Marine Safety Investigation Unit

Transport Malta

SAFETY INVESTIGATION REPORT

202311/027 REPORT NO.: 15/2024 November 2024

This safety investigation has been conducted with the assistance and cooperation of the Bundesstelle für Seeunfalluntersuchung (BSU) of Germany.

MT *AMUR STAR*
Tipping of loose steel plates on a crew member, in position 54° 12' N 007° 14' E 21 November 2023

SUMMARY

On 21 November 2023, whilst the motor tanker *Amur Star* was enroute to Immingham, United Kingdom, the electrician found the second engineer unconscious, trapped by steel plates in the steering gear compartment. The electrician raised the alarm, and together with other crew members, he freed the second engineer and attempted to resuscitate him.

The master sought medical help from the German authorities, and although two medical teams boarded the vessel by helicopter, they were unable to revive the second engineer.

The safety investigation concluded that the second engineer was alone in the steering gear compartment. A stack of heavy steel plates that was stored vertically and free from its lashings, tipped over on him, possibly as a result of the natural movement of the vessel in a seaway.

The MSIU has issued two recommendations to the Company and the flag State Administration, designed to address the safe stowage of heavy steel plates, and raise awareness on this particular hazard.

FACTUAL INFORMATION

The vessel

Amur Star (**Figure 1**) was a Maltese-registered oil / chemical tanker of 8,581 gt. It was built in 2010 at the 21st Century Shipbuilding Co. Ltd., South Korea. The vessel's registered owners were Valloeby Amur Star Ltd. and was managed by CST Schifffarts Gmbh & Co. KG based in Hamburg, Germany. *Amur Star* was classed by Lloyd's Register, which also acted as the recognised organisation for the compliance of the International Safety Management (ISM) Code.

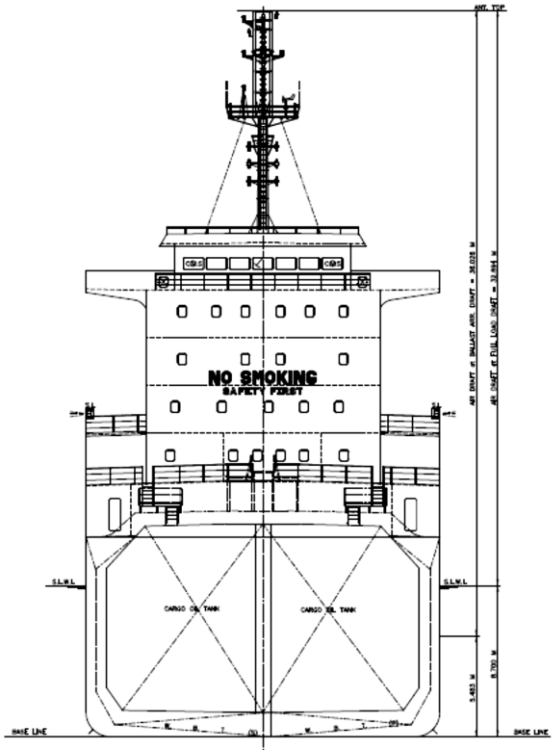

Figure 1: GA Plan MT Amur Star

Amur Star had an overall length of 128.60 m, a breadth of 20.40 m, and a summer deadweight of 13,019 tonnes, which corresponded to a summer draft of 8.71 m. Propulsive power was provided by a MAN B&W (6S35MC) STR slow-speed, marine diesel engine, producing 4,440 kW power at 173 rpm. The vessel was also fitted with a 400 kW bow thruster.

Amur Star had 12 cargo tanks and two slop tanks, with a capacity of 14,380.56 tonnes.

Manning

The Minimum Safe Manning Certificate stipulated a crew of 11. There were 19 persons on board, 15 Filipino nationals, three Polish nationals, and one Croatian national. The working language was English.

At the time of the accident, the vessel was underway, with the bridge manned by the third officer and the engine-room attended by the second engineer, who was the duty engineer. The electrician was also on duty, working on a day work schedule.

The second engineer

The second engineer was a 62-year-old Polish national and had joined the vessel on 06 August 2023 in Ghent, Belgium. He qualified for his STCW III/2 certificate of competency in 2007, which allowed him to sail as a chief engineer on ships with engines of 3,000 kW or more. He had been working with the present managers since 2011, as a second engineer.

The second engineer completed his general and job specific familiarisation training on the day he embarked. His responsibilities included the safe management of the engine-room operations and maintenance tasks. He was also responsible for the shipboard waste management, in accordance with the vessel's Garbage Management Plan.

The second engineer was about 170 cm tall. His last medical examination on 21 June 2023, confirmed that he was medically fit to serve at sea. At the time of the accident, he was wearing an overall, a safety helmet, gloves, and safety shoes.

Course of events[1]

Amur Star was due to complete discharging of its cargo of gasoline at Bremen, Germany at around midnight of 20 November 2023. In anticipation of its departure soon afterwards, the chief engineer advised the second engineer that along with the third engineer and oiler, he would be manning the engine control room (ECR) during the estimated six-hour long outbound pilotage. The second engineer was to attend the engine-room at the usual time in the morning and continue with the normal sea routine of manning the engine-room during the day, along with the electrician. There were no planned maintenance jobs discussed, apart from the second engineer assisting the chief officer during the cargo tanks cleaning, if required.

Discharging was completed at 2154, and the vessel departed its berth in ballast and under pilotage at 2354, bound for Immingham, UK.

The pilot disembarked at 0630 on 21 November and by 0642, the vessel was on full away on sea passage. Shortly afterwards, the master handed the navigation watch to the navigational officer of the watch (OOW), so that he could prepare the departure reports and transmit the cargo documents. At about 0800, seeing that all was well on the bridge, the master went to his cabin to rest.

In the meantime, soon after full away, the chief engineer released the third engineer and the oiler to rest. He also prepared the auxiliary engines and inert gas (IG) system for cargo tank washing. Cargo tank cleaning commenced at about 0730 by the bosun, an AB and a cadet, with the chief officer remaining in the cargo control room (CCR). By about 0810 and satisfied that all was well with the cargo tank cleaning process and the IG system, the chief engineer went into the engine-room, where he met the second engineer and the electrician in the workshop. From the entrance, he told the second engineer that he was going to his cabin to rest. He asked the second engineer to continue assisting the chief officer during the cargo tank cleaning.

In the meantime, the electrician continued to assist the second engineer to cut the top of a 200-litre oil drum and drain the residual oil into a bucket on completion. At about 0830, the second engineer and the electrician went to the galley together to discuss the outstanding work on the dishwasher in the galley. After about 10 minutes, the second engineer left the galley to return to the engine-room. Around the same time, the cargo tank cleaning was completed, and the deck crew members started to strip the cargo tanks.

At about 0930, the electrician completed his work in the galley and returned to the ECR to put his tools away and record the work carried out. On his way, he met the chief officer, who asked him about the second engineer's whereabouts as she was unable to find him. The electrician replied that he was not aware of where he was. After recording his work, the electrician looked around in the engine-room for the second engineer but could not find him either.

He kept looking for him, proceeding to the steering gear compartment. There, he found the second engineer unconscious and trapped between the spare parts shelving and several steel plates that appeared to have tilted on him (**Figure 2**). He immediately went to the ECR, called the bridge for assistance, and then went to the CCR to inform the chief officer of the matter. The time noted was about 0935.

The third officer on watch immediately informed the crew members working on deck, the master, and the chief engineer. The chief officer and one AB, together with the electrician arrived first on scene and attempted to lift the plates off the second engineer but could not do so because of the heavy weight.

[1] All times local time +1 UTC.

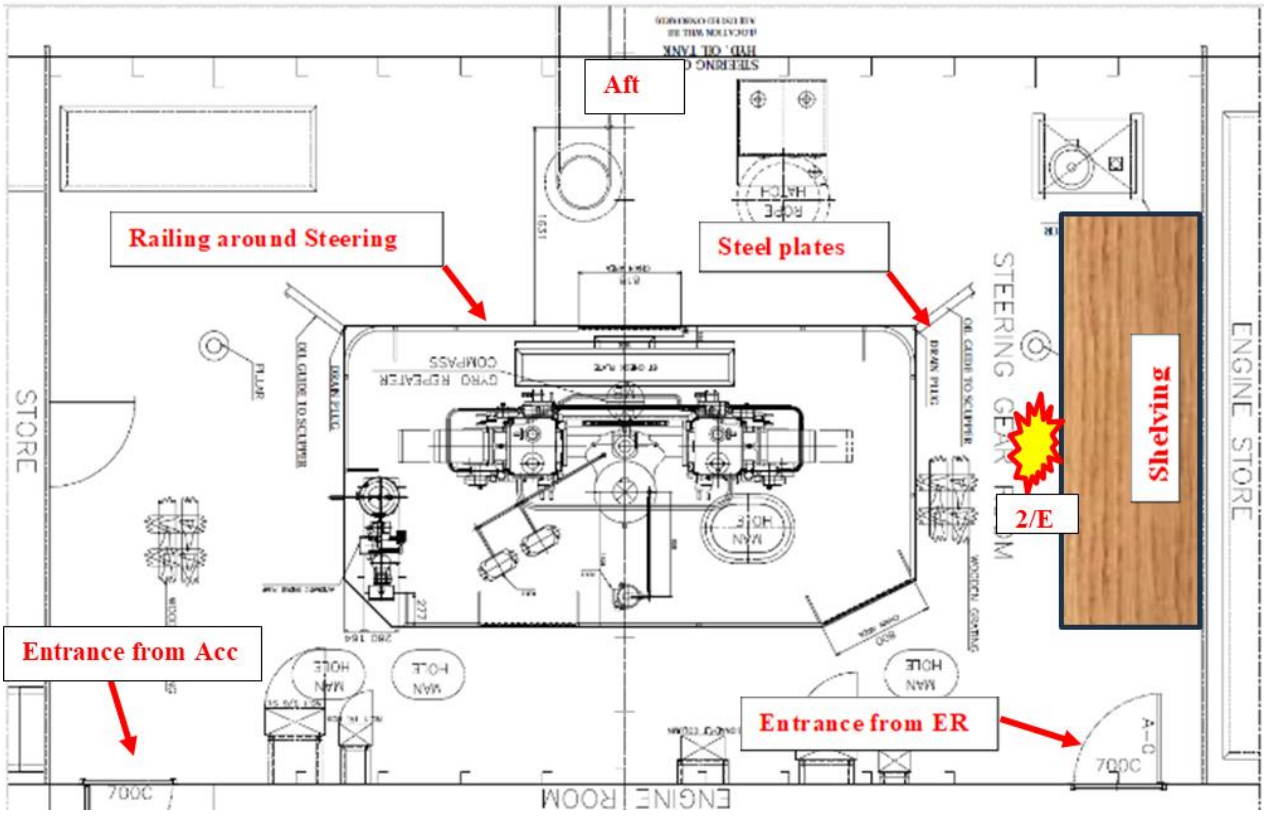

Figure 2: Plan of the steering gear compartment

The bosun and one of the cadets were the next crew members to arrive on site and immediately assisted their colleagues to lift the plates, one by one. Before the last plate was removed, the AB slid next to the second engineer and supported him so that he would not fall, while the last plate was being removed. The time was about 0942. The second engineer remained unresponsive and after the last plate had been removed, the AB laid the second engineer on the deck and along with the chief officer, started to administer cardiopulmonary resuscitation (CPR).

The master and the chief engineer arrived on scene within a few minutes and after assessing the situation, the master went to the bridge to seek medical advice. He also instructed the second officer to take the oxygen cylinder to assist. The chief engineer remained on site and assisted with the first aid.

The master arrived on the bridge at 0950 and called the Designated Person Ashore (DPA) to inform the Company of the emergency. At about 0955, the master contacted German Bight VTS, reporting the medical emergency, and requesting permission to turn back.

At about 1003, VTS advised the vessel to steer a course of 140° towards River Weser. The master then contacted Telemedical Maritime Assistance Service (TMAS)[2] at about 1006. The first helicopter, *Rescue 21*, was tasked to assist at 1033. Similarly, *Hans Hackmack* and *Bernard Grube*, two 23-metre lifeboats, were also dispatched to the vessel to provide the necessary assistance.

Rescue 21 arrived first on scene at 1108, with one paramedic and an operational communications officer lowered on the

[2] TMAS supports and gives advice to seafarers in case of sickness, accidents, maritime emergencies, and other incidents on board that require medical advice.

vessel in position 54° 01.6' N 007° 18.1' E. Following an initial assessment, the second engineer was shifted into the engine-room, where there was more space for the resuscitation efforts to continue.

Northen Rescue 01, another helicopter which was tasked at the same time as *Rescue 21*, arrived on-scene at 1124 with additional equipment and two medics. On board, the three medics and the operational communications officer continued the resuscitation attempts on the second engineer. At 1142, it was thought that a low pulse was detected, however, by 1148, the medical team leader declared that the second engineer had passed away. The death of the crew member was also confirmed by an emergency physician from the NHR Air Rescue Service, who was flown to the vessel by helicopter and lowered on board by winch to assist the other physician, who had been lowered on the vessel before.

The two lifeboats that had almost reached the vessel were released to return to base. At 1234, both medical teams signalled that they were ready to be picked up. The first team was picked up by *Rescue 21* at 1239 and the second team, together with the second engineer's body, were picked by *Northern Rescue 01* at 1306.

The vessel was then instructed to proceed to the Neue Wesser Reede Anchorage, where it dropped anchor at 1448 to complete formalities with the local authorities, following which, the vessel resumed its voyage towards Immingham on 22 November 2023 at 2112.

The stack of spare steel plates

The stack consisted of 15 steel plates of various dimensions (**Figure 3**). There were no records to determine when and why these steel plates had been supplied on board. The largest plate measured 2.04 m * 1.00 m and the smallest measured 1.00 m * 1.00 m. The longer steel plate, seen in **Figure 3**, measured 1.30 m * 1.30 m. The thicknesses of the steel plates varied from 3 mm to 20 mm. Considering that the density of steel is about 7,850 kgm^{-3}, it can be appreciated that total weight of the stack was significant.

Information obtained by the safety investigation indicated that the total estimated weight of the stack was approximately 1.2 tonnes. The first plate seen in front of the stack (**Figure 3**) weighed about 188 kg. The chief engineer recalled that the plates had been stowed in that area for more than 12 months and had never been used.

Figure 3: Stack of steel plates

The lashing arrangement (**Figures 3** and **4**) consisted of two nylon slings and a chain block.

Figure 4: Securing by chain block and nylon slings

The lower sling was attached with shackles on either end and was hand tight, while the upper sling was attached with a shackle on the railing at one end, then taken across the plates, looped over a railing, and taken back, where it was fastened to a chain block crown hook. The tail of the chain block was hooked on to the railing at the other end. The plates effectively rested on a hybrid lashing system of nylon slings and a chain block.

The crew members stated that when they removed the stack of plates to free the second engineer, they noticed that both slings were unhooked, the chain block was released, and the lashings were lying on the deck. There was no observed damage to the securing arrangements to suggest that the lashings had somehow failed.

Environment

The vessel's records indicated that at the time of this occurrence, the sky was overcast. The wind was blowing from the East Northeast direction, measuring Force 4 on the Beaufort Scale, with the sea state recorded as approximately 0.5 m. The air temperature was 9 °C.

The crew recalled that at the time of the occurrence, the vessel was generally steady. The CCTV footage also indicated that the vessel was almost steady with an occasional slight pitch / roll, if any.

Previous occurrences

While serious accidents involving steel plates may not be frequent, this is the third fatal accident[3] investigated by the MSIU, in the last three years, which resulted from similar circumstances, *i.e.*, the securing arrangement of stacked steel plates had been either slackened or removed, resulting in them tipping over with fatal consequences.

Moreover, there were two similar, but non-fatal accidents reported on board Maltese-registered vessels, which occurred in December 2022 and April 2023. In both cases, a stack of steel plates tipped over and fell on crew members, resulting in serious injuries.

In June 2024, the Republic of Marshall Islands Maritime Administrator issued a Marine Safety Advisory to owners/operators, masters, nautical inspectors, and recognized organizations on incidents involving the storage and handling of steel plates. The Advisory cautioned that since 2019, the Maritime Administrator had investigated 11 incidents of steel plates that were being manually handled, resulting in either fatalities or serious life-threatening injuries that required medical evacuation[4].

ANALYSIS

Aim

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, and to prevent further marine casualties or incidents from occurring in the future.

Cooperation

This safety investigation has been conducted with the assistance and cooperation of the Bundesstelle für Seeunfalluntersuchung (BSU) of Germany. The BSU has facilitated access to documents.

Records of hours of work / rest

The second engineer's work / rest hours records for the month of November 2023 indicated that his hours complied with the STCW requirements and that he should have

[3] *Vide* MSIU safety investigation reports 23/2021 and 12/2023.

[4] *Vide* Republic of Marshall Islands Marine Safety Advisory No. 06-24.

had at least eight hours of sleep before commencing work on the morning of 21 November. The safety investigation had no information on the quality of sleep, which the crew member had and therefore, was unable to analyse potential fatigue in more detail.

Drug and alcohol testing

The Company operated a 'zero' tolerance policy towards the consumption of alcohol and illegal drugs. All the alcohol tests carried out after the accident, returned negative results.

Cause of death

Crew members who were on scene to assist, confirmed that the second engineer had sustained heavy bruising across his abdomen, in line with where they found the top edge of the steel plates resting against his diaphragm (**Figure 5**).

Figure 5: Reconstruction of the accident site (The figure shows a simulation of the accident)

An autopsy report dated 05 December 2023, revealed that the cause of death was myocardial infarction. Moreover, the report did not reveal any evidence of external violence that either caused or had a significant impact on his death.

However, a forensic medical report was subsequently issued on 13 March 2024, following the communication of additional information on the facts of the case, to the Forensic Centre by the Federal Bureau of Maritime Casualty Investigation of Germany. The assessment made by the medical team considered the fact that the injured crew member had suffered from compression in the upper abdominal region, caused by the steel plates. The report concluded that in view of the autopsy findings and the facts of the occurrence, it was assumed that death was caused by suffocation due to severe chest compression (Perthes syndrome)[5]. Toxicological tests for alcohol and drugs returned negative results.

Cause of the accident

The MSIU was informed that no crew member had witnessed the accident. Following the accident, a cardboard template (**Figure 6**) was found in the engine-room workshop, near the empty oil drum that the second engineer and electrician had previously cut off its top.

Figure 6: Cardboard template found in the engine-room workshop

[5] The MSIU clarifies that the 'medical' cause of death did not have any bearing on the safety investigation *per se*. Rather, the safety investigation was only concerned with trying to achieve an understanding of the accident dynamics *vis-à-vis* the stowage and securing of the steel plates. The school of thought applied by the MSIU was that irrespective of the outcome of this occurrence, safety lessons could be extracted and shared with the maritime community. To this effect, it was decided that the 'medical' cause of death fell outside the scope of the safety investigation and therefore, it had no bearing on the analysis of the accident data which was collected.

The template fitted the oil drum top perfectly (**Figure 7**) and it was deduced that the second engineer may have planned to fabricate a lid for the drum, which was going to be used to store garbage. This logic was reinforced by the fact that the second engineer was tasked with the management of the garbage on board the vessel.

Figure 7: Cardboard template as a lid

Based on the accident data, which indicated that the securing arrangements of the steel plates had been found released, it was not excluded that the lashing could have been released to eventually identify a suitable plate to be used in the fabrication of the garbage drum lid.

Although the vessel was generally steady in the seaway around the time of the accident, it was not excluded that once the lashing was released, the heavy steel plates, which were stored vertically upright, would have tipped over at the slightest natural movement of the vessel in a seaway.

The safety investigation was of the view that the unlashed steel plates had tipped over unexpectedly and given the weight of the plates, it was humanly impossible for the second engineer to have the strength to either stop them from falling over him, or to free himself.

The accident data did not indicate who had released the lashings on the steel plates and when that operation had been executed. Post-accident discussions with the crew members suggested that the stack had been secure prior to the accident. Whether it was the action of the fatally injured crew member, or another crew member is irrelevant to the safety investigation[6].

A safety investigation is systemic and rather than identifying the crew member *per se*, is more concerned with the general risk acceptance and the applied securing methods of the steel plates. It is understood that the steering gear flat had surely been accessed by crew members on a number of occasions in the days preceding the accident for whatever reason.

It did not appear to the safety investigation that the methods employed to stow and secure the steel plates, and the associated risks had ever been questioned by any of the crew members. Neither were they questioned during various inspections carried out on board. This was indicative that no person had received / observed cues which would have suggested that there was a level of unacceptable risk, and which had to be addressed. The absence of cautionary warnings was also noticeable, reflecting the absence of concern with respect to risks associated with the steel plates.

Indeed, even by virtue of the number of incidents cited earlier in this safety investigation report, it was very clear that the stowage of steel plates in this manner is not an uncommon practice across the maritime industry.

[6] Even if the second engineer would have released the lashing, it would have been very improbable for him to select a steel plate to try and pull it out of the rack, in view of the very heavy weight of the individual plates.

Unplanned work

The fabrication of the garbage drum lid was neither documented nor discussed during the daily safety meeting. In fact, no safety meeting had taken place that morning because of the long river overnight pilotage, and during which, most of the crew members had been on duty.

However, it was understood that even if it had been planned, the fabrication of a drum lid was not likely to have required a work permit or completion of a risk assessment, unless hot work had been contemplated.

The safety investigation was unable to determine whether the second engineer had instead carried out an on-site dynamic risk assessment. If he had, it was highly likely that he may have not been able to identify all the associated hazards. This would have been the case, particularly when considering that he was reportedly working alone, and he had no access to raise the alarm if something had to happen to him. Alternatively, the second engineer did not perceive any hazards associated with such a simple task, and therefore decided that no risk assessment was necessary.

Working alone

Although the engine room was in 'manned' status and did not require the dead-man alarm system to be switched on when the second engineer became the duty engineer, he effectively was working alone in the engine-room for a long period of time, as soon as the electrician left to work in the galley.

A person working alone is either someone who cannot be seen or be heard by another person, or where a visit from another person is not expected. The MSIU did not come across any documentation on the matter[7].

The lashing arrangement

The safety investigation had been informed that the lashing arrangement of the steel plates had been in existence for some time.

The safety investigation identified several weaknesses and limitations in the applied arrangement. The nylon strops could not be tensioned independently, and a chain block was used to maintain tension on the upper nylon strop lashing. The second lashing appeared to be just hand tightened. It was further observed that the nylon strops were also prone to chaffing against the sharp steel plates edges, potentially resulting in them parting at some stage.

In order to select and take out a steel plate from the stack, the complete lashing arrangement had to be released. This meant that even when alongside with no vessel movement, there was a risk of a significant number of steel plates falling on crew member/s trying to extract one of the steel plates. The weight of the steel plates meant that the attendance of several crew members would have been required to restrain and prevent the plates from tipping over, with the risk of multiple serious injuries to themselves.

The safety investigation also observed that the stowage position and lashing arrangements of the steel plates neither allowed for the use of a hoist, nor lifting clamps to transfer / shift the plate safely and the space for safe operations was therefore limited. Moreover, the safety investigation did not come across guidelines and / or procedures for the safe handling of heavy items on board.

[7] The MSIU is aware of several companies which have implemented a 'working alone' policy on their ships, (especially for engineer officers working on a UMS vessel who would need to attend an alarm at night). To this effect, several ships are either fitted with numerous reset buttons around the machinery spaces or inform the bridge of their entry and set a periodical call to confirm that they are safe, until their exit from the space.

Emergency response

The technical managers provided the vessel with procedures addressing emergencies and their notifications. As required, the master contacted the Company first to report the severity of the accident. Following the contact with the VTS, the communications with the maritime rescue coordination centre and other rescue crafts, were satisfactory and the two helicopter medic teams landed and were evacuated safely from the vessel.

CONCLUSIONS

1. The second engineer was injured when a stack of steel plates tipped over, trapping him against the store shelving in the steering gear compartment.
2. The lashing intended to secure the stack was found slackened.
3. No maintenance was planned for the day and the work was unplanned.
4. The second engineer was working alone and there was no system in place for him to sound the alarm for assistance.
5. The safety investigation identified several weaknesses and limitations in the arrangement. For instance, in order to select and take out a steel plate from the stack, the complete lashing arrangement had to be released.
6. There was no information which indicated that the crew members had cues, which would have suggested to them that there was a level of unacceptable risk related to the stack of steel plates, and which had to be addressed.
7. The stowage position and lashing arrangements of the steel plates did not allow for the use of either a hoist or lifting clamps to transfer / shift the plates safely.
8. The stowage of steel plates on board is not an uncommon practice within the maritime industry, encountered by crew members and shore personnel alike.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[8]

CST Schifffarts Gmbh & Co. KG took a number of safety actions including:

- initiated its own internal investigation into the accident on board the vessel;
- issued a Circular Fleet Alert on 27 November 2023 to all its managed vessels;
- reviewed its safety management procedures to make them more robust and incorporate the findings of this accident. Company audit and inspection checklists have been included for the inspection of steel plate storage arrangements on board;
- appointed Fathom Marine Consultants, UK, to create a training video regarding the accident;
- the area around the steel plates has been marked as hazardous;
- a notice has been posted to caution crew members that work necessitating the use of steel plates, had to be notified to the chief engineer beforehand;
- a poster for the handling, stowage and securing of steel plates and pipes has been prepared and circulated among the fleet vessels;
- non-essential steel plates have been landed ashore;
- extra-reinforcement was welded around the steel plates to restrict them from

[8] **Safety actions and recommendations shall not create a presumption of blame and / or liability.**

tripping over, even if the lashings is released;

- initiated the process for the purchasing of a steel plate stowage rack for all fleet vessels;
- launched a campaign on all fleet vessels for the verification of steel plates securing arrangements on board.

RECOMMENDATIONS

Taking into consideration the safety actions taken, CST Schifffarts Gmbh & Co. KG is recommended to:

15/2024_R1 circulate the finding of this investigation to its managed and owned fleet.

The flag State Administration is recommended to:

15/2024_R2 issue an information notice to ship owners and ship managers, highlighting the importance of safe stowage and securing of steel plates, ensure the availability of the necessary tools and means to handle steel plates safely, and to transfer any unnecessary heavy steel plates ashore.

SHIP PARTICULARS

Vessel Name:	*Amur Star*
Flag:	Valletta
Classification Society:	Lloyd's Register (LR)
IMO Number:	9480368
Type:	Oil / chemical tanker (Type II)
Registered Owner:	Valloeby Amur Star Ltd.
Managers:	CST Schifffarts Gmbh & Co. KG
Construction:	Steel
Length Overall:	128.60 m
Registered Length:	120.40 m
Gross Tonnage:	8,581
Minimum Safe Manning:	11
Authorised Cargo:	Liquid in bulk

VOYAGE PARTICULARS

Port of Departure:	Bremen, Germany
Port of Arrival:	Immingham, UK
Type of Voyage:	International
Cargo Information:	In ballast
Manning:	19

MARINE OCCURRENCE INFORMATION

Date and Time:	21 November 2023 at about 0900 (UTC +1)
Classification of Occurrence:	Serious Marine Casualty
Location of Occurrence:	At sea in position 54° 12' N 007° 14' E
Place on Board	Steering gear compartment
Injuries / Fatalities:	One crew member injured
Damage / Environmental Impact:	None reported
Ship Operation:	Normal service - In passage - Displacement mode
Voyage Segment:	Transit
External & Internal Environment:	Overcast sky with a moderate breeze from the East Northeast. East Northeasterly swell and a significant wave height of 1.0 m. Air and sea temperatures were recorded at 9 °C.
Persons on board:	19