



# REPUBLIC OF THE MARSHALL ISLANDS

## Maritime Administrator

### ANTARES CASUALTY INVESTIGATION REPORT

Fatal Electrocution During Hold Cleaning

Indian Ocean | 7 September 2018

Official Number: 6098

IMO Number: 9696412





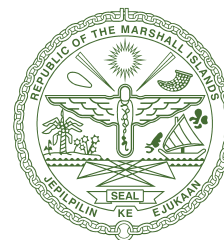
## **DISCLAIMER**

In accordance with national and international requirements, the Republic of the Marshall Islands Maritime Administrator (the “Administrator”) conducts marine safety investigations of marine casualties and incidents to promote the safety of life and property at sea and to promote the prevention of pollution. Marine safety investigations conducted by the Administrator do not seek to apportion blame or determine liability. While every effort has been made to ensure the accuracy of the information contained in this Report, the Administrator and its representatives, agents, employees, or affiliates accept no liability for any findings or determinations contained herein, or for any error or omission, alleged to be contained herein.

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## **AUTHORITY**

An investigation, under the authority of the Republic of the Marshall Islands laws and regulations, including all international instruments to which the Republic of the Marshall Islands is a Party, was conducted to determine the cause of the casualty.



*Maritime Administrator*



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## PART 1: EXECUTIVE SUMMARY

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On 7 September 2018, the Republic of the Marshall Islands-registered bulk carrier ANTARES, managed by Transocean Maritime Agencies S.A.M. (the “Company”), was underway off the east coast of Sri Lanka in ballast. In preparation for loading the next cargo, Cargo Hold No. 4 was to be washed by the deck crew.

Before cleaning began, a Special Work Permit was issued and a risk assessment conducted. At the time of issuance, the Cargo Hold No. 4 hatch cover was open, allowing natural light into the hold.

Later in the afternoon, the ship’s rolling motion began to increase, and the Master ordered the hatch cover closed to prevent damage to the opening mechanism. To properly and safely complete cleaning of the hold after the cargo hatch was closed, additional portable flood lights were required.

An Ordinary Seafarer (OS) cleaning the hold was sent to the main deck to rig additional lighting. When the OS did not return in a reasonable time, the Bosun sent an Able Seafarer Deck (ASD) to check on the OS. The ASD found the OS laying on the main deck and unresponsive. The OS was found holding a halogen floodlight. The cable was plugged into a receptacle and the switch was in the “on” position. After switching off power to the light, the OS was examined and declared deceased.

The Republic of the Marshall Islands Maritime Administrator’s (the “Administrator’s”) marine safety investigation determined that causal factors which contributed to the death of the OS were:

1. electrocution due to the handling of defective, energized electrical equipment;
2. using electrical equipment not designed for the intended use; and
3. handling energized electrical equipment while wearing wet clothing.

Additionally, causal factors which may have contributed to this fatality which were identified include:

1. failure to reassess hazards following a significant change in work conditions as required by the Company’s pre-task risk assessment identification, assessment, and control procedures;
2. inadequate supervision and scheduling of work when the Chief Officer (C/O) served as the responsible officer for the hold cleaning and simultaneously the Officer of the Watch (OOW) on the Bridge;
3. ineffective communication regarding the proper use of portable electrical devices;
4. failure to determine the intended use of the light fixtures during the procurement and provisioning process; and
5. failure to properly monitor the condition of portable electrical equipment and conduct preventive maintenance to identify and correct defects.

## PART 2: FINDINGS OF FACT

The following Findings of Fact are based on the information obtained during the Administrator’s marine safety investigation.

1. Ship particulars: *see* chart to right.
2. On 7 September 2018, ANTARES was underway in ballast from Gangavaram, India to the loading port of Santos, Brazil. At the time of the incident, the ship was off the east coast of Sri Lanka.
3. At about 0800,<sup>1</sup> the Master issued a Special Work Permit<sup>2</sup> for cleaning and washing of Cargo Hold No. 4. The permit listed the C/O as the supervising officer and all deck crew as the personnel undertaking the work. Hold cleaning was scheduled for daylight hours, and the permit indicated no additional lighting was necessary. A risk assessment conducted before issuing the permit identified the two primary risks as trips and pollution.

### SHIP PARTICULARS

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**Ship Name**  
ANTARES

**Registered Owner**  
New Dilong Shipping Corporation

**ISM Ship Management**  
Transocean Maritime Agencies S.A.M.

**Flag State**  
Republic of the Marshall Islands

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<b>IMO No.</b> 9696412	<b>Official No.</b> 6098	<b>Call Sign</b> V7JS8
<b>Year of Build</b> 2015	<b>Gross Tonnage</b> 44,034	
<b>Net Tonnage</b> 27,334	<b>Deadweight Tonnage</b> 81,600	

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**Length x Breadth x Depth**  
224.8 x 32.2 x 20.0 meters

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**Ship Type**  
Bulk Carrier

**Document of Compliance  
Recognized Organization**  
DNV-GL

**Safety Management Certificate  
Recognized Organization**  
DNV-GL

**Classification Society**  
DNV-GL

**Persons on Board**  
20

<sup>1</sup> Unless otherwise stated, all times are in ship’s local time (UTC +5.5).  
<sup>2</sup> The Company’s Safety Management System (SMS) on board ANTARES required that a permit be issued for special or non-routine work. The permit was properly completed for working with the hatch cover open.

4. Before the work began, the Cargo Hold No. 4 hatch cover was opened. Crew entered the empty hold to water wash all surfaces in preparation for loading at the next port.<sup>3</sup>
5. At about 1515, the Master ordered the hatch cover closed due to the ship's increased rolling as sea conditions deteriorated.<sup>4</sup> At this time, the crew involved in the cleaning went on break, and the C/O went to the Bridge to discuss the progress with the Master. They determined that the ship's movement was not great enough to pose a crew risk, nor prevent work from continuing.
6. About 30 minutes later, the deck crew resumed washing with the hatch cover now closed. Several portable lights were hung from the fore and aft safe access platforms in the hold.
7. At 1600, the C/O relieved the Second Officer (2/O) as OOW on the Bridge. The C/O's normally scheduled underway watches were 0400–0800 and 1600–2000 daily.
8. At about 1650, the Master relieved the C/O as the OOW so that the C/O could return to Cargo Hold No. 4 to supervise the cleaning. On his return, the C/O determined that the lighting was not adequate to complete the task properly and safely. The C/O directed the Bosun to place additional portable lights on the safe access platforms.
9. At about 1710, the Bosun tasked an OS to arrange the additional lighting. The OS left the hold using the aft ladder and went on deck to get the floodlights.
10. The C/O went to his cabin around 1715 to change clothes prior to returning to the Bridge to resume duty as the OOW.
11. Noticing that the OS had not returned with the additional lighting, the Bosun sent an ASD to check on the OS.
12. The ASD stated that at about 1740, he found the OS laying on his back on the main deck between Cargo Hold Nos. 3 and 4. The ASD reported that the OS was unresponsive and was holding a floodlight between his left side and arm.
13. The ASD switched off power to the outlet connected to the floodlight held by the OS, which was reported as being in the "on" position. The ASD tried to wake the OS without a response. Unable to revive the OS, the ASD ran to the C/O's cabin to notify him of the incident.
14. When notified, the C/O informed the Master and both proceeded to the incident location. The Master determined that the OS was deceased, as no pulse or respirations were observed. It was also noted that the coveralls worn by the OS were wet from washing water.<sup>5</sup>
15. A postmortem medical examination determined the cause of the OS's death was consistent with electrocution.<sup>6</sup>

<sup>3</sup> Residues from the previous coal cargo were being removed by water washing with hoses.

<sup>4</sup> Seas were recorded at 2-3 meters (m).

<sup>5</sup> As reported by the Company following their internal investigation.

<sup>6</sup> The autopsy report indicated electrical burns were found on the OS's left chest, arm, and left hand. The clothing in these areas also showed signs of burning. No other significant findings or potential causes of death were identified.

### ***Crew Experience***

16. ANTARES had a crew of 20, more than required by the Minimum Safe Manning Certificate issued by the Administrator. All the officers and ratings held valid seafarer documents.
17. The Company employed the C/O for about 12 years, all of which had been on board bulk carriers as the C/O. He had been on board ANTARES for 15 days.
18. The Company employed the Bosun for about five and a half years, all on board bulk carriers. For five years of his employment, he served as Bosun. He had been on board ANTARES for five months.
19. For about seven years, the Company employed the OS and all his time was on bulk carriers. The OS had been on board ANTARES for 49 days. The OS joined the Company and originally sailed for about one year as an ASD. The Company reported that the OS then sailed all remaining contracts as an OS, due to the limited availability for ASD positions.
20. There is no indication that the Master, C/O, OS, or any other involved crewmembers had failed to receive the amount of rest mandated by the International Maritime Organization's (IMO's) Seafarers Training, Certification and Watchkeeping (STCW) Code,<sup>7</sup> Section A-VIII/1 and the International Labour Organization's Maritime Labour Convention, 2006, regulation 2.3, prior to the incident.

### ***Safe Work Procedures and Emergency Readiness***

21. As required by the IMO's International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code), the Company's SMS provided detailed requirements for conducting special or non-routine work. This includes pre-task risk assessments, issuing work permits, Toolbox Talks, and identification of proper personal protective equipment (PPE). While manual cargo hold washing was a frequent task on board ANTARES, the SMS considered the work as special due to the unique hazards presented by working within the cargo holds.<sup>8</sup>
22. At the time of the incident, the OS was wearing all PPE required by the SMS (coveralls, safety shoes, and safety helmet). It is reported that the OS's clothes were wet, which was attributed to the cargo hold washing operations.

### ***Electrical Equipment***

23. The floodlight the OS was setting up at the time of the incident was an IP44-rated 220/240-volt, 50/60 hertz halogen light designed for fixed installations.<sup>9</sup> The unit had a cable and appropriate male plug for the intended receptacle (*see Figure 1*).

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7 As amended by STCW/CONF.2/34, The Manila Amendments to the STCW Code.

8 The Company's SMS requires that all closed cargo holds be considered enclosed spaces and adherence to enclosed space entry procedures.

9 IP44 refers to the classification of the degree of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72.5 kilovolts in accordance with the International Protection Marking (IP) Code (IEC Standard 60529). Specifically, IP44-rated units provide protection from foreign objects less than 1 millimeter (mm) in size from contacting hazardous parts and preventing ingress from splashing water.



Figure 1: The halogen flood light found with the OS.

24. The circuit powering the outlet for the light was 220-volt, 60 hertz and protected with a 16-amp fuse. Following the incident, the fuses for the switched outlets were checked by the ship’s electrician. The fuse for the outlet connected to the OS’s floodlight was found to be blown when tested. All remaining fuses were not blown.
25. A review of the design plan showed that the fuse in use at the time of the incident met the original specification.
26. The lamp involved in the incident was ordered as a replacement lamp for inoperable portable light fixtures and was received on board the ship on 7 May 2018. Several of the same type of fixtures were supplied to the ship as a replacement for broken portable lights.<sup>10</sup>
27. Following the incident, the lamp held by the OS had damage to the housing (which holds the glass cover in place) and the mounting bracket. The outer insulation of the cable was found pulled back from the weathertight connector on the lamp housing, exposing the individually insulated wires inside (see Figure 2).

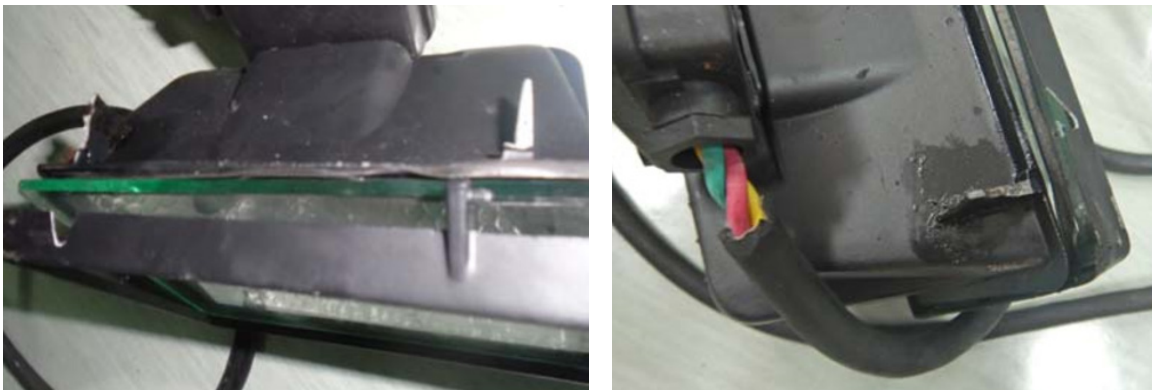


Figure 2: Damage to halogen flood light.

<sup>10</sup> The Company reported that the intended use of the lights was not known or considered when they were supplied to the ship with lights designed for fixed use when portable lights were needed.

## PART 3: ANALYSIS

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The following Analysis is based on the above Findings of Fact.

### *Onboard Risk Management*

The Company has provided an onboard SMS which details the requirements for carrying out special or non-routine work tasks, including the completion of a risk assessment and Toolbox Talk prior to commencing work. All the actions required by the SMS were completed prior to the Master issuing the Special Work Permit. At the time, the hatch covers were open, and the permit noted that natural lighting was adequate. As the ship's rolling increased in the afternoon, the Master ordered the hatch covers closed to prevent damage to the hatch cover mechanics. This significantly changed the work conditions from those originally identified on the Special Work Permit. However, the Special Work Permit was not reviewed, updated, or reissued to reflect this change in condition. In addition, the previously completed risk assessment was not reviewed, nor was a new one conducted to identify any new hazards resulting from the hatch closure.

As required by the SMS and Special Work Permit, the C/O reportedly conducted a Toolbox Talk before starting work in the morning. It is noted that no Toolbox Talk or other briefing was conducted when the crew resumed work in the closed Cargo Hold No. 4. However, the C/O identified the need for additional lighting to provide a safe work environment and initiated this with the Bosun after the work had already resumed.

### *Human Factors*

It is reported that when found, the OS was lying on the deck with a floodlight and its coiled cable held between his left chest and arm. The responding crewmembers reported that the light was plugged in and the outlet switch was "on." This suggests that the OS was carrying the energized light to the hold entrance when he was electrocuted. There were no witnesses to the incident and, therefore, it cannot be determined exactly what occurred immediately prior to the electrocution.

The OS was reported as wearing all the PPE required by the SMS for the cargo hold washing (coveralls, safety shoes, and a safety helmet). It is important to note that the OS's clothing at the time of the incident were wet from the water used during the hold cleaning operation. This would have increased the electrocution potential when handling energized electrical equipment.

### *Supervision*

When the Special Work Permit was issued and work started, the C/O was the supervising officer overseeing the task. However, the C/O left the work area shortly before 1600 to assume his normally scheduled navigation watch. The C/O left the Bosun in charge of the operation, but no formal handover was reported to have occurred. Although the C/O was still identified as responsible for the hold cleaning operation, he was unable to properly supervise the work from his remote position on the Bridge.

### ***Communication***

The additional risk posed by using portable electric lights was not communicated to the crew before the order to prepare the lighting was given. This is evidenced by the fact that the OS was connecting electrical devices while wearing wet clothing, and that he is presumed to have been handling energized wiring and devices. There is no indication that the C/O, as the supervising officer, and the Bosun, as the person directing the work, communicated these risks and the best work practices to limit exposure.

### ***Electrical Equipment Selection***

It is noted that the electrical halogen lamp selected by the OS was not designed for portable use. The unit was fitted with a bracket for permanent mounting to a fixed surface. The light was delivered to the ship as a replacement for other inoperable portable cargo hold lights. However, it was not ensured that the lights were of the proper design for their intended use prior to placing them in service on board. The Company reports that the requisition for the replacement lights did not specify the end use (i.e., portable versus fixed) nor was the intended use questioned by the Company.

### ***Condition of Electrical Equipment***

The light held by the OS when he was discovered had damage to the housing and the electrical cable. It is unclear when this damage occurred. Both or either of these defects could potentially have compromised the device's designed electrical insulation, creating an electrocution hazard.

Before the incident, the Company's SMS did not address inspecting or testing of portable light fixtures. There is no record available that would indicate the condition of the floodlights before their use on 7 September 2018. In addition, the lamp condition immediately before the incident, cannot be determined as the deceased OS was the only person to handle them.

## **PART 4: CONCLUSIONS**

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The following Conclusions are based on the above Findings of Fact and Analysis and shall in no way create a presumption of blame or apportion liability:

The causal factors that contributed to the death of the OS were:

1. electrocution due to the handling of defective, energized electrical equipment;
2. using electrical equipment not designed for the intended use; and
3. handling energized electrical equipment while wearing wet clothing.

The causal factors that may have additionally contributed to this fatality include:

1. failure to reassess hazards following a significant change in work conditions as required by the Company's pre-task risk assessment identification, assessment, and control procedures;

2. inadequate supervision and scheduling of work when the C/O served as the responsible officer for the hold cleaning and simultaneously the OOW on the Bridge;
3. ineffective communication regarding the proper use of portable electrical devices;
4. failure to determine the intended use of the light fixtures during the procurement and provisioning process; and
5. failure to properly monitor the condition of portable electrical equipment and conduct preventive maintenance to identify and correct defects.

## **PART 5: PREVENTIVE ACTIONS**

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In response to this very serious marine casualty, the Company has taken the following Preventive Actions.

1. The details of the incident and associated lessons learned were circulated to the Company's managed fleet, including awareness regarding the dangers of handling electrical equipment while wearing wet clothing or in wet areas.
2. The work permit procedures detailed in the SMS will be amended to include the development of a permit to work for entry into cargo holds, which requires the inspection of electrical equipment prior to commencing work and topics to be discussed during Toolbox Talks.
3. The Company's preventive maintenance system will be amended to include a requirement that all portable flood lights on managed ships be inventoried and inspected.
4. The Company's requisition process will be amended to require the details of the intended use for requested electrical equipment.
5. Internal audit and inspection checklists will be updated to include the inspection of portable electrical equipment.

## **PART 6: RECOMMENDATION**

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The following Recommendation is based on the above Conclusions and in consideration of the Preventive Actions taken.

Considering that the C/O was acting as the responsible person for the cargo hold cleaning while also serving as the OOW, it is recommended that the Company takes measures to ensure that conflicting responsibilities are properly identified and corrected as part of the risk assessment process and prior to commencing work.

The Administrator's marine safety investigation is closed. It will be reopened if additional information is received that would warrant further review.