M A I I S

AIR, MARITIME AND RAILWAY ACCIDENT AND INCIDENT INVESTIGATION UNIT

# REPORT ON INVESTIGATION FOR SERIOUS CASUALTY BY THE M/V MAERSK HOUSTON

breakaway from pier, bottom touching, contacts with shore infrastructure and moored tugboat in the Port of Koper

19. 07. 2023

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REPUBLIKA SLOVENIJA
MINISTRSTVO ZA INFRASTRUKTURO

SLUŽBA ZA PREISKOVANJE LETALSKIH, POMORSKIH IN ŽELEZNIŠKIH NESREČ IN INCIDENTOV

Tržaška cesta 19, 1000 Ljubljana

REPUBLIC OF SLOVENIA
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# REPORT ON INVESTIGATION FOR SERIOUS CASUALTY BY THE M/V MAERSK HOUSTON

## 19. 07. 2023

## breakaway from pier, bottom touching, contacts with shore infrastructure and moored tugboat in the Port of Koper, Slovenia

## Final Report

Capt. Vladimir Vladović

Marine Accidents Investigator

**MINISTRSTRY OF INFRASTRUCTURE**
Air, Marine and Railway Accident and Incident Investigation Unit

Izola, 26. Feb 2024

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Extract from the Maritime Code of the Republic of Slovenia (Official Journal of the Republic of Slovenia, No. 62/16 - Official Consolidated Text, 41/17, 21/18 - ZNOrg, 31/18 - ZPVZRZECEP, 18/21, 21/21 - Amended and 76/23)

## Chapter XI - INVESTIGATION OF MARITIME ACCIDENTS

### Article 200a

**The purpose of investigation of maritime accidents under this Act is not to establish the responsibility or fault, but to determine the causes of accidents and to prevent similar accidents.**

### Article 200e

**Data obtained by an investigator during the investigation of a maritime accident shall be confidential and not publicly available.** These data may be publicly available only if there is prevailing public interest arising from the investigator's final report on a maritime accident.

### Article 200g

**The investigation of a maritime accident shall be independent from investigations of criminal acts or other parallel investigations the object of which is the identification of responsibility and determination of fault.** These investigations shall not unduly inhibit, interrupt or defer the investigation of maritime accidents.

Information:

The Marine Accident and Incident Investigation Reports are published on the website of the Ministry of Infrastructure at the following address:

https://www.gov.si/drzavni-organi/ministrstva/ministrstvo-za-infrastrukturo/o-ministrstvu/sluzbe-za-preiskovanje-letalskih-pomorskih-in-zelezniskih-nesrec-in-incidentov/preiskovanje-pomorskih-nesrec-in-incidentov/

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All times mentioned in this report are local (UTC+2h) unless otherwise stated.

The provisions of the international conventions referred to in this report must be interpreted and understood in the light of the full text of those conventions, including any annexes.

**In no event shall the Safety Recommendations create a presumption of liability or fault.**

This report is published in identical Slovenian and English versions. In case of any disputes or disagreements, the Slovenian version of this report shall apply.

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# TABLE OF CONTENTS

# INDEX OF FIGURES

# INDEX OF TABLES



# ANNEXES

# MEANING OF TERMS

| **Concept / *Abbr*** | | **Description** |
|---|---|---|
| AIS | - | Automatic Identification System |
| ARSO | - | Slovenian Environment Agency |
| BA | - | British Admiralty |
| CNP | - | Traffic Control Centre (SMA) |
| CoC | - | Certificate of Competency |
| COG | - | Course Over Ground |
| DoC | - | Document of Compliance |
| ECDIS | - | Electronic navigation chart and information display system |
| EU | - | European Union |
| GT | - | Gross tonnage |
| IMO | - | International Maritime Organization |
| ISM Code | - | International Code for the Safe Operation of Ships |
| kt, kts | - | Knot, knots |
| kW | - | Kilowatt / Kilowatt |
| LOA | - | Length Over All |
| LPP | - | Length Between Perpendiculars |
| EN | - | Local time |
| m | - | Meter |
| M | - | Nautical mile |
| MBL | - | Minimum Breaking Load |
| MMSI | - | Maritime mobile service identity |
| MSC | - | Maritime Safety Committee (IMO) |
| NAVTEX | - | Narrow-band direct-printing telegraph equipment for receiving meteorological or navigational information |
| OOW | - | Officer Of Watch |
| ROT | - | Rate of Turn |
| SMA | - | Slovenian Maritime Administration |
| SMC | - | Safety Management Certificate |
| SMCP | - | Standard Marine Communicating Phrases |
| SMS | - | Safety Management System |
| SOG | - | Speed Over Ground |
| SOLAS | - | International Convention for the Safety of Life at Sea |
| STCW | - | International Convention on the Standards of Training, Certification and Watchkeeping for Seafarers 1978 |
| T | - | Tone (metric tons) |
| TEU | - | 20-foot equivalent unit |
| TRT | - | Port of Koper Bulk cargo terminal |
| UKC | - | Under Keel Clearance |

| **Concept / *Abbr*** | | **Description** |
|---|---|---|
| UTC | - | Universal Time Co-ordinated |
| VDR | - | Voyage Data Recorder |
| VHF | - | Very High Frequency (Radio) |
| VNT | - | Port of Koper Multi-purpose terminal |
| VRM | - | Variable Range Marker |
| VTS | - | Vessel Traffic Services |


*Figure 1: MAERSK HOUSTON IMO 98489950, (source: MarineTrafic.com)*

# SUMMARY

The container vessel MAERSK HOUSTON arrived from Haifa, Israel, at 12:42 on July 18th, 2023, in the port of Koper. After the pilot boarded the ship at 12:53, an exchange of information between the master and the pilot took place. At 14:10, the ship was moored in Basin I, Pier 1, Berth 7D, with a total of twelve lines. Container transshipment was carried out with four to five cranes. The following day, July 19th, 2023, following the warnings received from the PSCO and the CNP Duty Officer regarding forecasted weather deterioration and the possibility of storms, the master ordered reinforcement of the mooring pattern with one additional line each at the bow and stern. Thereafter, the ship was moored with a total of fourteen lines in a configuration of two springs and five lines fore and aft.

At about 22:40 on July 19th, 2023, the wind from the north-westerly direction increased and started blowing at a speed of more than 45 knots. The brakes on the individual drums started to slacken, which was followed by the snapping of the mooring lines at the stern. It continued by breaking of the forward springs. The ship's stern started to drift away from the berth, and at the same time, the ship started to move forward and contacted lowered horizontal boom of the container crane STS 59. This was followed by the breaking of the remaining two stern lines. Two tugs were simultaneously engaged in a maneuver to moor another ship at a berth in front of the Maersk Houston. At this time, no other tugs were readily available in the port. Due to the strong winds and seas, it was not possible or safe to use the pilot boat to embark the standby pilot on board the ship. Due to the combined action of the wind and the sea, the ship's stern began to drift towards the opposite south side of Basin I. Although the master used bow and stern thrusters, the ship's stern came into an area of shallower depths, touching the muddy bottom. At that point, the rudder contacted the passenger's pier vertical wall on the south side of the basin. A tugboat arrived at the starboard quarter and started pushing the stern to port. Using the thrusters together with tugboat aft pushing, the ship started to slowly move away from the passenger pier. During this time, the ship dropped a starboard anchor with approximately one shackle of length to prevent the bow from approaching Pier 1. However, the ship's bow made contact with the pier wall and the fenders. Due to thrusters' operation and tug's pushing, the ship's stern continued to approach toward the tugboats moored alongside the passenger pier and made contact with tugboat Sirius, which sustained damage. Soon after that, another two tugboats arrived alongside the ship, one being released from the ship that had finished berthing and the other being boarded by the stand-by crew. One tug was assisting on the starboard bow, the other made fast on the port quarter, pulling the stern towards the original berth position. At this point, the ship's bow again approached the wall of pier 1, and the forecastle's bulwark plating contacted the vertical leg of the container crane STS 58. At this time, weather has improved, winds have dropped, and, using the thrusters and with the assistance of the three tugs, the ship was positioned and temporarily secured at the same berth 7D at 00:30 on July 20th, 2023. Tugboats were alongside, keeping the ship in position while the crew prepared the damaged lines for the re-berthing. At 02:15, the ship was safely moored. One tugboat remained alongside the ship.

The following morning, the ship, mooring lines, and other equipment, as well as the required documentation, were inspected by the port authorities, port representatives, the shipowner representative, and the investigator. The VDR data was delivered to the investigator. In the following days, rope remnants of damaged ropes were inspected. Additional information from the ship, the container terminal, the control center, and other information, as well as security camera footage, were obtained for the purpose of the investigation.

The findings indicated, inter alia, a failure to prudently consider the characteristics of local weather phenomena, to closely monitor weather warnings, to use mooring equipment correctly regarding the

number, layout, and lifetime of the lines, and to maintain the mooring equipment in accordance with good maritime practice. The Company's internal procedures relating to safety management did not ensure that the prescribed procedures were fully observed and implemented entirely.
At the time when the weather conditions deteriorated and very strong winds started blowing from the north-westerly direction, which soon developed into gale force winds, the arms of the STS cranes at the container terminal were in a horizontal position and remained in this position even after the interruption of the transshipment operations.
At the start of the incident, two tugboats were readily available in the port. Tug company does not have prescribed written procedures for dealing with weather emergencies. The decision to call standby crews and activate other tugboats is subject to the daily pilotage plan or on the SMA request, or by following individual ship's request.
The radio communication between all the parties involved was driven by the current situation of the incoming ship maneuver and, additionally, the Maersk Houston incident. About ten different stakeholders or stations were communicating on the same VHF channel. The problem of using a single working channel was experienced, as well as the occasional use of a second radio channel, which was a duplex channel. There was a lack of specific coordination and management of the activities of all the parties involved.

The safety recommendations are made as a result of the findings of the investigation and are aimed at eliminating the factors that contributed to the occurrence or progression of the accident. In no case do they create a presumption of liability or fault.

# CHAPTER 1 - FACTUAL INFORMATION

## 1.1. SHIP'S PARTICULARS

| **SHIP'S PARTICULARS** | |
|---|---|
| Name of ship | MAERSK HOUSTON |
| Type of ship | CONTAINER SHIP |
| Owner | A. P. MOLLER Singapore PTE LTD |
| Controller | MAERSK A/S |
| Year of construction | 2019 |
| Classification Society | AMERICAN BUREAU OF SHIPPING |
| Flag | SINGAPORE |
| Port of entry | SINGAPORE |
| IMO number | 9848950 |
| MMSI number | 563078300 |
| Call sign | 9V3092 |
| Length | 353,02 |
| Width | 53,56 |
| Maximum draft | 17,00 m |
| Maximum height | 72,85 m |
| Hull height | 29,9 |
| Gross tonnage (GT) | 153,744 |
| Net tonnage (NT) | 79,806 |
| Displacement (D) | 224,100 t |
| Load capacity (DWT) | 178,403 |
| Freeboard | 5.677m |
| TPC | 165 t |
| FWA | 340 mm |
| Wind surface | 13,500 |
| Container capacity | 15,282 (21 bays, 9 holds) |
| Motor | MAN B&W 8G95ME-C9.5 (TIER II) |
| Engine power | MCR 54960 kW x 80 RPM / NCR 49464 kW x 77.2 RPM x 21.9 kn x 210 MT/Day |
| Ship's screw | 5-BLADE FP Dp=10000 mm, Pitch=9.0403 m |
| Lateral pushers | 4 x 1800 kW (2+2) |
| Ship's anchor | 2x 12,5 t, 2x14 shackles (27,5m=15 fathoms), 132 mm |
| **TRAVEL INFORMATION** | |
| Previous port | Haifa |
| Port of arrival | Koper |
| Port of destination | Trieste |
| Type of voyage | International |
| Cargo | Containers |

| | |
|---|---|
| Number of crew | 23 |
| **INFORMATION ON A POMORSKIE ACCIDENT OR INCIDENT** | |
| Date and time | 19/07/2023 at 22.40 LT |
| Type of accident or incident | Serious maritime accident |
| Location of the event | Port of Koper, Berth 7D |
| Part of the ship | Navigation bridge (top) |
| Human injuries / casualties | -/- |
| Damage / environmental impact | There was no |
| Shipping operations | Container transshipment |
| Travel segment | At berth, cargo operations |
| Weather and weather effects | Storm |
| A draft at the time of the accident | 11,20 (FWD) / 12,10 (AFT) |
| Load capacity (DWT) | 96,000 |
| Displacement (D) | 141,100 |
| Surface area of the superstructure | *9,960 m2 (Lateral) / *2,513 m2 (Transverse) |

* *estimated or calculated*

In accordance with the provisions of Article 2(2)(1) of the Regulation on the investigation of marine casualties (Official Journal of the Republic of Slovenia No 67/11), a marine casualty is any occurrence on board or in connection with a ship where:

- a person dies or suffers serious injury in connection with the operation of the ship:
- a person falls from the ship due to the operation of the ship,
- the ship is lost, presumed lost, or abandoned,
- **the ship is damaged,**
- **the boat runs aground, unless she runs aground for a short period of time on purpose and is not damaged as a result,**
- the ship is unseaworthy,
- **the ship collides,**
- **property damage caused by the operation of the ship,** or
- the environment is polluted as a result of damage to the ship or the operation of the ship.

## 1.2. DESCRIPTION OF THE EVENT

The container vessel MAERSK HOUSTON arrived in the port of Koper from Haifa, Israel, at 12:42 on July 18th, 2023. After the pilot boarded the ship at 12:53, an exchange of information between the master and the pilot took place. At 13:13, two tugboats made fast, one on the bow and the other on the stern. A third tugboat assisted alongside the ship. The ship was moored by her port side at berth 7D at 14:10. The ship was moored in a "4 and 2" configuration, i.e., with four headlines and two springs at the bow and with four stern lines and two springs at the stern. A total of twelve (12) lines were used for mooring.

19. 7. 2023

On July 19th, 2023, between 17:00 and 18:00, the master ordered reinforcement of the mooring with an additional headline and stern line, so that the ship was tied up with a total of fourteen (14) lines. At the same time, the rope tension control device on the mooring drums was deactivated, and the ropes were secured with brakes.

22:39 A "Stop work" notice was issued on the container terminal; container handling was suspended. All cranes stopped except STS 61; the container spreader was still in the ship's hold.

22:40 (about) the duty Watch Officer warned the master that the wind had picked up, and the master went to the bridge. The wind was blowing with 42,3 knots (21,8 m/s) from direction $331.4^0$.

22:42:30 wind 49,7 knots (25,6 m/s) from a direction of 327,6°.

22:42:54 the ship is still tied up, the aft springs are very tight, and given the observed ship's distance from the shore, it is likely that the mooring drum brakes have already failed. Winds remained within 45-47 knots (23,2 – 24,2 m/s) from 319.7°. The ship's course has changed by 1°, and the ROT has increased to 2,6°/min. At this point, the ship gained momentum.

22:43:08 first stern line broke and parted, the wind was 45,8 knots (22,8 m/s) from 327,5°.

22:43 STS 61 retrieved a spreader from the ship's hold.

22:43:21 second stern line parted, wind 44,3 knots (23,6 m/s) from 325,8°.

22:43:24 third stern line parted.


*Figure 2: Astern drift of the ship from the pier at 22:44:08 hours*

22:44 forward springs parted, other headlines also started to break, wind 40,8 knots (21,0 m/s) from 325,1°.

22:44:43 the master requested the engine duty officer to prepare the main engine and thrusters; the duty watch officer at 22:45:05 called the Traffic Control Centre (hereinafter referred to as the CNP) of the Slovenian Maritime Administration (SMA) on VHF channel 08, stating that the ship urgently needs tug's assistance.

22:45:22 the remaining two stern lines slacked / parted, and the ship started to drift away from the pier.

22:45:31 contact was made between the four (4) ship's signal masts on the compass deck (*"monkey island")* and the lowered boom of STS 59*,* wind 52,5 knots (27,0 m/s) from 328,3°.

22:46:36 the remaining two stern lines slackened/broke and the ship started to drift away from the pier.

22:47 the ship is positioned at an angle of approximately 45° to the berth, with her bow towards berth 7C and her stern away from berth 7D towards the passenger terminal berth on the south side of Basin I. The bow thrusters are operating with full power to port.

22:55 Maersk Houston confirmed that only one rope remained on the bow.

22:55:37 the ship temporarily touched the muddy bottom due to the reduced depth. The rudder made contact with the vertical wall concrete structure between bollards nos. 15 and 17 of the passenger's terminal. The second contact with the wall followed at 23:05:04.

23:02:30 tugboat Mercur started to assist on the starboard quarter.

23:03:33 last headline parted.

23:03:34 the master ordered the starboard anchor to be dropped; 23:03:53 anchor dropped.

23:04:39 ship's bow (bulb) contacted the fenders and the pier's vertical wall.

23:08:50 the ship made contact with the tugboat Sirius, moored alongside the tugboat Wotan, while both were moored alongside the passenger terminal.

23:13:00 Maersk Houston was under control with the help of a tugboat and her own thrusters. At that time, the stern started to move back to port and moved out of the soft bottom area.

23:16:00 tugboat Neptune made fast on the port quarter.

23:18:22 ship's bow contacted seaside leg 1 of the container STS crane 58, at a height of 7 m above the crane's portal cross beam.

23:31:00 tugboat Zeus assisted on the starboard bow.

23:36:45 tugboat Neptune made fast aft.

23:32 the ship was back alongside at berth 7D.

23:40:11 the tugboat Zeus made fast on the starboard bow.

23:56:52 starboard anchor heaved up.

<u>20. 7. 2023</u>

00:30 the ship was temporarily secured with two springs at the stern and one at the bow.

01:06 the ship was secured in "two and two" configuration.

02:30 the ship is moored again and secured in "6 + 2" configuration (6 headlines and 2 springs, and 6 stern lines and 2 springs). At the master's request, one tugboat has remained on stand-by alongside the ship in case of bad weather.

## 1.3. IMPLICATIONS

### 1.3.1. Damage on board Maersk Houston

- Due to the strong winds, the ship's mooring lines, 14 in total, snapped.
- The ship's navigation and communication equipment installed on four masts was broken after contact with the lowered STS 59 crane boom and bent towards the aft after part of the deck.
- Minor damage to the bow plating and bulwark (contact of the ship’s forward bulwark with seaside leg 2 of the STS 58 crane).
- Minor damage to the stern plating due to contact with the shore and with the tugboat Sirius.
- Abrasions on the rudder blade due to contact with the concrete mooring support of berth 1.
- Repeated mechanical damage was noted on 10 x 40” containers at Bays #58 and #62: bumps, torn sheet metal, and holes – probably caused by container spreader grips[1].


*Figure 3: Damages on Maersk Houston - Monkey Island*

*Figure4: Damage on bulwark*

[1] Joint survey, preliminary report M/s Maersk Houston, Koper, 21/07/2023

*Figure5: Bulbous bow-shore contact with Pier 1, port quarter plating-contact with tugboat, broken stern lines*

### 1.3.2. Damage to port infrastructure

Basin #1, Container Terminal / Pier #1 / Berth 7D

- STS Crane 58 - Damage to metal plates with indentations on the vertical elevator girder at a height of approximately seven (7) meters above the portal cross beam at the point of contact with the bow plating[2] .
- STS Crane 59 - Traces of contact with the ship's masts are visible on the seaward side of the outer part of the crane mast/rail for a length of approximately 20 m and on the gangway at the end of the mast. Scratches and paint marks are visible on the girder[3] .
- STS Crane 61 – Collateral damages due to crane use in emergency situations. Damaged metal wheel guards on the auxiliary trolley / wire tensioner due to knocks and scratches. Damaged container grips. Abrasions on lifting rope wheel guards, ladders destroyed, abrasions[4]
- Three cone fenders were damaged due to contact and sliding of the bow between moorings #17 and #21 on berths 7A and 7B.[5]
- Damaged vertical wall of the pier 7B due to contact with the ship's bow (bulb) between moorings #20 and "21. At the point of contact, on a 40 cm thick wall, a break is visible, inside the installation gutter a damage is visible also.

Passenger Terminal / Berth 1

[2] Oblak I. (2023), Survay_Report-MHouston, Koper 27.07. 2023, p.4
[3] See footnote 2, p.5
[4] See footnote 2, p. 6
[5] See footnote 2, p. 2

- Damage to the passenger's pier vertical foundations in three places at a depth of about 30 cm was due to contact with the ship's rudder. There are changes in depths due to the sliding of the ship's bottom.[6]

*Figure6: Upper and lower part of the foundation wall of Berth #1 (source: Sirio)*

### 1.3.3. Damage to tugboats Sirius and Wotan

The following damage was caused to the tugboat Sirius[7] because of contact by the Maersk Houston when the tugboat Sirius was moored sideways to the tugboat Wotan at Berth 1, Passenger Pier, Basin:

- Damage to the bridge (bridge structure, windows, equipment),
- Signal mast (distorted and broken, including fire-fighting equipment piping, vertical stairs, radar support, and various signaling fixtures and equipment)
- Rubber bumper on the right side of the cladding

Collateral damage was caused to the tugboat Wotan, to which the tugboat Sirius was laterally moored. The towing mooring bit on the bow and the protective fender on the left side of the tugboat are damaged.


*Figure7: Tugboat Sirius - damage to the bridge and main mast.*

[6] SIRIO, (2023), Examination of the underwater part of the 1st tie structure with diver due to ship impact
[7] RINA, (2023) Narrative Report (excerpt)

*Figure8: Tugboat Wotan, collateral damage*

## 1.4. THE PORT OF KOPER AND THE ADEQUACY OF THE BERTH

Despite challenging weather conditions, every port must provide a safe berth for ships. According to EN 1991-1-4, the design wind speed for the area of the freight Port of Koper is 30 m/s (for all facilities). Large container ships can also berth safely in Berth 7D due to the facilities installed there, which are also designed to allow safe berthing in wind gusts of up to 30 m/s (58.3 knots).

### 1.4.1. Bollards and mooring devices (buoys) overview

The extension of the pier in 2022 also included the installation of new bollards and the addition of stronger bollards on the existing pier. The bollards at berths 7C and 7D have a capacity of 150 tons, the others have a capacity of 100 tons. In addition, special bollard No. 42 has been installed, which has a capacity of 200 tons and is intended for the mooring of the stern (in the case of the port side berth), which is potentially the most exposed in the event of winds from Tramontana[8] and Lebičade[9] . The ropes on this bollard act as lateral ropes, which improve the lateral stability of the mooring[10] .
Intermediate bollards with a capacity of 150 tons have also been added along the entire shoreline to allow secure berthing also at the bow of the ship in the event of port side mooring (Nos. 14a, 15a, 16a, 17a, 18a, 21a, 22a, and 23a). In the past, even the largest ships were tied up with 5 lines to one 100-ton mooring, including Maersk's H-class ships in the last four years. They have also been subjected to strong storms (north-easterly direction) and gales on several occasions. The new bollards made the berthing of ships much safer, as the bow ropes are distributed over at least two bollards. The new 7D pier is also equipped with mooring bollards at the head of the pier, which are also of sufficient capacity (150 tons) to further strengthen the mooring. Two mooring devices (mooring buoys) of 250 tons capacity are anchored in the sea.[11] The use of the mooring devices is illustrated in Figure 10.

[8] Tramontana - Tramontana is a short-lived transient wind that blows from the north in the Adriatic. It blows at all times of the year. It can be a strong and dangerous wind. It usually becomes a gale. It can reach speeds of up to 108 km/h, but usually blows at 80 km/h.
[9] A lebich, lebičada, garbin (Italian: lebeccio) is a stormy south-westerly (SW) wind in the Adriatic, accompanied by heavy precipitation. In summer it forms as a local thermal storm wind.
[10] FPP (2023), Report-LK/MTE/01-2023 / Incident investigation "Maersk Houston" Case Study, p.8

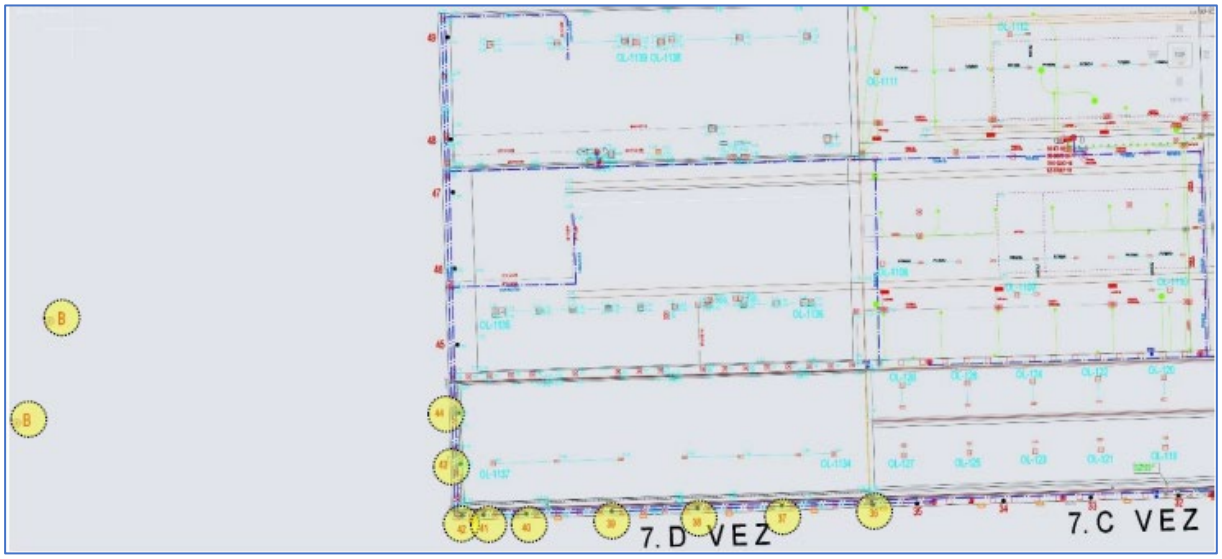



*Figure9: Overview of moorings and mooring facilities, Basin I, moorings 7D and 7C*

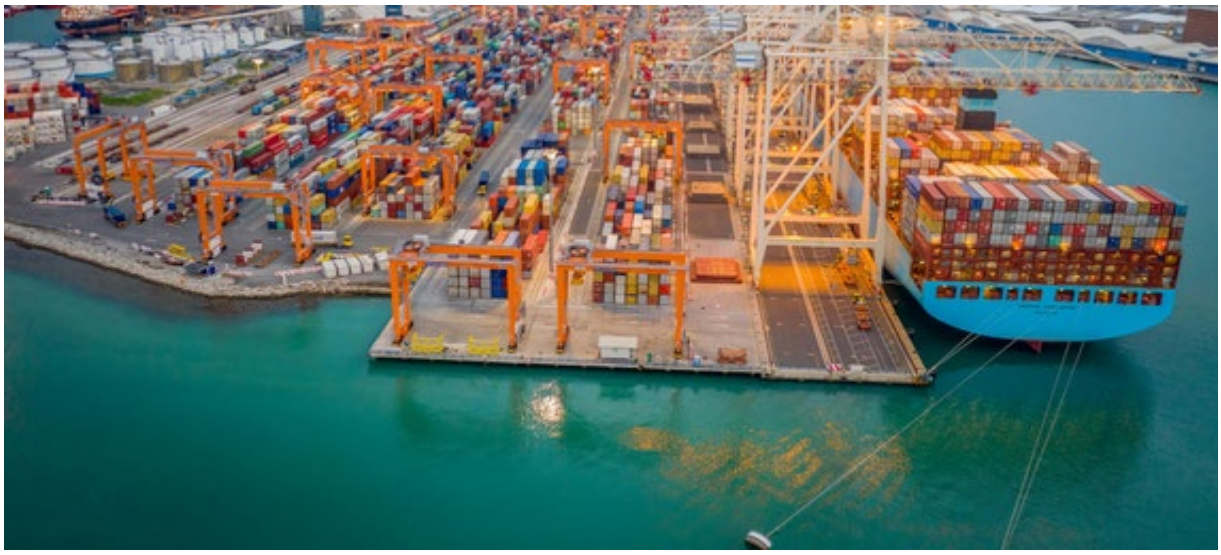


*Figure10: Illustration of the mooring of stern lines to mooring devices*

### 1.4.2. Suitability of fenders

Suitably selected fenders are important to ensure a safe mooring. The suitability of the fenders installed on the container shore depends on the maneuver preparation, the speed of entry, the backing, the slope to the shore, and the displacement of the ship.

The fenders are identical along the entire shoreline of the container terminal. They have been dimensioned for ships with a displacement of 169,200 tons, which can approach at speeds of up to 10.2 cm/s. All the fenders are of the conical type, state-of-the-art fenders suitable for container ships. They are 1000 mm (model SPC1000, G2.5) with an added spacer and a 2 m x 2 m backing panel, which is chained in place. The overall depth is 2000 mm. The characteristics of the fenders are as follows: E = 562 kNm, R = 1072 kN[12] .

[12] ''E'' - Normal energy of attachment absorbed by the bumper (kNm), ''R'' - Reaction force generated by the bumper

The fenders are placed along the entire coastline with a separation of 20 m. In accordance with the recommendations of British Standard BS 6349, Part 4, the distance between the fenders shall be 15% of the length of the smallest ship. This means that the existing arrangement is satisfactory for ships of more than 130 meters in length, which implies that a larger ship has a sufficient number of fenders. The fender's capacity and the arrangement of the fenders are also adequate for the safety of the berth in strong winds.[13]

### 1.4.3. Hydrographic survey of the approach channel and Basin I

The Port of Koper regularly carries out depth measurements in the basin, and the SMA verifies the depths of the approach channel, which is maintained at -15 meters hydrographically. The maintenance of the depths is the responsibility of the Port of Koper. A plot of the latest valid chart, ENC SI5KP001, is shown in Figure 11, showing the channel and part of the basin deepened to -15m. A new (additional) pilot boarding station was positioned in 2021, located 2.2 M west from the outer channel buoys, as a pilot boarding area for large vessels.

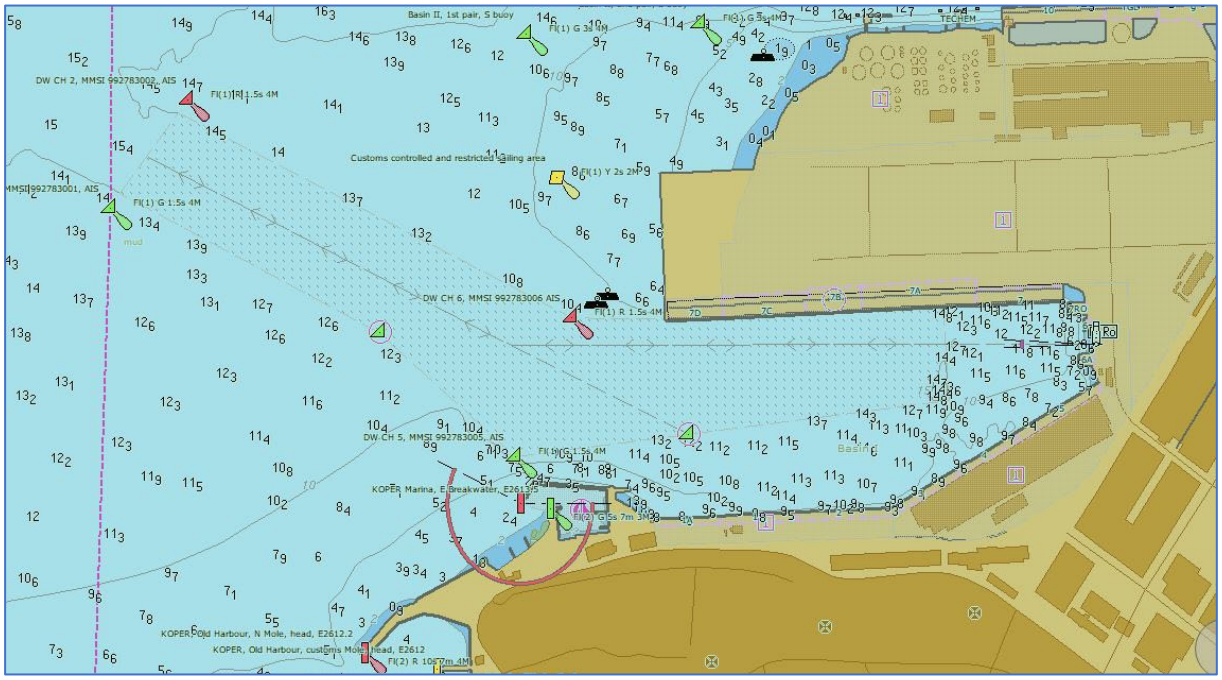



*Figure11: Extract of map ENC SI5KP001, Basin 1 area with channel (-15 m) and depths plotted.*

[13] FPP (2023), Report-LK/MTE/01-2023 / Incident investigation "Maersk Houston" Case Study, p.12

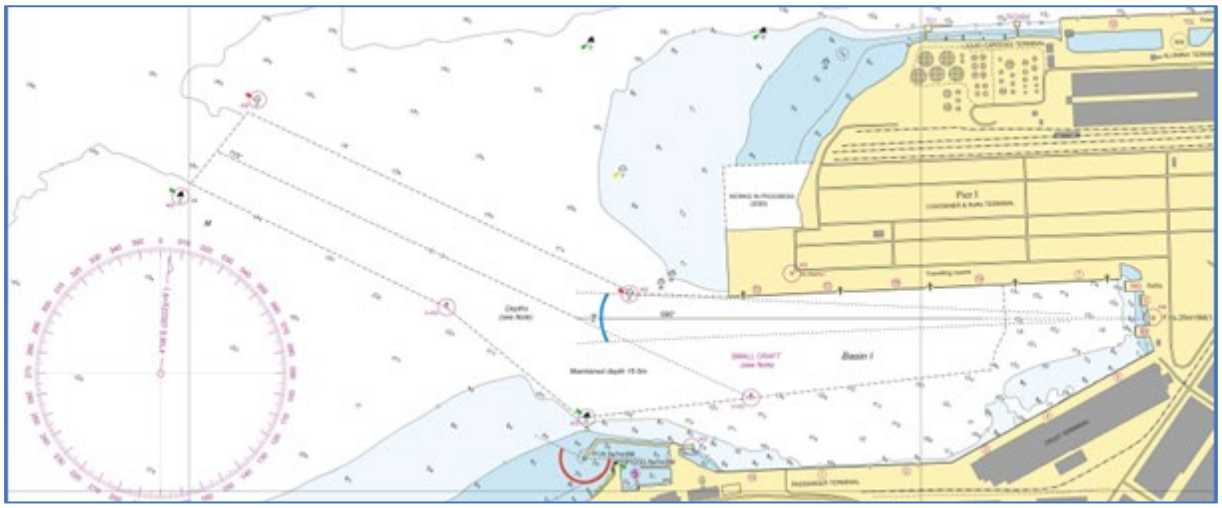


*Figure12: Extract Official chart (paper) Port Koper 04 with channel plotted (-15 m)*

Figure 12 is an extract from the printed map. At the entrance itself, a bathymetric line (15 m) can be seen inside the channel, but this does not significantly affect safety as the ship follows the center of the channel.

Figure 13 below gives a more detailed overview of the depths, showing an area with a depth of 15 m and more and an acceptable tolerance for navigation (the bottom is muddy), an area with a depth of 14.8 m and more in the Basin area, and 14.9 m and more in the inlet channel.

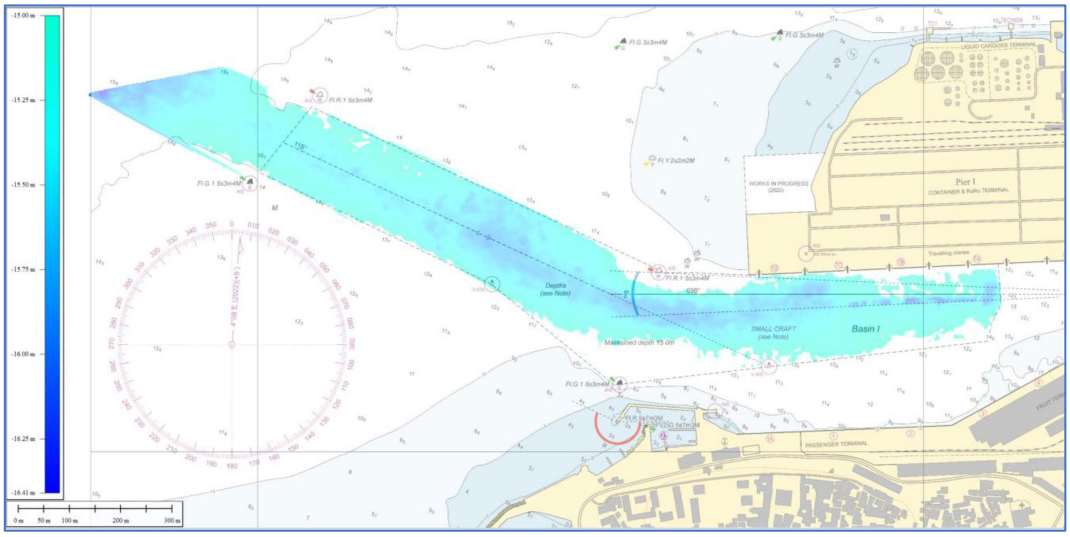


*Figure13: Depths, 14.9 m and over for the inlet channel and 14.8 m and over for the basin*

The design of the channel and the availability of depths allow safe access to the mooring site, accurate positioning, and good and safe mooring to the available bollards and floating mooring devices.

## 1.5. THE ENVIRONMENTAL CONDITIONS

### 1.5.1. General meteorological conditions in the Koper harbor area - overview

A good understanding and knowledge of meteorological and oceanographic conditions is fundamental to ensuring maritime safety. The area of the Gulf of Trieste is exposed to weather conditions that can roughen the sea and endanger the safety of vessels. The most common wind is a north-easterly wind, also known as a Bora. This gusty wind causes waves to form in irregular shapes, up to 3 m high. The waves in a storm are short, narrow, and steep, breaking in a picturesque manner and producing a spray of water droplets on the surface of the water. The storm pushes the surface water away from the shore, and the sea level then drops. On average, more than a third of all winds blow from this direction each year. Storms are particularly frequent from November to March.

In addition to the winds, there are also southeasterlies and southerlies, which blow evenly throughout the year. Waves are more regular in shape, up to 4 m or more high. Moderate southerly winds raise the water level up to 25 cm and up to 0.5 m in autumn and winter. However, from October to December, when the weather is accompanied by a strong south-easterly wind, the tide tends to push the sea masses towards the Slovenian and northern Italian coasts. This can cause flooding and raise sea levels by more than 85 cm above the mean sea level.
On the waterway and in the port itself, wind is the most prominent attribute of navigational risk. On the waterway and in the harbor, the most prominent attribute of navigational risk is wind. Summer storms are particularly dangerous, as they can catch ships just as they are docking.

Admiralty Sailing Directions NP47 - Mediterranean Pilot Vol. 3 (Ed. 17, 2020), under the subheading 'local weather' and chapter 10.129, states: *'"Tramontana (10.101) has a strong northerly wind blowing into the harbor. It is most common in winter, and strong gusts, usually associated with storms, can cause damage to vessels." Tramontane is specifically mentioned in paragraph 10.101: "Tramontane winds are strong but short-lived NW to NNW winds that are locally present in the Gulf of Koper. It can occur at any time of the year but is most likely to occur in the summer or early autumn. It is associated with the passage of cold fronts over the Alps and may be accompanied by storm activity in the direction of a north-westerly storm line heading towards Trieste and the Gulf of Koper. Winds are considered dangerous due to their sudden and frequent occurrence. Typical wind speeds are between 40 and 60 knots. Winds are of a transient nature, usually lasting between 1 and 3 hours in the Gulf of Koper, often quickly becoming gale force."*

Measurements have been carried out at the "Štapiči" site to the right of the entrance to Basin I since 2014, at the container terminal site since 2015, at the VNT terminal site since 2016, and at the site in front of Pier II since 2018. Measurements are carried out with modern high temporal resolution meters, allowing up to 20 Hz at VNT and CT.

The anemometer at the container terminal (Basin I) and the anemometer at the VNT (Basin III) are identical 3D anemometers capturing data at 20 Hz. A snapshot of the more recent measurements at the CT and VNT sites covering the period from 1.1.2020 to 1.1.2021 is shown in Annex 01.

### 1.5.2. Weather conditions before and during the Maersk Houston marine accident

Before the accident, an unstable weather situation had been developing for a week. The boundary between the cooler, moist Atlantic air and the hot African-Mediterranean air mostly passes over the Alps, but storms can also descend on the coastal part of Slovenia. The first storms hit Slovenia on July 12$^{th}$ and 13$^{th}$, followed by storms on July 18, 19 and 20$^{th}$. On July 18$^{th}$, we could see a storm moving across the northern part of Slovenia, by which time the Maersk Houston was already moored. The

storm also passed through the Primorska region the following afternoon. By the middle of the night of the 19th-20th, the storm system had crossed Istria, Kvarner, the Gorski kotar and southern Slovenia. Both storms were forecast.

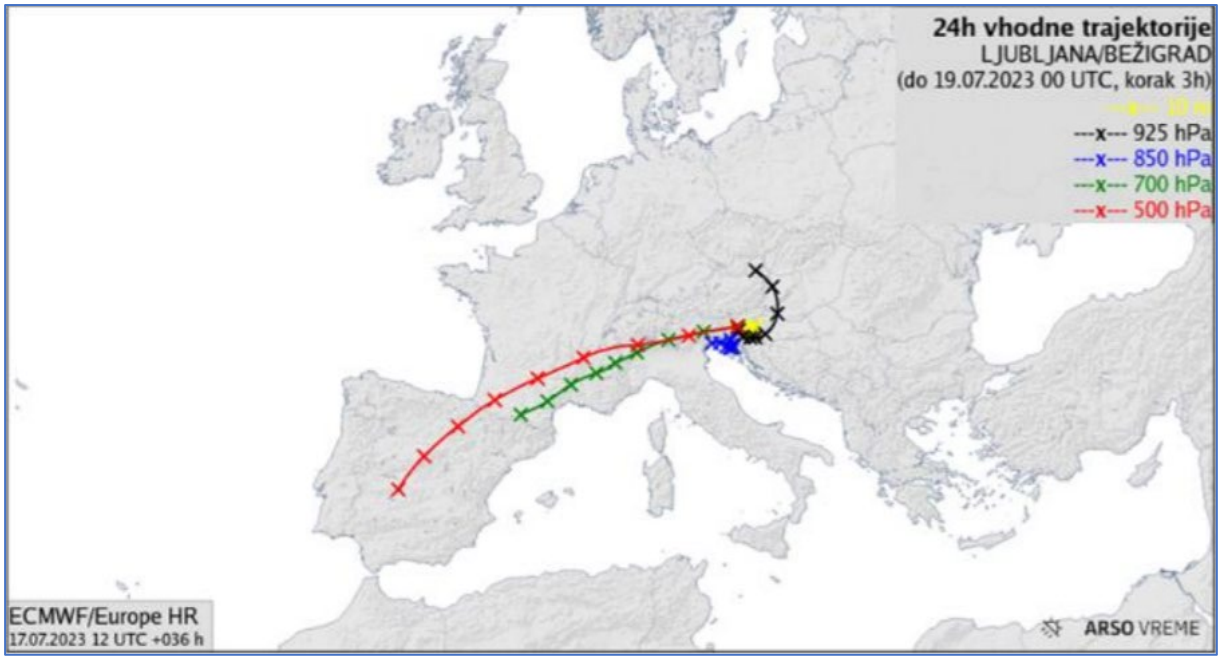



*Figure14: Forecasted 48-hour air mass trajectory from 02:00 on 17 July to 02:00 on 19 July (source: ARSO).*

The National Meteorological Service (ARSO) has issued several warnings of storms and high heat loads, based on the weather situation and forecasts from meteorological models. The warnings were also communicated to the ships via e-mails and a phone call to the shipowner's agent. In his statement, the pilot gave the information that during the ship's arrival, the Master was informed regarding the possibility of worsening weather and the possibility of storms in the next few days. The PSC inspector also made the master aware of these warnings during the ship's inspection. The ship was within range of two NAVTEX stations (Split and Mondolfo), which had also forecast storms. Trieste Radio had sent a SECURITE message before the storm. Visually, the storm could be observed at least one hour before its arrival.

**ARSO notices**:

18 July at 16.15
A strong storm system is located over northern Italy and Austria. Wind gusts at individual stations in Austria range from 100 to 160 km/h. The storm system will reach the extreme north-west of Slovenia around 17:00. Very strong wind gusts (above 100 km/h) are expected, and individual storm cells may bring thick hail.

19 July at 09.00
Local thunderstorms with hail, gusty winds, and heavy downpours are expected this afternoon, evening, and into Thursday night. In the Primorska region, there will be a high heat load in the middle of the day and in the afternoon.

19 July at 12.30
A storm system is approaching western Slovenia via northern Italy and is expected to affect the weather in western and parts of central Slovenia between 13:00 and 14:00. The main storm activity is expected across Slovenia in the late afternoon, evening, and overnight on Thursday.

19 July at 13.50
A strong storm system has covered western Slovenia and is strengthening, so a red warning has been issued for western and central Slovenia until 16:00. The storm system is mainly accompanied by very strong wind gusts, and locally hail is possible. It is moving very fast. Further storms are expected to develop across Slovenia in the late afternoon, evening, and overnight on Thursday.

19 July at 17.30
New storm cells are approaching rapidly from northern Italy and are expected to move across Slovenia between 18:00 and 22:00. Strong wind gusts, torrential rain, and locally also hail will be possible again.

Shortly after 21:00, the storm activity really picked up (for the second time that day). The first strong storm formed over the Karst at around 22:00, and less than an hour later, another area of heavy precipitation crossed the Karst just to the south. By mid-night, the storm system had passed over Istria, Kvarner, the Gorski kotar, and southern Slovenia.
The storm struck the Port of Koper at around 22:40.

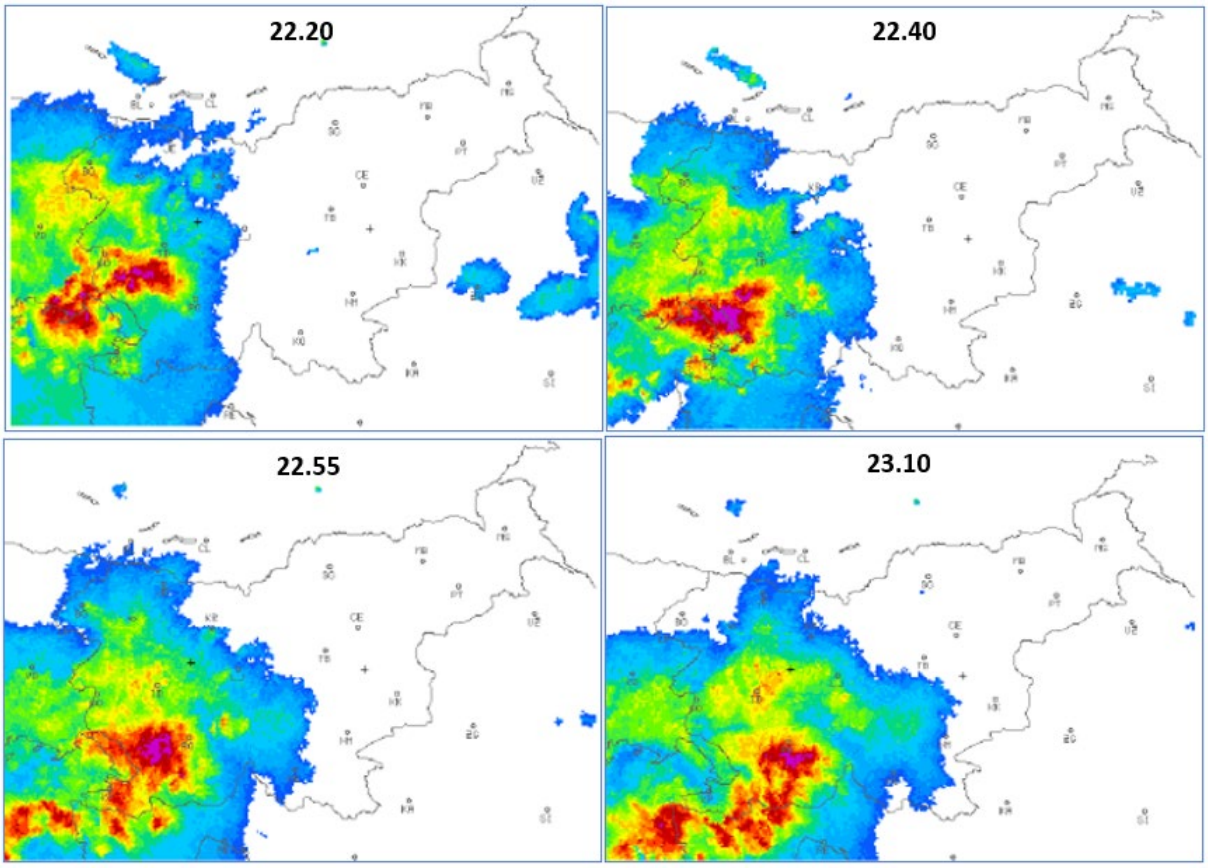



*Figure15: Maximum radar reflectivity of precipitation during the night of 19-20 July (source: ARSO).*

**NAVTEX messages**

Below are shown two messages dated July 19th, 2023, on the day of the accident and one for the previous day, on July 18th, 2023. The stations in range are Split (''Q'') and Mondolfo (''U''). On **18/07/2023, Split Radio issued weather warnings for the northern Adriatic and on July 19th , 2023, at 02.43 / 06.42 / 10.43 UTC**.

**QE89** / 7/19/2023 10:43:01 AM / 518 kHz

191040 UTC JUL 23
SPLIT RADIO

WEATHER BULLETIN FOR ADRIATIC ISSUED BY THE MARINE METEOROLOGICAL CENTER SPLIT 0N 19/07/2023 AT 10 00 UTC

WARNING:
POSS SUDDEN STORMS ON THE N-ERN ADRIATIC, MAINLY TWDS EVENING/OVERNIGHT.

SYNOPSIS:
FIELD OF MEDIUM OR LITTLE LOWERED AIR PRESS STNR OVER ADRIATIC, FRONTAL SYSTEM SHIFTING TO THE N O F ADRIATIC.

FORECAST FOR THE NEXT 24 HOURS VALID UNTIL 20/07/2023 AT 1000 UTC

2023-07-19 22:20:24(LV) AREA: U

ZCZC UE36

191920 UTC JUL 23

MONDOLFO RADIO

WEATHER FORECAST OVER MEDITERRANEAN AREAS ISSUED BY ROME METEOROLOGY CENTRE AT 18/UTC OF 19/07/2023

AND VALID UP TO 06/UTC OF 20/07/2023

1. WARNINGS:

THUNDERSTORMS UNDER COURSE: OVER NORTHERN ADRIATIC SEA.

THUNDERSTORMS FORECAST: OVER NORTHERN ADRIATIC SEA.

GALES UNDER COURSE: NORTHEASTERLY 7 IN THE NORTHERN ADRIATIC SEA.

GALES FORECAST: - VARIABLE 7 IN THE CENTRAL TYRRHENIAN SEA WEST SIDE.

- SOUTHERLY 8 IN THE NORTHERN ADRIATIC SEA.

- NORTHWESTERLY 7 IN THE NORTH BALEARI SEA.

2. WEATHER SITUATION:

HIGH AND FLAT FIELD OF 1016 HPA OVER WEST-CENTRAL MEDITERRANEAN SEA.

SEASONAL LOW OF 1008 HPA OVER LEVANTINE BASIN.

3. FORECAST TO 06/UTC OF 20/07/2023 AND 12 HOURS OUTLOOK:

NORTHERN ADRIATIC SEA: SOUTHERLY 4 BECOMING 8 FROM NORTHEASTERLY

OVER TRIESTE GULF -PARTLY CLOUDY WORSENING ISOLATED THUNDERSTORMS

OUTLOOK: NORTHERLY 4 -ISOLATED THUNDERSTORMS.

### 1.5.3. Metocean measurements

The area around the Port of Koper and its surroundings is equipped with an extensive network (Metocean) of wind gauges, sea level, current, visibility, and other standard meteorological parameters. For official wind speed measurements, average wind speeds within a 10-minute time window at a height of 10 meters are used. Wind gusts are measured as single measurements, more specifically as maximum 3-second wind measurements. Different types of wind gauges are located at different heights and locations, considering the effect of wind eddying around the gauge due to the terrain configuration, which may affect the measurements.

The following Figure 16 shows the most relevant wind measurements in the immediate vicinity of the container terminal (on the northern side, i.e., not in the shadow of the ship for the winds in the upper quadrant). The wind meter is on a light tower at a height of 34 meters, capturing measurements at 20 Hz, these measurements are averaged in real time into second measurements. The measurements are converted to a height of 10 meters, and the minute averages are displayed. The maximum measured wind gust is 28 m/s (54.4 knots), which is consistent with measurements at sea and on-board ships. The maximum minute average wind, which is relevant for the load on the ship, is 25 m/s (48.6 knots). The measurements show an extremely rapid increase in wind strength. Figure 17 below shows the raw wind measurements at 34 m for a longer period, which makes it even more obvious how fast the storm was developing.

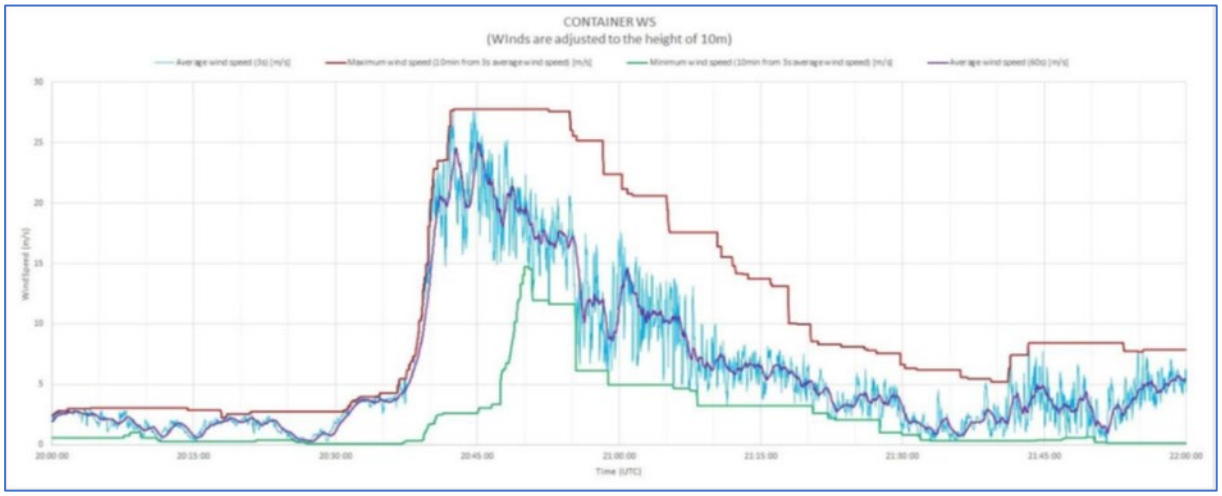



*Figure16: Wind measurements at the container terminal - conversion to 10 m height*

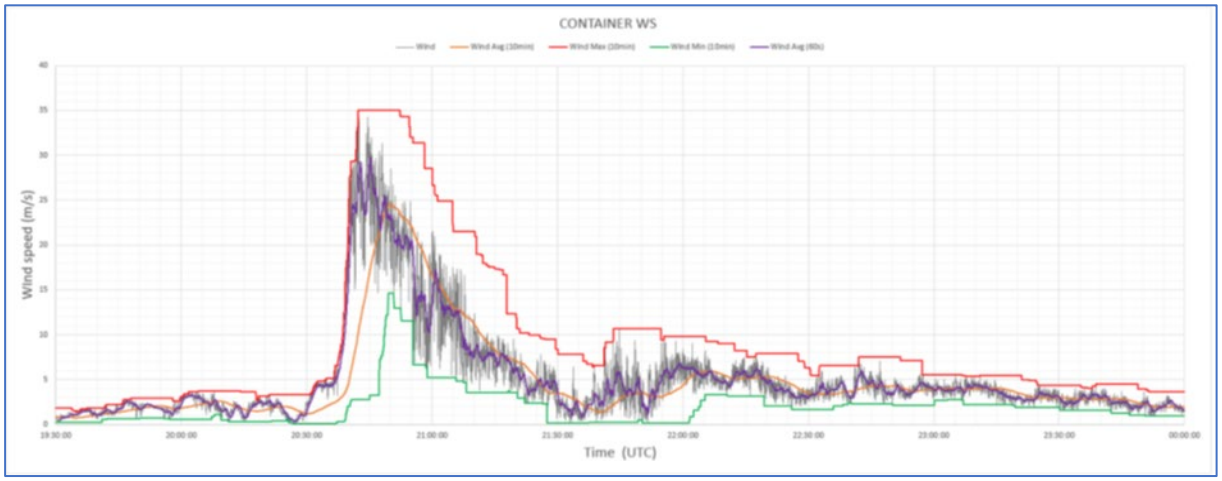



*Figure17: Wind measurements at the container terminal (H=34 m, also second gusts are shown)*

The following is a presentation of wind measurements at an extremely high altitude, specifically at 93 meters on a container lift. This measuring device is intended to automatically switch off the system in the event of strong winds. The maximum average wind gust is 33.9 m/s. The strongest wind blows from a direction of 331°, with a vertical velocity component of 6,5 m/s.

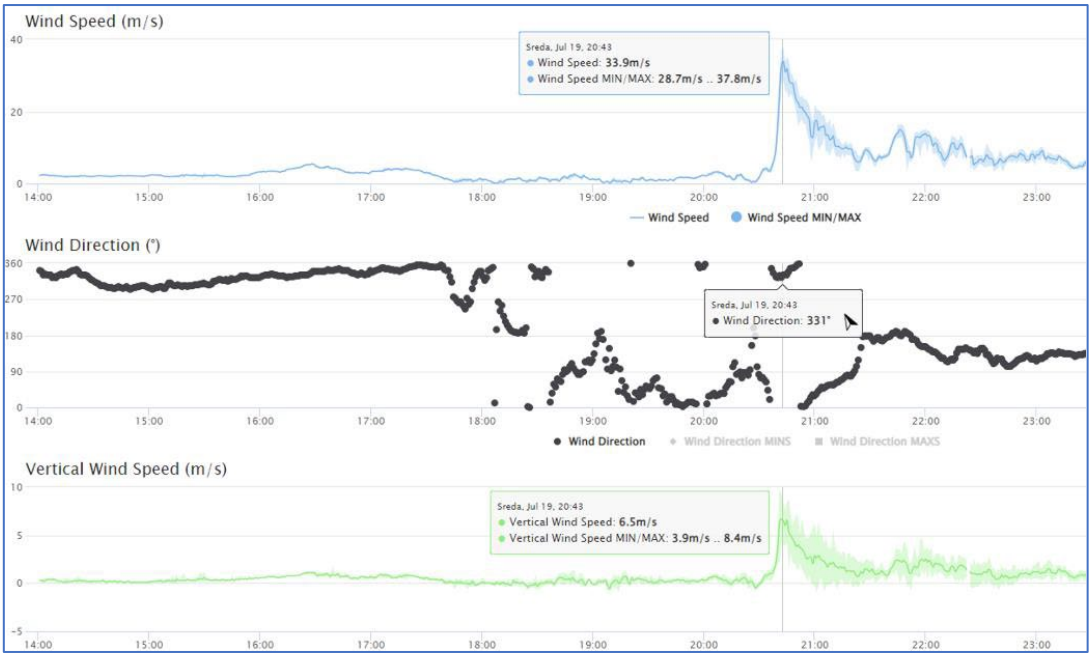



*Figure18: Wind measurements on a container lift (H=93 m)*

Figure 19, presented below, shows the wind rose for the Piran site and the container terminal. In this case, the raw data are shown, which include second measurements. The figure shows the difference in wind direction.

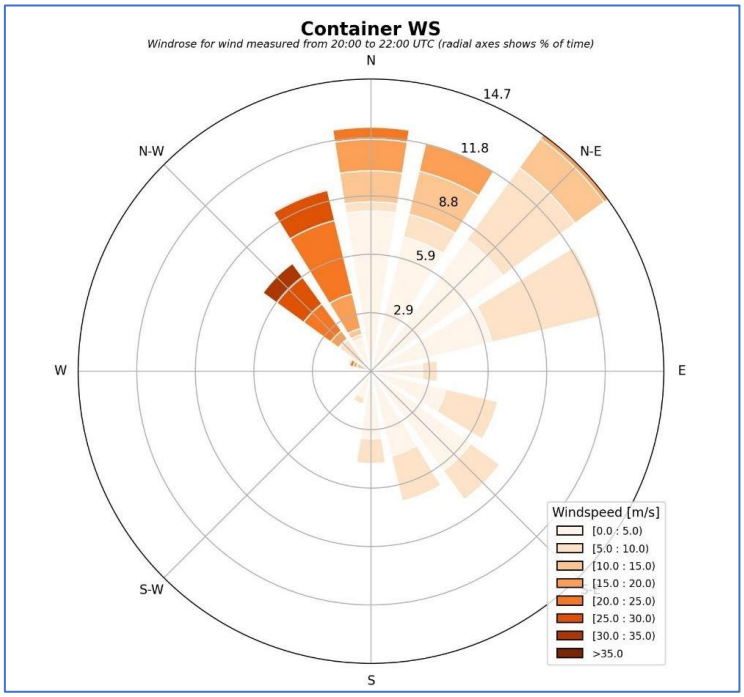



*Figure19: Wind rose for wind measurements in Piran and at the container terminal (H=34 m, 1 s)*

Changes in sea level, currents, and waves must also be considered when analyzing the effect of external forces on a moored ship. The ship at berth 7D is (almost) completely protected from waves, only the stern of the ship is partially exposed.

Figure 20. shows the sea height where the measured sea level is higher than the predicted sea level. The storm additionally caused a sea level rise in the bay, which caused the sea level at the mooring to rise by approximately 25 cm. This phenomenon had some effect on the ship, pushing it towards the interior of the basin, i.e., to the east.

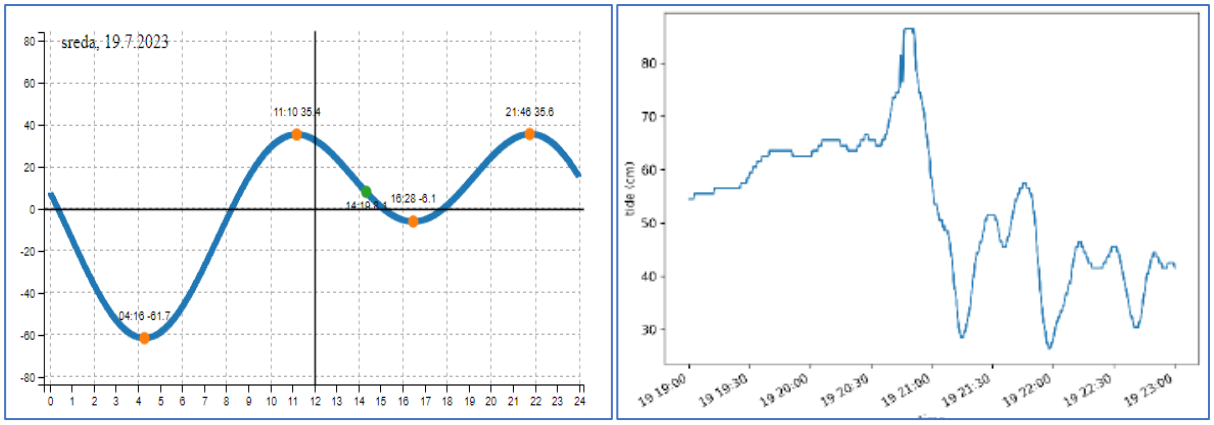



*Figure20: Sea heights (left predicted 35 cm, right measurements at sea, 87 cm in front of the second pier.)*

### 1.5.4. Measurements - data from the Maersk Houston

The following is a key part of the overview of weather conditions and their impact on the ship. The archive records of the VDR and the ECDIS stations have been examined. Basic records are recorded every 10 seconds. The true wind data is recorded and measured by a wind gauge mounted above the bridge at a height of approximately 65 meters above sea level (Figure 21). All the summarized data can be seen in Table 1. The true and relative data on wind, the ship's heading, rotation, position, and depth below the keel are extracted.

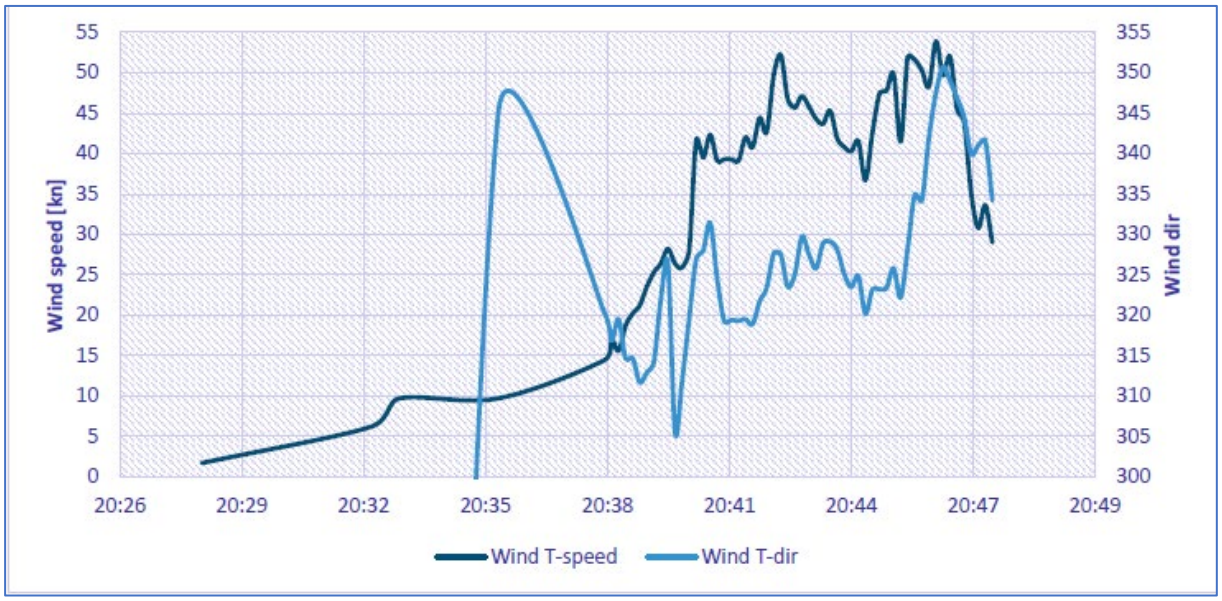



*Figure21: True wind measurements on Maersk Houston, maximum measured speed 27.7 m/s (53.9 kt))*

From the analysis of the meteorological records, it can be concluded that strong winds have occurred, but this is not a meteorological emergency as the measurements do not differ significantly from the archived wind measurements given in the ADMIRALTY Sailing Directions - NP47 Mediterranean Pilot Vol. 3, available on board the ship. The wind evolution and the analysis of the accident scenario are given in Chapter 2 - Analysis of the event.

*Table 1: Table of basic data from the Vessel Data Recorder (VDR) of the Maersk Houston*

| Time | Wind T-speed | Wind T-dir | Wind R-speed | Wind R-dir | Wind Attack | HDG | DBK | LAT | | LON | | ROT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19.07.2023 20:28 | 1.7 | 109.8 | | 22.9 | 22.9 | 86.9 | 5.7 | 45 | 33.178 | 13 | 43.942 | |
| 19.07.2023 20:32 | 6.2 | 56.1 | | 329.3 | 30.7 | 86.8 | 6.1 | | | | | |
| 19.07.2023 20:33 | 9.7 | 49.8 | | 323 | 53 | 86.8 | 6.1 | 45 | 33.178 | 13 | 43.942 | |
| 19.07.2023 20:35 | 9.7 | 344.7 | | 257.9 | 12.1 | 86.8 | 6 | | | | | |
| 19.07.2023 20:38 | 14.4 | 320.5 | | 233.7 | 36.3 | 86.8 | 6 | | | | | |
| 19.07.2023 20:38 | 16.9 | 316.9 | | 230.1 | 39.9 | 86.8 | 6 | | | | | |
| 19.07.2023 20:38 | 15.6 | 319.5 | | 232.7 | 37.3 | 86.8 | 5.7 | | | | | |
| 19.07.2023 20:38 | 18.7 | 314.6 | | 227.8 | 42.2 | 86.8 | 6 | | | | | |
| 19.07.2023 20:39 | 20.2 | 314.7 | | 227.9 | 42.1 | 86.8 | 6 | 45 | 33.178 | 13 | 43.942 | |
| 19.07.2023 20:39 | 21.2 | 311.7 | | 224.9 | 45.1 | 86.8 | 6.1 | | | | | |
| 19.07.2023 20:39 | 23.5 | 312.9 | | 226.1 | 43.9 | 86.8 | 6.2 | | | | | |
| 19.07.2023 20:39 | 25.3 | 314.2 | | 227.4 | 42.6 | 86.8 | 6 | | | | | |
| 19.07.2023 20:39 | 26.4 | 322 | | 235.2 | 34.8 | 86.8 | 6.3 | | | | | |
| 19.07.2023 20:39 | 28.2 | 326.4 | | 239.6 | 30.4 | 86.8 | 6.1 | | | | | |
| 19.07.2023 20:40 | 26.4 | 305.6 | | 218.8 | 51.2 | 86.8 | 6.1 | | | | | |
| 19.07.2023 20:40 | 25.9 | 311.8 | | 225.1 | 44.9 | 86.7 | 6.3 | | | | | |
| 19.07.2023 20:40 | 28 | 319.5 | | 232.8 | 37.2 | 86.7 | 6.1 | | | | | |
| 19.07.2023 20:40 | 41.6 | 326.9 | | 240.2 | 29.8 | 86.7 | 6.1 | | | | | |
| 19.07.2023 20:40 | 39.5 | 328 | | 241.3 | 28.7 | 86.7 | 6.1 | | | | | |
| 19.07.2023 20:40 | 42.3 | 331.4 | | 244.7 | 25.3 | 86.7 | 6.1 | | | | | |
| 19.07.2023 20:41 | 39.1 | 324.4 | | 237.5 | 32.5 | 86.9 | 6.2 | 45 | 33.178 | 13 | 43.943 | 0.5 |
| 19.07.2023 20:41 | 39.3 | 319.2 | | 232.3 | 37.7 | 86.9 | 6.2 | | | | | |
| 19.07.2023 20:41 | 39.3 | 319.4 | | 232.6 | 37.4 | 86.8 | 6.1 | 45 | 33.177 | 13 | 43.943 | |
| 19.07.2023 20:41 | 39.1 | 319.3 | | 232.6 | 37.4 | 86.7 | 6.1 | | | | | |
| 19.07.2023 20:41 | 42 | 319.5 | | 232.8 | 37.2 | 86.7 | 6.2 | | | | | |
| 19.07.2023 20:41 | 40.8 | 318.9 | | 232.2 | 37.8 | 86.7 | 6.2 | | | | | |
| 19.07.2023 20:42 | 44.4 | 321.7 | 44.3 | 234.9 | 35.1 | 86.8 | 6.5 | | | | | 0.3 |
| 19.07.2023 20:42 | 42.7 | 323.4 | 42.6 | 236.6 | 33.4 | 86.8 | 6.3 | | | | | |
| 19.07.2023 20:42 | 49.7 | 327.6 | 49.6 | 240.9 | 29.1 | 86.7 | 6 | | | | | |
| 19.07.2023 20:42 | 52.2 | 327.5 | 52.1 | 240.7 | 29.3 | 86.8 | 6.6 | 45 | 33.177 | 13 | 43.944 | |
| 19.07.2023 20:42 | 46.7 | 323.5 | | 236.7 | 33.3 | 86.8 | 6.3 | 45 | 33.176 | 13 | 43.943 | 1 |
| 19.07.2023 20:42 | 45.7 | 325.1 | | 238.7 | 31.3 | 86.4 | 6.1 | 45 | 33.176 | 13 | 43.943 | 2.6 |
| 19.07.2023 20:43 | 47.1 | 329.7 | 47 | 243.9 | 26.1 | 85.8 | 6.2 | | | | | |
| 19.07.2023 20:43 | 45.8 | 327.5 | 45.7 | 242.1 | 27.9 | 85.4 | 6.2 | 45 | 33.176 | 13 | 43.943 | 2 |
| 19.07.2023 20:43 | 44.3 | 325.8 | 44.1 | 240.4 | 29.6 | 85.4 | 6 | | | | | |
| 19.07.2023 20:43 | 43.7 | 328.9 | 43.5 | 243.6 | 26.4 | 85.3 | 6.5 | | | | | |
| 19.07.2023 20:43 | 45.3 | 329.1 | 45.1 | 244.1 | 25.9 | 85 | 6.6 | 45 | 33.175 | 13 | 43.944 | 1.5 |
| 19.07.2023 20:43 | 41.9 | 328.1 | 41.8 | 243.7 | 26.3 | 84.4 | 6.3 | 45 | 33.175 | 13 | 43.945 | 3.7 |
| 19.07.2023 20:44 | 40.8 | 325.1 | 40.6 | 241.4 | 28.6 | 83.7 | 6.1 | 45 | 33.174 | 13 | 43.946 | 4 |
| 19.07.2023 20:44 | 40.3 | 323.5 | 40 | 240.3 | 29.7 | 83.2 | 6.1 | | | | | |
| 19.07.2023 20:44 | 41.5 | 324.8 | 41.2 | 242.1 | 27.9 | 82.7 | 6.6 | | | | | |
| 19.07.2023 20:44 | 36.7 | 320.2 | 36.3 | 238.3 | 31.7 | 81.9 | 6.3 | 45 | 33.173 | 13 | 43.950 | 4.6 |
| 19.07.2023 20:44 | 42.6 | 323.2 | 42.2 | 242.1 | 27.9 | 81.1 | 6.7 | | | | | |
| 19.07.2023 20:44 | 47.4 | 323.2 | 46.8 | 243 | 27 | 80.2 | 6.2 | | | | | |
| 19.07.2023 20:45 | 47.8 | 323.4 | 47.2 | 244.2 | 25.8 | 79.2 | 6.5 | 45 | 33.170 | 13 | 43.955 | 6.4 |
| 19.07.2023 20:45 | 49.8 | 325.8 | 42.9 | 247.7 | 22.3 | 78.1 | 6.6 | | | | | |
| 19.07.2023 20:45 | 41.5 | 322.2 | 40.8 | 245.2 | 24.8 | 77 | 6.7 | | | | | |
| 19.07.2023 20:45 | 52 | 328.3 | 51.3 | 252.2 | 17.8 | 76.1 | 6 | | | | | |
| 19.07.2023 20:45 | 51.6 | 334.9 | 50.9 | 259.9 | 10.1 | 75 | 6.1 | | | | | |
| 19.07.2023 20:45 | 50.3 | 334.2 | 49.6 | 260.1 | 9.9 | 74.1 | 6.1 | | | | | |
| 19.07.2023 20:46 | 48.3 | 341.9 | 47.6 | 269.1 | 0.9 | 72.8 | 6.3 | 45 | 33.160 | 13 | 43.967 | 9.2 |
| 19.07.2023 20:46 | 53.9 | 347.5 | 53.5 | 276.2 | 6.2 | 71.3 | 6.6 | | | | | |
| 19.07.2023 20:46 | 49.7 | 350.7 | 49.2 | 281 | 11 | 69.7 | 6.1 | 45 | 33.157 | 13 | 43.970 | 10 |
| 19.07.2023 20:46 | 52 | 349 | 51.5 | 280.8 | 10.8 | 68.2 | 6.2 | | | | | |
| 19.07.2023 20:46 | 45.5 | 346.9 | 44.9 | 280.1 | 10.1 | 66.8 | 6.3 | | | | | |
| 19.07.2023 20:46 | 43.9 | 344.5 | 43.3 | 279 | 9 | 65.5 | 6.6 | | | | | |
| 19.07.2023 20:47 | 35.1 | 340 | 34.6 | 275.7 | 5.7 | 64.3 | 6.1 | | | | | |
| 19.07.2023 20:47 | 30.8 | 341 | 30.3 | 278.2 | 8.2 | 62.8 | 7.2 | | | | | |
| 19.07.2023 20:47 | 33.6 | 341.6 | 33 | 280.1 | 10.1 | 61.5 | 6 | | | | | |
| 19.07.2023 20:47 | 29 | 334.2 | 28.6 | 274 | 4 | 60.2 | 6 | | | | | |

Note: Wind speed is shown in knots, times are UTC.

## 1.6. MAERSK - QUALITY SYSTEM

### 1.6.1. Ownership and management

At the time of the accident, Maersk Houston was owned by A. P. Moller Singapore PTE LTD, a company with its registered office in Singapore, operated by Maersk A/S, Copenhagen, Denmark.

### 1.6.2. ISM - Safety Management

The requirement for management companies to establish a Safety Management System (SMS) is set out in the International Safety Management (ISM) Code. The Corporate Compliance Document (CCD) of Maersk Line A/S was valid until August 15th, 2024, at the time of the incident. The Document of Compliance (DoC) of Maersk Line A/S was valid until November 03rd 2027.

Maersk Line A/S operates an Integrated Management System (IMS), which contains the general procedures developed and approved by the onshore management and is applicable to the entire fleet. The *Operations Manual* is part of the IMS and contains, inter alia, procedures for mooring in bad weather (Annex 07), procedures in case of collision, allision, and grounding, as well as procedures for inspection, and care of mooring lines (Annex 4), etc. *The Planned Maintenance System* contains, among other things, a record of rope inspections (Annex 03).

## 1.7. CONTAINER TERMINAL AT THE PORT OF KOPER

### 1.7.1. General

The container terminal of the Port of Koper is in the northern part of Basin I, on pier No. 1. The area dedicated to container storage in the maritime part of the terminal has about 93,100 m2. The length of the operational part of the pier is 694 m and is divided into berths 7, 7a, 7b, 7c, and 7d. It is equipped with 11 container cranes, of which 4 are post-panamax and 4 are super post-panamax type. Immediately prior to the accident, 4 super-post panamax cranes were in operation.

### 1.7.2. Port of Koper's severe weather notification system

In accordance with Work Instruction 049 - Preventive Measures and Action in Emergency Weather Situations, VNC (Safety Control Centre) staff continuously monitors during a 24-hour period weather warnings and forecasts from the regional information center, radio stations. Also, weather information and warnings are published on the website of the Slovenian Environment Agency (ARSO), as well as current values from measuring stations installed within the port. The current weather conditions are monitored by the Shift Managers and the Responsible Supervisors before and during the commencement of work. Warnings and forecasts of extreme weather conditions (wind speeds above 17 m/s) are regularly received, and when the current wind speeds reach 15 m/s, information is communicated by VNC staff to the entire port community, i.e., to all organizational units, tenants, and other actors in the port.

In the event of a received warning or forecast of a weather emergency, the Shift Manager, in cooperation with the Operations Manager, shall adjust the planned activities in the light of the forecasts and warnings when drawing up the work plan. The responsible persons in the organizational unit shall take certain levels of action according to the current situation, considering the forecasts, and shall coordinate actions and activities between organizational units.

In the event of extreme weather conditions and winds above 20 m/s, the decision to suspend work shall be based on the safe stopping of the container cranes and safe parking (anchoring) in accordance with the instructions for working with cranes.

### 1.7.3. Transshipment operations before and during the event

The VNC received the weather warning and forwarded it on July 19th, 2023, at 10:54 and the following one at 15:05. The Operations department (planners) informed the agents of all the ships in the port by telephone. In the port itself, the notification process as described in the previous subchapter was carried out. During two interviews with the container terminal representatives, it was not possible to establish the exact reason, i.e., an answer was not obtained, why the commercial operations were not stopped as a precaution before the storm started.

Prior to the incident, cargo transshipment operations of containers were carried out by four container cranes, namely STS 59, STS 60, STS 61, and STS 62 (from bow to stern). Commercial operations were suspended at 22:39. At that time, the wind speed recorded on the ship reached 24,9 knots (12,8 m/s), average wind speed measured on the STS 59 crane was 24,1 knots (12,4 m/s).

At wind speeds above 20 m/s, the protection system slows down the crane operating speed (raising and lowering of the wire cables, and then automatically switches off. Crane STS 60 was stopped at 22:30. Cranes STS 59 and STS 62 stopped at 22:38. At 22:39, the STS 61 crane still had a container spreader in the ship's hold. Due to the built-in protection in case of high winds and the automatic shutdown of the crane, the operator managed to lift the container spreader out of the hold at 22:43 by means of repeated resets and restarts. At that time, the stern of the ship was already moving away from the pier. Horizontal booms on all STS cranes remained in a lowered horizontal position.

## 1.8. TUGBOATS ADRIATOW

AdriaTow is the only company providing ship towage services in the freight port of Koper. At the time of the Maersk Houston accident, the company had five harbor tugboats, three with about 74 tons of towing capacity on the hook and two with 25 tons of towing capacity.

The number of active tugboats and crews is not prescribed, but it depends on the pilotage plan issued by the Operations department, considering the number of scheduled departures or arrivals of ships and the prescribed compulsory towage regulations. At the time of the incident, AdriaTow did not have any prescribed written procedures and instructions in case of bad weather. In the event of bad weather, based on the company's verbal instructions and current practice, the decision to inform and call on standby crew, rests with the masters of the ''active'' tugboats. Standby crews are also called at the request of the SMA, or individual ship master.

On July 19th, 2023, during the evening, two tugboats, Zeus and Mercur, were readily available (active). At 22:07, they started a mandatory towing maneuver for the ship Delphis Bothnia to be berthed at berth 7. At 22:58, the Delphis Bothnia was alongside, and the tugboat Mercur was released and proceeded to assist the Maersk Houston. The tugboat Neptune started assistance after the arrival of the standby crew. The tugboat Zeus, after completing the maneuver of the Delphis Bothnia, commenced assisting the Maersk Houston on the starboard bow. During this time, the tugboat Wotan, towing the damaged tugboat Sirius, withdrew from berth No. 1. The three tugboats, Mercur, Neptune, and Zeus, continued their assistance with Maersk Houston, who was safely tied up again at 02:15. At the request of the Master, the tugboat Neptune remained on standby alongside the ship in case of deteriorating weather conditions.

## 1.9. KOPP PILOTS

The pilotage service in the Port of Koper is provided by the company Koper Port Pilotage - KOPP, with licensed pilots registered with the Slovenian Maritime Administration. The pilotage plan and the berthing plan are prepared by the Operational department of the Port of Koper. Pilotage is carried out

24 hours a day, every day of the week. Two pilots are always present during each of the working shifts. Pilotage is compulsory for ships with a gross tonnage of more than 500 GRT. For boarding the pilot, two pilot stations are designated. After passing through the port boundary, the maximum permissible speed of the ship between the pilot stations and the entrance to each access channel of the port, throughout the anchorage area, and during the embarkation or disembarkation of the pilot, shall be 6 knots or less.

On July 18th, 2019, the pilot boarded the Maersk Houston at 12:53. At 13:09, an exchange of information between the Master and the Pilot (MPX) took place (Annex 06 - Arrival CL and Movement book). According to the pilot's statement, among other issues, the master was informed of the weather forecast for the next three days, i.e., the deterioration of the weather over the next few days. At the berth, the ship was moored in a "4 + 2" configuration, i.e., four headlines and two forward springs, and four stern lines and two aft springs. The pilot in charge of the Maersk Houston at the time of her arrival and berthing stated that the use of floating appliances (mooring buoys) in addition to the shore bollards was presented to the master as preferable given the location of the berth, but that the master refused this option, as confirmed in the interview for the investigation both with the pilot and the master.

## 1.10. SLOVENIAN MARITIME ADMINISTRATION

The Slovenian Maritime Administration carries out administrative and professional tasks in the field of maritime affairs and port infrastructure and monitors order in ports and the rest of the territorial sea. It supervises the safety of navigation, the operation of maritime transport, and the maintenance of navigational safety facilities and waterways. It also carries out inspections of the implementation of the rules on maritime transport and port infrastructure. To ensure safe traffic and the maintenance of order in ports and the rest of the territorial sea, the SMA may order appropriate measures arising from the supervision of the implementation of the regulations on order in ports, maritime traffic, the movement and berthing of vessels, etc. It carries out video surveillance of parts of the sea when and where it is necessary to ensure the safety of navigation, records communications with maritime traffic participants, and establishes the position and speed of vessels and other information on the course of maritime traffic by means of video surveillance and radio and radar devices used in maritime traffic. In the Traffic Control Centre (CNP), two duty officers trained to IALA standards to perform the work and duties of a VTS operator carry out continuous surveillance. The VTS service is not yet in place. In addition to the maritime traffic monitoring devices, the CNP can monitor weather conditions with various weather sensors covering the entire Slovenian sea and coastline and by using various weather applications.

On July 19th, 2023, CNP received an Emergency Information Bulletin - Warning from the Centre for Information of the Republic of Slovenia (CORS) for the forecast of severe weather and the possibility of thunderstorms in the late afternoon, evening, and night. Ships in port exposed to the Tramontane winds were warned of the possibility of stormy weather (Annex 08). The ship "Maersk Houston was specifically warned at 16:06 hrs. after the completion of a lifeboat drill, which was also verbally confirmed by the duty officer to the Investigator.

## 1.11.COMMUNICATION DURING THE EVENT

The VHF 08 channel is used for radio communication between the stakeholders in the cargo port of Koper. Prior to the event, standard communication took place between the pilot on board the Delphis Bothnia, tugboats, and linesmen. At 22:27, the duty officer at the CNP informed the pilot that the wind

had reached a speed of 20 m/s or 39 knots at Cape Madona, lying 6.9 M west of the container terminal. At this time, in Basin I, a wind speed of two knots was recorded.
Radio communications between all participants (pilot and tugboats during the berthing maneuver of Delphis Bothnia, tugboats, linesmen, CNP, second duty pilot ashore, and Maersk Houston) were carried out on VHF channel 08, with occasional use of VHF channel 09 and VHF channel 07. Communication on channel 07 is duplex, it can only be used between the shore station and the ship, consequently. it cannot be followed in its entirety by other vessels. The second pilot on duty (stand-by pilot) on shift was unable to board the pilot boat due to the extremely high winds and the consequent rough seas. It was also not possible to enter the security area of the Port of Koper using a private vehicle. He monitored the situation and attempted to coordinate the activities of all the participants from Berth 1, on the south side of Basin I, and then, when the wind and sea calmed down, he went by pilot boat to Pier 1 and continued to coordinate the re-berthing of the ship from the shore. A transcript of the communication is in the Investigator's archives and is not available as an annex due to requirements for the protection of personal data.

## 1.12.PREVIOUS AND SUBSEQUENT ACCIDENTS AND INCIDENTS

### 1.12.1. Pre-existing accidents

APL California (EMCIP 5033/2017) - Breakage of mooring lines during sudden SSV winds

On September 16th, 2017, the ship's stern started to drift from the shore towards the center of Basin I when the wind gusted, and the stern was blown away by the wind. The ship drifted transversely into Basin I, and at the same time, due to the movement of the ship, the bow section of the ship struck the ship "KING BASIL" which was tied up approximately 15 m along the bow of the ship "APL CALIFORNIA". The stern of the 'APL CALIFORNIA' struck and damaged the tugboat 'NEPTUN', which was tied up at Berth 1. There was no major damage to the tugboat or to the port infrastructure.

The analysis concluded:

- Lack of relevant local weather information from the ship's crew,
- Insufficient mooring of the ship at the stern,
- Inadequate monitoring of brake lining wear on the drum brake shoes, despite regular servicing as recommended by the manufacturer.

### 1.12.2. Next accidents

Xin Beijing (EMCIP 2023/004707) - Breakage of mooring lines during sudden SSV winds

On July 26th, 2023, the ship's stern started to drift from the shore towards the center of Basin I when the wind gusted, and the stern was blown away by the wind. The ship drifted transversely into Basin I. After a short time, the ship was re-tied to the same tie 7D by the quick intervention of the tugboats. There was no damage to the ship itself, to other vessels, or to the port infrastructure.

The analysis concluded:

- Brake slack on mooring winches
- Inadequate mooring plan.

As the case of the incident was very similar to the Maersk Houston case (described in this report), a specific investigation of this case was not launched because, in the investigator's assessment, it would not have added any value or new safety recommendations.

# CHAPTER 2 - EVENT ANALYSIS

## 2.1. PURPOSE OF THE ANALYSIS

The purpose of the analysis is to determine the causes contributing to the accident and the circumstances of the accident as a basis for making recommendations to prevent a similar accident in the future.

## 2.2. ANALYSIS OF MOORING, MOORING EQUIPMENT AND ROPE BREAKAGE

### 2.2.1. Analysis of a berth

The berth analysis is described in detail in chapter 1.4.

### 2.2.2. Analysis of the current berthing situation of the Maersk Houston

Prior to the arrival at Berth 7D, the Port of Koper Operational department (planners) issued a Pilotage Plan specifying the berthing position by referencing the forward (bow) bollard position. The bow position was aligned with the 18th bollard. The mooring ropes were to be deployed along the entire length of the designated berthing position on the container terminal. They are usually set by the linesmen, but the final deployment rests with the responsibility of the master. The final mooring configuration was four plus two (4+2) lines fore and aft. On arrival and at the ship's berthing, the pilot asked the master if he wished to use the option of mooring the (some) stern lines to the mooring buoys. As the mooring boat had to be called in to use them and the weather was calm at the time of the mooring, the master refused this option, as it was confirmed in the interview with the master. An illustration of the mooring to the mooring buoys is shown in Figure 10, page 11. The next day, 19th July, after being informed by the PSC officer and following the information given by the CNP duty officer regarding the possibility of stormy conditions, the master ordered that mooring is to be reinforced with one additional line both forward and aft. Figure 22 below illustrates the mooring scheme.

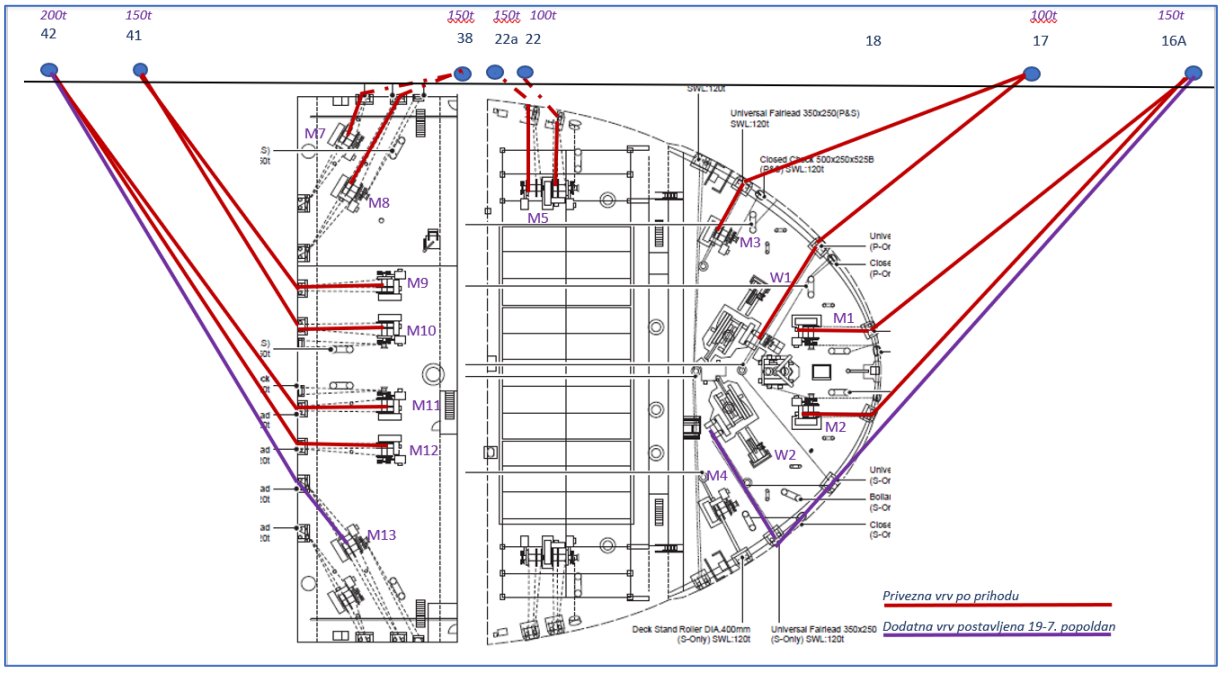



*Figure 22: Schematic of the mooring of the Maersk Houston at berth 7D*

The final configuration included three forward lines on bollard No. 16a, which has a safe working load of 150 tons, two bow lines on bollard No. 17 (100 tons), and two very short forward springs on bollards Nos. 22 and 22a. Two aft springs were put on bollard 38, two short stern lines on bollard No. 41, and three stern lines on bollard No. 42 (200-ton mooring). All stern lines act as breast lines. The mooring diagram shows asymmetry, as shown in Figure 22.

The longitudinal strength of the mooring in the direction of the Basin was provided by only two forward springs, while the stern lines and springs were short and operated at a high vertical angle and moderate horizontal angle to the shore, which reduced their effectiveness. Figure 23 shows the routing of the most critical lines, i.e., the stern lines and forward springs. The figure clearly shows the high vertical angles of the springs and the short stern lines.


*Figure 23: Fwd springs, Aft springs, and stern lines*

Good maritime practice suggests that any mooring line should be at least as long as the beam of the ship. For the analysis, UL-FPP experts have made a calculation[14] of the lengths of the used ship's mooring ropes, the vertical and horizontal angles, and the expected rope elongation to break. For this purpose, the ship plan and the container terminal plan were used in the same scale ratio. All bollards on shore and all ropes used have been marked. The vertical coordinates of the rope guides on the ship are taken from the ship's plan. The current draught of the ship and the influence of the tides have been considered. The accuracy of the calculation is confirmed by measurements of the heights of the damage to the ship's bow bulwark and the damage at the shore crane. The results of the calculation are shown in Table 2.

The table shows the final mooring rope lengths with the calculated vertical and horizontal angles. The ropes are pre-tensioned by 3%, and the elongation estimation is based on the rope tensioning standard, where the mooring winch has a capacity of 22 to 30% of the MBL of the rope. The ropes used may be further lengthened to accommodate the increased load. According to the rope manufacturer's datasheet, used ropes are expected to have a total elongation before breakage in the range of 12-13%, while new ropes are expected to have an elongation of 18%. Table 2 also identifies the critical ropes, those that have caused the mooring to collapse, either because they are too short or because they are poorly spaced. The most critical were the two bow springs, the M5b spring, which was less than 29 meters long, and the short stern lines attached to bolard #41 (M7, M8).

[14] FPP (2023), Report-LK/MTE/01-2023 / Incident investigation "Maersk Houston" Case Study, pp.38-42

*Table 2: Matrix - rope lengths, V and H angles and expected elongation at break (source: UL-FPP)*

| info | Vessel side | Quayside | horizontal length | relative heigth [m] | mooring line length (without tension) | rope elongation | mooring line length | bearing line (deg) | relative bearing -H (deg) | relative bearing - V (deg) | additional elongation | dL [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FORE** | | | | | | | | | | | | |
| Head 1 | M3 | 17 | 33.43 | 21.16 | 39.6 | 3% | 38.4 | 66.6 | 20.9 | 33.5 | 10% | 3.8 |
| Head 2 | W1 | 17 | 30.19 | 21.16 | 36.9 | 3% | 35.8 | 50.9 | 36.6 | 36.3 | 10% | 3.6 |
| Head 3 | M1 | 16A | 38.64 | 21.16 | 44.1 | 3% | 42.7 | 45.3 | 42.2 | 29.7 | 10% | 4.3 |
| Head 4 | M2 | 16A | 44.55 | 21.16 | 49.3 | 3% | 47.8 | 37.3 | 50.2 | 26.3 | 10% | 4.8 |
| Head 5 | W2 | 16A | 59.34 | 20.96 | 62.9 | 3% | 61.0 | 36.3 | 51.2 | 20.1 | 10% | 6.1 |
| Spring F 1 | M5a | 22A | 30.82 | 17.36 | 35.4 | 3% | 34.3 | 275.9 | 8.4 | 30.4 | 10% | 3.4 |
| Spring F 2 | M5b | 22 | 24.15 | 17.36 | 29.7 | 3% | 28.8 | 279.3 | 11.8 | 37.0 | 10% | 2.9 |
| **STERN** | | | | | | | | | | | | |
| Stern 1 | M9 | 41 | 25.06 | 12.26 | 27.9 | 3% | 27.1 | 328.8 | 56.3 | 26.9 | 10% | 2.7 |
| Stern 2 | M10 | 41 | 28.39 | 12.26 | 30.9 | 3% | 30.0 | 332.4 | 59.9 | 24.1 | 10% | 3.0 |
| Stern 3 | M11 | 42 | 37.7 | 12.26 | 39.6 | 3% | 38.5 | 330.5 | 58.0 | 18.6 | 10% | 3.8 |
| Stern 4 | M12 | 42 | 41.03 | 12.26 | 42.8 | 3% | 41.5 | 332.8 | 60.3 | 17.2 | 10% | 4.2 |
| Stern 5 | M13 | 42 | 44.33 | 12.26 | 46.0 | 3% | 44.6 | 334.7 | 62.2 | 16.0 | 10% | 4.5 |
| Spring A 1 | M7 | 38 | 32.48 | 12.26 | 34.7 | 3% | 33.7 | 81.0 | 6.5 | 21.4 | 10% | 3.4 |
| Spring A 2 | M8 | 38 | 29.45 | 12.26 | 31.9 | 3% | 30.9 | 80.4 | 7.1 | 23.3 | 10% | 3.1 |

### 2.2.3. Mooring lines and equipment

All used ropes were DNV classified. During the inspection of the rope certificates (Annex 02), it was found that all ropes are still original and were installed at the time of the ship's takeover (May 2019), having been in use since then. The ropes are Timm Master 8, MBL 1,231 kN braided with eight strands (*8 strands*), total diameter 80 mm. Only one rope has been replaced during the past period, and that is Timm Master 12, MBL 128.6 t, 81 mm diameter, with twelve strands (*12 strands*). The ropes are of the floating type, with a density of 0.99 t/m$^3$.

The *Inspection & Maintenance Log* (Annex 03) recorded the 3-monthly inspections of the ropes in accordance with the instructions of the shipowner/operator Maersk, namely *Mooring Ropes - Inspection & Care Document ID: P317* (Annex 04). On May 27$^{th}$, 2020, all the ropes were reversed (end to end). Among the other things, instructions state that due to the load, the ropes should be periodically changed from one mooring winch to another mooring winch. This was not explicitly recorded in the maintenance log. Furthermore, instructions state that the following information should be kept for each mooring rope: (1) Rope identification number, (2) Date of use, (3) Date of examination (inspection), (4) Description of examination and maintenance, (5) Date of rope turning, (6) Date of change to another position or drum of the mooring winch, (7) Date of end of use, and (8) Copy of the associated certificate. The available documentation shows items 2, 3 and 8. The rope reversal was only carried out once in 2020, the rope change is given in general terms without rope markings and without the number and positions of ropes or drums in 2021. Information on the number of operating (used) hours for individual ropes was not available, according to the ship's first officer, records are not kept.

*Table 3: Mooring rope characteristics (extract, source: DNV Type Approval Certificate)*

| Diameter [mm] | MBL Spliced [kN] | MBL Unspliced [kN] | MBL Spliced [metric ton] | MBL Unspliced [metric ton] |
|---|---|---|---|---|
| 80 | 1231 | 1368 | 125.5 | 139.5 |
| 81 | 1261 | 1424 | 128,0 | 142,9 |

From her departure from the Ulsan shipyard on May 17th ,2017 until the maritime accident in Koper on July 19th, 2023, Maersk Houston has visited a total of 300 ports of call. The manufacturer's guidelines for use and care of the mooring lines (Annex 05) state that the design life of installed 8-strand ropes is 4,000 hours in operation and 5,000 hours for 12-strand line.

*Table 4: Overview of ports and mooring lines hours in operation (source: Maersk Houston)*

| from | to | together | Hrs | days/hours | Number of ports | average hours/appr. |
|---|---|---|---|---|---|---|
| 7. 7. 2022 | 19. 7. 2023 | 2.421 | hrs. | 111 d 21h | 67 | 36,1 |
| 6. 7. 2021 | 3. 7. 2022 | 2.685 | hrs. | 100 d 21 h | 64 | 42,0 |
| 30. 6. 2020 | 6. 7. 2021 | 2.655 | hrs. | 110 d 15 h | 76 | 34,9 |
| 17. 5. 2019 | 30. 6. 2020 | 2.786 | hrs. | 116 d 02 h | 93 | 30,0 |
| **TOTAL** | | **10.547** | **hrs** | hrs. | **300** | **35,7** |

The data shown in Table 4, obtained from the ship, shows that the ship has been moored in ports for a total of 10,547 hours.

Maintaining the smooth surface of mooring winches and equipment is essential to prolonging the life of the rope. Sharp edges and rust can damage the rope and cause cuts or tear out braid threads or even the core. Rust and iron residues can also penetrate the rope and cause further damage. The optimum solution to preventing rope wear is to maintain a smooth surface at all contact points.

The inspection on board the Maersk Houston showed that the maintenance of the mooring drum surfaces and equipment is in poor condition**,** which was reflected on the ropes. In addition to aging and degradation of the ropes due to constant friction against rusted equipment parts, any major change in the direction of the mooring rope affects its final MBL. The condition of the equipment on board the Maersk Houston at the time of the accident is illustrated in Figure 25 on the following page.

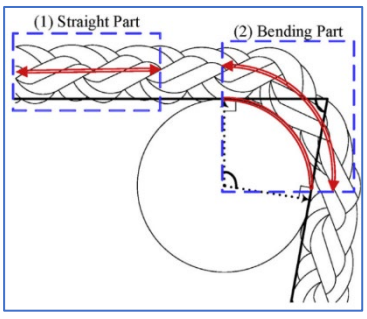



*Figure 24: Rope bending load*

In addition to the tension of the mooring rope during mooring, when it does not exceed the safety load threshold, over time the repetitive forces damage the ropes through heat generation due to the build-up of frictional energy. In addition, ropes are also affected by bending fatigue. Because of friction and bending fatigue, the temperature rise is higher when using synthetic fiber ropes, which can lead to rope breakage more quickly (Figure 24).

*Figure 25: Inspection of ropes and guides, showing corrosion of mooring equipment*

### 2.2.4. Maersk Houston - Rope breakage and breakaway analysis

The situation immediately before and during the storm is given and analyzed herewith. The purpose of the video recordings obtained by the VNC (Safety Control Centre) of the Port of Koper was to assess, as accurately as possible, the moment and course of the breaking of the ropes and the deviation from the initial position of the berth and the shore. Firstly, an overview of the course of events on the stern. The first sequence shows the situation on 19/07/2023 at 22:41:04, when, according to Table 1, the wind condition of 42.3 knots from 331.4° is strongly upwelling. The Duty Watch Officer has informed the Master that the wind has increased. The ship is off the pier, with the stern ropes and both springs visible in the first sequence (Figure 26). The ship has already made a small longitudinal movement (stretching of the mooring lines). At 22:42:18, the second sequence shows a larger longitudinal movement and a slight lateral offset of the stern. The longitudinal movement is larger, and both stern springs are slackened. The longitudinal movement is also evident from the markings on the containers. At that time, the wind increased by 3 to 4 knots, the wind direction changed slightly to the north, and

at 22:42:30, the wind reached 49,7 knots (25,6 m/s) from 328°. At 22:42:54, due to increased wind, the third sequence shows the ship drifting further away from the pier. The ship is still tied up, and the stern springs are heavily tensioned. Given the drift of the ship away from the shore, it is likely that the drum brakes have slackened at this point. The wind data indicate that the wind speed is between 45 and 47 knots, bearing 320°. The ship's course has decreased by 1° from the original course of the mooring along the shore, and the turning circle (ROT) has increased to 2,6°/min. At this point, the ship gained momentum.


*Figure 26: Longitudinal and transverse movement and rope breakage at the stern (source: VNC Luka Koper)*

22:43:08 the first, one of the shortest stern ropes broke, as shown in the snapshot from video surveillance (Figure 27, top). The rope was placed on the innermost side and attached to bollard No. 41. The wind speed is 45 knots (23 m/s) from 327.5°.

22:43:21 a second rope is seen breaking at the stern, both stern springs are heavily stretched. The wind was 44.3 knots (23 m/s) from 326°. The ship's heading is 085,4°, indicating that it has changed 1,5° to port.

22:43:24 the distance between the stern and pier is quite large, and the two stern springs are still attached.

22:43:24 another aft rope breaks, the springs are stretched, and the two remaining ropes are visible in the picture.

22:43:46 The stern springs are still holding, but heavily stretched, with at least one additional rope visible on the stern.

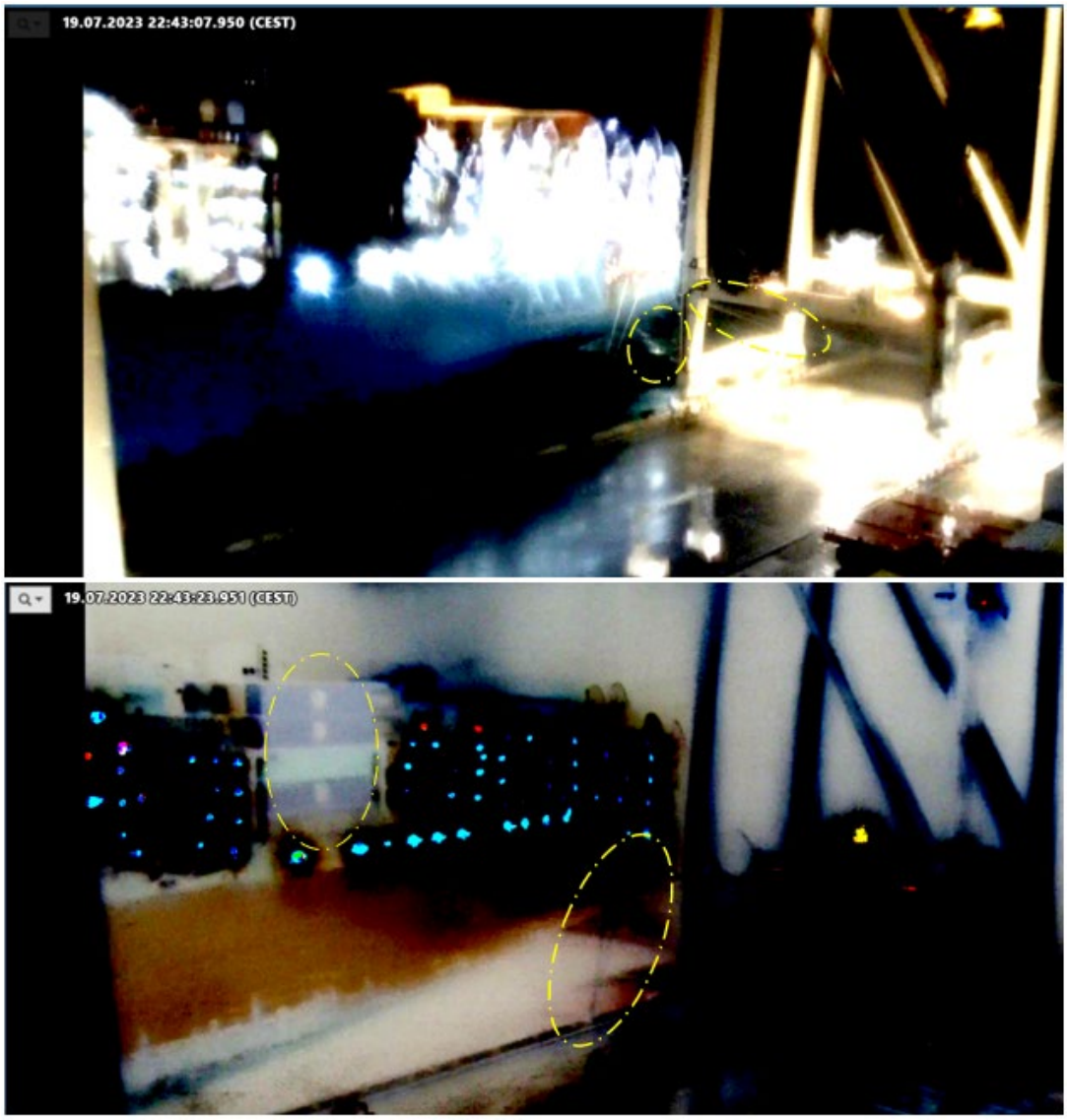



*Figure 27: Longitudinal and transverse movement, rope breakage aft (source: VNC Luka Koper),*

An overview of the forward motion of the center section of the ship, as well as the drift away from the pier, is shown below in two sequences (Figure 28). The upper part of the figure shows the position of the ship at 22:39:50 hours, when the wind was blowing from 326.2° at 28.2 knots (14.5 m/s).

At 22:42:44, a longitudinal shift and a slight drift of the stern away from the shoreline are observed. The wind speed is 46,7 knots (24 m/s) bearing 323,5°; at this time, the stern mooring winch drum brakes may have failed. To facilitate the estimation of longitudinal and transverse movement, lines are drawn on the figures.

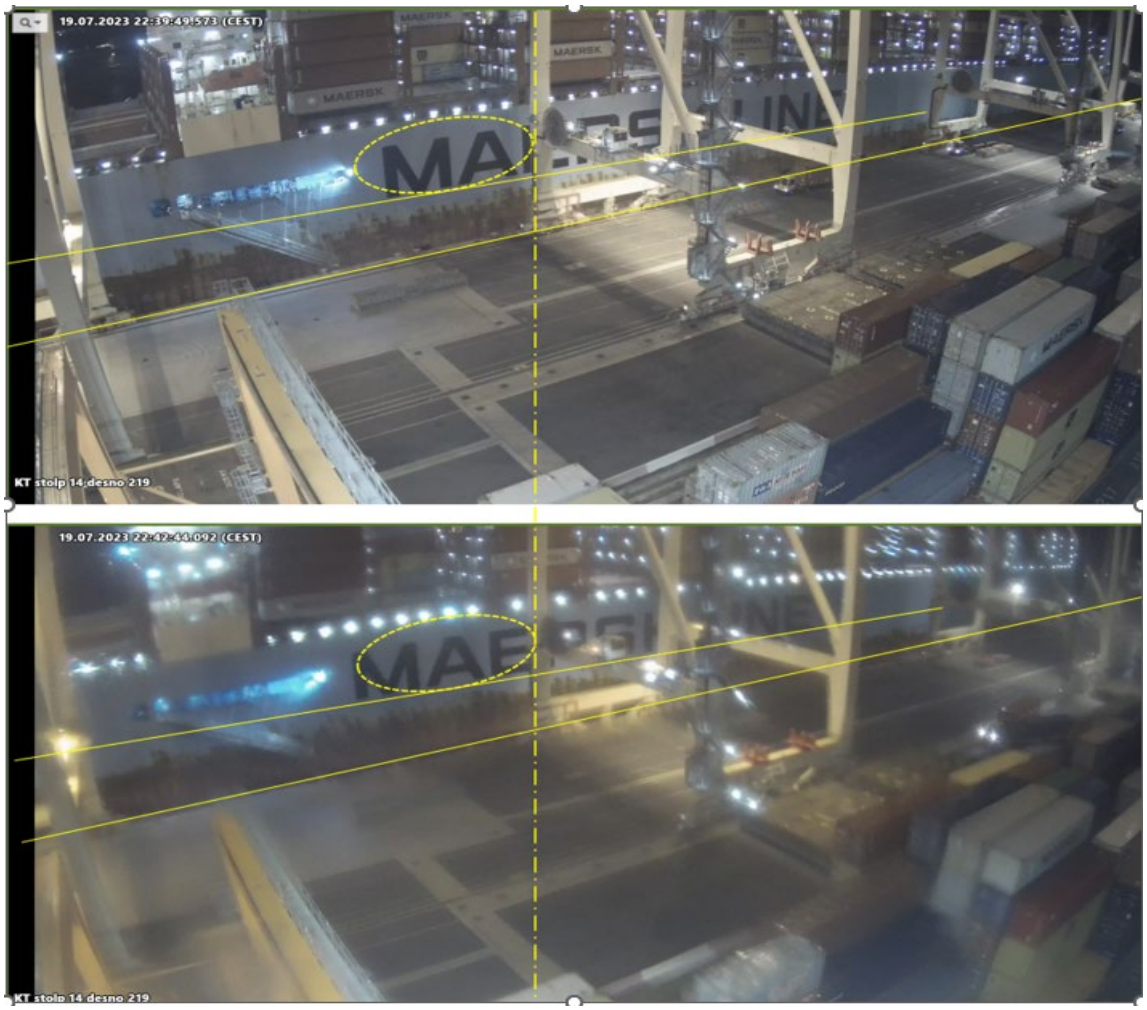



*Figure 28: Observed mid-ship longitudinal movement (source: VNC Luka Koper)*

To analyze the ship's bow movement, a control line is drawn on the time sequences (Figure 30) to make it easier to observe the slipping of the ship. In the second sequence at 22:42:27, showing the longitudinal movement of the ship, all the headlines are still visible. At 22:44:00 in the last sequence, the forward springs are missing. A larger longitudinal movement of the ship is observed. It is assumed that the forward springs, which were short and had a large angle of action, were the first lines to be slackened and parted, followed by the stern springs. The linesmen reported that the forward lines were snapping at that time.

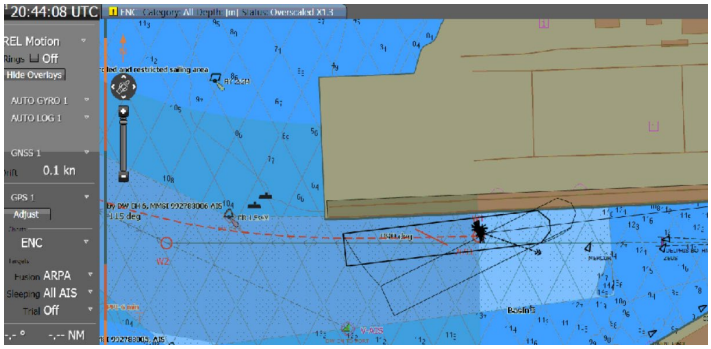



*Figure29: Situation at 22:44:08 (source: VDR)*

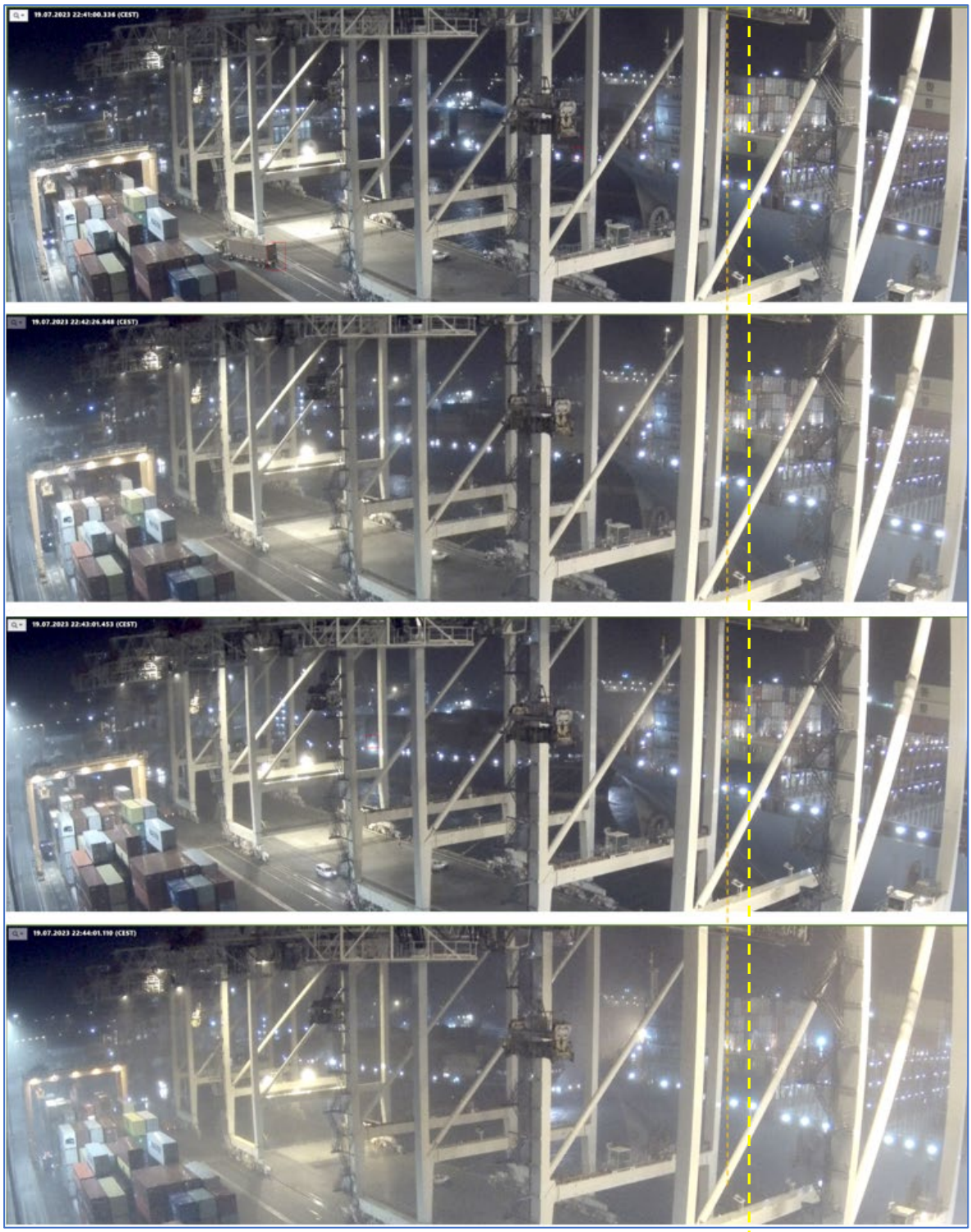


*Figure 30: Sequences of longitudinal and transverse movement at the bow (source: VNC Luka Koper)*

## 2.3. ANALYSIS OF CONSEQUENTIAL EVENTS

### 2.3.1. Short summary of consequential events

Due to the breaking of the stern lines and the influence of the strong wind, the ship's stern started to drift towards the opposite side of Basin I, towards berth 1. As a result, the proximity of the bow to the shore of Pier 1 made it impractical to use the main engine, which was already in stand-by mode. The master used the bow and stern side thrusters operating to port and tried to stop the bow and stern from moving towards the inside of the basin. Due to the influence of the wind and the sea, the stern

was moving towards the south side of the basin. The stern came into an area of shallower depths, and the stern section of the boat touched the soft mud bottom. The ship continued to move and made contact with the vertical wall of the passenger pier with a rudder. During this time, tugboat Mercur started to push the ship's stern away from the pier towards the entrance of the Basin. Due to the transverse position and length of the ship, the ship's bow approached Pier 1, and the bulb contacted the fenders and the pier's wall. As a result of the stern thrusters operating to port as well as the tugboat pushing to port, the ship's stern started to move to port and made contact with the tugboat Sirius, which was moored abreast the tugboat Wotan, both alongside the pier. At port quarter, the tugboat Neptune started to pull the stern to the port, and the tugboat Mercur at starboard quarter was also pushing the stern to the port. At the same time, the stern thrusters were also operating to port. The ship's bow again approached Pier 1 on the northern side of Basin I (container terminal), and with the upper part of her bow plating (bulwark), the ship made contact with the seaside leg 1 of the STS 58 crane. After this, the tugboats managed to align the ship with the shoreline, and the ship was successfully tied up again.

### 2.3.2. Maersk Houston - Contact with STS 59 crane

At 20:45:07, the linesmen informed that Maersk Houston was moving ahead. At the ship's request for tugboat's assistance, CNP informs that two tugboats were occupied by another ship's maneuver (ahead of the Maersk Houston) and that they will be deployed on the Maersk Houston as soon as they are available.

At 22:45:31 - due to the forward motion of the Maersk Houston caused by high winds and parted ship's lines, especially parted forward springs, Maersk Houston made contact with the lowered arm of container crane STS 59. Between 22:45:31 and 22:45:54, the ship's VDR recorded the sound of the contact and falling of the damaged signal masts on the compass deck. Winds from bearing $347^0$, at 54 knots (27.8 m/s), continued to push the ship off the pier. The ship's bearing was $074^0$, COG is $144^0$.

The stern began to drift towards the south side of Basin I and Berth 1 on the passenger terminal.

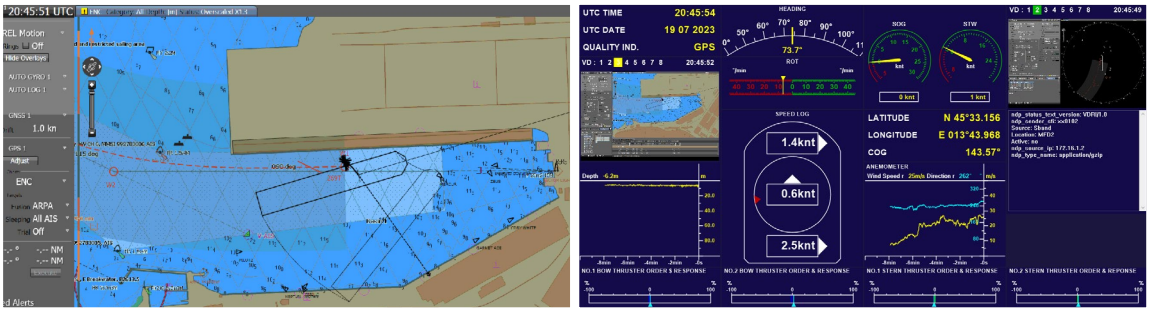



*Figure 31: Situation at 22:45:54 after contact, ship movement (source: VDR)*

The VNC recordings show that the last container handling operations took place at 22:39 (#59) and 22:43 (#60). Due to the strong winds and the operation of the crane protection system, which prevents the cranes from working in such weather conditions, it is no longer possible to raise the lowered arms of the cranes.

### 2.3.3. Maersk Houston - Grounding and contact with the passenger pier wall

At 22:47, the ship is turning towards $063^0$, COG is $169^0$ with a speed of 0.5 knots astern (Figure 32). The speed astern is as high as 1.9 knots. The bow thrusters (BT) operate at 50% power to port, pushing the bow to port. The wind is from direction $107^0$, and the wind speed is 15 knots (7,8 m/s).

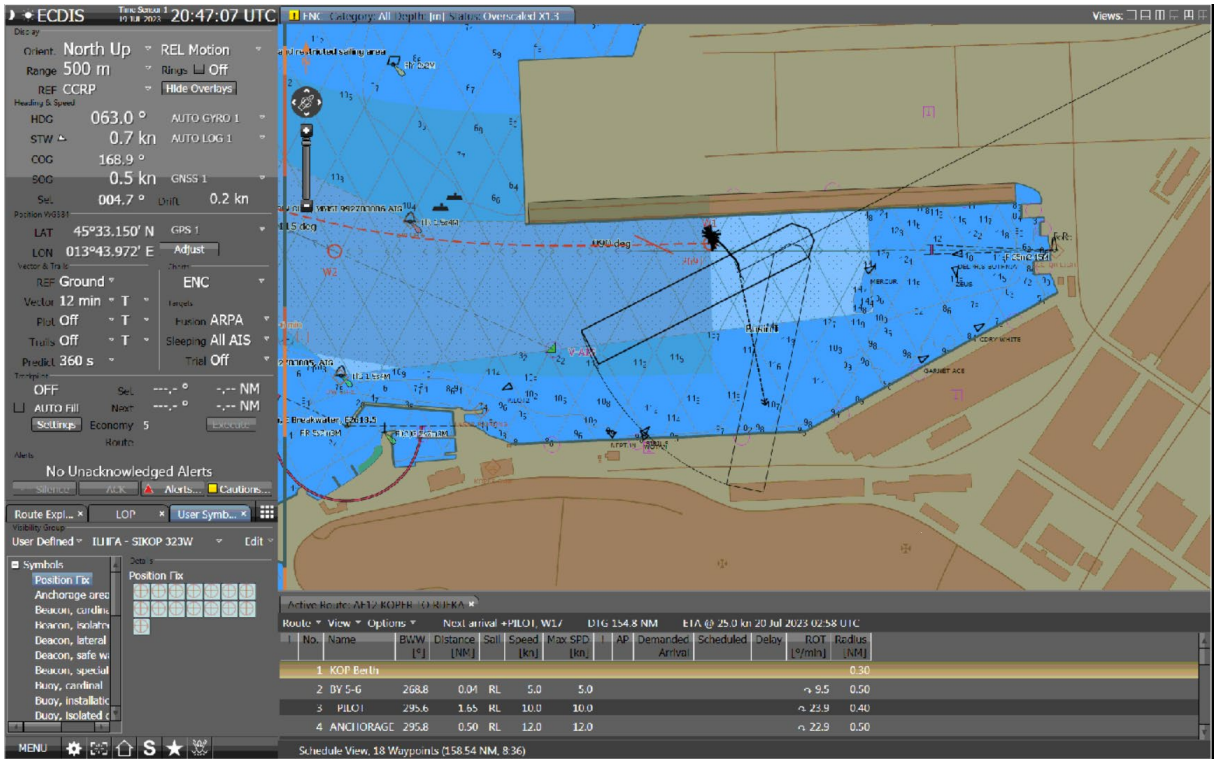



*Figure 32: Situation at 22:47 LT (source: VDR)*

At 22:55 (estimated), the ship touched the soft bottom and contacted the pier wall between bollards #15 and #17 at least three times (Figures 33 and 34).

The ship's heading is 036$^0$, COG is 072$^0$, and 0,3 knots astern. Bow thrusters (BT) are operating at 80% power to port, and the stern thrusters (ST) are also at 80% power to port. The main engine is not used due to the given position of the ship and the proximity of the bow to the pier, berth #7A. The wind is from direction 129$^0$, speed 15 knots (6,5 m/s).

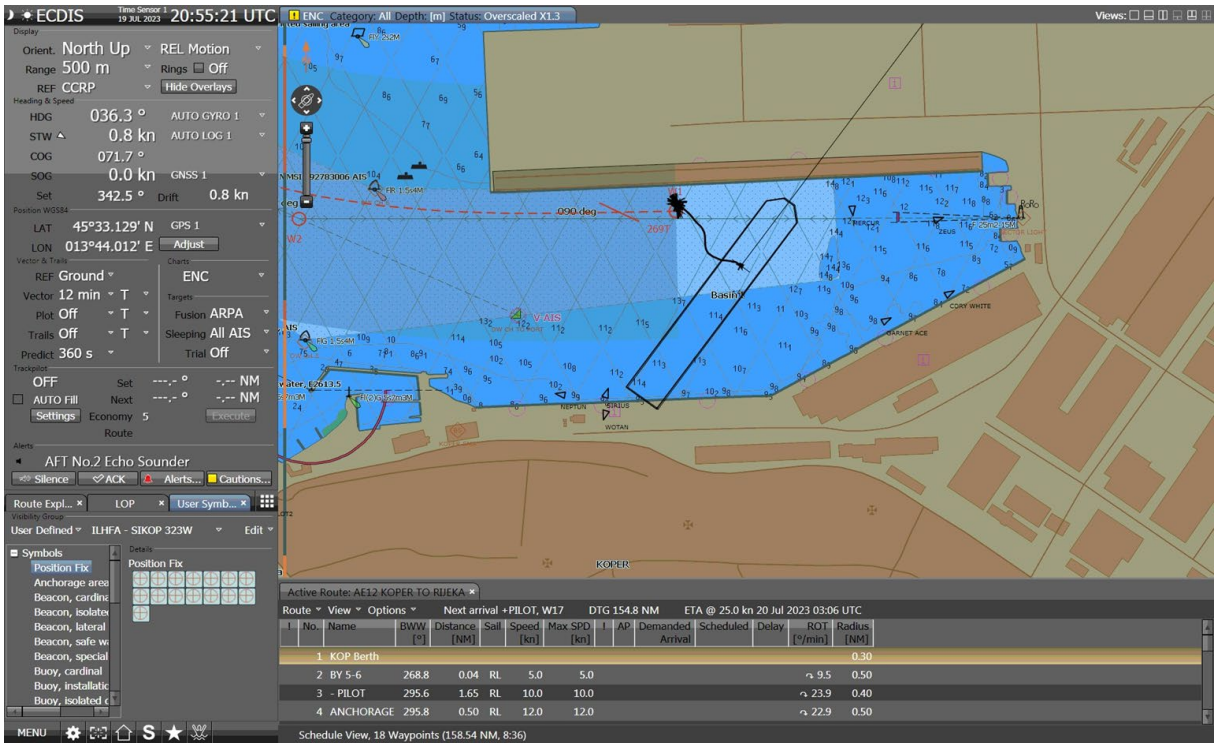



*Figure 33: Situation at 22:55 LT (source: VDR)*


*Figure34: Ship's contact with the shore (source: VNC Luka Koper)*

### 2.3.4. Maersk Houston - Contact with the Pier 1 wall and fenders

At 23:02, tugboat Mercur started assisting (boxing) on the starboard quarter. Bow thrusters (BT) are not operating, and stern thrusters (ST) are operating at 80% power to port. The ship's heading is $028^0$, and the COG is $297^0$. The ship is moving toward moored tugboats due to stern thrusters operating to port and the tugboat pushing from the starboard quarter. The main engine is not used due to the given position of the ship and the proximity between the bow and Pier 1, berth #7A (Figure 35).

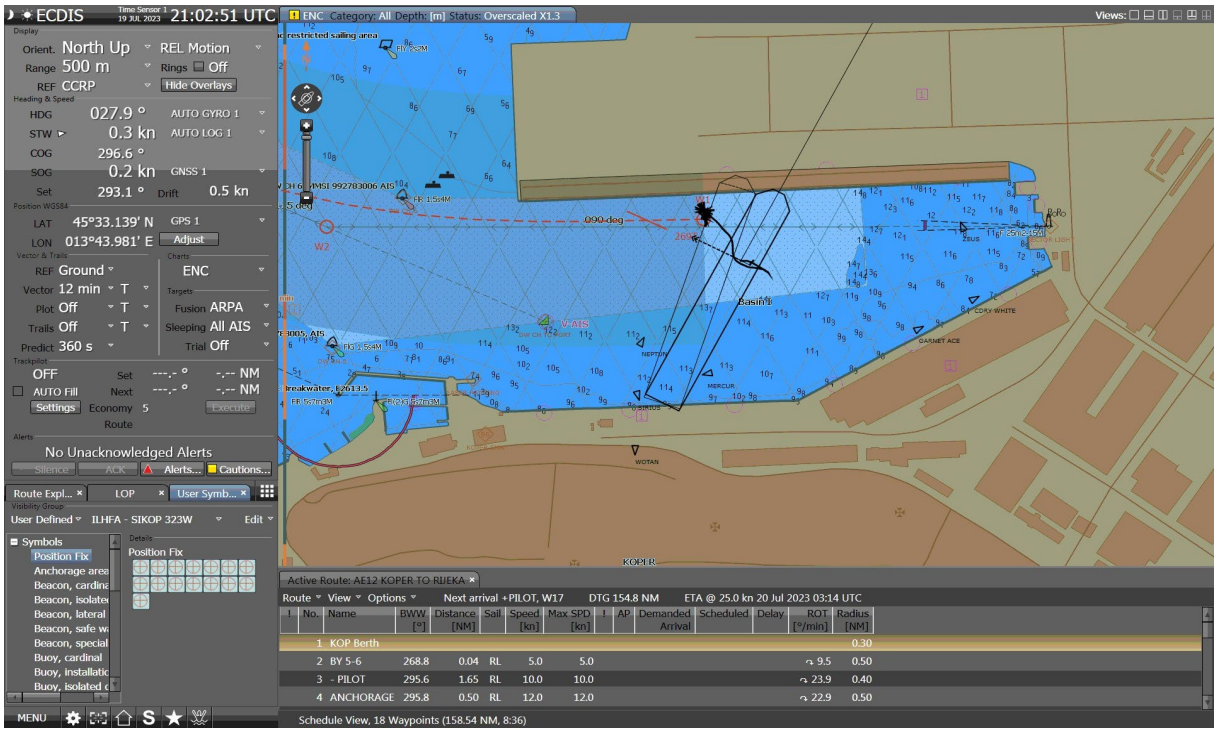



*Figure35: Situation at 23:02 LT (source: VDR)*

At 23:03:53, the starboard anchor was dropped to stop further approaching the bow towards Berth 7C. Bow thrusters are stopped, and stern thrusters are operating at 80% power to port. The ship's heading is $029^0$, COG is $232^0$. The ship's stern is continuing to move towards the tugboats moored alongside. At the same time, tugboat Mercur, on the starboard quarter, is pushing the stern of the ship to move the ship's stern away from the pier. The main engine is not used. The wind is blowing from direction $044^0$, and the ship's speed is 30,5 knots (15,7 m/s).

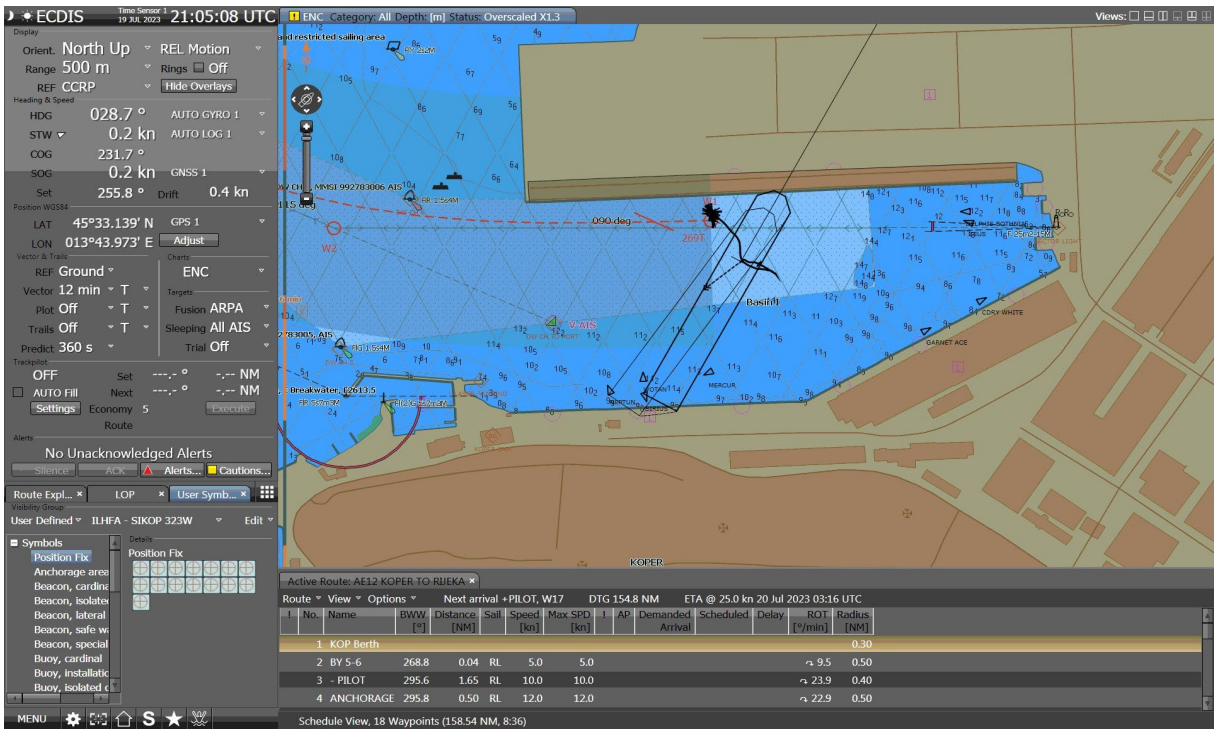



*Figure36: Situation at 23.05 LT - after shore contact, (source: VDR)*

At 23:04:39, the ship's bow made contact with the Pier 1 fenders and the pier's vertical wall. Bow thrusters are stopped while stern thrusters are operating at 80% power to port. Tugboat Mercur is assisting on the starboard quarter and pushing the stern to port, the main engine is not running (Figure 36).

### 2.3.5. Maersk Houston - Contact with the tugboat Sirius

The ship's heading is $027^0$, COG is $119^0$. Bow thrusters are stopped, and stern thrusters are operating at 60% to port. At starboard quarter, the tugboat Mercur is pushing stern to port, main engine is not running (Figure 37). The wind direction is $056^0$, 23,7 knots (12,2 m/s). At 23:08, the ship's stern (port quarter) made contact with the tugboat Sirius, abeam tugboat Wotan, moored on Berth 1 (Figures 37 and 38).

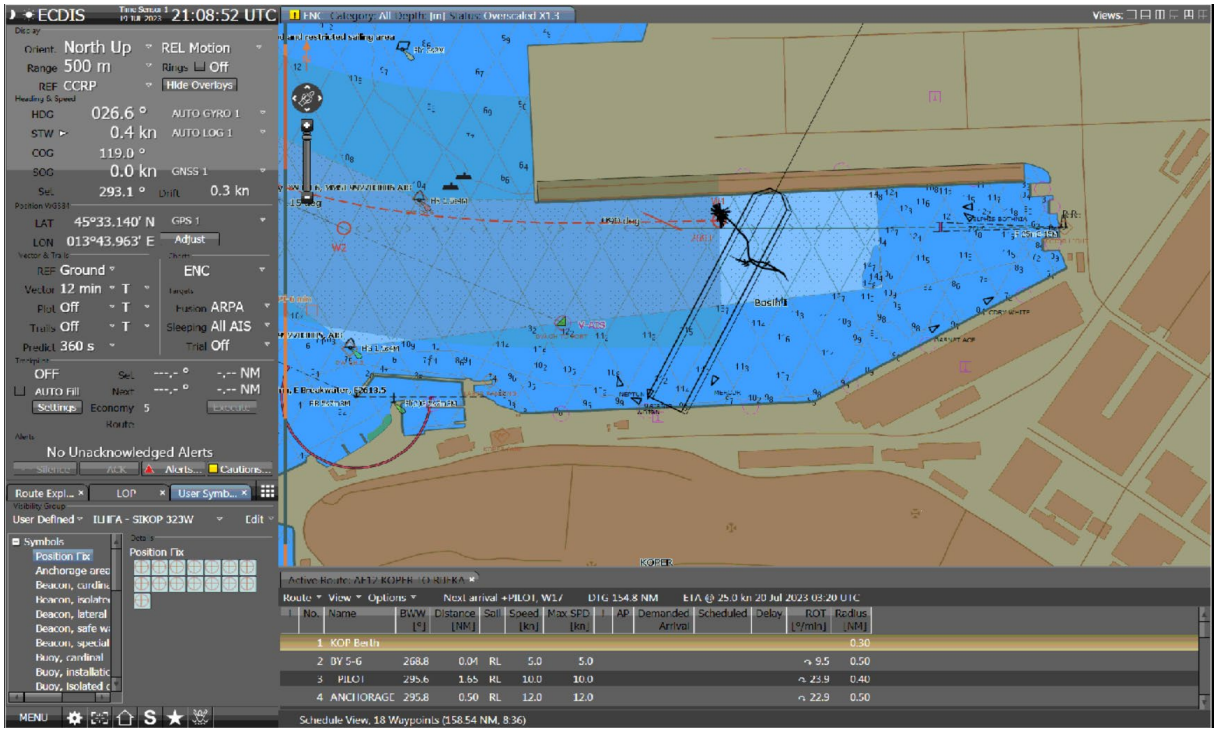



*Figure37: Situation at 23:08:50 LT - contact with the tugboat Sirius, (source: VDR)*


*Figure38: Maersk Houston in contact with the tugboat Sirius" (source: VNC Luka Koper)*

After the contact itself, the tugboat Wotan stand-by crew managed to tow away tugboat Sirius, which sustained damage to the navigation bridge and the signal mast away.

### 2.3.6. Maersk Houston - Contact with container crane STS 58

At 23:09, after the arrival of the stand-by crew tugboat Neptune, it sailed, and at 23:16, it made fast at the port quarter and began to pull the ship's stern to port. At starboard quarter, tugboat Mercur was pushing stern to port. The ship's heading is $028^0$, COG is $286^0$. Bow is moving to port, speed of 0,4 knots. Bow thrusters are stopped, and stern thrusters are operating at 60% power to port. A starboard anchor with one length of chain is still in the water.

The ship's course is $027^0$, bow is moving to port at 0,7 knots, although the starboard anchor is down. Stern is also moving to port at 1,0 knots. Bow thrusters are stopped, and Stern thrusters are operating at 60% power to port. The starboard anchor with one shackle of chain is still in the water. One tugboat

at the stern is pushing the ship to port, the other is pulling her to port (Figure 39). The wind direction is 081$^0$, speed of 19 knots (9.6 m/s). At 23:18:22, with her upper left part of the bow plating (bulwark), the ship made contact with the vertical seaside leg 1 of STS 58.

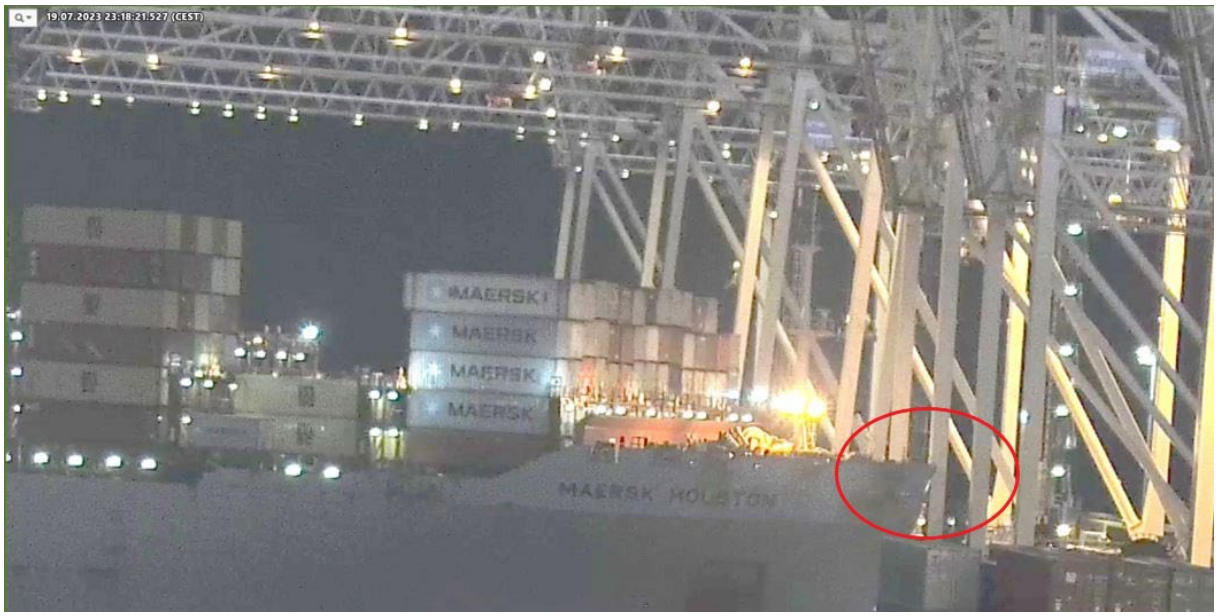



*Figure39: Ship in contact with lift #58 at 23:18:22 (source: VNC Luka Koper)*

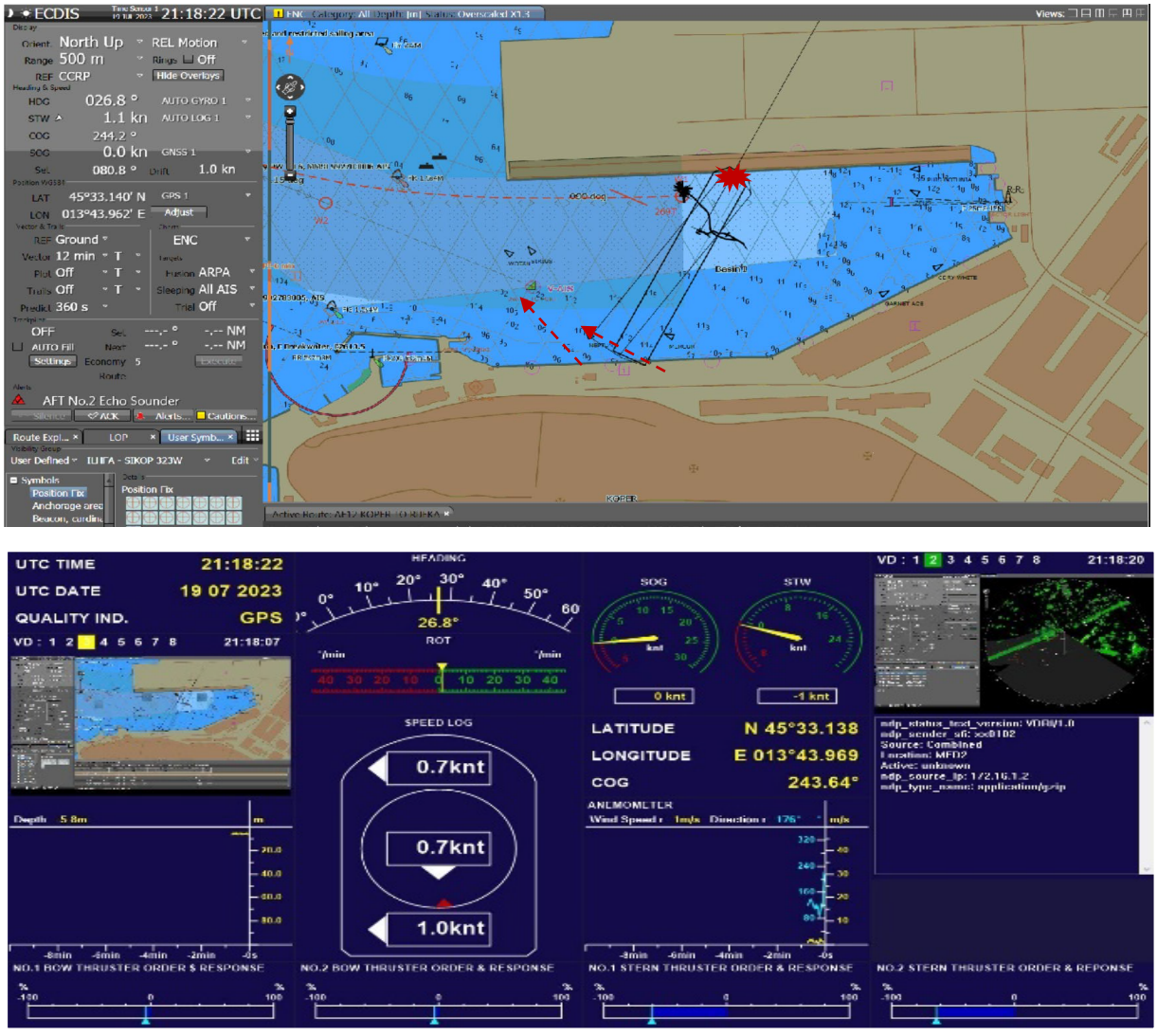



*Figure40: Situation at 23.18.22 LT - contact with shore lift #58 (source: VDR)*

## 2.4. CARGO AND WIND

At the time of the accident, the ship was carrying out commercial operations, loading and unloading the containers. The pictures below show the state of the cargo on board immediately after the accident.
At the time of the incident, not all the cargo bays on board were filled with containers. It is estimated that this doubled the total surface area and, consequently, the impact of the wind from the north-west direction. This caused a very high torque, which particularly put strain on the stern mooring lines and the forward springs.

The full calculation of the ship's wind load, the static load calculation, and the dynamic load simulation have been carried out by UL FPP experts and are given and available in the document Report-LK/MTE/01-2023.


*Figure41: Overview of the cargo distribution on board*

# CHAPTER 3 - CONCLUSIONS

1. The weather forecast and the possibility of stormy weather occurrences were predicted in advance. The ship was equipped with NAVTEX equipment. Before and after the arrival, the ship was within the range of the two NAVTEX stations, Split (Q) and Mondolfo (U), both of which issued a warning for the northern Adriatic stating the possibility of sudden storms, especially in the evening hours and during the night. NAVTEX messages are only checked on the NAVTEX equipment's display, and as per Bridge team information, those are not printed. Before the storm, Trieste Radio broadcasted a SECURITE message on VHF channels. Weather warnings were forwarded and communicated by telephone to the ship's agent, who passed them on to the Master. The master was also informed regarding the possibility of storms by the pilot on the ship's arrival and by the SMA PSC inspector while inspecting the ship in the morning of the day of the accident.

2. Weather conditions in the northern Adriatic are well described in Admiralty Sailing Directions NP47 - Mediterranean Pilot Volume 3 (Ed. 17, 2020), which specifically describes the possibility of extremely strong "Tramontane" winds from N to NNW.

3. It appears, the ship did not follow the bad weather mooring procedures listed in Maersk Document ID: P319, point 3.2, which states that the ship is obliged to get information on the local weather forecast for duration during port calls in advance.
   **Safety Recommendation 1.1 follows from points 1-3**

4. The ship was informed about the bad weather forecast by the PSC Officer and additionally by the Duty Officer at the CNP. On both occasions, the Master and the Duty Officer were advised to reinforce the ship's mooring.

5. In the afternoon of 19.07. ship's mooring was reinforced with additional ropes, one each at the bow and stern, so that 14 ropes were used in total. Two ropes (on M4 and M14 drums) were left unused.

6. The ship did not follow the procedures mentioned in Maersk Document ID: P319, Chapter 2, that, in case of bad weather, ropes should be positioned in a manner to be as long as possible. Ropes were arranged asymmetrically, and the springs were markedly too short. The most critical ropes were two forward springs, which were less than 29 meters long, and short stern lines attached to bollard No. 41 (M7, M8). The master did not take the opportunity to place at least two stern lines on the floating devices, as suggested by the pilot. The guidance given by Maersk in Maersk Document ID: P319 in Chapter 2 – Mooring, is cautious and in line with good seamanship. The geometry of the mooring scheme confirms that it was not followed by the crew.

7. The inspection of the Maersk Houston revealed a lack of mooring equipment maintenance. Mooring winches, drums, and horizontal and vertical swivel guides were showing visible erosion of the paint coating and corrosion, which in some places was detached or detaching, thus accelerating the friction of the rope, and reducing its load-bearing capacity. It can be concluded from the examination of the CCTV footage and the collected debris from all the mooring lines that the winch brakes have also failed, but it is not entirely clear at which load. This was followed by the ropes snapping. Ropes usually break at the loop, which was not the case. The length of the broken rope residues, the friction marks on the residues, and the rope fragments on the deck indicate that the ropes broke at the point of bending and friction.

The guidelines provided by Maersk in Maersk Document ID: P317 in Chapter 2 - Mooring Ropes - Inspection & Care are set out in accordance with good maritime practice. However, the information entered in the Inspection and Maintenance Log is scanty, incomplete, and some of the information is missing. This indicates that the prescribed procedures have not been fully followed by the persons in charge of the ship.

From points 4 to 8 above, it is concluded that the supervision of Maersk A/S' senior management over the implementation of the safety and quality management system on board is partially incomplete and that safety and quality procedure implementation, including tasks for routine maintenance of mooring equipment and ropes by the ship's crew, could be improved. This may be achieved by regular company staff inspections and audits by the responsible persons, like nautical and technical superintendents.

**Safety recommendations 1.2 and 1.3 follow from points 4-8.**

8. At the time of the incident, the ship used the original mooring ropes, which were delivered and installed before the ship was taken over in May 2019. From the information obtained by the ship, it was concluded that between takeover and departure from the shipyard until the incident on July 19th, 2023, the ship has called at 300 ports, where she has been moored for a total of 10,547 hours. This significantly exceeds rope's manufacturer designed lifetime of 4000 hours by approximately 6 500 hours.

   **Safety Recommendation 1.4 follows from point 8**

9. The Security Control Centre forwarded the weather warnings received from ARSO to the entire port community. All responsible persons at the various terminals, including the container terminal, were informed in a timely manner by internal electronic communication. The responsible persons in the Operations department informed the ship agents by telephone about the possibility of a storm to inform the ship masters. In the section Preventive measures in case of extreme weather conditions - CT transshipment on pages 14 and 15, Work Instruction DN049 states that in cases of wind speeds between 15-20 m/s or gusts between 22-30 m/s (7-8 Bf), the working process is to be carried out more slowly by means of a technological procedure.

   With wind gusts above 20 m/s and gusts above 30 m/s, posing a risk of serious injury to people and significant damage to property, activities include:

   - Analysis of critical wind values and decision to stop work,
   - Informing the participants in the work process about the suspension of work,
   - Evacuation of other participants, and
   - Stopping cranes.

   As a result, the instruction to stop loading and unloading operations was issued at 22:39 hours, when the average wind speed measured on the STS 59 crane was 18.7 knots and the maximum wind speed was 24.1 knots. As during this time, in just one minute at 22:40, the wind had reached an average speed of 32.7 m/s and gusted from 40 m/s, thus exceeding the values at which the cranes automatically slow down and then automatically shut down, it was not possible to operate them any further. This resulted in the horizontal booms on all four cranes remaining lowered. Meanwhile, the container spreader of the STS 61 crane was still in the ship's hold. While the crane was already in emergency mode, the crane operator managed to extract the spreader from the ship's hold and return it above the ship towards the shore at 22:43. The wind speed at that time had already reached an average of 65.9 kts. As the ship began to move forward due to the slackened stern lines and parted forward springs, the ship's signal masts on the compass deck contacted the lowered arm of the STS 59 crane. Unlike the Bora, a gusty, strong wind from the

north-easterly direction that may develop slowly or more quickly, and is usually well forecasted, the Tramontane is a strong, short-lived wind from the north-north-easterly to the north-north-easterly direction, that is locally present in the Gulf of Koper. It can occur at any time of the year but is most likely to occur in the summer or early autumn. It may be accompanied by storm activity in the direction of a north-westerly storm line heading towards Trieste and the Gulf of Koper. Winds are considered dangerous due to their sudden and frequent occurrence. Typical wind speeds are between 40 and 60 knots.[15]

In accordance with the instructions and guidelines of Work Instruction DN049 to stop the work at the prescribed wind strength and speed of 20 m/s, the stop notice was issued exactly one minute before the wind reached the level at which the cranes automatically shut down. The cranes were switched off automatically. As the ship's lines slackened and snapped, ship drifted away from the shore and moved forward, resulting in contact with the lowered boom of the STS 59 crane.

The crane manual Operators_Manual_CC2147-48 on pages 28 and 107 states that the crane arm boom shall be in the raised position when the crane is not working. Section 4.3 Lift shutdown lists the procedures for shutting down and securing (anchoring) the crane. As the wind had already exceeded the limit values, it was no longer possible to raise the horizontal booms. From the above, it is concluded that:

- The decision and consequently the notice to stop cargo operations have been issued in accordance with Work Instruction DN 049 in relation to the prescribed current wind speed.
- Due to the operation of the crane's safety system, it was not possible to raise the horizontal booms as required by the instructions in the Lift Manual.
- Work instruction DN 049 does not foresee the measures to be taken and to enable the precautionary early stoppage to enable timely securing and anchoring of the container cranes in accordance with the manufacturer's Manual.

**Safety Recommendation 2.1 follows from point 9**

10. Among other reasons, the harbor is temporarily closed when the wind reaches 17 m/s in a 10-minute average. Prior to the event, Delphis Bothnia was maneuvering into the harbor. The pilot boarded the ship at 21:54. There were no immediate reasons to prevent the boarding. The weather was calm, with winds of 1,5 m/s from an NE direction, until the bow of the ship was aligned with that of the Maersk Houston. At that point, the wind gusted to 18 m/s. SMA, with its modern Traffic Control Centre, has the capability to fully monitor traffic, events, and weather conditions, as well as the development and movement of storm cells.

    **Safety recommendations 5.1 and 5.7 follow from point 10**

11. At the time of the incident, only two tugboats were readily available in the port and were assisting the incoming ship. Crews of other tugboats were called summoned after the Maersk Houston breakaway from the pier. Although bad weather was forecasted, immediate deployment of other tugboats was not available. AdriaTow does not have prescribed written procedures for dealing with weather emergencies. The decision to call the standby crews and to activate other tugboats is subject to the daily pilotage plan. In accordance with a verbal instruction from the management, in case needed, decision to call up and activate the standby tugboat crews it is left to the active tugboat master's discretion. In addition, standby tugboats and their crew can be activated upon the request of SMA or a particular ship(s) request.

[15] e-NP 47 Mediterranean Pilot Volume 3 [16th Edition 2017], UKHO

**Safety Recommendation 3.1 follows from point 11**

12. As the two different events were taking place, the berthing of the Delphis Bothnia and the departure from the pier of the Maersk Houston, the communication between the participants (about ten different stations) was intertwined. The difficulties of using a single working channel as well as the occasional use of a second duplex channel were evident. The use of VHF channel 07 was not successful due to the duplex mode of operation, so in addition to VHF channel 08, communication between some stakeholders continued occasionally on VHF channel 09. It is clear from the transcript of the communication that the communication between the parties or stations involved was conditioned by the current situation of the berthing of the ship on arrival and the Maersk Houston incident. Communication was based on the needs and events of the moment, with a lack of full guidance and coordination of the actions of the parties involved. The second pilot on shift, due to his inability to board the ship itself, observed the events and tried to coordinate as best as possible from the shore itself.

    **Safety Recommendations 2.5 and 6.1 follow from point 12**

# CHAPTER 4 - SAFETY RECOMMENDATIONS

A safety recommendation is a proposal made by an investigating body, based on information obtained from an investigation, with the aim of preventing accidents or incidents.

Where the safety issue identified is considered to be of such a serious nature that it needs to be urgently addressed, a provisional preliminary safety recommendation is issued, even though the investigation is still ongoing, and the report has not yet been prepared. Tentative safety recommendations were issued on 1.8.2023 (Annex 09).

**1. <u>Maersk A/S</u>**

1.1. It is recommended that specific safety instructions be prepared and prescribed for the Bridge Team (masters and watchkeepers) regarding the specific seasonal weather conditions in the North Adriatic, mandatory monitoring of the NAVTEX weather warnings at stations Mandolfo (U) and Split (Q). The printing of NAVTEX warnings is necessary and expedient because, in addition to the master, all officers of the Bridge Team are aware of the weather warnings.

1.2. It is recommended that the Company's internal procedures be updated to better monitor the implementation of the prescribed maintenance guidelines for mooring equipment and ropes, as derived from the periodic maintenance and inspection documentation.

1.3. It is recommended that an internal audit *(Bridge Team Audit)* be established and carried out to verify, (among the others) the procedures for handling bad weather, including the correct use and positioning of mooring lines, like appropriate length of lines, a smaller angle of operation, etc.

1.4. It is recommended that a procedure be established for the management of mooring equipment on board ships and that it be monitored by the company's management in order to prevent the use of ropes whose manufacturer's recommended service life has expired.

1.5. It is recommended that the mooring at berth 7D be planned so that the ship, which is solely responsible for the proper and safe mooring, uses a sufficient number of mooring lines in such a way as to avoid short lines at high angles of action. For mooring port side alongside, it is recommended that the use of floating appliances for the required number of stern lines is mandatory.

**2. <u>Luka Koper d. d.</u>**

2.1. It is recommended that Work Instruction DN 049 (p. 14-16) be updated to ensure that a timely decision to stop transshipment operations allows the safe stopping and anchoring of container cranes in accordance with the crane’s manufacturer's instructions.

2.2. It is recommended to update the "Port Info Book" with additional information that, in case of bad weather, it is recommended to secure the mooring lines on the winches with brakes and that the constant tension facility is not recommended.

2.3. It is recommended to mention in the "Port Info Book" that in the port of Koper and in the whole landscape, wind speeds of 30 m/s or more may occasionally occur.

2.4. It is recommended that the berthing of large container ships at Berth 7D should be planned in such a way that the ship is able to use a sufficient number of mooring lines in such a way as to avoid the deployment of too short lines with a high angle of action.

2.5. It is recommended that consideration be given to the possibility (and limitations) of berthing large container ships at Berth 7D with the starboard side alongside (with the bow facing the entrance). It is expected that this could improve the berthing itself, make more efficient use of the floating devices (mooring buoys), and allow the use of bollards 43 and 44. Bow out positioning would enable quicker maneuvering and departing from the berth in case of emergency.

2.6. Permission for pilots for free access and entering the port security area using a private car in similar emergency situations shall be arranged.

**3. AdriaTow**

3.1. It is recommended to develop, prepare, and prescribe written procedures on the notification, handling, and response to forecasted weather emergencies in order to ensure sufficient crews and to improve tugboat response time.

**4. KOPP**

4.1. It is recommended that, for the purpose of providing general information to the masters of ships on arrival and the overall MPX, the KOPP prepare and use a form/checklist with written and visual information on the arrival maneuver, the planned course, the use of tugs, the berthing place and the rope layout, possible expected adverse weather conditions, etc.

5. **Slovenian Maritime Administration (SMA**)

**Actions taken by CNP in line with issued preliminary recommendations:**

5.1. To closely monitor weather forecasts, receive emergency bulletins and warnings of impending bad weather. The receipt of bulletins and warnings shall be recorded in the logbook.

5.2. On receipt of an emergency bulletin, to inform AdriaTow, KOPP - Pilots, Port of Koper Operations department, and Port of Koper VNC. Record in the logbook.

5.3. To continuously monitor radar images of precipitation on the official ARSO website or other official websites.

5.4. To contact the ARSO forecaster on duty. Record in the logbook.

5.5. To issue SECURITE message via VHF station on channel 16/08. Record in the logbook.

5.6. For berth 7D, check that the ship also has stern lines or headline lines (depending on the side of the berth) attached to the floating mooring devices (buoys).

5.7. To monitor surveillance cameras. If a weather front is expected to pass, all entries and exits to all the Basins are to be suspended in advance. All incidents shall be recorded in the logbook and the NEO (National Single Window),

5.8. To monitor the maneuvering vessels and in order to analyze AIS records more accurately, the Assigned Mode shall be changed to a value of 2 to 5 seconds (Assigned Mode) during

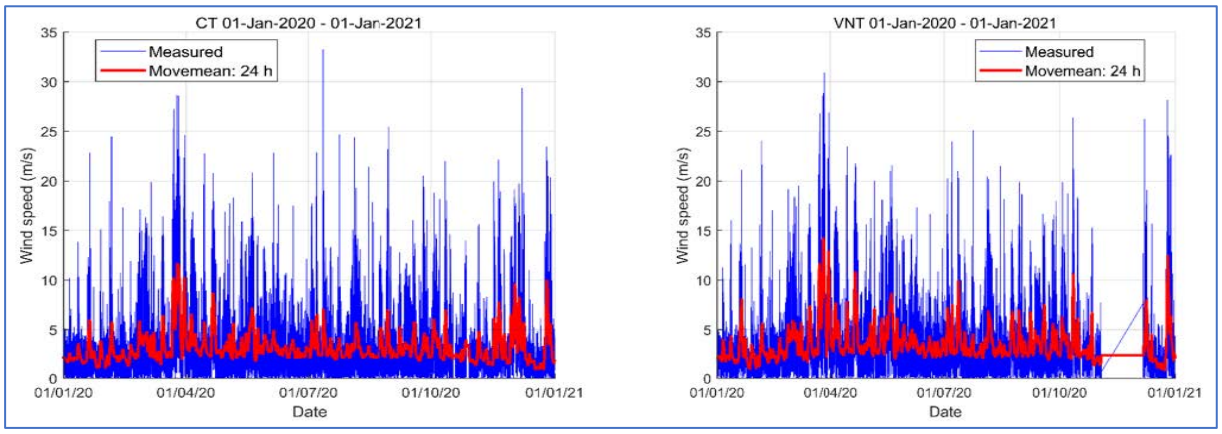
extreme bad weather and the passage of storm cells, by manual setting, until the automatic AIS data transmission mode is established, with a default transmission every 30 seconds (*Assigned Mode*).

6. **Ministry of Infrastructure (MZI) / Directorate for Air and Maritime Transport**

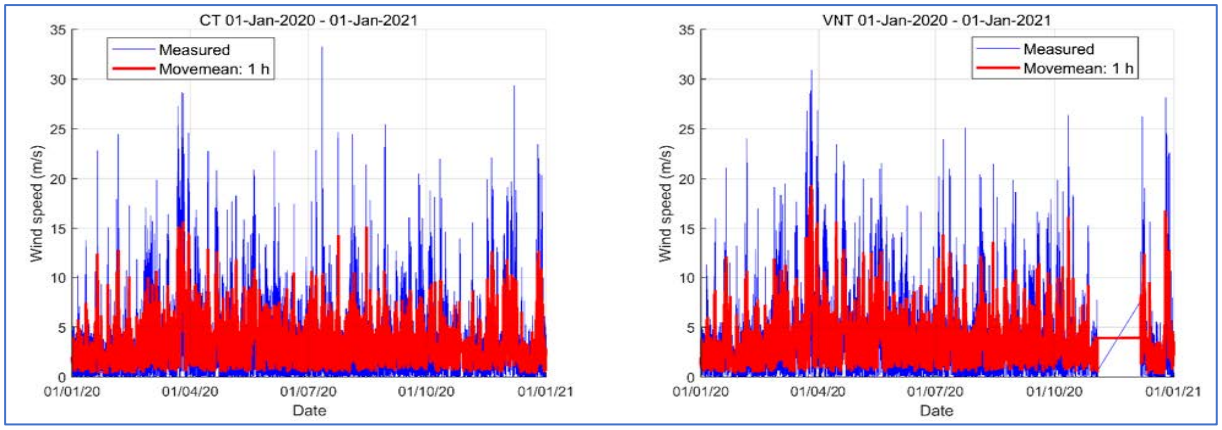
6.1 It is recommended that a procedure be initiated with the Agency for Communication Networks and Services of the Republic of Slovenia (AKOS) to officially obtain an additional VHF channel for the uninterrupted flow of radio communications in the event of two simultaneous maneuvers or in the event of an emergency in the anchorage area or in the basins of the Port of Koper. The additional VHF channel shall be a simplex channel.

# ANNEXES

# ANNEX 01 - RECENT WIND MEASUREMENTS AT CT AND VNT SITES OVER THE PERIOD FROM 1. 1. 2020 TO 01. 01. 2021.

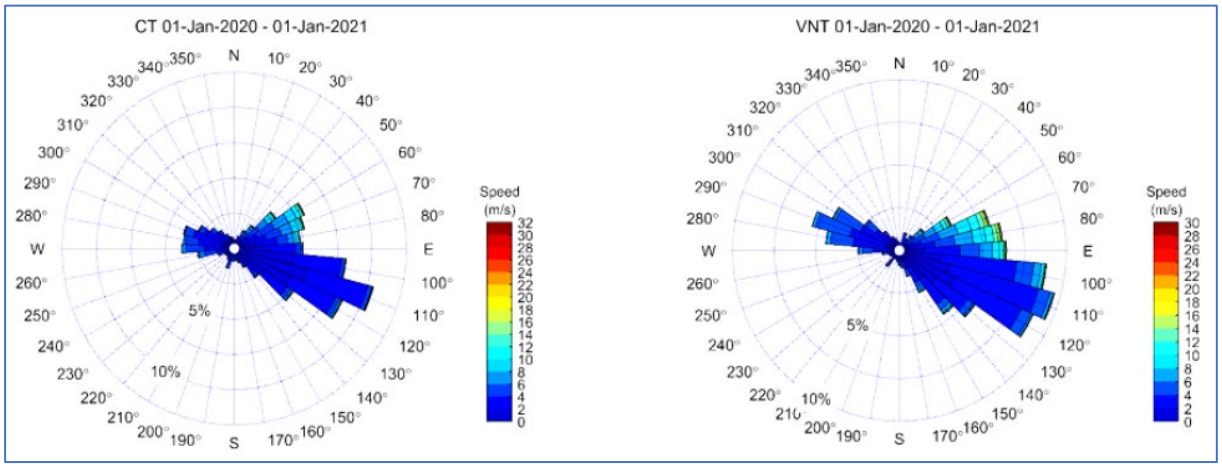



*Graf 1: Daily wind speed and 1-sec. wind*



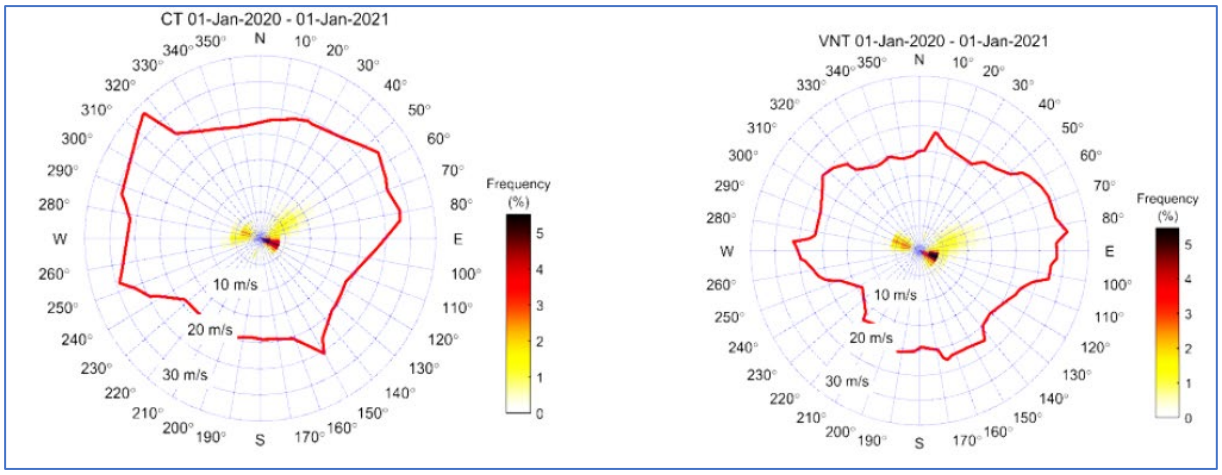

*Graf 2: Hourly wind speed and 1-sec. wind*

The anemometer at the container terminal (Basin I) and the anemometer at the VNT (Basin III) are identical 3D anemometers capturing data at 20 Hz, and the averages shown in the diagram are seconds averages. From the Weibull distribution, it can be seen that the most frequent wind intensity is 2 m/s, and that terminals with winds above 10 m/s are rare.




*Graf 3: CT in VNT anemometers - Distribution of wind direction and strength*

# ANNEX 01 - RECENT WIND MEASUREMENTS AT CT AND VNT SITES OVER THE PERIOD FROM 1. 1. 2020 TO 01. 01. 2021.




*Graf 4: CT in VNT anemometri - največje sekundne meritve po posameznih smereh*

The first rose in the middle shows the wind frequency by direction and intensity, the stronger winds come with gale force winds, and the next diagram shows the maximum measured speeds by sector. The colored polygons show the frequency by wind strength. From the last row, it is clear that the wind is predominantly from the east and west.
Wind speeds of around 30 m/s and above can be seen.

INSTALLED 14 May 2019 by yard

W1

Delivered by Wilhelmsen Ships Service

TYPE APPROVED PRODUCT
DNV·GL
DNVGL.COM/AF

# Certificate

**Client: MAERSK LINE - CPH - DESIGNATED**

**Certificate no: 54277**

Order No: C10012158 Customer Order No: #3911636#K1ONW18-7200198210

| Rope No. | Description | |
|---|---|---|
| 1860004822 | **TIMM MASTER 8 80MM 220M 1231KN WHITE 2X1,8M EYES** | |
| | Material: | Signal B5 yarn and High Performance Polyester |
| | Minimum Breaking Load (Unspliced): | 1368 kN |
| | Minimum Breaking Load (Spliced): | 1231 kN |
| | Type approval no.: | TAK0000094 |
| | Vessel Name: | MAERSK HOUSTON |
| | IMO No.: | 9848950 |
| | Manufactured acc. to: | ISO 10556:2009, ISO 9554:2010 |
| | Tested acc. to: | ISO 2307:2010 |

Name and address of manufacturer:
Wilhelmsen Ships Service AS, Strandveien 20, Postbox 33, 1366, LYSAKER, Norway

**We hereby confirm that the above mentioned product was released for delivery after inspection by a competent person.**

06. august 2018

Tore Strand

Tore Strand, Business Manager

Note: All certificates from W1 to M13 are identical.

M12

Wilhelmsen

01/12/2021 M12 Put = Service

Rec'd Singapore

by Wilhelmsen 22/09/202

# Mooring line certificate

We hereby confirm that the mentioned product was released for delivery after inspection by a competent person.

Wilhelmsen Ships Service AS,
Strandveien
20, Postbox 33, 1366
Lysaker, Norway.

## GENERAL INFORMATION

| | | | |
|---|---|---|---|
| Client | None | | |
| Vessel name: | MAERSK HOUSTON | IMO No: | 9848950 |
| Order No: | O14297715 | Certificate No: | 2e92d58e |
| Customer order No: | None | Manufactured acc. to: | ISO 9554, ISO 10556 |
| DNV GL Type Approval: | TAK0000094 | Tested acc. to: | ISO 2307, CI 1500A, DNVGL-CP-0100 |

## LINE SUPPLY INFORMATION

| | |
|---|---|
| Part number: | 411060 |
| Part description: | TIMM MASTER 12 SBA F120 [81MM] 220M |
| Serial number: | 2170121678 |
| meter: | 81 |
| Length: | 220 |
| Material: | Mixed polyolefins (B5 yarn) and HT PES |

## PERFORMANCE INDICATORS

| | |
|---|---|
| Line Design Break Force (LDBF): | 128.6 t |
| Unspliced MBL [t]: | 142.9 t |

**LDBF is the minimum force that a new, dry, spliced mooring tail will break at when tested according to appendix B OCIMF MEG4. This is for all mooring line and tail materials except those manufactured from nylon which is tested wet and spliced.

Line Description: TIMM MASTER 12 SBA F120 [81MM] 220M

2021-09-22

Veronika Aspelund

TYPE APPROVED PRODUCT DNV·GL DNVGL.COM/AF


ummary | Details | Rescheduling

ter :

Interval (done) From : 15-05-2019 To : 29-07-2023 Done by : (all)

Code : 10.03.05 Add. Filter : Task origin : (all)

incl. sub groups Safety task type : (all)

| Safety Task Remark | Code | Serial Number | Safety Task Name | Speciality | Done (Date) | Done (By / User) | Remark |
|---|---|---|---|---|---|---|---|
| Thorough inspection for condition check. | 10.03.05 | | Inspection of Mooring Ropes/Wires | [none] | 17-05-2019 | Chief Officer (V-olm213 | New ropes installed by yard on 14052019 |
| Thorough inspection for condition check. | | | | [none] | 05-06-2019 | Chief Officer (V-ris205 | All in good order. |
| Thorough inspection for condition check. | | | | [none] | 11-11-2019 | Chief Officer (v-olm213 | all in good order |
| Thorough inspection for condition check. | | | | [none] | 26-02-2020 | Chief Officer (V-ris205 | Inspection done. Maintenance done. New Tail rope installed, eye s |
| Thorough inspection for condition check. | | | | [none] | 27-05-2020 | Chief Officer (V-olm213 | all mooring rope in good condition, end to end turned on the winch |
| Thorough inspection for condition check. | | | | [none] | 22-08-2020 | Chief Officer (V-ris205 | Inspection done. Found in good order. Few eye protection |
| Thorough inspection for condition check. | | | | [none] | 27-11-2020 | Chief Officer (V-ris205 | Inspection done. Found in good order. Eye protection repaired |
| Thorough inspection for condition check. | | | | [none] | 26-02-2021 | Chief Officer (V-amg01 | All mooring ropes inspected, heaving lines and messenger ropes |
| Thorough inspection for condition check. | | | | [none] | 19-05-2021 | Chief Officer (V-amg01 | Inspection carried out. Ropes changed wherever required. |
| Thorough inspection for condition check. | | | | [none] | 19-08-2021 | Chief Officer (V-mis310 | |
| Thorough inspection for condition check. | | | | [none] | 17-11-2021 | Chief Officer (V-jcg206 | All Satisfactory |
| Thorough inspection for condition check. | | | | [none] | 18-02-2022 | Chief Officer (V-jcg206 | All good |
| Thorough inspection for condition check. | | | | [none] | 23-05-2022 | Chief Officer (1200305) | All satisfactory |
| Thorough inspection for condition check. | | | | [none] | 26-08-2022 | Chief Officer (1200305) | |
| Thorough inspection for condition check. | | | | [none] | 26-11-2022 | Chief Officer (47786) | Checks carried out.AIO |
| Thorough inspection for condition check. | | | | [none] | 24-02-2023 | Chief Officer (1200305) | |
| Thorough inspection for condition check. | | | | [none] | 26-05-2023 | Chief Officer (47786) | Checks carried out.AIO |

# Mooring Ropes - Inspection & Care

03 May 2023

Index



## 1. Roles and responsibilities

The Chief Officer shall:

Create and maintain a Mooring Equipment Logbook.

The Logbook shall contain the following:

- Mooring Ropes on winches (one index for each mooring)
- Loose Mooring Ropes (in Use)
- Spare Mooring Ropes
- Gant/Messenger Lines, Heaving Lines & Rope/Chain Stoppers

Use Form ID 410 & ID 411 for recordkeeping of above

Responsible person for mooring operation shall:

- Inspect mooring equipment prior to use
- Report any defects soonest possible to chief officer

## 2. Key Plan

Make a sketch showing mooring equipment layout and location of spare mooring equipment and name it "Key Plan".

## 3. Standard Stock of Mooring Equipment

Mooring Rope requirements:

- Only one type of rope to be kept on board
- Only certified rope to be used
- In few cases, if the mooring rope is from a different manufacturer, then continue to use until retired.
- New ropes should normally be 220m in length*
- Vessels transiting Panama Canal, must have six mooring ropes forward and aft in good condition before the transit

*On vessels with Ultra High Modulus Polyethylene Fibre Rope (HMPF), the length of hawser shall depend on the specific rope drum size.

**Note:** On few vessels with HMPF ropes, it is emphasized that these ropes have similar characteristics to wire ropes and are very stiff compared to conventional fibre ropes.

Vessels equipped with conventional fibre type mooring rope must maintain a necessary number of spare lines. These shall be same type and dimensions as the fixed mooring rope on winches.

New 12 strand Ropes (Snap Back Arrestor) have been introduced to the fleet and these are technically compatible with old 8 strand synthetic ropes (except HMPF), with additional safety. All synthetic mooring ropes onboard shall be gradually replaced with new 12 strand (SBA) rope when the ropes are retired from service.

The appropriate diameter and length of the new 12 strand rope for the different classes of vessel has been categorized and listed. Refer A317f.

## 4. Certificates

Mooring ropes and equipment shall be certified, and a copy of the certificate must be kept in the mooring log together with Form 410 for each item.

Spare ropes and loose gear shall be marked with certificate or serial number.

## 5. Mooring Rope care

- Check for Pulled out fibres/strands - Usually occurs when rope is snagged and been pulled out. It happens due to uneven surface and worn equipment. Work the strands back into the rope.
- Melted Fibres/Rope Compression - Usually occurs due to excessive heat causing fibres to fuse together with signs are charring due to extreme melting. Such area of the rope will stiffen and become unsafe. Cut out the melted areas and resplice.
- Reduction in rope volume – Usually occurs over a period of time due to external abrasion at all points of rope under tension or contact with another surface thus forcing a reduction in overall volume. If reduction reaches 25% or more then the rope should be retired.
- Cut strands in rope – Usually occurs due to sharp surfaces or cyclic tension wear causing multiple fibres to be cut at close proximity. If the adjacent strands are cut, then this is a serious situation requiring immediate action. Cutting the section of rope and resplice.

**CAUTION:** Damage that may not be detectable by visual inspection may occur due to overloading or shock loading. This causes significant loss of strength and/or durability. Shock loading may cause internal melting of fibre.

**CAUTION:** Long Splicing (i.e. end to end splicing) shall not be carried out within the length of rope. In case of parting of rope, cut 10 meters from the broken end and resplice an eye.

**Note:** All mooring ropes that are fitted on the mooring winches should be swapped with other winches periodically in order to ensure that ropes which are utilized more often due to mooring patterns, are not exposed for extended periods. This practice will increase the service life. Mooring ropes should be turned end to end, based on the condition of the rope

**Note:** Vessels to use covers on exposed ropes during long sea passages

There are no dedicated towing ropes specified for the fleet. If the normal synthetic mooring rope is used as towing, then additional safety margin should be considered when in service. There are no guidelines on how much the additional safety margin is required, however P&I Club recommends that the MBL of the Mooring Rope should be at least twice the bollard pull of the tug

**Note:** HMPF ropes should NOT be used as towing ropes as they may part due to dynamic shock loads during towing

## 6. Inspection and evaluation

As a minimum, every 3 months make a thorough inspection of mooring lines and associated lines/ropes & stoppers. Record the result in F410 -Mooring Lines, Messenger Lines, Heaving Lines, Chain & Rope Stoppers Inspection. As a guidance, pls note the below:

- Check the previous record in F410 of the Mooring Lines, Messenger Lines, Heaving Lines, Chain & Rope Stoppers before the inspection
- Layout the Mooring Rope in a straight line. Examine and check the potential damage areas as listed above
- Mooring ropes should be retired when the residual strength of the mooring rope is deemed unfit.
- Based on the results of inspection and evaluation, decide whether to continue use, repair, downgrade or replace the hawser. Reference section provides few illustrations of rope damages.
- Reference section provides work instruction for splicing of eye

**Note:** In slight to moderate conditions ropes can serve for many years. In severe to more severe conditions the same rope may degrade rapidly. The inspection regime shall be set accordingly.

# 7. Record Keeping

### 7.1 Moorings on Winches:

- Identification Number of Mooring Line
- Date put into service
- Date of inspections
- Details of Inspection & Maintenance
- Date changed end to end
- Date rope swapped to another winch
- Date of Rope Retiral
- Copies of relevant certificates

### 7.2 Loose Mooring Line in Use:

- Identification number for each Mooring Line
- Location on board (forward or aft Mooring station)
- Details of Inspection & Maintenance
- Date put into service
- Copies of relevant certificates

### 7.3 Spare Mooring Ropes:

Shall be stored in a safe environment to avoid degradation. Place the ropes on gratings/pallets to provide air flow below. The spare rope shall be inspected thoroughly prior to putting in service.

### 7.4 Inspection of Messenger Lines, Heaving Lines & Chain/Rope Stoppers

- Heaving lines - Remove all heavy monkey fists and any dangerous attachments
- Check all ropes for any signs of degradation. Discard if found unsuitable.
- Check that suitable strength and length of ropes are available
- Ropes to be kept away from paint, thinners, chemicals or other harmful substances
- Check Chain stopper for any cracks or deformation & the small, attached rope for deterioration.
- Check stopper securing arrangement is in good condition. (Bollard rings/Shackle)

## 8. Stopper guide

8.1 Rope stopper:

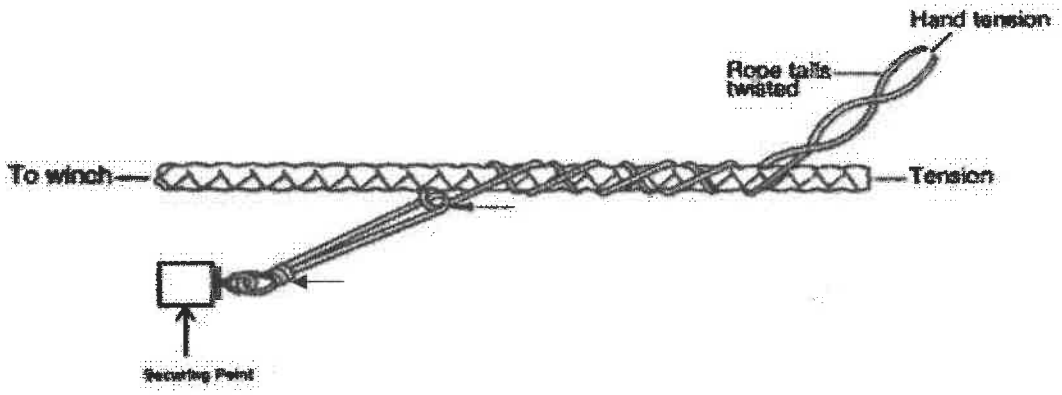
- Synthetic fibre rope stopper to be used with synthetic fibre ropes
- The "West Country" method (double and reverse stoppering) is preferable for synthetic fibre ropes

Making a rope stopper:

- Use a synthetic fibre rope of 24mm diameter and 6 m length with ends whipped.
- Pass rope through a strong point closest to bollard to be used for making fast hawser and make the two tails equal
- Tie an overhand knot 6 inches from the eye with rope pointing away from the bitts. Stopper is now ready to use

Using the rope stopper:

- As shown in below diagram, half hitch the two tails of the stopper below the hawser, crisscross over and under the hawser.
- Twist the rope tails and hold them as the weight is transferred from the drum to the stopper. Alternately, a reef knot tied may be tied over the hawser before transferring weight.



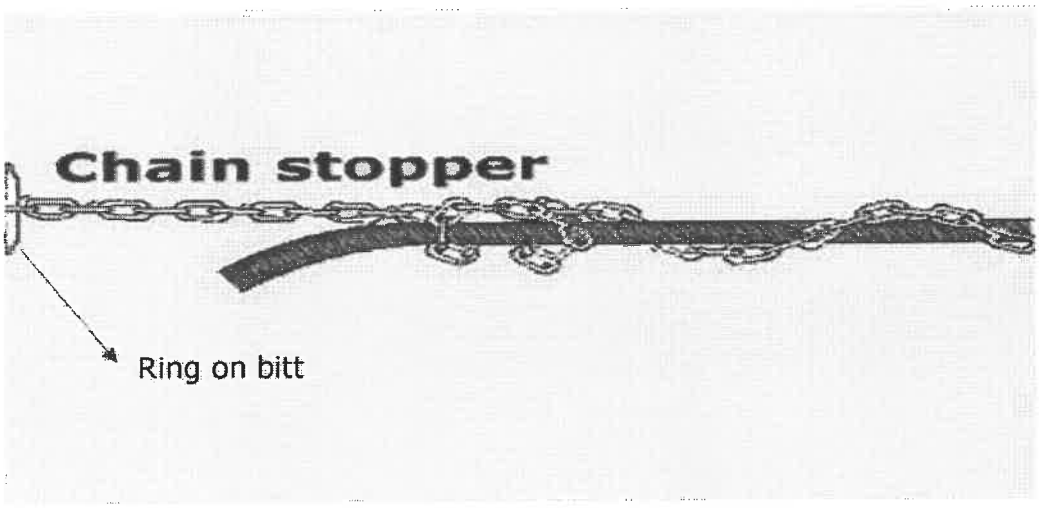

8.2 Chain stopper:

- Chain stopper to be used with wire ropes
- Each vessel should have a minimum of 2 pieces, other than the ones in the ETA box
- To order, use Article No. 688300

Using the chain stopper:

- Connect chain stopper shackle to a strong point closest to bollard being used for making fast wire

- Make a cow hitch, suitably spaced and against the lay of the wire (to ensure that the chain neither jams nor opens the lay of the wire)
- Take turns around the wire and against the lay. When sufficient turns are taken, hold the stopper end and pull away from the bitts at an angle of 30° with the wire.




**9 Use of Monkey Fist**

Prior to throwing the heaving line, warn the shore mooring crew or tug crew about it. Be aware that persons on a tug or on the berth staring up may be blinded by the sun and may not see things thrown down on them.

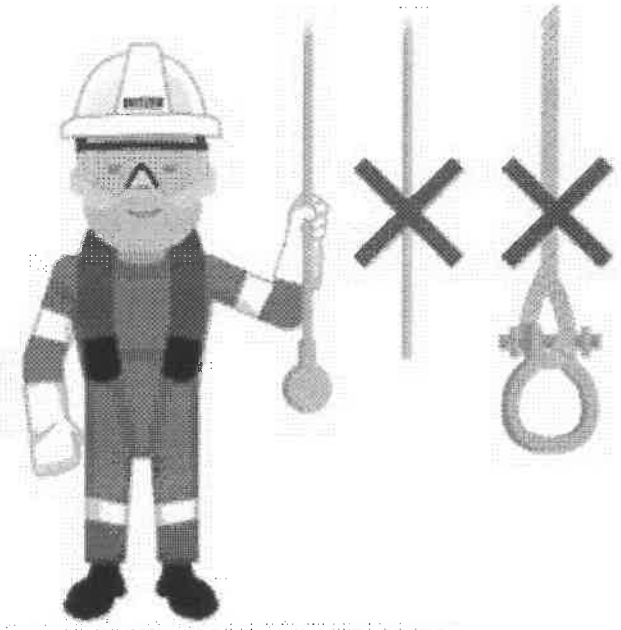
9.1 Dangerous heaving lines

To prevent personal injury to those receiving heaving lines, the 'monkey fist' should be made with rope only and must not contain weighing material.

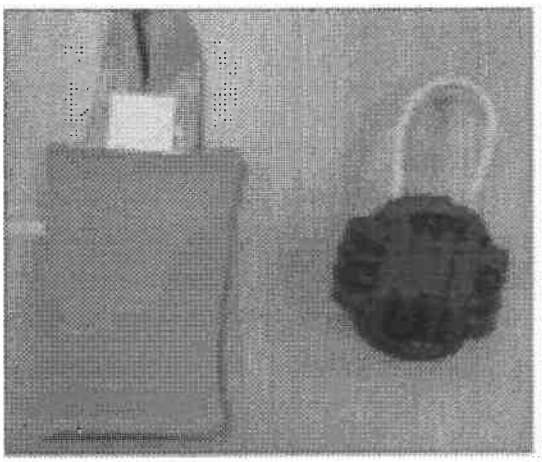
Safe alternatives could also include a high visibility soft pouch, filled with sand, with a weight of not more than 0.5kg, connected to the heaving line.

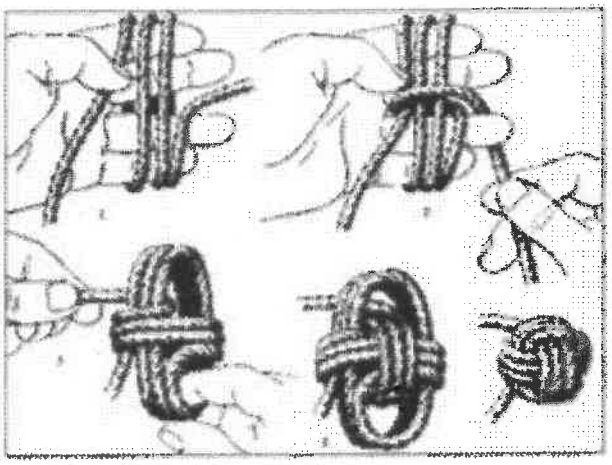
Under no circumstances is a line to be weighted by items such as shackles, bolts, nuts or twist locks.

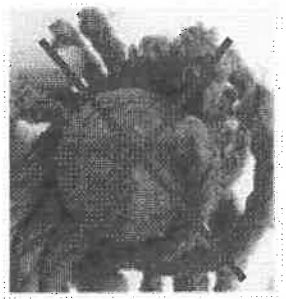
# GOOD SEAMANSHIP



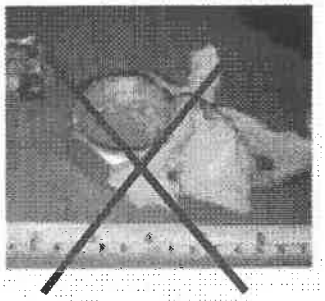
Use a monkey's fist by without extra load







Steel balls found in weighted heaving lines.



Nuts found in weighted heaving lines.

## 10 References

- Hawser Damage Illustrations (Doc ID A317a)
- Eye Splicing Work Instructions for 8 strand Rope (Doc ID: A317b)
- Eye Splicing Work Instructions for HMPE Type Hawsers (Doc ID: A317c)
- TIMM Rope damage abrasion and retiral guideline (Doc ID: A317d)
- Eye Splicing Work Instructions for 12 Strand SBA Rope (Doc ID: A317e)
- Standard Stock of Mooring Equipment (Form ID 411)
- Mooring Lines, Messenger Lines, Heaving Lines & Chain/Rope Stoppers Inspection (Form ID 410)
- SBA Ropes – Vessel Categorization List (Doc ID: A317f)

Wilhelmsen Ships Service

ANNEX 05 - Use & Care Guideines

# Timm™ Master 8

## Use and Care Guidelines for Mooring Ropes

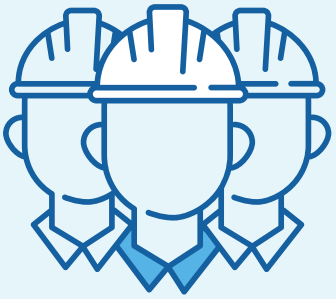
Timm™ Master 8 is a premium mixed polymer rope with polyester protected eyes in each end. The fiber consists of Timm B5 polyolefin yards and high tenacity polyester in the outer layer, giving the rope very good abrasion properties and excellent UV resistance, in addition to being buoyant.

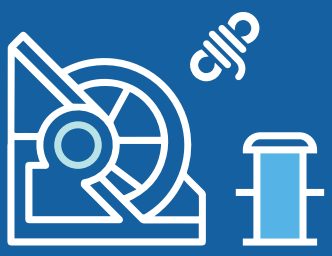
### Product features

| | |
|---|---|
| **Colour:** | White with 3 black marking yarns |
| **Construction:** | 8 strand braided |
| **Floating:** | Yes |
| **Elongation:** | 12-13% at break (stabilized)<br>18% at break (new) |
| **Melting Point:** | 165°C |
| **Water Absorption:** | 0% |
| **Designed Lifetime:** | 4000 mooring hours |

### 1 Installation should be carried out by experienced crew, according to the manufacturer's instructions

Incorrectly installed ropes can be a safety hazard for the crew and port workers. Wrong layering, lack of back tension, and twist are typical errors made. Twisting can cause a mooring rope to weaken by as much as 6% per turn per meter.



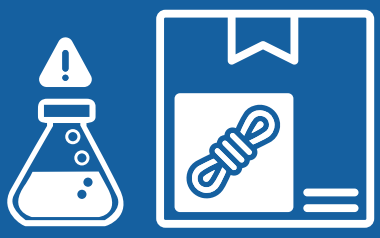


### 2 Regularly maintain mooring winches and fittings

Maintaining a smooth surface on mooring winches and fittings (such as mooring bits, bollards, fairleads, Panama chocks, and rollers) is key to prolonging a rope's lifespan. Sharp edges and rust will damage the rope and cause cuts, pulled strands or yarns. Debris from rust and iron may also penetrate the rope and cause further damage. The optimal solution to avoid abrasion is to maintain a smooth surface. If despite all preventive maintenance the ropes are still experiencing chafing, consider using specially designed chafe protection. Chafe protection is not a substitute for proper maintenance. The use of lubricants, rubber mats, or old ropes is not to be considered chafe protection,and will damage the rope.

### 3 Keep ropes covered and away from sunlight when not in use

Ultraviolet (UV) degradation is a very common occurrence. Covering ropes when they are not in use will give them the best possible protection from UV radiation. Indirect UV radiation may still cause deterioration, even if the ropes are in the shade.

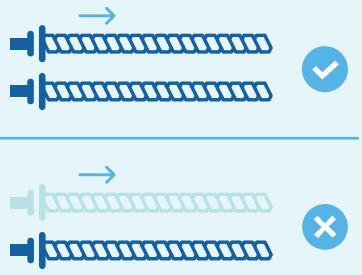


### 4 Do not store ropes near chemicals

Certain chemicals can damage ropes beyond recovery. It is highly recommended to always keep all types of chemicals away from ropes.

## 5 Use the same type of ropes and tails on all positions where they are working in parallel

Ropes working in parallel must be of the same model, construction, material, running time and condition (used/new) to prevent one of the two ropes from bearing most of the load. Ropes from different manufacturers may have slightly different elongations.

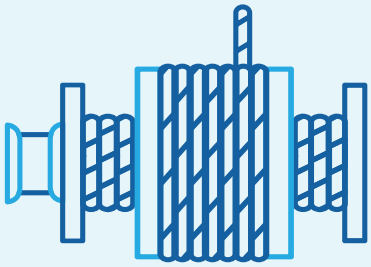


## 6 Conduct regular inspections (by crew and third parties)

Rope inspections can help reveal stress, damage, or wear on mooring ropes, and help prevent accidents before they occur. Expert advice from third parties can provide the crew with useful knowledge on how to optimize the working conditions for the ropes. Conduct regular inspections using Timm inspection and retirement guidelines and with the operators retirement and inspection plan. We recommend retiring the ropes and tails when their residual strength reaches 75% of the ship design MBL.

## 7 Minimum turns on tension drum

We recommend a minimum of 5-6 full turns on the tension drum, in one layer only. If 5-6 full turns are not possible, we recommend to make as many wraps as possible in one single layer. The main intention is to avoid slippage of the rope on the tension drum and avoid transfer of tension to the storage drum of the winch.



## 8 Work load limits

Working Load Limits: 50% of ship design MBL
Maximum Recommended Working Load: 22% of ship design MBL

Timm™ ropes are made as according to ISO and Cordage Institute, following the recommendations from OCIMF MEG4. The ropes are Type Approved by DNV and ClassNK.

**Wilhelmsen Ships Service**

Phone: (+47) 67 58 40 00
Fax: (+47) 67 58 40 80

Postal Address:
PO Box 33, NO-1324
Lysaker, Norway

wilhelmsen.com
V2.0-042023

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**for a closer look**

# MAERSK Checklist Arrival – Bridge

Document ID: C022a

| Vessel: | MAERSK HOUSTON | Port: | KOPGR |
|---|---|---|---|

**A tick or YES indicates the check has been performed and appropriate action taken.**

**N/A indicates the check is not applicable to the vessel or prevailing conditions.**

**This checklist is to be filled by hand and filed in hardcopy.**

**Prior arrival US waters (12nm from coast), this checklist to be completed in conjunction with C022e**

**Highlighted Column with Bold Entries = Time stamp to be filled in**

| Prior-Arrival (Checked by OOW or CPT) | | | |
|---|---|---|---|
| Charts, Tide Tables, Sailing Directions | | **Vessel Draft** **Fwd:** 12.2m **Aft:** 13.7m | |
| Check Auto pilot Setting / Hand steering | ✓ | Course & Rudder Recorder running / calibrated | ✓ |
| Reporting to VTS | ✓ | Magnetic Compass (Heading to be recorded) | 058° |
| ECDIS setting verified as per passage plan | ✓ | Gyro Repeaters & Bearing Diopters | ✓ |
| AIS Updated | ✓ | X-Band / S-Band / X- Band Fwd radars checked | ✓ |
| Check AIS Transmitter is **ON** | ✓ | | |
| NAVTEX and EGC | ✓ | Bridge Clocks synchronised with E.R. | ✓ |
| Speed log operational | ✓ | GMDSS Tests/Checks Carried-Out | ✓ |
| Clear-view screens & Bridge wipers tested. | ✓ | Bridge Navigation Watch Alarm System (BNWAS) - Status check | ✓ |
| GPS 1 and 2 checked & compared | ✓ | VDR operational - No error codes | ✓ |
| Master Gyro No. 1 & 2 (Heading to be recorded) 91:055° 92:059.6° | ✓ | Navigation, NUC, Anchor and X'mas tree lights/alarms tested. Day Signals checked. | ✓ |
| Echo-sounder - Correct range scale in use. Depth alarm set and tested on forward and aft sensors as fitted. | ✓ | MF/HF Watchkeeping Receiver | ✓ |
| Appropriate Flags / Day Signals Hoisted | ✓ | Aldis Lamp | ✓ |
| VHF Radio Telephones | ✓ | Whistle Fwd/Aft tested and transferred to aft (after check) | ✓ |
| Walkie Talkies | ✓ | Public Address System / Talk back System | ✓ |
| Telephones - Emergency Telephones | ✓ | Stabilizers confirmed as "IN" | N/A |
| Power for Windlass/Winches on deck | ✓ | All Rudder Angle Indicators (Including Bridge Wings). | ✓ |
| Anchors lashing removed & ready for emergency | ✓ | Pilot Card Prepared | ✓ |
| Engine Telegraphs (All M/E Consoles) | ✓ | Bow Thruster ventilation confirmed as open | ✓ |
| Manoeuvring Printer Incl. Time Calibration | CAMS | Steering Gear and FU-NFU tested | ✓ |
| | | | |
| **End of Sea Passage** | 1100 | **Duty Eng. Informed time for St. By Engine** | 1115 |
| **Time Above Checks Completed** | | | 1135 |

| Prior-Arrival (Checked by OOW or CPT) | | | |
|---|---|---|---|
| ETA Pilot | 1300 | Pilot Ladder/Combination | ✓ |
| Pilot Contacted | ✓ | Freeboard:<9m=ladder >9m=Combination Ladder | ✓ |
| Agreed side of pilot boarding (PS/SB): SB lm | ✓ | Required overside PPE is being used by crew | ✓ |
| Established position for Pilot Embarkation: | ✓ | Speed appropriate for safe rigging | ✓ |
| **Time Main Engine tried out astern** | 1226 | Adequate lee provided from swell | ✓ |
| Ch. Eng reported M/E ready for manoeuvring | ✓ | Visually inspected, clean, correctly rigged and safe for use. | ✓ |
| **Time all prior arrival checks completed, and logbook entry made** | 1230 | Pilot Ladder Tested, well illuminated, ready with safety equipment | ✓ |

MAERSK

# Checklist Arrival – Bridge

Document ID: C022a

| Arrival - Under Pilotage (OOW or CPT) | | | |
|---|---|---|---|
| **Pilot on board - (Last pilot if two or more)** | 1253 | Master and Pilot exchange of information | ✓ |
| Passage Plan for pilotage waters shared and agreed with Pilot | ✓ | Weather, Tugs, Moorings & other special circumstances discussed with pilot | ✓ |
| Check time for calling crew for Stations | ✓ | Pilot Card with Pilots Name & Signature | ✓ |
| | | | |
| **Arrival to Berth (OOW or CPT)** | | | |
| Shore cranes boomed up & clear of Bow, Stern & Accommodation area | ✓ | Confirm anchors ready for "Emergency" | ✓ |
| Mooring lines ready as per berthing plan | ✓ | Notice to E/R for Bow/Stern thruster | ✓ |

| TUGS | Name | Position made fast or st. by | Time |
|---|---|---|---|
| #1 | MERCUR | STBD BOW | 1313 |
| #2 | ZEUS | STBD QUARTER | 1313 |
| #3 | | | |
| #4 | | | |
| **First Line Ashore** | 1340 | **All Made fast Fwd & aft** | 1410 |

**Berth No./Name & Final Mooring pattern (4:2 ,3:1 etc.):** 4:2 F+A

| TUGS Away/Released | | Time | Which Side Alongside: PS | |
|---|---|---|---|---|
| #1 | MERCUR | 1352 | Check UKC (Echo sounder F & A transducers): | |
| #2 | ZEUS | 1345 | F – 3.5m A – 3.0m | |
| #3 | | | **Pilot Away (Last pilot if 2 or more)** | 1400 |
| #4 | | | Pilot ladders secured / Gangway Clear | ✓ |

**Remarks (Any unusual sightings, Incident details, other details which may be relevant):**

– NIL –

**Malfunction of any Statutory Equipment:**

– NIL –

| Upon completion of "Prior-Arrival" checks, entry to be made in vessel's Logbook | | | | | |
|---|---|---|---|---|---|
| **Checked by(OOW/CPT)** | | **Rank** | | **Signature:** | |
| **Master** | | | | **Signature:** | |
| **Date** | 18.07.2023 | | | **Time** | 1430 |

RADAR OVERLAY ON FOR POSITION FIXING

F - 12.2 M
A - 13.7 M

18.07.2023 ARR KOPER V32W

| | |
|---|---|
| 1030 | Vsl called KOPER Harbour Master Ch 08. Pilot on arrival. |
| 1115 | 1/2 HR Notice to E/R |
| 1135 | M/E Stand by. |
| 1214 | MASTER TOOK CTRL CONN FROM CCW |
| 1245 | ON CATCHING PILOTS ON VHF CH 68 45 MINS BEFORE ARRIVAL. PILOT UNDER STBD 1 M |
| 1226 | INTL TUGS OUT ASTERN |
| 1243 | STBD SIDE PILOT UNDER LADDER 1 M ABOVE WATER |
| 1253 | + PILOT S/L 4552 G/L 453.1 |
| 1309 | TOOLBOX TALK CARRIED OUT |
| 1313 | + TUGS FLO AND AFT MERCUR + ZEUS |
| 1340 | FIRST LINE |
| 1345 | + AFT TUG (ZEUS) |
| 1352 | + FLO TUG (MERCUR) |
| 1410 | ALL FAST FWD AND AFT |
| 1410 | CARGO OPS DOWN AND READY |
| 1520 | COMMENCE CARGO OPERATIONS |
| 1530 | FIRST CONTAINER LIFT |

19.07.2023 DRAFTS F. 11.1 M, A 12.1 M

2240 VESSEL BREAKAWAY FROM THE BERTH DUE TO SUDDEN OFFSHORE STORM FORCE WINDS OVER 50 KNOTS AND ALL MOORING LINES PARTED. DETAILS AS PER STATEMENT OF FACTS

# Berthing in Adverse weather

**1 Feb 2018**

Index



## 1. Personnel and Responsibilities

### 1.1 Master

The Master is responsible for:

- Ensure safe mooring of the vessel
- Discuss and agree on mooring arrangement with the pilot
- Tug boats is not to be dismissed until the vessel is safely moored alongside
- Sufficient strength and numbers of bollards are used
- Use of Loadprogram mooring module if available

### 1.2 Chief Engineer

The Chief Engineer shall ensure that thrusters (if fitted) are available, at short notice in case adverse weather.

### 1.3 Officer and crew on watch

Officer and crew on watch are responsible for:

- adjustment/increase of auto tension
- engagement of winch brakes
- calling for more hands on deck - e.g. to rig additional ropes
- Ensure tight mooring lines at all times
- Notify the Master

# 2. Moorings

If normal mooring pattern cannot be used, it should be considered to use the spring-lines as head-lines and head-lines as spring-lines. And/or use double lines to increase the length of the moorings.

If experiencing adverse weather/sea conditions consider:

- Shift vessel alongside
- Change ropes to alternative bollards
    - To have as long lines as possible
    - To use stronger bollards
    - Use unconventional mooring pattern
- Send in additional ropes
- Increase auto tension
- Keep mooring winches on break
- Request tug assistance
- Use of anchors to stabilize vessel
- Keep thrusters and main engine ready for use
- Prepare for departure

## 2.1 Adverse Weather and other conditions

A briefing should be held if:

- The mooring operation is known in advance to be a difficult one
- The berth is unknown or awkward
- Officers and responsible people are new to the ship or port

Good communication between bridge and mooring stations is of utmost importance to ensure safe and effective operation.

## 2.2 Thrusters and Tugboats

It may be needed to use thrusters and/or tugboats to ensure safe berthing. Keep in mind use of thrusters while alongside may be restricted in some ports. Time permitting; seek approval before use.

# 3. Effect of wind

## 3.1 Wind area calculation

Calculate a rough estimate of wind force with below formula. This gives an estimate of the total force of wind on a ship's side.

Wind force (in tonnes) = 0.52 x 10-4 x A x W2 , where
A = Wind area in m2
W = Wind speed in m/s
Estimate the total wind area in square meters as follows:

- For offshore beam wind conditions = LOA (meters) x exposed longitudinal Freeboard (meters) (up to uppermost container stack including the Longitudinal profile area of the Accommodation)
- For head/stern wind conditions = Beam (meters) x exposed Athwartship Freeboard (meters) (up to uppermost container stack including the area of bridge front above)

An estimate of total windage area for any relative directive of the wind will be between the above two figures.

Alternatively use Graphical Scale “S-157 Wind Scale” available in GLSM documentation module. This gives a graphical values of Wind Force (in Tons) for a range of “Total Windage Area”.

Above calculation gives an estimate of the total force of wind on a ship side. It gives an indication of the total power that tugs and/or thrusters will need. Either for staying alongside or for berthing/unberthing.

**Note:** The moorings of a ship will need to resist the forces due to some, or possibly all, of the factors like wind, current, tides, surges from passing ships, waves, swell, and ice, changes in draft, trim or list.

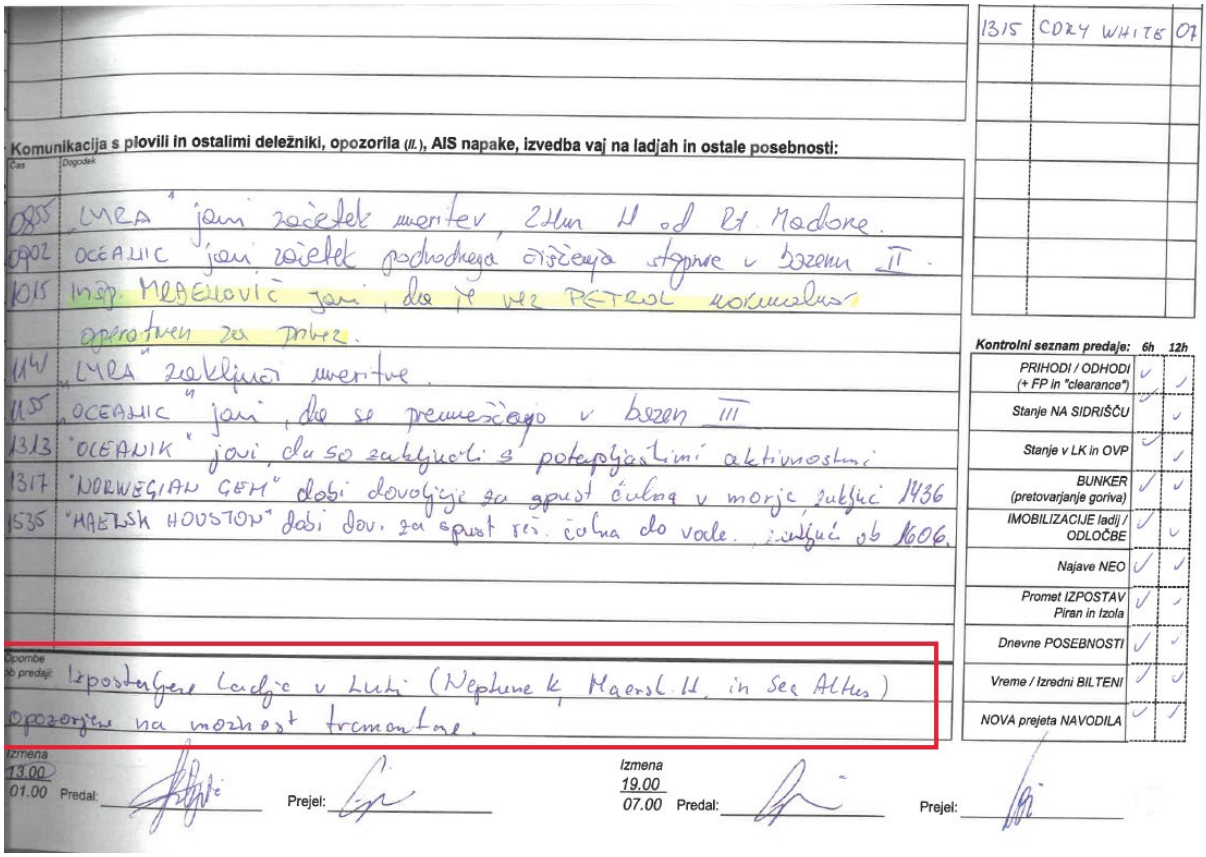
## 3.2 Points to remember:

- Obtain local weather forecast from the port/agents for duration of stay
- Verify environmental conditions are safe and suitable for the expected manoeuvre

- If berthing/unberthing in strong winds:
  - Take corrective action early
  - Reassess the situation, and make fast tugs earlier then during normal conditions
- A tug made fast is more beneficial than a tug standby during manoeuvring operations
- At berth, the earlier action is taken, the less needs to be done. The longer things are left, the more drastic action will be needed to correct the situation
- Tugs should have sufficient bollard pull capacity to:
  - Counteract the effects of wind
  - Get the ship to the required position.
- The windage area, and the force of the wind on the ship, will vary with the ships heading relative to the wind.
  - The maximum force on the ship is when the ship is abeam to the wind.
- Obtain contact information and required notice period for ordering of tugs if in need of assistance.

## 4. References

- Mooring operation (Doc ID: P318)
- Poster P157 - Wind Scale



| | | |
|---|---|---|
| 1315 | CDRY WHITE | 07 |

**Komunikacija s plovili in ostalimi deležniki, opozorila (II.), AIS napake, izvedba vaj na ladjah in ostale posebnosti:**

| Čas | Dogodek |
|---|---|
| 0855 | LYRA javi začetek meritev, 2 Hm II od Rt. Madona. |
| 0902 | OCEANIC javi začetek podvodnega čiščenja stopnje v bazen II. |
| 1015 | Ing. MARINOVIĆ javi, da je bil PETROL kontaminator operativen za privez. |
| 1147 | LYRA zaključi meritve. |
| 1155 | OCEANIC javi, da se premešča v bazen III |
| 1313 | "OCEANIK" javi, da so zaključili s potapljaškimi aktivnostmi |
| 1317 | "NORWEGIAN GEM" dobi dovoljenje za spust čolna v morje, zaključi 1436 |
| 1535 | "MAERSK HOUSTON" dobi dov. za spust reš. čolna do vode. zaključi ob 1606. |

Opombe ob predaji: Izpostavljena ladjica v Luki (Neptune K, Maersk H. in Sea Atlas)
opozorjene na možnost tremontane.

**Kontrolni seznam predaje:**

| | 6h | 12h |
|---|---|---|
| PRIHODI / ODHODI (+ FP in "clearance") | ✓ | ✓ |
| Stanje NA SIDRIŠČU | | ✓ |
| Stanje v LK in OVP | ✓ | ✓ |
| BUNKER (pretovarjanje goriva) | ✓ | ✓ |
| IMOBILIZACIJE ladij / ODLOČBE | ✓ | ✓ |
| Najave NEO | ✓ | ✓ |
| Promet IZPOSTAV Piran in Izola | ✓ | ✓ |
| Dnevne POSEBNOSTI | ✓ | ✓ |
| Vreme / Izredni BILTENI | ✓ | ✓ |
| NOVA prejeta NAVODILA | ✓ | ✓ |

Izmena 13.00 / 01.00 Predal: _____ Prejel: _____

Izmena 19.00 / 07.00 Predal: _____ Prejel: _____

**PRELIMINARY RECOMMENDATIONS**

CONCERNING MARITIME INCIDENTS IN THE PORT OF KOPER

on the 19.07. 2923 and 26.07.2023

In accordance with the terms of reference and recommendations of the MAIIF Manual (Marin Accidents Investigators International Forum, 2014), pending the final investigation of incidents and the issuance of the final report, the Marine Accident Investigator is issuing the following preliminary safety recommendations:

1. **Luka Koper:**

   *1.1.* Upon receipt of weather bulletins and warnings, take timely action in accordance with the (latest) version of Working Instructions DN049.[1]

   *1.2.* The berthing of large container ships at Berth 7D should be planned in such a way that a sufficient number of mooring lines are used on the shore as well as on the mooring buoys (*see project brief "Maritimes for anchoring floating structures in the extension of Berth 7C", p. 60, point 6).*

   1.2. It is recommended that the "Port Info Book" be updated and insert the text that in the event of expected bad weather, the mooring lines on the winches be secured with brakes and that the constant tension facility not be used. It should also be inserted that in the Port of Koper, or in the region, winds can reach speeds of 30 m/s, or more. [2]

2. **AdriaTow:**

   2.1. To improve the response time of tugs to intervene in the event of extreme weather conditions[3].

   2.2. It is recommended that sufficient tug crews are available to act in a timely manner in the event of forecasted adverse weather conditions.

3. **KOPP**

   3.1. In the exchange of information between the Pilot and the Master on arrival[4] it is recommended that the Pilot specifically warns the Master of occasional extreme weather

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[1] *Extract from DN049, 21. Purpose and scope - "In order to avoid injury to persons and major damage to property, it is necessary to follow weather forecasts and current situations in the area of the port of Koper carefully and to react immediately in accordance with the guidelines of this work instruction, the instructions of the manufacturers of machinery or equipment, and general good practice with regard to high winds or other extreme weather conditions.").*

[2] Design wind speed for all infrastructure, ships and shipowners to be informed.

[3] A safety recommendation has already been made in the final report on the APL California accident - EMCIP:5033/2017

[4] (en. *Master/Pilot exchange information, Anex A1 in A2 of the ICS Bridge Procedure Guide)*

conditions, advises the Master of the method of berthing as mentioned in points 1.2 and 1.3 and notes the same on the "Master/Pilot Information Exchange Sheet".

**4. URSP (SMA)**

4.1. It is recommended that when the existence and movement of storm cells is detected in the direction of the Gulf of Koper, the HMO Duty officer, notwithstanding the already published weather warnings and bulletins, additionally informs, and warns ships at anchor and in port with a "general warning" by radio on VHF channels 16 and 08.

4.2. It is recommended that when the existence and movement of storm cells is detected in the direction of the Gulf of Koper, the HMO Duty officer should immediately inform the LK Security Centre (VNC), regardless of the weather warnings and bulletins already issued.

4.3. It is also recommended that the AIS data transmission method described in point 4.3 be applied to all ships during manoeuvres of arrival and departure as well as to all ships at the anchor and in the port during severe weather conditions.

**5. OWNER / MANAGER (MAERSK A/S in Shanghai Ocean Shipping Co. Ltd.)**

5.1. The berthing of ships at berth 7D shall be planned in such a way that a sufficient number of mooring lines are used both on the shore and on the mooring buoys.

5.2. It is recommended that in the event of deteriorating weather conditions and after a weather warning has been received, the bow and stern thrusters and the main engine be prepared in advance for immediate action in the event of an emergency. If such procedures do not exist in the Safety & Quality Manual, an update is recommended.

5.3. It is recommended that in the event of expected bad weather, mooring lines on winches should be secured with brakes and that the constant tension facility should not be used. If such procedures do not exist in the Safety &Quality Manual, an update is recommended.

Koper, 01. 08. 2023

Capt. Vladimir Vladović

Vladimir Vladović

Digitalno podpisal Vladimir Vladović
DN: c=SI, o=state authorities, ou=web-certificates, givenName=Vladimir, sn=Vladović, serialNumber=1237639414012, cn=Vladimir Vladović
Datum: 2023.08.01 14:13:08 +02'00'

Preiskovalec pomorskih nesreč in incidentov

MINISTRSTVO ZA INFRASTRUKTURO
Služba za preiskovanje letalskih, pomorskih in železniških nesreč in incidentov

# Ports of Call List

## Name of ship: Maersk Houston

| from | to | ttl hours | | dys/hrs | ports of call | avg hrs/port |
|---|---|---|---|---|---|---|
| 07.07.2022 | 19.07.2023 | 2.421 | hrs | 111 d 21h | 67 | 36,1 |
| 06.07.2021 | 03.07.2022 | 2.685 | hrs | 100 d 21 h | 64 | 42,0 |
| 30.06.2020 | 06.07.2021 | 2.655 | hrs | 110 d 15 h | 76 | 34,9 |
| 17.05.2019 | 30.06.2020 | 2.786 | hrs | 116 d 02 h | 93 | 30,0 |
| **TOTAL** | | **10.547** | **hrs** | **439 d 11 h** | **300** | **35,7** |

| od | do | skupaj | ur | dni / ur | število pristanišč | povprečno št. ur/ prist. |
|---|---|---|---|---|---|---|
| 07.07.2022 | 19.07.2023 | 2.421 | ur | 111 d 21h | 67 | 36,1 |
| 06.07.2021 | 03.07.2022 | 2.685 | ur | 100 d 21 h | 64 | 42,0 |
| 30.06.2020 | 06.07.2021 | 2.655 | ur | 110 d 15 h | 76 | 34,9 |
| 17.05.2019 | 30.06.2020 | 2.786 | ur | 116 d 02 h | 93 | 30,0 |
| **SKUPAJ** | | **10.547** | **ur** | **439 d 11 h** | **300** | **35,7** |

## Ports of Call List

**Name of ship: Maersk Houston**

| PORT | PORT CODE | ARRIVAL DATE | DEPARTURE DATE | TIME HRS PORT STAY |
|---|---|---|---|---|
| Singapore | SGSIN | 30.06.2020 11:06 | 1.07.2020 19:12 | 32 |
| Shekou | CNIWN | 26.06.2020 15:12 | 27.06.2020 05:24 | 14 |
| Shanghai | CNSGH | 22.06.2020 20:24 | 23.06.2020 19:42 | 23 |
| Ningbo | CNNGB | 19.06.2020 08:54 | 20.06.2020 13:12 | 28 |
| Busan | KRBUS | 16.06.2020 14:30 | 17.06.2020 13:12 | 23 |
| Dalian | CNDAI | 14.06.2020 02:54 | 15.06.2020 06:36 | 28 |
| Xingang | CNHSK | 10.06.2020 21:00 | 12.06.2020 12:54 | 40 |
| Singapore | SGSIN | 3.06.2020 08:12 | 4.06.2020 14:18 | 30 |
| Salalah | OMSLL | 24.05.2020 08:12 | 25.05.2020 02:50 | 19 |
| King Abdullah | SAKAC | 20.05.2020 02:44 | 20.05.2020 17:45 | 15 |
| Port Said East | EGPSE | 16.05.2020 11:48 | 18.05.2020 04:00 | 40 |
| Trieste | ITTRS | 10.05.2020 12:36 | 12.05.2020 11:36 | 47 |
| Rijeka | HRRJK | 8.05.2020 13:54 | 10.05.2020 00:32 | 35 |
| Trieste | ITTRS | 6.05.2020 22:18 | 8.05.2020 00:44 | 26 |
| Koper | SIKOP | 4.05.2020 08:42 | 6.05.2020 19:21 | 59 |
| Haifa | ILHFA | 29.04.2020 22:18 | 1.05.2020 05:35 | 31 |
| Port Said East | EGPSE | 27.04.2020 16:30 | 28.04.2020 21:38 | 29 |
| Singapore | SGSIN | 14.04.2020 00:42 | 15.04.2020 01:42 | 25 |
| Shekou | CNIWN | 9.04.2020 22:06 | 10.04.2020 11:20 | 13 |
| Shanghai | CNSGH | 6.04.2020 11:48 | 7.04.2020 11:44 | 24 |
| Ningbo | CNNGB | 3.04.2020 10:30 | 4.04.2020 11:38 | 25 |
| Busan | KRBUS | 30.03.2020 16:18 | 31.03.2020 17:56 | 26 |
| Dalian | CNDAI | 28.03.2020 02:12 | 29.03.2020 00:14 | 22 |
| Xingang | CNHSK | 25.03.2020 17:18 | 27.03.2020 07:40 | 38 |
| Singapore | SGSIN | 18.03.2020 00:48 | 19.03.2020 13:38 | 37 |
| Salalah | OMSLL | 8.03.2020 09:42 | 9.03.2020 09:21 | 24 |
| King Abdullah | SAKAC | 4.03.2020 00:42 | 4.03.2020 17:06 | 16 |
| Port Said East | EGPSE | 29.02.2020 11:48 | 2.03.2020 04:26 | 41 |
| Trieste | ITTRS | 23.02.2020 15:48 | 25.02.2020 19:16 | 51 |
| Rijeka | HRRJK | 21.02.2020 11:24 | 23.02.2020 06:54 | 44 |
| Trieste | ITTRS | 19.02.2020 16:00 | 20.02.2020 17:42 | 26 |
| Koper | SIKOP | 17.02.2020 06:12 | 19.02.2020 12:18 | 54 |
| Haifa | ILHFA | 12.02.2020 22:42 | 14.02.2020 05:30 | 31 |
| Port Said East | EGPSE | 10.02.2020 16:54 | 12.02.2020 07:36 | 39 |
| Singapore | SGSIN | 30.01.2020 01:12 | 31.01.2020 07:04 | 30 |
| Shekou | CNIWN | 25.01.2020 14:00 | 26.01.2020 13:54 | 24 |
| Shanghai | CNSGH | 21.01.2020 20:24 | 23.01.2020 05:21 | 33 |
| Ningbo | CNNGB | 17.01.2020 08:18 | 18.01.2020 14:48 | 31 |
| Busan | KRBUS | 14.01.2020 02:42 | 15.01.2020 07:06 | 28 |
| Dalian | CNDAI | 11.01.2020 00:06 | 12.01.2020 05:20 | 29 |
| Xingang | CNHSK | 8.01.2020 08:48 | 9.01.2020 23:45 | 39 |
| Singapore | SGSIN | 1.01.2020 00:01 | 2.01.2020 09:18 | 33 |
| Salalah | OMSLL | 22.12.2019 11:18 | 23.12.2019 14:24 | 27 |
| King Abdullah | SAKAC | 18.12.2019 02:12 | 18.12.2019 23:54 | 22 |
| Port Said East | EGPSE | 14.12.2019 13:20 | 16.12.2019 03:54 | 39 |
| Trieste | ITTRS | 8.12.2019 07:30 | 10.12.2019 04:30 | 45 |
| Rijeka | HRRJK | 6.12.2019 14:12 | 7.12.2019 19:12 | 29 |
| Trieste | ITTRS | 4.12.2019 16:48 | 6.12.2019 00:12 | 31 |
| Koper | SIKOP | 2.12.2019 07:42 | 4.12.2019 00:50 | 41 |
| Haifa | ILHFA | 28.11.2019 00:00 | 29.11.2019 04:12 | 28 |
| Port Said East | EGPSE | 25.11.2019 16:42 | 26.11.2019 22:36 | 30 |
| Singapore | SGSIN | 13.11.2019 09:12 | 14.11.2019 09:54 | 25 |
| Shekou | CNIWN | 7.11.2019 22:54 | 8.11.2019 10:08 | 11 |
| Shanghai | CNSGH | 3.11.2019 23:18 | 5.11.2019 19:54 | 45 |
| Ningbo | CNNGB | 1.11.2019 12:54 | 2.11.2019 14:36 | 26 |
| Busan | KRBUS | 28.10.2019 20:42 | 29.10.2019 20:54 | 24 |
| Dalian | CNDAI | 26.10.2019 02:24 | 27.10.2019 05:06 | 27 |
| Xingang | CNHSK | 23.10.2019 07:48 | 25.10.2019 03:18 | 44 |
| Singapore | SGSIN | 15.10.2019 17:36 | 16.10.2019 22:42 | 29 |
| Salalah | OMSLL | 6.10.2019 09:06 | 7.10.2019 02:24 | 17 |
| King Abdullah | SAKAC | 2.10.2019 03:48 | 2.10.2019 21:54 | 18 |
| Port Said East | EGPSE | 28.09.2019 13:06 | 30.09.2019 06:30 | 41 |
| Trieste | ITTRS | 22.09.2019 12:36 | 27.09.2019 06:18 | 114 |
| Rijeka | HRRJK | 20.09.2019 14:36 | 21.09.2019 19:30 | 29 |
| Trieste | ITTRS | 18.09.2019 17:06 | 19.09.2019 18:48 | 26 |
| Koper | SIKOP | 16.09.2019 07:06 | 18.09.2019 04:12 | 45 |
| Haifa | ILHFA | 12.09.2019 00:06 | 13.09.2019 01:00 | 25 |
| Port Said East | EGPSE | 9.09.2019 15:42 | 10.09.2019 17:48 | 26 |
| Singapore | SGSIN | 26.08.2019 20:18 | 27.08.2019 16:06 | 20 |
| Shekou | CNIWN | 22.08.2019 20:00 | 23.08.2019 11:13 | 15 |
| Shanghai | CNSGH | 19.08.2019 21:06 | 20.08.2019 21:42 | 25 |
| Ningbo | CNNGB | 16.08.2019 14:24 | 17.08.2019 13:36 | 23 |
| Busan | KRBUS | 12.08.2019 14:54 | 13.08.2019 17:12 | 26 |
| Dalian | CNDAI | 9.08.2019 20:24 | 10.08.2019 16:12 | 20 |
| Xingang | CNHSK | 7.08.2019 08:00 | 8.08.2019 19:42 | 36 |
| Singapore | SGSIN | 31.07.2019 04:00 | 31.07.2019 23:54 | 20 |
| Salalah | OMSLL | 21.07.2019 02:24 | 21.07.2019 17:36 | 15 |
| King Abdullah | SAKAC | 17.07.2019 07:18 | 17.07.2019 21:18 | 14 |
| Port Said East | EGPSE | 13.07.2019 12:00 | 15.07.2019 04:42 | 41 |
| Trieste | ITTRS | 7.07.2019 23:30 | 9.07.2019 23:45 | 48 |
| Rijeka | HRRJK | 5.07.2019 22:00 | 7.07.2019 04:06 | 30 |
| Trieste | ITTRS | 3.07.2019 21:30 | 5.07.2019 07:00 | 33 |
| Koper | SIKOP | 1.07.2019 05:30 | 3.07.2019 03:54 | 46 |
| Haifa | ILHFA | 26.06.2019 23:21 | 28.06.2019 00:28 | 25 |
| Port Said East | EGPSE | 24.06.2019 15:18 | 25.06.2019 12:06 | 21 |
| Singapore | SGSIN | 10.06.2019 21:48 | 11.06.2019 16:00 | 18 |
| Shekou | CNIWN | 6.06.2019 02:16 | 7.06.2019 14:18 | 36 |
| Shanghai | CNSGH | 4.06.2019 08:00 | 4.06.2019 23:06 | 15 |
| Ningbo | CNNGB | 2.06.2019 09:12 | 3.06.2019 14:30 | 29 |
| Busan | KRBUS | 28.05.2019 02:12 | 28.05.2019 19:30 | 17 |
| Dalian | CNDAI | 24.05.2019 19:36 | 25.05.2019 18:42 | 23 |
| Xingang | CNHSK | 22.05.2019 07:30 | 23.05.2019 07:48 | 24 |
| Ulsan | KRUSN | | 17.05.2019 14:00 | 0 |
| | 93 | | | 2786 HRS |
| | | | | 116 d 2 h |

## Ports of Call List

**Name of ship: Maersk Houston**

| | | ARRIVAL | DEPARTURE | TIME HRS |
|---|---|---|---|---|
| PORT | PORT CODE | DATE | DATE | PORT STAY |
| Salalah | OMSLL | 27.06.2021 07:42 | 28.06.2021 10:36 | 27 |
| King Abdullah | SAKAC | 23.06.2021 08:30 | 24.06.2021 04:12 | 20 |
| Port Said East | EGPSE | 19.06.2021 18:30 | 21.06.2021 03:54 | 33 |
| Trieste | ITTRS | 13.06.2021 19:06 | 16.06.2021 16:42 | 70 |
| Rijeka | HRRJK | 11.06.2021 22:48 | 13.06.2021 07:30 | 33 |
| Trieste | ITTRS | 10.06.2021 13:54 | 11.06.2021 12:24 | 23 |
| Koper | SIKOP | 7.06.2021 05:18 | 9.06.2021 01:54 | 45 |
| Haifa | ILHFA | 29.05.2021 01:30 | 30.05.2021 20:42 | 43 |
| Port Said East | EGPSE | 26.05.2021 18:36 | 28.05.2021 10:00 | 39 |
| Singapore | SGSIN | 13.05.2021 23:30 | 15.05.2021 14:12 | 39 |
| Shekou | CNIWN | 9.05.2021 11:36 | 10.05.2021 06:24 | 19 |
| Shanghai | CNSGH | 5.05.2021 21:54 | 7.05.2021 02:24 | 29 |
| Busan | KRBUS | 3.05.2021 02:30 | 4.05.2021 15:18 | 37 |
| Dalian | CNDAI | 27.04.2021 15:06 | 28.04.2021 22:36 | 32 |
| Xingang | CNHSK | 25.04.2021 04:06 | 26.04.2021 23:12 | 43 |
| Singapore | SGSIN | 17.04.2021 06:48 | 18.04.2021 21:30 | 39 |
| King Abdullah | SAKAC | 6.04.2021 12:36 | 7.04.2021 16:24 | 28 |
| Port Said East | EGPSE | 31.03.2021 12:00 | 2.04.2021 03:30 | 40 |
| Trieste | ITTRS | 26.03.2021 13:06 | 28.03.2021 12:36 | 48 |
| Rijeka | HRRJK | 24.03.2021 12:00 | 25.03.2021 23:54 | 36 |
| Trieste | ITTRS | 22.03.2021 02:00 | 23.03.2021 13:54 | 36 |
| Koper | SIKOP | 19.03.2021 00:24 | 21.03.2021 21:42 | 69 |
| Haifa | ILHFA | 11.03.2021 04:24 | 12.03.2021 13:54 | 34 |
| Port Said East | EGPSE | 7.03.2021 17:48 | 8.03.2021 23:12 | 29 |
| Singapore | SGSIN | 23.02.2021 12:30 | 24.02.2021 19:06 | 31 |
| Shekou | CNIWN | 18.02.2021 04:42 | 19.02.2021 21:24 | 41 |
| Ningbo | CNNGB | 13.02.2021 16:30 | 15.02.2021 03:06 | 35 |
| Busan | KRBUS | 10.02.2021 19:26 | 12.02.2021 08:12 | 37 |
| Busan | KRBUS | 10.02.2021 00:01 | 10.02.2021 01:48 | 2 |
| Xingang | CNHSK | 6.02.2021 07:30 | 8.02.2021 00:00 | 41 |
| Singapore | SGSIN | 28.01.2021 23:42 | 30.01.2021 15:54 | 40 |
| Salalah | OMSLL | 19.01.2021 22:06 | 21.01.2021 08:30 | 34 |
| King Abdullah | SAKAC | 15.01.2021 10:18 | 17.01.2021 00:00 | 38 |
| Port Said East | EGPSE | 11.01.2021 12:00 | 13.01.2021 09:07 | 45 |
| Trieste | ITTRS | 7.01.2021 00:24 | 8.01.2021 13:10 | 37 |
| Rijeka | HRRJK | 5.01.2021 10:18 | 6.01.2021 13:56 | 28 |
| Trieste | ITTRS | 3.01.2021 04:00 | 4.01.2021 12:42 | 33 |
| Koper | SIKOP | 29.12.2020 21:42 | 3.01.2021 00:55 | 99 |
| Haifa | ILHFA | 23.12.2020 22:36 | 25.12.2020 04:28 | 30 |
| Port Said East | EGPSE | 18.12.2020 16:54 | 20.12.2020 10:00 | 41 |
| Singapore | SGSIN | 5.12.2020 12:42 | 6.12.2020 18:12 | 29 |
| Nansha | CNNAN | 30.11.2020 17:36 | 1.12.2020 10:46 | 17 |
| Shekou | CNIWN | 29.11.2020 10:36 | 30.11.2020 06:24 | 20 |
| Ningbo | CNNGB | 25.11.2020 16:12 | 26.11.2020 14:46 | 23 |
| Busan | KRBUS | 23.11.2020 00:48 | 24.11.2020 12:06 | 35 |
| Dalian | CNDAI | 20.11.2020 07:12 | 21.11.2020 03:42 | 20 |
| Xingang | CNHSK | 16.11.2020 05:12 | 17.11.2020 23:12 | 42 |
| Singapore | SGSIN | 8.11.2020 15:48 | 9.11.2020 21:45 | 30 |
| Salalah | OMSLL | 28.10.2020 21:00 | 29.10.2020 16:40 | 20 |
| King Abdullah | SAKAC | 25.10.2020 00:56 | 25.10.2020 14:54 | 14 |
| Port Said East | EGPSE | 21.10.2020 08:30 | 23.10.2020 04:00 | 44 |
| Trieste | ITTRS | 15.10.2020 00:36 | 17.10.2020 06:20 | 54 |
| Rijeka | HRRJK | 13.10.2020 08:00 | 14.10.2020 14:48 | 31 |
| Trieste | ITTRS | 10.10.2020 10:24 | 12.10.2020 13:30 | 51 |
| Koper | SIKOP | 7.10.2020 16:48 | 10.10.2020 06:30 | 62 |
| Haifa | ILHFA | 2.10.2020 05:54 | 4.10.2020 14:48 | 57 |
| Port Said East | EGPSE | 30.09.2020 17:42 | 2.10.2020 03:06 | 33 |
| Singapore | SGSIN | 19.09.2020 00:18 | 20.09.2020 04:30 | 28 |
| Shekou | CNIWN | 14.09.2020 18:24 | 15.09.2020 08:24 | 14 |
| Shanghai | CNSGH | 11.09.2020 23:03 | 12.09.2020 21:18 | 22 |
| Ningbo | CNNGB | 9.09.2020 08:48 | 10.09.2020 16:54 | 32 |
| Busan | KRBUS | 5.09.2020 01:36 | 6.09.2020 14:30 | 37 |
| Dalian | CNDAI | 29.08.2020 02:30 | 30.08.2020 00:48 | 22 |
| Xingang | CNHSK | 26.08.2020 08:06 | 28.08.2020 04:12 | 44 |
| Singapore | SGSIN | 19.08.2020 01:54 | 20.08.2020 00:24 | 23 |
| Salalah | OMSLL | 9.08.2020 20:42 | 11.08.2020 00:36 | 28 |
| King Abdullah | SAKAC | 6.08.2020 00:24 | 6.08.2020 19:18 | 19 |
| Port Said East | EGPSE | 2.08.2020 11:00 | 4.08.2020 04:12 | 41 |
| Gioia Tauro | ITGIT | 29.07.2020 19:18 | 31.07.2020 05:00 | 34 |
| Trieste | ITTRS | 26.07.2020 12:30 | 28.07.2020 00:06 | 36 |
| Rijeka | HRRJK | 24.07.2020 14:00 | 25.07.2020 23:27 | 33 |
| Trieste | ITTRS | 22.07.2020 17:54 | 24.07.2020 02:06 | 32 |
| Koper | SIKOP | 20.07.2020 06:12 | 21.07.2020 20:00 | 38 |
| Haifa | ILHFA | 15.07.2020 22:24 | 17.07.2020 04:18 | 30 |
| Port Said East | EGPSE | 13.07.2020 17:00 | 15.07.2020 00:27 | 31 |
| Singapore | SGSIN | 30.06.2020 11:06 | 1.07.2020 19:12 | 32 |
| | 76 | | | 2655 HRS |
| | | | | 110 d 15 h |

## Ports of Call List

**Name of ship: Maersk Houston**

| | | ARRIVAL | DEPARTURE | TIME HRS |
|---|---|---|---|---|
| PORT | PORT CODE | DATE AND TIME | DATE AND TIME | PORT STAY |
| Shekou | CNIWN | 3.07.2022 23:00 | 4.07.2022 13:00 | 14 |
| Shanghai | CNSHA | 28.06.2022 07:35 | 29.06.2022 07:00 | 23 |
| Busan | KRBUS | 25.06.2022 06:40 | 27.06.2022 04:02 | 45 |
| Dalian | CNDAI | 22.06.2022 03:35 | 23.06.2022 12:48 | 33 |
| Xingang | CNHSK | 18.06.2022 20:45 | 20.06.2022 20:12 | 47 |
| Singapore | SGSIN | 11.06.2022 01:15 | 12.06.2022 11:34 | 34 |
| Salalah | OMSLV | 2.06.2022 08:45 | 3.06.2022 16:02 | 31 |
| King Abdullah | SAKAC | 29.05.2022 05:40 | 30.05.2022 07:09 | 25 |
| Port Said East | EGPSE | 24.05.2022 23:56 | 26.05.2022 05:08 | 29 |
| Rijeka | HRRJK | 18.05.2022 06:30 | 20.05.2022 09:20 | 51 |
| Trieste | ITTRS | 12.05.2022 01:30 | 16.05.2022 15:28 | 110 |
| Koper | SIKOP | 9.05.2022 05:20 | 11.05.2022 22:28 | 65 |
| Haifa | ILHFA | 26.04.2022 03:24 | 27.04.2022 15:36 | 36 |
| Port Said East | EGPSE | 19.04.2022 15:18 | 21.04.2022 02:42 | 35 |
| Singapore | SGSIN | 7.04.2022 22:30 | 8.04.2022 17:30 | 19 |
| Shekou | CNIWN | 3.04.2022 14:36 | 4.04.2022 10:48 | 20 |
| Shanghai | CNSGH | 28.03.2022 12:06 | 29.03.2022 14:06 | 26 |
| Busan | KRBUS | 23.03.2022 15:30 | 25.03.2022 07:06 | 40 |
| Dalian | CNDAI | 20.03.2022 15:14 | 21.03.2022 09:00 | 18 |
| Xingang | CNHSK | 18.03.2022 09:00 | 19.03.2022 16:18 | 31 |
| Singapore | SGSIN | 10.03.2022 04:12 | 11.03.2022 13:42 | 33 |
| Salalah | OMSLV | 1.03.2022 20:24 | 3.03.2022 02:18 | 30 |
| King Abdullah | SAKAC | 24.02.2022 09:00 | 24.02.2022 22:00 | 13 |
| Port Said East | EGPSE | 20.02.2022 12:00 | 22.02.2022 06:12 | 42 |
| Rijeka | HRRJK | 13.02.2022 04:36 | 16.02.2022 04:06 | 71 |
| Trieste | ITTRS | 9.02.2022 17:12 | 12.02.2022 16:30 | 71 |
| Koper | SIKOP | 5.02.2022 23:30 | 9.02.2022 13:54 | 86 |
| Haifa | ILHFA | 31.01.2022 07:18 | 2.02.2022 14:42 | 55 |
| Port Said East | EGPSE | 29.01.2022 16:24 | 30.01.2022 18:42 | 26 |
| Singapore | SGSIN | 16.01.2022 21:30 | 18.01.2022 12:18 | 39 |
| Shekou | CNIWN | 12.01.2022 06:00 | 13.01.2022 16:18 | 34 |
| Ningbo | CNNGB | 8.01.2022 14:18 | 10.01.2022 15:06 | 49 |
| Busan | KRBUS | 1.01.2022 12:00 | 3.01.2022 09:30 | 46 |
| Dalian | CNDAI | 29.12.2021 21:06 | 30.12.2021 21:24 | 24 |
| Xingang | CNHSK | 27.12.2021 00:30 | 29.12.2021 03:36 | 51 |
| Singapore | SGSIN | 19.12.2021 00:00 | 20.12.2021 13:48 | 38 |
| Salalah | OMSLV | 9.12.2021 16:30 | 10.12.2021 21:42 | 29 |
| King Abdullah | SAKAC | 5.12.2021 13:06 | 6.12.2021 11:48 | 23 |
| Port Said East | EGPSE | 30.11.2021 14:00 | 2.12.2021 05:00 | 39 |
| Rijeka | HRRJK | 25.11.2021 10:00 | 27.11.2021 05:00 | 43 |
| Trieste | ITTRS | 21.11.2021 06:42 | 24.11.2021 23:18 | 89 |
| Koper | SIKOP | 18.11.2021 06:36 | 20.11.2021 17:36 | 59 |
| Haifa | ILHFA | 13.11.2021 22:12 | 15.11.2021 05:24 | 31 |
| Port Said East | EGPSE | 9.11.2021 17:06 | 11.11.2021 01:24 | 32 |
| Singapore | SGSIN | 28.10.2021 06:00 | 29.10.2021 13:48 | 32 |
| Shanghai | CNSGH | 20.10.2021 11:30 | 22.10.2021 07:36 | 44 |
| Busan | KRBUS | 10.10.2021 18:12 | 13.10.2021 12:00 | 66 |
| Dalian | CNDAI | 4.10.2021 13:48 | 5.10.2021 18:06 | 28 |
| Xingang | CNHSK | 30.09.2021 04:00 | 3.10.2021 03:48 | 72 |
| Singapore | SGSIN | 21.09.2021 22:24 | 24.09.2021 06:06 | 56 |
| Salalah | OMSLV | 13.09.2021 08:12 | 15.09.2021 02:36 | 42 |
| King Abdullah | SAKAC | 9.09.2021 04:12 | 10.09.2021 04:06 | 24 |
| Port Said East | EGPSE | 5.09.2021 14:00 | 7.09.2021 05:00 | 39 |
| Rijeka | HRRJK | 31.08.2021 08:48 | 1.09.2021 15:06 | 30 |
| Trieste | ITTRS | 27.08.2021 09:42 | 30.08.2021 15:12 | 77 |
| Koper | SIKOP | 25.08.2021 10:06 | 27.08.2021 05:54 | 44 |
| Haifa | ILHFA | 20.08.2021 06:42 | 22.08.2021 03:24 | 45 |
| Port Said East | EGPSE | 17.08.2021 17:48 | 19.08.2021 13:12 | 43 |
| Singapore | SGSIN | 5.08.2021 15:00 | 6.08.2021 22:00 | 31 |
| Shanghai | CNSGH | 29.07.2021 19:32 | 31.07.2021 09:00 | 37 |
| Busan | KRBUS | 21.07.2021 17:24 | 23.07.2021 17:30 | 48 |
| Dalian | CNDAI | 18.07.2021 10:30 | 19.07.2021 10:54 | 24 |
| Xingang | CNHSK | 14.07.2021 04:18 | 17.07.2021 08:12 | 76 |
| Singapore | SGSIN | 6.07.2021 15:42 | 8.07.2021 02:42 | 35 |
| | | | | 2685 HRS |
| | | 64 | | 111 d 21h |

## Ports of Call List

**Name of ship: Maersk Houston**

| | | ARRIVAL | | DEPARTURE | | TIME HRS |
|---|---|---|---|---|---|---|
| **PORT** | **PORT CODE** | **DATE** | **TIME** | **DATE** | **TIME** | **PORT STAY** |
| Koper | SIKOP | 18.07.23 | 14:10 | 19.07.23 | 22:40 | 32 |
| Haifa | ILHFA | 13.07.23 | 03:20 | 13.07.23 | 22:40 | 19 |
| Port Said | EGPSD | 10.07.23 | 16:45 | 11.07.23 | 17:33 | 25 |
| Singapore | SGSIN | 27.06.23 | 10:57 | 28.06.23 | 07:40 | 21 |
| Shekou | CNIWN | 21.06.23 | 20:15 | 22.06.23 | 10:00 | 14 |
| Shanghai | CNSGH | 19.06.23 | 02:48 | 19.06.23 | 17:22 | 15 |
| Ningbo | CNNPO | 16.06.23 | 08:50 | 17.06.23 | 08:12 | 23 |
| Busan Newport | KRPUS | 11.06.23 | 18:24 | 13.06.23 | 12:18 | 42 |
| Dalian | CNDAI | 07.06.23 | 17:54 | 08.06.23 | 06:12 | 12 |
| Xingang | CNHSK | 04.06.23 | 11:54 | 06.06.23 | 16:25 | 53 |
| Singapore | SGSIN | 24.05.23 | 08:37 | 25.05.23 | 18:40 | 34 |
| Salalah | OMSLV | 11.05.23 | 21:55 | 12.05.23 | 15:19 | 17 |
| King Abdullah | SAKAP | 07.05.23 | 17:00 | 07.05.23 | 23:00 | 6 |
| Port Said | EGPSD | 03.05.23 | 00:05 | 04.05.23 | 05:00 | 29 |
| Trieste | ITTRS | 22.04.23 | 11:03 | 25.04.23 | 23:49 | 85 |
| Koper | SIKOP | 19.04.23 | 10:00 | 22.04.23 | 08:06 | 70 |
| Haifa | ILHAF | 14.04.23 | 20:12 | 16.04.23 | 06:30 | 34 |
| Port Said | EGPSD | 10.04.23 | 17:00 | 11.04.23 | 14:34 | 22 |
| Singapore | SGSIN | 28.03.23 | 07:00 | 29.03.23 | 05:30 | 23 |
| Shekou | CNIWN | 24.03.23 | 08:00 | 24.03.23 | 21:30 | 14 |
| Ningbo | CNNPO | 19.03.23 | 08:00 | 20.03.23 | 11:00 | 27 |
| Busan New Port | KRBUS | 15.03.23 | 12:00 | 17.03.23 | 02:00 | 38 |
| Dalian | CNDAI | 12.03.23 | 01:00 | 13.03.23 | 00:12 | 23 |
| Xingang | CNHSK | 08.03.23 | 04:00 | 10.03.23 | 04:00 | 48 |
| Singapore | SGSIN | 27.02.23 | 17:42 | 01.03.23 | 07:12 | 38 |
| Salalah | OMSLV | 18.02.23 | 20:12 | 20.02.23 | 10:30 | 38 |
| King Abdullah | SAKAP | 14.02.23 | 14:48 | 15.02.23 | 17:00 | 26 |
| Port Said | EGPSD | 10.02.23 | 17:24 | 12.02.23 | 07:00 | 38 |
| Rijeka | HRRJK | 06.02.23 | 01:00 | 07.02.23 | 17:18 | 40 |
| Trieste | ITTRS | 31.01.23 | 21:48 | 05.02.23 | 11:18 | 110 |
| Koper | SIKOP | 28.01.23 | 14:30 | 31.01.23 | 18:18 | 76 |
| Haifa | ILHFA | 21.01.23 | 21:45 | 22.01.23 | 21:15 | 23 |
| Port Said | EGPSD | 19.01.23 | 16:40 | 21.01.23 | 00:28 | 32 |
| Suezcanal | EGSUC | 19.01.23 | 05:30 | 19.01.23 | 15:15 | 10 |
| Singapore | SGSIN | 07.01.23 | 11:45 | 08.01.23 | 13:45 | 26 |
| Shanghai | CNSGH | 02.01.23 | 04:00 | 02.01.23 | 18:42 | 15 |
| Ningbo | CNNPO | 27.12.22 | 12:52 | 28.12.22 | 18:27 | 30 |
| Busan | KRBUS | 22.12.22 | 05:58 | 23.12.22 | 23:10 | 41 |
| Dalian | CNDAI | 19.12.22 | 01:12 | 20.12.22 | 19:42 | 42 |
| Xingang | CNHSK | 15.12.22 | 04:24 | 17.12.22 | 16:00 | 60 |
| Singapore | SGSIN | 06.12.22 | 08:42 | 07.12.22 | 15:36 | 31 |
| Salalah | OMSLV | 27.11.22 | 01:54 | 27.11.22 | 20:11 | 18 |
| King Abdullah | SAKAP | 22.11.22 | 21:20 | 23.11.22 | 20:45 | 23 |
| Suez Canal | EGSUC | 20.11.22 | 05:30 | 20.11.22 | 15:12 | 10 |
| Port Said | EGPSD | 18.11.22 | 18:00 | 20.11.22 | 05:02 | 35 |
| Rijeka | HRRJK | 12.11.22 | 10:15 | 15.11.22 | 20:56 | 83 |
| Trieste | ITTRS | 07.11.22 | 06:30 | 11.11.22 | 01:46 | 91 |
| Koper | SIKOP | 03.11.22 | 06:10 | 06.11.22 | 10:10 | 76 |
| Haifa | ILHFA | 30.10.22 | 01:00 | 31.10.22 | 03:30 | 27 |
| Egypt | EGPSD | 27.10.22 | 16:24 | 28.10.22 | 23:00 | 31 |
| Singapore | SGSIN | 12.10.22 | 04:24 | 13.10.22 | 17:24 | 37 |
| Shekou | CNIWN | 08.10.22 | 02:32 | 08.10.22 | 18:18 | 16 |
| Yangshan | CNSGH | 05.10.22 | 09:24 | 06.10.22 | 00:42 | 15 |
| Ningbo | CNNPO | 01.10.22 | 09:09 | 02.10.22 | 10:54 | 26 |
| Busan | KRBUS | 27.09.22 | 14:15 | 29.09.22 | 13:18 | 47 |
| Dalian | CNDAI | 23.09.22 | 21:24 | 24.09.22 | 13:30 | 16 |
| Xingang | CNHSK | 14.09.22 | 11:54 | 16.09.22 | 17:12 | 53 |
| Singapore | SGSIN | 07.09.22 | 02:16 | 08.09.22 | 17:42 | 39 |
| Salalah | OMSLV | 28.08.22 | 02:06 | 29.08.22 | 01:12 | 23 |
| King Abdullah | SAKAP | 24.08.22 | 06:21 | 25.08.22 | 15:00 | 33 |
| Port Said | EGPSD | 20.08.22 | 17:12 | 22.08.22 | 04:24 | 35 |
| Rijeka | CRRJK | 14.08.22 | 18:50 | 16.08.22 | 16:06 | 45 |
| Trieste | ITTRS | 08.08.22 | 01:31 | 12.08.22 | 20:48 | 115 |
| Koper | SIKOP | 01.08.22 | 08:23 | 03.08.22 | 00:18 | 40 |
| Haifa | ILHFA | 23.07.22 | 18:10 | 24.07.22 | 22:10 | 28 |
| Port Said | EGPSD | 21.07.22 | 17:00 | 23.07.22 | 02:00 | 33 |
| Singapore | SGSIN | 07.07.22 | 19:30 | 08.07.22 | 20:40 | 25 |
| | | | | | | 2421 hrs |



100 days 21 hrs

| DELOVNO NAVODILO<br>PREVENTIVNI UKREPI IN UKREPANJE OB IZREDNIH VREMENSKIH RAZMERAH | DN 049<br>LUKA KOPER<br>Port of Koper | |
|---|---|---|
| Lastnik: VODJA POD. VAROVANJA ZDRAVJA IN EKOLOG. | Revizija 2.0 | Stran 14 od 42 |

*Pretovarjanje ladij*

**PREVENTIVNI UKREPI V PRIMERU NAPOVEDI IZREDNIH VREMENSKIH RAZMER – KT PRETOVARJANJE LADIJ**

| Jakost vetra - povprečna hitrost, sunki m/s | Posledice | Opis aktivnosti | Izvajalci aktivnosti |
|---|---|---|---|
| 15-20/ 22-30 (7-8 Bft) | Manjša možnost nastanka materialne škode | Delovne aktivnosti, ki so občutljive glede jakosti vetra naj se planira izven obdobja močnejšega vetra (projektni tovori ipd.)<br><br>Opravi se pregled območja in eventualne predmete, tovore, ki bi jih veter lahko odnašal ali poškodoval, umakniti ali zavarovati. | Vodja izmene Tehnolog<br><br>Odgovorni vodje del |
| Nad 20/ Nad 30 (>9 Bft) | Nevarnost za hude poškodbe ljudi in veliko materialno škodo | Dodatno:<br>Zaščita delovne opreme (dvigal ipd.) pred premikom in poškodbami, parkiranje mehanizacije in vozil na varno lokacijo in pregled ali so pravilno parkirana in zavarovana.. | Odgovorni vodja del Vodja garaže |

**TRENUTNI UKREPI V PRIMERU NASTOPA IZREDNIH VREMENSKIH RAZMER – KT PRETOVARJANJE LADIJ**

| Jakost vetra - povprečna hitrost, sunki m/s | Posledice | Opis aktivnosti | Izvajalci aktivnosti |
|---|---|---|---|
| 15-20/ 22-30 (7-8 Bft) | Možnost nastanka materialne škode | Delovni proces se opravlja bolj počasi skladno s tehnološkim postopkom. | Vodja izmene |
| Nad 20/ Nad 30 (>9 Bft) | Nevarnost za hude poškodbe ljudi in veliko materialno škodo | ANALIZA KRITIČNIH VREDNOSTI VETRA IN ODLOČANJE O PREKINITVI DEL<br>Na podlagi analize podatkov o trenutni hitrosti vetra, sunkih in smeri se izvedejo aktivnosti skladno s presojo (obveščanje o nevarnosti, evakuacija iz ladje in nevarnih območij).<br><br>OBVEŠČANJE UDELEŽENCEV V DELOVNEM PROCESU O PREKINITVI DEL<br>Odgovorni po radijski zvezi ali drugem običajnem načinu komunikacije obvestijo vse v udeležence v delovnem procesu po organizacijski strukturi navzdol. Vsak udeleženec mora potrditi prejem obvestila.<br><br>EVAKUACIJA OSTALIH UDELEŽENCEV<br>Pregled delovišč in evakuacija ostalih udeležencev (obiskovalcev, agentov, špediterjev, raznih izvajalcev).<br><br>USTAVITEV DVIGAL<br>Na podlagi odločitve o prekinitvi del se poskrbi za varno | *Vodja izmene*<br><br>Vodja izmene<br><br>Odgovorni vodje del<br><br>Odgovorni vodje del |

| | | | |
|---|---|---|---|
| | | ustavitev kontejnerskih dvigal in varno parkiranje (sidranje, coklanje) skladno z navodili za delo z dvigali.<br><br>Zaposlene se ob prekinitvi usmeri po varni poti na predvideno evakuacijsko mesto ; Upravna stavba PC KT (garderobe, pisarne, skupni prostori)<br><br>OBVESTILO O PREKINTIVI DEL ZAINTERESIRANI JAVNOSTI<br>Zainteresirano javnost se obvešča o prekinitvi del. | Vodja garaže<br><br>Odgovorni vodje del<br><br>Vodja izmene, POJ/VNC |

***Območje skladiščenja polnih kontejnerjev, vagonski del***

**PREVENTIVNI UKREPI V PRIMERU NAPOVEDI IZREDNIH VREMENSKIH RAZMER – KT POLNI KONTEJNERJI**

| Jakost vetra - povprečna hitrost, sunki m/s | Posledice | Opis aktivnosti | Izvajalci aktivnosti |
|---|---|---|---|
| 15-20/ 22-30 (7-8 Bft) | Manjša možnost nastanka materialne škode | Delovne aktivnosti, ki so občutljive glede jakosti vetra, naj se planira izven obdobja močnejšega vetra (projektni tovori ipd.)<br><br>Opravi se pregled območja in eventualne predmete, tovore, ki bi jih veter lahko odnašal ali poškodoval, umakniti ali zavarovati. | Vodja izmene Tehnolog<br><br>Odgovorni vodje del |
| Nad 20/ Nad 30 (>9 Bft) | Nevarnost za hude poškodbe ljudi in veliko materialno škodo | Dodatno:<br>Zaščita delovne opreme (RTG, RMG, ipd.) pred premikom in poškodbami, parkiranje mehanizacije in vozil na varno lokacijo skladno z navodili za delo z dvigali. | Odgovorni vodja del Vodja garaže |

**TRENUTNI UKREPI V PRIMERU NASTOPA IZREDNIH VREMENSKIH RAZMER – KT POLNI KONTEJNERJI**

| Jakost vetra - povprečna hitrost, sunki m/s | Posledice | Opis aktivnosti | Izvajalci aktivnosti |
|---|---|---|---|
| 15-20/ 22-30 (7-8 Bft) | Možnost nastanka materialne škode | Delovni proces se opravlja bolj počasi skladno s tehnološkim postopkom. | Vodja izmene Odgovorni vodje del |
| Nad 20-25/ 30-37 (9 Bft) | Nevarnost za hude poškodbe ljudi in veliko materialno škodo | ANALIZA KRITIČNIH VREDNOSTI VETRA IN ODLOČANJE O POSTOPNEM USTAVLJANJU PROCESOV, KI SO POVEZANI Z DELOVANJE DVIGAL<br>Na podlagi analize podatkov o trenutni hitrosti vetra, sunkih in smeri se izvedejo aktivnosti skladno s presojo (obveščanje o nevarnosti). | *Vodja izmene* |

Datum veljave: 13.3.2017., dokument je obvladovan elektronsko - veljavnost preveri na intranetu