



SAFETY INVESTIGATION REPORT

201109/020

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The Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 prescribe that the sole objective of marine safety investigations carried out in accordance with the regulations, including analysis, conclusions, and recommendations, which either result from them or are part of the process thereof, shall be the prevention of future marine accidents and incidents through the ascertainment of causes, contributing factors and circumstances.

Moreover, it is not the purpose of marine safety investigations carried out in accordance with these regulations to apportion blame or determine civil and criminal liabilities.

NOTE

This report is not written with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The report may therefore be misleading if used for purposes other than the promulgation of safety lessons.

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MV AGGELOS B

Fatality on board

In the port of King Abdul Aziz, Dammam

17 September 2011

SUMMARY

Aggelos B (Figure 1), a Maltese registered bulk carrier was alongside in the Port of King Abdul Aziz in Dammam, when one crew member died as a result of injuries, which he sustained after falling into cargo hold no. 5 from a height of around 18 m.

The AB had climbed onto the top of the hatch coaming and jumped into a brow, which was being used to carry out routine maintenance. With the sudden impact, the wooden flooring of the brow gave way and the AB fell into the empty cargo hold landing on the tanktop. At the time of the accident, the AB was not wearing the safety harness.

The crew member had made use of the brow on other occasions. The investigation also analysed the integrity of the brow's wooden flooring.

A.B. Maritime Inc. has since issued revised procedures for working aloft, facilitated the use of 'toolbox talk', and amended the relevant section of its Health & Safety Working Practices Manual.

Due to the actions taken by the managers of the vessel, no recommendations have been issued.



FACTUAL INFORMATION

The vessel

Aggelos B, a 34,374 mt bulk carrier was built by SPP Plant & Shipbuilding Co. Ltd., South Korea in 2010 and is registered in Malta. She was owned by Aggelos B Shipping Ltd., managed by A.B. Maritime Inc., and classed with American Bureau of Shipping. The vessel has an overall length of 196.0 m and a beam of 32.26 m.

Aggelos B operated on international voyages. She had a crew of 21, with English being the working language on board.

The crew member

The deceased crew member was Filipino, 33 years old, well built and weighed about 75 kgs. He joined the vessel on 16 November 2010. He was an experienced AB and had worked for A.B. Maritime Inc. for more than 11 years. At the time of the accident, the AB was wearing overalls, a pair of safety shoes, a safety helmet. He was not wearing a safety harness.

Environmental conditions

The weather was clear and the sea calm, with a north easterly light breeze. Outside air temperature was 30°C.

Narrative

Deck routine maintenance

It was routine practice for the crew members to carry out maintenance work on deck. Since there were no cargo operations in cargo hold no. 5, routine maintenance was planned for this particular area.

The plan for 17 September was to carry out surface preparation and coating of some areas on the inner port side of the hatch coaming. This operation necessitated the use of a crane and brow (Figure 2). The brow was suspended from the ship's cargo crane hook

by means of slings and manoeuvred in position by the crane.

One OS and the AB were assigned to carry out this specific task. Since most of the crew members were occupied with cargo operations in the adjacent holds, the other two remaining crew members were the chief mate and the bosun.

Both men who were to work aloft were briefed by the chief mate on the safety precautions being expected from both of them during this routine maintenance work. The chief mate's task was to operate the cargo crane no. 4, while the bosun was instructed to hold the brow tight in position by means of a 'bull' rope.

Using the crane, the chief mate lifted the brow from the deck and positioned it against the inner side of the hatch coaming of hold no. 5 (Figure 3). The first crew member to board the brow was the OS. It was reported that once in the brow, he adjusted the harness attached to his vest. The second crew member to board the brow was the AB.

The AB climbed on to the top of the cargo hold hatch coaming and grabbed hold of the harness sling to which the safety belt was fastened at that end. This was secured to the crane's hook (Figure 3). Without wearing the safety harness, he jumped into the brow whilst still holding on to the harness sling. He landed on the wooden part of the floor of the brow, which gave way and broke under the sudden impact (Figure 2).

Having held to the harness sling during his jump, the AB was now hanging freely through the broken floor opening. As his grip slipped, the OS moved to his rescue; yet the AB lost his hold and fell through the opening before he could be reached and assisted.

The fall was approximately an 18 m drop, with the victim landing on the cargo hold

tanktop (Figure 2). The accident happened at around 1305 hours (LT).

As soon as he realised what has happened, the chief mate stopped the crane and climbed down to the main deck. The bosun, who was still holding the 'bull' rope, rushed down the cargo hold to check the condition of the AB. The bosun could not detect any pulse or breathing.

The chief mate then returned to the crane and lowered the brow onto the cargo hold tanktop (Figure 3) in the hope that the brow will be used to lift the AB for medical assistance ashore.

He then climbed down into the cargo hold to personally check the AB's condition. He remained on site with the bosun and the OS, waiting for the medical team as well as further instructions from the Master, who by now was also informed of the accident.



Analysis

The Brow

The AB died of multiple injuries following a fall of approximately 18 m from the hatch coaming onto the tanktop of the cargo hold no. 5. The AB was seen jumping by the OS into a brow held at the level of the hold coaming, when the wooden part of the flooring gave way under the sudden impact.

The brow (Figure 4) was manufactured in Piraeus, Greece by a workshop known to the managers¹. It was noted that no certification of integrity of the brow and the slings was available, possibly indicating the absence of testing prior to use. The brow was normally used by the crew in order to reach high levels when attached to a crane. The brow was secured to the crane by four slings and was lifted by means of the crane's hook during hoisting.

The overall dimensions of the brow were nine metres by one metre and had railings around its perimeter, one metre high. On one end, a water tank was fitted to the structure, serving as a counter balance of the brow.

The base frame consisted of a steel hollow section material 100 mm by 40 mm by 5 mm material thickness. It had cross supports at 750 mm intervals, which served as a support for the floor boards.

Six vertical stanchions of a diameter of about 38 mm were welded along the structure's length, serving as a support for the horizontal railings. The top horizontal railing was a 38 mm pipe, while the other two horizontal railings further below, were made of a 14 mm solid steel bar. The one metre end, which was opposite the water tank, also had fitted steel railings of the same material and size.

The floor of the brow was partly made of steel mesh and partly of chipboard material having a thickness of 20 mm. The steel mesh

covered approximately 25% of the brow length, while the remaining 75% was covered with the chipboard material. The flooring had no longitudinal support, its only support were the cross members spaced at 750 mm intervals. The cross member supports were made of 48 mm pipes and in some places of a hollow section of 100 mm by 38 mm; the 100 mm being the face supporting the flooring. The chipboard panels were being retained in position by six millimetre diameter bolts.

The brow steel structure was of galvanized steel. Available photos did not indicate that the entire exposed surface area of the wood was treated (Figure 5). The brow had been used on various occasions prior to the accident by the crew members, including the victim himself.

It was not reported whether or not the vessel's safety officer questioned the integrity of this flooring and therefore bringing it to the attention of the safety managers. In the absence of such reports, it was considered that the vessel's safety officer had no doubts that the flooring's integrity was in any way compromised and therefore safe to be used.

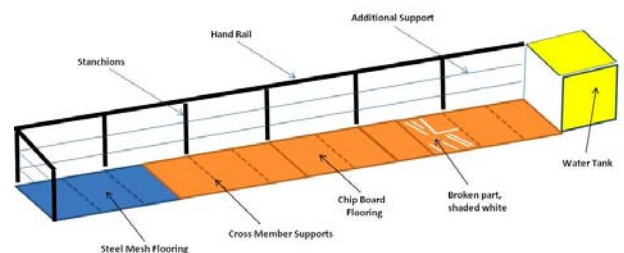


Figure 4: The brow

The Floor Material

Chipboard is considered to be an engineering wood product, manufactured from wood particles such as wood chips, sawmill shavings or even saw dust, and a synthetic binder made of resin or any other suitable type of binder which is capable of being pressed and extruded (Figure 5). This type of wood is cheaper in cost than the

¹ The brow was fabricated in January 2011.

conventional solid wood. Hence, it is normally chosen when strength of the material is not considered as a major factor for the task which needs to be carried out.

On the other hand, solid wood offers a vast range of structural advantages over chipboard; it is stronger and capable of sustaining a heavier weight, even if required over long horizontal spans without any longitudinal support.



A major disadvantage of chipboard, however, is that moisture makes it very prone to expansion (Figure 5) and discoloration, particularly when it is not covered with paint or some other sealer². Chipboard is rarely used for outdoor purposes or places that have high levels of moisture. Moisture was therefore problematic for the flooring's integrity given that the brow was normally stored on the main deck aft of cargo hatch no. 5 and close to the accommodation block.

Comparison of solid wood and chipboard

In addition to its relatively low cost, one other advantage of chipboard over solid timber is its availability in large sheets, making it easier to cut for general applications.

This is not applicable to chipboard. When compared to solid wood, the former material has a lower threshold for loading before it breaks. This is because the resin and wax binding the particles in the material do not allow it to withstand sudden impacts but only weights proportional to its thickness and density. Unless braced with supports, or used in thicker amounts, chipboard is likely to sag over time or snap near fasteners.

The installation of fasteners necessitates great caution, taking into account the mechanical properties of chipboard. For instance, over-tightening of a screw or bolt in chipboard may cause the material to 'blow out' if inserted near to the edge. Since moisture causes the chipboard material to expand, a similar 'blow out' effect will be experienced.

² In their submission, the managers maintained that the steel and the wooden flooring were properly maintained at all times with two coats of epoxy primer and one final coat of epoxy.

Risk Assessment

Routine maintenance work performed by the crew was considered as normal day-to-day tasks on board. The maintenance work was mainly carried out when there were no cargo operations in the area.

Discussion between the master, chief mate and bosun had taken place before the assignment of the manual surface preparation and coating task, which was to be carried out on the inner side of the hatch coaming in cargo hold no. 5.

A Risk Assessment Form was raised, duly filled, and signed. Points 5 and 6 of the Risk Assessment Form referred to the Personal Protective Equipment (PPE), and Defective Equipment (respectively).

The personal safety clothing and equipment were considered as low risk factors since the crew were performing routine maintenance work. The boarding of a crew member on the brow without wearing his safety harness was not considered to be an issue. This was also sustained in the chief mate's accident report; he expected that the AB would wear his safety harness / belt prior to boarding the brow.

The structural integrity of the brow and the flooring was also another critical safety aspect. There were no records of periodical close up inspections of the brow. Moreover, the damages inflicted onto the chipboard by marine elements were not questioned and the integrity of the brow's flooring was never a concern (Figure 5).

This was noted whilst taking into consideration that apart from this hazard, the flooring also had no longitudinal support (Figure 5) - a latent factor which even though it was not deemed as a risk in the first place, it is one which contributed towards its weakening.

The brow was used on several previous occasions and no problems were ever

reported. In this respect, whilst visible to any passing crew member, the lack of longitudinal support had never raised any concern.

In addition, it has to be pointed out that the width of the wooden part was about 100 mm less than the width of the brow's base (Figure 5). The wooden part of the flooring was bolted at its transverse edge but this was not enough to support the weight of the sudden impact, thus causing the chipboard to collapse when the AB jumped from the top of the hatch coaming onto the brow.

Acceptance of Risk

The AB joined the vessel on 16 November 2010. He then went through a training induction program during his first week, and was also made aware of the contents of the safety training record book.

Unaware of the physical properties of chipboard and conscious of the fact that the brow had been used on several occasions without any accident, the AB had no reason to assume that there existed a potential risk that the floor would break under his own weight.

CONCLUSIONS

1. The brow was not at deck level. The AB's jump onto the brow was instigated by the latter being suspended over the empty cargo hold.
2. The AB did not wear a safety harness before boarding onto the bow.
3. The brow lacked longitudinal support in the construction of its flooring, thus reducing its support.

4. The under surface of the wooden flooring was supported at certain point intervals by pipes, thus creating point loading in the longitudinal direction.
5. The selection of chipboard for the brow's flooring was inadequate in terms of material choice and thickness. Chipboard limited the flooring's capability to withstanding a sudden impact or sudden over-loading.
6. The wooden flooring was exposed to environmental hazards, and was also left untreated and without protective coatings, causing the acceleration of damage due to marine elements.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION³

Soon after the accident, A.B. Maritime Inc. instructed the crew members not to use the brow until the wooden flooring was replaced with steel bleaching plates.

A circular was also sent to all company's vessels with information on the accident and guidelines on the prevention of accidents on board. Special emphasis was made on the application of safety procedures and the Code of Safe Working Practices for Merchant Seamen.

The vessel was eventually supplied with stores and equipment and the wooden flooring replaced.

³ **Conclusions and safety actions should not create a presumption of blame and/or liability.**

SHIP PARTICULARS

Vessel Name:	<i>Aggelos B</i>
Flag:	Malta
Classification Society:	American Bureau of Shipping
IMO Number:	9577434
Type:	Bulk Carrier
Registered Owner:	Aggelos B Shipping Ltd.
Managers:	A.B. Maritime Inc.
Construction:	Steel
Length Overall:	196.00 metres
Registered Length:	190.09 metres
Gross Tonnage:	34374
Minimum Safe Manning:	16
Authorised Cargo:	Steel coils

VOYAGE PARTICULARS

Port of Departure:	Jebel Ali
Port of Arrival:	Dammam
Type of Voyage:	International
Cargo Information:	Loaded
Manning:	20

MARINE OCCURRENCE INFORMATION

Date and Time:	17 September 2011 at 13:15 (LT)
Classification of Occurrence:	Very Serious Marine Casualty
Location of occurrence:	Port of King Abdul Aziz, Dammam
Place on board	Cargo hold no. 5
Injuries / fatalities:	One fatality
Damage/environmental impact:	None
Ship Operation:	Berthed alongside
Voyage Segment:	Arrival
External & Internal Environment:	Weather: Clear; Wind: Light Breeze, NE 4 Knots Temperature: 30°C
Persons on board:	20