



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation

Interim Investigation Report 582/22

Serious Marine Casualty

**Allision of a mobile harbour crane, transported on
the heavy-lift vessel MERI, with two overhead bridge
constructions crossing the Kiel Canal
on 30 November 2022**

30 November 2023

Pursuant to the second sentence of Article 28(1) of the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG) in conjunction with the second sentence of Article 14(2) of Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009 establishing the fundamental principles governing the investigation of accidents in the maritime transport sector, the Federal Bureau of Maritime Casualty Investigation publishes an interim investigation report within a period of 12 months of a very serious or serious marine casualty if it is not possible to complete the corresponding investigation report within that period.

This interim investigation report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this interim investigation report.

Issued by:
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1 FACTUAL INFORMATION

1.1 Photograph of the ship



Figure 1: Photograph of the MERI, loaded with two mobile harbour cranes¹

1.2 Ship's particulars

Name of ship:	MERI
Type of ship:	Heavy-lift vessel
Flag:	Finland
Port of registry:	Turku
IMO number:	9622502
Call sign:	OJPH
Owner (acc. to EQUASIS):	Meriaura Oy
Shipping company:	Meriaura Oy
Year built:	2012
Shipyard:	STX Finland Turku
Classification society:	Bureau Veritas
Length overall:	105.4 m
Breadth overall:	18.8 m
Draught (max):	4.9 m
Gross tonnage:	3,360
Deadweight:	4,964 t
Engine rating:	2 x 1,400 kW
Main engine:	Schottel
(Service) speed (max):	12.6 kts

¹ Source: Meriaura Oy. There was only one crane on board on the day of the accident.

Hull material: Steel
Minimum safe manning: 8

1.3 Voyage particulars

Port of departure: Rostock/Germany
Port of call: Esbjerg/Denmark
Type of voyage: Merchant shipping/international
Cargo information: Mobile harbour crane (LHM 600 - Evo 6) as deck cargo
Manning: 9
Draught at time of accident: $d_f = 4.7 \text{ m}$, $d_a = 5.05 \text{ m}$
Pilot on board: Yes
Canal helmsman: Yes
Number of passengers: none

1.4 Marine casualty / Marine incident information

Type of marine casualty:	Serious marine casualty. Allision with two bridges due to height of the load.
Date / time:	30 November 2022, 0436 CET ²
Location:	Kiel Canal (NOK), canal kilometre 96.7
Latitude / Longitude:	$\phi = 54^{\circ}22.12'N$, $\lambda = 10^{\circ}7.33'E$
Voyage segment:	Fairway mode
Place on board:	Cargo deck, aft
Consequences:	Two structurally damaged highway bridges.

The Olympic Bridge, the bridge for northbound vehicles in normal operation, was closed until 14 June 2023 and then from 26 June 2023 to 4 September 2023. In the period from 15 June 2023 to 25 June 2023, there was a weight restriction of 12 tons. The Olympic Bridge was closed to pedestrians and cyclists from 8 March to 7 September 2023.

The Prinz-Heinrich-Brücke, the bridge for vehicles traveling southbound in regular operation, was opened in one lane for both directions as follows

- Since 7 December from 0600 to 2100 for motor vehicles up to 3.5 tons.
- Since 12 December without time restriction for all public buses.
- Since 15 December from 0600 to 2100 for all motor vehicles up to 12 t.
- Since 22 December for all buses and motor vehicles up to 12 t.

The Prinz-Heinrich-Brücke was opened to pedestrians and cyclists on 1 December 2022. The Prinz Heinrich Bridge has been closed for repair work since 4 September 2023.

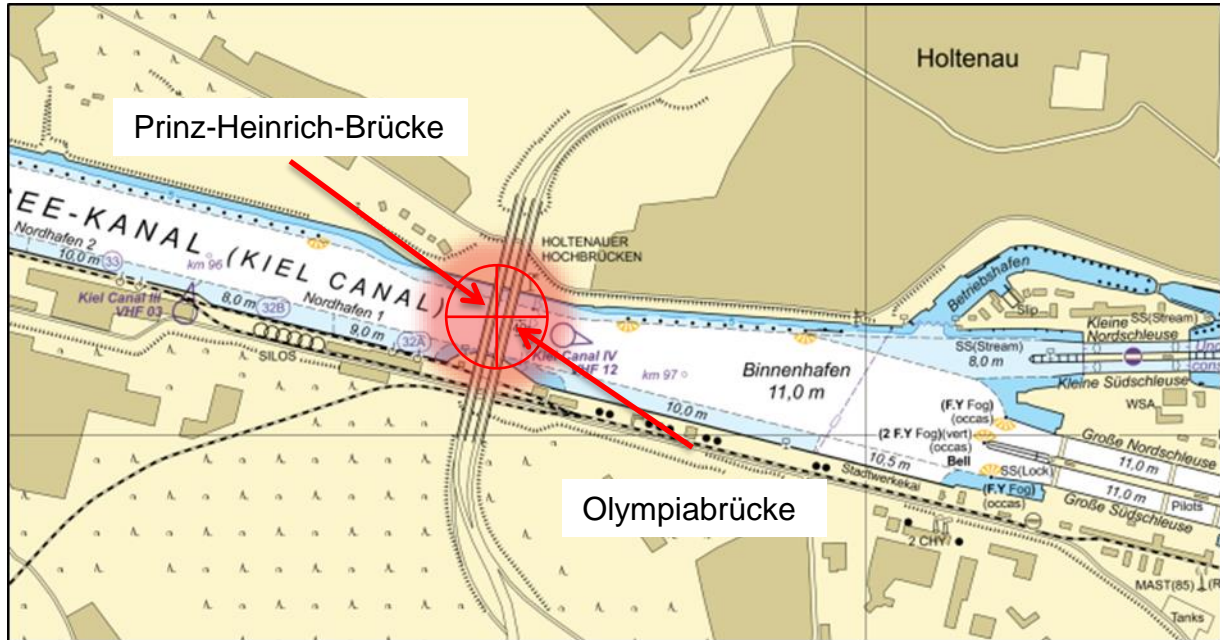
A destroyed mobile harbour crane LHM 600 - Evo 6.

The Kiel Canal was closed to shipping for several hours as a result of the crane's counterweights falling in the bridge area.

On the MERI, the cargo deck and parts of the railing in particular were damaged.

² Unless otherwise stated, all times are in Central European Time (CET) = UTC + 1 hour (local time at the scene of the accident).

Section of Navigational Chart Kiel Canal,
 German Federal Maritime and Hydrographic Agency BSH 42³



1.5 Shore authority involvement and emergency response

Agencies involved:	Vessel Traffic Services (VTS) NOK II; Kiel Waterway police station; Central regional control center; several surrounding police stations, road maintenance depot.
Resources used:	Deployment of numerous patrol cars for full closure of both high bridges.
Actions taken:	Kiel Canal closed for shipping, both bridges closed for all traffic; MERI moored in Nordhafen 2 (Kiel Canal; Kiel-Wik) at berth 33.

³ Issue number 3 dated 26 August 2021, corrected by NfS 15/2023.

2 SUMMARY

At the end of November 2022, the Finnish-flagged heavy-lift vessel MERI was transporting a mobile harbour crane from Rostock to Esbjerg, a port on the Danish North Sea coast. The Kiel Canal was determined to be the best possible route. Based on the relevant documents, the ship and its cargo had a permissible height to safely pass the overhead bridge constructions on the Kiel Canal.

However, while passing the first overhead constructions on the Kiel Canal, the Holtenauer Hochbrücken, on 30 November 2022, the tower tip of the mobile harbour crane hit the box girders of both lanes of the bridges. The force of the impact broke the lashings securing the 643-tonne crane on deck. This caused the crane to tip so far backwards that it passed under both bridges. In the process, it lost 8 counterweights, 3 of which fell into the water. After passing the bridges, the crane fell forward again in both cases due to its center of gravity and crashed back onto the deck with its undercarriage and support plates. The crane was destroyed. The deck of the MERI was also affected, it was deformed and perforated in one place by the crane jib. The bridges sustained considerable damage. The bridges and the Kiel Canal were temporarily closed to all traffic. The repair work on the bridges could not be completed by the time this interim report was published. Motor vehicle traffic is therefore still impaired (see section 1.4).



Figure 2: General view of the crane with broken jib⁴

⁴ Source: Waterway police Kiel. Photo taken at 0715 on the day of the accident.

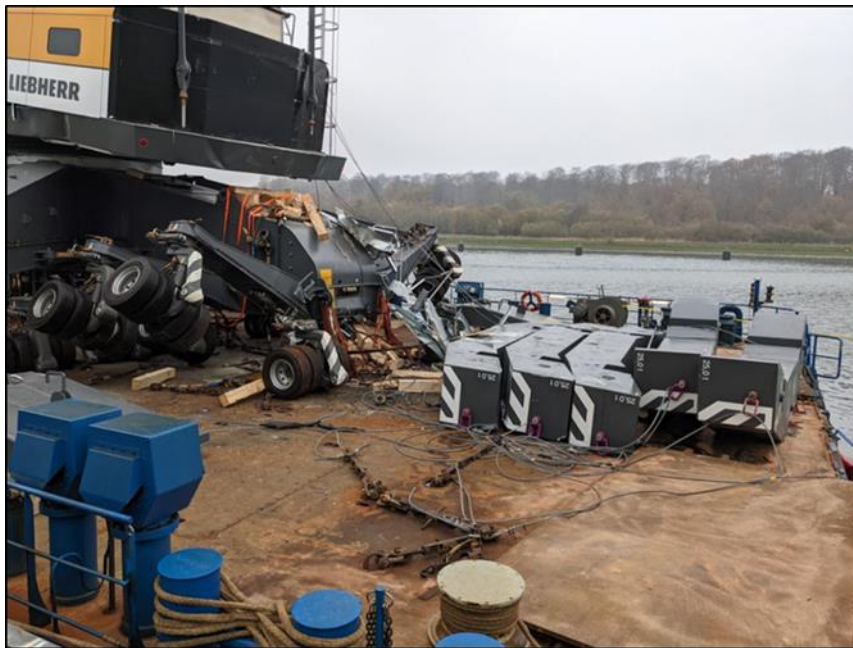


Figure 3: Fallen counterweights⁵

Part of the railing at the stern is missing, which - together with three counterweights - fell into the canal.

The BSU immediately went to the scene of the accident with two investigators to inspect the damage to the bridges, the MERI and her cargo, as well as the consequences for the safe passage of the canal, as far as necessary and possible, and to secure evidence.

After evaluating the initial investigation results, the BSU decided to carry out a main investigation. According to human judgment, the primary cause could only be a different height of the loaded crane than that specified in the loading documents and the height indicated on the crane. However, this first had to be proven in order to answer the following questions in particular:

- How could this have happened?
- Why was the incorrect crane height not noticed in time?
- How can something similar be prevented in the future?

A few days after the accident, the BSU attempted to determine the height of the damaged crane from the deck of the MERI "with on-board equipment"⁶ under good visibility conditions. The measurement of the values required for an angle calculation failed for various reasons and further sensitized the BSU to the issue of 'height measurements' and their complexity when considering all the framework conditions for determining suitable measurement arrangements.

Bridge allisions on the Kiel Canal are very rare accidents. According to the BSU's research, there have been four accidents in the past 25 years. Of the total of ten

⁵ Source: Water police Kiel.

⁶ A laser distance meter, a measuring tape and a sextant were used, knowing full well that sextants are no longer carried on board.

overhead constructions⁷, four different bridges – one railroad bridge and three road bridges – were hit. Only in the case of the KANOK NAREE on 11 December 1993⁸ was the on-board crane, a cargo boom, already higher than permitted and not in operation on the canal. Coming from Brunsbüttel, the KANOK NAREE had run into the Hochdonn railroad bridge. The ship had passed the first bridge, the Brunsbüttel road bridge, unscathed, although the clearance heights of both bridges are the same. In the case of both the KANOK NAREE and the MERI, the heights given in the relevant plans were not unambiguous or incorrect. In both cases, the heights had not been measured beforehand on the ship's side. In both cases, the incorrect heights were not detected by the inspections in the locks.

The Kiel Canal had to be temporarily closed for all bridge approaches. The bridge structures were always damaged - sometimes considerably - and human lives were always endangered. In the opinion of the BSU, it is only due to fortunate circumstances that no one was injured during the bridge collisions to date.

Against this background, the BSU commissioned a metrological report. This report examined which measurement methods could be used to determine the height of vessels and cargo on the ship's side and/or in the locks on the Kiel Canal. In particular, the advantages and disadvantages of measuring arrangements - including the measuring arrangement currently practised in the locks - were assessed with regard to their practical handling and confirmability. More complex measurement methods, with which ship heights could be safely carried out by the administration in the lock area, were only considered in principle, taking proportionality into account.

With the evaluation of all available evidence, the investigation also focused on the effort and time required to close the bridge, so that the emergency management of all parties involved after the approach was examined in more detail in order to develop a safety recommendation.

The investigation into the accident has since been completed and the BSU is currently in the process of compiling the investigation report.

Because the one-year deadline for publication, set by the European Union and adopted as national law by the Federal Republic of Germany, cannot be met, the public is informed about the status of the investigations into this serious marine accident by means of the publication of an interim investigation report.

⁷ Information on the ten bridges: [Brücken \(nok-sh.de\) \(2023-08-07\)](https://www.nok-sh.de/2023-08-07).

⁸ Seeamtsspruch (Ref.: SeeA1-DI 8/94 K), archived at the Federal Archives under Ref. B 175/737: [Motorschiff "Kanok Naree". - Beschädigung der Eisenbahnhochbrücke Hochdonn über den Nord Ostsee-Kanal bei Kilometer 18,8 am 11. Dez. 1993 - Archivportal-D \(2023-05-23\)](https://www.archivportal-d.de/2023-05-23). At the request of the BSU, the Federal Archives released the verdict for the purpose of the marine casualty investigation 582/22 MERI (official purposes). From 2026, this verdict will be released to the public.