

For hearing before the Commission of Inquiry  
at 10 am on Monday 11 March 2013

**Commission of Inquiry**  
**into the Collision of Vessels near Lamma Island on 1 October 2012**

**CLOSING SUBMISSIONS FOR THE FIRE SERVICES DEPARTMENT,**  
**HONG KONG POLICE FORCE AND THE MARINE DEPARTMENT**

**A. INTRODUCTION**

1. The Commission is required, under its Terms of Reference, to inquire into the facts and circumstances leading to and surrounding the collision of Lamma IV and Sea Smooth which took place on 1 October 2012 for 3 specific purposes:-
  - (1) To ascertain the causes of the incident and make findings thereof;
  - (2) To consider and evaluate the general conditions of maritime safety concerning passenger vessels in Hong Kong and the adequacy or otherwise of the present system of control; and
  - (3) To make recommendations on measures (if any) required for the prevention of recurrence of similar incidents in future.
  
2. The Fire Services Department and the Police attended the Inquiry primarily for the purpose of providing evidence (documentary and testimonial) to assist the Commission in its fact-finding exercise. They do not propose to make any submissions. The facts relevant to the rescue

operation can be found at [Fire 3/2/577-581, 622-7] and [Police Q/3/4975-1-4975-8]

3. The Marine Department's ("Mardep") submissions are as follows.

**B. CAUSES OF INCIDENT (PART (A) OF THE TERMS OF REFERENCE)**

4. This part of the Reference covers 2 aspects, the causes of the collision and the causes of the sinking of Lamma IV. The first aspect concerns navigation of the vessels by the crew involved. The second aspect touches on the structure of Lamma IV. Accordingly Mardep will focus its submissions on the second aspect.

5. In this regard:-

- (1) The exercise undertaken and the conclusions to be made by the Commission are essentially factual. The Terms of Reference expressly provide that the determination of any criminal and civil liability of any person is outside the ambit of this inquiry. The findings made by the Commission are not and should not be equated with findings of legal liability.

- (2) It is also significant to note that Mardep's role in relation to Lamma IV was regulatory and supervisory, having regard to the guidelines applicable at the material times. But the primary responsibility of ensuring compliance with those guidelines in design, construction and maintenance remains with the ship owner and its contractors (including the ship builder).

6. In the present case:-

- (1) Lamma IV was required to meet the “one compartment flooding” standard, which Dr Armstrong accepts to be a standard commonly applied to local vessels around the world.<sup>1</sup>
- (2) So far as the 0.1L rule is concerned, it was Mardep’s practice to apply such a rule so that, by reason of the short length of the steering gear compartment (1.625 metres), the bulkhead at Frame 1/2 should not be regarded as forming part of the subdivision of the ship, and should therefore be ignored for such purpose. This is so regardless of whether the bulkhead at Frame 1/2 is watertight or not watertight: CK Wong 1<sup>st</sup> §34.<sup>2</sup>
- (3) The collision caused 2 compartments of Lamma IV, the engine room and the tank room, to be breached.
- (4) The time from initial contact to the main deck at stern going below water was 96 seconds, and to Lamma IV resting on the sea bed at 70° angle was 118 seconds.<sup>3</sup>

7. Although many issues have been raised in the course of the inquiry, it is submitted, respectfully, that:-

- (1) The only matter which has a factual causal link to the sinking of Lamma IV is the existence of the access hole at Frame 1/2;

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<sup>1</sup> [Expert 2/423/§59; Transcript 28/1 Feb/18:2-7]

<sup>2</sup> [Marine 11/39/3877]

<sup>3</sup> [Expert 2/472/§6]

- (2) The hull side plating issue is factually irrelevant, since there is no evidence that its thickness as-built was less than 4.83 mm, which is within the range of industry tolerance for the plate ordered by Choey Lee with a thickness of 4.5 mm;
- (3) The collapsed passenger seats on the upper deck might have contributed to the death of some of the passengers who were trapped underwater. But the effective cause of such collapse was the combined force of (a) gravity when Lamma IV came to a vertical position and (b) persons applying their weight by sitting or hanging on to the seats. There is no evidence to show that the seats would not have withstood the condition encountered by the vessel in the normal course of its day-to-day operation;
- (4) The number of adult life jackets and other prescribed life-saving appliances on board was sufficient to cater for the number of passengers and crew on board on 1 October 2012. Any inability to make use of them was probably due to the chaos, panic, poor visibility after the power was gone and, probably, the sheering shortness of time available before Lamma IV came to a vertical position dislodging the passengers on board. It is accepted that, at the time of the accident, there appeared to be no child lifejackets on board. However, there is no suggestion in the evidence that the children on board had difficulty putting on or fitting into the adult life jackets even having regard to the condition at the scene described above; and
- (5) Crew-manning of 4 (as prescribed in the Certificate of Survey) would have been sufficient for Lamma IV, but an issue remains as

to whether Hong Kong Electric did in fact deploy this number of crew at the time.

**(B.1) Access hole on Frame 1/2**

8. There is no dispute that Lamma IV sank because the impact caused the breach of 2 compartments (engine room and tank room). This led to the flooding of the engine room, the tank room and the steering gear compartment.<sup>4</sup>

9. The following issues arise for consideration:-

(1) What were the guidelines prescribed by Mardep, in particular whether they required Lamma IV to have (a) a watertight bulkhead at Frame 1/2 and (b) the steering gear compartment to be a watertight aft peak?

(2) Had those guidelines been complied with in the construction of Lamma IV?

(3) If not, would it have made any difference if such guidelines had been complied with?

**(B.1.1) Applicable guidelines**

10. It is submitted that the evidence clearly shows that the Blue Book<sup>5</sup> (as opposed to the 1995 Instructions<sup>6</sup>) applied to the construction of Lamma

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<sup>4</sup> [Expert 1/463; Expert 2/710]

<sup>5</sup> [Marine 8/1/1761-1809]

IV, see (a) comments #2 on the approved “General Arrangement” plan;<sup>7</sup> (b) note #3 on the “Safety Plan”;<sup>8</sup> (c) Mardep’s internal inspection records;<sup>9</sup> (d) Marine Department Notice 7/1996;<sup>10</sup> (e) Wong CK 1<sup>st</sup> §21<sup>11</sup> (ship surveyor responsible for approving plans for Lamma IV); and (f) interview record of Cheung Chuen Yau, Engineering Manager of Cheoy Lee.<sup>12</sup>

11. In any event, both sets of instructions contained substantially similar requirements concerning watertight bulkheads and watertight subdivision:-

- (1) Peak bulkheads will be required at both ends (Blue Book reg.12(4); 1995 Instructions reg.5.1);
- (2) When any access opening is fitted in a watertight bulkhead, it is to have an efficient closing appliance (Blue Book reg.12(5); 1995 Instructions reg.5.4); and
- (3) All new launches designed to carry more than 100 passengers must comply with the watertight subdivision requirements in reg.6<sup>13</sup> of the Merchant Shipping (Passenger Ship Construction and Survey) Regulations 1984 (Blue Book reg.15; 1995 Instructions reg.8).

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<sup>6</sup> [Marine 8/2/1810-1872]

<sup>7</sup> [Marine 2/1/172]

<sup>8</sup> [Marine 2/30/264]

<sup>9</sup> [Marine 4/165/834]

<sup>10</sup> [Marine 11/40/3946-3947]

<sup>11</sup> [Marine 11/39/3873]

<sup>12</sup> [Marine 10/28c/3400-3401]

<sup>13</sup> The Blue Book refers to reg.5 but it is common ground that it was an error and the correct reference should be reg.6

Those requirements (Schedule 1 requirements) can be found at [Marine 8/17/2082-2084], and s.6(6) incorporates the “0.1L” rule.

- (4) Where damage stability calculation is submitted, such calculation was to be performed in accordance with Schedule 3 of the 1984 Regulations, subject to the modification that only “one compartment flooding” standard would be applied.<sup>14</sup> The 0.1L rule would remain applicable in such event: CK Wong 1<sup>st</sup> §47.<sup>15</sup>

12. As to the issue regarding aft peak bulkhead, Dr. Armstrong provided his “observation” that this “was normally located at the after end of the vessel and in [his] experience at about 10% or slightly less from the after end”.<sup>16</sup> However:-

- (1) He accepted that nothing in the Blue Book, the 1995 Instructions or the Merchant Shipping (Safety) (Passenger Ship Construction and Survey) (Ships Built On or After 1 September 1984) Regulations prescribed any minimum or maximum distance where the aft bulkhead should be located.<sup>17</sup>
- (2) He accepted that his remark on aft peak bulkhead being at approximately 0.1L was based on his experience in relation to multihull craft in particular catamarans (which Lamma IV is not).<sup>18</sup> It was not his evidence that there was any legal requirement or international standard stipulating that the aft peak bulkhead must

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<sup>14</sup> See fax from Mardep (1.8.94) [Marine 8/17/2081 §3]. See also CK Wong 1<sup>st</sup> §26 [Marine 11/39/3875]; WC Wong 1<sup>st</sup> §28 [Marine 11/40/3936]

<sup>15</sup> [Marine 11/39/3879]

<sup>16</sup> Armstrong 3<sup>rd</sup> Supp [Expert 3/1621 §5]

<sup>17</sup> [Transcript 28/1 Feb/56:10-60:2]

<sup>18</sup> [Expert 3/1622/§7]

be within 0.1L of the stern or the after perpendicular.<sup>19</sup> Nor was it derived from any written set of rules or any written set of industry practice or standard.<sup>20</sup>

- (3) In the context of reg.12(iv) of the Blue Book he accepted that, if Mardep takes the view that a bulkhead can be regarded as an after peak bulkhead because it encloses the rudder stock and is watertight, even if the distance is more than 0.1L from the stern or the rudder stock, he would not characterize such view as either unsustainable or plainly wrong, having regard to the language of reg.12(iv).<sup>21</sup>

13. Having regard to the lack of specificity under the Blue Book guideline on aft peak bulkhead, and the overall comments by Dr Armstrong, it is submitted that any scrutiny by the Commission of Mardep's view on this question should, at most, be a soft-edged rather a hard-edged review.<sup>22</sup> For an exegesis of this distinction, we draw attention to the speech of Lord Mustill in *R v Monopolies and Mergers Commission, ex parte South Yorkshire Transport Ltd* [1993] 1 WLR 23, 32F-H:-

“Once the criterion for a judgment has been properly understood, the fact that it was formerly part of a range of possible criteria from which it was difficult to choose and on which opinions might legitimately differ becomes a matter of history. The judgment now proceeds unequivocally on the basis of the criterion as ascertained. So far, no room for controversy. But this clear-cut approach cannot be applied to every case, for the criterion so established may itself be so imprecise that different decision-makers, each acting

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<sup>19</sup> [Transcript 28/1 Feb/60:12-61:24]

<sup>20</sup> [Transcript 47/7 Mar/196:7-12]

<sup>21</sup> [Transcript 47/7 Mar/196:19-197:2]

<sup>22</sup> The concept of “soft” or “light-touch” review was referred to by A Cheung J in *Anderson Asphalt Ltd v The Secretary for Justice* [2009] 3 HKLRD 215, 251 §108.



rationality, might reach differing conclusions when applying it to the facts of a given case. In such a case the court is entitled to substitute its own opinion for that of the person to whom the decision has been entrusted only if the decision is so aberrant that it cannot be classed as rational: *Edwards v. Bairstow* [1956] A.C. 14. The present is such a case. Even after eliminating inappropriate senses of ‘substantial’ one is still left with a meaning broad enough to call for the exercise of judgment rather than an exact quantitative measurement.”

Lord Mustill’s observations on the word “substantial” apply with equal force to the question of location of an aft peak bulkhead back in 1995 when, even under the Merchant Shipping (Safety) (Passenger Ship Construction and Survey) (Ships Built on or after 1 September 1984) Regulations, Cap.369AM, which did not apply to local vessels, there was no stipulation as to the location of an aft peak bulkhead. Reg.7(4) is of interest in that, in reference to stepped construction of afterpeak bulkhead, the only safety guideline given was that “the safety of the ship as regards subdivision is not thereby impaired”. Reg.7(5), which refers to “stern gland”, provides merely general safety guideline that, if the watertight shaft tunnel or space is flooded, “the margin line will not be submerged”. It also refers to “stern tube”, which “shall be enclosed in a watertight compartment, the volume of which shall be the smallest compatible with the proper design of the ship”. It is noted, by contrast, even such general guideline is absent in reg.7(4) as regards afterpeak bulkheads.

#### (B.1.2) Frame 1/2

14. There are 2 sets of relevant requirements in this regard:-

- (1) The floodable length and damage stability requirements, on the basis of “one compartment flooding” (para.11(3)-(4) above) – they

are determined by whether the margin line is immersed and whether  $GMT \geq 0.05$  metre, and if those requirements are not met the vessel would not be approved by Mardep.

- (2) The need to have watertight closing on an access opening in a watertight bulkhead (para.11(2) above) – this depends on whether the bulkhead in question is a watertight one, which may be affected by the answers to the requirements in (1) above.

15. From Mardep's point of view:-

- (1) Either the floodable length or damage stability requirements must be met<sup>23</sup>; and
- (2) Whether a door needs to be fitted to the access hole on Frame 1/2 depends on whether the bulkhead at Frame 1/2 is a watertight one, which in turn may depend on the floodable length or damage stability calculations – if a bulkhead has to be watertight for e.g. floodable length reasons then it must be made watertight, but if a bulkhead is to be disregarded for the same reasons (applying 0.1L) then it needs not be watertight.

(B.1.2.1) Damage stability calculations

16. It is submitted that:-

- (1) Because of the 0.1L requirement, the bulkhead at Frame 1/2 should be disregarded and therefore it does not matter whether it is

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<sup>23</sup> CK Wong 1<sup>st</sup> §26 [**Marine 11/39/2875**]

watertight, and the tank room and steering gear compartment should have been considered as one for the purpose of damage stability calculations;

- (2) In the Damage Stability Calculations submitted by Cheoy Lee in 1996, 1998 and 2005, the tank room and steering gear compartment were treated as separate watertight compartments;
- (3) If the tank room and steering gear compartment had been considered as one<sup>24</sup>:-
  - (a) In 1996, Lamma IV would still have met the margin line and GMT requirements;
  - (b) In 1998 (addition of 8.25t ballast), Lamma IV would have met the GMT requirement, though the margin line would have been slightly immersed in departure (full load) condition and actual load (on 1 October 2012) condition;
  - (c) In 2005 (raising of 8.25t ballast), she would also have met the GMT requirement, but again the margin line would have been slightly immersed in departure (full load) condition and actual load (on 1 October 2012) condition.

17. It is accepted by Cheung Fook Chor, who carried out the stability calculations on behalf of Cheoy Lee, that:-

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<sup>24</sup> Dr. Peter Cheng [Expert 2/708]; Dr. Armstrong [Expert 2/928/§12; Transcript 28/1 Feb/15:3-15]

- (1) He was aware of the 0.1L requirement for the purpose of damage stability calculations;<sup>25</sup>
- (2) He performed the calculation premised on Frame 1/2 as watertight, as he only saw the “General Arrangement”, “Profile and Deck” and “Lines Plan” drawings and did not see (because he was not shown) the “Sections and Bulkheads” drawing;<sup>26</sup>
- (3) He was also not aware of Naval Consult’s Preliminary Trim & Stability Booklet,<sup>27</sup> which considered the tank room and the steering gear compartment as one;<sup>28</sup>
- (4) Nor did it occur to him to inspect Lamma IV before he performed the calculations;<sup>29</sup>
- (5) He was negligent in failing to spot and forgetting to apply the 0.1L rule, since it should have been obvious to him that the steering gear compartment of Lamma IV was short and should therefore have been considered together with the tank room;<sup>30</sup> and
- (6) His omission was carried over to the 1998 stability calculations, also undertaken by him, as he simply adopted the 1996 figures and added the additional weight of the ballast without re-doing the calculations.<sup>31</sup>

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<sup>25</sup> [Transcript 41/27 Feb/51:9-14; 52:8-14]

<sup>26</sup> [Transcript 41/27 Feb/67:7-13; 70:6-18; 74:9-13; 107:7-25]

<sup>27</sup> [Misc/22/111-179]

<sup>28</sup> [Transcript 41/27 Feb/113:19-24]

<sup>29</sup> [Transcript 41/27 Feb/117:8-22]

<sup>30</sup> [Transcript 41/27Feb/77:15-18; 78:15-16; 81:6-20]

<sup>31</sup> [Transcript 41/27Feb/96:13-15; 98:17-19]

18. The 2005 stability calculations were performed by Kwok Hing Yin of Cheoy Lee. His evidence was that he was not aware of the 0.1L requirement for the purpose of damage stability calculations.<sup>32</sup> If he had followed his usual procedure and asked his colleague (Cheung Fook-chor) whether or not the access opening was watertight, and if the answer was that it was watertight, then he would not need to go further to check anything else.<sup>33</sup> Further, although his general practice was that he would consult plans like “General Arrangement”, “Lines Plan” and “Profile and Deck” drawings, he did not have an accurate recollection that he in fact consulted those drawings to ascertain whether or not the access opening was watertight or not.<sup>34</sup> However, assuming he had seen them at the time, he would have concluded from such drawings that the bulkhead at Frame 1/2 should be watertight.<sup>35</sup>
19. There can be no dispute that the ship inspectors and ship surveyors did carry out vetting of the stability calculations of Lamma IV, see the markings on the work sheet attached to the 1996 stability booklets,<sup>36</sup> the evidence of ship surveyor in 1998 that he requested the ship inspector to carry out the calculations using Mardep’s stability calculation programme;<sup>37</sup> and the ship inspector’s identification of discrepancy in the lightship weight and vertical centre of gravity.<sup>38</sup>
20. Nevertheless, none of them managed to spot Cheoy Lee’s failure to consider the tank room and steering gear compartment as one. It appears

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<sup>32</sup> [Transcript 44/4 Mar/35:2-4; 36:8-10]

<sup>33</sup> [Transcript 44/4 Mar/65:21-25]

<sup>34</sup> [Transcript 44/4 Mar/66:1-7]

<sup>35</sup> [Transcript 44/4 Mar/43:1-44:12; 51:15-22; 63:22-64:2]

<sup>36</sup> [Marine 2/58/322-336; 59/338-344] Ho Kai Tak §12(2)-(3) [Marine 11/50/4012]

<sup>37</sup> Choi Chi Chuen §12 [Marine 11/46/3989-3990] [Transcript 18/18 Jan/17:18-25]; Mak Yat Wai §§13-14 [Marine 11/53/4032] [Transcript 21/23 Jan/78:20-22]

<sup>38</sup> Chau To Yui §14 [Marine 11/49/4006-4007] [Transcript 22/24 Jan/22:21-23:2]

that this was due to the 1996 inspector's lack of familiarity with the 0.1L requirement,<sup>39</sup> which was not identified at the time when Mardep was thinly stretched and under a lot of stress due to the tremendous workload.<sup>40</sup> That was then carried over to the subsequent vetting exercises since the latter inspectors and surveyors proceeded on the premises that the previous exercise was correctly performed and there should be 6 watertight compartments.<sup>41</sup>

21. The relevant question is what follows from this.

### 1996

(1) If the error had been identified in 1996, it is clear that Mardep would still have approved the plans for Lamma IV because the steering gear compartment was less than 0.1L in length.<sup>42</sup> Further, Mardep would also have approved the vessel since the expert evidence shows that Lamma IV would still have satisfied the margin line and GMT requirements.<sup>43</sup>

### 1998

(2) On the true calculations in 1998, Lamma IV would still have satisfied the GMT requirement, though the margin line would have been immersed by 0.115 i.e. 39mm (=115-76) above deck.<sup>44</sup>

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<sup>39</sup> Ho Kai Tak §12(5) [**Marine 11/50/4012**] [**Transcript 20/22 Jan/83:6-84:7**]

<sup>40</sup> WC Wong 1<sup>st</sup> §35 [**Marine 11/40/3937-3938**]; Dr. Armstrong [**Transcript 46/6 Mar/88:5-89:9**]

<sup>41</sup> Mak Yat Wai [**Transcript 21/23 Jan/79:24-80:2; 84:23-25; 90:16-18**] Chau To Yui §14 [**Marine 11/49/4006**]

<sup>42</sup> CK Wong 1<sup>st</sup> §48 [**Marine 11/39/3880**]

<sup>43</sup> Dr. Peter Cheng [**Expert 2/708**]; Dr. Armstrong [**Expert 2/928/§12; Transcript 28/1 Feb/15:3-15**]; CK Wong 1<sup>st</sup> §57 [**Marine 11/39/3882**]

<sup>44</sup> Dr. Armstrong [**Expert 2/928/§12**]

- (3) Three points arise from this:-
- (a) There would be no question of Lamma IV foundering, since the GMT still exceeded the prescribed value;
  - (b) Although the margin line would have been immersed, the water level would still be below the openings above deck (e.g. air pipes) and there would not be further flooding of the compartment under the main deck leading to parallel sinking;<sup>45</sup> and
  - (c) As Dr. Armstrong accepted, if the problem had been identified then, the ballast could have been reduced or moved forward or buoyancy boxes could have been installed, which would then reduce the immersion of the margin line.<sup>46</sup>
- (4) In other words:-
- (a) The failure to carry out and to approve the correct calculations in 1998 were not causative of the sinking of Lamma IV, for the reasons in (3)(a)-(b) above; and
  - (b) Provided that the necessary adjustment to the positioning of the ballast be made, Lamma IV would have been able to satisfy the margin line requirement.

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<sup>45</sup> Dr. Peter Cheng [**Expert 2/709 §(2)**] Dr. Armstrong also accepted there was no necessary correlation between submerging the margin line and sinking [**Transcript 24/28 Jan/130:22-25**]

<sup>46</sup> [**Transcript 27/31 Jan/57:18-58:10; 28/1 Feb/102:5-103:19**]

2005

- (5) Similar conclusions as in the 1998 scenario should follow, given (a) Lamma IV would have satisfied the GMT requirement; (b) the water line would not have reached the deck at all; and (c) there was no addition of ballast and any margin line concern could have been removed by a change in the ballast location.
22. In the premises, it is submitted that the omission or error in relation to the damage stability calculations was not causative of the sinking of Lamma IV.

(B.1.2.2) Whether the bulkhead at Frame 1/2 should be watertight

23. There are conflicting views as to whether the bulkhead at Frame 1/2 was supposed to be watertight.
24. The evidence of both the designer (Naval-Consult) and the builder (Cheoy Lee) is that the bulkhead at Frame 1/2 was not intended to be watertight and there was not supposed to be any watertight door on the access hole:-
- (1) John Lim of Naval-Consult confirmed that the bulkhead at Frame 1/2 was not intended to be watertight because of the one compartment flooding requirement.<sup>47</sup> This is consistent with the Preliminary Trim and Stability Booklet prepared by Naval-Consult which shows the tank room and steering gear compartment being

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<sup>47</sup> [Transcript 19/21 Jan/125:2-11]



treated as one.<sup>48</sup> He believed the Naval-Consult draftsman made a mistake in the Lamma IV drawings when adopting the drawings of the “Eastern District No.1”.<sup>49</sup> This is consistent with the differences shown on comparing the “Sections and Bulkheads” drawings of Eastern District No.1 (NC-227-5)<sup>50</sup> and Lamma IV.<sup>51</sup> Further, Dr Armstrong himself accepted that, insofar as the damage stability calculation under the “Steering & Tank Room Damage” condition was concerned, and the requirement was for one compartment flooding, the designer might well have in mind that the steering gear compartment and tank room should be considered as one compartment.<sup>52</sup>

- (2) Ken Lo of Cheoy Lee also confirmed that there was a mistake in failing to remove the reference “WT BHD” from the plans, since both John Lim and he were aware of and discussed the requirements of 0.1L and “one compartment flooding” for Lamma IV, and it was on that basis that they decided to put an access opening instead of a watertight door at Frame 1/2.<sup>53</sup> As he explained, the cost of installing a watertight door on Frame 1/2 would have been negligible (a few thousand dollars),<sup>54</sup> so there would have been no reason not to install if that had been the intention of the designer and the builder.

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<sup>48</sup> [Misc/22/111, 141]

<sup>49</sup> [Marine 11/52/4027 Q2]; [Transcript 19/21 Jan/152:7-154:23]

<sup>50</sup> [Marine 2/4/198]

<sup>51</sup> [Marine 2/3/109; 5/205]

<sup>52</sup> [Transcript 28/1 Feb/16:22-17:8]

<sup>53</sup> [Transcript 18/18 Jan/100:23-101:18; 106:9-107:20; 114:16-20; 115:2-6]

<sup>54</sup> [Transcript 18/18 Jan/120:21-22; 19/21 Jan/85:23-86:9]

25. Unsurprisingly, those not involved in the design and construction and only had sight of the approved drawings took the view that the bulkhead at Frame 1/2 should be watertight, see the evidence of CK Wong,<sup>55</sup> Fung Wai Man,<sup>56</sup> Cheung Fook Chor,<sup>57</sup> Kwok Hing Yin<sup>58</sup> and Dr. Armstrong.
26. However, the plans “as fitted” reveal areas of “conflict”, as identified by Dr. Armstrong, namely, the “Docking Plan (as fitted)” shows an opening at Frame 1/2 in the underdeck drawing;<sup>59</sup> the plan showing “Hydraulic steering gear piping system (as fitted)” likewise reveals that an opening in the profile drawing.<sup>60</sup> If that opening was meant to have a door, Dr. Armstrong would have expected the drawings to show an arc with a line on it, indicating an open door.<sup>61</sup> As in other drawings, the bulkhead is said to be “watertight bulkhead”, he found them to be “a little confusing”.<sup>62</sup>
27. It is submitted that:-
- (1) In the fact-finding exercise, the Commission should have regard to the testimony of those who have personal knowledge of the matter, and test the credibility of that testimony against the contemporaneous documents and inherent probabilities.
  - (2) In this case, the parties with personal and first-hand knowledge of the design intention (Naval-Consult and Cheoy Lee) both

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<sup>55</sup> [Transcript 17/17 Jan/17:10-18:11]

<sup>56</sup> [Transcript 17/17 Jan/112:20-113:12]

<sup>57</sup> [Transcript 19/21 Jan/29:16-30:3; 34:5-35:10]

<sup>58</sup> [Transcript 44/4 Mar/43:1-44:12;51:15-22; 63:22-64:2]

<sup>59</sup> [Transcript 47/7 Mar/165:17-25]

<sup>60</sup> [Transcript 47/7 Mar/166:5-12]

<sup>61</sup> [Transcript 47/7 Mar/167:10-15]

<sup>62</sup> [Transcript 47/7 Mar/182:8-10]

confirmed that the bulkhead at Frame 1/2 was not intended to be watertight. That evidence is consistent with the contemporaneous documentary evidence, namely (i) the Preliminary Trim & Stability Booklet, which shows that the tank room and the steering gear compartment were considered as one; and (ii) the contrast with the “Sections and Bulkheads” drawing of “Eastern District No.1”. If it was intended that there should be a watertight door, there was no incentive for Cheoy Lee not to build one, as the cost of such installation would have been negligible.

- (3) Whilst it is true that those who only had sight of the approved drawings took the view that the plans as a whole showed that the bulkhead was watertight, yet the plans “as fitted” clearly contained conflicting indications, making the picture a confusing one.
- (4) The preponderance of evidence, however, shows that the bulkhead at Frame 1/2 was not intended to be watertight.

28. The above does not answer the question as to why, with the approved plans as a whole showing that the bulkhead at Frame 1/2 was watertight, there was no record of inspection to reveal that the bulkhead was in fact not watertight. There appears, therefore, to have been a disconnect (as noted by Dr. Armstrong) between the plan-approval and the survey processes. However, insofar as the approved plans had failed to reflect the true intention of the designer or shipbuilder, they should have taken the initiative to disclose such intention to Mardep, for example, by submitting drawings which amend the approved plans to reflect the absence of a watertight appliance at Frame 1/2.

29. These are matters particularly relevant to Parts (b) and (c) of the Terms of Reference.

(B.1.3) Aft peak bulkhead

30. It is submitted that:-

- (1) It is common ground that nothing in the Blue Book or the 1995 Instructions, or in any international standards that Dr. Armstrong was aware of, required that the aft bulkhead being located at any prescribed distance.
- (2) In the case of Lamma IV, there is a watertight bulkhead at the aft of the vessel i.e. the bulkhead between the engine room and the tank room. The builder (Cheoy Lee)<sup>63</sup> and the Mardep surveyor (CK Wong)<sup>64</sup> both confirmed that should be regarded as the aft peak bulkhead.
- (3) Although Dr. Armstrong suggested at one point that the aft peak bulkhead should not be further away than 0.1L from the stern, he has since confirmed that it was based on his experience in relation to multihull craft (in particular catamarans).<sup>65</sup> It was thus a feature he observed from a different class of vessels altogether.
- (4) Dr. Armstrong offered a number of reasons as to why the aft peak bulkhead should be closer to the stern (but not by reference to any

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<sup>63</sup> [Transcript 19/21 Jan/98:22-99:3; 110:4-20]

<sup>64</sup> [Marine 11/3926-9/§§4-5]

<sup>65</sup> [Expert 3/1622/§7; Transcript 46/6 Mar/69:15-17]

specific distance or percentage), namely (a) to contain and prevent the spillage of floodwater from the areas which house the propeller shaft and/or the rudders to other parts of the hull;<sup>66</sup> (b) to ensure the floodable length requirement is complied with (that margin line would not be immersed);<sup>67</sup> and (c) to provide buoyancy at the aft.<sup>68</sup>

- (5) It is submitted that these reasons only go to highlight and support the conclusion that there is no requirement for, and indeed it may not even be advisable to prescribe, the aft peak bulkhead be located at any specific distance from the stern. Each vessel would have its own design features – the propeller shafts and the rudders may be close together or may be further apart, and their watertight features may also differ. Those factors may well affect the location of the aft peak bulkhead,<sup>69</sup> but they are not the only factors at play. The vessel would still have to satisfy the floodable length and damage stability requirements. They too have an impact on the location of watertight bulkheads (including the aft bulkhead). Given the considerations and calculations for each vessel are different, it makes little sense to prescribe any specific distance or even range of distances for the aft peak bulkhead. On the contrary, the requirement stated in the Blue Book, the 1995 Instructions, the 1984 Regulations and SOLAS – namely making the requirement a general one without any reference to numerical or percentages – makes perfect sense. It serves the general purpose suggested by Dr. Armstrong of ensuring there is some buoyancy at the aft, but one must not lose sight of the fact that the vessel must separately

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<sup>66</sup> [Transcript 28/1 Feb/18:19-19:10; 71:17-22; 72:9-11]

<sup>67</sup> [Transcript 28/1 Feb/20:10-13]

<sup>68</sup> [Transcript 26/30Jan/7:8-21; 28/1 Feb/91:9-17; 146:14-21]

<sup>69</sup> Accepted by Dr. Armstrong [Transcript 28/1 Feb/94:22-95:1]

satisfy the floodable length and damage stability requirements, and those requirements (a) dictate where the watertight bulkheads should be and (b) in a vessel that has longer length, would ensure that there is a watertight bulkhead towards the aft.

(6) Nothing in the materials suggests, and indeed for the reasons set out above it would be counter-intuitive to suggest, that it is a separate and additional buoyancy requirement over and above the floodable length and damage stability.<sup>70</sup>

(7) It is significant that, in contemplating what recommendation he might wish to make in this regard, Dr. Armstrong would not be wanting to state numbers; nor to stipulate a distance or location; but simply to provide that the aft peak bulkhead is in the after part of the vessel, with a volume behind it of moderate capacity or minimum capacity or something like that, giving sufficient flexibility to the authority.<sup>71</sup>

31. Having regard to the above, it is submitted that the requirement to have a watertight aft bulkhead contemplated by reg.12(iv) of the Blue Book has been met.

#### (B.1.4) Conclusion on Frame 1/2

32. In light of the above:-

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<sup>70</sup> [Transcript 28/1 Feb/146:17-21]

<sup>71</sup> [Transcript 48/8 Mar/23:1-24:20]

- (1) From Mardep's point of view, Lamma IV would have met the applicable guidelines and be approved if it could satisfy the margin line and GMT requirements. On the correct calculations, those requirements would have been met in 1996, and with some adjustment to the positioning of the ballast could likewise be met in 1998 and 2005;
- (2) In any event, notwithstanding the apparent failure to meet the margin line requirement in 1998 and 2005, Lamma IV would have remained afloat on Mardep's prescribed standards since the GMT requirement has been satisfied at all times;
- (3) Lamma IV sank because the collision caused 2 compartments to be breached – an eventuality that was beyond the contemplation and standard of “one compartment flooding” applied by Mardep, which standard is commonly applied internationally;
- (4) Dr. Armstrong's opinion was that in the 2005 scenario, Lamma IV would have sunk in any event whether or not Frame 1/2 was watertight, though if Frame 1/2 had been watertight, there might be a time lag in that she might not have sunk immediately;<sup>72</sup>
- (5) Frame 1/2 was not intended to be a watertight bulkhead. Nor was there any requirement or standard mandating it to be watertight.

**(B.2) Hull thickness**

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<sup>72</sup> Dr. Armstrong 3rd Supp Report §3 [Expert 3/1621; Transcript 28/1 Feb/101:18-102:4; 46/6 Mar/64:1-65:14]

33. The only relevant issue is the thickness of the side plates and it arose in this way. In Armstrong's 1<sup>st</sup> Report, it was noted that the "Midship Section" plan (NC-391-3) approved on 17 May 1995<sup>73</sup> shows the side plates should have a thickness of 5mm, whereas the shell plating gauging carried out in June 2005<sup>74</sup> showed a thickness of 4.5mm only and that in 2011<sup>75</sup> showed a range from 4.3mm to 4.5mm. On the basis of this perceived 0.5mm difference over a period of some 10 years, Dr. Armstrong inferred that the side plating of Lamma IV as built was non-compliant. He then commented that thinner plating size might have contributed to the extent of the damage that was experienced, as plating of a greater thickness would have reduced the damaged hole size, which in turn might have provided marginally more time for escape before Lamma IV sank.<sup>76</sup> But there is no evidence as to the duration for the assessment of whether there would have been any difference in fact.
34. However, given the documentary evidence emerged in the course of the inquiry, it is now clear, and Dr. Armstrong has accepted as much, that the thickness of the side plates is a non-issue for 4 reasons.
35. First, regardless of whether the Blue Book or the 1995 Instructions applied to the construction of Lamma IV, Dr. Armstrong accepted that (a) neither instructions contained any requirement as to the thickness of aluminium side plates;<sup>77</sup> and (b) side plates of 5mm thickness would have been acceptable (i) if one were to apply the requirements for steel plates

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<sup>73</sup> [Marine 2/5/203]

<sup>74</sup> [Marine 4/137/654-655]

<sup>75</sup> [Police P/4870-4871]

<sup>76</sup> Armstrong 1<sup>st</sup> §25 [Expert 1/410-411]

<sup>77</sup> [Transcript 27/31 Jan/113:18-114:5; 127:4-129:1]



in the 1995 Instructions by converting that to aluminium<sup>78</sup> or (ii) if one were to adopt the Lloyd's Register Rules in the Blue Book regime whereunder the minimum thickness would be 4mm.<sup>79</sup>

36. Secondly, the documentary evidence clearly shows that Cheoy Lee never purchased 4.5mm plates for Lamma IV; it placed orders for 5mm 5083-H116 aluminium plates<sup>80</sup> and the goods delivered were of a thickness of 4.83mm (see 4 April 1995 letter referring to “due to material availability”).<sup>81</sup> Those plates were then provided to Wuzhou Shipyard on 20 April 1995.<sup>82</sup> The plates came with certificates issued by the ABS certifying their quality, both of which were inspected and accepted by CCS.<sup>83</sup> Dr. Armstrong also accepted that given these documents, the likelihood was that the side plates delivered were 4.83mm thick.<sup>84</sup>
37. Thirdly, the difference (5mm v. 4.83mm) was within the range of permissible tolerance accepted by the recognized classification societies,<sup>85</sup> so there was no question of Cheoy Lee failing to build in accordance with the approved plans or Mardep failing to spot any non-compliance. Dr. Armstrong also agreed that an under-thickness of less than 0.2mm would be in line and consistent with industry practice and be regarded as acceptable, having regard to the inherent difficulty in the manufacturing process.<sup>86</sup> He therefore accepted that, even if the 1995

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<sup>78</sup> [Transcript 27/Jan 31/129:14-130:2; Expert 2/956-12]

<sup>79</sup> [Transcript 28/1 Feb/7:6-19; 9:13-14; Marine 11/60-61/4067-4068]

<sup>80</sup> [W&G/17]

<sup>81</sup> [Marine 2/6/206]

<sup>82</sup> [W&G/25]

<sup>83</sup> [Marine 2/31/265]

<sup>84</sup> [Transcript 27/31 Jan/:75:9-19; 46/6 Mar/93:15-25]

<sup>85</sup> [Marine 11/56/4050; W&G/29, 40-51, 40-53, 40-57]

<sup>86</sup> [Transcript 25/29 Jan/48:5-13; 27/31Jan/64:2-22; 69:6-14; 72:3-5]

Instructions were to apply to Lamma IV, the use of side plates of 4.83mm would not involve any non-compliance with those instructions.<sup>87</sup>

38. Fourthly, Dr. Armstrong also accepted that if the side plates as installed were 4.83mm thick (which he accepted to be the likely scenario), the reduction in thickness from 4.83mm to 4.5mm/4.6mm (given the margin of error of  $\pm 0.1$ mm in measurement)<sup>88</sup> over a period of 9 years, and thereafter to 4.4mm/4.5mm over a further period of 5 years, was a plausible scenario and would not be regarded as exceptional, given the corrosion of the material in the specific context of Hong Kong with high temperatures, high humidity and atmospheric pollution.<sup>89</sup>
39. Accordingly, it is respectfully submitted that the thickness of the side plates is not a relevant cause for the sinking of Lamma IV.

### **(B.3) Passenger seats**

40. On Lamma IV, the seats on the upper deck, most of which appeared to be affixed to the fiberglass deck by self-tapping screws, came off when Lamma IV began to move into a vertical position with her stern in water<sup>90</sup> (reaching eventually an angle of 70° according to Dr. Armstrong) after the collision. The rescuers' evidence was to the effect that some of the bodies recovered from the submerged part of the upper deck were trapped inside the collapsed seats.<sup>91</sup>

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<sup>87</sup> [Transcript 27/31 Jan/130:14-131:1]

<sup>88</sup> [Transcript 27/31 Jan/82:13-15, 23-25]

<sup>89</sup> [Transcript 27/31 Jan/77:23-78:14, 83:1-90:18]

<sup>90</sup> Chan Kin Yan [Transcript 3/14 Dec/124:21-125:1]; Wong Tai Wah [Transcript 3/14 Dec/138:7-18; 143:6-8; 148:7-12]

<sup>91</sup> [Fire 3/2a/659; 662-7]

41. Two issues arise from this:-

- (1) What was the cause of the collapse of the seats; and
- (2) Whether the seats on Lamma IV complied with the requirements of Mardep.

42. It is submitted that:-

- (1) The expert evidence shows that the seats on the upper deck of Lamma IV would not become dislodged when the vessel was operating in a seaway. It was in the exceptional and unfortunate circumstances where Lamma IV had excessive stern trim and the passengers weight on the seats generated an “abnormal tipping force” beyond the tolerance of the design that the foundations of the seats failed;
- (2) Mardep’s requirement was that the seats should be properly secured for the purpose of normal operation of the vessel, which was a reasonable and sensible requirement; and
- (3) The seats on the upper deck of Lamma IV satisfied that requirement.

43. The experts, Dr. Cheng Yuk Ki and Dr. Armstrong, both agreed that the seats became dislodged as a result of the combined force of gravity when Lamma IV became vertical and the passenger weight on the seats.

(1) Dr. Cheng Yuk Ki's tests demonstrate that when Lamma IV was in a horizontal (normal) position, the seats would not dislodge since the force applied by the body weight of the passenger would be pushing downwards and there would be no resulting force on the back of the seats causing them to dislodge. However when Lamma IV was in a vertical position, force would be applied to the back of the seats, and in that case it would take no more than 115kg to dislodge them. He opined that 2 adults holding on to a row of seats would be sufficient to dislodge the seats in these circumstances. That could not be achieved when the vessel was in its normal, horizontal position unless something extreme was done to the seats.<sup>92</sup>

(2) Dr. Armstrong likewise opined that this was Lamma IV having assumed a severe stern trim that caused the seats to dislodge, and he accepted that this was an "abnormal condition".<sup>93</sup>

44. Mardep's requirement was that the seats should be properly secured. In this regard there is no material difference in the Blue Book and the 1995 Instructions, see Blue Book reg.26<sup>94</sup> and 1995 Instructions reg.4.1.<sup>95</sup> That was also the requirement applied in the case of Lamma IV, see comment #9 on the "General Arrangement" plan.<sup>96</sup>

45. It is common ground that this requirement was premised on the normal, day-to-day operation of vessels. Such premise was a perfectly reasonable

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<sup>92</sup> [Expert 1/374/§3.10.3; 377/§5.6; Transcript 23/25 Jan/61:8-62:18; 167:1-168:19]

<sup>93</sup> [Expert 1/417/§42; 419/§48; Transcript 27/31 Jan/135:20-136:5]

<sup>94</sup> [Marine 8/1/1773]

<sup>95</sup> [Marine 8/2/1835]

<sup>96</sup> [Marine 2/1/172]

premise to adopt from a regulator's point of view. Regulatory requirements, which are intended to be applied generally, are not normally formulated by reference to abnormal conditions or exceptional circumstances which are out of the ordinary, though those events may provide an impetus or occasion for the regulator to review the sufficiency of his requirements.

46. It is submitted that Mardep's requirement had been complied with in the case of Lamma IV.

(1) Dr. Cheng Yuk Ki's evidence was that, even taking into account his observations on the fiberglass and the screws used to secure the seats, in normal operation the seats would not be dislodged unless something extreme had been done which caused weight to be concentrated on the back of the seats generating resulting force of no less than 115kg.<sup>97</sup>

(2) Dr. Armstrong accepted that the seats as secured would be able to sustain the force generated by the collision (estimated to be 0.24g). He also accepted that they would be able to withstand the force generated by Lamma IV operating in a 1.2m high beam sea.<sup>98</sup>

(3) Further, Dr. Armstrong accepted that in the normal operating condition, the seats would not become detached.<sup>99</sup>

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<sup>97</sup> [Transcript 23/25 Jan/167:1-168:20]

<sup>98</sup> [Transcript 27/31 Jan/133:3-135:19]. This is consistent with the evidence of Ken Lo of Cheoy Lee [Transcript 18/18 Jan/126:5-11]

<sup>99</sup> [Transcript 27/31 Jan/136:6-137:9]

(4) He also accepted that the special requirements concerning seats in the High Speed Craft code (as modified in the 2006 Code of Practice)<sup>100</sup> do not apply to conventional ferries (which he clearly meant to include launches like Lamma IV) since they were designed to address the problems arising from collision at high speed.<sup>101</sup>

47. Dr. Armstrong nevertheless took the view that the seats were “inadequate” because they were liable to become detached over a period of time.<sup>102</sup> It is respectfully submitted that this goes beyond what is required, and loses sight of the fact that the seats are a regular maintenance item<sup>103</sup> and are checked annually in the final survey.<sup>104</sup> In that way, any loosening in the attachments would be detected and remedied and the seats would remain firmly secured.

#### **(B.4) Life saving appliances**

48. There were 4 types of life-saving appliances on board Lamma IV – lifejackets, lifebuoys, 2 lifelines and a liferaft. There is no issue concerning the lifebuoys, lifelines or liferaft.

49. In relation to lifejackets, a distinction needs to be drawn between (a) what were on board Lamma IV on 1 October 2012 and (b) what had been made available to Mardep, as the regulatory authority, during the annual survey

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<sup>100</sup> [Marine 11/29/3415-3669]

<sup>101</sup> [Transcript 27/31 Jan/138:11-23]

<sup>102</sup> [Transcript 27/31 Jan/155:6-10, 15-23; 156:24-157:2; 158:9-21]

<sup>103</sup> [Transcript 18/18 Jan/121:19]

<sup>104</sup> [Transcript 20/22 Jan/59:6-12]

of Lamma IV, the latest of which took place on 8 May 2012.<sup>105</sup> The evidence available suggests that there is a discrepancy between the two.

50. First, on the lifejackets on board Lamma IV on 1 October 2012:-

- (1) According to the coxswain,<sup>106</sup> there should be (a) one lifejacket underneath each seat in the main deck and upper deck cabins (63 + 147 = 210), which appears to be supported by the photographic evidence,<sup>107</sup>; (b) 33-35 in the lockers in the crew space under deck, which appears to be inconsistent with the photographic evidence showing only 15;<sup>108</sup> and (c) one lifejacket in the wheelhouse.
- (2) The evidence thus shows 226 adult<sup>109</sup> lifejackets on board on 1 October 2012. The number of persons on board that evening was 124 plus crew (3).
- (3) The evidence given by the passengers on board Lamma IV was that:-
  - (a) Those passengers who were inside the main deck and upper deck cabins at the time of collision were able to obtain lifejackets from underneath the seats;<sup>110</sup>

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<sup>105</sup> [Marine 4/163/822]

<sup>106</sup> [RSRB 3/1569-1571/§26]

<sup>107</sup> [Photo/319-324]

<sup>108</sup> [Marine 12/4906-4911]. Though the deckhand, Leung Tai Yau, stated that each of the lockers shown in the photographs could store 10 life jackets and 4 of those lockers had been used for that purpose [Transcript 38/22 Feb/5:10-6:4]

<sup>109</sup> The photographic and testimonial evidence only shows the presence of adult life jackets on board on 1 October 2012

<sup>110</sup> Wong Tai Wah [Police A2/352-3-352-4/§6; Transcript 3/14Dec/150:23-25]; Lau Kam Por [Police A2/364-12]; Lo Lai Ngan [Police A2/377-11]; Lee Ming Sun [Police A1/318-3-318-4/§4]; Lau Hau Yin [Police A1/45-7/§6]; Fong Hang Keung [Police A1/76-4/§7]

- (b) Passengers on the open deck portion of the upper deck also managed to enter the upper deck cabin and obtain lifejackets therefrom;<sup>111</sup>
- (c) There was no suggestion as to any difficulty in retrieving or donning the lifejackets. Some of the passengers did not manage to put on lifejackets because within a very short time<sup>112</sup> the vessel began to tilt stern down, water started gushing in and the situation became chaotic.<sup>113</sup> In other words it was due to the shortness of time before Lamma IV began to sink that they were not able to put on the life jackets; and
- (d) Nor was there any suggestion that the children on board had difficulty putting on or fitting into the adult life jackets.<sup>114</sup>

51. The evidence thus indicates that the lifejackets available on board on 1 October 2012 (a) were sufficient to cater for the actual number of persons on board; (b) the majority of which were located in positions which were readily identified and accessible to the passengers;<sup>115</sup> (c) were able to be used by children and adults alike; and (d) the inability of some of the passengers to don lifejackets was due to the shortness of time available

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<sup>111</sup> Lui Chi Kin [**Police A1/56-2-56-3/§7**]; Chan Kam Ho [**Police A2/492-3/§5**]; Chan Wing Hang [**Police A1/202-6/§4**]

<sup>112</sup> See IMO standard that an adult lifejacket be donned within one minute without assistance [**Expert 3/1742-7**]

<sup>113</sup> Wong Tai Wah [**Police A2/352-3-352-4/§6; Transcript 3/14 Dec/150:23-25**]; Lau Kam Bor [**Police A2/364-12**]; Lau Hau Yin [**Police A1/45-7/§6**]; Kwok Yin Tang [**Police A1/103-3/§10**]

<sup>114</sup> Lee Ming Sun [**Police A1/318-3-318-4/§4**]; Lau Hau Yin [**Police A1/45-7/§6**]; Fong Hang Keung [**Police A1/76-4/§7**]

<sup>115</sup> The ease of identification and donning was confirmed by Dr. Armstrong [**Expert 1/429/§69; Transcript 26/30 Jan/47:11-15**]



before Lamma IV began to sink stern down and assume a vertical position, causing items inside the cabin to dislodge and passengers losing balance and falling into the water.

52. Two specific issues concerning the quality of the lifejackets arose in the passengers' testimony:-

(1) One witness (Wong Tai Wah) said that the lifejacket he had did not have enough buoyancy.<sup>116</sup> But that was because that single life jacket was used to support the weight of 2 persons (he and his wife), which was beyond the design capacity of the life jacket (for one adult only).<sup>117</sup>

(2) Another witness (Lau Kam Bor) recounted that another passenger's lifejacket strap was caught in the seat and she had to remove the life jacket before she could free herself and struggle to the water surface.<sup>118</sup> But straps are an important feature of the life jacket as there must be some means to secure the life jacket to the body of the passenger. The buckle-type life jackets<sup>119</sup> may not allow the same to be pull tight which may result in the jacket coming off.<sup>120</sup> The life jackets were approved by the China Classification Society which in turn applied international standards.<sup>121</sup> Captain Pryke accepted that it would be difficult for Mardep, as a member of SOLAS, to reject appliances approved by classification societies as

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<sup>116</sup> [Transcript 3/14 Dec/139:22-140:3]

<sup>117</sup> [Misc/18/87]

<sup>118</sup> [Police A2/364-12]

<sup>119</sup> [Misc/18/91]

<sup>120</sup> [Transcript 26/30 Jan/50:19-51:17]

<sup>121</sup> Cf. Dr. Armstrong's comment at [Expert 1/429/§69; Transcript 26/30 Jan/46:16-23]

compliant with SOLAS standards, and the choice of appropriate appliances should really be a matter for the vessel owners.<sup>122</sup>

53. On Mardep's role in relation to the lifejackets on board Lamma IV:-

- (1) The requirements concerning life jackets on board Lamma IV when travelling anywhere within Hong Kong waters are set out in Parts 1 and 3 of Schedule 3 to Merchant Shipping (Local Vessels) (Safety and Survey) Regulation (Cap. 548G)<sup>123</sup> (“**Cap. 548G**”) and Chapter VII of the 2006 Code of Practice<sup>124</sup> promulgated thereunder. Lamma IV is required to have adult lifejackets for 100% persons on board (232) plus children lifejackets of 5% of that number (i.e. no less than 12).
- (2) Mardep enforced those requirements through (a) the annual final survey of the vessel and (b) spot checks carried out by the Local Vessels Safety Section and Harbour Patrol Section of Mardep.<sup>125</sup>
- (3) Regardless of the practice adopted in relation to other local vessels,<sup>126</sup> in the case of Lamma IV Mardep has enforced the requirements concerning life jackets in 2011 and 2012:-
  - (a) Lau Wing Tat,<sup>127</sup> the ship inspector who conducted the 2011 final survey, confirmed that he applied the Cap.548G

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<sup>122</sup> [Transcript 45/5 Mar/115:14-117:5]

<sup>123</sup> [Authorities 3/15]

<sup>124</sup> [Marine 11/29/3507-3511]

<sup>125</sup> WC Wong 3<sup>rd</sup> §§49, 49, 91 [Marine 12/71a/4176, 4189]

<sup>126</sup> WC Wong 3<sup>rd</sup> §92 [Marine 12/71a/4190]

<sup>127</sup> [Marine 12/67/4096/§13; Transcript 34/18 Feb/51:8-17; 45/5 Mar/34:19-35:4; 36:1-6; 43:11-15; 41:12-42:9]

standards (100% adult plus 5% children) to Lamma IV, and it was for that reason that he changed the notation in the certificate of survey from numbers (“92” and blank in 2010)<sup>128</sup> to asterisks denoting “one lifejacket for each person on board”.<sup>129</sup> As he explained, if he had not inspected and be satisfied that the number of adult lifejackets on board was compliant and there were children life jackets on board, it would not have been necessary for him to change the entry in the certificate of survey to asterisks and he could simply have followed the previous method of marking “92” and blank.<sup>130</sup> Indeed, he had only stated to work as an Assistant Ship Inspector in the Local Vessels Safety Section in 2009 and, at that time, Cap. 548G had already taken effect. That being the case, from the commencement of his job in the Section, he had not been briefed on the previous regime regarding life saving appliances; nor was he aware of the details of such previous regime at that time.<sup>131</sup>

- (b) Lau’s evidence is consistent with the fact that he also made conscientious changes to the lifelines on board Lamma IV. There was no entry in respect of the same in the 2010 certificate of survey and after Lau inspected them and was satisfied that they were compliant he added that entry to the certificate of survey.<sup>132</sup> This indicates that changes made by Lau to the certificate of survey were to record what he

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<sup>128</sup> [Marine 4/162/798]

<sup>129</sup> [Marine 4/163/805]

<sup>130</sup> [Transcript 34/18Feb/62:23-63:2; 63:16-17; 45/5 Mar/34:19-35:4; 37:19-39:6]

<sup>131</sup> Lau Wing-tat 2<sup>nd</sup> §4 [Marine 12/72a/4611]

<sup>132</sup> [Marine 4/163/805; Transcript 34/18 Feb/65:3-14]

observed to be different from the previous (2010) certificate of survey. The asterisks fall into the same category.

- (c) Wong Kam Ching, the senior ship inspector who conducted the 2012 final survey and issued the certificate of survey dated 8 May 2012,<sup>133</sup> confirmed that (i) the practice of Mardep officers was that they would “roll over” the entries on the certificate of survey in the previous year unless there were changes to the requirements or what they observed; (ii) he was shown and he counted both adult and children life jackets on board Lamma IV; (iii) he calculated the number of children life jackets required on his mobile phone; and (iv) since he was satisfied that the numbers were compliant, he did not change Lau’s asterisk entries in the 2012 certificate of survey.<sup>134</sup>
- (d) Lau’s and Wong’s evidence is confirmed by the evidence of Hui Sum Wai, the staff of Cheoy Lee who was present during the final survey of Lamma IV in 2010, 2011 and 2012.<sup>135</sup> Hui confirmed that he saw the ship inspectors counting the lifejackets on board, although he acknowledged that he did not witness the entire process and had no recollection as to whether he had seen children lifejackets on board.<sup>136</sup>

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<sup>133</sup> [Marine 4/164/822]

<sup>134</sup> [Transcript 34/18 Feb/25:19-21; 26:21-27:6; 60:15-31:16; 39:1-3]

<sup>135</sup> [Transcript 36/20 Feb/82:17-83:1]

<sup>136</sup> [Transcript 36/20 Feb/86:25-87:8; 88:22-89:2]

- (e) Likewise, Leung Tai Yau, the deckhand of Lamma IV, also confirmed that the ship inspectors actually inspected and counted the lifejackets during the final survey.<sup>137</sup>
- (f) Hong Kong Electric did not challenge the inspectors' evidence on the number of adult lifejackets.<sup>138</sup> However Tang Wan On (marine officer) and the crew of Lamma IV alleged that there were no and there never had been any children lifejacket on board Lamma IV.<sup>139</sup> However, Tang Wan On accepted that, at the 2011 inspection (when he was present), he did not go around the vessel to check whether there were children jackets, and there was no crew member on that occasion who told him that there were no children jackets on board.<sup>140</sup>
- (g) It is respectfully submitted that the evidence of Mardep's officers should be preferred because it is more consistent with the inherent probabilities.
- (h) On one hand there is the undisputed evidence that the ship inspectors actually counted the number of lifejackets, and the fact that the contents of the 2011 certificate of survey had been changed by Lau (and not only in relation to lifejackets but also lifelines). Clearly Lau would not have made those conscientious changes for no reason, and the

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<sup>137</sup> [Transcript 38/22 Feb/67:17-68:8]

<sup>138</sup> [Transcript 30/5 Feb/56:18-58:10]

<sup>139</sup> [Transcript 30/5 Feb/56:18-58:10; 35/19 Feb/24:1-5; 37/21Feb/24:2-6; 38/22 Feb/3:23-4:6]

<sup>140</sup> [Transcript 31/6 Feb/18:14-22]

changes must have been made because they reflected what he saw on board. Indeed according to the instruction or policy of Mardep at the time, the COS would have been issued even if there was no children lifejacket on board. There would have been no need for Lau to change the format of the COS if he had not counted the adult and children lifejackets during the inspection as reflected on the COS.

- (i) On the other hand, not only was Tang Wan On less than truthful to the Commission and to Mardep concerning the final survey (he claimed he was present as supervisor,<sup>141</sup> when in fact he was there to participate in the fire drills to make up for the fourth crew, as exposed by the coxswain Chow Chi Wai<sup>142</sup>), it is pertinent to note that the position would be worse for Hong Kong Electric if Lau and Wong's version of events is accepted, namely, that there were children life jackets at the times of the 2011 and 2012 inspections but which had somehow disappeared by the 1 October 2012 incident. Against such context, Hong Kong Electric's insistence that there were no children life jackets during the inspections was not at all an admission against its own interest.

54. Finally, it is submitted that there is no evidence that the availability or quality of lifejackets had added to the deaths on 1 October 2012.

#### **(B.5) Crew manning**

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<sup>141</sup> [Transcript 36/20 Feb/56:9-16]

<sup>142</sup> [Transcript 36/20 Feb/28:1-6; 77:14-78:12]

55. Crew-manning of 4 (as prescribed in the Certificate of Survey) would have been sufficient for Lamma IV, but an issue remains as to whether Hong Kong Electric did in fact deploy this number of crew at the time.

56. The issue arose in this way:-

- (1) As from 2 June 2008, the manning requirement for Lamma IV has been increased from 2 to 4.<sup>143</sup>
- (2) Hong Kong Electric was clearly aware of that change, and did not take up the matter with Mardep to make any complaint or seek any variation.<sup>144</sup> Tang Wan On's explanation was that he did not want to affect the relationship between Hong Kong Electric and Mardep, but as a matter of fact Hong Kong Electric did from time to time seek exemptions from Mardep on various matters.<sup>145</sup>
- (3) In the light of the increased manning requirement, Hong Kong Electric decided to adopt the strategy of treating a staff passenger on board – either an engineer or foreman from the Materials Handling Operations Section or a personnel from the Marine Section – as the fourth crew.<sup>146</sup>

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<sup>143</sup> [Marine 4/159/775]

<sup>144</sup> Tang Wan On §§11-12 [RSRB 1/7a/774-5-774-6]

<sup>145</sup> [Marine 4/151/741; Marine 4/154/746]. See also Tang's acceptance that seeking an explanation would not adversely affect the good relationship with Mardep [Transcript 30/5 Feb/31:6-9]

<sup>146</sup> Tang Wan On §§14-15 [RSRB 1/7a/774-6]

(4) At the annual final survey, Hong Kong Electric then assigned Tang Wan On to act as the fourth crew in the fire drill to make up the numbers.<sup>147</sup>

(5) On 1 October 2012, there is serious doubt as to whether there was any fourth crew present on Lamma IV. Following the strategy in (3) above, the event organizer of Hong Kong Electric was “treated” as the fourth crew.

57. There is no suggestion that a 4-crew standard was inadequate for Lamma IV. The concerns as to adequate look-out and assistance in emergency situations would have been ameliorated if the 4-crew requirement had been strictly complied with by Hong Kong Electric, so that there would be an extra crew on board fully devoted to the duties and issues of safety on board. As noted by Captain Pryke, it was Hong Kong Electric’s responsibility to ensure that the 4-crew requirement was complied with.<sup>148</sup>

**(B.6) Conclusions on Part (a) and Response to Closing Submissions of Counsel for the Commission**

58. In light of the foregoing, the Commission is invited to consider making the following findings:-

(1) The cause of the sinking of Lamma IV was the breach of the engine room and the tank room, which resulted in the flooding of

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<sup>147</sup> [Transcript 36/20 Feb/28:1-6; 77:14-78:12]. See also Hui Sum Wai’s evidence to the effect that there were 5 to 6 persons from Hong Kong Electric present at the time of the final survey [Transcript 36/20 Feb/88:4-7]

<sup>148</sup> [Transcript 45/5 Mar/97:14-18]



the engine room, the tank room and the steering gear compartment. In that scenario Lamma IV would have sunk regardless of whether the bulkhead at Frame 1/2 was watertight.

- (2) The breach of two compartments was beyond the design requirements for the vessel adopted by Mardep and in line with international practice for local craft.
- (3) Regardless of whether the bulkhead at Frame 1/2 was intended to be watertight, in order to meet the 0.1L rule, the bulkhead at Frame 1/2 should be disregarded.
- (4) In any event, the preponderance of evidence indicates that the bulkhead at Frame 1/2 was not intended to be watertight and that the plans would still have been approved and the vessel approved even on the basis that such bulkhead was not watertight.
- (5) There was an error in each of the stability calculations submitted by Cheoy Lee and considered by Mardep in 1996, 1998 and 2005, in that the tank room and the steering gear compartment were considered as 2 separate watertight compartments.
- (6) Nevertheless those errors did not result in the foundering of Lamma IV on 1 October 2012 because on the true analysis, Lamma IV (a) would have satisfied the GMT requirement at all times; and (b) would have satisfied the margin line requirement in 1996, which requirement could also be satisfied in 1998 and 2005 with some adjustment to the weight or positioning of the ballast.

- (7) There was no issue of under-thickness of the side plates, which were within the acceptable tolerance of the thickness approved in the drawings.
- (8) The collapse of the passenger seats on the upper deck cabin was due to Lamma IV having an abnormal, vertical position. The seats were otherwise adequately maintained for the purpose of normal operation of the vessel.
- (9) The number and type of life saving appliances on board Lamma IV on 1 October 2012 complied with the statutory requirements save in the case of children lifejackets.
- (10) Mardep did require and check that Lamma IV should have children lifejackets on board, but for whatever reasons, it appears that Hong Kong Electric did not have any children life jackets on board on 1 October 2012.
- (11) Mardep did impose a 4-crew requirement which was considered to be adequate for Lamma IV and did enforce that requirement through annual final survey. However, there is a serious issue as to whether Hong Kong Electric did comply with that requirement.

59. By reason of all of the above, we respectfully *disagree* with the written closing submissions by Counsel for the Commission on the following matters, namely:-

- (1) That “safe securing of seats must not only mean ‘safe’ during normal voyage but must also cater for marine casualties” and that

the manner of securing seats in the upperdeck is “inadequate”: 2<sup>nd</sup> set of Closing Submissions (on Seats) by Counsel for the Commission p.5 §12.

- (2) That, had Mardep discovered the absence of watertight door at Frame ½ in 1996, “it would refuse to certify Lamma IV” and the result would be the installation of a watertight door at Frame ½ as opposed to the amendment of the plans to make clear the absence of a watertight door: 1<sup>st</sup> set of Closing Submissions by Counsel for the Commission (“CS 1”) pp.41-42 §§79-82.
- (3) That “Mardep would have no valid justification in approving Lamma IV in 1996 (and reapproving it in 1998 and 2005)” by reason of Dr Armstrong’s view on aft peak bulkhead: CS 1 p.44 §85.
- (4) That, had the 0.1L rule been applied correctly in 1998 and 2005, Lamma IV would probably have been configured differently to address this issue but “the correct applications of the 0.1L rule would not result in any suggest of adding a watertight door at the Frame ½ bulkhead”. Arising from the above, “Mardep’s failure to insist on the Frame ½ bulkhead being watertight (so as to comply with the plans, and also to serve as a watertight aft-peak bulkhead) *did* contribute to the loss of the vessel more quickly than would otherwise have been the case”: CS 1 pp.44-45 §§86-90.

60. Finally, it is submitted that the criticism leveled against Wong Chi Kin on the basis of his comments in §56 of his Witness Statement<sup>149</sup> is un-called for since Counsel for the Commission, when questioning Mr Wong, did not in fact refer to this part of the Witness Statement; nor was Mr Wong even questioned thereon: CS 1 pp.64 §136.

**C. PARTS (B) AND (C) OF THE TERMS OF REFERENCE**

61. Mardep acknowledges that the 1 October 2012 reveals that improvement is called for in its work concerning plan approval and initial survey, stability calculations, annual final survey, periodic survey, and enforcement of standards concerning life-saving appliances.<sup>150</sup>
62. Mardep has also identified various changes to the existing system and standards which it intends to pursue (subject to funding, personnel availability and legislative approval where necessary). On plan approval, survey and stability calculations see WC Wong 3<sup>rd</sup> §§34, 37, 41, 44.<sup>151</sup> On safety improvements in particular life-saving appliances see WC Wong 3<sup>rd</sup> §§50, 52, 102, 105, 107.<sup>152</sup> On navigation equipments on vessels  $\geq 100$  see Chung §33.<sup>153</sup> On safety management system for large-scale ferries and launches see Leung §20.<sup>154</sup> On training of coxswains see Lai 1<sup>st</sup> §§20-21, 24.<sup>155</sup>

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<sup>149</sup> Wong Chi Kin [Marine 11/39/2882]

<sup>150</sup> WC Wong 3<sup>rd</sup> §§31-33, 36, 40, 43, 92, 101 [Marine 12/71a/4169, 4171, 4173-4175, 4190, 4192] [Transcript 43/1 Mar/18:17-19:6; 25:5-26:16; 27:19-28:7]

<sup>151</sup> [Marine 12/71a/4169-4170, 4172-4173, 4174-4176] [Transcript 43/1 Mar/8:10-25; 11:11-17; 17:5-18; 19:23-24:17; 78:16-81:9]

<sup>152</sup> [Marine 12/71a/4177-4172, 4192-4194, 4195]

<sup>153</sup> [Marine 12/73a/4627-4628]

<sup>154</sup> [Marine 12/75a/4666]

<sup>155</sup> [Marine 12/76a/4686-4688]

63. As to the recommendations proposed by Captain Pryke and Dr. Armstrong, Mardep's response is summarized as follows:-

- (1) Captain Pryke's recommendations<sup>156</sup> (1), (2),<sup>157</sup> (3), (5),<sup>158</sup> (6), (8), (9),<sup>159</sup> (10),<sup>160</sup> (12) and (13): Mardep is willing to consider their implementation, and some of them have already been accepted by Mardep as matters to look into and pursue.
- (2) Captain Pryke's recommendations (10) and (11): on (10) Mardep is willing to consider adjusting channel 14 boundary to cover Central to Yung Shu Wan route<sup>161</sup>, and while Mardep takes the view that for (11), specific control measures for Lamma Island approaches not justified since traffic is scare and no accident in that area before 1 October 2012 incident, it is willing to consider imposing speed limit on the fast ferries from zone B of speed limit area to the berth.
- (3) Captain Pryke's recommendation (4): Mardep concurs with Dr. Armstrong's view that it is not suitable for Hong Kong.<sup>162</sup>
- (4) Captain Pryke's recommendation (14): Mardep has great reservations as to the need for an appropriateness of such change.<sup>163</sup>

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<sup>156</sup> [Expert 3/1144-1146/§88]

<sup>157</sup> Leung §§20-21 [Marine 12/75a/4666] [Transcript 44/4 Mar/88, 89; 92:17-19]

<sup>158</sup> WC Wong 3<sup>rd</sup> §102(4) [Marine 12/71a/4193]

<sup>159</sup> WC Wong 3<sup>rd</sup> §102(9)(a) [Marine 12/71a/4194]

<sup>160</sup> Detailed implementation subject to liaison and agreement with Marpol

<sup>161</sup> NB. The only advantage to local ferries on this route is the ability to listen to VTC communication without switching channels since they are not VTC-participating

<sup>162</sup> [Transcript 47/7Mar/151:18-153:2]

(5) As for Dr. Armstrong's recommendations,<sup>164</sup> they fall into different categories which are summarized as follows:-

<b>Plan approval, inspection, alteration</b>	
A1 <sup>165</sup> , A2, B23-B27, B28-B31, B45-B50, B58, C14	Mardep agrees to implement these suggestions
A5, A20 <sup>166</sup>	Mardep is willing to consider implementing these suggestions
A6, C13	Although Mardep believes it is not necessary to have the information stated in the certificate or licence documents, it is willing to consider implementing these suggestions
A7	Mardep is willing to consider implementing this suggestion re Class I vessels $\geq$ 100
B44	Mardep is willing to consider implementing this suggestion re key as-built plans
<b>Damage stability and watertight subdivision</b>	
A14, B55, B56, C18-C20	Mardep agrees to implement these suggestions
A15	Mardep has reservations as the current calculation methods are widely adopted in the industry and the adjustment time and costs may be substantial
A16	Mardep has reservations on this suggestion. The wording of Annex F is not objectionable and similar to present Safety Code for Passenger Ships Operating Solely in UK Categorised Waters, MSN 1823 (M)
<b>Watertight bulkheads and access openings</b>	
A19, C12	Mardep agrees to implement these suggestions
<b>Hull plate</b>	
A18	Mardep agrees to implement this suggestion
<b>Passenger seats</b>	

<sup>163</sup> Cheng Yeung Ming §§9-13 [**Marine 13/89a/5099-5101**]

<sup>164</sup> [**Expert 3/1637-1673**]

<sup>165</sup> Alphabet in this column denotes Section of Expert Report from which Recommendation originates

<sup>166</sup> [**Expert 3/1655**]

A17, C15, C16	Mardep is willing to consider implementing them
<b>Life saving arrangements</b>	
A8, C7	Mardep is agreeable to amending the definition but prefers to adopt the IMO (as opposed to ISO) standards
A9, A10, B33, B34, C6, C8, C10	Mardep is willing to consider implementing these suggestions
A11 <sup>167</sup>	Mardep agrees to implement this suggestion
<b>Voyage data recorder (VDR)</b>	
A22, C17	Mardep has reservations as to the need for VDR, given the European Union does not require it for vessels operating within 20 nautical miles from coastline, and Mardep is not aware any other administration requiring its installation in local vessels. VDR may also be incompatible with the equipments on local vessels e.g. engines.
<b>Emergency electrical power</b>	
A12, A13, C11	Mardep is willing to consider implementing these suggestions
<b>Other safety arrangements</b>	
B37, B38, B41, B42, B43, B57	Mardep is willing to consider implementing these suggestions
<b>Machinery and electrical installation</b>	
B51	Mardep has reservation as to usefulness given local vessels have relatively small engine rooms which are un-manned most of the time
B52, B53	Mardep is willing to consider implementing these suggestions
B54	Mardep agrees to implement this suggestion
<b>Professional development of Mardep officers</b>	
A21 <sup>168</sup>	Mardep agrees to implement this suggestion <sup>169</sup>
<b>Miscellaneous</b>	
B35	Mardep has reservation since this may not be practicable, given the small size of local vessels and

<sup>167</sup> [Transcript 46/6 Mar/126:19-22]

<sup>168</sup> [Expert 3/1656]

<sup>169</sup> WC Wong 3<sup>rd</sup> §§59, 66, 67 [Marine12/71a/4180,4182-4183]

	the relatively high level of noise generated by their engines and high background noise in harbour
B36, B39, B40, B59	Mardep is willing to consider implementing these suggestions
C2	Mardep agrees to implement this suggestion

#### **D. CONCLUSION**

64. The occurrence of the collision incident last year is extremely regrettable; even more so were the losses of many lives caused by it. As a result of this Inquiry, there have been revealed a number of areas of weaknesses in the work processes within Mardep, which will benefit from the recommendations to be made by this Commission. In the area of plan approval, there is clearly a need for the approved plans to reflect the true intention of the submitting party and a mandatory procedure for the amendment of these plans to ensure that this is achieved. In the area of survey, the shortcomings and proposed improvements were identified in the 2<sup>nd</sup> Supplemental Witness Statement and oral testimony of Wong Wing Chuen. Mardep has gone further to consider seriously the recommendations made by both Captain Pryke and Dr. Armstrong, as indicated in section C above, with a view to implementing such of the proposals as are practicable without delay. It is sincerely hoped that, with the painful lesson learned from this incident, and following the implementation of the recommendations arising from the Inquiry, similar incidents will be prevented in the future, and that the people of Hong Kong may henceforth be spared the traumatic experiences which would inevitably be brought about thereby.



Dated this 11<sup>th</sup> day of March 2013.

**Johnny Mok SC**

**Eva Sit**

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