Vooruitgangstraat 56

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Belgium

Report 2019/000523

Report on the fatal accident on board mv SIMON STEVIN on 28 January 2019

Federal Bureau for the Investigation of Maritime Accidents

Extract from the European Directive 2009/18/EC

(26) Since the aim of the technical safety investigation is the prevention of marine casualties and incidents, the conclusions and the safety recommendations should under no circumstances determine liability or apportion blame.

Contents

1 List Of Illustrations

2 Glossary of Abbreviations and Acronyms

EC	European Community
FPO	fall pipe operator
FPV	fall pipe vessel
IMO	International Maritime Organisation
kW	kilowatt
m	metre(s)
mm	millimetre(s)
mt	metric tonnes
mv	motor vessel

3 Marine Casualty Information

3.1 Classification of Accident

According to Resolution A.849(20) of the IMO Assembly of 27 November 1997, Code for the investigation of Marine Casualties and Incidents, a *very serious marine casualty* means a marine casualty involving the total loss of the ship or a death or severe damage to the environment, consequentially, the incident was classified as

VERY SERIOUS

3.2 Accident Details

Time and Date	28 January 2019
Location	moored alongside at the Port of Zeebrugge (Belgium)
Deceased	1

4 Synopsis

The subsea rock installation vessel mv SIMON STEVIN was moored alongside at the Port of Zeebrugge for overhauling purposes. Most of the crew, except a few watchmen, were working in dayshifts, from 06.00 to 18.00.

On Monday, January 28th, tests of the fall pipe system were planned as maintenance of the system had been finished. A load test was witnessed by the classification society around 14.00. Not being successful, this test was stopped around 15.00 and the classification society left the vessel. The crew executed some improvements and controlled the entire system prior to do another test around 17.30.

At 17.55, a steel pipe section was lifted by the gripper and transferred to the manipulator of the gantry crane to drop off the pipe in a dedicated storage position. As the test with this particular pipe section was successful, a meeting was held and it was decided to continue the test with a heavier pipe section, namely the telescopic pipe.

The returning of a steel pipe to the storage position is an automated process, but the railing between the fall pipe deck and main deck level, some 12 metres below, needs to be opened allowing the manipulator enough space to transfer the steel pipe.

Both, the first fall pipe operator and the apprentice were present at the fall pipe deck, overseeing the operation of the transfer and drop off of the steel pipe.

The control room was also manned and was in communication with the two persons on the fall pipe deck, one level above.

Around 18.00, the manipulator failed to put the steel pipe back in the brackets at the storage position, so the first operator used the belly box remote control to overrule the automated process and to position the pipe in the guide brackets. To have a clear view on the storage position of the pipe, he entered the pipe handling area between the pipe racks.

To reset the manipulator back to automatic mode, it was necessary to bring it to the waiting position, in front of the opened gates. From the position of the operator, the waiting position was located behind his back.

The operator was walking backwards to keep a visual on all the components of the gantry crane diagonally above him while it was moving towards the waiting position. The apprentice was also observing the gantry crane.

The operator didn't notice that he was approaching the opened gate behind him and he fell down onto the main deck.

5 Factual Information

5.1 Particulars of mv SIMON STEVIN

Figure 1 - mv SIMON STEVIN

Name of ship	SIMON STEVIN
IMO number	9464807
MMSI nr.	253309000
Call sign	LXUB
Flag State	Luxembourg
Ship / craft type	subsea rock installation vessel
Gross tonnage	35.034
Deadweight	35.930 mt
Date keel laid	2008
Company name	Dredging & Maritime Management
Service speed	15,5 knots
Propulsion type	Internal combustion/Electric engine
Max. engine power	24.350 kW
Nr. main engines	4
Length overall	191,5 m
Breadth	40,0 m
Draught	9,25 m
Hull material	Steel
Capacity	70 persons

5.2 Fall Pipe Vessels

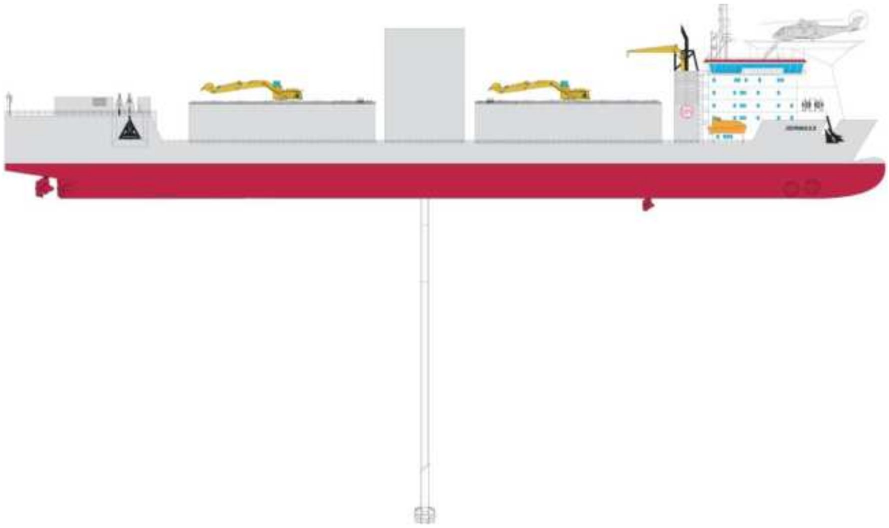

Figure 2 – Pictorial representation of a fall pipe vessel

A fall pipe vessel (FPV) is a self-propelled vessel that is equipped with pipe sections that can be connected on board to obtain a long fall pipe beneath the vessel as represented in Figure 2 on page 11.

Using its fall pipe, the vessel is able to guide rocks with a size up to 400 mm, from the water level, to depths up to 2,000 m. The fall pipe end is positioned by a powerful remotely operated underwater vehicle and allows for accurate rock installation on the seabed.
These vessels are highly suited to cover offshore cables and pipelines. They are also used to prepare the seabed for offshore structures and to put in scour protection for offshore wind turbines and platforms.

To keep up with the pace of oil and gas field developments in deeper waters, the dredging industry started engineering fall pipe vessels in the 1970s:

- At the end of the 1970s a steel, telescopic fall pipe was developed for rock installation at water depths significantly exceeding 50 metres. The large diameter steel fall pipes are, however, sensitive to drag.

- In the mid-1980s an improved technique was developed based on a semi-open, flexible fall pipe consisting of a string of bottomless, heavy plastic buckets along two chains. At the lower end of the string a remotely operated, propelled vehicle was attached. The remotely operated vehicle was equipped with a range of sophisticated technologies such as a camera and survey and positioning equipment. This flexible fall pipe design with the remotely operated vehicle, installed on a dynamically positioned vessel, was able to achieve more accurate placement of rock by correcting the off-setting caused by currents. The drag forces were lower and therefore the system was less sensitive to rupture.

- In the early 1990s DGPS (Differential Global Positioning System) was introduced in the offshore oil and gas and marine construction worlds: Differential drift of the rock-laying fall pipe vessel with respect to the subsea pipeline or cable could be achieved by dynamic positioning.

Further development and engineering lead to the construction of specialised fall pipe vessels with high loading capacities, similar to mv Simon Stevin.

5.3 Handling of Steel Pipe Sections on board FPV Simon Stevin

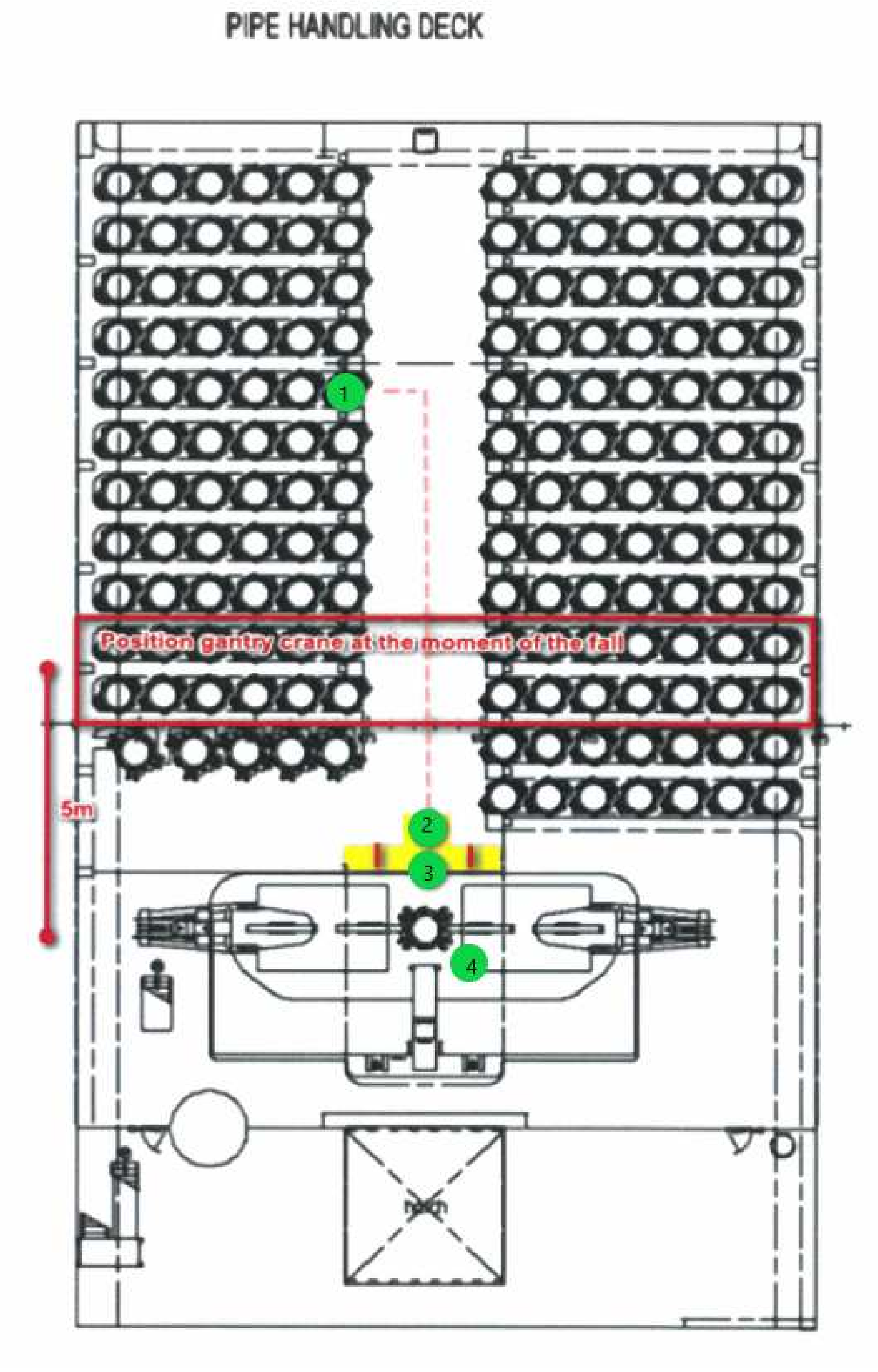

Figure 3 – Pipe handling deck

1. Pipe racks, where steel pipe sections are stored
2. Waiting position of the gantry crane (manipulator)
3. Railing that needs to be opened to transfer the pipes from the manipulator to the gripper
4. Gripper operating above the moon pool

As shown in Figure 3 on page 13, steel pipe sections had a storage position on the fall pipe deck. A manipulator (gantry crane) installed on this fall pipe deck could handle the pipes and transfer them to the gripper. The gripper could lower the pipe sections, so they could be connected to each other forming one long fall pipe through the moon pool in the ship's hull. The moon pool hatch was at main deck level, the fall pipe deck is some 12 metres higher. There was a railing between both deck levels that needed to be opened to allow for the transfer of steel pipe sections. The two gates in the railing needed to be opened manually. Both gates allow for a 90° opening, creating a safety barrier for any person that wanted to cross the pipe transfer area.

The transfer of steel pipe sections was an automated process. No person needed to enter the area during pipe transfers. The area where the transfer was performed was painted yellow. A zone painted yellow on board Simon Stevin is classified as a caution area. This is a location where extra care need to be taken due trip, slip and fall hazards.

Figure 4 - Pipe racks with steel pipes

Figure 5 - Gantry crane (manipulator)

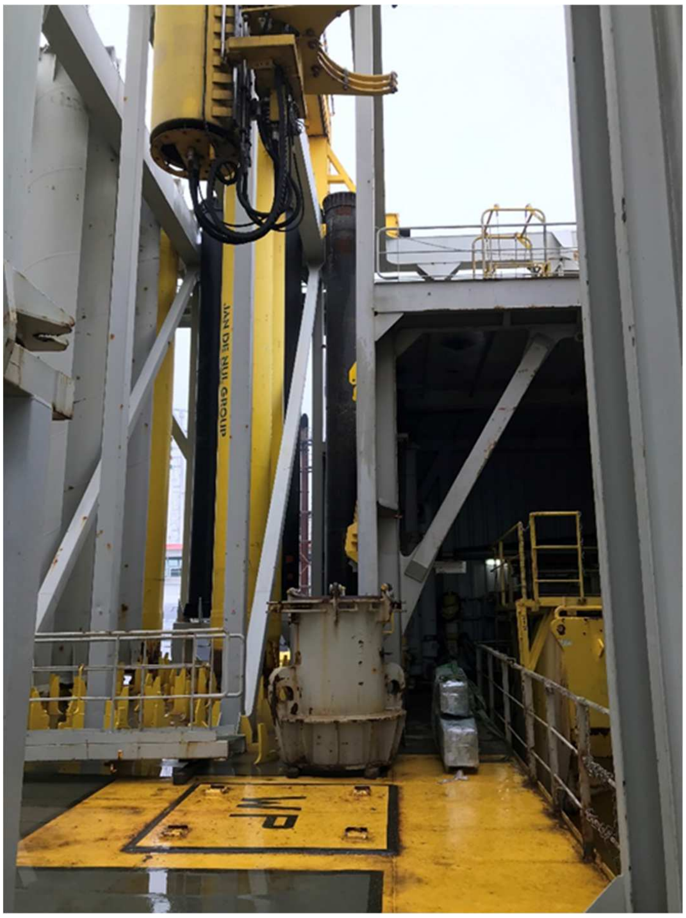

Figure 6 - Manipulator at waiting position in caution area

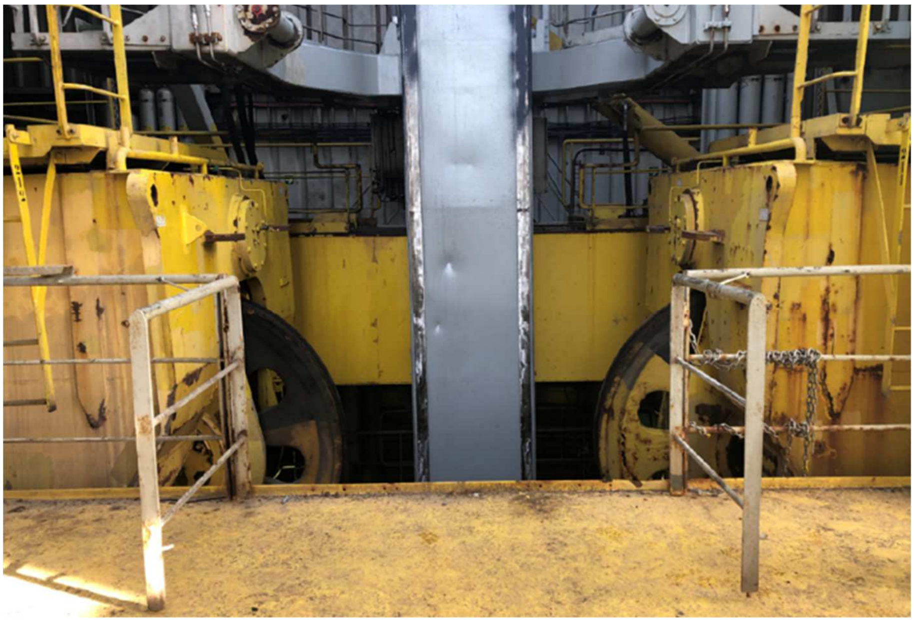

Figure 7 - Open railing, gates turned 90°

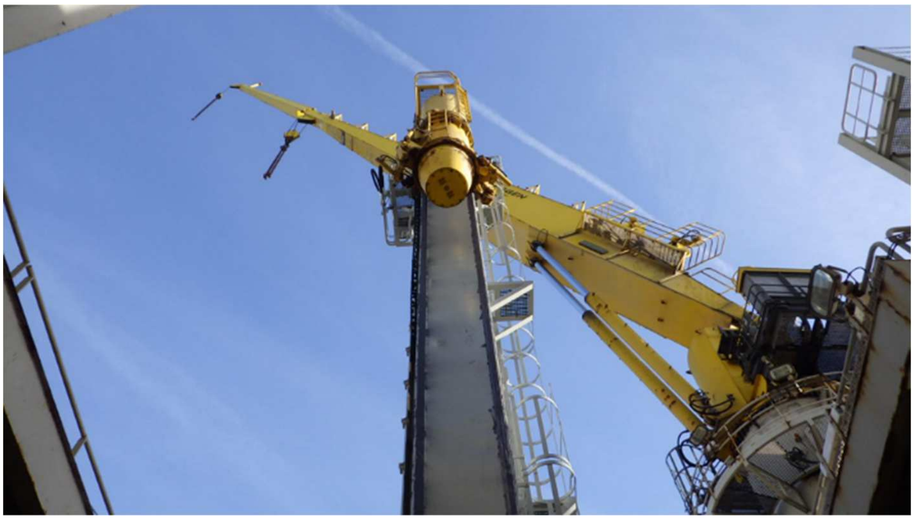

Figure 8 – Gripper

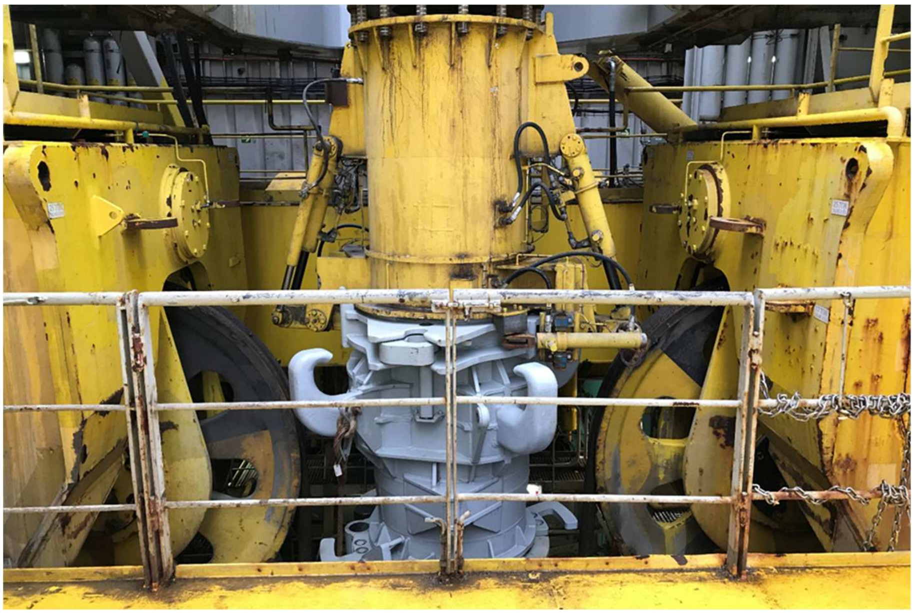

Figure 9 - Gripper holding telescopic pipe

6 Analyses

6.1 Open Fence

Transferring steel pipe sections from/to the storage position with the use of the manipulator was a standard operation for a fall pipe operator (FPO) on board FPV Simon Stevin. It was a safe work practice as listed in the safety management system.

A FPO was a purpose trained person to work with the fall pipe equipment on board a FPV.

The process itself was automated, but can be manually overruled by using a remote control.

The use of the remote control was not exceptional as, for example, the steel pipes sometimes collided with the guide brackets welded on deck.

Figure 10 - Detail of steel pipe in storage position with yellow guide brackets

During pipe transfers between manipulator and gripper, the two gates in the railing were opened. These two gates and the yellow painted caution area were two barriers to prevent any passage during pipe transfers. When pipe transfers were finished, the gates were closed again.

Figure 11- Indication on screen in control room

In case remote controlled intervention was needed by the FPO in the working area of the manipulator, only the caution area indicated the presence of the (opened) gates in the railing. It was not necessary to enter the caution area during remote controlled operations, but accidental entering was not excluded.

7 Cause of the Accident

1. The gates in the railing were open.

2. The FPO walked backwards, observing a gantry crane at a height of some 12 metres in front of him. He was not aware that he entered the caution area and that he was approaching the open gates.

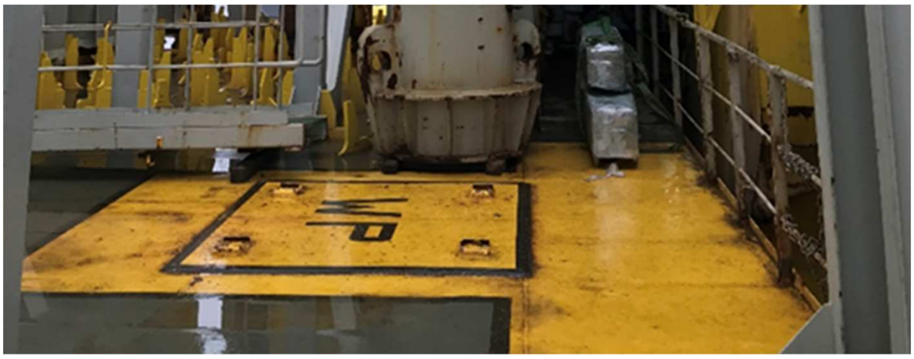

Figure 12 – Caution area

8 Conclusion

8.1 Cause of the Accident

As the gates in the railing were left open until the complete pipe transfer process had been completed, there was a possibility to fall from heights.

The caution area, a zone painted yellow, had not been observed during the manoeuvring with the gantry crane.

To operate the gantry crane to position the pipe in the storage position, there was no need to enter the caution area and so no personal protective equipment to prevent falling from heights was worn.

8.2 Safety Issues

Entrance in the caution area can only be visually observed and had not been noticed. There is no auditory or kinaesthetic barrier.

Pipe transfers between the manipulator and gripper are automated, but the opening of the gates needs to be done manually. The only reason to enter the caution area during operation is for opening and closing the gate. All other operations can be witnessed from other positions.

Opening and closing the gates in between pipe transfers was not described as a standard operation procedure. As the gate opening and closing was a manual affair, it was considered as an operation with added risk. Therefore, the gate was left open until the last pipe section was transferred.

8.3 Actions taken

The company had implemented improvements on FPV Simon Stevin and similar vessels. Other vessels of the fleet were also screened to detect any potential dangers for falling from heights.

1. The gates in the railing have been replaced by a sliding gate that can be operated without entering the caution area as seen in Figure 13 on page 23.

2. A railing was installed to prevent the entrance of the caution area. Standing behind this railing, the sliding gate can be operated manually.

3. A safety net had been installed behind the sliding gate as seen in Figure 16 on page 24.

4. A kinaesthetic barrier with a net and rubber mats had been installed to provoke a safe stumble in case of an unobserved entrance of the caution area. This barrier also prevented any passage in the caution area as seen in Figure 14 on page 23.

5. A study was started to construct a final and permanent railing around the whole caution area in way of the manipulator as seen in Figure 17 on page 24. The manipulator should lift the pipe over the railing, but needed reprogramming. The study included the height and position of the railing and the limitations of the manipulator.

Figure 13 – Sliding gate and permanent railing

Figure 14 - Kinaesthetic barrier

Figure 15 – Rubber under the net of the barrier for a safe stumble

Figure 16 - Safety net behind sliding gate

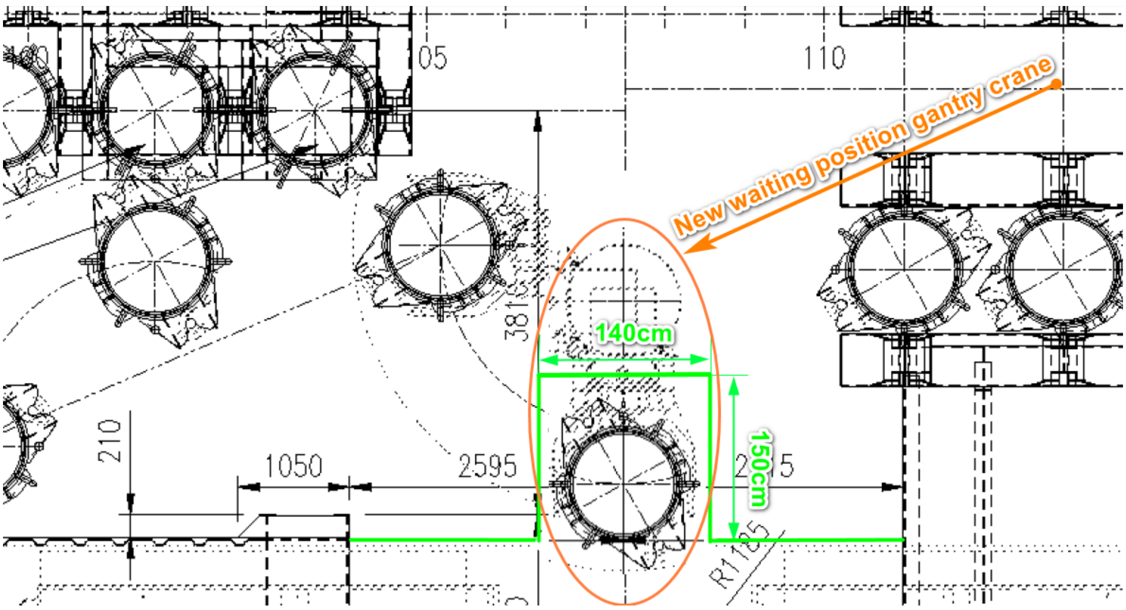

Figure 17 - Impression of final and permanent railing

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