

RESPONSES RECEIVED ON DRAFT REPORT 'HATCH COVER WHEEL BREAKS FREE. FATAL ACCIDENT ON BOARD THE MARJA'

Seq. no.	Organization	Chapter	Page	Line number	Comments	Argumentation / substantiation of your response	Adopted	Dutch Safety Board response
1	Holwerda Shipmanagement BV		5	28	After Safety Board add 'by the manufacturer'	It is unclear who no longer replied. In the opinion of the owner Sheepvaartonderneming Marja BV, all questions from the Safety Board were always answered.	Yes	Added that it was the manufacturer of the hatch cover system.
2	Holwerda Shipmanagement BV	2.2	6		Ms Marja is fitted with hatch covers from Macor and not MacGregor.	The hatch cover system from Macor differs from that of MacGregor in that the wheels are larger and heavier, the hydraulic system is different and the track over which the wheels roll is differently configured. In addition, the system of trusses and the transfer of weight from the containers to the coaming is configured differently on Macor hatches than those from MacGregor.	Yes	Photograph altered.
3	Holwerda Shipmanagement BV	2.3	9	9	After grease add: according to the maintenance schedule from the manufacturer of the hatch cover system, which is included in the lubricating schedule of the chief engineer and which is marked with a date of completion in the list of periodic tasks and reported in the monthly report.	Maintenance is carried out according to regulations and is checked for completion. A report is submitted monthly to the office.	Yes	
4	Holwerda Shipmanagement BV	2.3	11		The cover plate is not very heavy, but due to the height of the coaming it is difficult to handle. For that reason, a corner line is welded to the cover, so that the cover can be easily positioned in respect of the bolt holes.	The cover is not intended to absorb lateral forces. The cover protects the bearing against the penetration of dirt and/or seawater and serves as a grease retainer.	No	We agree that the cover is not intended to absorb lateral forces, but serves only for protection. This is also reflected in the text.
5	Holwerda Shipmanagement BV	2.3	11	11	Add after maintenance: 'no further inspections of the bearings are included in the maintenance schedule from the manufacturer of the hatch cover system'.	The manufacturer did not specify a periodic inspection of the bearings. The functioning of the bearings is periodically checked, with the hatch cover closed, by rotating the wheel under no load.	Yes	

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6	Holwerda Shipmanagement BV	4.1	11		When the hatch cover is closed, the wheel is free from the runway, and the rotation of the wheel can be checked.	If the wheel rotates smoothly and no axial play is observed, it can be assumed that the bearing is functioning correctly. This is also checked with the hatch covers closed by the inspectors when they visit the ships. The hatches on the ms Marja are opened and closed every day, whereby the wheels are visible during operation. When a bearing begins to wear, the wheel starts to wobble slightly, an indication that the bearing needs to be replaced. The hatch covers from Macor have larger wheels and bearings. This has never been reported on ms Marja or her 5 sister vessels. The wheels from MacGregor, on comparable hatch covers have a smaller diameter and bearings. Moreover, on occasion, bearings of MacGregor systems sometimes develop too much play. As a rule, when this wobbling is observed, there is still sufficient time to replace the bearing. On MacGregor hatch covers, the bearing is then replaced under supervision of one of the inspectors. On all vessels, a jack is available so that it is possible to slightly lift a wheel under load, with a half-opened hatch cover, in order to check the bearing play. This is possible after that hatch cover has been fixed with chains, to prevent further movement. In 2004, Ms Marja was purchased and until the day of the accident the wheels functioned normally.	Yes	
7	Holwerda Shipmanagement BV	4.1	14	4.1	After C add: 'During the monthly lubrication, as specified by the manufacturer, the grease moves through the bearing. Because the grease is not fully replaced each month, grease remains in the bearing for a longer period, and also under normal circumstances will acquire a different composition from fresh grease from the pack.	The grease is slowly forced out through the bearing during the monthly lubrication. In practice, new grease is forced in until grease emerges visibly on the outside. In the case of a grease-filled bearing, only a few grams of new grease will be added/removed, on each occasion.	Yes	
8	Holwerda Shipmanagement BV	4.1	14	4.1		The assumption that the wheel must have not been running smoothly for some time can be neither confirmed nor disproved due to a lack of objective information. The hatch covers are opened and closed daily. When a bearing starts to wear, a wheel wobbles noticeable. Based on years of experience with ms Marja and 5 sister ships, no bearing damage has occurred on wheels on Macor hatch cover systems.	No	This conclusion is based on the analysis of the grease: "The increased levels that were observed of among others Iron, Magnesium and Titanium (see table 2) are indicators in this case that the wheel had not been turning as it should for a longer period of time, and that the roller thrust bearings were no longer functioning correctly."
9	Holwerda Shipmanagement BV	4.1	14	4.1	Add the units in which the observed components of the grease were measured.	Provides clarification.	Yes	
10	Holwerda Shipmanagement BV	4.1	15	4.1	We must disagree with the comment that the inspection of the functioning of the wheel requires considerable preparation.	When the hatch covers are closed, the wheels are free from the runway. As the hatch cover is opened, the hydraulic cylinders on the cylinder side are forced slightly upwards, forcing the wheel into the runway at which point it starts to roll. When the hatch covers are closed, the functioning of the bearing can be easily checked. Measuring the bearing play is a time-consuming activity, but is not specified by the manufacturer as a periodic inspection.	Yes	See also comment 58.
11	Holwerda Shipmanagement BV					The cause of the blocking of the wheel remains unclear. During daily use, no non-conformities were observed in the functioning of the wheel shortly before the accident.	No	It is already recorded in the report that the cause of the blocking of the wheel could not be identified.

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12	Holwerda Shipmanagement BV				Action on ms Marja	Immediately following the accident, an inspector visited the ms Marja, but was also refused access to the vessel until the moment that the wheel involved in the accident had been removed by the Italian police. The condition of the bearing left behind in the wheel and the circlip could not be determined because the wheel with the cover plate was placed on the top of the main deck and the Italian authorities had seized and removed the wheel. The axle shaft was measured and showed no non-conformities that exceeded the tolerance. All 7 other wheels were then inspected for functioning of the bearing by rotating them and then by removing the cover plate and checking the wheels for bearing play. No non-conformities were observed that exceeded the tolerance. The seized wheel was replaced by a spare wheel and bearing which was placed on board the vessel at the time of delivery in 1995, and stored as a spare wheel.	Yes	
13	Holwerda Shipmanagement BV				Action on 5 sister ships.	The bearings of the 8 wheels on the 5 sister ships were also checked. On one ship, a circlip welded in place was detected, which was replaced with a new circlip. The welding in place of the circlip was carried out by the previous owner. None of the bearings had any observable play.	Yes	
14	Holwerda Shipmanagement BV				Action captain's instruction.	At the start of each new charter, a captain's instruction is drawn up. The instruction includes more explicitly the statement that in the event of operational disruptions, the operations department must immediately be called in. Depending on the findings, they will for example call in the technical department to advise the vessel on how to correct the disruption. The technical department has more extensive expertise of problem solving than the crew. The operations department maintains contacts with the shipping agency and via the agency can mediate to arrange crane assistance or instruct a shore-based company to assist in solving the problem.	Yes	
15	Holwerda Shipmanagement BV				Action ISM system.	The ISM system refers to the risk assessments for standard risks of ship operations. A ship-specific risk assessment is prepared for each vessel. An alteration has been introduced outlining more explicitly that also in the event of unusual repairs, a risk assessment must first be carried out, and a toolbox meeting held to ensure that everyone is fully aware of the risks of the proposed non-standard repair. The ISM also states that a written record must be kept.	Yes	

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The DSB had to wait a long time for the information of Macor. In the meantime the company has been taken over and the new owner responded during the consultation period. The response is reflected in the comments below.								
16	Macor		4	5-6	"...noticed that the wheel on the hatch cover had run between 5 and 7 cm clear off the rail...".	"For information: The rails are 70mm wide. The plain wheels on starboard side do have a width of 130 mm and are positioned abt. 15 mm off the rail centre line towards CL. The wheel axle length is almost identical with the wheel width. At a distance of 5 cm off (beside) the rail, the distance between side of wheel / bearings and the outer axle edge amounts to appr. 35 mm. Thus, the wheel would have left the axle and fallen down, but could not rest on the axle yet. At that moment where the wheel theoretically abandons the rail, the wheel is still resting on the axle by appr. 15 mm. However, in this moment, due to its deadweight, the unsupported hatch cover edge sags. By this, a return movement of the wheel back onto both the rail and the axle is impossible. If, however, the wheel position would have been appr. 5-7 cm off the normal position on the rail as specified above, it cannot fall down as it is still resting on the axle and in direct contact with the rail under vertical hatch cover load. For information: The rails are 70mm wide. The plain wheels on starboard side do have a width of 130 mm and are positioned abt. 15 mm off the rail centre line towards CL. The wheel axle length is almost identical with the wheel width."	No	Page 4 is part of the description of the course of events. This was written on the basis of the information in statements. The information in this comment is valuable but does not change the course of events as described in the report.
17	Macor		4	6	"... immediately halted the hydraulic pump..."	"Should read to: "... immediately stopped the hatch cover opening sequence...". It is not reported if the deckhand stopped just by setting the operation lever at the control stand to "0" or if an emergency stop control button was pressed. Only in the latter case the hydraulic pump is stopped automatically. The emergency-stop buttons however are installed on port side only"	yes	
18	Macor		4	7-8	"... the CE attempted to hammer the wheel back into position using a sledge hammer..."	It is supposed that the CE has checked the situation before he decided to carry out this proceeding, but under consideration of the mentioned under item 1, this must be doubted.	No	Page 4 is part of the description of the course of events. This was written on the basis of the information in statements. Moreover, the Safety Board passes no judgement on guilt or responsibility.
19	Macor		4	8-9	"During the process, the wheel suddenly broke free from the axle..."	"Refer also to item 1. If this happened, the wheel must have been totally free off the rail, and as a response of the hammer stroke obviously, the wheel jumped back and off the axle. The main question is at which position the chief engineer was standing when he swung the sledge hammer. In case he stood on the main deck beside the hatch coaming ("gangway") just in front of the wheel, that would have been an absolutely useless position as from there no sufficient and precise power of impact can be applied. Would the CE have stood in a higher position beside the wheel, he would have had a better position to apply a more powerful stroke, and he would not have been in the course of the dropping wheel."	No	See comment 18.
20	Macor		6	18	"The hatch cover system of the..."	"The hatch cover system onboard the MARJA comprises of 1 single hinged cover (hatch #1) and 4 folding pairs (each 2 pairs at hatch #2 and #3).	Yes	

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21	Macor		6	18-19	"This means that the hatch covers..."	"Each folding pair consists of one cover which is fixed by main hinges to the hatch coaming and a second trailed cover which is hinge-connected to the coaming-hinged cover."	Yes	
22	Macor		6	19-20	"Using a hydraulic cylinder..."	"Each folding pair (and the hinged cover as well) is operated (opened / closed) by means of one pair of hydraulic cylinders, located on port and starboard side."	Yes	
23	Macor		6	20-21	"During this process, wheels that are connected..."	"During the opening- / closing sequence the trailed covers are supported at their free ends by means of wheels which are running on rails which are placed on top of the hatch coamings on port- and starboard side."	Yes	
24	Macor		7	3-4	"Folding hatch covers..."	"At each hatch cover folding pair, the trailed cover is equipped with wheels located at its free end which run on guide rails located on top of the hatch coamings. The wheels provide a controlled movement of the folding pair via the trailed cover during the folding- / unfolding process."	Yes	
25	Macor		7	5	"The wheel on the port side..."	"The wheels on port side are so-called guide wheels and are of flanged design in order to keep the folding pair via the trailed cover in its specified position during the folding- / unfolding process."	Yes	
26	Macor		7	7-8	"..., to compensate for any expansion..."	"Should read to: "... in order to maintain free movements of the longitudinal hatch coamings underneath the hatch covers, caused by hull- / hatch coaming deflections depending on loading conditions / draughts and / or structure deformations caused by heat ingress (sun radiation).""	Yes	
27	Macor		7	8-9	"This design means ..."	Sentence might be cancelled.	Yes	
28	Macor		8	3-4	"The role of the hatch cover wheel..."	"Should read to: "The aim of the wheels is to support the movement of the hatch cover folding pair during the folding- (opening-) / unfolding (closing) process."	Yes	
29	Macor		8	4-5	"The bearing installed,..."	"Should read to: "All installed bearings of both guide- and plain wheels are of spherical-roller type in twin arrangement. The bearings are designed to absorb the radial forces of the hatch cover structures via the wheel bodies into the hatch coaming structure. Figure 5 as a sample shows a plain wheel located on starboard side. The bearing roller design and -arrangement within the guide wheels on port side is identical.""	Yes	
30	Macor		8	9-11	"As a result, in the design..."	"Should read to: "The twin spherical roller bearings are fixed within the wheel bodies by means of a press fit. The wheel bodies (via the press-fitted bearings) are fixed on the wheel axles by means of so-called Seeger circlip rings in order to keep the wheels in position.""	Yes	

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31	Macor		9	3-4	"The grease is injected..."	"Should read to: "The grease is filled in via a grease nipple (pos. 18 of figure 7) into the axle, located at the inner side of the hatch cover side plates, and is led through the boring within the wheel axle to the opposite exit where it is spread all over the space between the axle (pos. 1) and the cover (pos. 14) . From there the grease attains to the bearing rollers." Remark: The aim of the cover is to protect the bearings and the axles against water-and dirt ingress and to lead the grease to the bearings."	Yes	
32	Macor		9	4	"Figure 7 includes a red line..."	"Remark: The indication of the red line at the outer side of the wheel is not correct. The vertical red line must be drawn between cover and axle as specified under item 16. See also attached sketch which should replace figure 7."	Yes	
33	Macor		9	6-7	"The wheel in question was last lubricated with grease on 15 January 2018."	"Remark: The time distance between last reported lubrication and the accident amounts to appr.3,5 weeks. It is supposed that at that date the percentage of worn metal particles was already high such as the analysis has shown, i.e. the bearings must have been damaged already then. During a full opening- / closing sequence the wheel moves appr. 12,5 m which corresponds to appr. 8 turns, i.e. abt. 16 turns during a port call. Provided the vessel calls 2 times a week, the wheel turns 32 times, and in 3,5 weeks it results to appr. 110 turns which is not that much. In any case, the bearings do not get damaged within such a short period."	No	Comment added about lubricating schedule. This information was not previously available, text adjusted at detail level.
34	Macor		10	1-2	"The cover plate is difficult to lift off."	"The cover plate is just fixed with 4 cylinder screws at the wheel body, and a sealing is arranged between cover and wheel body to prevent the spill of grease. In case the dismantling of the cover is difficult it is supposed that the cover was not removed for a longer period."	No	Agree with the comments. The removal or inspection of the bearing in this manner is however not covered by the standard instructions.
35	Macor		10	2-3	" A tool first has to be installed..."	"In case a dismantling tool is needed, there is no objection against an usage. However, such a tools shown in figure 8, is of the worst design which can be chosen ever. The "tool" is a square bar which is unsymmetrically welded onto the cover plate. The heat produced by the welding may penetrate up to the bearings and may have negative influence. The worse matter however are the unsymmetrical (one-sided) forces and moments which are caused by hammer sledges or hydraulic jack pressure, which may damage or even destroy parts of the roller bearings which are not designed for such loads / impacts. In case a dismantling tool must be used, it has to be of symmetrical design by all means, and the forces have to be applied symmetrically as far as possible. The welding has to be placed at the most outer edge of the cover plate in order to avoid excessive heat ingress (see above)."	No	This suggests that it was not really the intention to work in this way. There are no instructions on how the cover plate should be removed or any other action indicators.

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36	Macor		10	6-9	"The lubrication process..."	"During the monthly lubricating with grease, the inspection of the grease escaping from the channel outlet at the axle end requires the dismantling of the cover, and supposed this is done, the condition of the roller bearings may be visually checked, too. This however, is not written in the OMM expressively." "	No	See comment 35.
37	Macor		11	2-5	Content clear	Content clear	No	
38	Macor		11	5-7	"With the exception of the front hatch..."	"Should read to: "Except hatch cover #1, the hatch covers of hold #2 and #3 are so-called folding-pair type hatch covers, comprising of 2 hinge-connected hatch covers each. Cargo hold #2 and #3 are covered by 2 folding pairs each whereby the forward pairs are titled with "A", the aft ones with "B", i.e. for hatch #2 covers 2A+2B, for hatch #3 covers 3A+3B." "	Yes	See comments 20 and 21. Here no change to the existing text.
39	Macor		11	6	... that have to be opened...	"Should read to: "All hatch covers are operated from their own individual local control stands, all located on starboard side at the longitudinal hatch coamings. Each hatch cover / hatch cover pair is operated by a pair of hydraulic cylinders, arranged on P&S outside the hatch coamings."	Yes	
40	Macor		11	7	"Changing operation positions..."	It is supposed that the time needed to go from one control stand to the next is meant.	Yes	
41	Macor		11	8	"... port side gangway..."	"Should read to: "... port side hatch coaming..."	No	Here the gangway is referred to.
42	Macor		11	8-21	All sentences	"The description of the proceedings is not clear and can be misinterpreted. The actual interpretation is reflected hereinafter."		
43	Macor		11	9	"The first mate instructed the deckhand to check and open hatch cover 2."	It is understood that according to that statement, the deckhand operated the hatch covers, not the first mate.	No	Deckhand operated the hatch cover.
44	Macor		11	10-11	"The deckhand approached hatch cover 2B and carried out the inspection as instructed."	If the inspection was carried out on PS, the deckhand could not see the problem with the wheel on starboard side.	No	Agree, but this does not change the overall story.
45	Macor		11	11	"He saw nothing unusual and therefore started to open the hatch cover".	"To operate the hatch covers, the deckhand had to move to the starboard side where the local control stand is located. If however, he would have inspected the hatch covers on starboard side, too, before he started to operate, he must have detected the trouble with the wheel already. However, this inspection was not done obviously."	Partly	Added that the deckhand walked to the operation position on the starboard side before opening the hatch cover. We are unable to say that the inspection was not carried out, only that the problem was not recognized.
46	Macor		11	11-13	"During the opening of the hatch cover, the deckhand saw that the wheel on the starboard side was not running normally on the rail."	At which position / opening grade of the hatch cover the failure was detected?	No	This information is not available.

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47	Macor		11	13	"He therefore immediately shut down the hydraulic pump".	"To shut down the hydraulic pump, one of the emergency-stop buttons has to be pressed, which however are installed on port side only. At the local control stand (on starboard side) just the hatch cover movement can be stopped by setting the operating lever to "0". The pump unit is switched on/off on site at the starter panel."	Yes	See comment 17.
48	Macor		11	14-15	"He decided to return to the gangway and in the meantime reported the occurrence to the first mate, via the walkie talkie."	"Content is incomprehensible. The deckhand was at the gangway (hatch coaming) at the local control stand. So where did he go to?"	Yes	
49	Macor		11	15-16	"When he arrived at the gangway, the deckhand took over the position from the first mate."	"Content is incomprehensible. At which "gangway" (hatch coaming) the deck hand arrived?"	No	See comment 48.
50	Macor		11	19	"The first mate approached hatch cover 2B..."	Where was the first mate, i.e. on which side and at which hatch cover?	No	No change to the existing text.
51	Macor		11	19-21	"... , saw that the wheel had run between five and seven centimetres off the axle, and was therefore not in line with the rail."	Refer to item 1.	No	See comment 16.
52	Macor		12	1-5	All sentences.	"If the captain, the chief engineer and the chief mate commonly agreed and decided that the wheel can be moved back by hammer sledges, the wheel must have been placed on the rail yet. Otherwise, as already mentioned, the hatch cover would have sagged by its deadweight such that the wheel cannot be pushed back into its position on the rail at all, and for sure this would have been noticed. Refer also to item 1."	No	This is the judgement of Macor, and cannot be confirmed by the information available. See also comment 16.
53	Macor		13	23-31	All sentences	"The analysis which shows extremely high values of different materials found in the grease taken from the damaged wheel leads to following hypothesis: It is supposed that the bearings have not been lubricated for a longer period. Consequently, the bearings ran dry and finally the rollers could not freely move (turn) anymore as necessary. This in turn caused the tremendous material abrasion, and the bearing rollers got totally stuck by the ingressed particles. Due to the massive abrasion the bearing roller size decreased, and due to the vertical hatch cover weight, maybe the inner bearing ring which rests on the axle was bent up such that the wheel started to be able to glide on the axle laterally."	No	Due to the fact that no technical inspection of the wheel and bearing was possible, we were unable to determine this.
54	Macor		13	31	"..., and the breaking of the circlip."	"This may happen only, if the wheel tends to move outwards caused by high forces. This however hypothesizes that either the wheel axle is inclined, or the bearing borings have become worn out as a result of the proceedings prescribed under item 38. In normal hatch cover operating conditions, the axial forces within the wheels / bearings are marginal."	No	The circlip is not intended to absorb major axle forces, so we agree that under normal circumstances this would not happen. In this case, the circlip must have broken, or the wheel would not have come off the axle.
55	Macor		14	1-2	"Given the passage... .. made a further negative contribution."	Maybe the fresh grease, applied at the last official greasing interval on 15.01.2018, increased the slippage of the wheel bearings on the axle.	No	This hypothesis cannot be based on the information available.

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56	Macor		14	6-7	"The maintenance regulations list no..."	Same as for the end- and cylinder bearings as well as for the hinges, beside the monthly lubrication applications which automatically include a visual inspection, there are no further inspections necessary.	No	Agree with the comment, no change to existing text.
57	Macor		14	7-8	"In addition, the visual inspection..."	Is contradictory with the following para.	No	Visual inspection of the bearings is possibly something different from checking the functioning of the bearing.
58	Macor		14	10-13	"However, there are ways of periodically checking..."	<p>"In the closed position of the hatch cover folding pairs, the hatch covers rest on and are locked to the hatch coamings.</p> <p>All wheels are located in pockets / recesses where they are hanging completely free and unloaded. This a must as the wheels are not designed to bear any further loads resulting from the container loads on top of the hatch covers.</p> <p>In this position the wheels can be easily moved (turned) resp. inspected for free movement and for the straight seat on the axle."</p>	Yes	See also comment 10.