



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Federal Ministry
of Transport and Digital Infrastructure

Investigation Report 19/19

Less Serious Marine Casualty

**Accident involving a person
on the multi-purpose vessel MARFAAM
at the Rüsterbergen pilot station
on the Kiel Canal (NOK)
on 13 January 2019**

17 December 2020

This investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG). According to said Law, the sole objective of this investigation is to prevent future accidents. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This 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 investigation report.

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1 SUMMARY

At 0650 on 13 January 2019¹, the Dutch-flagged multi-purpose vessel MARFAAM was sailing westbound on the NOK level of the Rüterbergen pilot transfer station, where the canal helmsman and the pilot were to be transferred.

A 4 – 5 Bft south-west wind prevailed, it was still dark and it was raining. The pilot vessel RÜSTERBERGEN went to the starboard side of the MARFAAM. The lowered pilot ladder was illuminated and the overall impression of the pilot embarkation point from on board the pilot vessel was apparently good.

The canal helmsman was the first to climb the pilot ladder. He was unable to find a handhold when he was level with the main deck at the gateway and fell from a height of 3 – 4 m first upon the rails and from there head first upon the deck of the pilot vessel. The transfer manoeuvre was immediately aborted and the pilot on board the pilot vessel administered first aid. The emergency services were alerted and the pilot vessel sailed to the pilot station. The emergency services arrived at shortly after 0700 and took charge of administering medical care.

The pilot and the canal helmsman from the eastern section stayed on board the MARFAAM and sailed on to Brunsbüttel.

The canal helmsman suffered life-threatening injuries. Despite a basilar skull fracture, rib fractures, lung contusions, rupture of the spleen and further injuries, he was fit for work again after several months.

In the wake of this accident, the BSU became aware of two similar incidents involving the MARFAAM during the transfer of personnel at the Rüterbergen pilot transfer station prior to mid-March 2019. They both occurred in December 2018. The two cases also involved pilots being unable to find a handhold while crossing from the pilot ladder to the main deck via the gateway. However, for various reasons these individuals escaped with nothing more than just a fright and were able to reach the main deck physically unharmed.

The lack of – internationally binding – adequate handholds at the MARFAAM's gateway was the reason for the accident involving the canal helmsman and the two pilots nearly falling from a height. In particular, both this and the other accidents that have come to light were caused by the fact that

- lacking handholds were not identified but the pilot embarkation point certified as appropriate by a classification society acting on behalf of the flag State²;
- this situation was not identified subsequently during a port State control inspection;

¹ All times shown in this report are Central European Time (CET) = UTC + 1 hour.

² The flag State is the State whose flag a ship legitimately carries.

- neither pilots nor canal helmsmen rated this deficiency as a threat to the safe navigation of the MARFAAM or potential threat to the environment and therefore failed to report it to a vessel traffic service (VTS) for specific scrutiny during a port State control inspection.

From the BSU's perspective, adequate handholds have now been installed on the MARFAAM to eliminate the primary cause of the accident.

The investigation revealed many other hazards of a fundamental nature associated with the use of pilot embarkation points, which can be reduced if the safety recommendations are observed. In particular, they include an

- absence of occupational health and safety standards for canal helmsmen and pilots and unclear responsibilities, respectively.
- absence of specific international requirements for the adequacy of handholds at pilot embarkation points with a gateway;
- absence of a culture of reporting dangerous pilot embarkation points to VTSs, and
- absence of sufficient implementation and enforcement of existing internationally binding rules for pilot transfer arrangements.

Further aspects and details can be found in the investigation report.

2 FACTUAL INFORMATION

2.1 Photograph of the MARFAAM



Source: Hasenpusch Photo-Productions

Figure 1: Multi-purpose vessel MARFAAM

2.1.1 Ship particulars: MARFAAM

Name of ship:	MARFAAM
Type of ship:	Multi-purpose vessel
Flag:	Netherlands
Port of registry:	Lemmer
IMO number:	9526100
Call sign:	PCNH
Owner:	Visser Shipping (IMO number: 5640191)
Ship operator/shipping company:	Boomsma Shipping (IMO number: 4007781)
Year built:	2011 (keel laid in 2008)
Shipyard:	Damen Shipyard in Bergum
Classification society:	Lloyd's Shipping Register (LR)
Length overall:	118.14 m
Breadth overall:	16.13 m
Draught (max.):	7.2 m
Gross tonnage:	5,422
Deadweight:	11,089 t
Engine rating:	2,970 kW
Main engine:	MAK 2970 kW
(Service) Speed:	13.3 kts (max. 13.7 kts)
Hull material:	Steel
Hull design:	Single hull vessel
Minimum safe manning:	7
Miscellaneous:	9 sister ships

2.1.2 Voyage particulars: MARFAAM

Port of departure:	Ventspils, Latvia
Port of call:	Ghent, Belgium
Type of voyage:	International merchant shipping
Cargo information:	Peat
Manning:	9
Draught at time of accident:	$D_f = 5.0 \text{ m}$, $D_a = 5.8 \text{ m}$
Freeboard when accident happened:	About 4.50 m at pilot embarkation point
Pilot on board:	Yes
Canal helmsman:	Yes

2.2 Photograph of the RÜSTERBERGEN



Figure 2: Pilot vessel RÜSTERBERGEN

2.2.1 Ship particulars: RÜSTERBERGEN

Name of ship:	RÜSTERBERGEN
Type of ship:	Pilot vessel
Flag:	Germany (federal flag)
Port of registry:	Kiel
Call sign:	DH6520
Owner:	Federal Republic of Germany
Ship operator/shipping company:	Lotsbetriebsverein e.V. [German pilot facility society]
Year built:	1994
Shipyard:	Aluminium Schiffswerft Lübeck
Classification society:	DNV GL
Length overall:	12.87 m
Breadth overall:	4.02 m
Draught (max.):	1.00 m
Engine rating:	180 kW

Main engine:	2 x 90 kW
(Service) Speed:	12 kts
Hull material:	Aluminium
Minimum safe manning:	1
Miscellaneous:	Registered as an inland waterway vessel

2.2.2 Voyage particulars: RÜSTERBERGEN

Port of departure:	Rüsterbergen pilot station
Port of call:	Rüsterbergen pilot station
Type of voyage:	Transfer service for pilots and canal helmsmen
Manning:	1
Additionally on board:	1 pilot and 1 canal helmsman

2.3 Marine casualty information

Type of marine casualty:	Less serious marine casualty ³ ; accident involving a person
Date, time:	13/01/2019, 0657
Location:	NOK km 55 (northern side); Rüsterbergen pilot transfer station at Schülp, near by Rendsburg

Extract from Navigational Chart 1720, BSH⁴

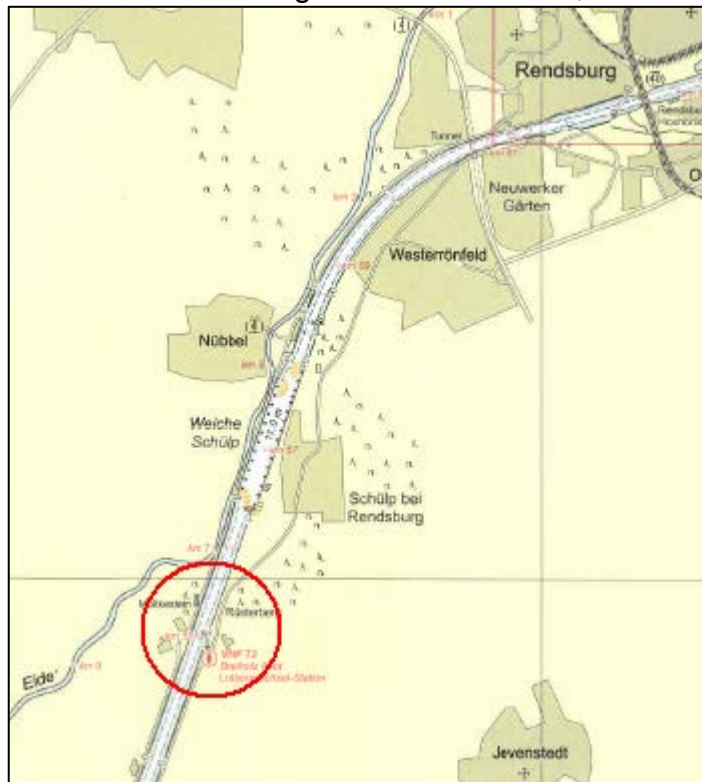


Figure 3: Scene of the accident; NOK km 55 (Rüsterbergen pilot transfer station)

³ Categorisation according to Article 1a SUG.
⁴ BSH: Federal Maritime and Hydrographic Agency.

Ship operation and voyage segment:	Estuary trading
Place on board:	Pilot embarkation point (to ship's deck)
Consequences:	The casualty suffered life-threatening injuries (inter alia, basilar skull fracture, rib fractures, lung contusions, rupture of the spleen) and was unfit for work for several months.

2.4 Shore authority involvement and emergency response

Agencies involved:	VTS NOK; Waterway Police (WSP) Kiel and WSP Brunsbüttel, rescue coordination centres, Prevention Division and Ship Safety Division (BG Verkehr ⁵), BSU.
Actions taken:	The emergency measures of the pilot vessel's skipper and second person on board included the return manoeuvre of the pilot vessel, first aid, and a request for medical assistance. The pilot and the canal helmsman from the eastern section of the NOK stayed on the MARFAAM until Brunsbüttel.
Results achieved:	The injured person was given medical care and able to return to work after several months. The MARFAAM transited the western section of the NOK safely.

⁵ BG Verkehr: German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication.

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

According to VTS NOK's accident report in conjunction with statements of the casualty and several witnesses, the following sequence of events can be regarded as certain.

The Dutch-flagged multi-purpose vessel MARFAAM sailed westbound on the NOK during her voyage from Ventspils in Latvia to Ghent in Belgium. Apart from the crew, a pilot and a canal helmsman⁶ were on board. The pilot and the canal helmsman from the eastern section were scheduled for replacement when she was about half way down the canal at the Rüterbergen pilot transfer station (NOK km 55). The MARFAAM reached the pilot station at about 0650 on 13 January 2019. The freeboard was about 4.50 m when the accident happened.



Source: WSP Brunsbüttel

Figure 4: The MARFAAM's pilot embarkation point on the day of the accident

Preparations were made for the transfer on the starboard side in accordance with conditions on board. Embarkation was via a pilot ladder and an open gateway in the

⁶ According to the announcement No 25.3 of the German Federal Waterways and Shipping Agency, branch office North, with respect to Paragraph 42 section 5 SeeSchStrO - *German Traffic Regulations for Navigable Maritime Waterways*) – acceptance of helmsmen on the Kiel Canal) the MAARFAAM was manned by a canal helmsman due to her dimensions (length 118.14 m, breadth 16.13 m, draught 5.60).

ship's rails. The pilot ladder was lowered and the gateway was opened as far as possible. A lifebuoy was suspended in the immediate vicinity. As it was still dark, the pilot embarkation point was illuminated on the part of the MARFAAM. Two ratings⁷ from the deck department stood next to the gateway.

The RÜSTERBERGEN (registered as an inland waterway vessel and operated by one person) sailed alongside on the starboard side of the MARFAAM to execute the transfers of the canal helmsman and of the pilot. There was no swell, it was still dark and it was raining. In keeping with common practise, the canal helmsman checked the pilot ladder was firmly attached before climbing up it by standing on it with one foot and holding it with one hand while still standing on and holding the pilot vessel with the other foot and hand. It seems that the impression of the pilot ladder was good. He could see a crew member near the gateway. The canal helmsman was the first to begin the ascent. When his head was level with the main deck he was unable to find a handhold on the side tubing that forms part of the gateway with his left hand. He could not see a handhold or anything else suitable to take hold of because of the rain and darkness. He therefore tried to grasp a cross bar in the rails but was unable to. He tried to find something firm to take hold of with his left hand several times without success. He did not notice any assistance from the deck crew. After several failed attempts he fell from a height of 3-4 m upon the pilot vessel's rails and then struck his head on the deck. The pilot on board the RÜSTERBERGEN immediately saw that the fall had caused serious injuries. He put the casualty in a safe position on the RÜSTERBERGEN's deck and initiated the first response. The skipper immediately aborted the transfer manoeuvre, alerted the emergency services and returned to the jetty of the pilot station. The emergency services arrived at the pilot station in Rusterbergen shortly after 0700. After emergency medical care was administered, the casualty was transported to the 'imland Klinik' hospital in Rendsburg in the presence of an emergency physician.

The MARFAAM continued her voyage westbound with the pilot and the canal helmsman from the eastern section still on board.

3.2 Investigation

All parties involved assisted with the investigation in a constructive manner.

3.2.1 Investigations on the day of the accident

WSP Kiel was informed about the accident at 0700 on 13 January 2019. The casualty was receiving emergency medical care when the police arrived at the Rusterbergen pilot transfer station. The witnesses present (the skipper and pilot) were asked about the course of events leading up to and during the accident. WSP Kiel informed the BSU about the accident by phone at about 1010. The BSU asked for written statements from the witnesses on each vessel and for an assessment of the pilot ladder by WSP Brunsbüttel.

⁷ In accordance with the definition given in Regulation I/1, paragraph 13 of the Annex to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, (STCW Convention), 'rating' means a member of the ship's crew other than the master or an officer.

Officers from WSP Brunsbüttel boarded the MARFAAM at 1120 in the Große Südschleuse lock in Brunsbüttel. The pilot ladder was lowered again at the request of the police and inspected. A photographic report of the pilot embarkation point was prepared. After their identities were established, the MARFAAM's master, the pilot and the ratings working at the gateway were asked to give a written account of the facts from their respective standpoints and to submit these accounts to WSP Brunsbüttel, if necessary additionally in their first language. The MARFAAM sailed out of the lock for the sea at shortly after 1200. WSP Brunsbüttel informed the BSU about the results of the on-scene assessment by phone. Further information was to be obtained from the pending written accounts.

3.2.2 Other incidents involving the MARFAAM

WSP Kiel sent the written accounts of the witnesses involved at the end of February. The file sent also contained the account of a similar accident involving the MARFAAM at about 1900 on 4 December 2018 from another canal pilot. The canal pilot who made the report was also unable to find a firm handhold while accessing the ship's deck of the MARFAAM from the pilot ladder. At that time, the MARFAAM was also level with the Rüsterbergen pilot transfer station while transiting the canal from Kiel Holtenau to Brunsbüttel. However, the draught stood at 6.80 m instead of 5.60 m. At 3.30 m, the freeboard was 1.20 m lower than on 13 January 2019. In addition to the pilot who made the report, a skipper, a trainee pilot and a canal helmsman were also on board the pilot vessel. When the canal pilot stood with both feet on the lower rungs of the pilot ladder and tried to hold on to the stanchion with his right hand, he did not manage to grasp it completely. He fell back upon the deck of the pilot vessel. This happened from a height of about 1 m above the deck of the pilot vessel. Thanks also to the determined grasp of the trainee pilot who happened to be there, he managed to find a steady upright position with his left leg outside the rails and his right leg inside the pilot vessel between her rails and rear-view mirror. The pilot survived the fall without major injury and only a few bruises.

On the day of the accident, the pilot attributed the incident chiefly to the slanted bottommost rung of the pilot ladder, especially since he managed to climb across on the second attempt. After he heard about the accident involving the canal helmsman and learned by chance about a third similar event involving the MARFAAM, it seemed other reasons were applicable. He believed one of the main reasons was the exceptionally thick circumference of the stanchion on the MARFAAM. Moreover, he felt this was compounded by the fact that the leaf hinges on the MARFAAM were positioned on the right-hand side of the gateway, meaning anyone embarking was forced to first reach through between stanchion and leaf with their right hand before taking hold. As a right-handed person, he would always reach for the stanchion with his right hand first. If there were also darkness, glare from deck lights, slipperiness due to moisture, etc., when embarking, then an accident could occur very quickly.

Following this statement, the BSU contacted the third casualty. The latter reported an event at 1830 on 24 December 2018, which also happened at the Rüsterbergen pilot transfer station. The pilot ladder was again lowered on the MARFAAM's starboard side. Despite the draught of 7.10 m, due to the freeboard of some 3.00 m the pilot ladder was so long that he first had to climb several rungs up it. As usual, he held on to the ropes of the pilot ladder before being able to reach the height of the main deck. When

he changed the holding position of the left hand from pilot ladder to main deck stanchion, he was unable to grasp the latter. His left hand slipped. It was thanks only to holding firmly on to the pilot ladder with his right hand that he reached the main deck and was able to avoid falling from a height.

3.2.3 Further marine casualty during pilot embarkation

On 15 August 2019, the BSU was notified of a further accident during a personnel transfer at sea. A pilot fell into the water while crossing from the pilot ladder in Bremerhaven. He was rescued without any external signs of injury. The pilot embarkation point also had a gateway. Similar to the MARFAAM, it was not possible to open the gateway completely. The stanchions at the gateway entrance served as handholds. The stanchions were not round, but – as usual for stanchions – square. Shortly before he fell, the pilot held on to the right-hand stanchion with his right hand and, *inter alia*, started to rotate, during which his right hand presumably opened, causing him to lose his grip. However, other accident factors are different from the cases involving the MARFAAM referred to here and not considered further in this investigation.

3.2.4 Statements

3.2.4.1 Injured canal helmsman

On 18 January 2019, the BSU requested an account of the course of events leading up to and during the accident from the injured canal helmsman via the *Verein der Kanalsteurer e.V.* [German association of canal helmsmen] as soon as possible. Since the canal helmsman suffered life-threatening injuries by the fall from a height, especially a basilar skull fracture, he was initially unable to comment on the accident. Despite the serious injuries, he was able to resume work in October 2019 in the course of a vocational integration measure and to speak with the BSU about the incident on several occasions. His recollection of the accident is as follows. It was raining when the accident happened. A north-westerly wind of about 6 Bft prevailed. The surroundings seemed to be very dark. He believes that if there was any lighting, it was only on deck and that no special lighting for the transfer arrangements was in operation. The pilot ladder was lowered properly and the gateway was open. He saw at least one person at the gateway. He climbed several metres up the pilot ladder. When he had reached the gateway level with the main deck, he tried to grasp a stanchion with his left hand but could not find an adequate handhold there. Although he did not see a cross bar, he then reached for a bar with his left because rails always have cross bars and they are usually much thinner. His attempt was unsuccessful, however. Since he could not find a firm handhold despite desperate attempts, he became more and more panic-stricken. He suffered skin abrasions on his left fingertips in the process. Although he tried to gain a firm handhold for a long time, he did not notice any assistance from the deck. Although the safe deck was visible, he did not consider discontinuing the embarkation and climbing back. Therefore, he fell from a height of 3-4 m onto the pilot boat.

From his point of view, the accident was caused by a lack of handholds and/or a suitable stanchions that can be gripped safely with one hand.

He was not (and had not in the years before) wearing any gloves, safety footwear or helmet. For personal protection, he was wearing a safety vest⁸ and ankle boots with a natural rubber sole⁹. As always, he had a rucksack on his back with a handle at the top. He believes that a helping hand could have taken hold of this handle, possibly preventing the fall. The darkness was intensified by the dark blue colour of the gunwale and gateway. The embarkation point was not illuminated by the pilot vessel.

During the vocational integration measure, he boarded several ships which he believes did not comply with SOLAS requirements. He sees a need for action in various areas, such as

- in the safety culture, where it would probably make sense to wear appropriate personal protective equipment (PPE) at all times and for pilots or canal helmsmen to report safety deficiencies when embarking more consistently to the VTS;
- in one-person operation of the pilot vessels on the NOK in Rüterbergen, where in the event of a comparable accident, initial measures could only be carried out to a limited extent if just one pilot and no additional canal helmsman were to be transferred, as there would only be one skipper and no additional deck crew on board the pilot vessel;
- in the communication, which is usually absent between the ship's command and pilot vessel given the routine nature of the task. In this case, it may be helpful if the ship notifies the pilot vessel that she is ready for pilot transfer;
- in the execution of the transfer manoeuvre, where it might be helpful if the pilot vessel always veered off as soon as the person being transferred is standing on the pilot ladder. In the event of falling from a height, the person in question would then land in the water rather than upon the pilot vessel.

3.2.4.2 Crew of the MARFAAM

Statements were obtained from the master and the ratings working at the gateway. According to the crew list, the ratings employed were a seafarer deck and an unskilled seaman. Both ratings held valid certificates of competency issued by the Philippine Administration in accordance with Regulation II/4 of the Annex to the STCW Convention. A holder of such a certificate of competency is entitled to form part of the navigational watch.

The statements point to the following facts. At the time of the accident, the chief officer was in charge of the navigational watch on the bridge. The recorded freeboard was 4.60 m. The pilot ladder was lowered on the starboard side to about 1 m above the waterline. A lifebuoy was in the immediate vicinity. The two ratings saw a person climbing up the pilot ladder. When this person's head had reached deck level, he either

⁸ Following the publication of the Ship Safety Division in the manual sea – occupational health and health care in maritime shipping and fisheries – the term “vest” instead of “life jacket” is generally used in the investigation report. Vests consist particularly of folded floating bodies, which inflate after contact with the water or after having been triggered manually and then turn the person on the back in order to keep the breathing openings above water. Both kinds of vests must be marked with a CE-sign.

⁹ Similar to the sole of indoor training shoes.

already held on to the left- and right-hand stanchion with both hands or tried to find a handhold on the rails with his left hand. The two ratings reported that the canal helmsman's left hand suddenly slipped off the rails. Neither of them could hold him but saw him fall upon the rails of the pilot vessel, landing on his back, and then strike his head on the deck of the pilot vessel. The ratings notified the chief officer on the bridge and the latter notified the master. When the master appeared on the bridge at 0700, the deck was illuminated with spotlights and the chief officer was liaising with the ratings. They heard that the casualty was the replacement canal helmsman. The pilot and canal helmsman transfers were aborted and the MARFAAM sailed on to Brunsbüttel with the canal helmsman and pilot on board from the NOK's eastern section.

3.2.4.3 Skipper of the pilot vessel and first aider (pilot)

When the MARFAAM passed the Schülpsiding at 0648, the replacement canal helmsman and replacement pilot left the pilot station on the pilot vessel RÜSTERBERGEN and headed for the MARFAAM. The RÜSTERBERGEN was manned by one person (the skipper). A westerly wind of 5 Bft prevailed and it was drizzling. The pilot vessel went alongside on the starboard side of the MARFAAM at 0653. It seems that the impression of the pilot ladder was good. The pilot ladder was illuminated and a crew member stood in the vicinity of the opened gateway.

The canal helmsman was the first to climb up the pilot ladder. When he was level with the main deck, he lost contact with the ship and fell from a height of 3-4 m upon the deck of the pilot vessel. The transfer was immediately aborted and the pilot vessel headed for the pilot station. The injured canal helmsman was responsive and conscious. The pilot administered first aid and the pilot vessel's skipper alerted the emergency services. The cause of the fall from a height was not observed.

3.2.5 Access to the ship's deck of the MARFAAM

During the first call at a German port after the accident on 13 January 2019, WSP Bremen boarded the MARFAAM and provided administrative assistance to the BSU. Following an indication of the exceptionally thick circumference of the tubing in the area of the gateway, several points were to be measured.

Source: WSP Bremen



Figure 5: Open gateway

It was found that the pilot gateway is not mounted on a stanchion, but rather on the handrail of the rails, which continues down to the deck in this area. The handrail has a diameter of 6 cm and circumference of 19.7 cm there. The middle cross bars on the rails, which the injured canal helmsman had tried to take hold of inevitable and unsuccessfully, have a diameter of 3.2 cm.

Source: WSP Bremen



Figure 6: 6 cm diameter handrail

It is not possible to completely open the gateway 90° because the leaf hits the hatch coaming first. There is no way of fixing or locking the gateway leaf in position when it is open, either.

A photograph of the ship operator shows handhold stanchions mounted above the rails. According to the accident reports and statements, the crew dispensed with mounting these supports on the day of the accident.



Figure 7: The MARFAAM's embarkation point up until September 2019

3.2.6 BG Verkehr – occupational health and safety (canal helmsmen)

The Verein der Kanalsteuerer e.V. reported the occupational accident to the Prevention Division (BG Verkehr). The Prevention Division investigated the accident on 22 March 2019 on the basis of documents sent by the Verein der Kanalsteuerer e.V. It was found that the struts in the rails and the gateway are made of thick tubing and that

these also serve as a support for people embarking. The poor (or lack of additional) handholds on the rails was considered to be the cause of the accident. Based on the documents sent, the condition of the pilot ladder was rated as poor. However, it was not possible to determine whether the pilot ladder was partly responsible for the accident. Since the MARFAAM is operated under the Dutch flag, the Prevention Division reported the accident to the Ship Safety Division (BG Verkehr), so as to allow the latter to survey the ship as part of a port State control inspection in order to provide an opportunity for embarking safely on scene.

3.2.7 BG Verkehr – port State control inspection

On 27 March 2019, the Prevention Division notified the Ship Safety Division (both BG Verkehr) of an accident involving a person on 13 January 2019. Despite the fact that the event took place some time ago, the information was taken extremely seriously. The MARFAAM was prioritised for an additional port State control and inspected on the same day.

In particular, the pilot ladder and gateway were assessed during the inspection. No deficiencies were identified. In addition, questions were asked about the course of the accident because repairs or changes in the design may have been made in the period between the accident and the port State control inspection. The crew stated that no changes had been made. From the point of view of the Ship Safety Division (BG Verkehr), the embarkation point was consistent with internationally binding minimum standards. For the MARFAAM (keel laid: 2008; year built: 2011), there were reportedly no binding specifications regarding the design of the handholds. Recommendations for the implementation of minimum standards only became mandatory when the SOLAS amendments were adopted in 2010 for ships whose keel was laid in 2012 or later. However, even those recommendations only specify a minimum diameter of 32 mm for handholds and there are no standards for the maximum diameter.

Following a request from the BSU, the Ship Safety Division (BG Verkehr) advised that there are reportedly no further possibilities for intervention on the part of the port State control authority, as the classification society (Lloyd's Register) would probably have found the existing design presumably appropriate and approved it. Moreover, a stanchion can be regarded as a handhold. Subsequently fitted handholds may lead to a change in the breadth of the ship, resulting in an inadmissible change in the ship's design.

The Ship Safety Division (BG Verkehr) noted that it needed to receive notifications earlier so as to be able to respond to such accidents more quickly. According to the ALV¹⁰, this is reportedly provided for. Pursuant to Section 12(1) in conjunction with Section 3 ALV, sea pilots must "(...) establish that the condition of the ship and her equipment are in due form within the scope of their usual work as pilots. In German territory, the sea pilot must immediately report any deficiencies identified that may jeopardise the safe navigation of the ship or pose a threat to the marine environment

¹⁰ ALV: *Verordnung über die Seelotsreviere und ihre Grenzen (Allgemeine Lotsverordnung - ALV)* [German regulation on sea pilotage districts and their boundaries] of 21 April 1987 (BGBl. [Federal Law Gazette] I p. 1290), as amended by Article 68 of the Regulation dated 2 June 2016 (BGBl. I p. 1257).

to the body designated by the German Federal Waterways and Shipping Agency (GDWS). The latter shall immediately send this notification to the *See-Berufsgenossenschaft (See-BG)* [German marine insurance and safety association]." The GDWS has designated the VTSs as competent authorities. BG Verkehr (and in this case the Ship Safety Division) is the successor of the See-BG, making it the competent recipient of such notifications. According to the Ship Safety Division, no such notifications have been received in recent years.

Following the accidents that have come to light here and in connection with the International Maritime Pilots' Association (IMPA) safety campaign (see Subsection 3.2.13.1), the Ship Safety Division sees a need for action with respect to the issue of pilot transfer arrangements. The issue may be suitable for a port State control authority concentrated inspection campaign (CIC).

During the so-called Port State Controls in the ports, compliance with international regulations for ships safety, for the prevention of environmental pollution and with respect to the working and living conditions of seafarers are adhered to on board seagoing ships. Many countries coordinate these controls in associations. Germany is e.g. a member of the Paris Memorandum of Understanding (Paris MoU).¹¹ This association agrees upon annual concentrated inspections, the so-called CIC's.

The CIC's require several years of preparation and are conducted for a period of about three months. During a CIC, the ships are normally inspected only once. CICs are announced in advance so that ship operators, crews and the flag States responsible for compliance with international standards can prepare for them. This makes it possible to uncover and remedy shortcomings.

It is unlikely a CIC dealing with the issue of "pilot embarkation points" could be implemented before 2023 due to other priorities already envisaged. Before that, there would be further need for action in individual cases.

3.2.8 Weather report

To establish the role played by the weather, Germany's National Meteorological Service (DWD) was instructed to prepare a report based on weather data for the area of the Rüterbergen pilot transfer station,¹² in which all the periods of the near-misses and accidents involving the MARFAAM during pilot or canal helmsman transfers that have come to light should be considered.

The weather situation on 4 December 2018 was marked by a high pressure system (1026 hPa) over southern Germany, which extended over northern Germany into the Norwegian Sea with a wedge. The area of the accident was situated in a weak to moderate westerly current. A westerly wind of 8 kts (3 Bft) prevailed at 1900. No wind gusts in excess of 2 Bft above mean wind were registered due to the stable

¹¹ The Paris MoU is an organisation in which competent authorities from 27 countries coordinate port State control inspections. It covers the ports of the European coastal states and the North Atlantic basin from North America to Europe.

¹² Official report of 14 October 2019 based on weather data for the area of the Rüterbergen pilot station at 1900 CET on 4 December 2018, 1830 CET on 24 December 2018 and 0700 CET on 13 January 2019; Reference WV13/64.30.16-20/50_19.

stratification. It was mainly cloudless. No precipitation was registered. The air temperature was measured at 3.5 °C.

On 24 December 2018, the weather was marked by a powerful high pressure system (1035 hPa) over north-eastern France. The area of the accident was located on the north-eastern edge in a west to north-westerly current. A west to north-westerly wind of 8 kts (3 Bft) prevailed at 1830. No wind gusts in excess of 2 Bft above mean wind were registered due to the stable stratification. It was mainly cloudless and no precipitation was registered. The air temperature was measured at 4 °C.

On 13 January 2019, the weather was marked by a low pressure system (975 hPa) on the Norwegian coast. The fronts of an associated minor secondary low (983 hPa) tracked across the area of the accident. The warm front brought rain to the region in the early hours of the morning. A west to south-westerly wind of 12 kts (4 Bft) prevailed at 0700. No wind gusts in excess of 2 Bft above mean wind were registered due to the stratification with stable humidity. It was mainly overcast. Precipitation was heavy at times. The air temperature was measured at 7 °C.

3.2.9 Legal framework – transferring personnel on the NOK

Based on the approach taken for occupational health and safety, an examination of which legal regulations may influence the technical, operational and personal measures taken when transferring personnel on the NOK via pilot ladder was carried out. Since a canal helmsman and two pilots were unable to find a handhold while accessing the deck of the MARFAAM, these professions were the focus of attention. The examination also considered whether and to what extent regulations influence the freedom pilots and canal helmsmen have when deciding to carry out a transfer.

3.2.9.1 International regulations

Internationally binding rules for the safe transfer of personnel at sea are contained in Regulation 23, Chapter V (Safety of navigation) of the International Convention for the Safety of Life at Sea, 1974 (SOLAS). Regulation 23 deals with arrangements for the transfer of pilots (or personnel) embarking on or disembarking from ships that fall within the scope of the SOLAS Convention.

The rules apply in principle to any ship on a domestic or international voyage that may need a pilot. Ships solely navigating the Great Lakes of North America and their connecting and tributary waters are exempt¹³. The respective flag State decides on the extent to which the rules are implemented on ships of less than 150 GT and fishing vessels.

However, warships, naval auxiliaries and other ships owned or operated by a contracting government and used only on government non-commercial service shall, so far as is reasonable and practicable, act in accordance with Regulation 23.

This regulation provides binding standards for shipbuilding arrangements, minimum standards of equipment and measures for the organisation of personnel. Shipbuilding arrangements and equipment for transferring pilots shall always comply at least with

¹³ See point 1.2 of Regulation 1, Chapter V SOLAS for details.

the requirements in force at the time of installation (see Regulation 23, paragraph 1, Chapter V SOLAS (Application)). The mandatory standards referred to below and relevant to this accident have been in force since 1 July 2002 and in some cases for longer. The regulations governing the MARFAAM are appended to the report (Annexes 9.1 and 9.2).

In principle, any arrangements used for transferring pilots must be fit for purpose. The purpose is "(...) enabling pilots to embark and disembark safely." (See first sentence of Regulation 23, paragraph 2.1, Chapter V SOLAS.)

If the deck is accessed via a gateway in the rails (as in the present MARFAAM case), then adequate handholds and a gateway that does not open outwards should form part of the ship's design (see Regulation 23, paragraphs 4.1 and 5, Chapter V SOLAS). With regard to the ship's equipment, an approved pilot ladder must be used.

Accessories such as manropes, lifebuoy with self-igniting light, a heaving line and illumination must be kept at the ready for immediate use (see Regulation 23, paragraphs 2.3, 7 and 8, Chapter V SOLAS).

With regard to the organisation of personnel: "The rigging of the pilot transfer arrangements and the embarkation of a pilot shall be supervised by a responsible officer having means of communication with the navigation bridge and who shall also arrange for the escort of the pilot by a safe route to and from the navigation bridge." (See Regulation 23, paragraph 2.2, Chapter V SOLAS.)

Inter alia, recommendations on the handholds to be fitted were agreed upon in Resolution A.1045(27) of the Maritime Safety Committee on 30 November 2011 (see Gazette of the Federal Ministry of Transport and Digital Infrastructure (2/2014 No 25 p. 93)) and most recently revised in December 2015 with Resolution A1108(29): The adequate handholds shall be provided at the point of embarkation on or disembarkation from the ship on both sides, mounted at a distance of 0.7-0.8 m apart from one another. Each handhold must be rigidly attached to the hull at or near its lower end and again at a higher point. The handholds should be at least 32 mm in diameter and extend at least 1.2 m upwards beyond the bulwark. This recommendation applies to all SOLAS vessels built or whose keel was laid since 30 November 2011 and to SOLAS vessels on which relevant structural alterations have been made subsequently. Resolution A.1045(27) replaced the previously applicable Resolution A.889(21) of 25 November 1999. The recommendation of 1999 was in line with the aforementioned binding rules on handholds of 2002 and is therefore not considered further.

On 23 February 1995, the IMO's¹⁴ Maritime Safety Committee adopted the first visual summary (poster) of the main mandatory and recommended SOLAS regulations for pilot transfer arrangements, which it published in MSC/Circ.568/Rev.1.

¹⁴ International Maritime Organization

The Maritime Safety Committee provided an updated version of the poster to IMO Member States for distribution to pilots, seafarers, shipowners, ship operators and any other person involved in pilot transfer (see Figure 9 and Annex 9.3) on 28 May 2012 in MSC.1/Circ.1428.

As a rule, only the poster most recently published can be found on relevant websites, such as that of the IMPA¹⁵, even though the older poster (see figure 8) is still valid in principle, e.g. for ships built before 30 November 2011 and on which no structural changes have been made to the pilot embarkation point after that date.

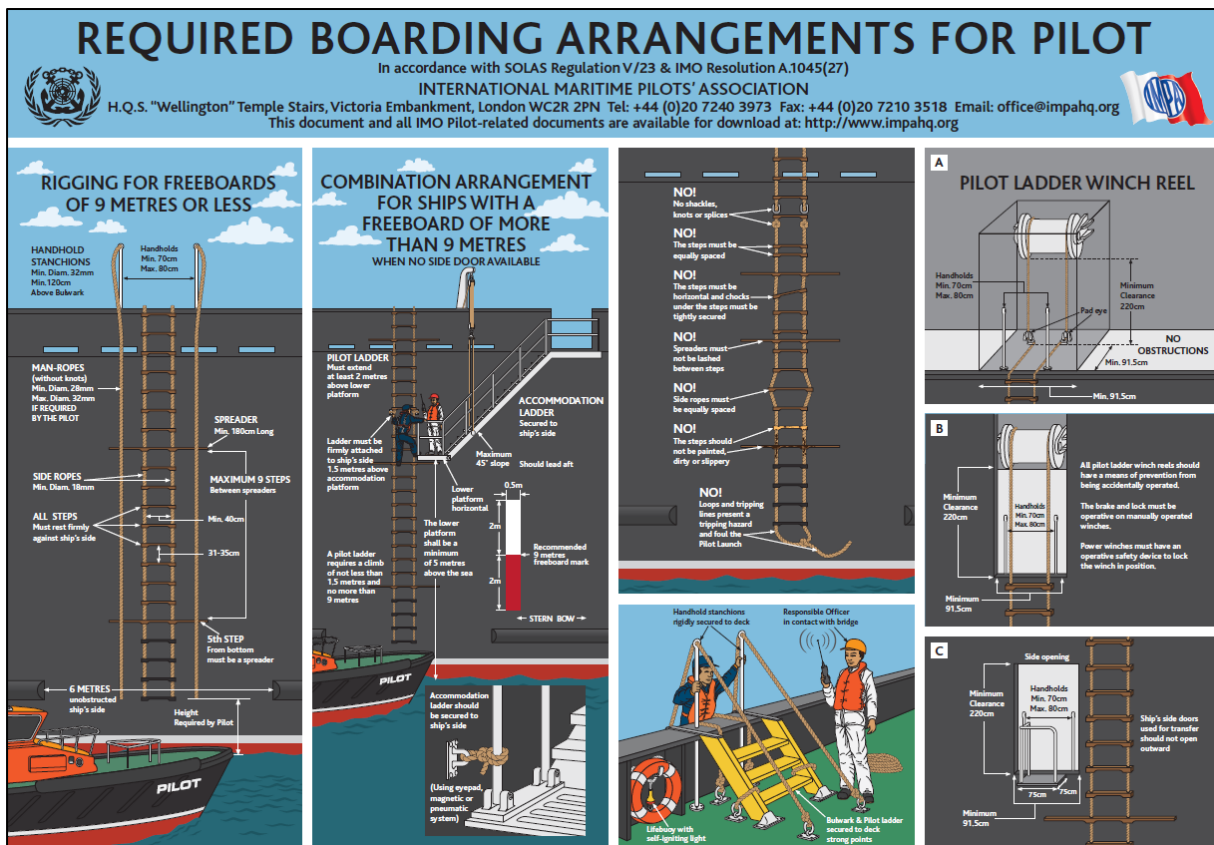


Figure 9: MSC.1/Circ.1428 of 28 May 2012 (larger version in Annex III)

Implementation of and compliance with SOLAS regulations is the responsibility of the respective flag State Administration (see Article 94 of the Law of the Sea Convention). Flag States may delegate this task to a classification society (Regulation 6, Chapter I SOLAS). The pilot transfer arrangements must be inspected and checked for compliance with all regulations before a vessel is put into service. Cargo ships such as the MARFAAM are then subject to a periodical survey every 24 months in which continued compliance is verified. Flag States confirm compliance with all requirements (Regulations 7 and 8, Chapter I SOLAS) by issuing a safety equipment certificate. The ship's operator must ensure the condition at the time of the survey is maintained to the extent that the requirements of the applicable rules continue to be met. No alterations may be made without the approval of the competent authority

¹⁵ www.impahq.org/downloads.php.

of the flag State (Regulation 11, Chapter I SOLAS). Valid safety equipment certificates should be recognised during port State control inspections, unless there are well founded reasons for believing that the condition of a ship or her equipment does not substantially correspond to the particulars contained in the certificate or the applicable standards. If an inspection gives cause for intervention, appropriate measures must be taken to rectify the shortcoming and the flag State must be involved (Regulation 19, Chapter I SOLAS). If the ship is involved in an accident (such as the MARFAAM) or if a fault that affects the safety of the ship or the efficiency or completeness of her life-saving appliances or other equipment is discovered, then the master or owner of the ship must notify the Administration, the surveyor or the recognised body at the earliest opportunity so that a new survey may be carried out. At the port of destination, the port State must be informed so that a port State control inspection may be carried out (see Regulation 11, Chapter I SOLAS).

3.2.9.2 National regulations

3.2.9.2.1 Crew of the pilot vessel

Pilot vessels at the Rusterbergen pilot transfer station are operated by one person. In the accidents investigated here, there were always at least two people on board who did not form part of the crew and were able to provide assistance. Since usually only the pilot and no canal helmsman is changed at Rusterbergen and assistance would not be available to the skipper in the event of a similar incident, the manning of the pilot vessel RÜSTERBERGEN was considered as part of the investigation.

The RÜSTERBERGEN is one of two permanently deployed transfer vessels at the Rusterbergen pilot station. Germany's Federal Chamber of Pilots (FCP)¹⁶ operates and maintains this pilot station in accordance with Section 6 SeeLG¹⁷ in conjunction with Section 6 ALV. The FCP has assigned this task to the Lotsbetriebsverein e.V. The GDWS carries out technical supervision of the Lotsbetriebsverein e.V. via its Kiel and Aurich stations.

The pilot vessel RÜSTERBERGEN is registered as an inland waterway vessel and does not fall within the scope of SOLAS. She has been used for the transfer service in one-person operation for years. According to information from the FCP, the manning concept was probably decided by the former Waterways and Shipping Directorate South-West in Mainz, which was responsible for this. The reason(s) for this decision are not known to those currently responsible. From the operator's point of view, the long-standing practise has so far shown no need for change. The proximity to the bank (about 100 m) facilitates short-term external assistance. A second (manned) pilot vessel is always available. According to information from the Lotsbetriebsverein e.V., one-person operation is not uncommon for transfers in international pilotage.

¹⁶ *Gesetz über das Seelotswesen (Seelotsgesetz - SeeLG)* [German sea pilotage act], as amended by the Notice of 13 September 1984 (BGBl. I p. 1213), as amended by Article 4(135) of the Act dated 18 July 2016 (BGBl. I p. 1666). Section 6 SeeLG still refers to Section 5 rather than to Section 6 ALV.

¹⁷ Germany's FCP is the legally prescribed body that represents the interests of all pilot associations. The FCP is a federal body governed by public law and based in Hamburg.

In particular, the following aspects concerning the safe manning of the pilot vessel RÜSTERBERGEN could not be clarified over the course of the investigation and were not pursued further for lack of direct relevance to the accident:

- licencing requirements for skippers;
- training concept for skippers;
- possible guidelines and/or procedures for transfer manoeuvres;
- requirements and/or procedures for person-overboard manoeuvres and other emergency procedures.

3.2.9.2.2 Occupational health and safety for canal helmsmen

The question arises whether occupational health and safety measures, in particular, by an appropriate risk assessment and PPE, could have mitigated the consequences of the accident. The accident could have possibly be avoided. Since both the replacing canal helmsman and the pilot could not embark due to the accident on 13 January 2019 and the helmsman and pilot remained on board for the western section of the canal, possible increased the risk, because the two individuals continued with their assignments without a rest period. For these reasons, and because questions about the employment relationship between canal helmsmen and the actual employer arose during the preliminary investigation, an investigation into which regulations may affect the occupational health and safety of canal helmsmen was made.

The investigation revealed a number of facts concerning the legal status of canal helmsmen, which the BSU views as unclear. These are described in the following section.

It was first examined whether the *Arbeitsschutzgesetz (ArbSchG)* [German act on occupational health and safety]¹⁸ applies to canal helmsmen. The ArbSchG transposes EU directives with the aim of ensuring and improving the health and safety of employees. Most of the obligations under this law are initially directed at employers. The material obligations include

- appraisal of working conditions by means of a risk assessment;
- definition of occupational health and safety measures on the basis of the risk assessment;
- regular review and adaptation of measures;
- instruction of workers;
- organisation of emergency measures;
- preventive occupational health care, and the
- assumption of all costs arising from the ArbSchG.

¹⁸ *Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit* [German act on the implementation of measures of occupational health and safety to encourage improvements in the safety and health protection of workers at work] of 7 August 1996 (BGBl. I p. 1246), as amended by Article 113 *Zweites Datenschutz-Anpassungs- und Umsetzungsgesetz EU* [Germany's second act on data protection adaptation and implementation (EU)] of 20 November 2019 (BGBl. I p.1626).

From the moment the employer issues safety regulations due to its duties or enters into a works agreement with workers, compliance with these regulations by employees is mandatory. Employee violations may have consequences under labour law.

In principle, the ArbSchG applies to all workers at work. It also applies to workers employed on seagoing vessels that fly the flag of Germany, as otherwise further relevant legislation that does not currently exist would have to be enacted (see Section 1(2) ArbSchG).

Section 2(2) ArbSchG provides a conclusive definition of the term 'workers'. For the purposes of the ArbSchG, 'workers' are:

- employees;
- those employed for the purpose of their vocational training;
- people comparable to employees within the meaning of Section 5(1) of the *Arbeitsgerichtsgesetz (ArbGG)* [German labour courts act], excluding domestic workers and those equal in law to domestic workers;
- civil servants;
- judges;
- soldiers;
- those employed in workshops for the disabled.

Since canal helmsmen are not explicitly mentioned, it was examined whether they fall into the 'employees' group.

There is no legal definition of the term 'employee' in the ArbSchG. In employment law, Section 611a *Bürgerliches Gesetzbuch* [German civil code] is based on the employee's obligation to follow instructions: "The employment contract obliges the employee to perform, subject to instructions, work determined by a third party in relation to whom the person is personally dependent on behalf of another." According to the case-law of the *Bundesarbeitsgericht* [German labour court]: "[...] it is further specified, any individual who has work within the framework of a work organisation determined by a third party is an employee, whereas any individual who is essentially free to organise their work and to determine their working hours is self-employed. Integration into an external work organisation is, in particular, evident in the fact that an employee is subject to the employer's right to issue instructions with regard to time, duration and place of performance of the agreed services. [...]"¹⁹When considering whether and to what extent the employee is personally dependent, the specific nature of the respective activity must be taken into account, in particular.

Abstract criteria that apply to all employees cannot be established. An assessment of how the characteristics of the legal relationship arise from the content of the contract and the practical implementation and arrangement of the contractual relationship must be made."²⁰

¹⁹ So e.g. BAG, Urt. v. 11.8.2015 – 9 AZR 98/14.

²⁰ www.haufe.de/personal/haufe-personal-office-platin/arbeitnehmer_i_desk_PI42323_HI520081.html [in German].

On the other hand, the ArbSchG defines the term 'employer'. It states that employers are natural or legal persons and partnerships with legal personality employing the persons referred to in Section 2(2) ArbSchG.

The ArbSchG does not apply to people who work on a self-employed or freelance basis, as they are not employees within the meaning of Section 2(2) ArbSchG.

In 2019, the some 120 canal helmsmen²¹ steered a total of 11,335 ships operating under various flags through the NOK, always in accordance with the instructions of the respective master or officer on watch. Even if canal helmsmen act in accordance with the instructions of the ship's command responsible, they do not form part of the ship's crew in principle. On ships flying the flag of Germany, canal helmsmen are explicitly excluded from the term 'crew' under Section 3 *Seearbeitsgesetz (SeeArbG)* [German maritime labour act]

It is currently not clearly regulated whether canal helmsmen are workers within the meaning of the ArbSchG and if so, who the employer of canal helmsmen is. Canal helmsmen do not have an employment contract. As a general rule, canal helmsmen on the NOK are controlled by the Verein der Kanalsteuerer e.V. There is no legal but rather a de facto obligation to be a member. As a legal person governed by private law, the Verein der Kanalsteuerer e.V. is primarily responsible for the necessary provision, operation and maintenance of the facilities, as well as for activities relating to the training, examination, licencing and further training of canal helmsmen in accordance with Section 14 *Seeaufgabengesetz (SeeAufgG)*^{22 23}. The Verein der Kanalsteuerer does not conclude service contracts with the ship's operators but instead assumes the delegated tasks according to the SeeSchStrO and the SeeAufgG. The fees are not paid to the Verein der Kanalsteuerer but to the Federal Cash Office, which also does the invoicing to maritime shipping. The amount of the canal helmsman costs is stipulated by the Federal Government through the canal helmsman directive (directive about the fees of the canal helmsman on the Kiel Canal).

Irrespective of the above, the Verein der Kanalsteuerer e.V. believes it has a quasi-employer role. Section 1 of the current articles of association dated 12 June 2017 reads: "The Verein der Kanalsteuerer e.V. is a union of workers operating as canal helmsmen on behalf of shipping on the NOK. It looks after the professional interests of canal helmsmen and issues of a social nature, without paying any attention whatsoever to political or religious beliefs. To this end, it shall perform partial functions of an employer in place of the shipowners engaging and remunerating its members in their entirety, in so far as the protection and welfare obligations incumbent upon shipowners towards the canal helmsmen must be regulated and implemented in addition to employment and remuneration obligations." In accordance with the articles, the Verein der Kanalsteuerer e.V. has arranged statutory accident insurance for its members with BG Verkehr and reported the accident as an occupational accident (see Subsection 3.2.6). However, the Verein der Kanalsteuerer e.V. does not claim to be an

²¹ Number of canal helmsmen in 2019.

²² See Ehlers, Prof. Dr. Dr. h.c., *Recht des Seeverkehrs* [Law of maritime transport]. Commentary, 1st Edition 2017; p. 175ff.

²³ SeeAufgG: *Gesetz über die Aufgaben des Bundes auf dem Gebiet der Seeschifffahrt* [German act on federal maritime responsibility].

employer under labour law and can only give a recommendation on health and safety measures, for example.

Since 1 August 2013 and in contrast to the ArbSchG, canal helmsmen have been clearly designated in Section 13 *Sozialgesetzbuch (SGB) IV* [German social code IV]²⁴ following the entry into force of Article 4(2) *Gesetz zur Umsetzung des Seearbeitsübereinkommens 2006 der Internationalen Arbeitsorganisation* [German act on implementing the 2006 Consolidated Maritime Labour Convention of the International Labour Organisation] and are treated in the same way as employed crew members on board seagoing vessels. Canal helmsmen are thus integrated into the statutory social security system irrespective of their actual legal status and can be covered by the statutory accident insurance.

In accordance with the provisions of SGB VII, statutory accident insurance institutions must, in particular, prevent accidents at work, occupational illnesses and work-related health risks using all appropriate means. Statutory accident insurance has been arranged for canal helmsmen with BG Verkehr. The BG Verkehr Prevention Division classes the Verein der Kanalsteuerer e.V. as the employer of canal helmsmen. The Verein der Kanalsteuerer e.V. not only reportedly provides for the payment of membership fees but has reportedly also appointed an expert for occupational safety and reportedly raises occupational health and safety issues in the context of occupational health and safety instruction at annual general meetings. According to the Verein der Kanalsteuerer e.V., such issues include lock entry regulations, alcohol on duty, and rest periods, for example.

According to the GDWS, which is responsible for traffic management on the NOK, the questions of employer and company responsible for occupational health and safety cannot be answered clearly at present. On merchant ships flying the flag of Germany, canal helmsmen may have been employees of the shipowner for the duration of their assignment under Section 7 *Seemannsgesetz (SeemG)* [German seamen's law] prior to 31 July 2013. This interpretation was largely confirmed by a decision of the *Reichsgericht* [German imperial court] of 22 May 1925 – III 161/24 –, RGZ 111, 37-40 and subsequently by decisions of the Schleswig higher regional court (16 W 17/98) and of the Schleswig-Holstein higher labour court (decision of 14 August 2008 – 2 Ta 145/08). Section 7 SeemG stated that shipowners were responsible for the occupational health and safety of canal helmsmen, insofar as the fourth section of the SeemG so provided for ships flying the German flag. The SeeArbG replaced the SeemG with effect from 1 August 2013. As mentioned above, canal helmsmen on merchant ships flying the flag of Germany do not form part of the crew according to point 11 of Section 3(3) SeeArbG. According to Section 3(4) SeeArbG, canal helmsmen are subject to certain provisions which otherwise only apply to crew members, however. These include the minimum age (Section 10), regulations for the prevention of dangers to the ship (Section 36), maintenance of order on board (Sections 120-126), and the requirement of fitness for service at sea (Sections 11 – 20 in conjunction with Section 13 MariMedV²⁵).

²⁴ The fourth book of the German social code contains the common rules for social security in Germany.

²⁵ MariMedV: *Verordnung über maritime medizinische Anforderungen auf Kauffahrteischiffen (Maritime-Medizin-Verordnung)* [German regulation on maritime medicine requirements on merchant vessels].

The regulations on the maintenance of order on board generally relate only to the maintenance of public safety and order on board in the context of operating the vessel and not to the occupational safety of canal helmsmen. The shipowner's occupational health and safety obligations to crew members are laid down in Section 114 SeeArbG and do not apply to canal helmsmen.

Similar to seafarers, to meet the requirements of fitness for service at sea, canal helmsmen must demonstrate their physical and mental fitness for service on board seagoing vessels at least every two years. The MariMedV states that canal helmsmen shall be considered to be fit for service at sea if they meet the medical requirements for working in the deck department and the increased requirements for visual acuity in the dark. In addition to establishing minimum visual acuity and sufficient hearing ability, the deck department examination must determine whether routine movements can be carried out on a ship, e.g. via stairways or fixed ladders. This involves testing agile locomotion and the sense of balance. According to MariMedV, agile locomotion means it is possible to climb ladders, stairways and the like unassisted. The regulation does not indicate whether other aids are permitted. After a successful examination, the physician licenced by the Maritime Medical Service (BG Verkehr) issues a certificate confirming fitness for service at sea. If the examination criteria are not met, then no certificate shall be issued.

Unlike seafarers, canal helmsmen from Rüsterbergen regularly have to use pilot ladders (i.e. moving ladders suspended over the side) in all weather to board a ship. In 2019, canal helmsmen were transferred for cost reasons on 3,403 ships due to the size of the ships in Rüsterbergen; the helmsmen were only collected on 286 ships. There was no transfer on 7,646 ships, as there were two helmsmen on board due to the size of the vessel and they alternated²⁶ regularly. The BSU believes that any person who uses a pilot ladder should be sufficiently fit and able to work at heights within the meaning of the ArbSchG and preventive occupational health care. Neither of these criteria forms part of the examination for fitness for service at sea, as this is basically only intended for seafarers and seafarers only use pilot ladders in exceptional circumstances.

In other professions, the ability to work at heights is generally examined by the employer. The requirement arises from the ArbSchG in conjunction with the *Verordnung zur arbeitsmedizinischen Vorsorge (ArbMedVV)* [German regulation on preventive occupational health care]. For activities or work stresses of an especially hazardous nature, employers are obliged to offer workers occupational health examinations for their own protection. The obligation arises from the employer's risk assessment. According to the ArbSchG, risks would have to be identified when using pilot ladders in the present case. Since pilot ladders are used to overcome height, it can be assumed that there is a risk of falling from a height. With regard to preventive occupational health care, employers' liability insurance associations have compiled an

²⁶ The mandatory acceptance of and the decision as to the number of helmsmen – no, one or two helmsmen – is subject to the Kiel Canal's segment and the ship's dimensions (see announcement of the GDWS with respect to Paragraph 42 section 5 SeeSchStrO).

instruction manual for works involving a risk of falling from a height (G 41²⁷). This instruction manual does not define absolute heights with regard to when a hazard is to be expected. The employer must determine the risk depending on the type of activity. Some professions assume there is a risk of falling from a height as soon as a height of 1 m is exceeded. For example, the construction industry assumes there is a risk of falling from a height when the workplace is on or above water in which a person can sink. If this principle were applied to the transfer of personnel at Rüsterbergen, then there is a permanent risk of canal helmsmen sinking after a fall from a height. In addition to the height-related hazards, many other hazards are conceivable when using a pilot ladder. Certain WSP services of the *Länder* and the GDWS have carried out risk assessments on the crossing of personnel at sea for their staff. Even if the assessments relate not only to ship-to-ship crossings, but in some cases risks involving ship-to-fixed platform crossings, some of the risks referred to certainly apply to the use of pilot ladders. Here are some of the risks referred to:

- slipping or falling from a height due to unexpected ship movements;
- becoming trapped and squeezed between ships;
- slipperiness due to a dirty, wet or icy ship's deck;
- other weather conditions;
- communication problems due to the wind and other noises, restricted visibility;
- defective lighting;
- falling from a height into the water and risk of drowning or risks posed by ships;
- mental stress before and while crossing to the safety of the deck.

There are certainly other risks, such as if pilot transfer arrangements do not comply with internationally binding minimum standards.

Based on the risk assessment, employers must take protective measures as far as possible. In cases where protective measures are not possible, protection must be provided by PPE. According to the *PSA BV*²⁸ [German regulation on the use of PPE], employers may only select and provide workers with PPE that offers protection against the risks posed without itself posing a greater risk. Moreover, the PPE must meet the ergonomic and health requirements of the workers. Additional details can be found in the regulation.

If embarkation via a pilot ladder is unavoidable, a risk of falling from a height will exist despite the use of a PPE. From the moment it is no longer possible to rule out a risk of falling from a height when using a pilot ladder on the basis of a risk assessment, the employer must arrange occupational health examinations in accordance with the ArbMedVV. Moreover, these examinations can be carried out both at the request of a worker and on behalf of the employer if the latter wishes to ascertain whether PPE provided meets the health requirements of workers (see point 4 of Section 2(1) PSA-BV).

²⁷ See *Deutschen Rentenversicherung (DGUV)* [German pension insurance] information (BG/GUV-I 504–41).

²⁸ *Verordnung über Sicherheit und Gesundheitsschutz bei der Benutzung persönlicher Schutzausrüstungen bei der Arbeit (PSA-Benutzungsverordnung – PSA BV)* [German regulation on safety and the protection of health when using PPE at work].

The preventive medical check-up for works involving a risk of falling from a height (G 41) must be performed every 12 – 36 months, depending on age or at the physician's discretion. In addition to a general health examination, an exercise ECG is carried out from the age of 40 onwards to determine individual physical capacity.

In contrast to the examination for fitness for service at sea, employers and employees only receive a certificate of attendance for a preventive medical check-up, which indicates when the next preventive medical check-up should be carried out in the opinion of the physician. Examining physicians must record the results of the examination and any findings in writing. Only the worker receives information and advice on the results of the examination. The result is made available to the worker at his or her request (see Section 6(3) ArbMedVV).

Examining occupational physicians must use the findings from preventive medical check-ups and give the employer advice on how to improve occupational health and safety measures if necessary. Such proposals may relate to one or several employees.

Accordingly, unlike an examination for fitness for service at sea, a preventive medical check-up is not an aptitude examination or a prerequisite for performing a task. Employers may only have a preventive medical check-up performed as an aptitude examination if there is a legal basis for so doing (e.g. law, regulation, provision in an employment contract, service agreement).

As the investigation progressed, the question as to whether other regulations might affect the occupational safety of canal helmsmen arose. Relevant standards include Section 42(5) SeeSchStrO and Section 14(1) SeeAufgG, which regulate the recognition and the licencing of canal helmsman, respectively, and the obligation of ships to engage a canal helmsman.

According to Section 42(5) SeeSchStrO, certain vessels are obliged to engage recognised canal helmsmen on the NOK. WSA Kiel will recognise an individual as a canal helmsman if the applicant is reliable and familiar with conditions on the NOK. No further details can be found in this set of rules.

The licencing of canal helmsmen has been laid down by law in Section 14(1) SeeAufgG since 2 June 2016. It provides for the licencing of people who

- have the requisite navigational and seamanlike maritime knowledge for navigating a vessel safely on the NOK;
- have the fitness necessary for service at sea, and
- are reliable.

According to paragraph 2, the Federal Ministry of Transport and Digital Infrastructure is authorised to lay down detailed requirements for the licencing of a canal helmsman and the procedure without the approval of the Federal Council. There is no regulation at present. According to the GDWS, WSA Kiel issues licences to canal helmsmen within the meaning of Section 42 (5) SeeSchStrO on the NOK after an oral and practical examination.

3.2.9.2.3 Occupational health and safety for pilots

Given the fact that in December 2018 and January 2019 two pilots failed to find a handhold and slipped while boarding the MARFAAM and, moreover, that we are also aware of similar accidents involving other ships, the regulations that may affect the personal health and safety of pilots at work during embarkation and disembarkation²⁹ via pilot ladder were investigated.

Pilotage in Germany has developed over time such that the pilot's activities are carried out by freelance sea pilots within the framework of a public organisation and oversight system. Pilots on the NOK are controlled by the NOK I and the NOK II pilot associations. Some 300 canal pilots piloted a total of 20,753 ships through the NOK in 2019. The pilots always transfer at Rüsterbergen. Accordingly, more than 41,000 pilot transfers (each involving one embarkation and one disembarkation) took place at Rüsterbergen in 2019.

The associations are bodies governed by public law. In particular, their responsibilities include the organisation of operations, the collection and distribution of pilot fees and supervising the fulfilment of pilot's duties. The GDWS is responsible for the direct governmental tasks. In particular, such tasks include defining districts and deciding on the obligation to engage a pilot, the licencing of sea pilots, supervisory functions, the provision and operation of pilot facilities, and the setting of fees.

The overall aim of this pilotage structure is to ensure the public interest in safety, as well as the pilotage structure's reliability and cost effectiveness.³⁰ This structure is essentially regulated by the SeeLG and ALV.

A closer examination of the SeeLG and ALV reveals that the State has a significant interest in manning the ships to be piloted, whereas the above two pieces of legislation – given the legal status of sea pilots as self-employed – do not contain explicit provisions on occupational health and safety. Under Section 8(1) ALV, pilots are required to carry out every pilotage assignment for which they are designated according to the so-called *Börtordnung*³¹. Subsection 2 states that a pilot has the option of refusing a pilotage assignment on the grounds of it being unreasonable if the ship or her equipment exhibits serious deficiencies or if her crew is insufficient or not sufficiently qualified, thus seriously jeopardising the safety of shipping or the environment. However, the following list of unreasonable aspects (which is not exhaustive in the Regulation) does not include anything that might indicate a risk to pilots during a transfer at sea (due to an unlawful pilot embarkation point, for example): "Unreasonable aspects may include, in particular

1. the master or her/his deputy being unable to operate the vessel safely due to the consumption of alcohol;

²⁹ Disembarkation is the process of picking up the pilot from the ship.

³⁰ See Ehlers, Prof. Dr. Dr. h.c., *Recht des Seeverkehrs* [Law of maritime transport]. Commentary, 1st Edition 2017; p. 271ff.

³¹ Börtordnung: A pilot deployment plan, more or less like a statue, drawn up by the pilot association and approved by the GDWS (as supervisory authority). It is not a deployment plan.

2. serious deficiencies in the propulsion or steering gear or in the command elements,
or
3. a tanker not being equipped with a serviceable radar or a VHF radiotelephone with the necessary communication channels for the district."

The legislator has accounted for the fact that pilots may not be able to disembark (see Section 24(3) SeeLG). If disembarkation is not possible when leaving the sea pilotage district (due to the weather, for example), then pilots are not obliged to continue their pilotage assignment but may do so at the request of the master.

If one regards the pilot embarkation point as part of the pilotage task, Paragraph 25 (2) SeeLG takes also into account the person transfer via pilot ladders associated with many risks. Thus, pilots shall "(...) use such technical aids during their activity as may be required in the practise of good seamanship, the instructions of the supervisory authority or the special circumstances of the case." In particular, the tradition of transferring personnel via pilot ladder is centuries old, inexpensive and neither fundamentally questioned by pilots and no other party involved, such as flag or port States. Pilot embarkation points are used on a daily basis, even if they do not comply with international standards. This is probably because it is part of everyday life and good seamanship.

However, the commentary on the SeeLG of Prof. Dr. Dr. h.c. Ehlers infers that this rule does not concern the pilot embarkation point, but mainly the use of the navigational and radio equipment on ships. The rule refers directly to the main obligation of the pilots, advising the nautical ships command. With the use of the term "seaman's custom" the connection to the basic rule for the conduct in maritime traffic according to the SeeSchStrO and the international regulations for preventing collision at sea (COLREGs) is established³²

Irrespective of the current legal framework, the FCP has stated that pilot associations are already increasingly concerned with the topic of occupational health and safety and PPE within the scope of self-government and in their own interests. Younger pilots in particular would increasingly don occupational safety footwear, vests and gloves voluntarily and practise a different safety culture.

That things can be dealt with differently is shown by countries in which pilots are employed as salaried staff and required by their employers to wear PPE. For example, pilots in Ireland are required to wear a safety jacket with integrated vest, emergency light and safety harness, safety footwear, gloves, and (depending on district) a climbing helmet with or without lamp and eye protection.

Both pilots and canal helmsmen regularly use a pilot ladder during pilot transfers on the NOK at Rusterbergen. Similar to canal helmsmen, pilots should be adequately fit for this. Trainee sea pilots and sea pilots must prove their physical and mental aptitude by means of an aptitude certificate in accordance with the SeeLotUntV 1998³³. Physicians licenced by the Maritime Medical Service (BG Verkehr) may perform the

³² Cf Ehlers, Prof. Dr. Dr. h.c., Law of maritime traffic, commentary, 1st edition 2017. Page 303.

³³ *Verordnung über die seeärztliche Untersuchung der Seelotsen (Seelotsenuntersuchungsverordnung - SeeLotUntV 1998)* [German regulation on the examination of sea pilots by a maritime physician].

examination. In particular, hearing and sight and acuity of colour perception are tested according to clear criteria during the examination. According to the current version of the SeeLotUntV 1998, further assessment of the physical and mental aptitude is carried out based on an exclusion procedure, where certain characteristics may not be present. Characteristics to be examined are set out in an annex to the *Seediensttauglichkeitsverordnung (SeetaugIV)* [German regulation on fitness for service at sea]; however, this was repealed without a follow-up regulation on 21 August 2014 when the MariMedV came into force. In the absence of a follow-up regulation, examinations continue to be carried out in accordance with the annex to the SeetaugIV. Some of the examination criteria are vague. For example, general physical weakness or obesity that impairs performance must not be present. In other words, characteristics that are likely to significantly affect embarkation and disembarkation via pilot ladder. However, for the two characteristics there were/are no criteria for determining when general physical weakness or obesity that impairs performance exists. Assessment was/is left to the discretion of the licenced physician.

Sea pilots must attend such examinations every five years until the age of 45 and at least every three years thereafter. Pilotage may only be practised if aptitude is confirmed by means of an aptitude certificate (see Section 16(2) SeeLG). Similar to canal helmsmen, the ability to work at a height is not part of the examination. Since appointed pilots carry out their work on a freelance and non-commercial basis by law and do not form part of the ship's crew (see second sentence of Section 1 SeeLG, Section 21 SeeLG and point 1 of Section 3(3) SeeArbG), regulations on occupational health and safety, such as with regard to risk assessments and preventive medical check-ups for works involving a risk of falling from a height (G 41), do not apply.

Similar to canal helmsmen, pilots on ships flying the flag of Germany are subject to the master's instructions (see first sentence of Section 3(4) in conjunction with Sections 120-126 SeeArbG), where the powers of command are limited to the maintenance of public safety and order on board in the context of operating the vessel and not to the occupational safety of pilots. The shipowner's occupational health and safety obligations to crew members are laid down in Section 114 SeeArbG and do not apply to pilots. In that regard, the master of a vessel flying the German flag has no influence on the personal safety of a pilot during a pilot transfer. Ships operating under other flags are subject to the rules adopted by the flag State concerned.

3.2.9.2.4 Notification of identified deficiencies

Since the Ship Safety Division (BG Verkehr) only became aware of the accident after some 2.5 months had passed, following a notification from the Prevention Division (BG Verkehr), and had not been notified of safety-critical pilot embarkation points previously, the BSU investigated how many safety-deficiency notifications were submitted within the framework of the SeeLG or ALV in 2019 and in what form they were submitted (see Subsection 3.2.7).

Pursuant to the first sentence of Section 26(1) SeeLG, "the sea pilot (...) must immediately and by the fastest means of transmission report to the body appointed by the supervisory authority and to the pilot association any observation concerning the safety of navigation, in particular changes or disturbances to aids to navigation or pollution of the water."

The second and third sentences of Section 12(1) ALV state that sea pilots must "(...) establish that the condition of the ship and her equipment comply with regulations within the scope of their usual work as pilots. In German territory, the sea pilot must immediately report any deficiencies identified that may jeopardise the safe navigation of the ship or pose a threat to the marine environment to the body designated by the supervisory authority. The latter shall immediately send this notification to the See-BG."

According to the GDWS and FCP, such notifications are made via VTSs. No further findings could be drawn from this in the course of the investigation because such notifications are not recorded, however.

If pilots fail to comply with this obligation intentionally or negligently, then they are acting contrary to regulations according to Section 15 ALV.

A comparable obligation to notify does not exist for canal helmsmen.

3.2.10 Access to the ship's deck – classification societies

Over the course of the investigation, the question arose as to whether access to the ship's deck of the MARFAAM complied with the requirements of the SOLAS Convention (a pilot transfer arrangement must include adequate handholds when access to the deck is via a gateway in the rails).

The flag State concerned is responsible for implementation of and compliance with the internationally binding regulations under Regulation 23, paragraph 4, Chapter V SOLAS (Access to the ship's deck). Flag States may delegate their responsibility for the inspection of ships to classification societies (referred to below as 'class or classes'). A class is a private company which, in addition to other tasks, monitors compliance with international technical safety regulations on behalf of a flag State Administration and issues international safety equipment certificates on behalf of the flag State concerned. European flag States may only commission classes recognised by the European Commission in accordance with Regulation (EC) No 391/2009.

LR is the competent class of the Dutch-flagged MARFAAM. Since access to the deck of many ships is arranged in the same way as it is on the MARFAAM and since the matter is of fundamental importance, the eight³⁴ classes recognised by Germany for ship safety were contacted in writing with the following questions concerning implementation of the relevant regulation.

- Do classes verify implementation of the relevant SOLAS regulations (see Subsection 3.2.9.1)?
- What is the relevance of the corresponding SOLAS recommendations³⁵?
- Who defines 'adequate handholds'?
- Are stanchions also regarded as handholds?
- What must be observed if (adequate) handholds are to be retrofitted?

³⁴ American Bureau of Shipping, Bureau Veritas, DNV GL, LR, Nippon Kaiji Kyokai, Korean Register, Registro Italiano Navale, Russian Maritime Register of Shipping.

³⁵ Resolutions A.889(21) or A.1045(27), as amended by A.1108(29).

The classes were also asked to provide other information on the subject. Of the eight classes, LR, DNV GL, RINA (Registro Italiano Navale) and RS (Russian Maritime Register of Shipping) responded. Although the responses varied in detail, they can be summarised as follows.

When a class is acting on behalf of the flag State, an examination of drawings is carried out for new builds. In the event of a transfer between registers or before a safety equipment certificate is issued, a local survey is carried out with the SOLAS recommendations being generally regarded as a mandatory regulation or minimum standard. Since there is no standard for handholds, the flag State concerned determines their adequacy and since no flag State requirements are known of, the classes set the criteria for this. In the process, the classes pay attention to the minimum diameter of the handholds as specified by SOLAS (32 mm) and to the strength. Some classes regard stanchions or handrails as handholds.

The classes consistently state that there are very detailed standards with regard to pilot ladders. However, any standards for access to the deck are formulated in an extremely vague manner. It is striking that the classes are indiscriminate in their use of the terms 'handrail', 'handhold stanchions' and 'handholds' in their answers, where the SOLAS Convention uses them specifically. In accordance with Regulation 23, paragraph 4.1, Chapter V SOLAS, 'adequate' handholds must be fitted at pilot embarkation points such as that of the MARFAAM. Recommendations on the adequacy of handholds in the maritime sector can only be found in the current Maritime Safety Committee Resolution A.1045(27), which states that the diameter of handholds must not be less than 32 mm (see Subsection 3.2.9.1). There is no maximum value. A tube or similar component with a round cross section must be fitted. Other handhold standards, such as for example the European standard for railway handholds³⁶, do not exist for shipping. The classes do not have standards from individual flag States, either.

One class was not aware of any safety warnings from an administration, shipowner, shipyard or other body concerning a problem with accessing a ship's deck.

According to LR, for reasons of ship design and in the absence of a design for handholds, the handrails on the MARFAAM were continued down to the deck and regarded as handholds (see Figure 10).

³⁶ EN 16116.



Source: WSP Brunsbüttel

Figure 10: Handrail continues down to the deck

LR stated that stanchions cannot be regarded as handholds in principle, as these supports are usually made of 60 x 15 mm flat iron in the shipbuilding industry and not of round material with a diameter greater than 32 mm.

3.2.11 Adequate handholds

The recommendations on 'adequate handholds' (see Subsection 3.2.9.1) adopted by the Maritime Safety Committee on 30 November 2011 with A.1045(27), as amended by A.1108(29), only consider a few aspects:

- adequate handholds should be provided at the point of embarking on or disembarking from the ship on each side;
- they should be between 0.7 and 0.8 m apart;
- each handhold should be rigidly secured to the ship's structure at or near its base and also at a higher point;
- the diameter of handholds should not be less than 32 mm, and
- they must extend upwards not less than 1.2 m above the bulwark.

The recommendations do not say anything about, *inter alia*, the material, strength or maximum diameter of handholds.

An examination as to whether there were any other recommendations from flag States, classes, users or any other standards for handholds that might be appropriate was therefore made.

Feedback from the classes and our own research indicate that a standard for handholds does not exist. There are standards for handrails but they do not apply.

DNV GL advises its customers to have a diameter of 40 mm for handholds, where 45 mm should not be exceeded in any case. According to the FCP, there are no recommendations from a user perspective for the adequacy of handholds.

On 22 May 1934, the European Journal of Applied Physiology published a study by E.A. Müller on the best handhold or handle for work equipment. According to this study, the most favourable handle has a diameter of 30-40 mm, is not rotatable and has a high-friction surface.

Part 1 of EN 16116 – a European standard with minimum requirements for the ergonomics and structural strength of handholds for railway staff – refers, *inter alia*, to handholds that allow access to passenger vehicles, luggage vans and locomotives or rail vehicle drive units. Its scope indicates that Part 1 is also applicable to car transporters. In particular, the standard defines dimensions, space requirements and material or design load requirements. Some of the handhold requirements in this standard follow:

- handholds shall be capable of withstanding a force of 1.5 kN applied by the operator at any point and in any direction without permanent deformation of the handhold or its fastening;
- handholds shall not have sharp edges. The edges of handholds with a rectangular cross-section shall be rounded. Unless otherwise specified in the standard, the cross-sectional dimensions shall meet the following requirements: between 20 and 35 mm for round shapes or for oval shapes a minimum dimension of 12 mm thick and 35 mm wide and a maximum of 40 mm;
- unless otherwise specified in the standard, handholds should have a minimum clearance of 100 mm, which may be reduced to 40 mm if necessary.

Part 2 of this standard refers, *inter alia*, to handholds for railway staff to allow access to freight wagons. In particular, this standard also defines the dimensions, positions and limits for the durability and functionality of handholds.

Additional details can be found in the standard.

3.2.12 Accidents at work – falls from a height: lessons learned

Flag States investigate marine casualties, *inter alia*, on the basis of Regulation 21, Chapter I SOLAS so as to learn from them and thus avoid similar accidents as far as possible in the future. The IMO publishes some of the marine

casualties investigated online in the 'Lessons learned' section³⁷. In particular, the aim is to inform seafarers about marine casualties investigated and to raise awareness with a view to preventing them from occurring. The 'Occupational accidents' section contains an account of several accidents involving falls from a height. Although most of these accidents have occurred on board ships, e.g. by falling from a height in cargo holds, much of the substance of the recommendations is applicable to the accident in question. The following is a selection of the recommendations and/or comments following mostly fatal occupational accidents caused by falls from a height:

- all activities on board a ship should be considered from the perspective of risk management;
- all works in the vicinity of the ship's side must be assessed with regard to the risk of falling from a height;
- shipowners, operators and masters should ensure that the procedures, authorisations and risk assessments for personnel working at a height take into account all hazards and establish measures to mitigate all risks;
- even falls from a low or medium height can lead to serious injury or death. Seafarers should not become complacent about the risks of working at a height, especially when using ladders;
- there is a risk that crew members working at relatively low heights may find the risk acceptable;
- risks associated with seemingly routine tasks can be perceived as lower if those tasks are carried out with a certain degree of independence and decision-making autonomy and if it is assumed they are under one's own control. A positive illusion of control arises when the risk is underestimated and a person is therefore more willing to accept the risk and hazard;
- neither the master nor the crew member wore a vest when they disembarked from the ship via a pilot ladder;
- a helmet offers better protection when secured with a chinstrap.

3.2.13 Further investigation results

3.2.13.1 IMPA safety campaigns

For several years, the IMPA has been conducting safety campaigns for the pilot transfer arrangements on vessels requiring a pilot following worldwide reports of sometimes fatal accidents during pilot transfers and countless near-misses. The most recently published report in 2019 (Annex 9.4) shows, *inter alia*, that the European pilots involved in the campaign were of the opinion that 15.89% (previous year: 14.12 %) of

³⁷ www.imo.org/en/OurWork/MSAS/Casualties/Pages/Lessons-learned.aspx.

the pilot embarkations points did not meet international standards. The FCP informs that German pilots are also participating in the campaign.

The study refers to the following hazards, in particular:

- pilot transfer arrangements do not meet international minimum standards from a structural perspective;
- pilot transfer arrangements are deployed despite damage;
- pilot transfer arrangements are not deployed properly by the crew;
- pilot transfers are insufficiently supervised (a responsible officer is not at the pilot transfer arrangement/there is no VHF communication with the bridge).

The IMPA sees a need for action and recently informed the IMO about the investigation at the 6th session of the Sub-Committee on Navigation, Communications and Search and Rescue. The Sub-Committee took note of the information. No further action has yet been taken by IMO Member States to reduce the number of shortcomings identified annually.

The IMPA safety campaign is complemented by a global 'Dangerous Ladder' campaign, which is supported by the IMPA. In addition to a video³⁸ published on YouTube and elsewhere, 'pilot ladder' examples from all over the world are published on Twitter with Hashtag#Dangerous ladders within the framework of this campaign.

Moreover, the IMPA, the European Maritime Pilots' Association (EMPA), the UK Maritime and Coastguard Agency (MCA), *et al.* published a calendar for 2020, which draws attention to different hazards during the transfer of personnel via a pilot ladder with pictures and explanatory notes on a monthly basis. The publishers expressly state that the calendar is not intended to be a comprehensive guide or legal advice. The purpose of the calendar is to make all pilot ladder users, including but not limited to ship's crews, pilots and canal helmsmen, more familiar with the rules for using pilot embarkation points. The pilots drawn in the calendar are equipped with PPE.

Inter alia, sturdy footwear, vest, gloves and an orange helmet are visible. These pilots do not carry a rucksack or bag. Figure 11 of the investigation report shows the calendar picture for the month of October, which deals with Regulation 23, paragraph 4 SOLAS (Access to the ship's deck). The calendar pictures for other months each deal with different SOLAS violations.

³⁸ <https://youtu.be/EeSojRYYEDc>.

Source: IMPA, EMPA, MCA, et al.



Figure 11: IMPA calendar page for October 2020

In the centre of the calendar there is a drawing (see Figure 12) based on the poster from the IMO's Maritime Safety Committee with a visual presentation of essential mandatory and recommended SOLAS regulations for pilot transfer arrangements (see Subsection 3.2.9.1).

Source: IMPA, EMPA, MCA, et al.

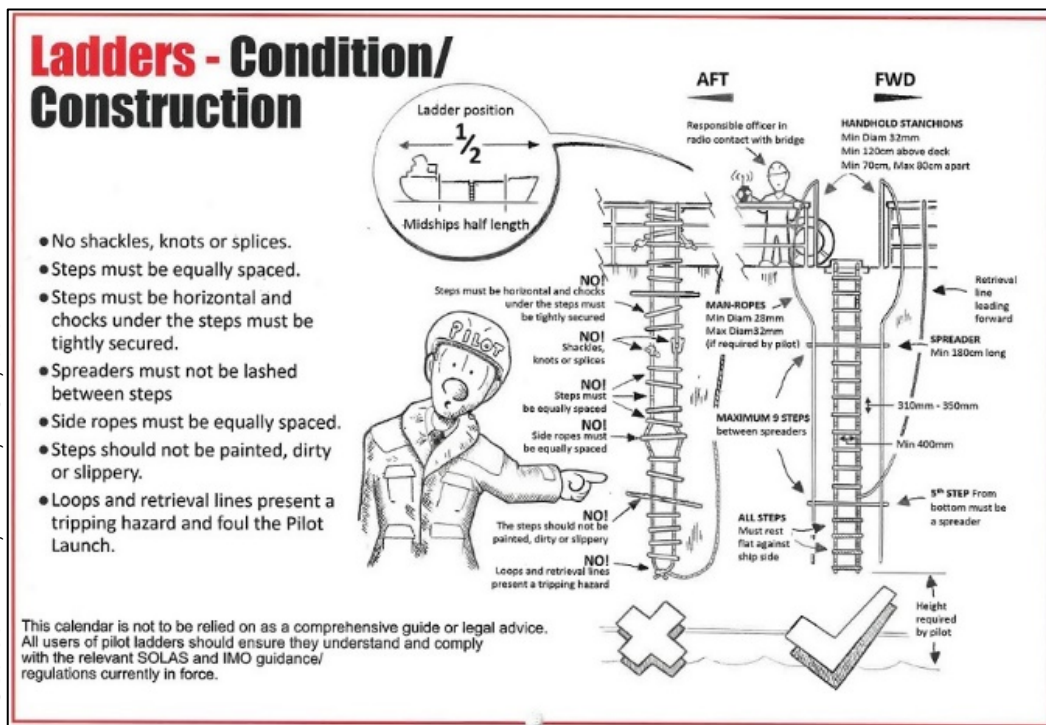


Figure 12: From the IMPA calendar for 2020

This drawing also takes into account access via a gateway, which is not included in the diagrams adopted by the Maritime Safety Committee. Handhold stanchions are erroneously drawn, which are intended for access via a bulwark ladder. Handholds similar to those required for access via a gateway should actually be provided (see Regulation 23, paragraph 4, Chapter V SOLAS). Handhold stanchions should only be used if they can be mounted freely and where a hand reaching for one is not obstructed by other components.

3.2.13.2 Notifications via app

The Australian Maritime Safety Authority (AMSA) has been providing a mobile reporting service for Australian pilots since 2017 via 'AMSA Pilot'. The service can be used via smartphones and other internet-enabled mobile devices.

The AMSA developed the application within two years with the involvement of the Australian Marine Pilot Institute with the following objectives, in particular:

- pilots should be able to report non-compliance with the rules on the transfer of pilots in a user-friendly manner even in cases of suspicion;
- information on legally compliant pilot transfers should be stored in the application such that pilots can specifically address a shortcoming to the master or responsible officer on board and explain it with the aid of the application. This is intended to promote understanding of how to eliminate the anomaly on the part of the ship's command.

The AMSA Pilot is available from the various application stores and can be viewed by all interested parties.

Since 30 September 2019, the United Kingdom Maritime Pilots' Association (UKMPA) has provided its pilots with a similar application.

3.2.13.3 Pilot Information Assistant

On a daily basis, the pilots are confronted with different standards of bridge equipment on board the ships they advise. In order to satisfy the requirements of a safe pilotage, the pilots have been using an additional source of information, a "Portable Pilot Unit" (PPU) in the German pilotage area since 2014. The PPU comprises a notebook or tablet with a software displaying an electronic pilotage area chart specifically adapted to the pilot's needs as well as sensors establishing movement data also displayed on the notebook.

Moreover, the PPU consists of further functions, such as for example provision of current legal foundations as well as the "Pilot Information Assistant (PIA)". Every pilot can provide information in the further comments section. This information is available to other pilots who have access to the PIA. The PIA does currently not provide access to third parties.

3.2.13.4 Seafarer's Compendium

BG Verkehr has published a reference manual on the subject of occupational health and safety in merchant shipping and fisheries, which contains few words and many pictures, in German and English. This manual can be found on board almost all German-flagged seagoing vessels. A digital version called 'Seafarer's Compendium', which won the 'eLearning Award 2018', has also been available since 2018. This can be downloaded free of charge from the application stores for the Android and iOS operating systems.

In 69 modules seafarers are advised on safe working practises on board to protect themselves and others. The information is also useful as a basis for occupational safety training.

The subject of pilot transfers is also addressed. One picture shows an embarkation point with a gateway, which is largely the same as that of the MARFAAM on the day of the accident.

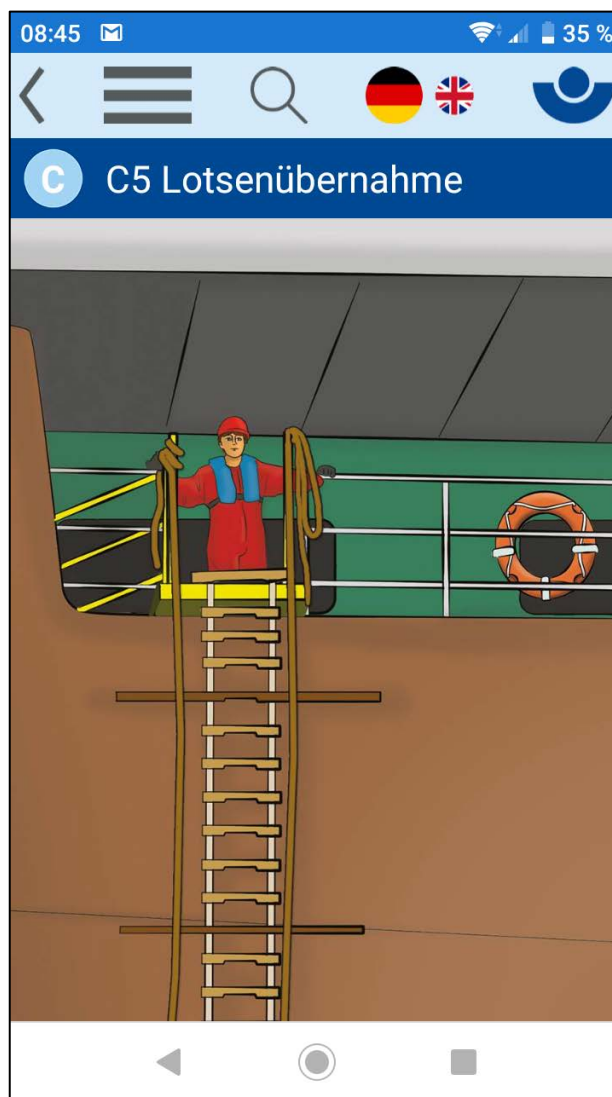


Figure 13: Screenshot from the Seafarer's Compendium application

The BSU is of the opinion that the depiction of the following points is erroneous: Handhold stanchions are visible instead of adequate handholds. The handhold stanchions are mounted inside the gateway and as such can make the entrance narrower. People embarking could also encounter access problems if the gap between the handhold stanchion and rails is too narrow. Regardless of the fundamental problems, people embarking will have difficulty using the handhold stanchions, as manropes are hanging in front of them.

3.2.13.5 Occupational health and safety at LR

The occupational health and safety culture of other employers in the context of personnel transfers via pilot ladder was examined during the investigation. The occupational health and safety for workers at LR is summarised here by way of example.

The employer's aim is to prevent any harm to its workers and customers. Works over water and at a height are classified as a high-risk activity. Workers must attend appropriate safety training before taking up such a task.

Vessel transfers may only take place if the transferring vessel is suitable for this purpose, if there are at least two competent crew members on board (including in ports), if rescue equipment for recovering people overboard is available and if there is suitable marine radio equipment on board. Employees must never carry luggage personally when using a pilot ladder. Luggage must be pulled up or lowered separately, for example with a rope. Pilot ladders must be consistent with international standards and automatic vests worn when using them.

All workers must always stop any activity as soon as a situation is considered unsafe.

3.2.13.6 Alternative personnel transfer arrangements

Personnel transfers from one ship to another are complex manoeuvres that involve many high risks for the people crossing. Some of the risks are discussed in Subsection 3.2.9.2.2 (Occupational health and safety for canal helmsmen). For both pilots and canal helmsmen the situation is complicated by the fact that not only two but at least three independent parties are involved in the direct process of transferring personnel:

- a) the ship's command of the seagoing vessel requesting the services of a pilot or canal helmsman;
- b) the skipper of the pilot vessel, and
- c) the pilot or canal helmsman crossing.

All parties involved are subject to different underlying conditions and must coordinate closely. Pilots and canal helmsmen neither form part of the crew of the seagoing vessel nor that of the pilot vessel. For the most part they operate independently of the ship's command or skipper. The ship's command of a seagoing vessel or skipper of a pilot vessel always decides on their own responsibility to what extent they implement requests of a pilot or canal helmsman made to facilitate a transfer manoeuvre. There is no centrally responsible management for the transfer process.

There have been many developments in the area of personnel transfers in offshore wind farms. Largely ignoring maritime traditions in recent years, this industry has invested time and money in alternative ideas and technical developments with a view to safely organising access via mostly fixed ladders on permanently installed structures. For example, vessels with personnel transfer arrangements are used, which are supposed to be able to compensate for ship movements of more than 3 m in all directions. According to the manufacturer, some of these developments should also be suitable for crossing between ships. A closer look at the overall process of transferring personnel at sea and these alternative systems is complex and goes beyond the scope of this accident investigation, however.

4 ANALYSIS

4.1 Course of the accident

The various investigation sources, in particular the testimonies of the injured canal helmsman and the pilots who had also failed to find a handhold on board the MARFAAM when boarding her some time ago, indicate that the primary cause of the accident is the lack of adequate handholds for accessing the deck. The handrails that continue down to the deck and have a diameter of about 6 cm cannot be grasped safely by most hands, meaning they do not provide sufficient support.

On the day of the canal helmsman's accident, rainfall and darkness had a negative impact on the course of the accident but did not cause it. Such underlying conditions are part of the day-to-day working environment and occur regularly. There was no relevant swell at the scene of the accident due to the district. With regard to the near-misses involving the pilots, the weather also had no real effect on events and can be ruled out as the cause.

Statements on the illumination of the transfer arrangements vary. They indicate that the pilot ladder was illuminated by spotlights on the MARFAAM. However, the injured canal helmsman felt that the access point to the deck, in particular, was very dark. The situation was visually only partially recognisable for the canal helmsman. The access point was possibly outside the light beam on the illuminated pilot ladder and appeared very dark, especially in contrast to the illuminated pilot ladder. In addition, the rails and access area were coated in a dark colour.

The MARFAAM's freeboard was 4.50 m at the time of the accident. After the canal helmsman lost his grip and fell, neither he nor the pilot standing on the pilot vessel was able to slow down the fall from this height. The height of the fall was partly responsible for the consequences of the accident.

Since a pilot was supposed to board the MARFAAM after the canal helmsman, too, the pilot vessel remained at the starboard side of the MARFAAM during the transfer manoeuvre and did not veer off immediately after the canal helmsman was on the pilot ladder. The canal helmsman therefore fell upon the deck of the pilot vessel and not into the water. Falling into water would probably have prevented the serious injuries but may have had other negative consequences.

The canal helmsman's PPE included half-boots with a sole of natural rubber and a safety vest. With the personal protective equipment, e.g. comprising adequate gloves, safety shoes, safety vest, back protector and a helmet, the fall itself could not have been prevented. But gloves might have prevented the skin abrasions at the left fingertips and – more important – with an adequate helmet the basilar skull fracture could have been prevented.

The canal helmsman was wearing a rucksack at the time of the accident. It is conceivable that this rucksack also had a negative impact on the accident, as the rucksack increased a probable rotational movement. However, the impact depends largely on the design and weight of the rucksack. The handle on the rucksack might

have tempted the crew members standing at the rails to take hold of it to give the person boarding some support. Since this did not happen, other conceivable consequences were avoided. The crew members were standing at an open gateway without height safety equipment and could have lost their own footing had they reached for it. Furthermore, a rucksack handle is not designed to prevent a person from falling from a height. Even specially designed climbing rucksacks generally increase the risk of falling from a height due to the additional weight compared to embarking without one. The backpack might have affected the protective effect³⁹ of the vest adversely.

Overall, the pilot waiting on the pilot vessel to board the MARFAAM was able to mitigate the consequences of the accident, as he was able to administer first aid immediately and, *inter alia*, secured the injured canal helmsman on the pilot vessel's foredeck. Only with this assistance was it possible for the pilot vessel's skipper to return to the pilot transfer station immediately after the fall from a height and to request assistance from third parties during the return voyage. Otherwise, the skipper would have had to carry out initial life-saving measures first, such as placing in a safe position on the deck.

4.2 International regulations

To ensure the safe transfer of personnel at sea, mandatory international standards have been laid down in Regulation 23, Chapter V SOLAS for any ships falling within the scope of this Convention that intend to take pilots or other personnel on board at sea. However, there are no international standards that apply to vessels making the transfer (such as a pilot vessel).

The standards agreed in the SOLAS Convention concern aspects of shipbuilding, equipment and the organisation of personnel. The principle is always that everything should be fit for purpose and enable safe embarkation and disembarkation (of pilots).

The competent authorities of the flag State Administration and of the port State, which inspected the MARFAAM's pilot transfer arrangements before and after the accident, did not find any shortcomings in the context of international standards. The same applies to pilots who regularly used the MARFAAM's embarkation point before the accident. At least there were no shortcomings reported. The ship's operator and crew had to assume that the embarkation point was suitable.

The findings of the investigation in terms of the SOLAS standards are evaluated separately in the following sections according to shipbuilding aspects, equipment and the organisation of personnel on board the MARFAAM.

4.2.1 The MARFAAM – shipbuilding (handholds/gateway)

In the MARFAAM case Regulation 23, paragraph 4.1, Chapter V SOLAS is relevant for the design of the pilot embarkation point. Since access from the pilot ladder to the deck is via a gateway, 'adequate handholds' must be installed at the access point.

³⁹ This concerns the required buoyancy in order to keep the breathing openings above water.

There were no handholds on the MARFAAM at the time of the accident. At the gateway the handrails continued down to the deck. Their diameter was about 60 mm, making it difficult for a hand to grasp them.



Figure 14: Hand grasping a 60 mm tube

Handhold stanchions can be mounted above the rails (see Figure 15) on the MARFAAM. However, these handhold stanchions are not adequate, as personnel embarking can only grasp them when at deck level. To reach the deck of the MARFAAM safely, it is necessary to reach for a handhold from the pilot ladder at deck level.



Source: Boomsma Shipping

Figure 15: Handhold stanchions out of reach

In particular, the bodies of the flag and port State consulted rated the handrails, which continued down to the deck, as 'adequate handholds' during their inspections following the accident. The investigation revealed that competent authorities often fail to differentiate between the terms 'handrail', 'handhold stanchions' and 'handholds' used in SOLAS. Moreover, tubing and other installed round components with a diameter of at least 32 mm are regularly interpreted as 'adequate', as this circumference is the minimum recommended circumference in the Maritime Safety Committee's Resolution A.1045(27), which provides recommendations for handholds and only a few other recommendations (see Subsection 3.2.9.1).

According to a lack of legal regulations, the DNV GL recommends, that its customers have a diameter of 40 mm, where 45 mm should not be exceeded in any case. This recommendation thus corresponds to a study dating from 1934 on the best handhold for work equipment (see Subsection 3.2.11.). No other recommendations for handholds from flag States or user groups, such as pilots, were identified within the scope of the investigation. Detailed requirements for the ergonomics and structural strength of handholds for railway carriage staff have been laid down at European level in EN 16116 (see Subsection 3.2.11). This standard may provide further guidance on the handholds required here.

4.2.2 The MARFAAM – equipment

The ship's equipment laid down in Regulation 23, paragraphs 2.3, 7 and 8, Chapter V SOLAS, such as an approved pilot ladder, manropes, lifebuoy with self-igniting light, heaving line and illumination were provided.

According to the information available, it is reasonable to assume that the pilot ladder complied with international requirements and was correctly deployed. There is nothing to suggest that the pilot ladder was responsible for the fall from a height.

It can be assumed that although the crew of the MARFAAM illuminated the pilot ladder, the canal helmsman was still unable to see the situation and therefore less able to assess it. Moreover, the handrail (which continued down to the deck) and the entrance area were painted dark blue.

The rucksack carried by the canal helmsman was not pulled on board with the heaving line so as to avoid any risk of possible accelerative forces and reduce negative consequences in the event of falling upon the deck or into the water from a height.

4.2.3 The MARFAAM – organisation of personnel

Contrary to the mandatory requirements of Regulation 23, paragraph 2.2, Chapter V SOLAS, there was no responsible officer at the gateway when the accident happened. Two ratings were present.

The ratings employed were recorded in the crew list as a seafarer deck and an unqualified seaman. Both held valid certificates of competency issued by the Philippine Administration in accordance with Regulation II/4 of the Annex to the STCW Convention. Having demonstrated to the certifying administration, in particular, that they are able to execute helm orders issued in English and to act as lookouts on the bridge (see Table A-II/4 STCW Code), holders of such certificates of competency are entitled to form part of the navigational watch.

Able seafarers deck are issued official certificates of competency in accordance with Regulation II/5 of the Annex to the STCW Convention. Holders of such a certificate have demonstrated to the certifying State competence for working in the deck department at the support level, as specified in Table A-II/5 of the STCW Code. This also includes knowing how to set up pilot ladders for use, how to fasten them securely and how to dismantle them again afterwards. A certificate of competency under the terms of rule II/5 of the attachment to the SOLAS-convention was not available.

The ratings employed at the gateway had no way of influencing the event positively and preventing the fall from a height. As is common practise on all ships, both stood in the immediate vicinity of the open gateway without protection against the risk of falling from a height. If one of the ratings had caught hold of the canal helmsman before the latter fell, he might have fallen upon the deck of the pilot vessel with the canal helmsman due to being unsecured. The ratings informed the officer in charge of the navigational watch on the bridge about what had happened immediately after the fall from a height. An officer at the gateway could not have prevented this accident, either.

The IMPA regularly notes in the course of its safety campaigns that, by way of derogation from the mandatory SOLAS requirements, no officer is at the pilot transfer arrangements during a pilot transfer. This may be due to the manning of the ship always being tightly calculated and the observance of minimum rest periods in accordance with the internationally binding watchkeeping requirements under A-VIII/1 STCW Code. The SOLAS standard of relevance here has existed for many decades. In the interest of ship safety, it is important that rested and qualified crew members, who can communicate whenever necessary with the ship's command on the bridge, which is responsible for the pilot or personnel transfer, are employed at the pilot transfer arrangements. The Manila Amendments to the STCW Convention introduced the first set of minimum standards for seafarers deck (with effect from 1 January 2012).

These seafarers are qualified to prepare for and follow up all activities associated with a pilot transfer. Following on-board familiarisation, holders of such a certificate of competency should – if they possess the English language skills usually required - also be adequately qualified to deploy pilot transfer arrangements, supervise the transfer of personnel on site, communicate with the responsible officer on the bridge and take embarking pilots and other personnel to the bridge or other destinations safely.

4.2.4 Visual representation of pilot transfer arrangements

The internationally binding and recommended SOLAS regulations for pilot transfer arrangements are complex because rule amendments generally only apply to new ships, for example. On the initiative of the IMPA, the IMO's Maritime Safety Committee published a visual overview (poster) of these standards as early as in 1997 and updated it in 2012 (see Subsection 3.2.9.1 and Annex 3) for pilots, seafarers, shipowners, ship operators and any other person involved in pilot transfers. Although this poster is extremely helpful in that it provides a quick overview and better understanding, it does not cover every regulation. For example, the combination of pilot ladder and access through a gateway with the prescribed handholds is not displayed. The poster does not contain any reference to rules that may not have been taken into account, either. By pointing to the references in SOLAS and the recommendation, it appears to the user to be conclusive. The visual representation puts the mandatory SOLAS text into the background for users.

The calendar with advice on using pilot ladders (see Subsection 3.2.13.1) published by IMPA, *et al.*, has taken this into account and the publishers explicitly refer, *inter alia*, to mandatory regulations in SOLAS. The calendar merely acts as supplementary illustrative material to assist users in their everyday life. However, in the course of this investigation it was found that although accessing the deck via a gateway is addressed, handhold stanchions have been drawn on one picture instead of handholds.

The Seafarer's Compendium published by BG Verkehr (see Subsection 3.2.13.3) condenses the complex topic of occupational health and safety in merchant shipping and fisheries into essential aspects, conveying the subject illustratively. The manual is made by practitioners for practitioners. The adequate handholds required by SOLAS are missing on the image showing a pilot embarkation point with a gateway.

4.3 National regulations

4.3.1 Crew of the pilot vessel

The pilot vessel RÜSTERBERGEN is generally manned by one skipper only. Additional deck personnel have been dispensed with for years due to conditions of the district.

With regard to the canal helmsman's fall from a height investigated here and to the two previous near-misses involving pilots, at least one additional assisting person was directly on scene because this individual was also supposed to be embarking, and therefore was still on board the pilot boat. In one case the fall was from such a low height that it did not cause any injuries. In the other case the second person was able to prevent a fall from a height with consequences. In the case under investigation here, the person on deck could neither prevent nor mitigate the accident due to the height of the fall. Fortunately, this person was not injured by the fall from a height and therefore able to immediately secure the canal helmsman on the pilot vessel's deck and administer first aid.

Taking their own safety into account, additional deck personnel on a pilot vessel can increase safety in the event of particular hazards when people are transferring.

Increased hazards could exist, e.g. due to weather-related environmental factors, such as icing, or an increased risk of falling from a height could arise from the need to overcome a freeboard of an undetermined height using a pilot ladder.

The additional deck personnel could particularly assume the following tasks to reduce the risks.

In particular hazards, the tasks of the additional deck personnel could include but are not limited to:

- the principle of dual control when assessing the pilot transfer arrangements;
- support for communication between the people involved in the transfer, e.g. with the aim of improving the illumination of the pilot transfer arrangements;
- stabilization of the pilot ladder;
- preventing the pilot ladder from jamming between the pilot boat and the ship, e.g., by communicating with the deckhands on board the seagoing ship;
- telling the person climbing down the rungs still to be climbed to prevent the person from turning around.
- support for person-overboard manoeuvres;
- implementation of first aid measures.

4.3.2 Transferring personnel on the NOK

4.3.2.1 Occupational health and safety for canal helmsmen

The service provided by canal helmsmen, i.e. steering different vessels on the NOK in accordance with the instructions of a master or officer in charge of the navigational watch, is a quasi-employee activity. The question as to the employer, who would be responsible for occupational health and safety under the ArbSchG, still has to be conclusively resolved.

Until the SeeArbG was introduced in 2013, the operator of the vessel on which a canal helmsman provided her/his services was usually regarded as the employer. Point 11 of Section 3(3) SeeArbG lays down that canal helmsmen are not crew members on ships flying the German flag. This means that the operator of a ship flying the German flag could no longer be legally responsible for occupational health and safety. The operator of a ship flying another flag was not responsible for occupational health and safety under German law in any case because the law of the respective flag State would be applicable.

At present, the Verein der Kanalsteurer e.V. performs some of the tasks of an employer. In particular, these include the assignment of work, as well as the payment of wages and social security contributions. According to the articles of association, members consider themselves to be employees and the Verein der Kanalsteurer e.V. should carry out an employer's duties of protection and care with regard to occupational health and safety, even though the latter does not employ the canal helmsmen. The Verein der Kanalsteurer e.V. fulfils its obligations in accordance with its articles and has arranged statutory accident insurance for its members with the BG Verkehr. Due to the statutory accident insurance, the Verein der Kanalsteurer e.V. performs many functions arising from the ArbSchG, which would otherwise be the obligations of an employer. For example, one member of the Verein der Kanalsteurer e.V. has been assigned the role of expert for occupational safety. In the basic training for canal helmsmen and at annual general meetings, occupational health and safety topics are addressed in the sense of relevant training. We are not aware of measures taken by the Verein der Kanalsteurer e.V. for preventive occupational health care within the meaning of the ArbSchG.

Given that the Verein der Kanalsteurer e.V. is not the canal helmsmen's employer and that no other employer can be specified, the ArbSchG cannot have binding effect. In particular, since membership of the Verein der Kanalsteurer e.V. is on a voluntary basis and, e.g. not a prerequisite for the recognition of a canal helmsman, the occupational health and safety measures taken on a voluntary basis by the Verein der Kanalsteurer e.V. are only of a recommendatory nature for canal helmsmen. The annual safety training to be carried out for all workers cannot be guaranteed for all canal helmsmen at the annual general meeting, as attendance is not compulsory. According to the articles, canal helmsmen can even be excluded from membership at any time for an important reason. One example of an important reason listed is behaviour that seriously damages the Verein der Kanalsteurer e.V. However, exclusion from the Verein der Kanalsteurer e.V. does not automatically lead to withdrawal of the recognition to continue working as a canal helmsman. However, membership is a de facto requirement for canal helmsmen to carry out their work (especially since work

orders can only be made virtually via the Verein der Kanalsteuerer e.V.). This is equivalent to compulsory membership.

That the Verein der Kanalsteuerer e.V. takes charge of the issue of occupational health and safety is quite appropriate. As a result of the service provided, canal helmsmen work on ships of various flags. At the Rüsterbergen pilot station, canal helmsmen are transferred by means of personnel transfer on a pilot vessel. Such a personnel transfer gives rise to completely different occupational safety requirements for canal helmsmen than for the crew members of a seagoing vessel. The master of a vessel that (must) use the services of a canal helmsman has only limited influence on the process of transferring personnel on a pilot vessel. Moreover, it cannot be in the interest of canal helmsmen that each ship's command may interpret occupational health and safety for canal helmsmen differently, resulting in changing PPE requirements for canal helmsmen.

Any embarkation or disembarkation with a pilot vessel involves greater risk than, for example, embarkation via a gangway in one of the NOK's locks. This is all the more so when the pilot transfer arrangements of a ship do not comply with international rules, for example. Appropriate risk assessments would enable canal helmsmen to develop standardised procedures, justifiably refuse the transfer of personnel by pilot vessel under certain conditions for safety reasons. In such exceptional cases they could provide the required service along the entire route, similar to larger vessels with two helmsmen.

The conditions laid down in Section 14(1) SeeAufgG for the licencing of canal helmsmen have neither a reference to nor an influence on the process of personnel transfer via pilot ladder and the necessary occupational health and safety. Navigational and maritime knowledge needed to safely navigate a vessel on the NOK are required but not practical skills for the safe use of pilot ladders. Even the required proof of fitness for service at sea has only a limited impact on the physical fitness necessary due to the examination criteria. An examination for fitness for service at sea is mainly concerned with visual acuity, hearing ability and whether routine movements on a ship can be carried out via stairways and fixed ladders. The ability to climb moving ladders suspended over the sides is not tested. Accordingly, examinations for fitness for service at sea are not comparable with a preventive medical check-up for works involving a risk of falling from a height (G 41) carried out for employed workers in other occupational sectors with comparable risks.

The criteria for examinations for fitness for service at sea are based on the requirements for seafarers and correspond to the internationally mandatory minimum requirements laid down in the STCW Convention. Unlike preventive medical check-ups, certificates of fitness for service at sea are more in line with occupational legislation. A canal helmsman cannot be licenced without a certificate of fitness for service at sea.

Preventive medical check-ups are basically only intended to provide information and advice to workers, as they are the only people who receive information about the results of the examination. Neither the employer nor the licencing authority is informed of the results of the examination. The employer is only informed about attendance. If

necessary, the occupational physician provides the employer with recommendations for improving occupational health and safety measures. A preventive medical check-up can only have consequences for canal helmsmen under occupational legislation if it must be performed as an aptitude examination on the basis of legislation.

4.3.2.2 Occupational health and safety for pilots

The introduction to the commentary on the SeeLG by Prof. Dr. Dr. h.c. Ehlers reads: "Given the importance of pilotage to the safety of shipping, there is an increased public interest in ensuring that sea pilots meet certain quality requirements and that services that meet the needs of shipping are available and used by shipping at all times." Irrespective of this importance, the State leaves essential occupational health and safety measures for the manning of ships with pilots via pilot ladder to the pilots themselves. The pilot transfer process is given little attention by legislation. As a general rule, the State expects pilotage to be used always. Personal risks can be taken into account within the scope of Section 8 (2) ALV. This Paragraph allows for the refusal of the pilotage in case of serious deficiencies with respect to the ship/equipment or inadequate and insufficiently qualified crew, respectively, if the safety of maritime shipping or the environment is endangered. In this respect, deficiencies preventing a regular pilot advice are at the same time a risk for the safety of maritime shipping and thus an authorization for the refusal of the pilotage.

From a legal point of view, pilotages can be refused by pilots under the terms of Section 8 (2) ALV if a pilot embarkation point exhibits severe deficiencies and is therefore unacceptable. However, it cannot be learned from the ordinance's text in which cases pilots can assume that a pilot embarkation point exhibits severe deficiencies, to refuse pilotages for reasons of the own safety and at the expense of the ships operator (s. chapter 3.2.9.2.3, section four)

Appointed (licenced) pilots perform their work in accordance with the SeeLG on a freelance and non-commercial basis. Unlike canal helmsmen, the ArbSchG clearly does not apply to pilots.

There are no mandatory requirements for the implementation of occupational health and safety measures, such as risk assessments, PPE or preventive medical check-ups for works involving a risk of falling from a height (G 41).

Pilots always act on their own responsibility. In principle, they must assess the risk themselves and decide on their PPE. Private accident insurance may give rise to specific occupational health and safety requirements for individual pilots. In any case, no occupational health and safety measures can be derived from the statutory sickness, accident and pension insurance scheme, as pilots are not listed in the SGB IV. Pilots can conclude a statutory accident insurance if they wish to do so.

In addition, there are no provisions for the protection of pilots in the event of them discontinuing a crossing due to unlawful or unsafe embarkation points and thus refusing pilotage for reasons of personal safety.

4.3.3 Notification of identified deficiencies

Pilot transfer arrangements that do not comply with international regulations pose a risk to all people who need to use this embarkation point. If a pilot or canal helmsman does not embark, then the safety of the ship and the marine environment are fundamentally endangered, otherwise the obligation to engage pilots and canal helmsmen would have to be questioned in principle.

Pilot embarkation points that endanger safety fall within the category of notifications under Section 26 SeeLG and Section 12 ALV. However, BG Verkehr has not received any notifications on hazardous pilot transfer arrangements in the past – neither in relation to this specific accident nor other notifications, even though statistically just over one in six installations does not comply with international standards (see IMPA safety campaign).

The reason for these notifications not being received was not investigated. Due to a lack of information, an empirical study would be necessary for this, since this would exceed the scope of this marine casualty investigation. Many reasons are conceivable – a few of them, including some deliberately provocative ones, follow.

- Pilot embarkation points are part of everyday life for pilots.
- Inadequate pilot embarkation points are also part of everyday life.
- Pilot embarkation points on ships calling at a German port or transiting the NOK are regularly used several times by different pilots. Why, for example, should NOK pilots submit a notification when other pilots, such as Elbe pilots, have been confronted with the shortcoming before and still embarked?
- Why should pilots report something if this does not change anything (as in the case of the MARFAAM)?
- Possibly notifications get lost on the reporting channel via the VTS to the Ship Safety Division.

With the Pilot Information Assistant (PIA), the pilots do have an information system that can document improper pilot embarkation points. The PIA is an internal pilot information system. With the information contained in the PIA, only other pilots who have access to the PIA are reached. This can and should be used for the own safety. However, it is currently not possible to convey identified deficiencies immediately to third parties for inspection and the necessary remedy.

4.4 Pilot ladders – alternative personnel transfer arrangements

The tradition of transferring personnel via pilot ladder is centuries old, inexpensive and fundamentally questioned by pilots and no other party involved, such as flag or port States. The manoeuvres are complex and always involve a high risk for the people crossing.

For as long as the transfer of personnel from one ship to another cannot be avoided, any hazards identified should be eliminated or mitigated in the interest of occupational health and safety by technical measures in the respective area of responsibility.

Technical developments for the transfer of personnel in the offshore wind energy sector are manifold and should be looked at more closely, taking into account the needs of the respective sea pilotage districts. There is usually no swell in the NOK. Accordingly, a technical measure to compensate for swell must be disregarded there. The risk at the Rüsterbergen transfer station increases with the height to be overcome, in particular. More precise statements cannot be made in the context of this investigation, as the actual requirements for transferring personnel safely would first have to be investigated.

5 Actions taken

5.1 BG Verkehr/Verein der Kanalsteurer e.V. – occupational health and safety

Following the accident, the Prevention Division (BG Verkehr) placed the Verein der Kanalsteurer e.V. under an obligation to develop a risk analysis and operating instructions for canal helmsmen.

A risk assessment was prepared. The risk of a hazard due to stumbling, falling from a height or slipping has been assessed as higher than any of the other hazards mentioned. To reduce the risks, personal protection measures are specified:

- use of PPE, including S3 safety footwear⁴⁰, safety gloves, automatic lifejackets tested within the required time limits and with at least 150 N buoyancy⁴¹, and weather protection clothing if necessary;
- periodic training;
- physical fitness according to Section 13 MariMedV ('Fitness for service at sea requirements to be fulfilled by canal helmsmen').

As a result, the Verein der Kanalsteurer e.V. has issued operating instructions for its members for the deployment of canal helmsmen on ships (with effect from 1 July 2019). The hazards to people and the environment referred to in the operating instructions include falling from a height, drowning, stumbling, as well as those arising from uncontrolled moving parts and systems and the weather conditions. Protection measures and rules of conduct of relevance to accidents include the following aspects:

- in principle, the rules of good seamanship and the specifications of the respective ship apply;
- instructions of the crew must be complied with;⁴²
- when moving on board ships, S3 safety footwear must always be worn;
- suitable weather protection clothing must be worn in bad weather;

⁴⁰ Safety footwear consist usually of mid-height footwear or boots made out of leather. There are several standardized categories. Essential requirements of S3-safety footwear are

- a protective lid for the toes out of metal or plastic with a load capacity of 200 Joule,
- antistatic and puncture-resistant soles,
- a certain resilience regarding dampness and wetness, being maintained with corresponding care.

Safety footwear accounting for the category SRC are satisfied the requirements of the standard for the best anti-slip property.

⁴¹ The ship safety division recommends safety vests with a buoyancy of at least 275 N if further PPE with undefined buoyancy is donned in combination with the safety vest, e.g. weather protection clothing (s. handbooksea – occupational safety and health protection in maritime shipping and fisheries A 8.2 October 2014).

⁴² It is not clear whether the instructions of the crew of the pilot vessel and of the seagoing vessel should be followed and under what circumstances instructions may be disregarded.

- ships must always be embarked and disembarked via safe embarkation points and in a manner customary in the seafaring community, e.g. by means of a secured Jacob's ladder⁴³;
- special care is required when crossing from ship to ship and the tested automatic lifejacket⁴⁴ must always be worn.

From the perspective of the Verein der Kanalsteurer e.V., the measures taken are only to be understood as a recommendation, as it is not the employer of the canal helmsmen under labour law.

Irrespective of its role under employment legislation, the Verein der Kanalsteurer e.V. has set up an occupational health and safety committee in accordance with Section 11 *Arbeitssicherheitsgesetz (ASiG)* [German occupational safety act] and holds appropriate meetings. At the last such meeting in 2019, it was determined that almost all canal helmsmen use S3 safety footwear, as recommended by the Verein der Kanalsteurer e.V. In particular, it was claimed that acceptance was so high because word had spread that good safety footwear did not cost very much. Following the accident, the question of work gloves was revisited. Up to now, the use and choice of gloves has only been recommended to helmsmen because using them when crossing via a pilot ladder can lead to additional hazards, e.g. slipping on natural fibre ropes in wet conditions. In cooperation with a supplier of occupational health and safety products, the requirements were re-scrutinised. It was found that

- gloves made of leather or with leather parts are not suitable because they do not provide sufficient grip in wet or frozen conditions;
- completely waterproof (rubber) gloves do not provide sufficient grip on natural fibre ropes and metal railings;
- gloves with special, mostly protruding fasteners, e.g. Velcro on the wrist, do not fit under the cuff of jackets;
- gauntlet-style gloves pose a risk of catching on or behind things.

Three glove samples were chosen for testing. The result is still pending.

⁴³ A Jacob's ladder is a simple rope ladder, usually with round rungs, which does not comply with the requirements for a certified and tested pilot ladder in accordance with Regulation 23, paragraphs 2.3-2.5, Chapter V SOLAS. Jacob's ladders should not be used, as they do not meet the requirements for safe embarkation and disembarkation of pilots (see Regulation 23, paragraph 2.1, Chapter V SOLAS).

⁴⁴ According to the Ship Safety Division only approved vests may be used. These must be marked with a CE-sign.

5.2 Ship operator/shipping company

After the WSP had been on board the MARFAAM several times following the accident and the Ship Safety Division (BG Verkehr) had carried out a port State control inspection in April 2019 without any reservations (see Section 3 of this report), the Dutch ship operator Boomsma Shipping was able to assume the process was completed. After further questions from the BSU and a phone call, the extremely cooperative ship operator arranged for the installation of handholds at the pulled down handrails, in October 2019, which from the BSU's perspective, by all appearances, could be regarded as adequate. Since the gate has a breadth of 82,5 cm, the distance between the hand rails will be greater than 0.8 m and will therefore not comply with the recommendation A1045(27), stipulating that a distance of 0.7 to 0.8 m has to be kept.

Source: Boomsma Shipping



Figure 16: Handholds for accessing the deck of the MARFAAM (October 2019)

Source: Boomsma Shipping



Figure 17: Handholds for accessing the deck of the MARFAAM (October 2019)

Some of the parties involved in this investigation became aware of this measure via the BSU. BG Verkehr, the Verein der Kanalsteurer e.V. and the pilots involved in MARFAAM accidents have made positive statements to the BSU on the measures taken by the ship operator.

The reservations expressed by the Ship Safety Division with regard to possible inadmissible structural changes (s. chapter 3.2.7) are apparently not applicable in this case, since the class did subsequently not complain about.

5.3 The MARFAAM's shipyard; owner of sister ships

The MARFAAM's shipyard was notified about the problem of the missing handholds by the ship operator and wrote to the owners of the sister ships. An owner of six sister ships then contacted the BSU, stating that adequate handholds would be fitted on all ships with a similar embarkation point.

5.4 Federal Chamber of Pilots (FCP)/Lotsbetriebsverein e.V. (LBV)

The FCP and the LBV assisted the BSU in conducting the investigation and preparing the investigation report. They explained in a joint statement, that meanwhile several

measures for preventing similar accidents were implemented and initiated, respectively. These concern especially:

- All LBV employees involved in transfer- and disembarking were equipped with modern helmets for the transfer procedure.
- A call for bids for the uniform equipment of the pilot boats with an optimised arrangement for recovering persons out of the water was published.
- The LBV is asked for a new risk assessment, where appropriate, with the consultation of external experts, with respect to the one-person-operation of the pilot boats in Rüsterbergen.
- The FCP asked the pilots via the pilot associations, to participate in the IMPA-safety campaigns. Feedback conveyed to the FCP shows that the number of participants could be increased significantly.
- The Introduction of an adequate notification app is being advanced by the FCP. A coordination with the GDWS will be effected after the technical and financial demand is established.

6 CONCLUSIONS

The BSU believes that the accident would not have happened if the pilot embarkation point had complied with the international minimum standards and if handholds with a diameter smaller than the handrails that continue down to the deck (about 60 mm) had already been fitted at the gateway. The accident and its consequences may have been facilitated by the underlying conditions (e.g. darkness, insufficient illumination and the rucksack). The consequences of the accident may have been mitigated by appropriate PPE, e.g. gloves, safety footwear, safety vest, back protector and a proper helmet.

In the opinion of the BSU, the MARFAAM had sailed with this embarkation point for years without the deficiency coming to light. The flag State did not eliminate the hazard because it accepted the embarkation point without handholds when the new build was approved. No port State control authorities objected to this embarkation point and ensured it was remedied in a timely manner. There are no known notifications from pilots who objected to the embarkation point. This is all the more astonishing since pilot associations provide extensive information on pilot embarkation points and have been documenting shortcomings and reporting them to the IMO for years.

From the perspective of the BSU, the ship operator of the MARFAAM installed adequate handholds immediately after the specific problem was described to it. The MARFAAM's shipyard wrote to all the owners of the sister ships in order to remedy similar shortcomings.

Positive action has been taken by pilot associations, which have relentlessly gathered information on inadequate pilot embarkation points and raised awareness of this issue among all users. Notification formats that function via smartphone application similar to those of AMSA and UKMPA are exemplary.

The IMPA safety campaign, the accident in Bremerhaven, and other observations made in various ports show that many other ships have similar embarkation points that do not have adequate handholds and that many other shortcomings also exist in the area of pilot transfer arrangements and pilot transfers.

The use of pilot ladders is always dangerous, even when there is no swell and a lower freeboard than in the cases on the NOK described above and no swell. The hazard can be reduced if each involved party analyses the topic in its area of responsibility and – in the context of the safety partnership under Section 3 *Schiffssicherheitsverordnung (SchSV)* [German ship safety ordinance] – takes measures in accordance with the safety recommendations following this accident.

The conclusions are summarised in the following sections in terms of a comprehensive strategy, which comprises:

- long-term action, such as the enhancement of international minimum standards;
- medium-term action, such as the enhancement of national legal frameworks, the development of an application for reporting inadequate pilot transfer arrangements and a CIC by port State control inspectors, and

- short-term action, such as the enhancement of specific occupational health and safety measures and the implementation of targeted inspections by classification societies and port State control inspectors, particularly after notifications of inadequate embarkation points by pilots.

6.1 International regulations

6.1.1 Shipbuilding – missing handholds/gateway

In accordance with Regulation 23, Chapter V SOLAS, the mandatory standards for pilot transfer arrangements with access to a deck are formulated only in a result-driven manner. For example, the arrangements must enable safe embarkation and disembarkation and the handholds to be fitted must be adequate.

The Maritime Safety Committee published criteria for adequate handholds as a recommendation in Resolution A.1045(27), as amended by A.1108(29). Handholds must have a minimum diameter of 32 mm and be rigidly secured to the ship on both sides at or near their base and also at a higher point at a distance from one another of between 0.7 m and 0.8 m.



Source: BSU

Figure 18: Tubing examples of 30⁴⁵/40/60 mm in diameter

⁴⁵ Standard tubing was used for the photograph. At 30 mm, the diameter of the tubing is 2 mm thinner than that permitted by SOLAS.

The replies of the classification societies (which check if pilot transfer arrangements comply with requirements on behalf of the flag State) questioned show that no other flag State requirements for the adequacy of handholds are known about. The recommendations of the Safety Committee are complied with as a general principle. One class recommends that its customers use a diameter of between 40 mm and no more than 45 mm, thus ensuring the handholds are adequate and meet SOLAS requirements.



Source: BSU

Figure 19: Hand grasping a 40 mm tube

The result of this investigation should be used as an opportunity to limit the existing margin of discretion with regard to the circumference of handholds and set a maximum permissible value. Based on the findings of the investigation, the above recommendation of the class is credible and should be made mandatory in SOLAS for all ships with such pilot transfer arrangements.

In addition, the handholds should be coated in a bright colour. Insufficient lighting as well as the lack of a colour differentiation between the entrance area and handrail that continued down to the deck facilitated the accident.

The accident brought to light other hazards, which fortunately did not have any consequences in the present case but which cast doubt on the suitability of the MARFAAM's pilot embarkation point, i.e. the gateway leaf could neither be completely opened nor locked in an open position and the deckhands stood next to an open

gateway without being secured. People embarking can easily lose their footing if they need to hold on to the unsecured gateway. People embarking can easily lose their footing if they need to hold on to the unsecured gateway. In particular, crew members standing at open gateways may lose their footing due to unexpected swell or if they instinctively try to support an embarking person by reaching out, for example. The crew members should be secured against falling from a height.

Before an initiative to amend the SOLAS Convention is submitted, users of pilot transfer arrangements should be consulted on whether further criteria should be laid down in international law for the suitability of pilot transfer arrangements.

6.1.2 Organisation of personnel

Regulation 23, paragraph 2.2, Chapter V SOLAS provides that an officer shall, in particular, supervise the rigging of pilot transfer arrangements and the (dis)embarkation of a pilot on site and communicate with the ship's command on the bridge. Moreover, officers should escort pilots to and from the bridge. Following the entry into force of the Manila Amendments to the STCW Convention, Regulation II/5 of the Annex to the STCW Convention introduced standards of competence for seafarers deck. The BSU therefor believes that it is no longer essential for an officer to perform this duty.

Seafarers who are qualified to hold a certificate of competency in accordance with Regulation II/5 of the Annex to the STCW Convention, are, after appropriate familiarisation, suitably qualified to perform the functions required in this regard. According to the STCW Convention, able seafarers (deck) must only be able to implement the helm orders issued to them in the English language to steer the ship. Further language requirements for able seafarers (deck) are not binding in international law. The ability of the able seafarer (deck) to communicate in the English language with pilots and other embarking or disembarking persons, must be assessed on board the ship by the ship's commands.

The SOLAS standard should take into account the development of the STCW Convention so as to improve compliance with rest periods for officers.

The IMPA safety campaign shows that it is common for pilots not to encounter an officer at the embarkation point. It would not have been possible for an officer at the gateway to prevent the accident investigated here. Similarly, the lessons learned from other pilot embarkation point accidents do not infer that it is strictly necessary for an officer to perform this task.

6.1.3 Visual presentation of the pilot transfer arrangements

The internationally binding and recommended SOLAS regulations for pilot transfer arrangements are complex. At the initiative of the IMPA, the IMO has published a pictorial presentation of the standards. This is helpful for people that deal with this issue. However, this poster relegates the authoritative text to the background. Since the poster neither takes into account all the facts nor contains any indication of omissions, it should be enhanced and disseminated in an appropriate form.

Similarly, BG Verkehr's handbook on occupational health and safety uses images and simplified text to communicate complex issues, making it difficult to present specific facts completely accurately due to simplifications. However, since pictures are more memorable than words, the picture referred to in this investigation should be revised. Alternatively, an appropriate text could take into account the issue of 'adequate handholds' in the short term.

6.2 National measures – safety partnership

The following conclusions relate to aspects that can be influenced at national level within the framework of the safety partnership according to the SchSV, in particular.

6.2.1 Occupational health and safety

To promote the individual safety of canal helmsmen and pilots and to prevent risks to the safety and efficiency of traffic and to the environment, appropriate and effective occupational health and safety measures should be ensured for both professions.

6.2.1.1 Occupational health and safety for canal helmsmen

In any case, the legislator should ensure sufficient occupational health and safety with corresponding assignable responsibility by a statutory rule.

One possibility would be to entrust the Verein der Kanalsteuerer e.V. with the duties of an employer for canal helmsmen under the ArbSchG, for example. In this case, canal helmsmen would have the rights and obligations of workers under the ArbSchG. Moreover, it would be conceivable to introduce a legally binding membership in the Verein der Kanalsteuerer e.V. for canal helmsmen, which must be part of the licensing requirements so that the license can be revoked in the case of expulsion of the Verein der Kanalsteuerer e.V.

The legislator's solution must ensure that as part of its supervisory function, the statutory accident insurance institution is able to confirm that the Verein der Kanalsteuerer e.V. complies with all statutory occupational health and safety measures, carrying out occupational medical examinations, for example, despite corresponding costs. It must be ensured that the Verein der Kanalsteuerer e.V. produces risk assessments, provides PPE and arranges for preventive medical check-ups. The operating instructions produced by the Verein der Kanalsteuerer e.V. following the accident are a step in the right direction but expressed in very general terms. They fail to provide the canal helmsmen with any limits for when embarkation should not be made for reasons of occupational health and safety (see Occupational health and safety at LR, Subsection 3.2.13.45), for example. Canal helmsmen can and should adapt their actions depending on the hazards prevailing. In certain circumstances, for example in the event of a pilot embarkation point being unsuitable and contrary to international law, the particular characteristics of the NOK should be made use of. In certain cases, a transfer at Rüsterbergen should not take place but rather only the locks at Brunsbüttel and Kiel should be used for safe embarkation for reasons of safety. To this end, it would be helpful if Elbe pilots or Kiel Firth pilots reported inadequate pilot embarkation points in an appropriate form.

6.2.1.2 Occupational health and safety for pilots

As long as pilot ladders are used and no technical alternatives are available, users are at risk. In the interest of ship safety and for all pilots, any measures⁴⁶ within the meaning of the ArbSchG should be implemented, even if there is currently no legal obligation to do so.

At the very minimum the State should ensure that physical fitness for works involving a risk of falling from a height is known and that examination elements are taken into account in accordance with the preventive medical check-up for works involving a risk of falling from a height (G 41) in the SeeLotUntV 1998.

According to Section 8(2) ALV, pilotages may be refused, inter alia, in case of serious deficiencies regarding the ship/equipment. Pilots should assume a serious deficiency in connection with a pilot embarkation point, if the embarkation point does not meet international standards or is not suitable and no alternatives, such as transfer by helicopter, can be used.

6.2.2 Notification of identified deficiencies

Pilots should notify the Ship Safety Division's 24/7 on-call service immediately of embarkation points endangering the safety via the Vessel Traffic Services.

However, reporting readiness of the pilots should be improved by appropriate means.

The issue of pilot embarkation points is complex. Hazardous situations must be identified, communicated immediately and eliminated. It is the user of a pilot embarkation point, in particular, who will be best placed to identify a safety risk. Identified risks must be reported to the competent port State control authority as soon as possible so that – in the best case – they can be eliminated without undue delay.

AMSA and UKMPA have developed tools for good communication between pilots and the Administration with their applications, which can provide guidance for own measures (see Subsection 3.2.13.2). In particular, an application should consider the following aspects:

- relevant and up-to-date information about pilot embarkation should be freely available at all times;
- safety risks and necessary action should be stored categorised;
- it should be possible to submit notifications in a standardised manner;
- taking into account data protection, notifications from a third party should be accessible to avoid duplication;
- corrective actions should be communicated as far as possible.

⁴⁶ In particular, this includes the preparation of risk assessments, preventive medical check-ups, and the use of appropriate PPE to the extent necessary on the basis of the risk assessment.

With a user-friendly application, the prescribed reporting-channel via the Vessel Traffic Services to the Ship Safety Division could be simplified, so that the notification is simultaneously sent to both recipients. Possibly, a software usable for this can be applied with the existing PPU's.

6.2.3 Inspections (flag State – classification societies/port State)

The inspection of ships for their safety and compliance with international standards, e.g. for pilot transfer arrangements, is the responsibility of the flag State, which usually delegates this task to classification societies. Port State control inspectors carry out spot checks to verify that flag States comply with their responsibility and take corrective action whenever necessary. In the present case, neither the flag State nor the port State had identified any deficiencies. The missing handholds were the cause of the accident and led to severe injuries. The ship's operator was able to remedy the cause quickly and, in all probability, inexpensively. According to IMPA ship safety campaign figures, other shortcomings of this nature also exist.

Flag States (or the classification societies appointed) and port State control inspectors should inspect pilot embarkation points with a gateway in the rails during forthcoming inspections and, if necessary, ensure any shortcomings, such as missing or inadequate handholds, are remedied.

6.2.4 CIC

In light of the accident and the results of the annual IMPA safety campaigns, port State control authorities should consider the issue of pilot transfer arrangements as a matter of principle within the framework of a CIC⁴⁷.

Such a measure could reduce the risks to people embarking at least on the part of seagoing vessels.

6.2.5 Crew of the pilot vessel

Pilot vessels at Rusterbergen are manned by only one person (the skipper). In both the accident investigated and the others, there were other people on board who were not part of the crew in all cases. These people were able to provide support and prevent more severe consequences.

Even if one-person operation has existed for years without any known accident consequences, the operator should review this concept on the basis of a risk analysis. Particular attention should be paid – in addition to the tasks assigned to the deck crew in order to reduce the risks mentioned in chapter 4.3.1 – to the options for rescuing people who fall overboard, caring for casualties, the increased risk of displacement in particular weather conditions and low temperatures.

⁴⁷ CIC: Regular checks are carried out on board seagoing vessels in port to ensure that international regulations on ship safety, pollution prevention and the working and living conditions of seafarers are complied with. Many countries jointly coordinate inspections. Germany is a signatory to the Paris MoU, for example. Signatories agree upon annual priority inspections (so-called CICs).

6.2.6 Pilot ladders – alternative personnel transfer arrangements

Since the transfer of people via pilot ladder is easy to implement technically and therefore inexpensive, fundamental technical changes on the part of the ship's operator are not to be expected. People such as canal helmsmen and pilots will therefore have to take whatever steps they can to protect themselves individually so as to reduce risk.

In addition to PPE, consideration should nevertheless be given to alternative systems to reduce or eliminate the risk of falling from a height for as long as people at sea have to use a pilot ladder to cross from one vessel to another.

Developments in the offshore wind farm sector may provide information on alternative personnel transfer arrangements or safety systems. A separate examination as to whether suitable alternative products are already on the market should be made.

7 SAFETY RECOMMENDATIONS

The following safety recommendations do not constitute a presumption of blame or liability in respect of type, number or sequence.

7.1 Federal Ministry of Labour and Social Affairs

- a) The BSU recommends that the Federal Ministry of Labour and Social Affairs clarify the legal status of canal helmsmen with regard to occupational health and safety.
- b) The BSU recommends that the Federal Ministry of Labour and Social Affairs introduce and enforce binding occupational health and safety standards for canal helmsmen that correspond to the general standards of the ArbSchG.

7.2 Federal Ministry of Transport and Digital Infrastructure

- a) The BSU recommends that the Federal Ministry of Transport and Digital Infrastructure consider an initiative to amend Regulation 23, Chapter V SOLAS Convention:
 - aa) the adequacy requirements for handholds at a pilot embarkation point with a gateway should be specified with regard to circumference of these handles (minimum/maximum), in particular, and should be mandatory for all ships. In addition, the handholds should be coated in a bright colour, the gateways always fully open and it should be possible to lock the gateways in an open position. Crew members standing at an open gateway should be secured against falling from a height so as to be able to assist with embarkation if necessary (see also Investigation Report 478/09);
 - ab) ship's commands should be permitted to arrange the mandatory organisation of personnel during a pilot transfer, as required by Regulation 23, paragraph 2.2, Chapter V SOLAS, more flexibly to allow for officer rest periods. The Manila Amendments to the STCW Convention introduced standards of competence for seafarers deck. By virtue of their competence, holders of a seafarer deck certificate of competency should be allowed to carry out the duties associated with pilot embarkation and disembarkation in place of an officer, as far as the linguistic communication with the pilots is provided for.
- b) The BSU recommends that the Federal Ministry of Transport and Digital Infrastructure develop the requirements for the licencing of canal helmsmen further and issue a regulation in accordance with the SeeAufgG.
- c) The BSU recommends that the Federal Ministry of Transport and Digital Infrastructure revise the SeeLotUntV 1998, taking into account examination criteria for works involving a risk of falling from a height.

7.3 Classification societies

The BSU recommends that classification societies approved by Germany do not substitute 'handholds', as prescribed by SOLAS, with stanchions, handrails, handhold stanchions, etc. at pilot embarkation points with a gateway.

7.4 Ship Safety Division (BG Verkehr)

- a) The BSU recommends that BG Verkehr pay more attention to possibly absent handholds at pilot embarkation points with a gateway during port State control inspections, so as to initiate appropriate measures to remedy any shortcomings if necessary.
- b) The BSU recommends that BG Verkehr launch an initiative to conduct a CIC for pilot transfer arrangements, taking into account all aspects of the pilot embarkation point in accordance with the IMPA safety campaign.

7.5 Prevention Division (BG Verkehr)

The BSU recommends that the Prevention Division (BG Verkehr) revise the visual presentation of a pilot transfer in the manual on occupational health and safety in merchant shipping and fisheries (s. especially 3.2.13.4).

7.6 GDWS

The BSU recommends that the GDWS review the one-person operation of pilot vessels on the NOK taking into account the tasks of the deck crew mentioned in chapter 4.3.1, in order to preferably prevent accidents during a pilot transfer or other comparable operations. It should always be possible to ensure that person-overboard manoeuvres and first aid measures can be carried out immediately.

7.7 Verein der Kanalsteuerer e.V.

The BSU recommends that the Verein der Kanalsteuerer e.V. continue and enhance ongoing occupational health and safety measures for its members until the current legal position is clarified, i.e. in particular give concrete form to the operating instructions, continuous training on the subject of embarkation via pilot ladder.

7.8 FCP

- a) The BSU recommends that the FCP regularly advise all pilot trainees and pilots within the scope of their basic and advanced training that dangerous pilot embarkation points are to be reported to the Vessel Traffic Services (VTS).
- b) The BSU recommends the FCP regularly advise all pilot trainees and pilots within the scope of their basic and advanced training that pilotages may be refused under the terms of Section 8 (2) ALV, if the embarkation point neither complies with the international standards nor is adequate and no alternative can be used.
- c) The BSU recommends that the FCP develop and provide a digital application (App) for pilot embarkation points. In particular, this application should be capable of presenting current requirements for pilot embarkation and notifications to the respective Vessel Traffic Service and the Ship Safety Division with respect to

arrangements endangering safety in a manner that is transparent for all users. Possibly, the PIA can be further developed. The FCP should include the port pilots.

- d) The BSU recommends that the FCP enhance the safety culture among pilots so as to reduce dangers during pilot transfers at sea. In particular, this includes the introduction of risk assessments and use of appropriate PPE.
- e) The BSU recommends that the FCP enhance the poster on pilot transfer arrangements published by the IMPA via the IMO. In particular, the poster should include a note stating that it contains only a selection of possible pilot embarkation points and that the SOLAS text is authoritative.
- f) The BSU recommends that the FCP participate in the SOLAS amendment initiative. In particular, further adequacy criteria for handholds should be specified if necessary.
- g) The BSU recommends that the FCP assist BG Verkehr (Ship Safety Division) in preparing a CIC.
- h) The BSU recommends that the FCP conducts or commissions a study about “alternative pilot transfer arrangements to avoid pilot ladders” and implement appropriate alternatives so as to improve the occupational health and safety for all users of pilot ladders.

7.9 Port pilots

The BSU recommends that the competent authorities of the Free and Hanseatic City of Hamburg and the Free Hanseatic City of Bremen implement all safety recommendations of this investigation report relevant to port pilots in accordance with the law of the respective *Land*. Moreover, it is to be ensured that pilotages may be refused if the embarkation point neither complies with international standards nor is adequate and no alternative can be used.

8 SOURCES

- Enquiries of the WSP
- Witness testimony
- Written explanations/submissions
 - Prevention Division (BG Verkehr)
 - Ship Safety Division (BG Verkehr)
 - FCP
 - GDWS
 - Classification societies
 - Lotsbetriebsverein e.V.
 - Verein der Kanalsteurer e.V.
 - Ship's command/crew members
 - Ship operator/shipping company
- Official weather report, DWD
- Technical papers (WSP of the *Länder*)
- Navigational charts, BSH
- Legal frameworks/comments, in particular:
 - SOLAS Convention
 - STCW Convention
 - SeeAufgG
 - SeeLG
 - ALV
 - ArbSchG
 - SeeSchStrO
 - Resolutions of the Maritime Safety Committee, guidelines, fact sheets
- Information published on the internet:
 - IMO, EMSA, IMPA, AMSA, MCA, *et al.*

9 ANNEXES

- 9.1 Regulation 23, Chapter V SOLAS; mandatory provisions for pilot transfer arrangements on ships such as the MARFAAM built between 1 July 2002 and 1 July 2012**
- 9.2 Resolution A.1045(27) of the Maritime Safety Committee: Recommendation on Pilot Transfer Arrangements**
- 9.3 MSC.1/Circ.1428 of 28 May 2012, poster on pilot transfer arrangements**
- 9.4 IMPA Safety Campaign 2019**