



SAFETY INVESTIGATION REPORT

201804/021

REPORT NO.: 08/2019

April 2019

The Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 prescribe that the sole objective of marine safety investigations carried out in accordance with the regulations, including analysis, conclusions, and recommendations, which either result from them or are part of the process thereof, shall be the prevention of future marine accidents and incidents through the ascertainment of causes, contributing factors and circumstances.

Moreover, it is not the purpose of marine safety investigations carried out in accordance with these regulations to apportion blame or determine civil and criminal liabilities.

NOTE

This report is not written with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The report may therefore be misleading if used for purposes other than the promulgation of safety lessons.

© Copyright TM, 2019.

This document/publication (excluding the logos) may be re-used free of charge in any format or medium for education purposes. It may be only re-used accurately and not in a misleading context. The material must be acknowledged as TM copyright.

The document/publication shall be cited and properly referenced. Where the MSIU would have identified any third party copyright, permission must be obtained from the copyright holders concerned.

MV NS TERA **Serious injury to stevedore** **at Laboratory Wharf, Valletta** **17 April 2018**

SUMMARY

NS Tera arrived at Valletta on 16 April 2018 and berthed at Laboratory Wharf at 1700 to discharge her cargo of rolled steel products. Discharge operations started immediately but were suspended for the night and resumed the following morning.

Cargo operations were conducted by two stevedore gangs and two shore cranes. At around 1440 on 17 April, while the gang at the aft end was slinging a steel coil, one of the stevedores attempted to arrange the chain sling through one of the coils.

In the process, he was caught between two adjacent coils from the chest area. He was immediately assisted by his colleagues and transferred to a local hospital after being freed.

The safety investigation revealed that during his attempt to arrange the chain sling, one of the steel coils dislodged itself and entrapped the stevedore.

The MSIU has issued three recommendations to the Port Workers Co-Operative designed to ensure the safety of stevedores during cargo operations in ports.



FACTUAL INFORMATION

Vessel

NS Tera, a 1,861 gt gearless general cargo, was built in 1985 and registered in Panama. She was owned and managed by Solid Navigation Inc. and classed by the Panama Shipping Register.

The vessel had a single cargo hold, closed by two sets of hatch covers, one at the fore end and the other at the after end. She was fitted with a low-lying accommodation and a bridge deck, which could be lowered to enable passes under low bridges. This low layout of the accommodation also meant that when the after hatch was open, the vertically stowed open hatch covers blocked the view of the cargo hold from the accommodation decks.

Propulsive power was provided through a gearbox by a single 6-cylinder Deutz BV 6M 628, four stroke, medium speed diesel engine, producing 860 kW at 750 RPM. This drove a single, variable pitch propeller to reach a service speed of 10 knots.

Crew members

The vessel was manned by eight crew members, who were all Albanian nationals. The master held a Certificate of Competency STCW II/2. He had just been promoted to a master by the Company, about two weeks prior to the accident. He had already served for several years as a chief officer on *NS Tera*, but also on other Company vessels. The chief officer also held a Certificate of Competency issued under the provisions of STCW II/2. He had joined the vessel two weeks prior to the accident.

The manning level was in accordance with the requirements of the flag State, as stipulated on the Minimum Safe Manning Certificate, issued by the Panamanian authorities.

Stevedores

All stevedores working on *NS Tera* on 17 April, had more than 10 years of work experience, with one of the stevedores having been in the job for about 13 years. Both foremen also had long years of service. Moreover, all persons confirmed that they had worked similar cargoes on several occasions prior to the accident.

Cargo operations at the Terminal

Cargo operations in Valletta are managed by Valletta Gateway Terminals Ltd. (VGT). Its chief activities include handling of conventional cargo, ro-ro and containers, and warehouses operations. VGT is also responsible for the provision of shore mobile cranes for loading / discharging of break-bulk cargoes. Cranes are sourced from an approved list of crane-operators, which is kept by VGT. VGT has a certification process for cranes and related cargo operations equipment.

Foremen are provided by the Foremen Co-operative (which also provided additional equipment, such as slings and nets for the handling of loose cargo units). Stevedores are provided by the Port Workers Co-Operative. The Co-operative, which is administered by the Ports & Yachting Directorate of Transport Malta, has about 380 stevedores. The Directorate oversees the assignment of stevedores to vessels, the accounts and other administrative functions of the Co-operative.

Weather conditions

At the time of the accident, the weather was reported to be clear with good visibility (10 nautical miles). There was a slight north-westerly swell. A gentle breeze was also from the Northwest. Air temperature was recorded to be 20 °C and the sea temperature was 17 °C.

Narrative¹

NS Tera loaded a full cargo of steel products consisting of steel beams / pipes, heavy plates and bundles of reinforced steel coils, at the Italian port of Nogaro. The consignment of steel coils was stowed in regular tiers athwartships, reaching from side to side of the vessel, with the major axis of the coils horizontal and in the fore and aft line (Figure 1).



Figure 1: Steel coils stowed in the cargo hold

The vessel departed Porto Nogaro on 12 April 2018 at 0900 bound for Valletta, where she arrived on 16 April at 0300. Upon arrival, she dropped her anchor outside port limits. The voyage was uneventful with generally good weather throughout as evidenced by weather entries in the deck logbook. Later on, that day, at about 1705, *NS Tera* docked at Laboratory Wharf in Valletta, starboard side alongside.

Two shore mobile cranes had been allocated to carry out cargo discharge operations; one intended to operate from the forward hatch and the other working cargo hatch no. 2. Both crane drivers had several years of experience in this work.

Two stevedore gangs were called out for the cargo discharge operations, each gang consisting of four stevedores assigned to work on the ship, and four others working ashore to assist in discharging cargo from trailers onto the storage area at the Terminal.

¹ Unless otherwise stated, all times are Local (LT).

There were also two assigned signalmen *i.e.*, a total of 18 workers - eight stevedores to work on board, eight stevedores to work ashore and the two signalmen. Two foremen² were also engaged to superintend the discharging of cargo.

When the hatches were opened at commencement of discharge operations, a safety survey was jointly carried out by the VGT safety officer, supervisor, foreman, and the ship's officer. It was observed that no stacks were unstable and the cargo was stowed all the way up to the hatch coaming, and therefore access into the cargo hold was from top of the hatch. The access remained like that until discharge operations reached a stage where the access hatches and ladders were clear. VGT maintained a stand by safety crane in the vicinity and a safety personnel cage adjacent to the ship to assist personnel to access the cargo hold.

Cargo discharge operations started at around 1830, soon after the vessel docked at Laboratory Wharf on 16 April 2018 at 1705. The stevedores were using steel chain slings, discharging one steel coil at a time. They were also using 4" x 4" timber to wedge and temporarily secure steel coils during the slinging operation to try and prevent any movement of the steel coils (Figure 2).



Figure 2: Security bands and 4" x 4" timber used to wedge the steel coils

² The Port Workers Ordinance defines a foreman as any person who, on his own behalf or on behalf of another person, employs port workers.

Initial progress was described by the master as slow. The discharge operations were suspended for the day at 1930. As per ship's deck logbook, operations then resumed at 0845 on the following morning with two gangs and continued without any issues all morning with a stop for lunch break between 1200 and 1300. According to the Port Workers Time Sheets, each gang was assigned a signaller and eight port workers (four on board and four on the quay).

However, at the time of the accident, two stevedores were slinging cargo for the foreward crane. Two other stevedores were tasked with slinging cargo for the aft crane. No signaller was present and the crane operations were coordinated among the crane drivers and stevedores by means of two-way portable radios; one held by one of the stevedores and the other held by the crane driver.

At one point later in the afternoon, at about 1435, as discharge operations continued after the lunch break, the stevedores slinging cargo for the crane working the aft part of the cargo hold were having problems using the long steel hook to pull the chain sling through, owing to the location of an adjacent coil.

One of the stevedores moved down between two adjacent coils to try to pull the chain sling through the coil manually. As he did so, the steel roll being slung moved slightly and caught him by the shoulders against adjacent steel coil (Figure 3). His shoulders and torso were pressed, only leaving his head free inside the coil. The time was about 1440.

Aware that he was trapped, the stevedore immediately shouted out to his colleagues for help. The other stevedore at the aft end raised the alarm and called out to the other two stevedores who were working in the fore part of the cargo hold to come over and assist the entrapped stevedore.



Figure 3: Location of the accident

The stevedores inside the cargo hold immediately made their way to the assistance of the entrapped stevedore. Freeing him, however, proved to be no easy task due to the weight of the coil. They used timber to try to ease the pressure from the steel coils on the stevedore. The entrapped stevedore initially remained conscious but after a while, he slipped into unconsciousness.

Both the master and chief officer were inside the accommodation deck, discussing the cargo plan and the discharge operations with the foreman. They had not seen the accident happening since the view over the cargo hold was blocked by the open cargo hold hatch covers. However, on hearing the call for help, they also immediately went to assist while other crew members brought the ship's stretcher to the accident site. Shore emergency services were also called by one VGT official.

Eventually, the stevedores and other first aiders managed to shift one of the steel coils with the use of the crane and free the stevedore. The stevedore had by now passed out and mouth-to-mouth resuscitation was carried out. The stevedore regained consciousness.

In the meantime, paramedics had arrived on the jetty and were lowered inside the cargo hold. The injured stevedore was lifted ashore on a stretcher and to the waiting ambulance from where he was transferred to hospital.

Sustained injuries

At the hospital, the stevedore was examined and was found to have suffered a fractured rib, injuries to the collar and to his back. He also had a swollen chest, shoulder and eyes due to the pressure sustained with the weight of the steel coil. He was subsequently discharged from hospital on 20 April and continued his convalescence at home in conjunction with physiotherapy sessions.

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.

Cargo lifting

It is an established practice that coils of metal wire are lifted by either passing a solid steel bar through the coil or a sling / chain of adequate strength. The stevedores on board were using a chain and therefore the methodology adopted was not considered to be a contributing factor to this accident.

Cargo stowage

During the course of the safety investigation, it was observed that the steel coils were stowed with their major axis leading fore and aft and fastened together with security bands to form a unitised coil bundle to hold coils from opening up under the longitudinal forces of the vessel's motion (Figure 2).

It was also noticed that successive tiers of coils were stowed in a tight block stow, each coil overlapping the coils below, up to the cargo hatch coaming to prevent the transverse movement of the cargo in a seaway (Figure 1). Although wire coils settle and mesh together, the arrangement of the

stow on *NS Tera* was in accordance with the provisions of Annex 7 of the IMO Res. A.714(17) - Code of Safe Practice for Cargo Stowage and Securing.

While the applied stowage arrangement would have prevented cargo shifting during the sea passage, the stow would have been broken as soon as the cargo discharge operations commence and the steel coils may become unstable and liable to move.

It is highly probable that irrespective of the 4" x 4" timber used by the stevedores, the steel coils moved slightly during the discharge operations, consequently pinning the stevedore's shoulder while slinging the coil.

Cargo operations

It would appear that the risks of, which are inherent in the work of a stevedore, were anticipated. Then, the insertion of the 4" x 4" timber to temporarily wedge and secure the steel coils during the slinging operation to try and prevent any movement of the steel coils was also indicative that the risk was acknowledged.

When a vessel arrives at a VGT berth, an initial meeting is held between the foremen and VGT PFSO-HSE staff member to assess safety of the area being worked, and to complete a Safety (Visual) Checklist for Supervisors (Conventional Operations). The Checklist was completed on 16 April at 1850 and signed by the VGT Health & Safety Officer, the foremen, and the vessel's chief officer³.

Item 11 on the Checklist, which denoted whether any cargo stack visually appeared to be unstable, was ticked off as "no". Although it is acknowledged that at the time of inspection, the stowage was actually stable, the Checklist did not highlight the

³ The Port Workers' Health and Safety Representative was not present for the inspection and therefore did not sign the Checklist.

possibility of instability, once the stow is broken during discharging.

Notwithstanding, the fact that instability during cargo discharge (rather than stowage) was not addressed in the Checklist, a Health and Safety Guidelines List for stevedores was available and also read out to the stevedores⁴. The completed List, signed by the VGT Health and Safety Officer and the stevedore foreman, had been read out to the workers on board *NS Tera* on 17 April *i.e.*, the day of the accident.

Written in the Maltese language, item 5 on the List made reference to cargo instability during cargo operations as follows:

“[a]raw li l-post fejn qed taħdmu fuqu huwa stabli u ma hemm xejn li jista jersaq jekk tittiehed xi merkanzija”⁵ (*sic*).

Item 4 on the List also made reference to stow stability, if walking on the cargo was a necessity.

Instructions (and guidelines) in safety critical domains are known as incorporeal barrier systems. Once interpreted correctly, incorporeal barrier systems require continuous checking and monitoring of the situation (in this case on board a ship) during cargo operations *i.e.*, during a situation which is dynamic and therefore evolving continuously.

The dynamic characteristic of the situation *per se* puts a significant burden on the stevedores who, while being occupied with the cargo operations, are also tasked to keep a watchful eye on how a wider context is evolving. The work on board, involving

⁴ It is the Terminal’s procedure that the Health & Safety Guidelines list is read at the beginning of each shift and duly endorsed by the Foreman, VGT Operations and port workers (Stevedores) Health and Safety Representative.

⁵ The English translation of the text would read, “ensure that the area you are working in is stable and that there is nothing which can shift if cargo items are removed.”

potential multiple tasks, which are running simultaneously, is considered to be an event-rich domain. Attention, however, is a limited resource in human beings and it needs to be acknowledged that a stevedore working actively on board can neither attend all tasks simultaneously nor shift attention easily from one task to another.

The ‘richness’ of the domain in question (*i.e.* the ship-terminal interface) is well understood and the supporting organisation and related entities reflects this very clearly. One of the characteristics within the system is a certain degree of resilience which is embedded within. This was reflected in the actual presence of stevedores on board.

Although port workers are assigned to ships on a daily basis (as evidenced by the Port Workers Time Sheet), those listed may not necessarily be working on the vessel assigned to them due to the informal shift changes effected directly between the port workers and without necessarily informing the Co-operative in question.

Resilience is a necessity within any organisational set-up. It ensures that multiple goals are met and cargo operations are conducted seamlessly and with minimal interruptions, if any. However, it has to be ensured that the operational structure remains stable. For instance, at the time of the accident, all stevedores assigned to the vessel were not on board, and there was no person acting as a signalman since the person assigned with this task had actually assumed the role of a stevedore and was inside the cargo hold assisting in the cargo discharge.

The MSIU does not believe that this had a contributory role in the dynamics of the accident. Irrespective of whether or not a signalman was present on deck, the steel coil would have nonetheless become unstable, once the security band holding the coil together had come undone; freeing a section of the coil to move longitudinally at the

critical movement of slinging the bundle (Figure 4).

However, the absence of yet another person overseeing a cargo operation is still, in terms of safety, considered to be a missing barrier system, with the potential of identifying a hazard in a timely manner and which the stevedore could have otherwise missed.



Figure 4: Photo showing a loose security band

CONCLUSIONS

1. Successive tiers of coils were stowed in a tight block stow, each coil overlapping the coils below, and secured against the ship's side, up to the cargo hatch coaming, as recommended by international standards;
2. A Health and Safety Guidelines List, read out to the stevedores made reference to cargo instability during cargo operations;
3. During cargo discharge operations, 4" x 4" timber was used by the stevedores to prevent transverse movement of the steel coils;
4. The methodology adopted by the stevedores on board was correct and not considered to be a contributing factor to this accident;

5. The security band around the steel coil bundle had become undone, freeing the top section of the coil which then moved slightly, pinning the stevedore against the adjacent steel coil;
6. The dynamic characteristic of the situation *per se* puts a significant burden on the stevedores who, while being occupied with the cargo operations, are also tasked to keep a watchful eye on how a wider context is evolving;
7. Although not contributory to the accident, the absence of full complement of stevedores and another person overseeing a cargo operation remains, in terms of safety, a missing barrier system.

RECOMMENDATIONS

The Port Workers Co-Operative is recommended to:

- 08/2019_R1** use this safety investigation report as a case study and disseminate the identified safety lessons to its members;
- 08/2019_R2** adopt procedures to ensure that actual number of persons attending the cargo operations reflects the assigned level of persons;
- 08/2019_R3** ensure that Port Workers' Health and Safety Representative is available for cargo safety checks along with the VGT officials.

SHIP PARTICULARS

| | |
|-------------------------|--------------------------|
| Vessel Name: | <i>NS Tera</i> |
| Flag: | Panama |
| Classification Society: | Panama Shipping Register |
| IMO Number: | 8411566 |
| Type: | General Cargo |
| Registered Owner: | Solid Navigation Inc. |
| Managers: | Solid Navigation Inc. |
| Construction: | Steel (Double bottom) |
| Length Overall: | 91.12 m |
| Registered Length: | 86.82 m |
| Gross Tonnage: | 1861 |
| Minimum Safe Manning: | 8 |
| Authorised Cargo: | General cargo |

VOYAGE PARTICULARS

| | |
|--------------------|----------------------------------|
| Port of Departure: | Porto Nogaro, Italy |
| Port of Arrival: | Valetta, Malta |
| Type of Voyage: | International |
| Cargo Information: | 2633.13 tonnes of steel products |
| Manning: | 8 |

MARINE OCCURRENCE INFORMATION

| | |
|----------------------------------|---|
| Date and Time: | 17 April 2018 at 14:40 (LT) |
| Classification of Occurrence: | Serious Marine Casualty |
| Location of Occurrence: | Port of Valetta |
| Place on Board | Cargo hold |
| Injuries / Fatalities: | One serious injury |
| Damage / Environmental Impact: | None reported |
| Ship Operation: | Cargo discharge |
| Voyage Segment: | Arrival / Alongside moored |
| External & Internal Environment: | The weather was reported to be clear with good and a slight Northwesterly swell. A gentle breeze was also from the Northwest. Air temperature was recorded to be 20 °C and the sea temperature was 17 °C. |
| Persons on board: | 14 |