check

Page 156

on it.
THE CHAIRMAN: Yes.
Well, Dr Armstrong, thank you very much for the assistance that you've given us so far. There is more assistance that we will be seeking from you in due course as to the second and third aspects of our report. But thank you very much for all the help you've given us in what must be a very long week for you, and we wish you safe travel.
A. Thank you very much, sir. Thank you.
THE CHAIRMAN: Feel free to leave the witness box.
(The witness withdrew)
MR MOK: Mr Chairman, there is a matter that I wish to update the Commission on.
THE CHAIRMAN: Yes?
MR MOK: One of the matters that you asked Dr YK Cheng to follow up was to test the light bulbs.
THE CHAIRMAN: Yes.
MR MOK: He has already completed a report on that, and according to him, I understand that he has certain interesting findings. I haven't read it myself yet.
THE CHAIRMAN: It's reached me.
MR MOK: I wonder whether or not you will wish, or the parties may wish, to recall him.
THE CHAIRMAN: The Commission would like to hear from him

Page 157

again. We thank him for what he's provided, but we'd like to hear his oral testimony.
MR MOK: Thank you. Maybe that can be scheduled later.
THE CHAIRMAN: Yes.
MR SHIEH: Mr Chairman, this being 4.25 on a Friday afternoon, normally speaking one might suggest that we call it a day, but we have Mr Tang Ying-kit who witnessed the wake in the waves at almost the point of -- well, the time of impact, or shortly before the time of the impact.
I understand he has been arranged to attend the hearing today. His evidence need not and should not take very long.
THE CHAIRMAN: We'll accommodate him. Please call him.
MR SHIEH: Yes. May I please now have Mr Tang Ying-kit.
MR TANG YING-KIT (affirmed in Punti)
(All answers via interpreter unless otherwise indicated)
Examination by MR SHIEH
MR SHIEH: Mr Tang, thank you very much for attending this hearing at rather short notice. The reason we require your assistance is that during the course of the expert evidence, an issue has arisen to which your evidence concerning what you saw shortly prior to the collision could be of some assistance. We are grateful for you agreeing to come. We know that you have suffered

Page 158

a loss, the bereavement of someone close to you. May I first of all, on behalf of the Commission, express our condolences to you and wish that you could have a speedy recovery mentally and physically.
Could I have the witness's statement projected onto the screen. It's police bundle A(II). The Chinese version is page 190. I think in line with the previous practice, we'll project the Chinese version onto the screen while I read out the relevant part in English.
Yes. Unfortunately, for members of the public and the press, the handwriting may be a little bit difficult to decipher. But could I read it out.
Mr Tang, you can see a Chinese version of your police statement that you have given to the police.
A. (Witness nods).
Q. Before coming into the witness box, have you been provided with a copy of this, and if so, have you had a chance of refreshing your memory as to its contents?
A. Yes, I have read it once.
Q. Thank you. I'm going to read out the relevant part of it into the record, and you obviously can take a mental note as to what I am reading from, mentally translating it, or by looking at the screen.
You say:
"I am the above-stated Chinese male Tang Ying-kit,

Page 159

single, living with family at above address ... On 21 February 2007, I entered Hongkong Electric Company and became a staff member of the information technology department. My work place is at the Hongkong Electric Centre, Kennedy Road ..."
I should have said, you have also received university education.
Then moving on:
"I remember that sometime in early June 2012, I learnt that the recreation department of my company organised a social event to watch fireworks display on July 1 and October 1 respectively. I enrolled in the event. Around two weeks later, the name list for the event was released. I learnt that I was allocated by lot drawing four tickets for the October 1 event. Then I arranged to watch the fireworks display with my girlfriend ... my friend Cham ... and his girlfriend.
Around 1.30 pm on 1 October 2012 ... my girlfriend ... my friend Cham ... and his girlfriend Choi boarded a ferry at Tsim Sha Tsui Ferry Pier. Then the ferry sailed to Central Pier to pick up passengers, and then to Ap Lei Chau Pier to pick up passengers. Eventually we went to visit Lamma Island Power Plant."
Then I will skip over the dinner part, and I go straight to the part where it says:

Page 160

"The four of us stayed on the upper deck at the open area of the stern near the staircase where we could feel the breeze and watch the fireworks. At that time I was standing by the railings of the stern facing the sea."
Could I now ask you to look at a plan of the weather deck which will be projected onto the screen. It is a mixture of a plan of drawings where various benches are, and also some photographs depicting the actual appearance of those locations on the deck.
Can I ask you to look at the upper deck plan in the middle and then see whether you could assist us in identifying where you and your friends were standing at the upper deck at the open area at the time the ship departed?
You can ask the cursor to help you. You can see the cursor. You can have the cursor moved up or down.
A. At that time, I was standing with my girlfriend at the lower left-hand corner in front of the railings. At that time, I was facing the stern.
THE CHAIRMAN: Are you describing the place where the cursor is, that hand?
A. Correct.
MR SHIEH: And also where the cross is at page 598 of the police bundle A(II)? There's a cross at page 598.
A. Correct.

Page 161

THE CHAIRMAN: So that's marked on the starboard side of the stern?
A. Yes.
MR SHIEH: Could I ask you to look back at the plan, the deck plan. I believe the photograph that would best enable us to see where you were standing is the one at the bottom left-hand corner. That would enable you to point to us where you were standing round about that time?
If I could have the cursor moved to indicate where you were standing.
A. A little bit to the left. This is about the place. Close to the railings on the left at the stern.
Q. Thank you. We can mentally reconstruct it, because obviously it's now deformed in the photograph.
I'll read on:
"Around 8.15 pm the same day ...
I'm reading on from the Chinese witness statement at page 592, Chinese; the English being at page 598-3.
"Around 8.15 pm the same day, the ferry set sail. At that time the four of us were still standing on the upper deck at the open area of the stern. The four of us were chatting. I was facing the sea with my back to the bow. Having sailed for around 5 minutes, I felt that the ferry accelerated for I saw splashes of water

Page 162

off the stern, and the engine noise was getting louder."
When you say "splashes of water off the stern", could you describe their appearance? Did it look like waves or did it look like currents or ...?
A. It was like water splashes in white colour.
Q. Like a turbulence?
A. It was not a very high -- not a big wave, and it was not like a turbulence. It was very dense water splashes.
THE CHAIRMAN: In the wake of the vessel?
A. Yes. It emanates from the wake of the vessel.
MR SHIEH: "... and the engine noise was getting louder. However, I could see that the ferry did not tilt to the left or to the right."
Could I pause here, because it may well have to do with the way the Chinese was put. When you say "the ferry did not tilt to the left or to the right", do you mean turning to the left or to the right, or being listed to the left or to the right? You know the difference? Turning to the left or right, or listing or tilting to the left or the right?
A. What I mean is that the ship did not turn to any other direction; it was sailing forward, in a straight path.
Q. "Around two or three seconds letter, I felt that the ferry accelerated again. This time I felt something unusual."

Page 163

What facts made you feel something unusual?
A. Since the vessel set sail, it had been sailing at a steady speed for four to five minutes, and then at one point, the engine noise became louder and it had obviously accelerated, and the wake became more dense and became larger.
Q. You said "the ferry accelerated". You said this two times. Does it mean that the ferry accelerated, so went faster, and then kept at the same speed and then went faster again?
A. Yes.
Q. Thank you.
"Around four or five seconds later, I sensed that something hit the ferry from the right, and the four of us fell onto the floor."
So in your position, when you felt the ferry being hit from the right, it was actually the ferry itself being hit from the left; that's correct? Because you were actually with your back facing the bow of the ship.
A. Correct.
Q. Thank you.
"I stood up immediately to help my girlfriend to the sofa in the middle of the upper deck at the stern to take a rest."
You went indoors, that is to say; correct?

Page 164

A. No. It was not indoors.
THE CHAIRMAN: Were these bench seats located on the open deck, but in the middle?
A. Yes. It was bench 2 and bench 3 on the plan. At that time, I helped my girlfriend to sit in the middle of bench 3.
MR SHIEH: Thank you. So you were outdoors.
A. Yes, I was outdoors.
Q. "Then, when I turned round, I saw that the railings and seats on the left side of the ferry were broken as a result of an impact. Meanwhile, my friend and his girlfriend also got to the sitting place where my girlfriend was. Then I sensed that the ferry began to tilt to the left. I went to get lifebuoys from the stern. At this juncture, I heard someone yell from downstairs, "Don't leave, save life first!' then I sensed that the tilt sped up."
That means the tilt to the left; correct?
I don't think it's necessary to translate what I've read out, because the witness can see it from the screen. I was asking him one question. When he said the ferry began to tilt to the left, and later he said "I sensed that the tilt sped up", it meant the leftward tilt sped up; correct?
A. In fact the tilt was towards the right. It was tilting

Page 165

towards the direction of the sea.
Q. I think we have to ascertain the meaning of left and right. When you say "to the right", do you mean the real right side of the ship, or the right side as observed by you with your back to the fore?
THE CHAIRMAN: Can I suggest we use the model to demonstrate.
MR SHIEH: Yes.
THE CHAIRMAN: Could you give him the model.
I'm going to ask you to take the model of the vessel and just demonstrate.
A. (In English) Okay.
THE CHAIRMAN: Perhaps you could stand up to do it.
A. At that time, the vessel was tilting towards that direction (indicates).
THE CHAIRMAN: That's towards the right, you're demonstrating, the starboard side at the stern?
A. Yes, correct.
THE CHAIRMAN: Thank you.
MR SHIEH: Then can I read on:
"I went to get lifebuoys from the stern ... I told my girlfriend and the (two) friends that we had to hold hand in hand and not let go. Around twenty seconds later, the ferry sank in a little while. The four of us eventually failed to hold on to each other. It was in

Page 166

a state of chaos. Moments later, the ferry became steady, and I saw only the bow above the sea. At that time I was trapped in the cabin; the wheelhouse was right before me facing upwards. The upper deck was in a state of chaos."
Mr Tang, could you assist us in describing your movements from where you were near bench 2 and bench 3, outside on the weather deck, on the outer deck, how you eventually got to inside the cabin with the wheelhouse right in front of you? Because that is quite a distance, between what I would call the outer deck to where you finally ended up.
A. After helping my girlfriend to bench 3, I went to the stern to fetch two lifebuoys. Then I went back to the middle of bench 2. At that time, my girlfriend was still sitting on bench 3, and I took the lifebuoys and then crossed over the backs of the two benches and put the buoys on her. Then I told my friends that we should hold hands together and should not lose each other, but after more than 10 seconds, the vessel began to sink and the lower part of my body was already immersed in water, and very soon my head was also immersed in water. When I went up to the surface, I was already in the cabin, already in the indoors.
Q. I see. So the fact that you eventually ended up at the

Page 167

position a little bit outside the wheelhouse was not because you either climbed or crawled or walked along the deck; it was simply because you were immersed in water and basically you floated up to the surface and the surface happened to be a little bit outside the wheelhouse?
A. Yes, correct.
Q. I'll read on:
"I heard someone yell, 'Don't move!' I put on a life jacket to wait for help."
Pausing here. At this point in time, as you said earlier, the ferry was in a steady state. So there was a pause or stop in the sinking movement of the vessel; right? It stopped sinking, put it this way.
A. Yes.
Q. "Around thirty [seconds] later, I saw lights coming from outside, but I was not sure who they were."
THE CHAIRMAN: Is that translated incorrectly? Because it says "minutes" in English. It's "seconds" in the Chinese, is it?
MR SHIEH: It's "30 minutes", I think. The Chinese is actually "30 minutes".
THE CHAIRMAN: Yes. I think you'd read it as "30 seconds".
MR SHIEH: 30 minutes, sorry.
"Around thirty minutes later, I saw lights coming

Page 168

from outside, but I was not sure who they were. Someone kicked to smash the windowpane on the upper deck, but I could not tell whether it was on the left or right. Then I head someone says, 'Rescue the kids first.' At this point, I felt that the ferry started to go further down the sea. Then I put off the life jacket to dive out of the cabin through the side windowpane."
May I stop here. Was that a windowpane that was smashed by the people outside?
A. Yes, it was a windowpane.
Q. So you swam out through a broken window?
A. Yes.
Q. But when you swam out, you were already submerged again, immersed again?
A. Yes. I was still in the water after I swam out.
Q. I think I might have actually not put the matter very well.
When you went outside the windowpane, was it water outside or was it air outside?
A. In fact when I tried to swim out of the broken window, the broken window was already in the water.
Q. I see. So you swam out the broken window and you then had to float up to the water surface?
A. Yes.
Q. Thank you.

Page 169

"Having surfaced, I saw lifebuoys on the waters and managed to grab one. Very soon, the people of a passing by yacht rescued me. They gave me hot water and a blanket. I saw two unknown persons who had also been rescued by the people from the yacht. They arranged for us to rest in the cabin. Shortly, I saw Choi Ming-chi, the girlfriend of my friend, who had also been rescued. Later, we were taken onto a rescue launch and sent to Kwong Wah Hospital for treatment.

Question: Do you know who of the recreation department is in charge of this event?

Answer: I do not know, but sometime in September, someone named Fok Wing-kei rang me to verify if we would attend the event. I know that Lai Ho-yin offered help in organising the event that day. I know no-one else then.

Question: Have you got Cham's ... phone number?"

I think we'll skip that.

"When the ferry set sail, was the speed high?

Answer: I remember when leaving Lamma Island for Victoria Harbour, the speed was not high.

Question: At the time of the collision, did you hear any sound of horn from the vessel, or from other vessels?

Answer: No, definitely."

Page 170

Why were you so sure, when you say "definitely"?

A. Because I didn't hear it.

Q. It continues:

"During the sail, did you see who went in/out of the wheelhouse?

Answer: No, I could not see it from the point I stood.

Question: At the time of the collision, was any message broadcasted from the vessel?

Answer: No.

Question: At the time of the collision, did you take photos?

Answer: No.

Question: When did you learn ..."

I'll skip through that.

"Question: For the 'vessel collision', did you find any property missing?"

We can skip through that.

"Were you injured?

Answer: Scratches on both hands, and back injury.

Question: Are you insured?

Answer: No.

Question: At the time of the collision, did you see or feel that the ferry changed direction?

Answer: No. I only felt that the ferry accelerated

Page 171

twice.

Question: How could you tell that the ferry accelerated?

Answer: It was obvious that the speed was getting high suddenly."

Did you correlate that to the splashes that you saw, the acceleration?

A. Yes.

Q. So you formed the impression of the ship accelerating at least partly because you saw the water splashes, white water splashes at the back of the vessel?

A. You can put it that way.

THE CHAIRMAN: You told us also that you heard the engine sound being louder.

A. Yes. This is another part of it.

MR SHIEH: Thank you.

"When you saw the left of the ferry being hit and damaged, did you see any other vessels?

Answer: No, I did not see.

Question: Do you know the name of the vessel you were on?

Answer: I do not know."

Mr Tang, do you confirm the truth of what I have read out, subject to the questions that I have also clarified with you?

Page 172

A. Yes, they are correct.

MR SHIEH: Thank you. Mr Tang, I have finished my questioning of you but could you remain in the witness box because other counsel and the Commission may have questions for you.

THE CHAIRMAN: Mr Grossman?

MR GROSSMAN: I'd like to pass on condolences, and I have one question only about the life jacket.

THE CHAIRMAN: Yes.

Examination by MR GROSSMAN

MR GROSSMAN: Mr Tang, I appear here on behalf of Hongkong Electric, and I want to publicly give you condolences on behalf of Hongkong Electric and myself for your great loss.

I have one question only for you. You've said that when you were in the cabin, your life jacket was on but you took it off to get outside. Why was that?

A. Because if I don't take away the life jacket, I can't dive into the water to swim out of the broken window.

Q. There was just not enough room to get out of the window with your life jacket on; is that what you mean?

A. No. Because if I put the life jacket on, I will stay afloat and I can't dive into the water.

MR GROSSMAN: Okay. Thank you very much.

THE CHAIRMAN: Mr Zimmern?

Page 173

MR ZIMMERN: Thank you, Mr Chairman. No, we have no questions.
MR PAO: We have no questions.
THE CHAIRMAN: Mr Mok?
MR MOK: May I have one follow-up question from Mr Grossman's question?
THE CHAIRMAN: Yes.
Examination by MR MOK
MR MOK: Mr Tang, earlier on you said that you had to take off the life jacket in order to dive into the water and out through the window.
A. Yes.
Q. What would have happened if you did not do that; that is, if you did not take off your life jacket at that time, what do you imagine would have happened to you?
A. At that time, the vessel was sinking, although not in a very high speed. But I considered that if I didn't go out of the window, the water would soon reach up to the ceiling. So I decided to go out.
Q. And what would happen to you if you didn't take off the life jacket and the water kept going up?
A. I would be submerged in water. My head would be submerged in water.
Q. And at that juncture, if you still wished to swim outside of the vessel, would you have been able to do

Page 174

so, in that scenario?
A. I don't know.
MR MOK: Thank you.
THE CHAIRMAN: Mr Yeung?
MR YEUNG: No application.
THE CHAIRMAN: Mr Shieh?
MR SHIEH: I have no re-examination.
THE CHAIRMAN: Mr Tang, thank you for coming to assist the Commission with your evidence. Our apologies if you've been delayed in being brought on to give your evidence. But it's been helpful to us. And condolences from the Commission as well as to the loss of your girlfriend in this tragedy.
MR SHIEH: Mr Chairman, I've just been reminded there may be one question that I have omitted to raise with this witness, but perhaps I --
THE CHAIRMAN: Yes. Let's have that translated first. Apparently there's one more question. Yes, Mr Shieh?
Further examination by MR SHIEH
MR SHIEH: You were facing Lamma Island when you were at the outer deck of the Lamma IV?
A. Yes.
Q. Could you see a very strong light at or near the ferry pier?

Page 175

A. No.
MR SHIEH: Thank you.
THE CHAIRMAN: Well, your questioning now is complete, Mr Tang, and you're free to leave now. Thank you very much.
(The witness withdrew)
THE CHAIRMAN: Mr Shieh, can you give us any indication of the sequence of evidence for next week?
MR SHIEH: As initially planned, there is Mr Tang Wan-on, the Hongkong Electric officer, and then there is Mr Ng, the Hong Kong & Kowloon Ferry officer responsible for training matters.
Then there is Mr Wong Wing-chuen, the Marine Department inspector who will address for relevant purposes the issue of life jackets.
Then there will be Captain Pryke's return to deal with questions to be asked on behalf of Hong Kong & Kowloon Ferry.
THE CHAIRMAN: Yes.
MR SHIEH: But now we have the potential interposition of Dr Cheng Yuk-ki to talk about the result of his laboratory testing, the results of which reached us shortly before lunch. So we would perhaps have to work out how Dr Cheng is to be placed in this sequence.
THE CHAIRMAN: Yes. I think since Captain Pryke deals with

Page 176

a discrete issue in respect of his evidence which was given in mid-December, that could be taken at any stage next week --
MR SHIEH: Yes, especially if --
THE CHAIRMAN: -- to suit his availability, subject to any submissions counsel have to make.
Mr Zimmern, this concerns you.
MR ZIMMERN: Yes, it does, but no, we have no comment as to when Captain Pryke should give evidence.
THE CHAIRMAN: Thank you.
Mr Mok, this may or may not concern you.
MR MOK: Not too much, so --
THE CHAIRMAN: You've no objection to that?
MR MOK: No.
THE CHAIRMAN: The sequence of the evidence to accommodate Captain Pryke.
So there you are.
MR SHIEH: We will perhaps confer amongst counsel to see when Dr Cheng can be interposed, subject to his availability and subject to our consideration. It may well be first thing Monday, while the matter is fresh in our memory.
THE CHAIRMAN: Yes. Very well.
MR SHIEH: And also the report is hot off the press, and subject to whether he can come --

THE CHAIRMAN: Yes, of course. I'll leave that with counsel. But as I indicated, I think priority ultimately should be given to Captain Pryke so that that part of his evidence can be disposed of.
MR SHIEH: Yes. He's arriving Monday and it may well be he needs some time to rest anyway.
THE CHAIRMAN: Yes, I understand that. I will leave that for counsel to judge the best way to deal with it.
If there are no other matters, we'll adjourn until Monday at 10 o'clock.
(5.03 pm)
(The hearing adjourned until 10 am on Monday, 4 February 2013)

I N D E X