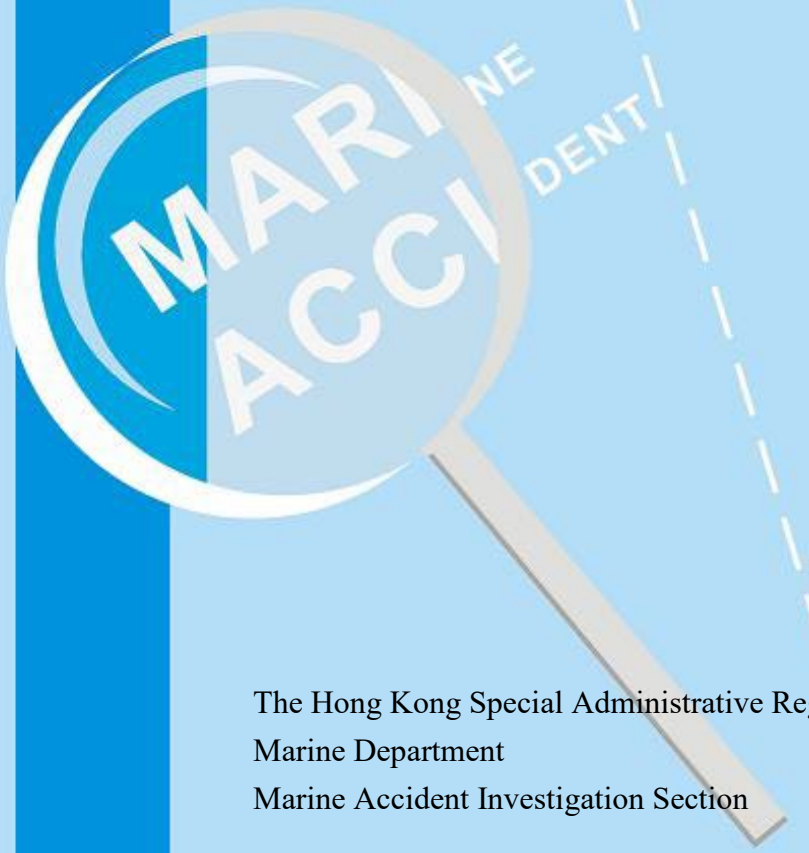
Report of investigation into the fatal accident happened on board Hong Kong registered bulk carrier "*Great Century*" during shifting operation at the port of Pascagoula, USA, on 20 November 2022



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

19 June 2023

Purpose of Investigation

The purpose of this investigation, conducted by the Marine Accident Investigation Branch (MAIB) of Marine Department, is to determine the circumstances and the causes of the incident with the aim of enhancing the safety of life at sea and avoiding similar incidents in future.

It is not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAIB 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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Summary

On 18 November 2022, the Hong Kong registered bulk carrier "Great Century" (*the vessel*) was alongside by her port side at No.8 berth of Chevron Coke Dock (*the terminal*) at the port of Pascagoula, USA (*the loading port*) for loading cargo of petroleum coke in bulk.

At 1748 hours on 18 November 2022, *the vessel* commenced loading operation. Due to the operational limits of the loading machine of *the terminal*, *the vessel* was required to be shifted forward or backward for loading cargo to different cargo holds of *the vessel* according to the loading plan. At 2338 hours on 20 November 2022, the crew of *the vessel* started to shift *the vessel* for about 60 meters ahead (*the shifting operation*) for loading cargo into holds Nos. 2, 3 and 4. At 2356 hours, the Master of *the vessel* (the Master) instructed the second officer (2/O) to heave the slack aft spring line when *the vessel* was in position. Afterwards, 2/O relayed the order to an able seaman (AB1) by VHF radio to heave the slack aft spring line by winch and he then ran forward to the position near the port side bunker hose crane (*the accident site*) to check the condition of the spring lines. Unfortunately, 2/O was hit heavily in a flash by the aft spring line due to sudden escaping from the edge of the fender, lying on the main deck with blood in his mouth and nose without breathing and pulse. Despite shipboard first aid carried out by the crew and medical treatment was initiated by shore medical team for the 2/O, the 2/O was declared dead onboard by shore medical team at 0038 hours on 21 November 2022.

The investigation identified that the contributory factors leading to the accident were that the crew failed to follow the requirements of the "Code of Safe Working Practices for Merchant Seafarers"[1](*the Code*) of section 26.3.13 to remain in a safe position when mooring lines are under strain and its recommendation to identify the dangerous areas by using a bird's eye view of the mooring deck arrangement during *the shifting operation* including the provision of illumination around the fender area which was far from the vessel; the crew failed to follow the requirements of *the Code* of section 26.3.12 to hold a toolbox meeting before *the shifting operation*;

[1] The Code is a publication required to be carried onboard Hong Kong ships pursuant to the Merchant Shipping (Seafarers) (Code of Safe Working Practices) Regulation (Cap. 478M)

the crew lacked a safe working culture of good communication and clear leadership during *the shifting operation;* the shipboard training on mooring/unmooring operation to 2/O was ineffective; the shipboard risk assessment for mooring and unmooring operations was ineffective; and 2/O lacked safety awareness to the risk of snap-back zone of the mooring lines when they were under strain.

1. Description of the vessel

Ship name	:	*Great Century* (Figure 1)
Flag	:	Hong Kong, China
Port of registry	:	Hong Kong
IMO number	:	9796999
Type	:	Bulk Carrier
Year built, shipyard	:	2017, Dalian COSCO KHI Ship Engineering Co., Ltd., China
Gross tonnage	:	34,590
Net tonnage	:	20,201
Length overall	:	199.90 meters
Breadth	:	32.24 meters
Depth	:	18.60 meters
Engine power, type	:	8130 kW, MAN B&W 6S50 ME-B9.3
Classification society	:	China Classification Society
Registered owner	:	SEA 17 LEASING CO. LIMITED
Management company	:	Hong Kong Ming Wah Ship Management Company Limited

Figure 1: *Great Century*

2. Sources of evidence

2.1 Information provided by the Master, the crew members and the management company (*the Company*) of *the vessel*.

3. Outline of events

(All times were local time UTC - 6 hours)

3.1 At 1236 hours on 18 November 2022, *the vessel* was alongside by her port side at *the terminal* in *the loading port* for loading cargo of petroleum coke in bulk.

3.2 *The terminal* was equipped with a loading machine consisting of a conveyor belt and loading spout[2] (Figure 2), which can be travelled on the arced rail during loading operation. The movement of the loading spout was within a limited range due to the construction of arced rail.

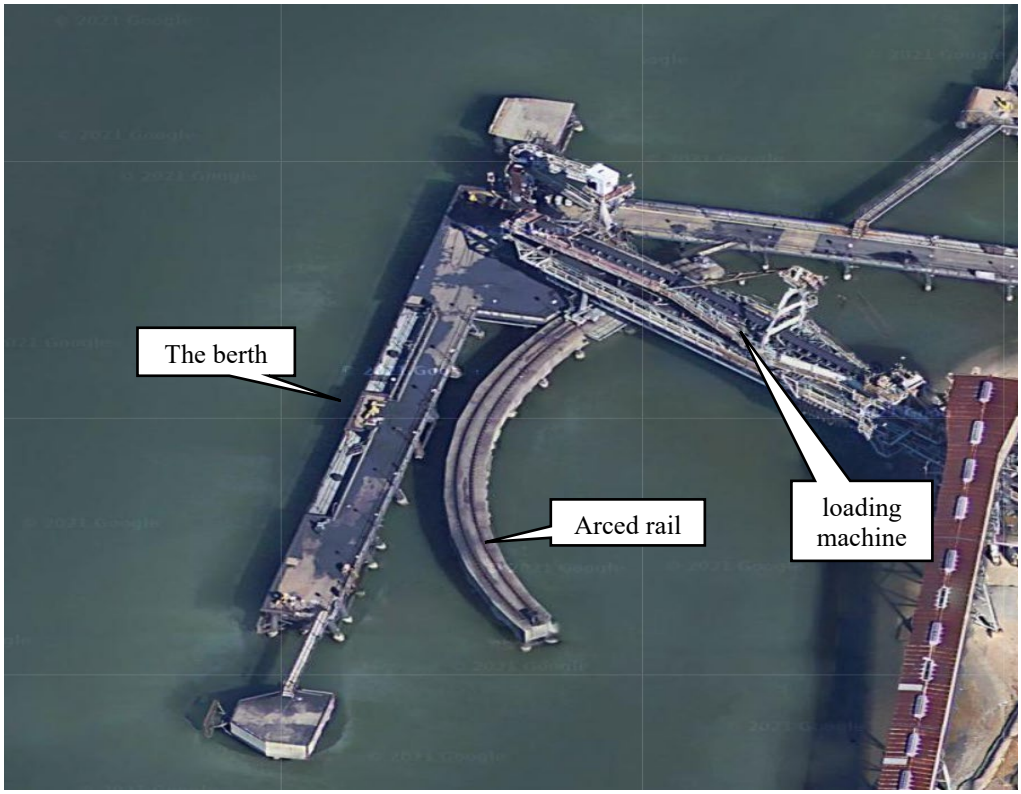

Figure 2: layout of *the terminal*[3]

[2] Loading Spout (also known as loading chutes) provides fast and steady material flow during the loading of dry/bulk solid materials in open and/or enclosed vessels such as trucks, railcars, tank vehicles, ships, barges, and stockpiling. These loading spouts are designed to capture fugitive dust, prevent material waste, and ensure plant and environmental safety.

[3]https://www.google.com/maps/search/No+8+berth+of+Chevron+Coke+Dock+Pascagoula,+USA/@30.3369914,-88.5118566,712m/data=!3m1!1e3?hl=zh-TW

3.3 *The vessel* was moored with twelve (12) pieces of mooring lines which are the head or stern lines, spring lines and breast lines on forward and aft of *the vessel* respectively (Figure 3 & 4). Each mooring[4] line was required to be adjusted for positioning the hatch of cargo hold to be loaded under the movement range of the loading spout, i.e. *the vessel* was required to be shifted backward or forward along *the terminal* during the loading operation.

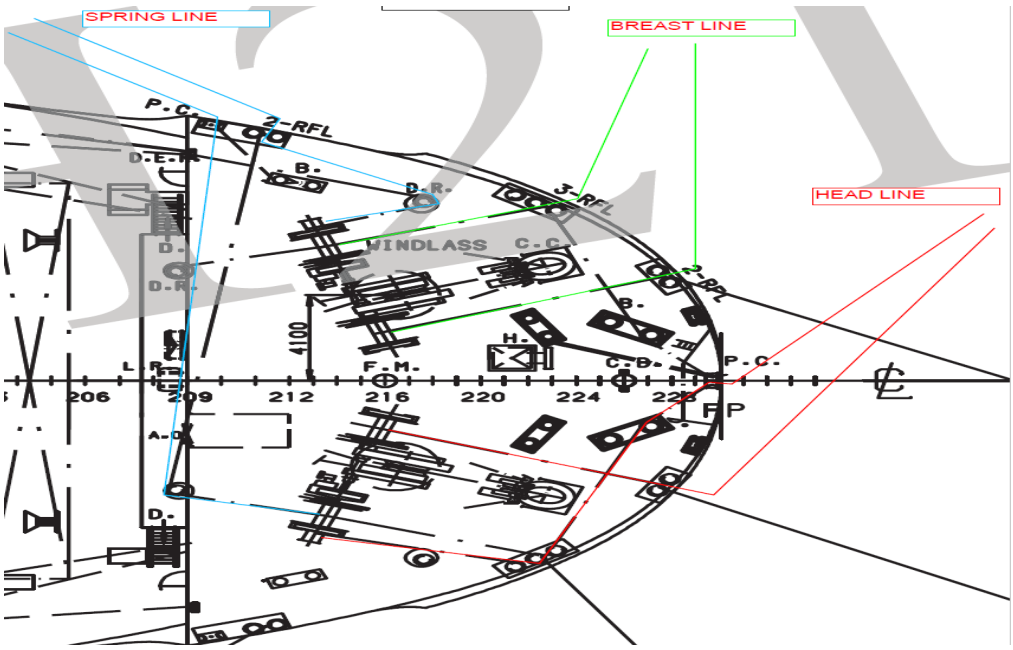

Figure 3: arrangement of mooring lines on fore mooring deck (color lines)

[4] **Breast lines** - mooring lines leading ashore as perpendicular as possible to the ship fore and aft line. They restrain the ship in one direction (off the berth). **Head lines** - mooring lines leading ashore from the fore end or forecastle of a ship, often at an angle of about 45 degrees to the fore and aft line. **Spring lines** - mooring lines leading in a nearly fore and aft direction, the purpose of which is to prevent longitudinal movement (surge) of the ship while in berth. They restrain the ship in two directions: headsprings prevent forward motion and backsprings prevent aft motion. **Stern lines** - mooring lines leading ashore from the after end of a ship, often at an angle of about 45 degrees to the fore and aft line. (https://www.wartsila.com/encyclopedia/term/mooring-lines)

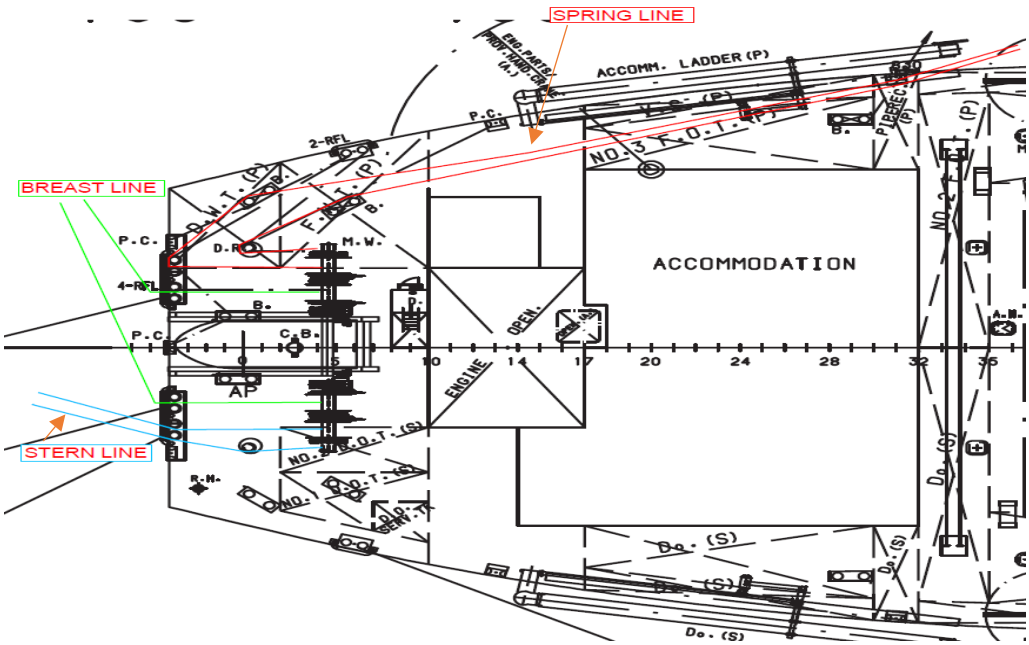

Figure 4: arrangement of mooring lines on aft mooring deck (color lines)

3.4 At 1348 hours on 18 November 2022, a pre-loading meeting was held between representatives of *the terminal* and *the vessel* and agreed with 30-minutes advance notice to stop loading when shifting vessel was required. As the shifting operation was carried out onboard *the vessel* only, no mooring lines would be shifted from its bollards and therefore no line handlers would attend *the shifting operation* at the terminal.

3.5 At 1748 hours, *the vessel* commenced loading cargo. At 1935 hours on 19 November 2022, *the vessel* completed the shifting operation for loading cargo to hold No.5 after partially loading in holds Nos. 2, 3 and 4. At 2324 hours on 20 November 2022, *the vessel* completed cargo loading in holds Nos.1 and 5.

3.6 At 2338 hours, *the vessel* was planned to shift ahead for about 60 meters for final loading holds Nos. 2, 3 and 4. The Master at the port bridge wing of *the vessel* was the overall in charge of *the shifting operation*. Three able seamen (i.e., AB1, AB2, AB3), deputy bosun and 2/O stood by at the aft mooring station. The bosun, an ordinary seafarer, the training deck officer (T/O) and the chief officer (C/O) stood by at the forward mooring station. They were assigned to operate the mooring winches and handle the

mooring lines as required during the shifting operation. The third officer (3/O) was assigned at midship of the port side main deck to spot the position of the loading spout.

3.7 At 2341 hours, the crew commenced shifting *the vessel* by adjusting the length of the mooring lines with the main engine on standby. At 2356 hours, *the vessel* was in position and the Master instructed to tend all mooring lines. After that, the Master noticed that the aft spring lines were slack and ordered 2/O to heave the aft spring lines. The 2/O relayed the order to AB1 who was operating the mooring winch to heave aft spring lines, and he then went forward quickly to check the condition of aft spring lines (Figure 5).

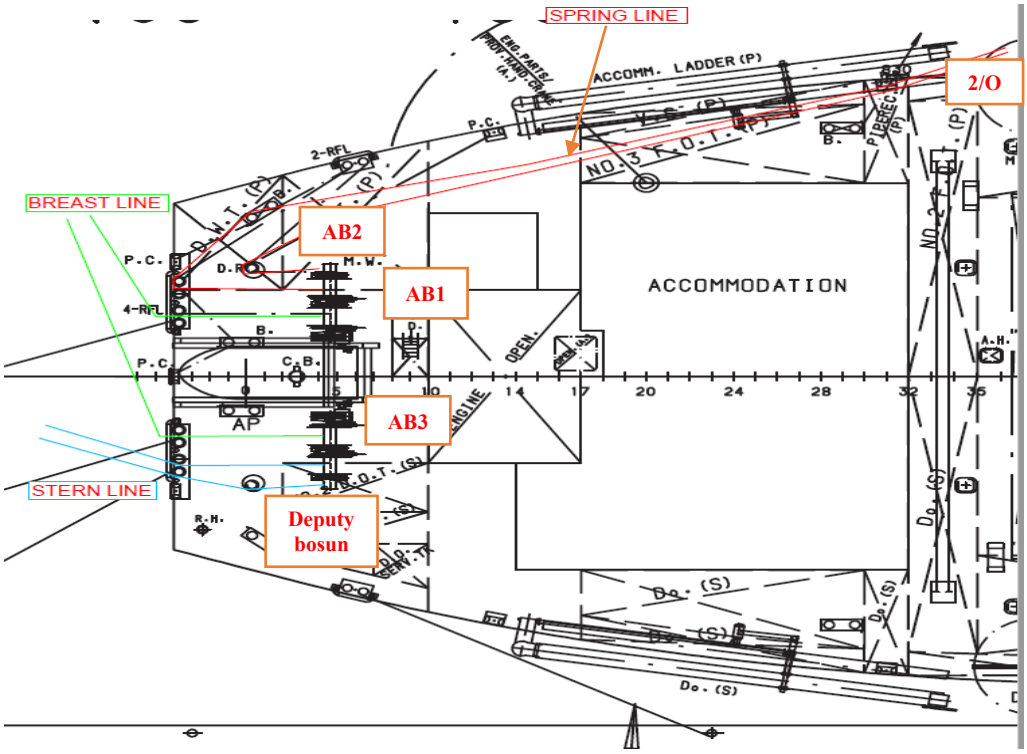

Figure 5: position of the crew at the aft deck at the accident time

3.8 Unfortunately, about 15 seconds after the 2/O relayed the order to AB1 to heave the aft spring lines, the Master heard a loud noise from the port side main deck in front of the accommodation. He looked down from the bridge wing and found 2/O lying on *the accident site* and one of the aft spring lines jumping up and down in an oscillatory movement.

3.9 The Master ordered C/O immediately to go to the spot with 3/O to assess the condition of 2/O and provide first aid to him. The C/O checked the vital signs of 2/O after arriving at *the accident site* and found 2/O had no breathing, no heart beating, blood in his mouth and nose, and bloody stain on deck around him (Figure 6). Meanwhile, the Master immediately contacted the local agent to seek emergency medical treatment for 2/O.

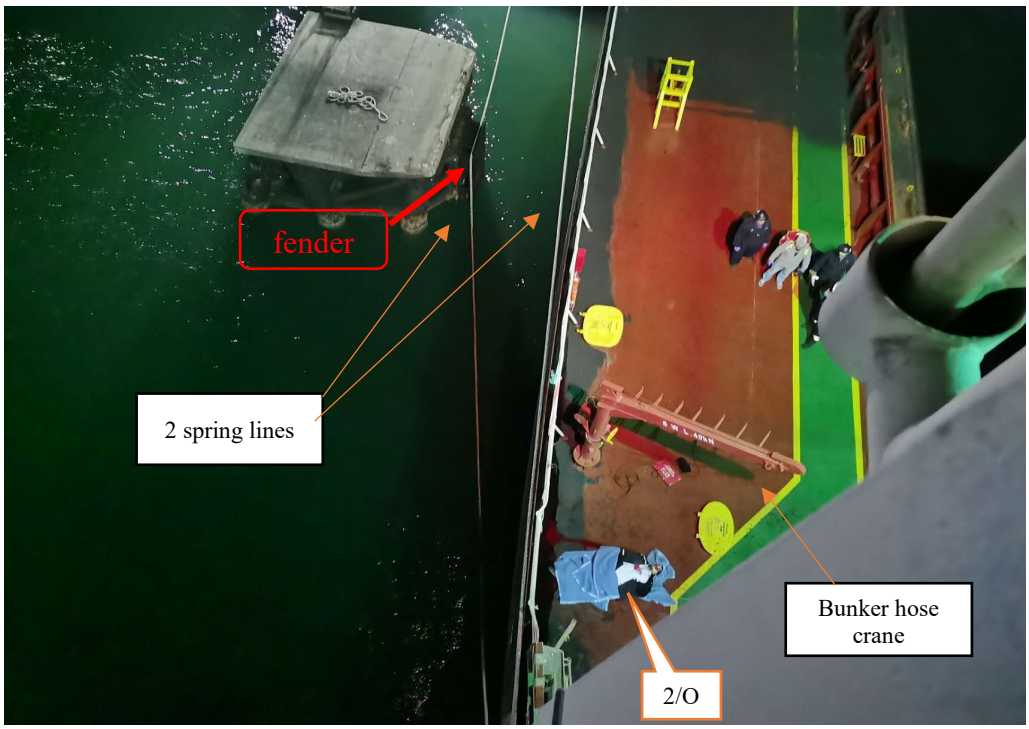

Figure 6: *the accident site*

3.10 At 0018 hours on 21 November 2022, the shore medical team arrived on board *the vessel* and applied medical first aid to 2/O. At 0038 hours, the 2/O was declared dead by the shore medical team and his body was sent ashore at 0240 hours.

4. Analysis

Certificates and manning

4.1 The statutory trading certificates of *the vessel* were valid and in order. *The vessel* was manned by 22 crew members, including the Master and fulfilled the requirements stipulated in the Minimum Safe Manning Certificate of *the vessel*.

4.2 The Master joined *the vessel* on 13 November 2022. He had 8 months of sea experience as a master. The Master possessed a Master Certificate of Competency issued by China, valid until 22 October 2024.

4.3 The Chief Engineer (C/E) joined *the vessel* on 11 January 2022. He had about seven years of sea experience as a chief engineer. The C/E possessed a chief engineer Certificate of Competency issued by China, valid until 27 August 2023.

4.4 The C/O joined *the vessel* on 11 January 2022. He had about one and half years of sea experience as a chief officer. The C/O possessed a chief officer Certificate of Competency issued by China, valid until 17 September 2026.

4.5 The 2/O joined *the vessel* on 13 November 2022. He had about five years of sea experience as a second officer. The 2/O possessed a second officer Certificate of Competency issued by Ukraine, valid until 12 July 2027.

4.6 The 3/O joined *the vessel* on 28 September 2022. He had about two years of sea experience as a third officer. The 3/O possessed a third officer Certificate of Competency issued by Myanmar, valid until 6 September 2023.

4.7 The bosun joined *the vessel* on 1 June 2022. He had about seven years of sea experience as a bosun.

4.8 The deputy bosun joined *the vessel* on 11 January 2022. He had about eleven months of sea experience as a deputy bosun.

4.9 The AB1 joined the vessel on 28 September 2022. He had about four years of sea experience as an able seaman.

4.10 The AB2 joined *the vessel* on 11 January 2022. He had about one year of sea experience as an able seaman.

4.11 The AB3 joined the vessel on 28 September 2022. He had about four years of sea experience as an able seaman.

4.12 There was no abnormality onboard with regard to the certification and qualification of the crew concerned.

Fatigue, alcohol and drugs abuse

4.13 There was no evidence to show that the crew on board suffered from either fatigue at work or abuse of alcohol and drugs.

Weather and sea conditions

4.14 On the day of the accident, the weather was fine with northerly wind of Beaufort wind scale Force 3. The sea was slight and visibility was good. The weather and sea conditions were not considered to be the contributory factors to the accident.

Illumination for shifting operation

4.15 Chapter 11.2.2 of *the Code* stated that adequate lighting should be provided in areas for transit, loading or unloading of cargo or other work processes. According to the photos of *the accident site* and poop deck provided by *the Company* (Figure 7), the illumination on *the terminal* and *the vessel* was sufficient for *the shifting operation* except for the area near the fender where the aft spring line was entangled as reported by the Master. The illumination might be considered to be one of the contributory factors to the accident.

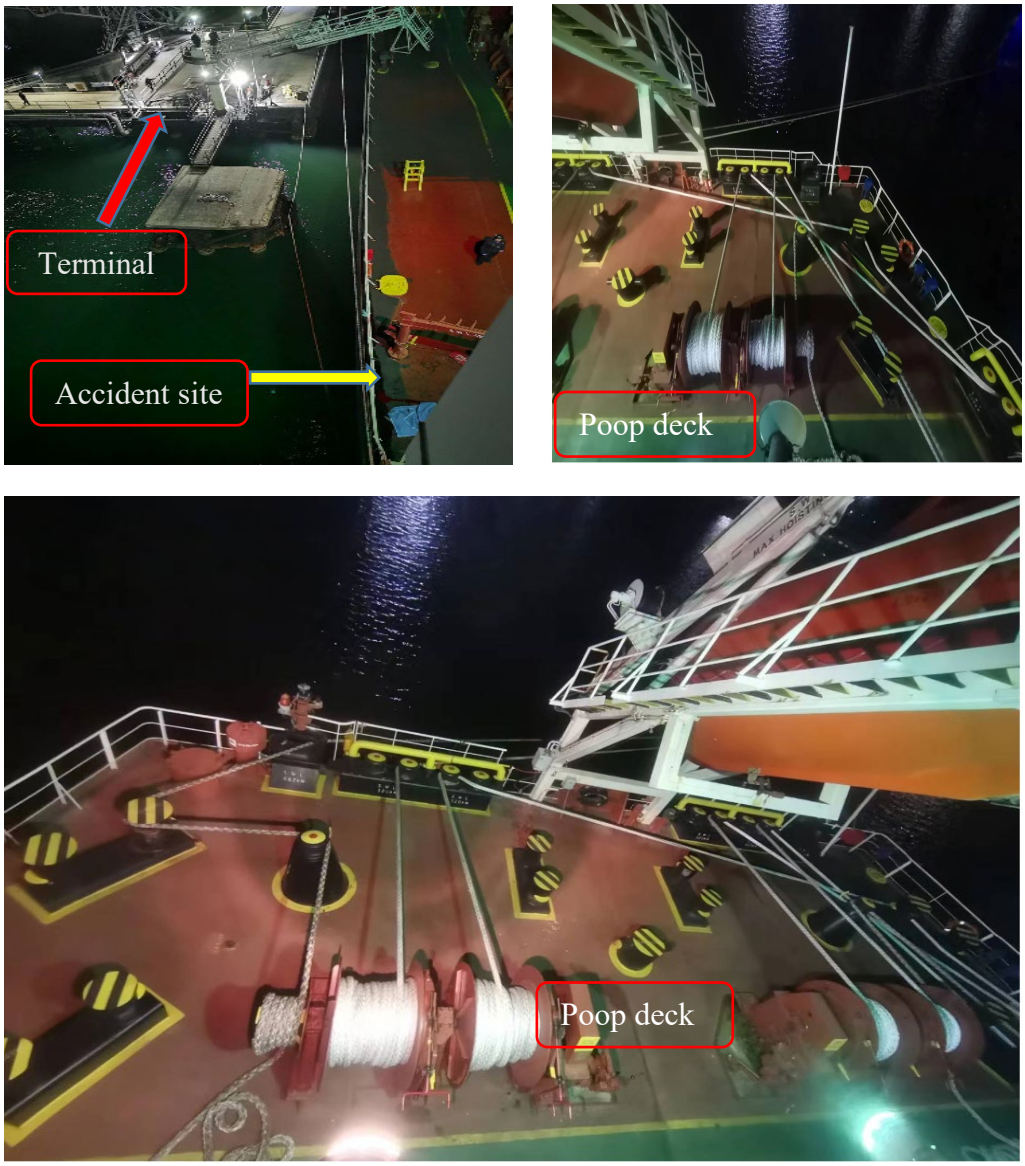

Figure 7: illumination of *the accident site*, terminal and poop deck

Cause of death

4.16 The aft spring lines were found slack when the vessel was in position during *the shifting operation.* The 2/O ordered AB1 to heave the slack aft spring lines and checked their condition simultaneously at *the accident site*. The investigation revealed that the 2/O was found lying on *the accident site* by the Master after a loud noise was heard while one aft spring line was jumping up and down in an oscillatory movement with the other aft spring line still being entangled by the upper edge of the fender. It could be deduced that the 2/O was hit heavily in a flash by the snap-back of the aft spring line, which escaped suddenly from the upper edge of

the fender due to continuous heaving operation.

Safety awareness to unsafe position

4.17 Section 26.3.13 of *the Code* advised that when mooring lines are under strain, all personnel in the vicinity should remain in positions of safety to avoid the snap-back zone. *The Code* also strongly recommends to produce a bird's eye[5] view of the mooring deck arrangement to identify dangerous areas.

4.18 The 2/O positioned himself at *the accident site,* which was 4 meters only to the fairlead of aft spring lines when the AB1 was heaving the aft spring line (Figures 8 & 9 refer). The 2/O was unaware of the risk of snapping back of the aft spring lines[6], which was entangled with the edge of the fender and might be free from the fender if under strain.

4.19 The Master was at the port bridge wing of *the vessel* in charge of *the shifting operation*. The investigation found that the Master failed to identify the dangerous areas on the mooring deck when he could acquire a bird's eye view from the bridge wing during *the shifting operation.*

4.20 The investigation revealed that 2/O lacked safety awareness to realize the risk of snap-back zone of aft spring lines when they were under strain. During *the shifting operation,* 2/O also failed to follow the requirement of *the Code* to remain in a safe position.

[5] A view from a high place to see a large area.
[6] The length of the aft spring lines from the fairlead to the bollard at the terminal was about 70 meters (Figure 9 refers).

Figure 8: the layout of two aft spring lines on aft main deck

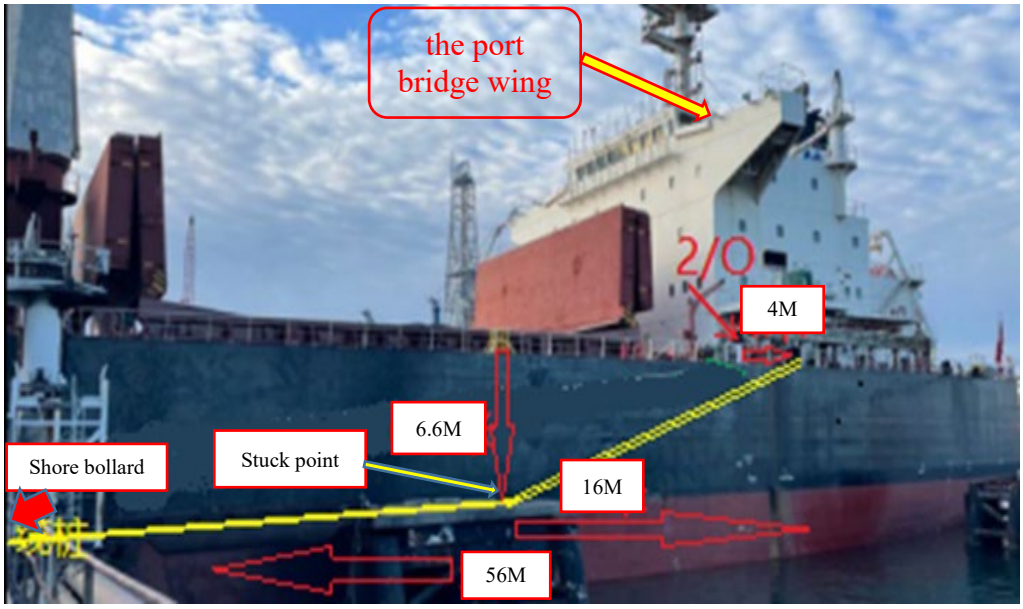

Figure 9: condition of spring lines prior to the accident

Risk assessment and toolbox meeting

4.21 Section 26.3.10 of *the Code* advises that risk assessment for making fast operation should consider the shoreside mooring equipment at the berth, with particular attention be given to the consequences of a line snagging on a fender and then suddenly released under tension. Section 26.3.12 also advises that a risk assessment for

shifting vessel should be carried out. The risk assessment should include consideration of environmental conditions, the vessel's size, careful regard to the type and length of rope used, and the capability of the shoreside mooring arrangements. A toolbox talk should precede operations while maintaining good communication with all participants.

4.22 Paragraph 4.3.3 of Chapter 2.3.2.23 of the shipboard SMM (i.e., Section II "Mooring and Unmooring operations") requires also that risk assessment shall be made before shifting operation.

4.23 According to the shipboard risk assessment reports on 19 and 20 November 2022, risk assessments for mooring and unmooring operations were carried out on board *the vessel*. The risks, including crew members were not familiar with the equipment and procedure, mooring hawsers/heaving lines broken, crew getting tangled in ropes, propeller fouled by hawsers, etc., were identified. However, the risk of mooring lines being entangled with the fenders of *the terminal* with its danger arising from it was not identified. It was deduced that the shipboard risk assessment for mooring and unmooring operations was not effective.

4.24 The investigation also found that the toolbox meeting was not carried out before *the shifting operation*, which failed to comply with *the Code* to carry out toolbox meeting before *the shifting operation*.

Dangerous working culture for shifting operation

4.25 Section 1.2 of *the Code* advises that a safe working culture should be implemented on board by the master and crew, including good communication, clear leadership, etc.

4.26 The deck crew of *the vessel* was divided into two groups at the fore and aft mooring stations under the leading of C/O and 2/O respectively during *the shifting operation*. The communication among C/O, 2/O, and the Master on the bridge was maintained via a portable radio. However, the investigation revealed that the communication during *the shifting operation* was ineffective because the Master communicated with C/O in their native

language, which 2/O could not understand.

4.27 In addition, when the Master found the aft spring lines were slack and ordered 2/O to heave the spring lines, he did not realize that the vessel was about 2 meters apart from the terminal (Figure 10). Figure 11 shows the normal mooring condition of *the vessel*. If the Master ordered C/O and 2/O to heave fore and aft breast lines first, the aft spring lines might be free from the fender before becoming strain, and the accident might have been avoided.

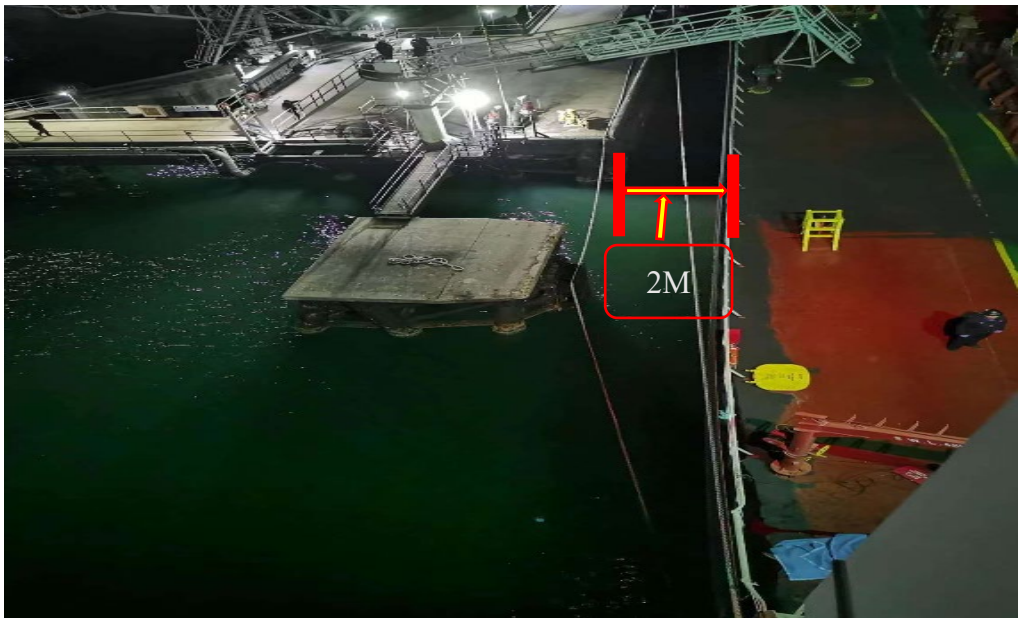

Figure 10: the condition of *the vessel* which was about 2 M apart from the terminal

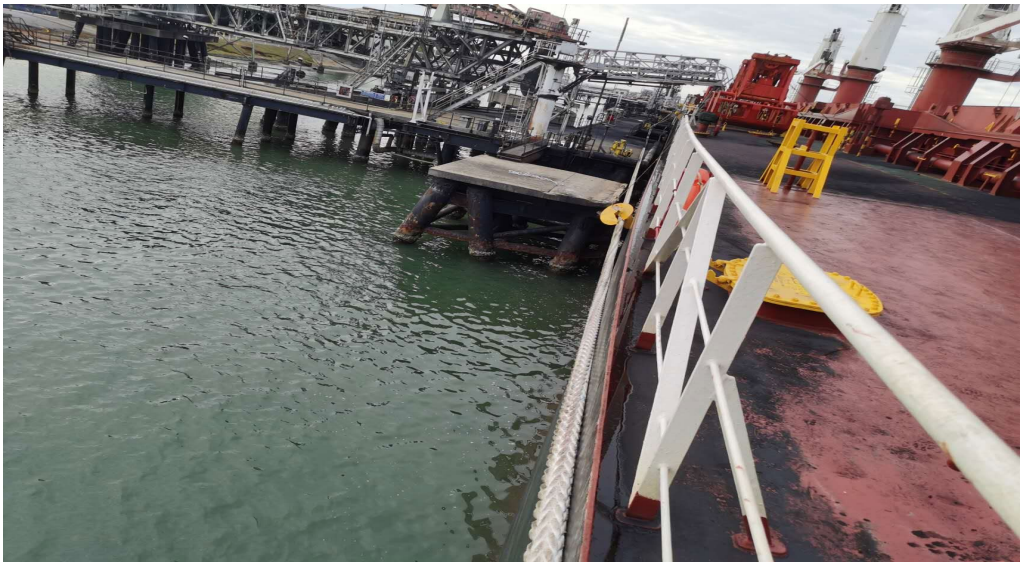

Figure 11: the normal mooring condition to *the terminal*

4.28 The investigation revealed that the shifting operation was carried out under an unsafe working culture, i.e., lacking good communication and clear leadership.

Training on mooring and unmooring operation

4.29 Paragraphs 4.3.1.2, 4.3.2.1 & 4.3.4.1 of Chapter 4.1.5 of the shipboard SMS (i.e. Section IV Crew Training) require that all seafarers shall receive familiarization and basic safety training before being assigned to shipboard duties after embarkation. On crew's operational skill training, the Master should organize operational skill and knowledge trainings to the crew based on their actual needs and shipboard operations.

4.30 According to the shipboard training record, the 2/O received the familiarization training as a newly joining deck officer and familiarization and basic safety training before being assigned to shipboard duties on the date of joining *the vessel.* However, no evidence showed that the 2/O attended the operational skill and knowledge trainings for the mooring and unmooring operation after joining *the vessel*. It was deduced that the shipboard training on mooring/unmooring operation to 2/O was ineffective.

5. Conclusions

5.1 On 18 November 2022, *the vessel* was alongside by her port side at *the terminal* at *the loading port* for loading the cargo of petroleum coke in bulk.

5.2 At 1748 hours on 18 November 2022, the vessel commenced loading operation. Due to the operational limits of the loading machine on *the terminal*, *the vessel* was required to be shifted along the terminal when loading cargo to different cargo holds of *the vessel* according to its loading plan. At 2338 hours on 20 November 2022, the crew of *the vessel* started *the shifting operation* for loading cargo into holds Nos. 2, 3 and 4. At 2356 hours, the Master instructed 2/O to heave the slack aft spring lines when the vessel was in position. Afterwards, 2/O relayed the order to AB1 by VHF radio to heave the slack aft spring line by winch and he then ran forward to *the accident site* to check the condition of the spring lines. Unfortunately, 2/O was hit heavily in a flash by one of the aft spring line due to sudden escaping from the edge of fender, laying on the main deck with blood in his mouth and nose without breathing and pulse. Despite the shipboard first aid carried out by the crew and medical treatment applied by the shore medical team for 2/O, the 2/O was declared dead at 0038 hours onboard by the shore medical team on 21 November 2022.

5.3 The investigation revealed that main contributory factors leading to the accident were as follows:

(a) the crew failed to follow the requirement of *the Code* to remain in a safe position and its recommendation to identify the dangerous areas by using a bird's eye view of the mooring arrangement during *the shifting operation* including the provision of illumination around the fender area which was far from the vessel;

(b) the crew failed to follow the requirements of *the Code* to hold a toolbox meeting before *the shifting operation*;

(c) the crew lacked a safe working culture of good communication and clear leadership during *the shifting operation*;

(d) the shipboard training on mooring/unmooring operation to 2/O was ineffective;

(e) the shipboard risk assessment for mooring and unmooring operations was ineffective; and

(f) the 2/O lacked safety awareness to realize the risk of snap-back zone of aft spring lines when they were under strain during *the shifting operation*.

6. Recommendations

6.1 The management company should issue circular informing all masters, officers and crew members of its fleet of the investigation findings and lessons learnt from this accident to:

(a) strictly follow the requirement of *the Code* to remain in safe position and its recommendation to identify dangerous areas by using a bird's eye view of the mooring deck arrangement during operation of shifting vessel including the provision of illumination around the fender area which is far from the vessel;

(b) strictly follow the requirements of *the Code* to hold a toolbox meeting before the operation of shifting vessel;

(c) strictly follow the requirements of *the Code* and shipboard SMM to carry out an effective risk assessment for operation of shifting vessel;

(d) enhance safety awareness of the crew to the risk of the snap-back zone of mooring lines during the operation of shifting vessel;

(e) ensure the operation of shifting vessel be carried out under safe working culture, including good communication and clear leadership; and

(f) ensure effective onboard training to the crew for safe mooring and unmooring, including the operation of shifting vessel.

6.2 A Hong Kong Merchant Shipping Information Note is to be issued to promulgate the lessons learnt from this accident.

7. Submission

7.1 The draft investigation report, in its entirety, was sent to *the Company* and the Master of *the vessel* for comments.

7.2 By the end of the consultation, there was no comment received from the above-mentioned parties.