



**The Bahamas  
Maritime Authority**

## **THE COMMONWEALTH OF THE BAHAMAS**

**“BRAEMAR”**

**IMO Number 9000699**

**Official Number 8000647**

**Report of the investigation into  
Entrapment of Fourth Engineer in Engine Room  
Watertight Door**

**on**

**26<sup>th</sup> August 2009**

*The Bahamas Maritime Authority investigates incidents at sea for the sole purpose of discovering any lessons which may be learned with a view to preventing any repetition. It is not the purpose of the investigation to establish liability or to apportion blame, except in so far as emerges as part of the process of investigating that incident.*

*It should be noted that the Bahamas Merchant Shipping Act, Para 170 (2) requires officers of a ship involved in an accident to answer an Inspector's questions fully and truly. If the contents of a report were subsequently submitted as evidence in court proceedings relating to an accident this could offend the principle that a person cannot be required to give evidence against himself. The Bahamas Maritime Authority makes this report available to any interested parties on the strict understanding that it will not be used as evidence in any court proceedings anywhere in the world.*

Date of Issue: 26 October 2010

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# 1 SYNOPSIS

- 1.1** At 1142 on 26<sup>th</sup> August 2009, whilst the M.V. “Braemar” was departing from the port of Flaam in Norway, the Fourth Engineer became entrapped in No 1 watertight door, between the purifier and auxiliary engine rooms, whilst making rounds of the engine room prior to taking over the twelve-to-four engine room watch.
- 1.2** A number of factors contributed to his entrapment, in particular:
- The Officer did not follow the recommended transit procedures when passing through a watertight door.
  - Company procedures for operation of watertight doors were not monitored or enforced.
- 1.3** There was no evidence of any malfunction of the watertight door.
- 1.4** VDR data indicated that a large majority of the opening and closing sequences of watertight doors in the engine room represented significantly less than the full travel of the door, and thus that the most personnel were passing through without the door fully open, and in at least some cases, the door would have been in motion at the time of passing through.
- 1.5** VDR data also indicated that many of the doors were routinely left open when navigating in confined waters, which could potentially compromise the watertight integrity of the vessel, in the event of an incident.
- 1.6** Following the M.V. Eurovoyager entrapment incident in November 2008, the UK Marine Accident Investigation Branch made recommendations to the Maritime and Coastguard Agency to “explore potential means of improving the safe use of powered watertight doors, through industry bodies such as the National Occupational Health and Safety Committee, taking into account ship crews’ apparent reluctance to observe existing guidelines, current technology and the need to keep watertight doors closed at sea” (MAIB 2009/150). The Bahamas Maritime Authority supports this recommendation.
- 1.7** Recommendations have also been made to Fred Olsen Cruise Lines aimed at improving their crews’ compliance with the procedures for the operation of watertight doors within their fleet, and improved documentation of their training procedures.

## 2 PARTICULARS OF VESSEL

**2.1** BRAEMAR was a Passenger Vessel registered at Nassau, Bahamas, of welded steel construction. The accommodation and machinery spaces were situated amidships. She had the following principal particulars:

• Official Number	-	8000647
• IMO Number	-	9000699
• Call Sign	-	C6SY7
• Length overall	-	195.82 metres
• Length BP	-	171.29 metres
• Breadth	-	22.52 metres
• Depth	-	7.20 metres
• Gross Tonnage	-	24,344 tonnes
• Net Tonnage	-	10,164 tonnes
• Deadweight	-	1,800 tonnes



- 2.2** She was powered by four main engines that developed 13,120 kW (17,828 bhp) and which drove two controllable pitch propellers. She had four main generators that developed a total of 7,144 kW.
- 2.3** The vessel was built in 1993 at Union Naval de Levante shipyard, Valencia, Spain, and was formerly named CROWN MAJESTY (1993-97). CROWN DYNASTY (1997), NORWEGIAN DYNASTY (1997-99), CROWN DYNASTY (1999-01). The vessel was lengthened during drydock at Blohm & Voss, Germany, in 2008, where an additional mid-body section (with frames numbered from aft: L1 to L48) was inserted between original frames 110 and 111. At the time of the incident, the vessel was owned by Braemar Cruise Ltd, and managed by Fred Olsen Cruise Lines Ltd., of White House Road, Ipswich, United Kingdom.
- 2.4** The vessel was first registered under the Bahamas Flag in July 2003 and was entered with Bureau Veritas Classification Society. At the time, she complied with the all statutory and international requirements and certification.
- 2.5** “Braemar” was last subjected to a Bahamas Maritime Authority Annual Inspection at the Port of Helsinki on 6<sup>th</sup> August 2009, with no observations or deficiencies recorded.
- 2.6** She had received a Port State Control Inspection at the Port of Gibraltar on 7<sup>th</sup> May 2009 where no relevant defects were noted.

### 3 NARRATIVE OF EVENTS

- 3.1** Times given in this narrative are in the style of the standard 24-hour clock without additional annotation, and correspond to local time on the vessel, which was UTC+2 hours. Where other timing is used, this is noted in brackets.
- 3.2** The vessel sailed from Flaam at 11:27 and proceeded down Aurlands Fjord. Present on the bridge on departure were the Captain, Pilot, Chief Officer, Safety Officer, Helmsman, and also the Company's Safety Superintendent and Firefighting Instructor. The Pilot had the conn.
- 3.3** The weather at the time of the incident was fine, with light airs and good visibility; the vessel was in sheltered waters without any significant sea or swell.
- 3.4** The Fourth Engineer was assigned to duty on the 00-04 and 12-16 watches. It is believed that prior to coming on watch, and according to the normal practice on board, he was in the process of carrying out a routine round of the engine room, before reporting for duty in the Engine Control Room (ECR).
- 3.5** When the incident occurred, he was proceeding from the Auxiliary Room into the Fuel Treatment room, via watertight door No 1 (WTD1) in the watertight bulkhead which separates these two compartments.
- 3.6** Whilst attempting to pass through this watertight door, he became temporarily trapped when it closed on him. He succeeded in freeing himself from the watertight door, and made his way the Engine Control Room.
- 3.7** On arrival at the Engine Control Room, he was seen by the Chief Engineer and Chief Electrician as he collapsed to the deck, complaining of pains in his chest and back, and blurred vision.
- 3.8** The Chief Electrician called the bridge at 11:46. This call was taken by the Safety Officer on the Bridge. There was some miscommunication and the Safety Officer apparently understood that the Fourth Engineer was still trapped in the watertight door; this was relayed to the other members of the Bridge Team.
- 3.9** A "Code Alpha" (medical emergency) was announced at 11:47, over the ships PA system and the medical team dispatched to the Engine Control Room. Personnel were also dispatched to release the Fourth Engineer (as the Bridge Team believed him to be still trapped).
- 3.10** At 11:50, the medical team arrived at the Engine Control Room and administered oxygen to the casualty.
- 3.11** At 11:56, the vessel turned around and proceeded back towards Flaam. The Pilot handled communications with the shore to arrange a helicopter to meet the vessel at the berth.

- 3.12** At 11:59, the casualty had been removed to the ships hospital by the medical team.
- 3.13** The vessel secured alongside at 12:20 and the doctor boarded at 12:22, followed by a medical team at 12:29.
- 3.14** The casualty and medical team left by helicopter at 12:45 for Bergen Hospital.
- 3.15** The ship sailed at 12:49 for Gudvangen.
- 3.16** The hospital subsequently reported that the casualty had rupture damages, chest damages and broken ribs and was under observation in the intensive care unit.
- 3.17** He was subsequently medically repatriated to the Philippines, approximately one week later.
- 3.18** The casualty (Fourth Engineer) was 38 years of age and held a Philippine Certificate of Competency (issued 1999) as Officer in Charge of an Engineering Watch and a Bahamas Endorsement attesting to the recognition of that certificate. Ships records showed that he had attended the following safety and security training on board:
- Initial briefing before sailing – 19<sup>th</sup> February 2009
  - Safety Familiarization Training and Examination – 23<sup>rd</sup>, 24 and 25<sup>th</sup> February 2009
  - Security Awareness Training – 28<sup>th</sup> February 2009
- 3.19** His Time and Attendance sheet, completed up to 0400 on 26<sup>th</sup> August indicated that he had worked only the twelve-to-four watch, with no overtime (i.e. exactly eight hours every day) since 8<sup>th</sup> August.
- 3.20** His Performance Appraisals, dated 19<sup>th</sup> May and 19<sup>th</sup> August 2009 rated him as ‘very good’ in conduct and job attitude, and ‘good’ in all other aspects (including safety awareness). The first appraisal recorded that he was still within his probationary period with the Company and needed “more attention... ..in familiarisation with ship systems” but there was no such comment on his second appraisal.



## 4 ANALYSIS

- 4.1** The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.
- 4.2** SOLAS regulations on watertight doors: Part B - Subdivision and Stability Regulation 15 *Openings in Watertight Bulkheads in Passenger Ships* are applicable to passenger ships constructed on or after 1 February 1992. This requires that all watertight doors shall be capable of being closed from an operating console on the bridge in not more than 60 seconds with the ship in upright position, and be provided with an audible alarm distinct from any other alarm in the area, which shall sound for 5 to 10 seconds before the door begins to close in remote mode and shall continue to sound until it is completely closed. It also requires that:
- *The closure time, from the time the door begins to move to the time it reaches the completely closed position, shall in no case be less than 20 seconds or more than 40 seconds with the ship in the upright position.*
- 4.3** The Regulation also states that flag states may consider an intermittent visual signal, at doors in passenger areas and areas of high ambient noise such as machinery spaces, to supplement the audible alarm. There is no requirement for any local indication to show when doors are in remote operation.
- 4.4** It is a requirement that the master mode switch on the operating console on the bridge be always kept in ‘local control’ mode, and the remote mode shall be used only in an emergency or for testing purposes.
- 4.5** The Bahamas administration categorises watertight doors into three types A, B and C. During a potentially hazardous voyage, all watertight doors must be kept closed. During a normal voyage: type A doors may be kept open; type B doors must be closed, but may be kept open while there is someone in the adjacent compartment; and type C doors must be closed and may only be opened for sufficient time to permit someone to pass through.
- 4.6** The classification of watertight doors on “Braemar” is shown in the extract from the Operating Instructions contained in Appendix I. Watertight Door No 1 was a type “C” door”.
- 4.7** As originally built, “Braemar” was fitted with thirteen watertight doors as follows:

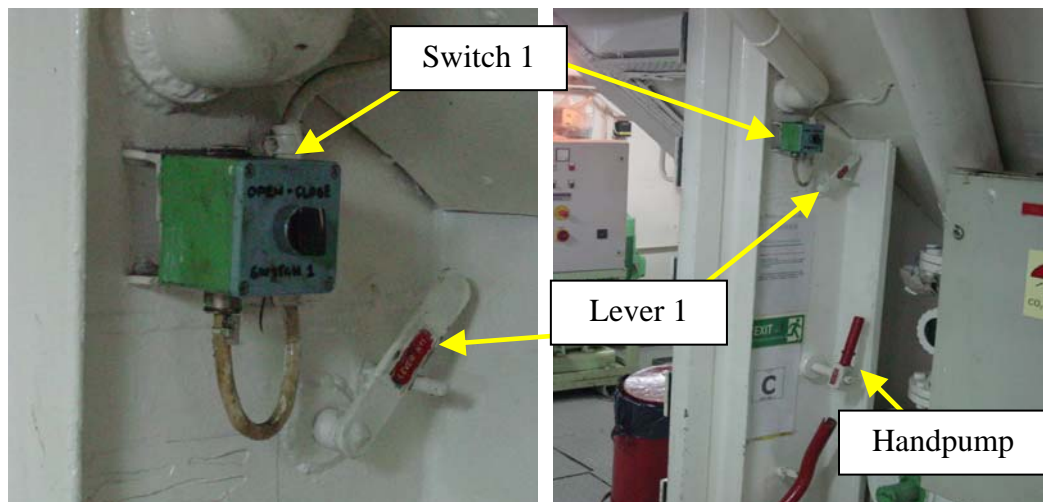
Door No	Deck	Frame	Between
1	Tank Top	98	Aux Engine Room & Purifier Room
2	Tank Top	110	Purifier Room & AC Compressor Rm
3	Tank Top	143	Laundry

4	Deck 1	22	Shop and Store Rooms
5	Deck 1	35	Bakery
6	Deck 1	50	Engine Store & Workshop
7	Deck 1	62	Workshop & Main Engine Room
8	Deck 1	81	Main Engine Room & Aux Engine Room
9	Deck 1	98	Engine Control Rm & Electrical Workshop
10	Deck 1	126	Crew Accommodation
11	Deck 1	142	Crew Accommodation
12	Deck 1	154	Crew Accommodation
13	Deck 1	170	Crew Accommodation

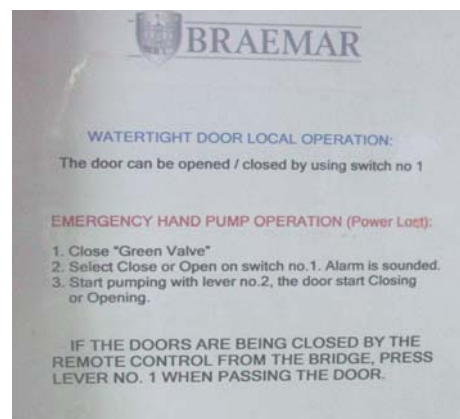
- 4.8** Watertight door No 1, in which the Fourth Engineer was trapped, is typical of these doors – see photograph below. They are conventional side-rolling electro-hydraulically operated doors, fitted with a local electric switch (“Switch 1”), a local control lever (“Lever 1”) and a hand pump for emergency operation, in the event of power failure.



- 4.9** The operation of the local electrical switch (“Switch 1”) sets the door either opening or closing and once activated, the door will normally continue in motion until it reaches the fully open or fully closed position; however, if the switch position is changed whilst the door is in motion, the door will immediately respond to the new command - i.e. without completing its normal travel. There is no neutral or lock-off position, and the door cannot be stopped in any intermediate position.



- 4.10** When the watertight door is closed (either by the local switch or on the remote command from the bridge), the door can be opened using the lever (“lever 1”). Whilst the lever is held over towards the door, the door will open and remain open. Once the lever is released, the door will close again, normally. Lever 1 is connected to a partner lever on the opposite side of the bulkhead and positioned so that both levers can be held in the open position by a single person unaided throughout transit of the doorway.

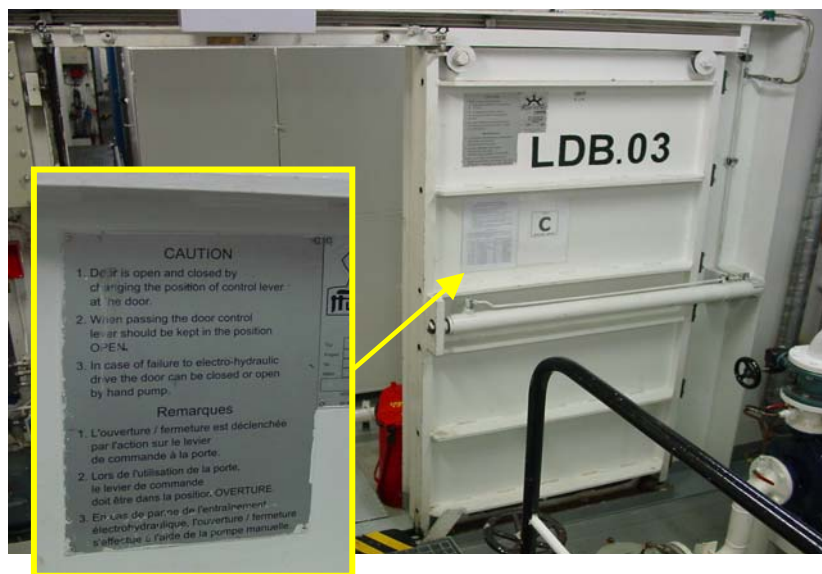


- 4.11** Operation instructions are posted locally for all three methods of operation (above left). These can also be seen in the photograph above the hand pump handle and below “Switch 1” and “Lever 1”, above. There is also a visible and audible alarm (above right).
- 4.12** When the vessel was lengthened, additional watertight doors were fitted in the new section, frames L1 to L48 (and one at frame 78 in the original hull section) as follows:-

Door No	Deck	Frame	Between
LDB.01	Tank Top	L48	Machinery compartments
LDB.02	Tank Top	L32	Machinery compartments
LDB.03	Tank Top	L16	Machinery compartments

L1.01	Deck 1	L48	Crew Accommodation
L1.02	Deck 1	L32	Crew Accommodation
L1.03	Deck 1	L16	Crew Accommodation
L2.01	Deck 2	L48	Passenger Accommodation
L2.02	Deck 2	L48	Crew Accommodation
L2.03	Deck 2	L32	Passenger Accommodation
L2.04	Deck 2	L16	Crew Accommodation
L2.06	Deck 2	78	Passenger Accommodation
L2.07	Deck 2	L32	Crew Accommodation

- 4.13** The watertight doors in the new section are of a different design to those originally fitted, the principal operational difference being that these doors *can be stopped in an intermediate position* by releasing the operating lever into the “neutral” position.



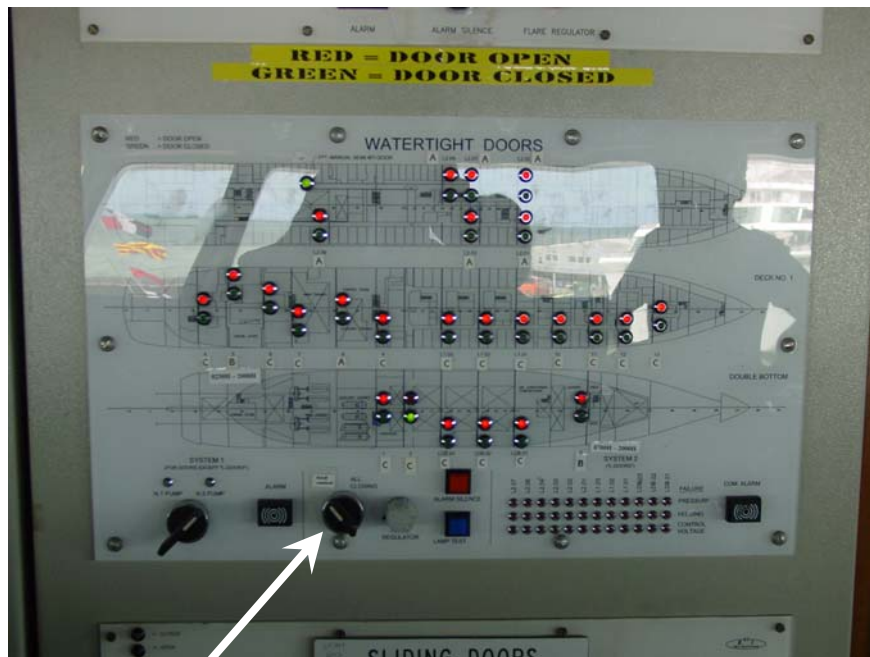
New Section Watertight Door (LDB 3) and instructions



“New Section” Watertight Door (LDB 3) – Controls



- 4.14** Instructions are posted in the working language, English, at the operating consoles; instruction on how to operate the door in the event of power failure is also posted, as shown in the photographs above. For the old type doors, the operating instructions do not clearly state that the operating lever should be held in the open position while transiting the door.
- 4.15** There were no instructions to open the doors fully before passing through or not passing through whilst the door is in motion; there were also no notices or posters to indicate the potential dangers of entrapment if the correct transit procedures were not followed.
- 4.16** There is no indication at the door to show whether remote or local operation is selected.
- 4.17** An operating console is provided on the bridge, which shows the positions of all watertight doors. Doors can be set to “local control” or “all close” from this console by the switch indicated:



Operating Console on the Bridge

- 4.18** Watertight doors are normally kept on local control, as they were on the occasion of this incident. All watertight doors are tested on a weekly basis, remotely from the bridge (the previous last test was reported to be on 20<sup>th</sup> August 2009). The last test of all watertight doors recorded in the Official Log Book was on 11<sup>th</sup> August 2009.

- 4.19** Instruction on the operation of watertight doors is contained in the Vessel Operations Manual, copies of which are located on the Bridge, Crew Day room and Crew Mess Room. A copy of the relevant extract is contained in Appendix 1 to this report. These operating instructions describe how to operate the machinery but do not include any instruction or guidance on the procedures for safe personnel transit through the door.
- 4.20** The Safety Handbook issued to all crew contains the following additional information on watertight doors:
- Each door has a loud bell that rings before the door closes. If the bell is ringing you must not attempt to pass through the door in operation. It is not only highly dangerous but also a disciplinary offence for any crew member attempting to pass through a watertight door in operation.*
- Each door closes with a considerable force and will not be stopped by bone, flesh, clothing, etc.*
- If a door is closed you are not permitted to open it, pass through and close it behind you.*
- 4.21** There is no record of any disciplinary action (verbal or written) taken against any person for failure to comply with the Company procedures for the safe transit through watertight doors.
- 4.22** When crew join the vessel, the safety officer gives them a general safety briefing covering all the emergency and lifesaving equipment onboard. The slide presentation used for this briefing contains one slide (out of a total of 212 slides) which warns of the dangers of watertight doors in general terms, but does not contain any practical instructions for the proper operation of watertight doors – see Appendix IV.
- 4.23** It was reported that those required and permitted to use watertight doors are given special additional instruction, in addition to the above, which includes a demonstration of the operation of both types of watertight doors fitted to the ship, by remote and local control. They are also made aware of the audible and visible alarms when the door is closing or opening. The ship could not provide any additional documentation or certification supporting this training (although dates and locations of such training were recorded in the Official Log Book).
- 4.24** VDR data was provided for the period from 20:16 UTC on 25<sup>th</sup> August to 11:16 UTC on 26<sup>th</sup> August (i.e. 13½ hours before to 1½ hours after the incident). The data includes voice recording on the bridge and shows routine operation of the watertight doors throughout the period.
- 4.25** The International Electrotechnical Commission (IEC) standard 61996 (VDR performance standard) requires that a vessel's watertight door status is recorded each second. Inspection of the data indicates that the VDR records the time of opening and closing each watertight door to the nearest second.

- 4.26** With the exception of the period from 0500 to 0900 and 1020 to 1049 UTC (alongside at Flaam), the remainder of the period covered would have been on standby for entry and leaving port and coastal navigation in confined waters, for which all water doors should have been closed (and in local control).
- 4.27** In fact, the data shows that many watertight doors were opened during this period for varying durations. Some doors were open continuously for several hours; e.g. No 1 W/T door was open from 20:16 to 03:31 (7 hours 15 minutes) and W/T door No 8 was open from 20:16 to 09:21 (13 hours 5 minutes).
- 4.28** Notwithstanding, approximately 80 percent of the remaining openings were of less than 2 minutes duration. It is reasonable to assume that these openings represented personnel opening and closing the door to pass through for access. Longer openings may represent the door being left open for some other purpose.
- 4.29** The table in Appendix II shows the opening times and the duration of opening of watertight door Nos 1, 2, LDB3, LDB2 and LDB1 and No 8, for all openings of less than two minutes duration, in chronological order. It should be noted that the sequence of the table, left to right - viz: No 1, No 2, LDB3, LDB2 and LDB1 represents the watertight doors in sequence from aft to forward on the tank top level, and some patterns of personnel passing from one end to the other are evident from inspection of the table. WT Door No 8 is separate, and gives access to the workshop on the deck above.
- 4.30** From the table it can be seen that the minimum duration for which doors are opened varies from 9 to 19 seconds and the mode (most common) time varies from 13 and 19 seconds.
- 4.31** Tests carried out in the presence of the BMA inspector on 5<sup>th</sup> September at Dover, gave the following closing times for the watertight doors:

<b>W/T Door</b>	<b>Time - Open to Closed</b>
No 1	22 seconds
No 2	33 seconds
LDB 3	28 seconds
No.8	30 seconds

- 4.32** In addition, it was noted that the time for the full cycle for complete opening and closing of any door ranged from 34 to 45 seconds. Considering this data, together with the results from the review of the VDR data as summarised in paragraph 4.30, indicates that some 90% of the opening and closing sequences in the table represent significantly less than the full travel of the watertight door. – i.e. that personnel are passing through without the door being fully open. In the case of the old type doors, which have no ‘neutral’ position, this would also mean that the door was in motion at the time of passing through.

- 4.33** From the VDR, bridge communication times and the watertight door operating times, it is evident that the Fourth Engineer was trapped in No 1 watertight door either at 11:40:02, when the door was operated for 15 seconds or (more likely) at 11:42:13, when the door was open for 65 seconds.
- 4.34** The Fourth Engineer remained conscious throughout the incident and immediate aftermath. Marks from the crushing injury were visible on his chest. From the fact that he was able to release himself from the watertight door, it is considered that he was passing through the doorway with his back to the door (facing the frame) and thus able to reach the controls to re-open the door.
- 4.35** Ships staff were questioned on the correct procedure for passing through watertight doors; those interviewed consistently stated their understanding that personnel should not pass through a watertight door while it was moving or not fully open. This was said to be the Company's requirement, and it is in line with industry guidance, as set out – for example - in the UK Marine Guidance Notice (35 M+F)<sup>1</sup>. Although it was said to be and understood to be the Company's requirements, no documentary evidence of this could be provided.
- 4.36** Notwithstanding this, the pragmatic and normal practice adopted by most personnel was to set the watertight door to 'open'; pass through once the door was sufficiently open (and still opening) and then set the door to 'closed', when safely on the opposite side. Whilst this practice is less stringent than the Company's stated requirements, it is nevertheless consistent with the Code of Safe Working Practices for Merchant Seamen (section 13.6.4) which states that personnel "should not attempt to pass through a watertight door when it is closing and/or the warning bell is sounding" (this is also consistent with the ILO publication: Accident Prevention on board Ship, para 9.3.4).
- 4.37** It is reasonable to assume that personnel who pass through watertight doors whilst they are moving or not fully open, do so in the knowledge that they are contravening Company procedures; nevertheless the fact that they do it indicates that they believe that the time saved justifies the risk to their own personal safety.
- 4.38** There was no evidence to indicate any malfunction of No 1 watertight door at the time of the incident. The fact that the Fourth Engineer was trapped indicates that he did not follow the practice in section 4.35 above; the known facts indicate that he attempted to pass through the door while it was closing.
- 4.39** Ship staff interviewed suggested that the Fourth Engineer may have employed a more hazardous variant of the practice described in section 4.36 above, where, instead of passing through whilst the door was opening, he set the door to 'closed' before passing through, or set the switch to closed as he passed through; it was suggested that this requires less physical manipulation of the controls and/or might save a few seconds in the complete process.

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<sup>1</sup> It should be noted that there is no requirement for Bahamas Flag vessels to carry or comply with the recommendations of UK Marine Guidance Notices.



- 4.40** In the event, it is also possible that the Fourth Engineer may have confused the operation of WTD No 1 with that of the new sections doors, which have the facility to stop in an intermediate position.
- 4.41** It is not unknown for watertight doors to initially move quite suddenly, before adopting their normal slow steady movement - particularly when the direction of motion is suddenly reversed and without having completed the full travel; however, any such tendency observed in the operation of No 1 watertight door, during the investigation was no more than 1-2 cm.
- 4.42** The findings therefore suggest that, in addition to the safest method of transiting watertight doors – i.e. with the door fully open and stopped, there is, in practice, an adopted and widespread alternative method of passing through, with the door opening, and possibly a third, used by at least one person - the casualty – of passing through with the door closing.
- 4.43** It is considered likely that less experienced crew members may not be able to distinguish between the risks involved in transiting a closing door and one which is opening (or stationary).
- 4.44** It is suggested that ships' officers and senior rates may be uncomfortable in advising or instructing any crew member seen to be transiting a closing door to use the less hazardous method of transiting whilst the door was opening, as both are contrary to Company procedures and some published industry 'best practice'.
- 4.45** A routine Safety and Environmental Committee Meeting was held on 28th July 2009. At this meeting, the MAIB report on the entrapment of a fitter in a watertight door on M/V Eurovoyager was circulated and discussed, and the risk of passing through a moving watertight door was discussed. The Fourth Engineer was not present at that meeting.

## 5 CONCLUSIONS

- 5.1** There are no new lessons to be learned from this incident – only old ones to be re-learned.
- 5.2** The circumstances of the incident indicate that the Fourth Engineer was passing through the watertight door whilst the door was closing and thus that he had set the door to ‘close’ before (or perhaps during) transiting, and that the door was only partially opened when the Fourth Engineer passed through.
- 5.3** Anecdotal evidence indicates ships staff are aware that they should not pass through watertight doors which are moving or not fully open; however, it is reportedly common practice - for reasons of practicability - for personnel to pass through doors which are still opening.
- 5.4** Analysis of the VDR data for watertight doors indicates that engine room personnel routinely pass through watertight doors which are not fully open and are moving.
- 5.5** The extent (if any) to which ships staff pass through doors which are closing could not be established. It is considered likely that some ships staff may not understand the difference in risk of passing through a watertight which is opening, closing, stationary or fully open.
- 5.6** Ships’ officers and senior ratings may be apprehensive in advising or instructing any crew member seen to be transiting a closing door to use the less hazardous method of transiting whilst the door was opening, as both are contrary Company procedures and some published industry ‘best practice’.
- 5.7** Although operating instructions are provided adjacent to each door, there is no notice to advise of the correct and required procedure for transiting the door, nor are there any notices or posters to indicate the potential dangers of entrapment if the correct transit procedures are not followed.
- 5.8** The Vessel Operations Manual provides requirements for the operational status of the watertight doors, but there are no documented procedures or requirements which describe how personnel are supposed to transit a watertight door, or description of the potential dangers of entrapment if the correct transit procedures are not followed.
- 5.9** On board procedures for operation of watertight doors were not adequately monitored or enforced by the Ships Officers and the Managers.

- 5.10** This incident bears a striking similarity in root cause to the incident on M.V. “Eurovoyager” on 3rd November 2008. A copy of the MAIB report on that incident was on board and had been discussed during the safety meeting on 28th July 2009. No apology is therefore made for quoting the following analysis from that report which is entirely and equally applicable to this incident:

*“Individuals are frequently prepared to take ‘manageable’ risks when faced with monotonous, repetitive or time-consuming tasks. Overcoming this sort of behaviour is often very difficult, and requires not only a commitment to safety at all levels; it also requires that procedures are reasonable, proportionate and easy to follow. It is evident that for many, the procedures for passing through watertight doors are perceived as excessive and time-consuming, particularly when operating doors that are in frequent use.”*

## 6 RECOMMENDATIONS

### **Fred Olsen Cruise Lines Ltd is recommended to:**

- 6.1 Review and explicitly define the Company's required procedures for personnel transit through watertight doors in the Vessel Operations Manual.
- 6.2 Introduce a documented system within the Safety Management System for the training and certification of personnel to operate critical equipment and appliances such as watertight doors, the misoperation of which could result in injury or fatality to personnel, or significant damage to the vessel.
- 6.3 Instruct Masters and ships officers to ensure that Company procedures for personnel transit through watertight doors are monitored and enforced by the ships senior personnel - backed-up, if necessary, by appropriate disciplinary procedures.
- 6.4 Improve signage at watertight doors to:
  - clearly state the Company's required procedure for personnel transit through watertight doors
  - warn of the potential dangers of entrapment if the correct transit procedures were not followed

### **Ship Owners and Ship Managers are recommended to:**

- 6.5 Adopt industry best practice on the safe use of watertight doors is currently considered to be the UK MCA's MGN 35(M+F) and the Code of Safe Working Practice for Merchant Seamen (or the ILO's Accident Prevention on board Ship at Sea and in Port). These documents set out different standards for personnel transit of watertight doors. *Best practice on the safe use of watertight doors should be reviewed and harmonised.*

### **IACS members are recommended:**

- 6.6 In the case of major conversions (e.g. lengthening), all W/T doors should operate identically, irrespective of the original date of build, and should meet the regulations applicable to a ship of that class whose keel was laid at the time of such conversion. In the case where one or more additional W/T doors are fitted, without major modification to the hull, such W/T doors need only meet the specification applicable at the original date of build.

## APPENDIX I

## Extract From Damage Control Plan

**“BRAEMAR” CALL SIGN : C6SY7 IMO. No. 9000699**

### INSTRUCTIONS FOR THE OPERATION OF WATERTIGHT DOORS.

1. All watertight doors must be maintained closed when the following conditions apply:  
The vessel is navigating in areas where visibility is less than two miles;  
The depth of water is less than three times the ship's draught;  
The vessel is within two miles of shore;  
There is a high density of shipping traffic within a two miles area;  
Berthing, during arrivals and departures, within five to two miles from ashore and whenever under pilotage;  
At any time the Officer of the Watch deems it necessary for the safety of the vessel;  
The adjacent spaces are unmanned.
2. All watertight doors permitted to remain open during navigation shall be always ready to be immediately closed.
3. All watertight doors permitted to remain open during navigation shall be clearly indicated in the ship's approved stability information and on the approved Damage Control Plan.
4. The open and closed position indication of the watertight doors should be available for the guidance of the Officer of the Watch.
5. The opening and closing of the watertight doors is recorded in both the Official Log Book and the Engine Room Log Book. Those watertight doors that are open must be recorded in both the Official Log Book and the Engine Room Log Book at the beginning of each day.

#### List of Watertight Doors

A TYPE A DOOR may be opened during navigation subject to the conditions listed above.

A TYPE B DOOR may be opened during navigation only whilst someone is working in the compartment adjacent to that door and subject to the conditions listed above.

A TYPE C DOOR may be opened during navigation only to permit persons to pass through and then immediately after closed subject to the conditions listed above.

Watertight Door No.	Deck	Frame No.	Location	Category	Hours of opening	Reason for opening
1	Tank Top	98	Auxiliary Engine Room / Purifier Room	Type C	-	Safe operation of the ship
2	Tank Top	110	Purifier Room / A.C. Compressor Room	Type C	-	Safe operation of the ship
3	Tank Top	143	Laundry	Type B	0700 – 2000	Operation of laundry
4	Deck 1	22	Shop & store rooms	Type C	-	Operation of store rooms
5	Deck 1	35	Bakery	Type B	0230 – 2000	Operation of bakery
6	Deck 1	50	Engine store room / workshop	Type C	-	Operation of engine spaces
7	Deck 1	62	Workshop / Main engine room	Type C	-	Operation of engine spaces
8	Deck 1	81	Main engine room / Auxiliary engine room	Type A	-	Safe operation of the ship
9	Deck 1	98	Engine control room / Electrical workshop	Type C	-	Operation of engine spaces
10	Deck 1	126	Crew Accommodation	Type C	-	Emergency access
11	Deck 1	142	Crew Accommodation	Type C	-	Emergency access
12	Deck 1	154	Crew Accommodation	Type C	-	Emergency access
13	Deck 1	170	Crew Accommodation	Type C	-	Emergency access
LBD.01	Tank Top	L.48	Machinery Compartments	Type C	-	Operation of engine spaces
LBD.02	Tank Top	L.32	Machinery Compartments	Type C	-	Operation of engine spaces
LBD.03	Tank Top	L.16	Machinery Compartments	Type C	-	Operation of engine spaces
L1.01	Deck 1	L.48	Crew Accommodation	Type C	-	Access to accommodation
L1.02	Deck 1	L.32	Crew Accommodation	Type C	-	Access to accommodation
L1.03	Deck 1	L.16	Crew Accommodation	Type C	-	Access to accommodation
L2.01	Deck 2	L.48	Passenger Accommodation	Type A	-	Access to accommodation
L2.02	Deck 2	L.48	Crew Accommodation	Type A	-	Access to accommodation
L2.03	Deck 2	L.32	Passenger Accommodation	Type A	-	Access to accommodation
L2.04	Deck 2	L.16	Crew Accommodation	Type A	-	Access to accommodation
L2.06	Deck 2	78	Passenger Accommodation	Type A	-	Access to accommodation
L2.07	Deck 2	L.32	Crew Accommodation	Type A	-	Access to accommodation

## Safety Management System

### Extract from Vessel Operations Manual – Chapter 3. Deck Procedures

#### Operational Instructions for Watertight Doors

##### 3.1.5 WATERTIGHT DOORS, OPERATIONAL INSTRUCTIONS

All watertight doors shall be closed during navigation and must be maintained closed when the following conditions apply:

- The vessel is navigating in areas where the visibility is less than two miles;
- The depth of water is less than three times the ship's draught;
- The vessel is within two miles from shore;
- There is a high density of shipping traffic within two miles area;
- Berthing, during departures and arrivals, within five to two miles from shore and whenever under pilotage;
- At any time that the officer of the watch deems it necessary for the safety of the vessel;
- The adjacent spaces are unmanned.

The Master may permit a watertight door to be opened whilst under navigation in the following circumstances:

- A watertight door permitted to remain open shall always be ready to be immediately closed;
- The open or closed position indication of the watertight doors shall be available to the officer of the watch at all times;
- The opening or closing of any watertight door is to be recorded in both the official log book and the engine room log book, those watertight doors that are open must be recorded in both the official log book and the engine room log book at the beginning of each day;
- In an emergency situation when he considers that such an action is essential for the overall safety of the ship;
- In an exceptional circumstance for a specific purpose and for a specific period of time provided that the details are recorded in the deck log book.

Each watertight door must be designated as being a Type A, Type B or a Type C door.

- A Type A door may be open during navigation subject to the conditions listed above;
- A Type B door may be open during navigation only whilst an authorised person suitably trained in the operation of watertight doors is working in the immediate vicinity of the open door and subject to the conditions listed above;
- A Type C door may not be opened during navigation.

The category type and meaning of that category are to be clearly marked on both sides of the door either on the door itself or on the bulkhead adjacent to the door.

A copy of these instructions together with a listing of the category type of each door is to be posted at the Bridge control unit so as to be readily available for the officer in charge of the watch.

A copy of the listing of the category type of each door is to be included on the Damage Control Plan and in the Stability Information.

For all doors the Bridge control unit's master switch shall be in the local control mode during normal operations.

The remote operation of all watertight doors must be supervised by the officer of the watch. Whenever possible, an announcement should be made throughout the ship on the public address system prior to the closing of watertight doors by means of the Bridge control unit.

All watertight doors and their associated controls and warning alarms systems must be kept in an efficient working condition at all times and be inspected and tested at intervals of not more than seven days.

The operation of all watertight doors that may be permitted to be open whilst under navigation must be function tested both daily and during each fire drill. Each function testing of the doors is to be recorded in the official log book.

An authorised person is a member of the crew that has been instructed in the safe opening and closing operation of the ship's watertight doors.

Safety warnings notices are to be available to all members of the crew in the Safety handbook.

## APPENDIX II

**Analysis of opening times of selected W/T Doors**

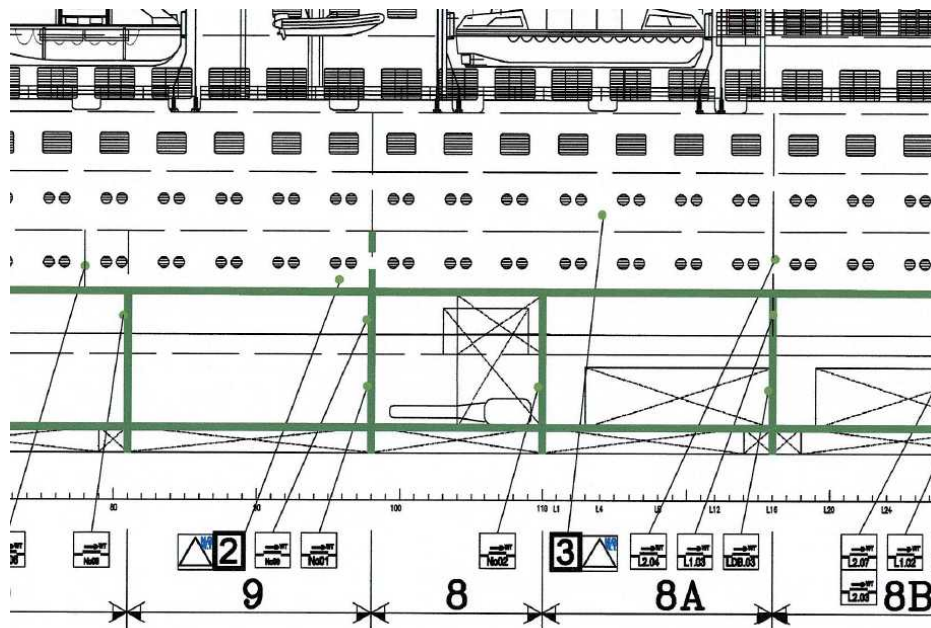
Opening Time (UTC)	WT 8	WTD 1	WTD 2	LDB 3	LDB 2	LDB1
23:18:59			0:23			
23:31:52			0:41			
00:25:29			0:18			
00:31:06			0:17			
01:02:55			0:18			
01:04:27			0:19			
01:20:50			0:19			
01:42:00			0:21			
02:27:13			0:18			
03:14:18			0:22			
03:30:58			0:18			
04:58:32			0:22			
04:58:55						1:00
05:02:48			0:19			
IN PORT - FLAAM						
08:46:50		1:40				
08:47:03			0:21			
08:48:38		0:15				
08:54:12			0:24			
08:54:27		1:20				
09:00:11			0:19			
09:05:33		0:16				
09:05:45			0:19			
09:21:24		0:14				
09:21:31	0:12					
09:21:42			0:21			
09:21:55		0:16				
09:22:25	0:13					
09:23:14	0:13					
09:24:29	0:18					
09:24:55	0:10					
09:25:15					0:19	
09:25:19			0:19			
09:25:22	0:09					
09:26:27			0:19			
09:30:28	0:10					
09:30:31		0:32				
09:30:48					0:28	
09:31:15		0:14				
09:31:41	0:12					
09:32:18						0:31
09:32:18				0:31		

Opening Time (UTC)	WT 8	WTD 1	WTD 2	LDB 3	LDB 2	LDB1
09:33:04			0:51			
09:33:21	0:13					
09:33:29		1:19				
09:35:20						0:27
09:35:20				0:27		
09:35:49	0:16					
09:36:31		0:16				
09:39:01	0:12					
09:40:02		0:15				
09:41:10	0:14					
09:41:50	0:11					
09:42:13		1:05				
09:43:29	0:19					
09:47:40						0:16
09:47:40				0:16		
09:48:08			0:20			
09:48:41	0:11					
09:49:40	0:37					
09:51:29	0:11					
09:55:01	0:17					
09:58:10	0:13					
09:59:46	0:17					
10:03:03	0:14					
10:07:39		0:18				
10:07:51	0:15					
10:08:10		0:43				
10:14:26	0:27					
IN PORT - FLAAM						
10:37:18	0:15					
10:47:54	0:14					
10:53:28	0:21					
11:00:13	0:19					
11:02:05	0:33					
11:02:27		0:45				
11:03:06	0:20					
11:04:12		0:20				
11:04:42		0:27				
11:11:13		0:16				
11:12:42			0:22			
11:13:02						0:27
11:13:02				0:27		
<b>Minimum</b>	<b>0:09</b>	<b>0:14</b>	<b>0:17</b>	<b>0:16</b>	<b>0:19</b>	<b>0:16</b>
<b>Mode</b>	<b>0:13</b>	<b>0:16</b>	<b>0:19</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
<b>Average</b>	<b>0:16</b>	<b>0:35</b>	<b>0:22</b>	<b>0:25</b>	<b>0:24</b>	<b>0:32</b>

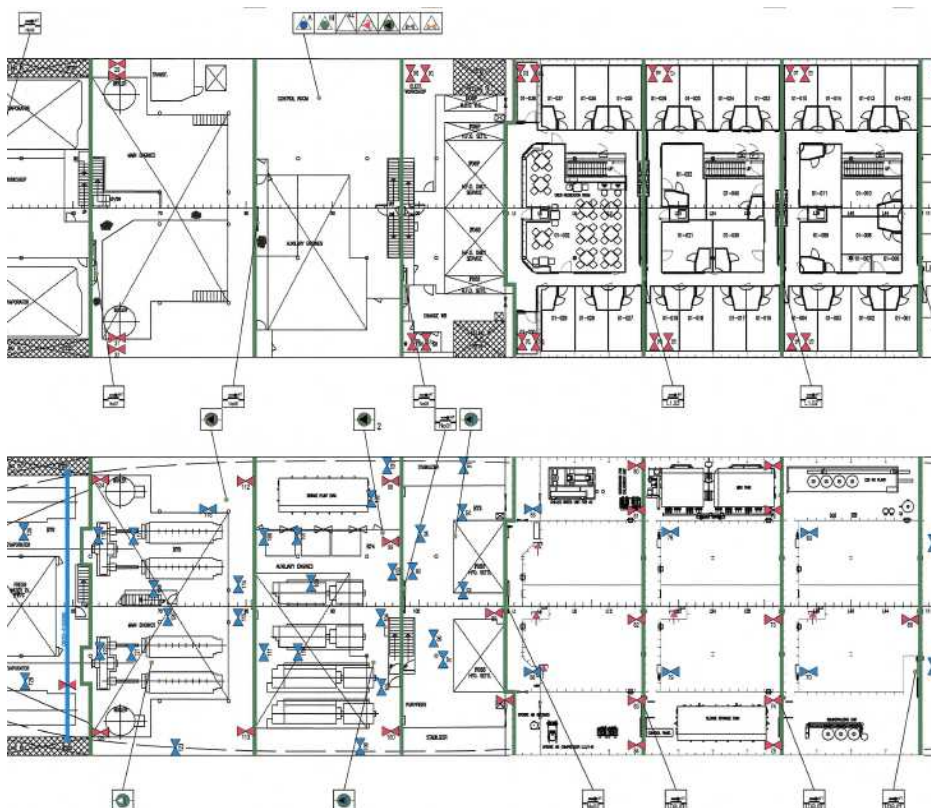


# APPENDIX III

## Extracts from Ships Damage Control Plan



Elevation showing WTDs 1, 2, LDB3 on tank top, and Nos 8 and 9 on Deck 1



Plan View showing watertight doors

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## APPENDIX IV



## Slide from Crew Safety Presentation

Each door has a loud bell that rings before the door closes. If the bell is ringing you must not attempt to pass through the door in operation. It is not only highly dangerous but also a disciplinary offense for any Crewmember attempting to pass through a watertight door in operation.

Each door closes with a considerable force and will not be stopped by bone, flesh, clothing, etc.

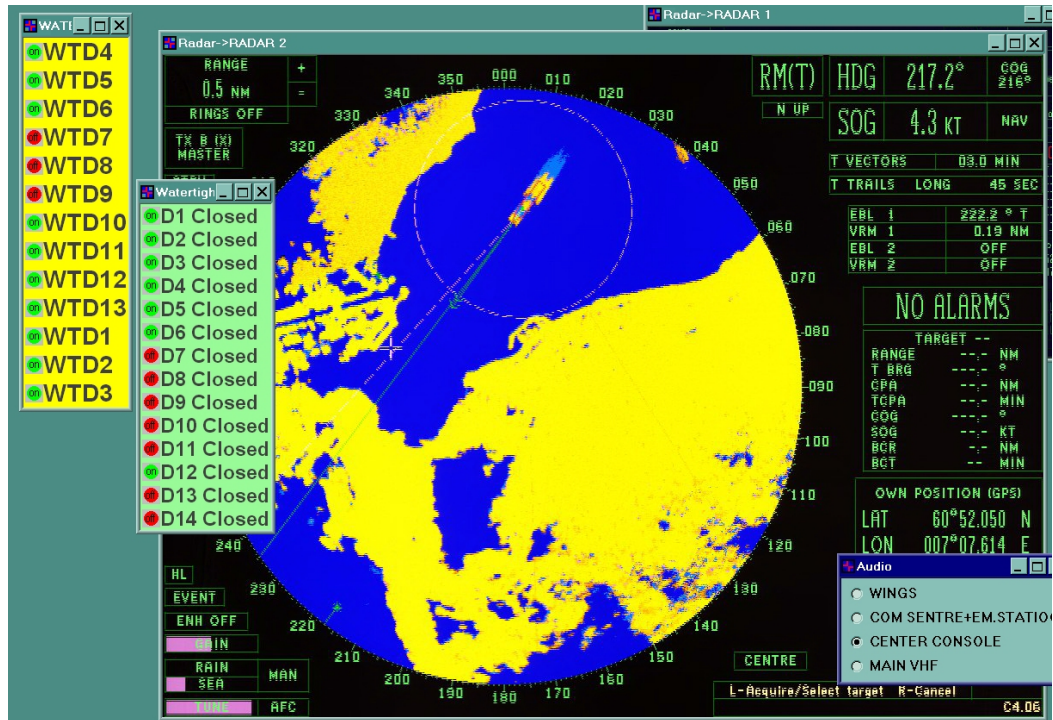
If a door is closed you are not permitted to open it, pass through and close it behind you. One day the Ocean might come in to meet you.

## Extract from Safety Handbook



## APPENDIX V

## VDR Playback.



Green dot indicates door closed and red dot indicates door open



## APPENDIX VII

### BEST PRACTICE IN THE OPERATIONS OF WATERTIGHT DOORS

#### **ILO's Accident Prevention on board Ship at Sea and in Port**

##### **9.3 Watertight doors**

9.3.1. All seafarers who may have to use watertight doors should be instructed in their safe use.

9.3.2. Power-operated watertight doors can be closed from the bridge and particular care should be taken when using such doors. If opened locally under these circumstances a door will recluse automatically and crush anyone in its path as soon as local control has been released. Both hands are usually required to operate the local controls, and for this reason no person should alone attempt to carry any load through such doors. The bridge should be notified whenever such doors are opened and immediately after they are closed.

9.3.3. Notices clearly stating the method of operating the local controls of watertight doors should be prominently displayed on both sides of the doors.

9.3.4. (1) No attempt should be made to pass through a watertight door when it is closing or when the warning alarm is sounding.

(2) Whenever a watertight door is energized, and under remote control, transit is not allowed. If necessary to leave the area confined by such doors, emergency exits shall be used. A warning to that effect shall be displayed at the local operating point.

#### **Code of Safe Working Practice for Merchant Seamen – April 2006 MCA**

##### **13.6 Watertight doors**

13.6.1 All members of the crew who would have occasion to use any watertight doors should be instructed in their safe operation.

13.6.2 Particular care should be taken when using power operated watertight doors which have been closed from the bridge. If opened locally under these circumstances the door will re-close automatically with a force sufficient to crush anyone in its path as soon as the local control has been released. The local controls are positioned on each side of the door so that a person passing through may open the door and then reach to the other control to keep the door in the open position until transit is complete. As both hands are required to operate the controls, no person should attempt to carry any load through the door unassisted.

13.6.3 Notices clearly stating the method of operation of the local controls should be prominently displayed on both sides of each watertight door.

13.6.4 No-one should attempt to pass through a watertight door when it is closing and/or the warning bell is sounding.