Report of investigation

into the death of a Seaman on board

the Singapore Registered

Bulk Carrier

"*Equator Peace*"

at Tap Shek Kok, Hong Kong

on 24 May 2013

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

31 October 2014

Purpose of Investigation

This incident is investigated in accordance with the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (the Casualty Investigation Code) adopted by IMO Resolution MSC 255(84).

The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department, in pursuant to the Merchant Shipping Ordinance Cap. 281, the Shipping and Port Control Ordinance (Cap. 313), or the Merchant Shipping (Local Vessels) Ordinance (Cap. 548), as appropriate, is to determine the circumstances and the causes of the incident with the aim of improving the safety of life at sea and avoiding similar incident in future.

The conclusions drawn in this report aim to identify the different factors contributing to the incident. They are not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAISSPB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

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1. Summary

1.1 On 24 May 2013, a fatal accident happened on board the Singapore registered bulk carrier "*Equator Peace*" at a coal terminal in Tap Shek Kok, Hong Kong.

1.2 At about 1800 hours, when the vessel was mooring alongside the terminal, the crewmembers on board found the vessel had drifted about one metre away from the jetty due to change in draft after some cargo discharged. The third officer with the ordinary seaman went to the forecastle to tighten up the mooring ropes. In the process, the breast rope connected to the starboard winch parted and snapped on the head of the ordinary seaman. The ordinary seaman was seriously injured and sent to the hospital. He was certified dead at about 2000 hours in the hospital on the same day.

1.3 The investigation into the accident revealed that the main contributing factors to this accident were:

1.3.1 The number of mooring ropes used in the mooring arrangement was less than that as recommended. As a result, the tension in the mooring ropes was too high;

1.3.2 The mooring ropes on board this vessel were generally in poor condition and lacked of maintenance;

1.3.3 The crewmembers kept on tightening up the starboard forward breast rope which had a shorter lead (and hence with a higher share of loading) to pull the bow of the vessel to the berth. Such practice would increase the tension in that mooring rope which was finally parted; and

1.3.4 The mooring arrangement on deck failed to keep the winch operating positions clear from the snap back zone.

1.4 The investigation also revealed the following safety issues:

1.4.1 The Company did not promptly provide the spare mooring ropes to the vessel;

1.4.2 The Company failed to discover the problems on the mooring ropes despite shipboard inspections and audits; and

1.4.3 On the day of the accident, the terminal equipment for measuring the current velocity, the tidal status and the wind velocity were mal-functioned.

2. Description of the Vessel

Particulars of "*Equator Peace"*

Port of Registry:	Singapore
Flag:	Singapore
IMO No.:	9218179
Type of Vessel:	Bulk Carrier
Year of Built:	2000
Classification Society:	Nippon Kaiji Kyokai
Ship Management Company:	Synergy Marine Pte Ltd
Main Engine:	Diesel Engine; 13,917kW
Length, Overall:	287.64m
Length Between Perpendiculars:	277m
Breadth:	45m
Depth:	24.1m
Gross Tonnage:	85,868
Net Tonnage:	56,634
Deadweight:	171,191
Speed:	14.4 knots
Number of Crew:	22
Max. Breaking Load (MBL) of the mooring ropes:	77200 kgs (77.2 Ton)

Fig. 1 Bulk Carrier "*Equator Peace*"

3. Source of Evidence

3.1 On-scene visit

3.2 The master and the crew of "*Equator Peace*"

3.3 The ship management company

3.4 China Light & Power (Tap Shek Kok Marine Terminal)

4. Outline of Events

(All times used in this report are local time in Hong Kong (UTC+8)

4.1 On 10 April 2013, the *"Equator Peace"* (the vessel) received a voyage instruction from its Charterer stating that the vessel would carry coal to the Tap Shek Kok Terminal of the China Light and Power (CLP) in Hong Kong. The master sent a message to the company claiming that the tidal streams at the CLP berth were strong and the mooring ropes available on board the vessel were not in a good condition. He therefore raised an urgent requisition for two new mooring ropes to be used in the mooring operation in Hong Kong. On the same day, the company replied the master that delivering mooring ropes to the vessel in Indonesia was not possible and they would check the price and deliver them to the vessel in Hong Kong.

4.2 On 16 April 2013, the vessel departed Adang Bay, Indonesia for Hong Kong with a load of coal. The vessel arrived at Hong Kong Outer Port Limit on 5 May 2013 at about 0530 hours awaiting for berthing instruction. On 24 May 2013, the vessel came alongside the CLP coal terminal at Tap Shek Kok at about 1230 hours. The ship was berthed alongside the terminal as shown in Fig. 2. Cargo work was started at about 1500 hours.

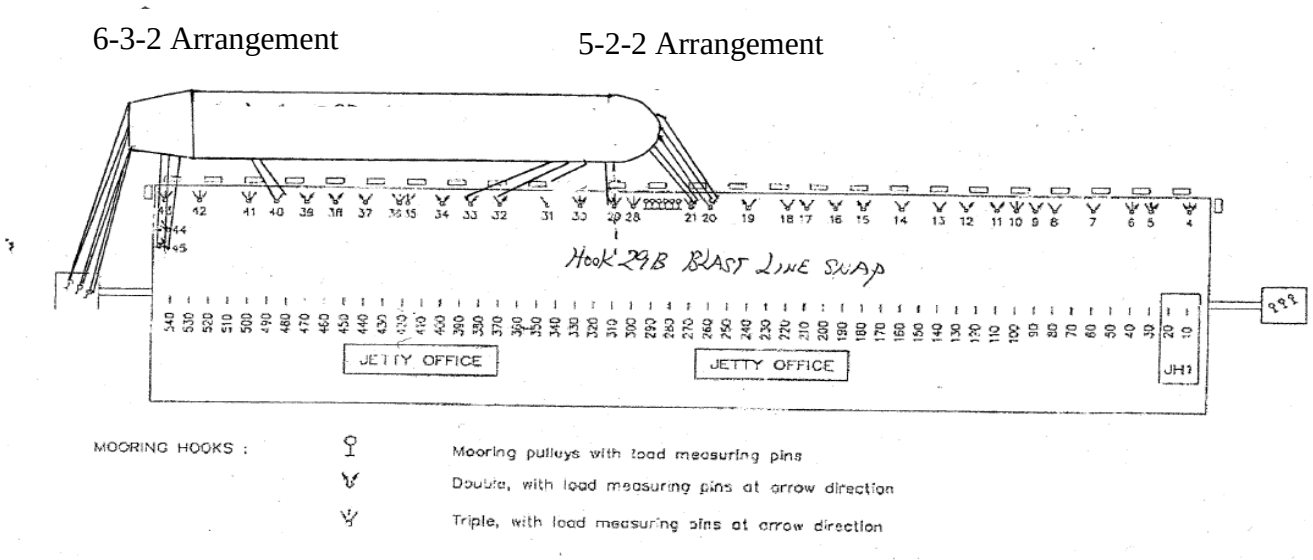


Fig. 2 The berthing position of the vessel in Tap Shek Kok Terminal

Before arriving at the berth, the master agreed with the pilot that the vessel should be berthed with a mooring ropes arrangement of 6-3-3 forward and aft respectively. However, during the mooring operation, one of the forward spring mooring ropes was found fouled on the fender and rendered useless. The vessel was finally moored with 5 head ropes; 2 breast ropes and 2 springs in the forward (5-2-2) and 6 stern ropes; 3 breast ropes and 2 springs in the aft (6-3-2). Details of the mooring arrangements for Forward and Aft ends were shown in Fig. 3.

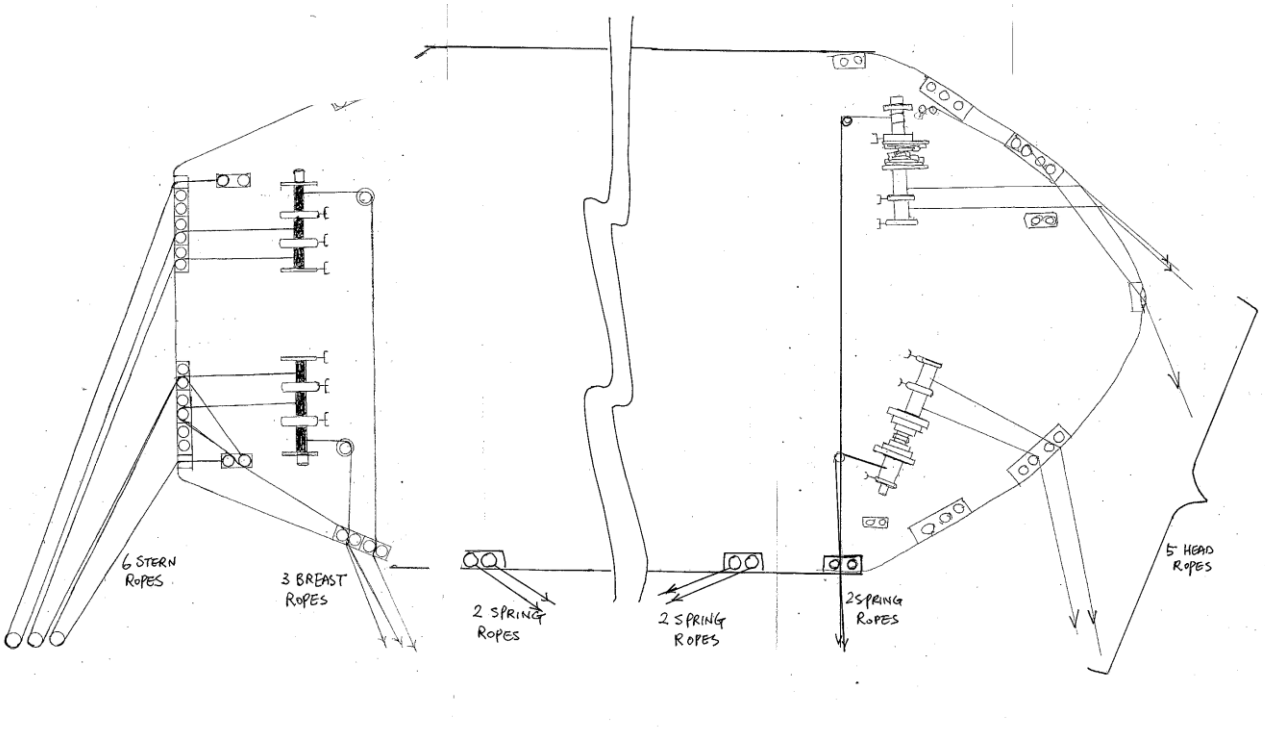


Fig. 3 Mooring Arrangements in Forward and Aft of the vessel

4.3 On 24 May at 1800 hours, the third officer started his watch. The second officer told him that the vessel was about 1 metre away from the berth and needed to tighten up the mooring ropes. The third officer together with an ordinary seaman (OS) went forward and the second officer with an able-bodied seaman (AB) worked in the stern. When the third officer's team arrived at the forecastle, they removed the mouse traps and checked the mooring ropes. The OS switched on the power to starboard mooring winch and engaged the breast rope drum gear with the hydraulic motor and released

the brake. The third officer tried to tighten up the breast rope which was connected to the starboard winch. However, the breast rope was not able to bring the ship alongside. During this operation, the OS was standing beside the third officer.

4.4 The third officer called the second officer by radio and asked him to stop the motor of the stern mooring winch and ordered the OS to switch on the second motor for the mooring winch. He then went to gear up the portside winch to tighten up the head ropes. At the same time, the third officer ordered the OS to tighten up the breast rope which was connected to the starboard winch. The OS went to the operation position on the platform of the starboard winch as shown in Fig. 4 and started to tighten up the breast rope.

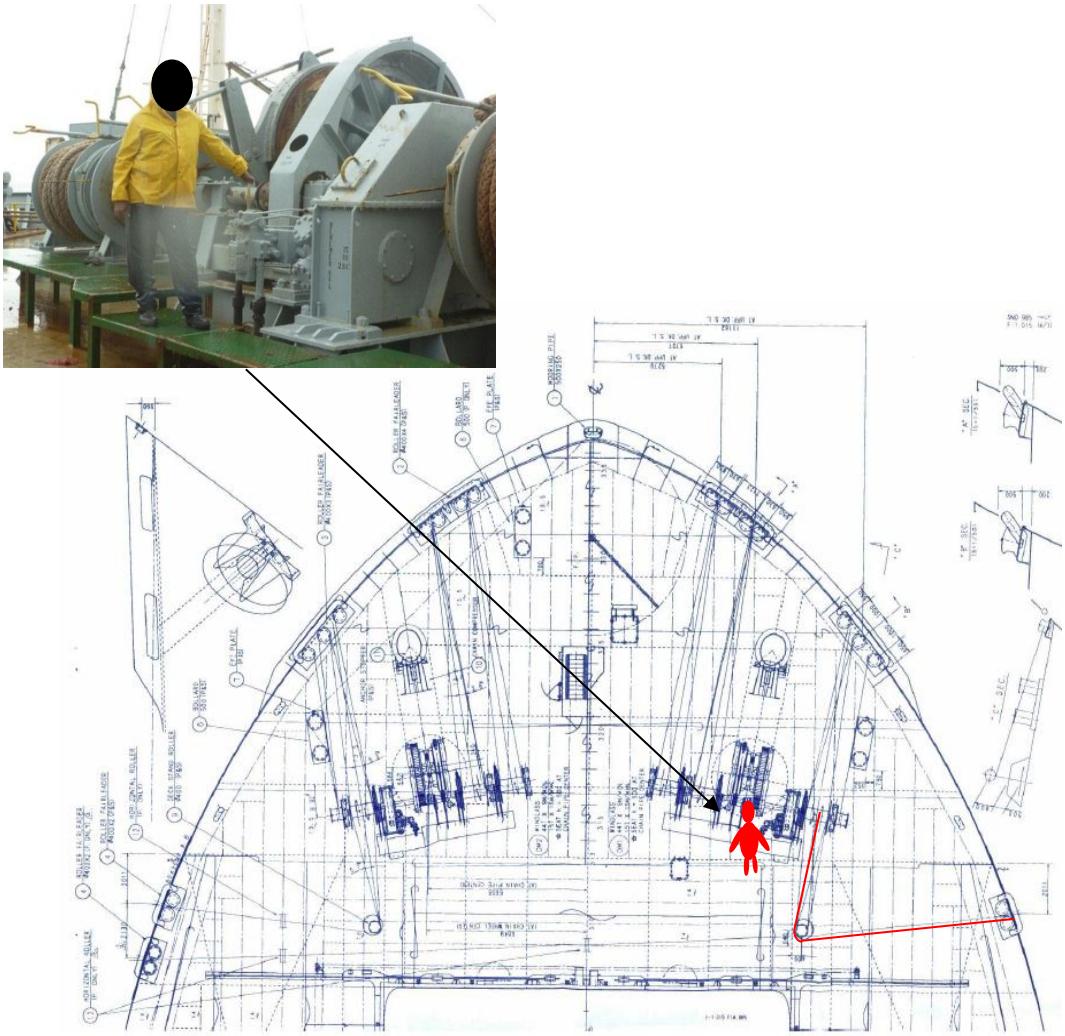


Fig. 4 The position of the OS before being struck by the parted mooring breast rope

4.5 During this operation at 1800 hours, the starboard forward breast rope suddenly parted (as shown in Fig5) and the parted mooring rope struck the OS on his head and the OS suffered from serious head injuries.

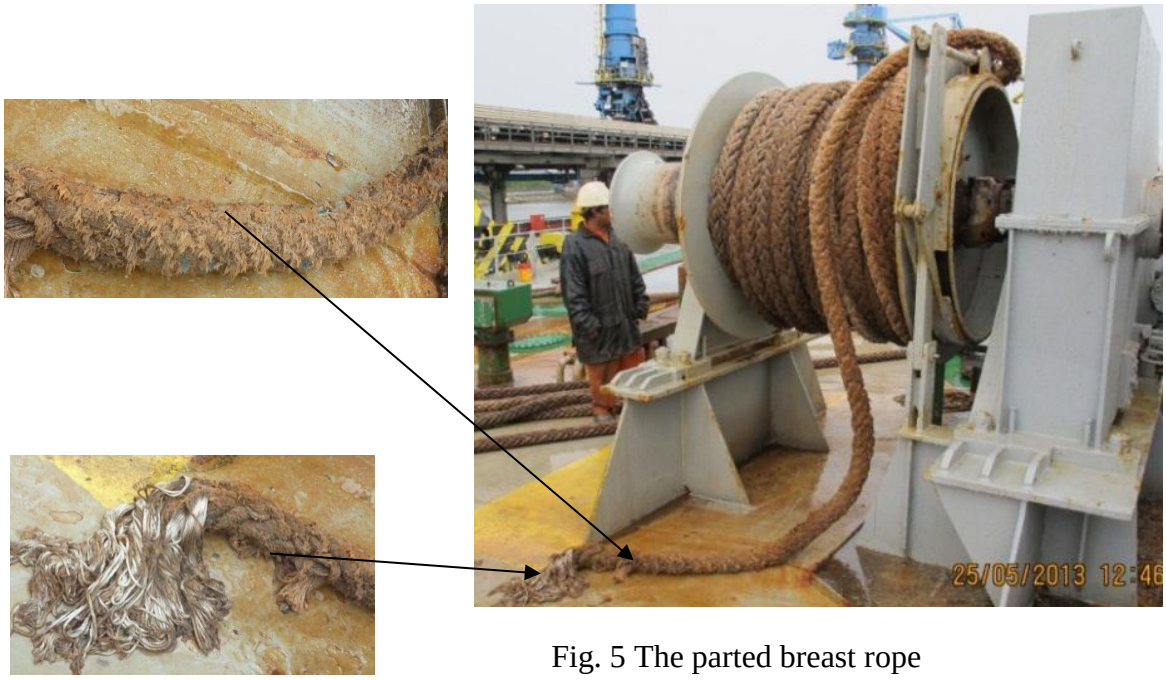


Fig. 5 The parted breast rope

The third officer called out through the radio that a forward breast rope was parted and the OS was seriously injured and required urgent help. The master called the agent for help and other crewmembers brought a stretcher to bring the injured OS to starboard side near the gangway. An ambulance soon arrived and conveyed the injured OS to hospital. The OS was later certified dead in the hospital.

4.6 When the forward breast rope parted, a section of the parted rope struck a panel under the unloader* beside the jetty and also knocked out some of the railings. The panel door was deformed and the railings were pulled out from the anchoring position as shown in Fig. 6 & Fig. 7.

Remarks: *An unloader was an equipment fitted at the terminal for unloading coal cargo from the vessel to the terminal.

Knocked
down rails

Fig. 6 Rails in ways of the parted rope were knocked out form their anchored positions

Fig. 7 The damage caused by the parted mooring rope on the shore equipment

5. Analysis of Evidence

Condition of the mooring ropes

5.1 A mooring rope will be parted when the tension exerted on the rope exceeds the Maximum Breaking Strength (MBS) of the rope. However, if the yarns in the mooring rope were deteriorated or partly damaged, the rope might still be parted even if the tension exerted on it was below its nominal MBS.

5.2 When a ship is secured to a terminal by a system of mooring ropes, the total load and its distribution between the ropes depends on the following of factors:

i) the environmental forces acting on the vessel;
ii) the conditions and properties of the ropes;
iii) tending of the mooring ropes;
iv) the mooring pattern of the ship.

5.3 When this accident took place, the tension exerted on the ropes was not measured by any instrument and hence the actual tension of the parted rope was not known. The condition of the mooring ropes provided on the vessel was poor especially the parted one. The condition of the rope was considered as one of the contributory factors of the accident.

Environmental forces acting on the ship

5.4 Two environmental forces acting on the hull of the ship:

a) wind; and
b) tidal current at the jetty.

5.5 According to the Hong Kong Observatory, the wind velocity, was 13km/hr and the wind direction was southerly (about 45 degrees acting on the vessel's starboard beam), the effects of the wind was mild and did not have a significant effect to the vessel.

5.6 In the Tap Shek Kok Marine Terminal, there was a current meter, a tide gauge and an anemometer installed to measure the velocity of the current, the height of the

tide and the wind velocity respectively. However, on the day of accident, the terminal claimed that all these instruments were defective and no real time figures could be provided for investigation.

5.6 The China Light & Power Station Tap Shek Kok Marine Terminal had published the "Terminal Information and Rules & Regulations" (Fourth Revision) booklet (hereafter referred to as Terminal Information Booklet), it provided some data to the estimation of the load on the ropes.

5.7 The direction and magnitude of the tidal current at the terminal jetty:

According to the Tide Tables for Hong Kong 2013 published by Hong Kong Observatory, the times and heights of high and low tides at Lok On Pai** before and after the accident on are as below:

	Time (24 May 2013)	Metre
Low Tide	15:49	0.2
High Tide	22:21	1.6

The tidal variation of the dates (from 22 May 2013 to 28 May 2013) at Lok On Pai tide station from the Hong Kong Observatory were as below:

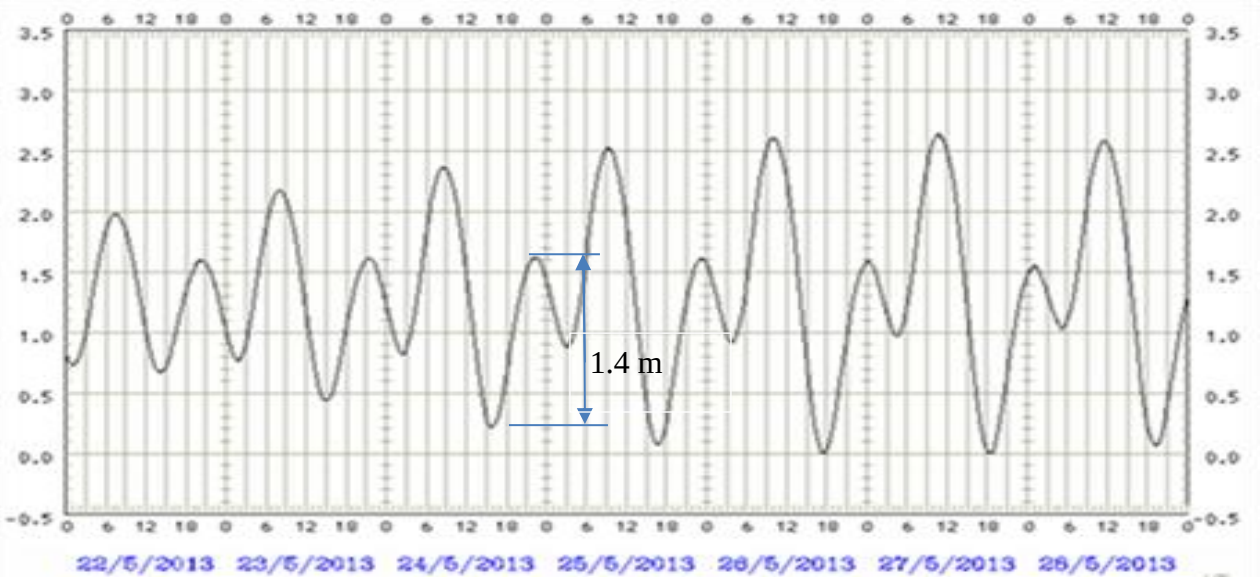


Fig.8 Tidal variation with time record in the Lok On Pai, by the Hong Kong Observatory

Remarks: **Lok on Pai was a tide station at about 4.3 nautical mile East of the Tap Shek Kok Marine Terminal

5.8 The different between the high and low tides were 1.4 metres which was moderate comparing to the other periods (Fig. 8).

5.9 At the time of the incident, the direction of the tidal stream was north-westerly and the wind was southerly. The tidal stream was about to push the vessel to forward direction while the wind was to push the vessel towards the jetty (Fig. 9). Furthermore, both the strengths of the tidal stream and the wind were moderate and mild respectively. The environment effects were not considered as the main factors leading to the accident.

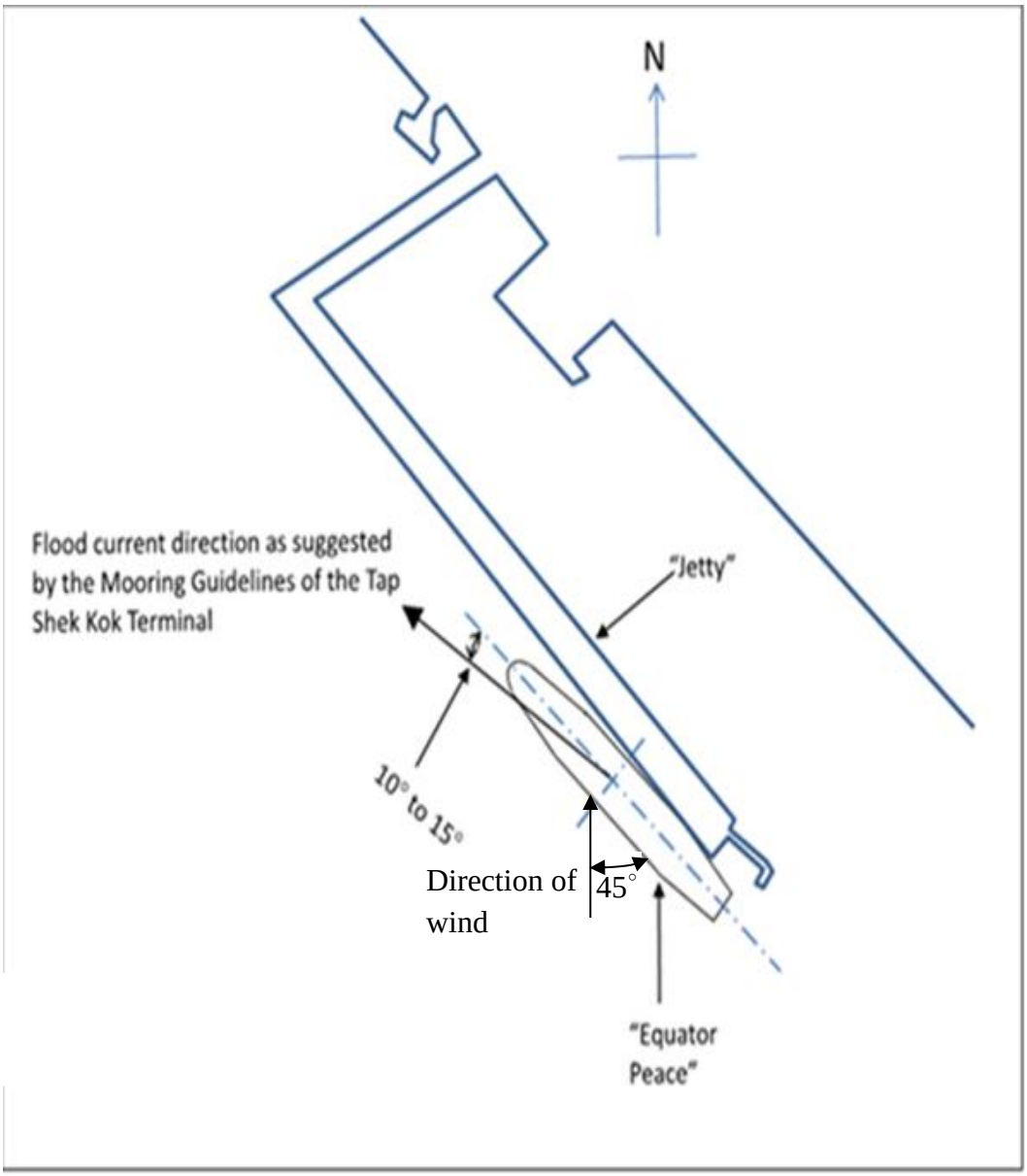


Fig. 8 Direction of the force acting on the vessel due to tidal stream and wind

Condition of the mooring ropes

5.11 There were 16 sets of mooring ropes on drums and 3 sets of spare ropes. But they were old and used ropes. The specifications of the mooring ropes as follows:

i. Polypropylene Hi-Min 8-strand Rope
ii. Medium-Soft Lay
iii. Diameter: 72 mm
iv. MBL (Max. Breaking Load): 77200 kgs (77.2 Ton)
v. Breaking Load test witness Certificate issued by Lloyd's Register, 3 sets

Fig. 9, 10, 11 and 12 showed the condition of the mooring ropes of the vessel when the investigation officer visited the vessel.

Fig. 9 showed that one of the stern ropes suffered from abnormal wear on the surface of the rope causing darkening of the surface and damages to the surface yarns.

Fig. 10 showed the condition of a spring mooring rope loaded on a drum of the forward spring mooring winch. Two out of the 8 strands were cut through.

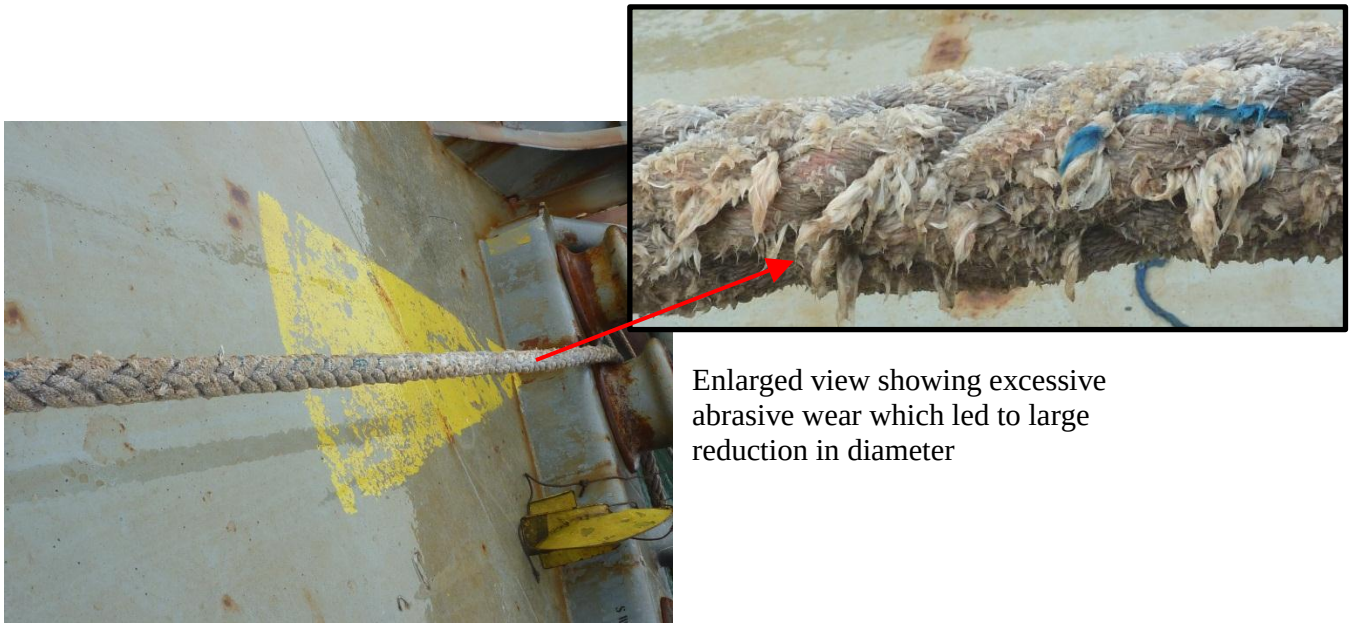
Fig. 11 indicated the condition of the remaining forward breast rope. The enlarged view showed that the rope suffered from serious abrasion and there were positions with large reduction in the diameter.

Fig. 12 showed a mooring rope lying on the deck. A section of the rope was found almost parted.

Fig.9 One of the Stern ropes showed sign of chemical damage on the surface

Fig. 10

Condition of a mooring rope which was loaded on the drum of the forward spring mooring winch. Deep cuts were found on two strands.



Enlarged view showing excessive abrasive wear which led to large reduction in diameter

Fig. 11 Condition of the remaining forward breast rope

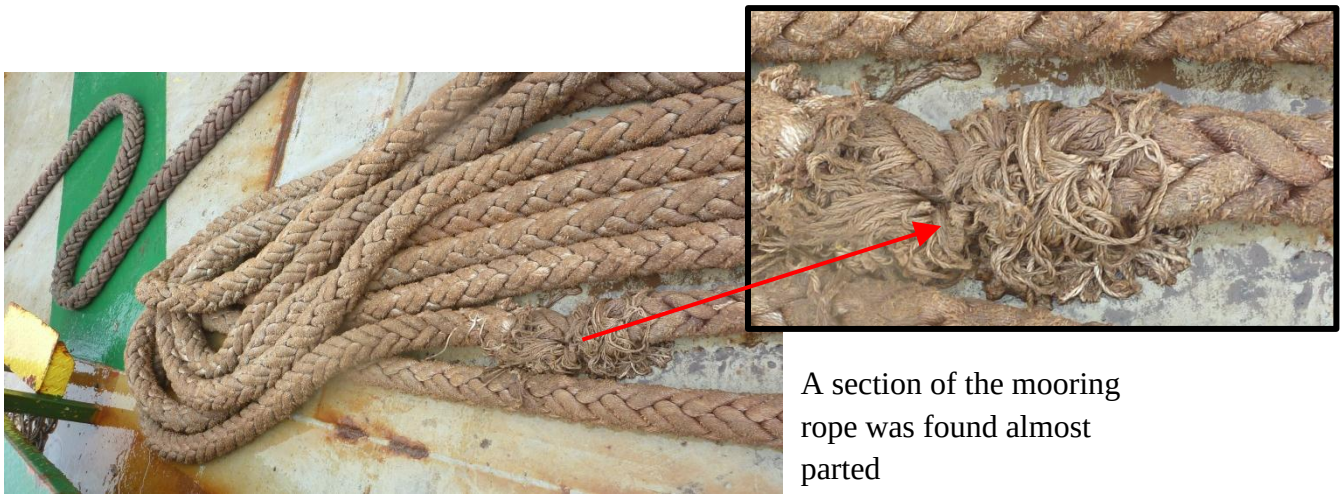


Fig. 12 General condition of a mooring rope found on deck of the vessel

5.12 The general condition of the mooring ropes on board was poor. Fig. 13 showed the condition of the mooring rope at the position of parting with all the strands spread out. The damages are highlighted with red circles indicated the positions where the yarns of each strand that was shorter comparing with the other yarns in the same strand. The shorter yarns were not over-strained in the parting in the accident. The ends of the short yarns were also stained to a brownish colour which meant that they had been worn down for a long time before the mooring rope was finally parted. All these signs indicated that the condition of the rope was poor before it parted. Furthermore, the surface yarns of the remaining portion were found various damages with hairy appearance. (Fig. 14)

Fig. 13 Photo showing the condition of the strands at the position of parting

Fig. 14 Photo showing the section of the parted mooring rope remained on board

5.13 SOLAS Chapter II-1 Reg. 3-8 required that ships shall be provided with arrangements, equipment and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associate with the normal operation of the ship. There were three mooring rope Breaking Load Test Certificates kept on board but there were a total of 19 sets of mooring ropes. The crewmembers also admitted that they did not know if these certificates actually belonged to these mooring ropes.

5.14 In section 25.3.5 of the Code of Safe Working Practices for Merchant Seamen, frequent inspection of the mooring ropes was required. There was no objective evidence on board showing that this requirement has been complied with.

5.15 In the Safety Management System (SMS) manual of the vessel, the chief officer was responsible for ensuring all mooring equipment to be maintained in good working condition and for ensuring that the vessel remained safely moored

alongside. There was no objective evidence on board indicating that the poor condition of the mooring ropes had been reported to the Management Company. In addition, there was no record of inspection and maintenance of the mooring ropes kept on board.

Tending of the Mooring Ropes

5.16 According to the SMS manual, "*As long as a ship is secured alongside, moorings were only required to absorb the loads arising from wind, current, passing ships and loading /discharging. However, once there was slack in the mooring system, the ship could move and large dynamic loads would occur*". Hence, in case of large environmental forces e.g. high current velocity were anticipated, mooring ropes should not be the only means to push the vessel alongside.

5.17 In the two attempts to pull the bow of the vessel alongside, only the starboard breast rope was used. Owning to the shorter lead of the starboard breast rope, the tension induced on the starboard rope was larger than the tension in the port rope. Such aggregation of tension in the rope increased the chance of parting.

5.18 The SMS manual required that the person in charge should ensure that Staff were stationed in safe areas, having due regard to the likely lash back zones of parted ropes. The third officer, being the person in charge of this operation, he failed to observe the said requirement.

Support from the Terminal

5.19 The Terminal Information Booklet claimed that berthing aids, including the Laser Docking System, a Current Meter, a Tide Gauge and an anemometer were available to help the berthing. However, the terminal reported that the above instruments were defective on the day the accident took place. Had the real time data were available, the information could provide more information for the mooring gangs.

Support from the Shipping Company

5.20 At the time when the master of the vessel received the voyage instruction from his charterer, he immediately raised a request for 2 new mooring ropes to the management company. However, after the vessel arrived at Hong Kong and stayed at anchorage for half of a month, the mooring ropes have not been sent to the ship. The mooring ropes were finally delivered three days after the accident.

It indicated that the support from the management company was not effective in this incident.

5.21 The management company was not able to provide any evidence that the problems with the mooring ropes were addressed to in any internal or ISM audits.

Mooring arrangement

5.22 The mooring arrangement 6-3-3-3-3-6 verse 5-2-2-2-3-6

The China Light & Power Station Tap Shek Kok Marine Terminal had published the "Terminal Information and Rules & Regulations" (Fourth Revision) booklet (hereafter referred to as Terminal Information Booklet), it provided mooring guidelines for the ship and terminal operators to refer to.

According to the mooring guidelines, vessels of size larger than 145,000 DWT should be moored with a 6-3-3-3-3-6 pattern, i.e. 6 head ropes, 3 forward breast ropes, 3 forward spring ropes, 3 aft spring ropes, 3 aft breast ropes and 6 stern ropes. Such arrangement was also agreed between the master, the Pilot and the Terminal Management before berthing. However, during berthing, one of the mooring ropes was fouled but it was not replaced with the spare mooring ropes. Instead the mooring arrangement was reduced to 5-2-2-2-3-6. Such reduction in number of mooring ropes increased the tension exerted on all mooring ropes and made the defected breast rope more vulnerable to parting.

6 Conclusion

6.1 On 24 May 2013, a fatal accident happened on board the Singapore registered bulk carrier "*Equator Peace*" at the Tap Shek Kok Marine Terminal, Hong Kong.

6.2 At about 1800 hours, when the vessel was mooring alongside the terminal, the crewmembers on board found the vessel had drifted about one metre away from the jetty due to change in draft after some cargo discharged. The third officer with the ordinary seaman went to the forecastle to tighten up the mooring ropes. In the process, the breast rope connected to the starboard winch parted and snapped on the head of the ordinary seaman. The ordinary seaman was seriously injured and sent to the hospital. He was certified dead at about 2000 hours in the hospital on the same day.

6.3 The investigation into the accident revealed that the main contributing factors to this accident were:

6.3.1 The number of mooring ropes used in the mooring arrangement was less than that as recommended. As a result, the tension in the mooring ropes was too high;

6.3.2 The mooring ropes on board this vessel were generally in poor condition and lacked of maintenance;

6.3.3 The crewmembers kept on tightening up the starboard forward breast rope which had a shorter lead (and hence with a higher share of loading) to pull the bow of the vessel to the berth. Such practice would increase the tension in that mooring rope which was finally parted; and

6.3.4 The mooring arrangement on deck failed to keep the winch operating positions clear from the snap back zone.

6.4 The investigation also revealed the following safety issues:

6.4.1 The Company did not promptly provide the spare mooring ropes to the vessel;

6.4.2 The Company failed to discover the problems on the mooring ropes despite shipboard inspections and audits; and

6.4.3 On the day of the accident, the terminal equipment for measuring the current velocity, the tidal status and the wind velocity were mal-functioned.

7 Recommendations

7.1 A copy of the report should be sent to the Maritime and Port Authority of Singapore (MPA) for their consideration to request the ship management company:

i) to inform the master, officers and crewmembers of the vessel the findings of this accident investigation;

ii) to ensure the deck mooring arrangement be planned in such a way to prevent crew members staying within snap back zones while controlling winch;

iii) to ensure the crewmembers to observe company safety procedures to avoid persons from staying within the snap back zones of mooring ropes at all times;

iv) to provide instructions and procedures in the Safety Management System for the inspection and maintenance of mooring ropes and the criteria for their replacement;

v) to provide prompt support to the shipboard management upon requisitions of essential stores and provisions; and

vi) to carry out additional safety audits to ensure good maintenance of mooring equipment on board and all relevant safety procedures are followed.

7.2 A copy of the report should be sent to the company of the Tap Shek Kok Marine Terminal, to inform them of the findings of the investigation. The company should, as far as practicable, ensure that:

i) the terminal equipment are well maintained at all times; and

ii) both the personnel of the ships and the terminal should observe the mooring guidelines stipulated in their rules and regulations(*).

(*) The rules and regulations are referred to the "Castle Peak Power Station China Light Power Station Tap Shek Kok Marine Terminal Information and Rules and Regulations" Fourth Revision issued on 15.04.2011

8. Submission

8.1 In the event that the conduct of any person or organization is commented in an accident investigation report, it is the policy of the Marine Department to send a copy of the draft report in its entirety or parts thereof to that person or organization for comments.

8.2 The draft report was sent to the ship management company and the master of the vessel for their comments.

8.3 The draft report was sent to the company of Tap Shek Kok Marine Terminal for their comments.

8.4 The draft report was sent to the flag state of the vessel, MPA for their information and comments.

8.5 Comments were received from the ship management company and the report was amended as appropriate.