

Fall accident

The Swedish Accident Investigation Authority has investigated a fall accident involving ROERBORG in the Port of Oxelösund, Södermanland county, 15 October 2023

19 November 2024



About Swedish Accident Investigation Authority

The Swedish Accident Investigation Authority (SHK) investigates accidents and incidents from a safety perspective regardless of whether they occurred on land, at sea or in the air. The authority's accident investigations are intended to disseminate knowledge and provide a basis for actions by authorities, companies, organizations, and individuals that improve safety and reduce the risk of accidents. The activities should also contribute to people feeling secure and having trust in society's institutions and the confidence in transportation systems. The mission also includes assessing the efforts made by the rescue services in connection with an accident. However, the investigations should not assign blame or liability, whether criminally, civilly, or administratively.

The investigations by SHK aim to answer three questions:

- What happened?
- Why did it happen?
- How can a similar accident/incident be avoided in the future?

The report is also available on the Swedish Accident Investigation Authority's website: www.shk.se.

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Summary

On Sunday 15 October 2023 a fall accident occurred on the general cargo ship ROERBORG. The vessel was berthed in the port of Oxelösund and was loading steel products. One crew member had just manoeuvred the gantry crane that was on board for the purpose of lifting the cargo hold hatches off and on. The crew member began climbing down from the crane but lost their footing and fell down onto the quay. The crew member initially fell down onto a small platform on the lower part of the gantry crane, then over the platform railing and down over the railing that ran along the side of the vessel, before finally landing on the quay. The total height of the fall was just over 11 metres.

The crew member was seriously injured by the fall, but did not suffer permanent injuries. At the time of the accident the person was wearing several layers of clothing and a helmet with a chinstrap. The clothing and the personal protective equipment have probably mitigated the consequences.

The investigation shows that there were deficiencies in the fall protection arrangements on the gantry crane. The upper ladder was equipped with a protective cage that seems to have worked as intended. However, the platform under the ladder was too small or did not have surrounding protection that was high enough to catch the falling crew member.

The various fall protection arrangements seem to have been designed to be used on a level surface. In fact, the crane ran on an elevated cargo hold coaming along the side of the vessel next to the open cargo hold, which meant that the fall protection arrangements became insufficient for the actual fall height.

Causes of the accident

The reason why a crew member could fall overboard was that the fall protection arrangements were designed in such a way that they did not provide sufficient protection.

The underlying reason why the fall protection arrangements did not provide sufficient protection was that the design of the fall protection did not take into account the actual conditions that prevailed where the gantry crane was used.

Safety recommendations

The measures taken by the shipping company after the accident are considered sufficient and SHK sees no need to issue any recommendations.

The investigation

SHK was informed on 15 October 2023 that a fall accident involving ROERBORG, with the registration IMO number 9592599, had occurred in Oxelösund, Södermanland county, that same day at 12:00 hrs.

The accident has been investigated by SHK represented by Kristina Börjevik Kovaniemi, Chairperson until 30 January 2024, and subsequently Jenny Ferm, Chairperson, Daniel Söderman, Investigator in Charge Björn Ramstedt, Operations Investigator.

Linda Eliasson has participated as coordinator for the Swedish Transport Agency.

Investigation material

Interviews have been conducted with the crew member who was injured. The ship was visited two months after the accident to examine the gantry crane and talk with parts of the crew. The crew's written testimony as well as the police's photos from the scene have been obtained. Documentation and regulations have been reviewed. The investigative report made by Wagenborg Shipping B.V. has also been reviewed.

Final report SHK 2024:16e

Ship particulars	
Flag/register	The Netherlands
Identification IMO identification/ call sign	9592599/PCPO
Type of ship	General Cargo Ship
New building shipyard/year	2014
Gross tonnage	14 224
Length, over all	169.75 m
Beam	20.4 m
Draft, max	9.5 m
Deadweight at max draft	23 260 tonnes
Main engine, output	4 500 kW
Propulsion arrangement	One diesel engine connected to one propeller with a fixed pitch
Lateral thruster	860 kW
Ownership and operation	Wagenborg Shipping B.V.
Classification society/RO	Bureau Veritas/Lloyds Register

Voyage particulars	
Berthed in	Oxelösund, the steel port
Manning	13

Marine casualty information	
Type of marine casualty	Very serious marine incident
Date and time	15/10/2023, at 12:00 noon
Position and location of the marine casualty or incident	58°40'31 N, 017°8'13 E
Weather conditions	North-westerly wind 6 m/s and good visibility. Air temperature c. 10° C
Other factors	
Consequences	
- Injuries to persons	One person was seriously injured by the fall.

1. Factual information

1.1 Sequence of events

The general cargo ship ROERBORG was berthed at the steel port in Oxelösund and was loading products from the steelmaker SSAB. The vessel had been in the port for five days. It was midday and the weather was clear, with moderate winds and good visibility.

The ship had a gantry crane, which ran on a rail on the coaming of each side of the holds and was used to lift on and off the hatches covering the holds, see Figures 1 and 2. After a crew member had operated the crane and was about to climb down, the crew member lost their footing on one of the upper rungs and fell down onto the quay. The total height of the fall was just over 11 metres, but the fall took place in stages.



Figure 1. ROERBORG berthed in Oxelösund, but not at the quay where the accident took place. The gantry crane is the white structure visible in the red markings. The blue crane in the background belongs to the port.

The crew member initially fell down onto a platform on the lower part of the gantry crane, then over the platform railing and down over the railing that ran along the side of the vessel, before finally landing on the quay.

The ladder that the crew member was climbing on was equipped with a protective cage and the platform under the ladder was equipped with a railing. Between the platform railing and the ladder's protective cage there was an unprotected space measuring just over 1 metre, which the crew member fell through, see Figure 2.

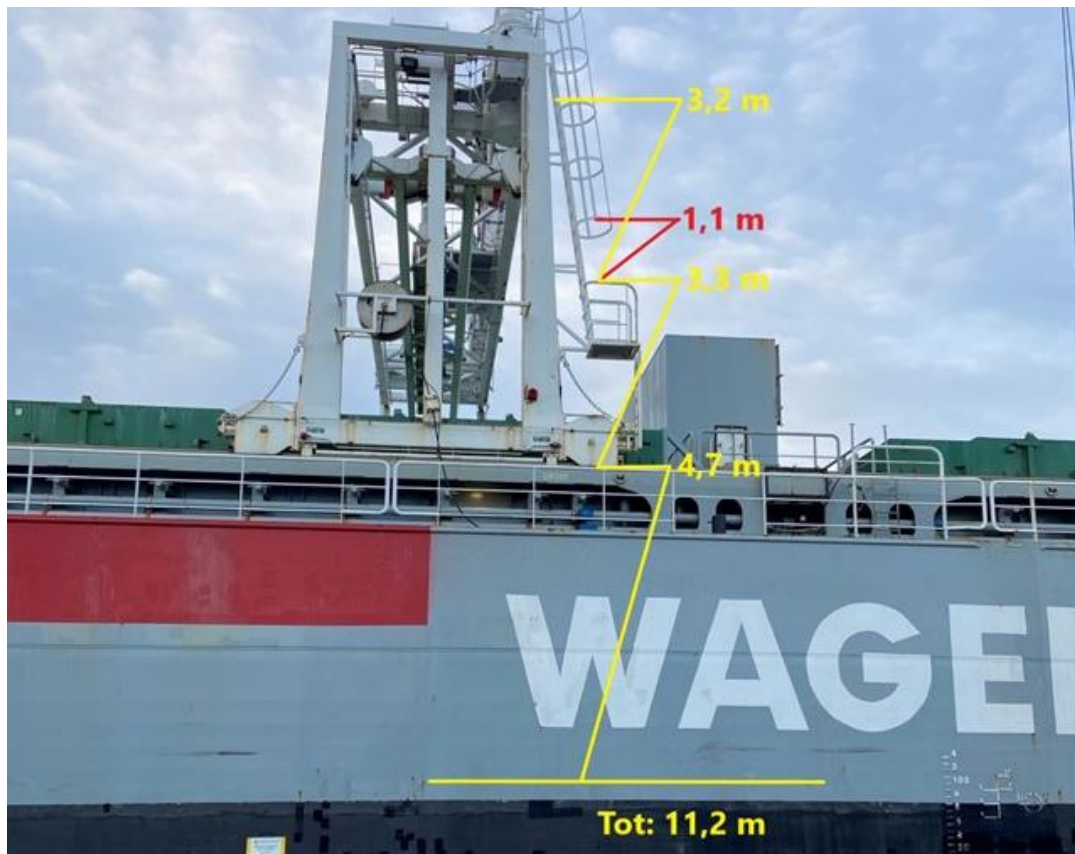


Figure 2. The picture shows how the person fell down onto the quay. Yellow lines and figures mark the heights of the various stages of the fall. Red figures and lines mark the opening that was present between the ladder's protective cage and the railing on the narrow platform. The picture has been taken on another occasion when the vessel had a different draught. The bottom yellow horizontal line marks the height of the quay at the time of the accident.

Other crew members saw the fall and rushed down onto the quay in order to provide assistance and also called for external assistance. The first unit that arrived was from the internal rescue service at SSAB and then an ambulance arrived that took the injured person to the hospital in Nyköping. However, the injuries required more advanced care and the injured crew member was therefore transferred to Karolinska University Hospital in Solna, Stockholm county.

After having been discharged from hospital, the crew member had to stay at a hotel for a period of time with regular follow-up appointments at the hospital until the crew member's state of health allowed for a flight home.

1.2 Ship particulars

ROERBORG was owned and operated by Wagenborg Shipping B.V., a Dutch shipowner founded in 1898 with over 160 vessels and just over 3,000 employees.

The vessel belonged to a series of three general cargo ships, together with REESTBORG and REGGEBORG, and was also the shipowner's largest in terms of cargo capacity. They were built in Germany by Ferus Smit Leer GmbH. The vessels operated internationally and were able to carry not only general cargo but also bulk goods and containers.

ROERBORG had two cargo holds. Cargo hold 1 stretched from the forward mooring deck to half the length of the vessel. Cargo hold 2 stretched from half the length of the vessel to the deckhouse, see Figure 3.

The crew consisted of various nationalities including the Netherlands, the Philippines and South Africa.

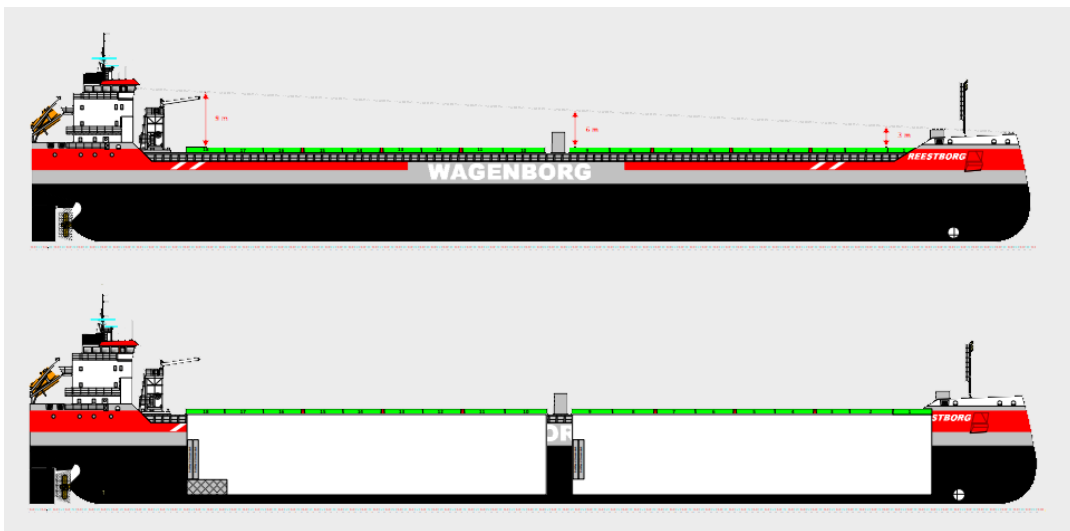


Figure 1. Side view showing the vessel. The lower picture shows a cross-section of the cargo holds.
Illustration: Wagenborg Shipping B.V.

1.3 Description of relevant parts of the equipment and systems

1.3.1 Fall protection arrangements on and surrounding the gantry crane

The gantry crane was used to lift the cargo hold hatches on and off and was moved fore and aft on rails. The rails were located on the cargo hold coaming on each side of the cargo hold, see Figure 4.



Figure 2. View from the top of the gantry crane. The cargo hold is open and the cargo hold hatches are lying in the background stacked on top of one another. The cargo hold frame is visible within the circled area.

To get to the crane, it was necessary to walk on the cargo hold coaming, which was around 1.3 metres above the level of the deck. The cargo hold coaming was not equipped with railings. Below the coaming was the bulwark, which was about 1 metre wide and had a 110 cm-high railing towards the sea. The cargo hold was on the inside of the coaming. When the cargo hold hatches were removed there was nothing to prevent a person from falling from the coaming down into the open cargo hold.

To get up on the gantry crane from the cargo hold frame it was necessary to first climb on a 2.2 metre-high and 30 cm-wide ladder to a small platform. The platform was just over 1 square metre in size and was equipped with a 110-cm-high railing. From the platform there was a 4-metre-high and 30-cm-wide ladder up to the top of the gantry crane. The upper ladder was equipped with a protective cage that began 2.2 metres above the floor of the platform and extended to just over one metre above the upper part of the gantry crane. The protective cage consisted of five horizontal hoops that were welded in place, with three vertical bars between the hoops. The diameter of the hoops was just under 70 cm. There was an unprotected space between the railing on the platform and the ladder's protective cage, see Figures 2 and 5.

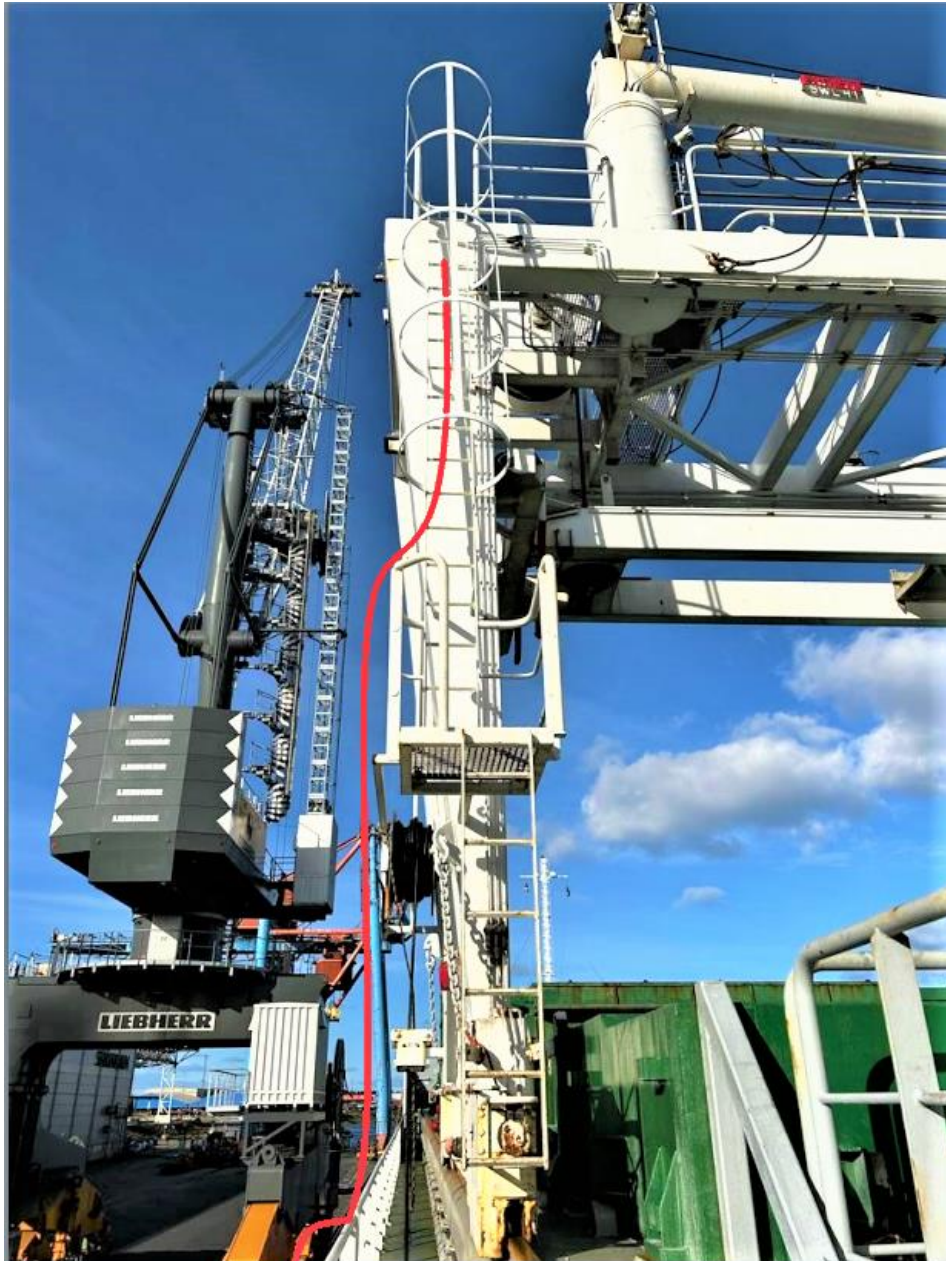


Figure 3. The picture shows the ladder and platform of the gantry crane. The red line marks the approximate route of the crew member's fall.

1.3.2 The quay

The quay at which ROERBORG was berthed was, approximately 2.5 metres above the sea surface. Impact-absorbent fenders were mounted alongside the quay. These fenders made a gap of approximately 70 cm between the edge of the quay and the side of the vessel when it was berthed, see Figure 6. On the quay there were also bollards, pipe structures, rails and other things that were sticking up.



Figure 4. The quay at the steel port in Oxelösund where the accident took place.

1.3.3 Personal Protective Equipment

The crew member who fell was wearing protective shoes, gloves and a helmet with a chinstrap, in accordance with the personal protective equipment matrix developed by the shipping company for the work in question. The crew member was to be working outdoors for several hours and was dressed warmly in several layers. The crew member was not wearing a lifejacket or other floatation aid and these are also not used when performing this type of task.

1.4 Regulations

1.4.1 International rules and standards

There are no specific international requirements for ladders or fall protection for vessels, with the exception of certain rules governing the width of stairs for evacuation and arrangements for access to, for example, cargo holds and tanks on board.

There is an international standard for fixed vertical steel ladders onboard ships, ISO 3797¹. The standard specifies how a ladder with fall protection must be designed. The ladders on the gantry crane were designed according to the standard.

¹ ISO 3797 Ships and marine technology – Vertical steel ladders.

1.4.2 The rules of the classification society

When a ship is built, it is the rules of the classification society and the national regulations of the flag state that determine how ladders, stairs, railings and other protection against falls should be designed. However, Bureau Veritas does not have its own rules for ladders and fall protection on gantry cranes, but refers to the flag state's regulations.

1.4.3 National rules

The vessel was flagged in the Netherlands and it is therefore Dutch law that applies to the work on board. The Dutch working conditions regulation contains general rules concerning fall protection². This states that when performing work where there is a risk of falling, the danger shall be mitigated through the mounting of appropriate fencing, railings or other similar devices. According to the rules, a risk of falling is considered to exist if the fall height is 2.5 meters or more. Furthermore, it is stated that railings and handrails are considered effective and provide protection against falls if they are at least 1 metre above the work surface.

Under this regulation measures that aim to provide collective protection take precedence over measures that aim to provide individual protection, which means that, for example, railings that protect everyone are preferable to individual harnesses and lifelines.

2. Actions taken

On the same day as the accident, the shipping company's Designated Person Ashore (DPA) travelled to ROERBORG and the day after that to the hospital in Solna to meet the injured crew member. An internal investigation report was made afterwards.

After the accident, the shipping company modified the fall protection arrangements at the crane. The protective cage around the upper ladder has now been extended to meet the railing of the platform below. Different options were considered before the final design was determined, see Figure 7.

The internal investigation report recommends the shipping company:

- That gantry crane ladders with associated fall protection, on the shipping company's other vessels should be checked and modified if necessary.
- To share the internal investigation report with the crane manufacturer.
- To consider more guidance for newly hired crew members and also consider their background skills.

² [wetten.nl - Regeling - Arbeidsomstandighedenbesluit - BWBR0008498 \(overheid.nl\)](https://wetten.nl/Regeling-Arbeidsomstandighedenbesluit-BWBR0008498)



Figure 7. Additional protection has been added between the platform railing and the ladders protective cage.
Picture: Wagenborg Shipping B.V.

3. Analysis

The aim of the analysis is to establish why the crew member was able to fall overboard from a crane despite there being fall protection devices.

Nothing has emerged to indicate that the weather conditions at the time, the crew member's health or the work situation on board had an impact on the accident.

Nor has anything come to light during the investigative work that prompts SHK to analyse the rescue effort more deeply.

3.1 What happened?

A crew member climbed down from a gantry crane on board but lost their footing and fell. The first stage of the fall took place down through the protective basket that was around the ladder. At the end of the protective basket, the crew member then fell out through a gap between the protective basket and the railing onto the platform that was under the steps. The crew member was not caught by the railing along the ship's side but instead hit the railing and then fell onto the quay.

3.2 Why did it happen?

3.2.1 There were deficiencies in the design of the fall protection

Both the platform and the upper ladder were equipped with fall protection in the form of a railing and protective basket. However, the overall protective ability of the fall protection arrangements at the gantry crane was insufficient.

The ladder from the top of the crane, the upper ladder, had a protective basket, but between the platform railing and the ladder protective basket there was a space of 1.1 meters open on all sides. Through that opening the crew member fell out. Had the platform been larger or had additional protection on the sides, the person would have landed on the platform floor instead of falling further.

The railing around the platform was 1.1 metres high and protected three of the four sides. The aft side, where the ladder between the cargo holds coaming and the platform was located, was open. The platform was probably not made larger because there would be a risk of this hitting removed cargo hold hatches and other things alongside the leg of the crane.

It may be the case that the platform did not have railings aft because the platform floor was 2.2 metres above the cargo hold frame. If the cargo hold coaming is considered as floor level, the distance is thus lower than the 2.5 meters, which according to the Dutch regulations require fall protection, see section 1.4.3. However, the cargo hold coaming should not be regarded as a floor area when designing the fall protection. The cargo holds hatches cannot be considered floor space either. The crane may fail or the vessel may lose power when standing at an open hold. Then it is about 13 meters down to the bottom of the hold from the hold frame and a further 2.2 meters from the platform on the crane. There is also always a risk of falling overboard.

It can be stated that there were deficiencies in the fall protection arrangements that need to be rectified in order to prevent similar accidents from occurring again.

3.3 What can be done to avoid a similar accident?

3.3.1 The fall protection needs to be reviewed

The open gap between the platform railing and the ladder's protective cage meant that the crew member was not caught as intended when falling down from the ladder. The platform itself only had railings on three sides and was open aft. If a person who is standing on the platform loses their balance, there is a risk of them falling down onto the cargo hold coaming and, in the worst case, also down into the cargo hold or overboard. The shorter lower ladder between the platform and the cargo hold coaming had no protection at all against falling down into the cargo hold, and there was also a risk of falling overboard.

After the accident, the shipping company modified the fall protection arrangements at the crane. See Section 2 and Figure 7.

4. Conclusions

4.1 Findings

- a) A crew member who was climbing down a ladder from a crane on the vessel fell down onto the quay.
- b) The upper ladder had a protective cage.
- c) The platform under the ladder had railings on three out of four sides.
- d) The lower ladder did not have a protective cage.
- e) The crew member fell out from the platform through the gap between the platform railings and the protective cage.
- f) The crew member hit the ship's side railing and then fell onto the quay.
- g) The fall took place in three stages, two falls of just over 3 metres and the final fall of just over 4 metres.
- h) The crew member who fell was seriously injured.
- i) The fall protection arrangements that were in place did not prevent the person from falling down onto the quay.

4.2 Causes of the accident

The reason why a crew member could fall overboard was that the fall protection arrangements were designed in such a way that they did not provide sufficient protection.

The underlying reason why the fall protection arrangements did not provide sufficient protection was that the design of the fall protection did not take into account the actual conditions that prevailed where the gantry crane was used.

5. Safety recommendations

The measures taken by the shipping company after the accident are considered sufficient and SHK sees no need to issue any recommendations.

On behalf of the Swedish Accident Investigation Authority

Jenny Ferm

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