



Marine Safety Investigation Unit



Transport Malta



MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the fatality inside the elevator shaft
on board the Maltese registered bulk carrier

ABYO AUDREY

in position 35° 42.54' N 121° 01.42' E

on 05 April 2017

201704/002

MARINE SAFETY INVESTIGATION REPORT NO. 06/2018

FINAL

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

This safety investigation report is not written, in terms of content and style, 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 objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 05 April 2017. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

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Managers' representative on board the *MV Abyo Audrey*

Master and crew of the *MV Abyo Audrey*

Documentation supplied by the vessel and Managers

Statements from master, chief engineer and electro-technical trainee

GLOSSARY OF TERMS AND ABBREVIATIONS

ET	Electro–technical trainee
COSWPMS	Code of Safe Working Practices for Merchant Seafarers
DPA	Designated Person Ashore
ETTO	Efficiency-to-thoroughness trade off
HSEQ	Health, Safety, Environment, & Quality
ILO	International Labor Organization
LT	Local time
MSIU	Marine Safety Investigation Unit
OPL	Outside Port Limits
PA	Public Address
SMS	Safety Management System
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 a amended
UTC	Universal Time Coordinated
m	Meters
mm	Millimetre

SUMMARY

On 05 April 2017, the electrician on board the Maltese registered bulk carrier *Abyo Audrey* suffered fatal injuries while working inside the elevator shaft.

The electrician had been working with the electro-technical trainee when work was stopped for the day. However, at about 1745 (LT), when the electrician had not shown up for dinner, the trainee engineer became concerned and informed the chief engineer. A search of the area where the electrician was last known to be working was carried out and he was eventually found inside the elevator shaft, trapped between the counterweight and a protective beam.

The alarm was raised and the crew rushed to release him and administered first aid, including resuscitation, but he did not respond. He was pronounced dead at the scene. The master immediately informed the company Designated Person Ashore (DPA) and the local authorities.

The safety investigation concluded that although safety procedures had been observed throughout the day of the accident, the entry into the elevator shaft without being assisted and in communication with other crew member, was a contributing factor to this accident.

The Marine Safety Investigation Unit (MSIU) has made five recommendations to the flag State Administration and Augustea Technoservice Srl, the managers of *Abyo Audrey*, aimed at making procedures clearer and bringing attention to the importance of communication when working alone.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine Casualty Particulars

Name	<i>Abyo Audrey</i>
Flag	Malta
Classification Society	Bureau Veritas
IMO Number	9585596
Type	Bulk Carrier
Registered Owner	ABY Fifteen Ltd.
Managers	Augustea Technoservice S.R.L.
Construction	Steel (Double bottom)
Length overall	291.80 m
Registered Length	282.20 m
Gross Tonnage	91,909
Minimum Safe Manning	15
Authorised Cargo	Bulk cargo
Port of Departure	Sudeste, Brazil
Port of Arrival	Qingdao, China
Type of Voyage	International
Cargo Information	Iron ore (165,738 mt)
Manning	19
Date and Time	05 April 2017 at 17:45 (LT)
Type of Marine Casualty	Very Serious Marine Casualty
Place on Board	Crew elevator shaft
Injuries/Fatalities	One fatality
Damage/Environmental Impact	None
Ship Operation	Normal Service – Arrival
Voyage Segment	At anchor
External & Internal Environment	Good visibility with Northerly Beaufort force 4 wind. Sea state 3.
Persons on Board	19

1.2 Description of Vessel

1.2.1 General

The Maltese registered *Abyo Audrey* is a Cape Size bulk carrier built in 2011 at the New Times Shipbuilding Co. Ltd. in China. *Abyo Audrey* has a gross tonnage (gt) of 91,909 and deadweight of 175,125 tonnes. The vessel is classed by Bureau Veritas, owned by ABY Fifteen Ltd., and managed and operated by Augustea Technoservice Srl (Augustea), based in Naples, Italy.

The vessel has a length overall of 291.8 m and a beam of 45 m. Her depth is 24.75 m and her maximum draught, when fully loaded, is 18.27 m. *Abyo Audrey*'s propulsive power is provided by a two-stroke, single acting diesel engine, producing 16,860 kW at 91 rpm. The engine drives a single fixed pitch propeller that gives her a maximum speed of 15 knots and a service speed of 12 knots.

The vessel has a single hull with a double bottom arrangement. It has 9 cargo holds with hydraulically operated, side opening, hatch covers (Figure 1).



Figure 1: General view of *Abyo Audrey* from the bridge

1.2.2 Accommodation

Abyo Audrey's accommodation block is split into six decks, including the navigation deck. The six decks are labelled A, B, C, D, E and the navigation deck. Deck A is the lowest deck. An elevator (Figure 2) runs between Deck A and Deck E, with access at each level. The elevator also goes down to, and terminates at the deck which is level with the engine control room (ECR), namely Deck 2.

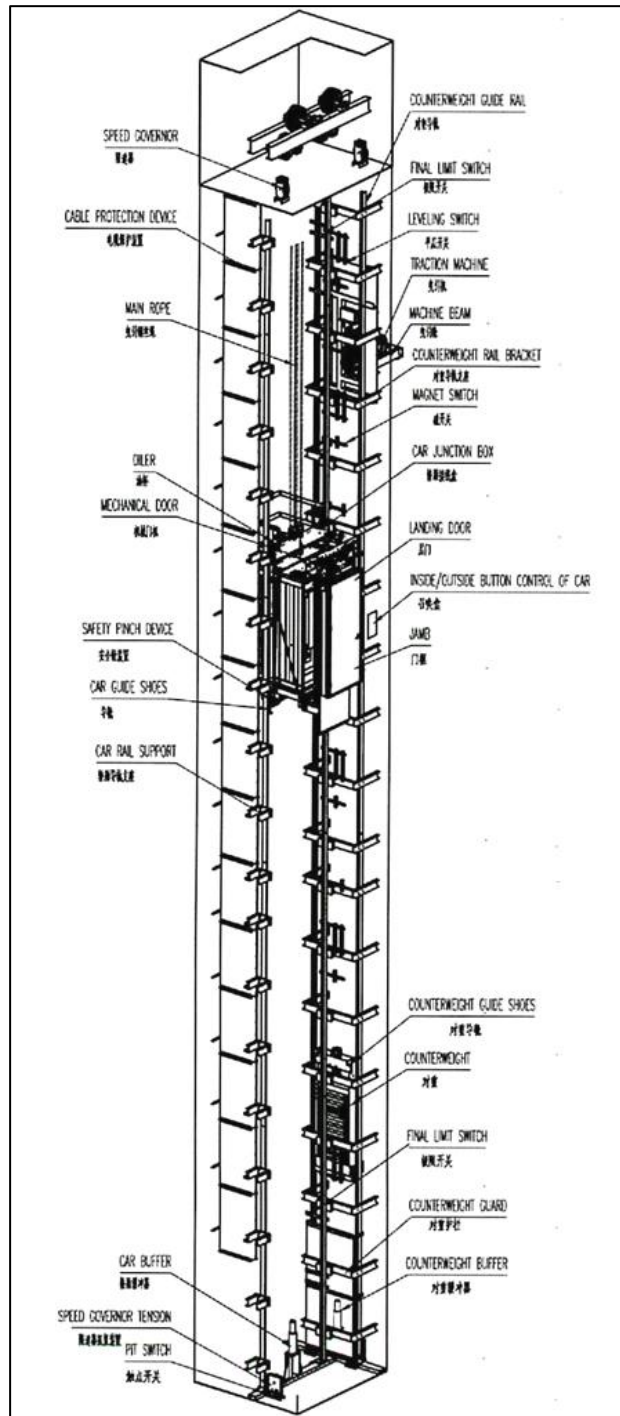


Figure 2: Elevator plan

Each deck has a hinged door, which can be opened when the elevator car stops at that deck. Inside the hinged door is a sliding door on the elevator car, which opens automatically when the car arrives at the deck.

The elevator was manufactured by Shanghai Marine Equipment Research Institute. The last annual safety inspection of the elevator by a shore technician took place in Lianyungang, China, in September 2016 by a company called Mr Elevator whose head office is in the Netherlands. A copy of the inspection certificate can be found at attached to this safety investigation report (**Annex A**).

1.3 Manning and Crew

At the time of the accident, *Abyo Audrey* was manned by 20 persons, including the master, three navigation watchkeeping officers (OOWs), one chief engineer, three engineers and an electrician. All of the crew members were Filipino nationals and the working language on board was English.

Abyo Audrey was manned in excess of the Minimum Safe Manning Document issued by the flag State Administration. The watchkeeping hours on the bridge were divided among the three deck officers on a '4-on, 8-off' basis. The engine-room was certified as an unmanned machinery space operation and normally operated in an unmanned mode. It was routinely manned during the day between 0800 and 1700.

1.3.1 Master

The master was 49 years old. He had been at sea for 17 years and had five years experience in the rank of master. He had sailed with the Company in the rank of a master for two years and for 2.2 years prior to that in a different rank. He had joined *Abyo Audrey* on 18 February 2017.

1.3.2 Chief engineer

The chief engineer was 58 years old. He had been at sea for 12 years and had been in the rank of chief engineer for 10 years. He had joined the Company in 2014 as a chief engineer. He had signed on *Abyo Audrey* on 23 October 2016.

1.3.3 Second engineer

At the time of the accident, the second engineer was 47 years old and had been at sea for six years. He had his second engineer's certificate for two and a half years and had since sailed in this rank with the Company. He embarked on *Abyo Audrey* in Dampier in October 2016.

1.3.4 Electrician

The electrician had been at sea for 1.7 years, serving in this rank. However, he had only obtained his Certificate of Competency eight months prior to the accident. The Certificate of Competency, issued under Regulation III/6, allowed him to conduct work at operational level for the following:

*“Electrical, electronic and control engineering maintenance and repair
Controlling the operation of the ship and care for person on board”*

He had always worked for the Company. He joined the vessel on 23 October 2016 in the port of Qingdao.

1.3.5 Electro-technical trainee

The electro-technical trainee was 26 years old and has been at sea for two years, serving on board vessels under the Company's management. He had joined the vessel on 23 October 2016.

1.4 Environment

Visibility was moderate with a Southwesterly swell and a moderate Northerly breeze. The outside air and sea temperatures were 12 °C and 9 °C respectively. The work inside the elevator shaft was artificial but considered adequate.

1.5 Narrative¹

1.5.1 Events leading to the accident

Abyo Audrey departed Sudeste, Brazil on 19 February 2017 with a cargo of iron ore, bound for China and a brief stopover in Singapore for bunkers.

During the voyage, it appeared that there were some problems with the stopping position of the elevator car at each level. At the time, it was thought that these problems may have been related to the heat in the control cabinet because of higher ambient temperatures and possibly the limit switch adjustment.

Checks were carried out on 21, 22 and 27 March. The details of the work carried out were recorded in the electrical maintenance report for March 2017 (**Annex B**). However, the fault on the elevator car stopping level at each floor persisted and could not be rectified. As a result of this problem, the elevator was reportedly put out of order until further checks could be carried out at a later date or at the next anchorage.

This work was additional to the routine weekly checks to be carried out on the elevator as indicated in the inspection/maintenance report for the Personal Lift and Elevator Form SMS MAN 4A F-50 Rev 01/16 (**Annex C**). The chief engineer's work plan for the anchorage at Qingdao (**Annex D**) indicated in item 15 that the limit switches of the elevator were to be checked.

Abyo Audrey arrived outside port limits (OPL) Qingdao, China on 03 April 2017, calling finished with engines at 1406. The vessel dropped anchor there to await further orders for the discharging of the cargo.

On the morning of 05 April 2017 between 0800 and 0820, a tool box meeting was held in the engine-room prior to commencing work for the day. The meeting record indicated that the electrician and electro-technical trainee would check the speed governor and limit switches of elevator (**Annex E**). As the second engineer required assistance with the cleaning of scavenge spaces, this particular item was deferred to start at 1300.

¹ Unless otherwise stated, all times are local (LT).

In trying to check the governor and limit switches, the chief engineer wanted to try and rectify the problem with the elevator car not stopping exactly at the deck level. It was reported that prior to the commencement of this work, signs were posted on every floor and on the control panel indicating that the equipment was out of order due to maintenance (Figure 3). Similar signs were posted over the call buttons at individual decks.



Figure 3: Out of Order Sign *(The DPA sign was put after the accident happened)*

During the lunch hour, the second mate made an announcement on the public address (PA) system that maintenance on the elevator was to be carried out. The work was scheduled to take place between 1300 and 1700.

As the work involved working in the elevator shaft, a 'Working Aloft' permit was issued for work to be carried out between this period (**Annex F**). The permit was signed by both the electrician and the chief engineer. The chief engineer also checked the site prior to the commencement of the work.

The electrician and the electro-technical trainee, commenced with the checking and adjusting of the limit switches (which give the signal for the elevator to stop at the various decks), working from Deck E downwards. The electrician was working inside the elevator shaft and the electro-technical trainee was attending outside as a safety/communication person.

This work was uneventful until approximately 1645 when the electrician and electro-technical trainee stopped work as it was time for dinner, which was normally served at 1700. The elevator car was parked on Deck B and the electro-technical trainee watched the electrician come down through the escape hatch in the roof of the elevator car and exit through the open elevator door on Deck B.

The electrician informed the wheelhouse by VHF radio that both the electro-technical trainee and himself were out of the elevator shaft and would continue the work on the following morning. This was overheard by the chief engineer on his hand set. No PA announcement was made at this time.

On his way to the changing room, located on the upper deck, the electro-technical trainee was under the impression that the electrician had been following him. However, when he looked back, he noticed that the electrician was not behind him. At the time, he did not consider this unusual, assuming that the electrician had gone to his cabin on Deck C rather than the changing room to clean up and change for dinner.

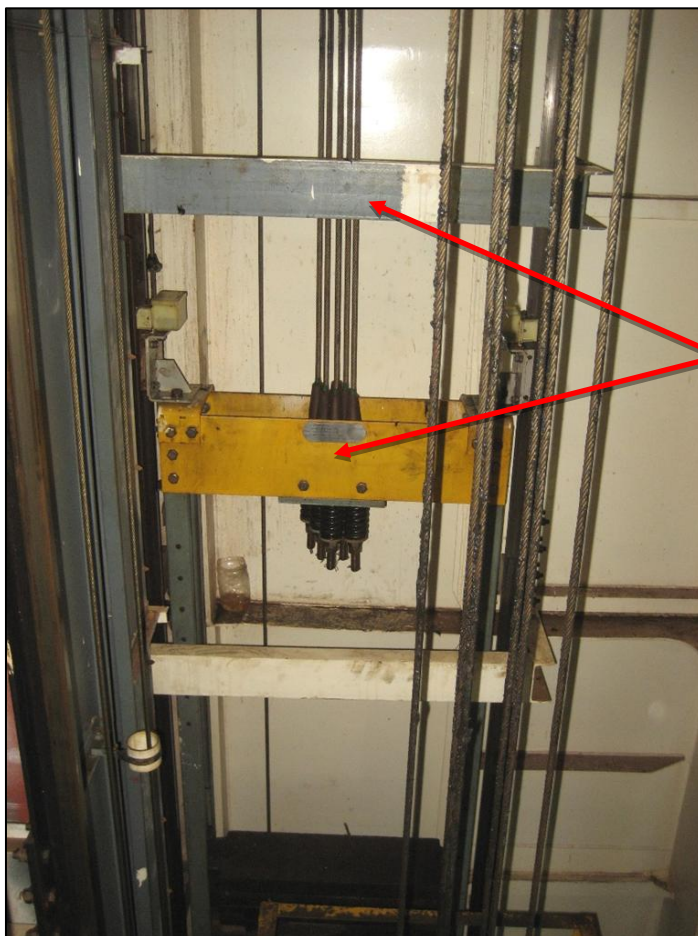
However, the electrician never turned up for dinner. At about 1745, the electro-technical trainee became worried and conveyed his concerns to the chief engineer that something may have happened to the electrician as he had not have dinner. Both the chief engineer and electro-technical trainee went first to the changing room to see if the electrician was there. However, he was not.

The chief engineer asked the electro-technical trainee to indicate the last place of work and they proceeded to the Deck B door, which was shut. Upon opening the door with the emergency tool (Figure 4), they found that the elevator car had moved downwards between decks. The electrician was sighted inside the elevator shaft with his right leg draped over the counterweight and his upper torso trapped between the counterweight and one of the counterweight guard beams.



Figure 4: Emergency door tool

It was noticed that the electrician was wearing a safety harness but was outside the safety of the cage on the top of the elevator car (Figure 5).



The electrician's torso trapped between the counterweight (yellow) and the beam (grey), with his right leg straddling the counterweight.

Figure 5: The area where the electrician was found inside the elevator shaft

1.5.2 Post-discovery of the electrician

The chief engineer notified the master immediately upon the discovery at 1748. The master raised the alarm for all crew members to attend at the scene and assist where possible. He then went to the wheelhouse to inform the Company's Designated Person Ashore (DPA) of the matter and radioed the local authorities for medical assistance. He also informed the charterer and the crewing office in Manila.

The chief cook, who was part of the medical emergency team, entered the elevator shaft to check for vital signs. He confirmed that the electrician was neither breathing, nor could he detect a pulse.

Arrangements using wire strops and chain blocks were rigged. This allowed the elevator car to be hoisted and the counterweight to move down and release the electrician from the entrapped position between the beam and the counterweight.

At 1815, the electrician's body was released and retrieved from the elevator shaft. The second mate, who was the ship's medical officer, confirmed there was no pulse. At 1820, the body of the deceased crew member was moved to the vessel's hospital whilst awaiting shore assistance. The second mate then went to the wheelhouse to assist with contacting the local authorities.

Due to a miscommunication regarding an email address used for official communication and request for assistance, there was no immediate response from the local authorities. At 2222, the master received instructions from the charterers' agent to shift the vessel towards Chaolian Dao Lighthouse to meet rescue vessel *Bei Hai Jiu 113*, with the intention of rendering assistance.

At 2300, *Abyo Audrey* commenced heaving her anchor and sailed towards the required position. She dropped anchor again in position 35° 48.0' N 120° 52.5' E at 0136 on 06 April 2017. The rescue vessel *Bei Hai Jiu 113* came alongside at 0210 and five persons boarded *Abyo Audrey* several minutes later. These persons consisted of two medics, one cameraman and two assistants.

Awaiting further instructions from their office, and having completed a medical examination of the electrician's body, the shore personnel departed the vessel at 0245. At 0223, the DPA advised the master to preserve the body and to follow the Ship

Captains Medical Guide in this respect. The body of the electrician was subsequently landed ashore by boat on 09 April. The vessel finally berthed on 11 April, to discharge in Rizhao, China.

A post mortem carried out in the Philippines confirmed the cause of death to be a blunt compressive trauma to the trunk, which was in line with the injuries sustained by the electrician in the elevator shaft on board.

1.5.3 Post accident inspection of the elevator

On completion of the on board investigation by local authorities, the managers arranged for an authorised expert from a specialist firm based in Shanghai, to carry out an inspection of the elevator. This inspection took place on the night of 16 May 2017. The inspection report (**Annex G**) indicated no findings of any significance to suggest any failure of the elevator machinery related to this particular accident.

1.6 The Elevator

1.6.1 Procedures for maintenance of the elevator

The manufacturers provided guidance on the maintenance of the elevator and categorised the role of the person(s) who can work on the elevator, as follows:

Expert: Expert representative of our lift firm or an appointed service partner of our firm;

Specialist firm: Lift firm with sufficient experience in the field of lift construction;

Person responsible for the lift: A person instructed by an expert, who supervises the operation and provides assistance in the event of faults as well as carrying out maintenance if required.

By default, the ‘Person responsible for the lift’ on board the vessel is someone from the ship’s technical staff, in this case, the electrician under instruction from the chief engineer.

The manufacturer’s manual also stated in section 1.3:

...[t]he technical staff on board a ship bears the responsibility for the safe operation of your lift. To ensure that the lift remains operable, maintenance must be carried out on

this lift regularly, on a monthly basis. For this purpose, we provide you with our detailed maintenance instructions.

This type of maintenance was covered by the planned maintenance system on board in section 3 of the instruction manual (**Annex H**).

1.6.2 Stopping at the floors

When the elevator car is called to a floor, it should stop at a level equal to the floor or deck it is called to, within certain limits. The stopping criterion is a function of speed, weight, braking and a magnetic proximity switch to tell the elevator to stop. The speed is controlled by a governor operating a brake; however, the weight varies according to load. It is expected that additional weight could cause the elevator to overshoot slightly going down and undershoot in the upward direction. The position of the proximity switches partially compensates for this and brings the elevator car level with the deck, within predetermined limits. The proximity switches are adjustable from inside the elevator shaft.

1.6.3 Installed safety features

The elevator system has safety features installed to safeguard both passengers and maintenance/service personnel whilst working on the installation.

The elevator car roof is fitted with an emergency escape hatch. In the event of a failure, the escape hatch may be used to access the elevator shaft and escape through one of the shaft doors into the accommodation. The shaft doors can be opened by a release inside the shaft. To prevent the elevator car from suddenly starting again while people are evacuating through the roof of the car, a latch-out system is incorporated in the escape hatch. The latch-out system is designed to disable the power to the elevator and prevent it from moving until the system is manually reset in the machinery room located on deck D (Figure 6).



Figure 6: Reset button inside control cabinet

Whilst working inside the elevator shaft, the car is locked out if an access door to any deck is open. On top of the elevator car, is a control box for maintenance operations whilst working inside the elevator shaft. The control box has a switch marked 'Inspection' OFF and ON. As soon as the maintenance engineer enters the shaft, this switch should be turned in the ON position (Figure 7).



Figure 7: Inspection switch (in the OFF position)

This switch enables the engineer to move the elevator car by the use of up and down buttons whilst inside the elevator shaft. It would also ensure that no one outside the elevator car operates the elevator. The top of the car has a safety cage and is intended for the engineer to remain within it when operating the car from inside the elevator shaft (Figure 8).

Upon leaving the elevator shaft, the inspection switch should be returned to the OFF position, so that normal service of the elevator car can be resumed.

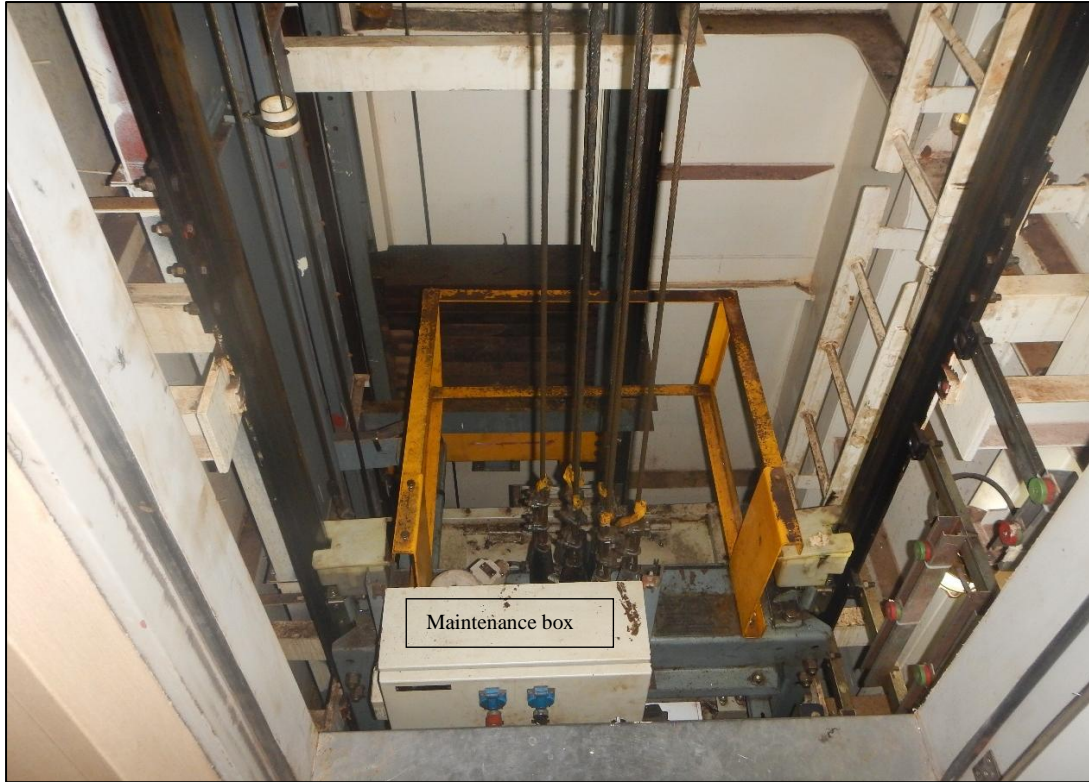


Figure 8 – Top of elevator car, showing maintenance box and safety cage

1.7 Maintenance and Inspection Procedures

In accordance with the vessel's safety management system (SMS), the Company supplied the vessel with maintenance and safety procedures, and instructions.

Relevant to this accident are:

- Safety Management Manual – Maintenance, Inspection and Test Procedures (**Annex I**);
- HSEQ Manual – Risk assessment (**Annex J**); and
- SMS MAN 4A F-24/A REV.01/16 – Working aloft permit (**Annex C**).

Apart from an annual safety inspection to be carried out by an expert company, the elevator is also part of an onboard planned maintenance regime.

The planned maintenance on board is a paper maintenance system. The elevator maintenance consisted of weekly checks as listed below:

- check on machine room compartment, lighting and communication system (telephone);

- check ropes for possible worn out;
- check oil level on gearbox through inspection glass (top up when necessary);
- check brake linings for wear and cleanness and inspect guide rails, guide shoe linings, oil level inside oiler system; and
- check and test limit switches and inspect proper guiding of main trailing cable.

There does not appear to be any more intensive maintenance for this equipment. The operational checks can be carried out externally, however, the close up inspections do require access to the elevator shaft. This maintenance has been recorded as being carried out regularly on a weekly basis on Company form SMS MAN 4A F-50 Rev. 01/16, indicating that access to the elevator shaft is a regular occurrence on board.

2 ANALYSIS

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

2.2 Overview of the Accident

The electrician was found outside the boundary of the safety cage, while the elevator was powered on. The safety investigation could neither establish why the electrician stepped out of the safety cage, nor why the elevator car moved uncontrollably. These points, however, and a number of contributing factors to the accident are discussed in the sections below.

2.3 Fatigue and Alcohol

Both the electrician and the electro-technical trainee were reported as being well rested at the time of the accident. The hours of rest records showed that rest hours were in excess of those required by the STCW Convention and the ILO.

The Company's drug and alcohol policy states that its ships are considered 'Alcohol Free' and there was no evidence of alcohol consumption during the investigation. Although there was no toxicology report included in the autopsy, the use of alcohol was not suspected of being a contributing factor to this accident. Therefore, both fatigue and alcohol were not considered to have contributed to the accident.

2.4 Status of the Elevator upon Completion of the Work

After completing his work for the day, the electrician exited the elevator shaft through the emergency escape hatch into the elevator cabin. This would have triggered the latch-out system and isolated the power on the system.

To reactivate the elevator, one would have to check that the emergency escape hatch was in a closed position and thereafter physically reset the system that was located in

the machinery room inside the control cabinet on D deck (Figure 6). However, following the accident, the maintenance switch was found in the 'ON' position, which meant that the electrician could move the elevator car up or down from within the elevator shaft, as long as the shaft doors were closed and the emergency latch-out was not triggered.

The safety investigation noticed that there was conflicting information regarding which door was opened first after the electrician was reported 'missing'. The chief mate stated that the door on deck A was opened first and after noticing the position of the elevator car, the door on deck B was opened. However, both the chief engineer and the electro-technical trainee recollected that they went to open the door on deck B where they discovered the electrician. This suggested that the elevator had moved down one deck in the interim period. The position of the elevator car would suggest that the electrician probably reset the latch-out system in the machinery room on deck D and thereafter called the elevator car to deck A, prior to entry into the elevator shaft through the elevator door on deck B.

2.5 Possible Reason for the Electrician's Re-entry into the Elevator Shaft

The investigation could not establish why the electrician returned to the elevator shaft after finishing his work for the day. Although the reasons for his actions were unclear, it was evident that he went back into the elevator shaft without informing anyone of his intentions. The electrician was considered to be a very safety conscience person, excellent at his job, and imparted his knowledge to the trainees on board. His decision will be analysed in some more detail in the following sub-sections.

Without any evidence, the safety investigation hypothesised that the electrician returned to the elevator shaft either to:

- retrieve something;
- check something that he had forgotten; or
- re-check/verify something.

The position he was found in suggested he was engaged in an activity in the far left corner of the elevator shaft. This hypothesis was based on the position he was discovered where his feet were straddled between the horizontal frame on the far side of the elevator shaft and the counterweight protection beam with the counterweight between his legs.

From the position in which the electrician was found, the only logical explanation appears to be that he returned to retrieve a plastic bottle of oil (Figure 9), either to prevent an oil spillage or to top it up and return it on the following day.

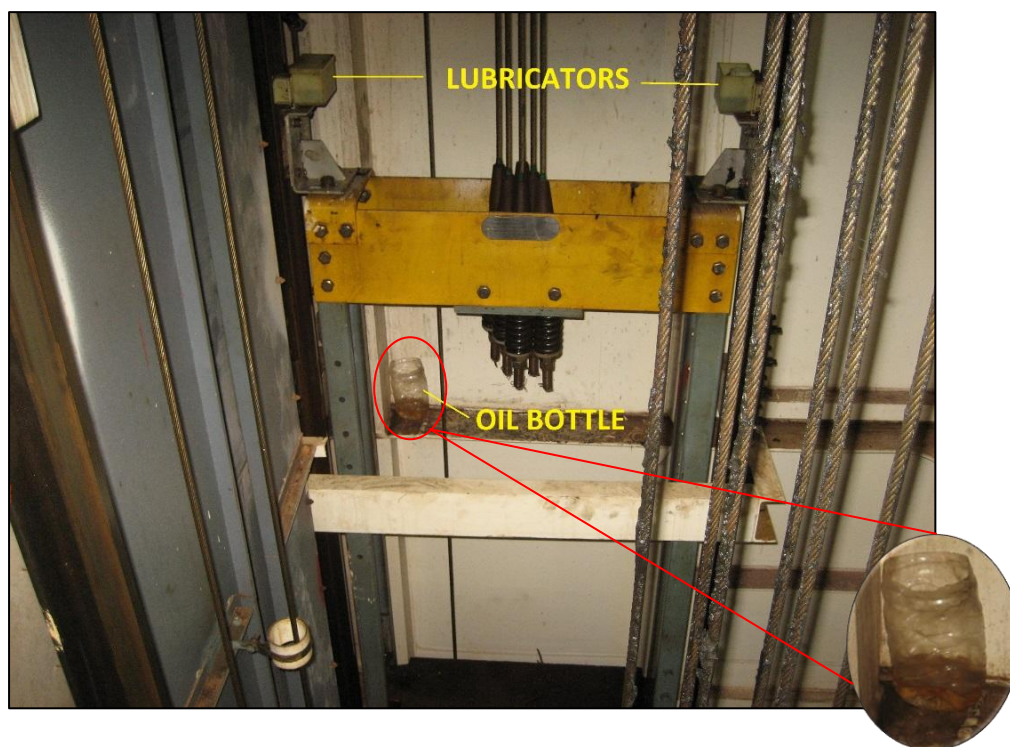


Figure 9: Position of lubricators and plastic oil bottle left in the elevator shaft

This bottle was used to top up the guide rail lubrication boxes and had been left behind on the horizontal frame at the back of the shaft. The only probable reason appears to be that while trying to retrieve the bottle, the elevator must have inexplicably moved downwards, trapping him between the counterweight and the counterweight guard beam.

2.6 Levelling of the Elevator Car

The manufacturer's instruction manual was neither clear nor consistent in its definition of what can be considered as the level of accuracy for tolerances when the elevator arrives at its stop. For instance, section 2.3.5 indicated that levelling of +/- 5 mm was acceptable, whereas on page 63, a more generous tolerance of between 20 to 30 mm was suggested. It then went on to suggest that a tolerance of +/- 10 mm was acceptable.

While this guidance may create confusion to someone who was not an expert in elevator maintenance, it was quite clear from the instructions (Figure 10) that if the elevator is not levelling at any floor, then it should be put out of service. This was done on *Abyo Audrey* a few days before the accident. Whilst the elevator was put out of service, the responsible expert was neither called nor informed of the problem, as required by the manufacturer's manual.

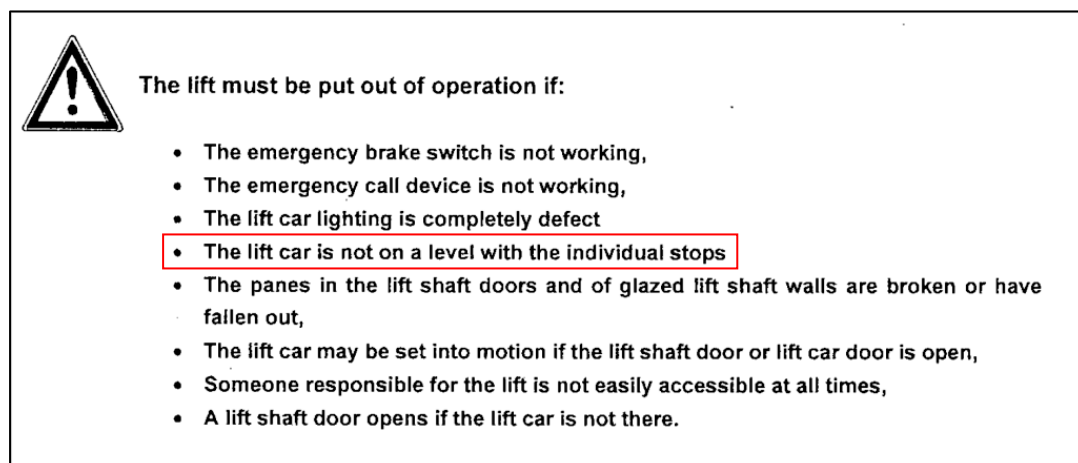


Figure 10: Warning in instruction manual

An inspection carried out by an authorised expert after the accident on 16 May 2017 suggested that a tolerance of 35 mm was acceptable. At the time of the inspection, the measurement read 30 mm (*vide* item LD04 of the checklist in **Annex G**).

2.7 Safety Management

2.7.1 Procedures

The Safety Management Procedure, OPS. ACC 2 (**Annex K**), which is pertinent to the elevator, inferred that no maintenance was to be carried out by ship's crew and that any defects are to be dealt with by either an elevator service provider, or an expert as referred to by the makers. The chief engineer understood that this only referred to annual checks by the service provider on major items whereas that routine maintenance and servicing of items could be done by the ship's staff.

This is broadly in line with the requirements of the instructions in the operations manual, which required routine checks and on board maintenance by the crew. Some of these checks could only be done from inside the elevator shaft and therefore safety procedures had to be followed in this respect.

While the Company provided a risk assessment for 'Electrical Workshop Activities on Elevator Cage' (**Annex J**), this only covered the use of PPE for protective actions. The Company's procedure, M2 Sec. II OPS.ELE. 1 to 6 M3 C2 EMP 5.3 referred to in the risk assessment did not cover the risks associated with working inside the elevator shaft and there was no provision for electrical isolation or safe entry and exit of the shaft.

2.7.2 Compliance

Prior to, during, and on completion of maintenance being carried out on the day of the accident, the following routines were carried out:

- Tool Box meeting in the morning to discuss the work for the day, including who will carry out which task and who will assist;
- A risk assessment was in place for working on the elevator cage shown (**Annex J**);
- A risk review was carried out by the chief engineer and electrician prior to commencement of work and a permit to work aloft was issued before work commenced;
- "OUT OF ORDER MAINTENANCE IN PROGRESS" signs were posted over the call buttons on each individual deck (Figure 11);

- The maintenance work was announced on the ships PA system and that the lift was out of commission during this time. (No announcement was made at the completion of work for the day);
- A second person was in attendance outside the lift shaft during the maintenance period, namely the electro-technical trainee. This was a requirement imposed by the manufacturers;
- Communication between the electrician and the wheelhouse was heard by the chief engineer when work had been completed for the day; and
- When exiting the elevator, the opening of the escape hatch isolated the power on the system.



Figure 11: Signage on each deck during maintenance

It was evident that up until the electrician and electro-technical trainee finished work for the day just before dinner on the evening of 05 April, the on board procedures in accordance with the safety management system were complied with.

2.7.3 Control measures

The United Kingdom's Code of Safe Working Practices for Merchant Seafarers (COSWPMS), section 19, stipulates that before gaining access to work within the elevator shaft:

...[t]he mains switch should be locked in the OFF position (or alternatively the fuses should be withdrawn and retained in a safe place) and an appropriate safety sign positioned at the point of such isolation. This should include both main and emergency supplies...

The vessel's procedures provided for a tag out system to be adopted by placing 'Out of Order Maintenance in Progress' signs. As electrical power would have been required for the person conducting the work within the elevator shaft to travel up and down during inspection and maintenance, this appears to have been a safe system. However, this system only worked if maintenance was being carried out from within the boundary of the safety cage within the elevator shaft.

This system would not be safe if the person undertaking maintenance had to step out of the safety zone for some other work, as the electrician did. The only way to have undertaken work outside the safety zone would have been to have a 'Lock-out' system in place where the power is isolated. The advantage of this system is that it prevents inadvertent operation of the machinery and when the power is isolated, the brakes, by default automatically engage in safe mode, preventing any movement.

2.8 Acceptance of Risk

The actual risk taken by the electrician to access the elevator shaft on his own is suggestive of an efficiency-to-thoroughness trade off (ETTO). It was highlighted during the interviews that the electrician was extremely meticulous in his work. In fact, the safety investigation analysed the decision of the electrician (to access the shaft on his own) from a slightly unique perspective.

Given that the electrician succumbed to his injuries, it was not possible for the safety investigation to identify the precise reason as to why he had opted to access the shaft on his own. Three possible reasons were, however, analysed:

1. The re-entry inside the elevator was perceived to be trivial. As indicated elsewhere in this safety investigation report, it was not excluded that the electrician wanted to pick the small container of oil. As such, this would not have necessitated the presence of another person inside the elevator shaft (in terms of workload);
2. The accompanying electro-technical trainee had already left for his cabin to shower and go for his dinner. It would have been possible that the electrician did not want to disturb him again and therefore proceeded to the elevator shaft on his own; and
3. The electrician may have perceived a potential problem inside the elevator shaft and immediate remedial actions had to be taken, without full diagnosis of the problem being possible, not least, the unexpected movement of the car.

As such, however, the possible reasons behind the decision of the electrician to access the elevator shaft on his own did not explain why or how the elevator car moved when he was on the roof of the elevator car.

2.9 The Elevator's Shift in Position between Decks

It was clear that for the electrician to have become trapped between the counterweight and the protection beam, the elevator car had to move down under power, causing the counterweight to move upwards.

As already explained, whilst working inside the elevator shaft, the maintenance switch on top of the car had to be switched to the 'ON' position (Figure 7). According to the interviewed crew members, this was the position in which the switch was found².

Although the electrician left the elevator for dinner via the escape hatch in the roof of the elevator car at deck B, it appeared that he had reset the system in the machinery

² As indicated elsewhere, the switch in the 'ON' position meant that with all doors closed, the elevator would only be operated from the elevator car roof, but not from the outside.

room on deck D and therefore he had correctly put the elevator back into maintenance mode as required, for working inside the elevator shaft.

The electrician was found to be wearing a safety line which was attached to the balance weight protective beam at the time of discovery. This was towards the rear of the elevator shaft, suggesting that he was attending to something in that area at the time of the accident. The position in which he was found indicated that he would not have been able to operate the elevator manually, as he would have been unable to reach the maintenance buttons due to the attachment of the safety harness. This would suggest that the elevator was not intentionally moved from inside the shaft at the time of the accident.

The only way the elevator could have moved mechanically would be if the maintenance switch was *not* in the 'ON' position at this time³. This would enable the elevator to be called at any deck level. It has to be stated, however, that there were 'Out of Order' signs covering the operating buttons on each deck, and the crew were aware of the ongoing problems with the elevator.

Another considered possibility was that the mechanical brake on the elevator winch motor had failed just at the time when the electrician had stepped outside the safety cage. However, subsequent checks by a qualified person found the brake to be in good working order. The only fault found by the qualified person was that the guide rail shoes were worn which, however, would not have affected the ability of the elevator to move.

Taking into consideration these factors, the safety investigation could not identify any other obvious reasons as to why the lift moved inadvertently.

³ This would have meant that the maintenance switch was only put in the 'ON' position during the rescue operation.

**THE FOLLOWING CONCLUSIONS AND
RECOMMENDATIONS SHALL IN NO CASE CREATE
A PRESUMPTION OF BLAME OR LIABILITY.
NEITHER ARE THEY BINDING NOR LISTED IN ANY
ORDER OF PRIORITY.**

3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factor

- .1 The immediate cause of the death was the downward powered movement of the elevator car, causing the counterweight to move upwards and entrapping the electrician between the counterweight and one of the counterweight guard beams.

3.2 Latent Conditions and other Safety Factors

- .1 The electrician stepped out of the safety cage;
- .2 The position of the elevator car would suggest that the electrician probably reset the latch-out system in the machinery room on deck D and thereafter called the elevator car to deck A, prior to entry into the elevator shaft through the elevator door on deck B;
- .3 From the position in which the electrician was found, the only logical explanation appears to be that he returned to retrieve a plastic bottle of oil, either to prevent an oil spillage or to top it up and return it on the following day;
- .4 The actual risk taken by the electrician to access the elevator shaft on his own is suggestive of an efficiency-to-thoroughness trade off (ETTO);
- .5 The re-entry inside the elevator after the day's work was over must have been perceived to be trivial and did not require the entry of a second person.

3.3 Other Findings

- .1 Both fatigue and alcohol were not considered to have contributed to the accident;
- .2 Whilst the elevator was put out of service, the responsible expert was not called or informed of the problem as required by the manufacturer's manual;
- .3 It was evident that up until the electrician and electro-technical trainee finished work for the day just before dinner on the evening of 05 April, the on board procedures in accordance with the safety management system were complied with;
- .4 The position in which the electrician was found indicated that he would not have been able to operate the elevator manually, as he would have been unable to reach the maintenance buttons due to the attachment of the safety harness;
- .5 The elevator was not intentionally moved from the inside of the shaft at the time of the accident;
- .6 The only way the elevator could have moved mechanically would be if the maintenance switch was *not* in the 'ON' position at this time;
- .7 Subsequent checks by a qualified person found the elevator brake to be in good working order.

4 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

The Merchant Shipping Directorate is recommended to:

06/2018_R1 publish an Information Notice to raise awareness on the hazards related to working alone and the importance of communication in enclosed spaces.

Augstea Tecnoservice srl is recommended to:

06/2018_R2 disseminate the findings of this safety investigation report to the fleet regardless of whether they have elevators or not, in order to highlight the importance of communication when working alone or in confined spaces;

06/2018_R3 review the risk assessment for 'Electrical Workshop Activities on Elevator Cage', with a view to include electrical isolation, and safe entry and exit of the elevator shaft;

06/2018_R4 provide specific training to personnel involved in elevator maintenance;

06/2018_R5 review the maintenance, inspection and test operational procedures so as to specifically exclude all adjustment of limits by ships personnel unless supervised by an expert.

ANNEXES

Annex A Inspection Report by Shore Company



Certificate of Approval*

*The official certificate will sent by post within 3 weeks after inspection date

Annual Safety Inspection Marine elevator

General

Name vessel: ABYO AUDREY
Managed by: AUGUSTEA TECNOSERVICE SRL
Date survey performed: 10th SEP. 2016
Port name: LIANYUNGANG. CHINA

Elevator specifications

Type: crew cargo passenger dumb-waiter
Make: SMERI
Installation number: 10020305

Certificate registration

Job Number: J-34232



Approved by:

Name Technician

Signature:



Mr Elevator head office

tel: +31 10 714 4882
info@mr-elevator.com

ICS 91.140.90 ISO 8383:1985 LIFTS ON SHIPS
NEN-EN 81-1 Safety Rules Construction and Installation of Lifts ELECTRIC LIFTS
NEN-EN 81-2 Safety Rules Construction and Installation of Lifts HYDRAULIC LIFTS



Annex B March 2017 Electrical Maintenance Report



Electrical Maintenance Report

	-Replaced busted radar mast light and fuse
14/03/17	-Daily work routine. Machinery inspection and checklist. -Replaced all busted fluorescent lights in engine room -Attended preparation meeting for PSC inspection -Replaced all busted electric ballast on lighting fixtures in engine room
15/03/17	-Daily work routine. Machinery inspection and checklist. -Rectify and cleaned sensor of forward stbd void space due abnormal water level alarm -Replaced all busted incandescent lights with new CFL at forward bosun store
16/03/17	-Daily work routine. Machinery inspection and checklist -Checked and cleaned sensor and copper tubing of F.O Leak in DG No. 3 -Replaced all busted lamps of flood lights in engine room -Rectify faulty wiring of emergency flood lamp in engine room
17/03/17	-Daily work routine. Machinery inspection and checklist. -Charged ECR aircon no. 1 with 3kgs R404A Freon -Troubleshoot ECR aircon no. 2 due to malfunction
18/03/17	-Daily work routine. Machinery inspection and checklist. - Weekly test on emergency machinery and equipment, bilges alarm, oily water separator 15 ppm alarm, check all emergency batteries, test fire alarm, hospital alarm and reefer chamber alarm
19/03/17	-Daily work routine. Machinery inspection and checklist. -Rectify ECR aircon and reefer plant alarm
20/03/17	-Daily work routine. Machinery inspection and checklist. -Replaced all busted illuminating lights inside engine room -Dismantled and checked/troubleshoot compressor of ECR aircon -Maintenance work at accommodation AHU
21/03/17	-Daily work routine. Machinery inspection and checklist. -Check carried out on elevator machine, visual check brake and control panel inspection, tested and put into service
22/03/17	-Daily work routine. Machinery inspection and checklist. -Replaced busted CFL in D deck laundry -Replaced flickering fluorescent light at crew recreation room -Replaced busted normal and emergency fluorescent lights and CFL in forecabin, fore mooring hydraulic room, midship hatch cover hydraulic room, aft bosun store, SOPEP room, upper deck engine casing -Checking of elevator regulator(inside control panel) due to abnormal occurrence of error
23/03/17	-Daily work routine. Machinery inspection and checklist. -Tested Port and Stbd fuel hose crane in preparation for bunkering operations -Tested hoisting functionality of provision crane in preparation for provision handling in Singapore -Replaced and rectified socket and wirings of busted flood lamps of fore and aft mooring winch lights, fore and aft emergency illuminating flood lamps
24/03/17	-Daily work routine. Machinery inspection and checklist -Standby at engine room for maneuvering and prepare lights and tools for bunkering for arrival at Singapore anchorage -Bunkering and provision operations -Charged 0.25kg R404A Freon on ECR air conditioning unit no. 2 -Replaced flickering fluorescent lamp at ER workshop -Annual inspection of ER water mist system with maker technician
25/03/17	-Daily work routine. Machinery inspection and checklist -Continue with bunkering operation -Standby at engine room for maneuvering, departure from Singapore anchorage - Weekly test on emergency machinery and equipment, bilges alarm, oily water separator 15 ppm alarm, check all emergency batteries, test fire alarm, hospital alarm and reefer chamber alarm
26/03/17	-Daily work routine. Machinery inspection and checklist. -Replaced flickering fluorescent light on duct keel entrance in ER
27/03/17	-Daily work routine. Machinery inspection and checklist -Check levelling switch on all floor levels of service elevator due to uneven level of car and landing floor
28/03/17	-Daily work routine. Machinery inspection and checklist

**Annex C Personal Lift and Elevator Reporting Form SMS MAN 4A F-50
Rev 01/16**



7a

M/V ABYO AUDREY

INSPECTION / MAINTENANCE REPORTING		OPS. ACC-2	
TYPE OF OPERATION		SCHEDULED	<input checked="" type="checkbox"/>
PERSONAL LIFT AND ELEVATOR		ACCIDENTAL	<input type="checkbox"/>
PERSONAL LIFT AND ELEVATOR		OCCASIONAL	<input type="checkbox"/>
Verification and Corrective Action if Any : 04 MAR 2017 - Check on machine room compartment, lighting and communication system (telephone). - Check ropes for possible worn out. - Check oil level on gearbox through inspection glass (top up when necessary). - Check brake linings for wear and cleanness and inspect guide rails, guide shoe linings, oil level inside oiler system. - Check and test limit switches and inspect proper guiding of main trailing cable. 11 MAR 2017 - Check on machine room compartment, lighting and communication system (telephone). - Check ropes for possible worn out. - Check oil level on gearbox through inspection glass (top up when necessary). - Check brake linings for wear and cleanness and inspect guide rails, guide shoe linings, oil level inside oiler system. - Check and test limit switches and inspect proper guiding of main trailing cable. 18 MAR 2017 - Check on machine room compartment, lighting and communication system (telephone). - Check ropes for possible worn out. - Check oil level on gearbox through inspection glass (top up when necessary). - Check brake linings for wear and cleanness and inspect guide rails, guide shoe linings, oil level inside oiler system. - Check and test limit switches and inspect proper guiding of main trailing cable. 25 MAR 2017 - Check on machine room compartment, lighting and communication system (telephone). - Check ropes for possible worn out. - Check oil level on gearbox through inspection glass (top up when necessary). - Check brake linings for wear and cleanness and inspect guide rails, guide shoe linings, oil level inside oiler system. - Check and test limit switches and inspect proper guiding of main trailing cable.			
SPARE PARTS			
DRW. Part Nr.	DESCRIPTION	USED	IN STOCK
Performing Department: ENGINE	Date 31 MARCH 2017	Signature: 	

Annex D Chief Engineer's Work Plan at Qingdao Anchorage

DATE: APRIL 2017

WORK PLAN AT ANCHORAGE/ QINGDAO, CHINA /OPL

1. REPLACE FUEL OIL AUTO BACKWASH FILTER.
2. REPLACE M.E. FUEL OIL INJECTION V/V NO. 1 CYLINDER AND NO. 3 AFT SIDE. — 04 APRIL '17
3. OPEN AND CLEAN SCAVENGING SPACE AND UNDER SIDE PISTON. — 05 APRIL '17
4. CHECK PISTON, RINGS AND CYLINDER LINER CONDITION. — 05-APRIL-'17
5. CLEAN M.E LUBRICATING AUTO BACKWASH FILTER.
6. REPLACE FUEL OIL BY PASS FILTER.
7. CONTINUE CLEANING ON GENERATOR FLOORING. — 03-APRIL-17
8. RECONDITION MUSHROOM VENTILATION AT PAINT ROOM.
9. CLEAN LOW SEA CHEST STRAINER AFTER DISCHARGING.
10. CLEAN ALPHA LUBRICATING SUCTION FILTER.
11. CLEAN OIL MIST DETECTOR FILTER/REPLACE IF AVAILABLE. — 06-APRIL-17
12. ROUTINE CLEANING EVERY RESPECTIVE AREA. — ON PROGRESS
13. DI-CLOGGING GALLEY DRAINAGE SYSTEM AND OPEN THEN CLEAN THE MUD BOX. — 07 APRIL-17
14. REPLACE AIR SUCTION FILTER OF M.E. TURBO CHARGER. — 07-APRIL-17
15. TO CHECK LIMIT SWITCHES OF ELEVATOR —

PREPARED BY: CHIEF ENG. 

Annex F 'Working Aloft' Permit



WORKING ALOFT PERMIT

WORK PLACE/ AREA ... ABOVE ELEVATOR CAGE		EQUIPMENT TO BE WORKED ELEVATOR	
DESCRIPTION OF WORK <u>CHECKING OF LIMIT SWITCHES AND GOVERNOR SPEED OF ELEVATOR (OUT OF SERVICE)</u> <u>ASSISTED BY E/T PALMA</u>			
PERMIT VALIDITY (1) FROM <u>1300HRS. OF 05/04/2017</u> TO <u>1700H. HRS. OF 05/04/2017</u>			
PREPAREDNESS, PRECAUTIONS, PROTECTIVE EQUIPMENT (Record YES or NOT as Necessary)			
WORKING ALOFT ?	<input checked="" type="checkbox"/>	HAVE ALL SAFETY PERSONNEL PROTECTION SATISFIED ?	<input checked="" type="checkbox"/>
WORKING OVERSIDE ?	<input checked="" type="checkbox"/>	ARE THE TOOLS TO BE USED WELL SECURED ?	<input checked="" type="checkbox"/>
ARE ALL INVOLVED PERSONNEL BEEN INFORMED ?	<input checked="" type="checkbox"/>	OTHER SPECIAL PRECAUTION ..	<input type="checkbox"/>
HAS THE SAFETY NET RIGGED ?	<input type="checkbox"/>	1. <u>ADEQUATE SAFETY MARKING HAVE POSTED</u>	<input checked="" type="checkbox"/>
IS THE WORK PLACE NEAR THE WHISTLE, R/SCANNER, OR RADIO ANTENNA ?	<input type="checkbox"/>	2.	<input type="checkbox"/>
HAVE THE ABOVE MENTIONED INSTRUMENTS BEEN SWITCHED OFF AND NOTICE NOT TO OPERATE POSTED ?	<input checked="" type="checkbox"/>	3.	<input type="checkbox"/>
.....RADAR-S ...BAND.....	<input type="checkbox"/>	4.	<input type="checkbox"/>
.....RADAR-X BAND.....	<input type="checkbox"/>	5.	<input type="checkbox"/>
SIGN AS APPROPRIATE		ELECTRICIAN _____ CHIEF ENGINEER / _____	
THE ABOVE PREPAREDNESS ACCOMPLISHED AND PRECAUTIONS TAKEN THEN THIS PERMIT IS AUTHORIZED FOR WORK UNDER THE ABOVE CIRCUMSTANCES.			
PERMIT AUTHORIZED AT <u>1300H</u> hrs. Of <u>05/04/2017</u>		By: C/E _____ (C/ENGR.)	
WORK SUSPENSION FOR :	WORK RESUMEND AT :hrs. of/...../.....	WORK COMPLETED AND ALL PERSONS, MATERIAL AND EQUIPMENT HAVE BEEN WITHDRAWN AND PLACE LEFT SAFE	
AT :hrs.	AGAINST ABOVE PRECAUTIONS AND SAFETY CHECK PERFORMED	ATH...../...../.....	
By :	By :	PERS. CHARGE	
		MASTER AMNW.	

(1)THE PERMIT IS VALID FOR 12 hrs. UNDER THE ABOVE ASSESSED CIRCUMSTANCES, IF THE WORK IS NOT COMPLETED WITHIN THIS TIME, IT MUST BE AUTHORIZED BY MASTER FOR EXTENSION UNTIL THE COMPLETION OF WORKS.

Annex G Post-accident Inspection Report



<h2 style="text-align: center;">Examination and Test Report</h2> <h3 style="text-align: center;">According to EN81-1/2 and ISO8383</h3>			
Inspection interval : Annual			
Vessel Details			
Name vessel	ABYD ALDREY	IMO nr.	9585596
Owner		Yard and year built	NTS, 2011
		Hull number	0117629
Flag	MALTA	Class	BV
Elevator Details			
Maker	SMERI	Type	CREW ELEVATOR
Serial number:	602005	2 speed or VVVF	VVVF
Type (traction, hydr)	TRACTION	Speed (m/s)	0.5
Rated load (kg)	350	Travel length (m)	21.55
Number of stops	7	at deck numbers	S.U.A.B.C.O.Z
Traction			
Traction machine type	TW45B	Number of steel wires	6
Traction machine maker	L2EQUIP	Steel wires type	8x519 #10
Doors			
Landing door type	H2H620 DOOR	Fire rating	[A0] [A60] [A120]
Cabin door type	CENTRAL OPENING		
Power Supply			
Wiring	[3 phase], [3 phase + N], [3 phase + N + Ground]		
Frequency (Hz)	60	Voltage (V)	440
Machinery room:	top/below/ <u>beside</u>	at deck number:	"D" DECK
<p>Mr Elevator address details</p> <p>Rotterdam: Walenburgerplein 106, 3039AN, Rotterdam, The Netherlands.</p> <p>Shanghai: 34 Fengpuyuan (# 402), Nanqiao Town, Shanghai, China</p> <p>Miami: 6365 Collins Ave, (#3809), 33141 Miami Beach, Florida, USA</p> <p>Central contact details: +31 10 714 4882 info@mr-elevator.com</p>			

Checklist (please see legend at the end of document)		Accept		
Area	Description	Y	N	NA
G1	Machine room is adequately locked	x		
G2	Emergency stop & main switch easy accessible and clearly marked	x		
G3	Installation manual present and up to date	x		
G4	Operating & rescue instructions, notices (Machine room & trap door)	x		
G5	All lightning and/or emergency lightning working	x		
G6	No foreign objects in the machine room and clean	x		
G7	Socket outlet available	x		
G8	Heating/ventilation in the machinery space between +5 and +40 degree. C	x		
G9	Hooks with the indication of the SWL	x		
CP1	Main power supply sufficient (fuses, circuit breakers etc), lockable main switch	x		
CP2	Fuses of the travelling cable not higher than 10A	x		
CP3	Fuses & circuit breakers is sufficient capacity and lift installation is adequately grounded	x		
CP4	Phase missing and phase reversal protection	x		
CP5	Machine Space (Clear area of 0,7m x width of the panel in front of the panel, and height of 2m at working areas)	x		
TM1	Electrical motor properly grounded	x		
TM2	Thermal safety device or fuses present and appropriate for the motor	x		
TM3	Gear, bearings, and flexible couplings in good condition	x		
TM4	Traction machine, flywheel, traction sheave, drum, deflector pulley's properly secured, and in good condition	x		
TM5	Traction sheave groove within its limits (check for wear)	x		
TM6	Slipping sufficient	x		
TM7	Emergency brake working	x		
TM8	Check brake holders (clamps) for fractures and general condition fitted	x		
TM9	Brake pads not worn, nor markings on drums	x		
TM10	Play in the worm and gear within limits	x		
TM11	Oil level of the worm gear sufficient and in good condition (if not, please fill up to marker)	x		
TM12	Brake test on each brake independently (check OEM manual)	x		
CB1	Landing signal lights working (elevator up/down, recall, arrival etc.)	x		
CB2	After a stop on the landing call buttons shall remain inoperative (Landing=3 sec, Car=1 sec) (Manual doors)	x		
CB3	Cabin push buttons, door open and close buttons working	x		
CB4	Cabin level indicator working	x		
CB5	Cabin Alarm button working	x		
CB6	Cabin Intercom working properly and 24/7 reachable	x		
CB7	Landing push buttons working	x		
CT1	Emergency stop working	x		
CT2	Maintenance switch and UP / DOWN switch working	x		
CT3	Escape hatch contact working	x		
CT4	Guide shoes in good condition		x	
CT5	Oilers fitted and filled with oil (if not, please fill up)	x		
CT6	Socket outlet present & working	x		
CT7	Electrical cables undamaged, protected and connected	x		
CT8	Distance Final limit switch top landing = 180.....mm			
CT9	Distance Final limit switch bottom landing = 192.....mm			
FS1	Jump of the elevator = $0,035 \times (\text{speed})^2 = \dots\dots\dots m$			

Checklist (please see legend at the end of document)		Accept		
Area	Description	Y	N	NA
FS2	DCW=distance Counterweight - Buffer when the cabin at top landing = 400mm			
FS3	Distance between highest standing area of the car roof and ceiling -> DCW 0,75m	x		
FS4	Distance of highest piece of equipment fixed on car roof and ceiling = 0,3+DCW+Jump	x		
FS5	highest part of the guide shoe/rope attachment/header cabin door = 0,1+DCW+Jump	x		
FS6	Free space to accommodate a rectangular box not less than 0,5 * 0,6 * 0,8m	x		
SW2	Wire rope condition (Check for wear, corrosion, rust, reduction of diameter, kink, external damages, nests of fractures or broken strands)	x		
SW3	Wire ropes prevented from rotating	x		
SW4	Number of wires fractures (less than 6 per strand and 12 per lay)	x		
SW5	Wire rope fastening (termination) and hitch plate	x		
SW6	Compensation ropes fitted and in good condition	x		
CW1	Guide shoes and linings in good condition		x	
CW2	Oilers fitted and filled with oil (if not, please fill up)	x		
CW3	Pulleys in good condition (if applicable)			x
CW4	Steel wire ropes prevented from rotating	x		
LD1	Unlocking contact working	x		
LD2	Emergency unlocking working	x		
LD3	5mm engagement of the lock contact working	x		
LD4	Distance cabin and landing sill =?2.....mm (less than 35mm)			
LD5	Sliding door: self closing and force of door does not exceed 150N			x
LD6	Sliding door: linking wires of the panels in good condition			x
LD7	Sliding door: Panels prevented from lifting of the guide - oppression rollers			x
LD8	Hinged doors: hinges in good condition	x		
LD9	Hinged doors: door stopper present to prevent damages	x		
P1	Pit clean (no oil and dirt).	x		
P2	All lighting working and sufficient	x		
P3	Sufficient tension on speed governor deflection pulleys	x		
P4	All oil spoons empty (if not, please empty)	x		
P5	Car and counterweight buffers/springs in good condition	x		
P6	Enough space for the tensioning contact (stretching of steel wires)	x		
CD1	Door controller working correctly	x		
CD2	Door reopening device (safety edge, light curtain) working correctly	x		
CD3	Cabin doors secured and cannot unrail (upthrust rollers)	x		
CD4	Cabin door rollers clean, if not, please clean; and good condition	x		
CD5	Safety circuit remains open when door is not fully closed	x		
S1	All shaft lighting working	x		
S2	Pulley room present?			x
S3	Emergency stop present			x
S4	Pulleys (Car, CWT, top of the shaft and diverter) & bearings in good condition	x		
S5	Car and counterweight guides adequately secured	x		
S6	All electrical items in good condition, secured and grounded	x		
S7	Wall facing car door entrance has smooth surface (not applicable if cabin door interlock is fitted)	x		
LT1	Load test required			x

Checklist (please see legend at the end of document)				
Area	Description	Accept		
		Y	N	NA
LT2	Overload switch activated at 110% load			X
LT3	Elevator runs at 125% load (after testing ensure to remove the bypass!)			X
SG1	Car speed =m/s Counterweight speed =m/s			
SG2	Safety gear contact functions when safety gear is activated	X		
SG3	Car speed governor functions, sealed and in good condition	X		
SG4	Car safety gear functions (both jaws simultaneously) and in good condition	X		
SG5	Counterweight speed governor functions, sealed and in good condition	X		
SG6	Counterweight safety gear functions, and in good condition	X		
SG7	No markings on the guide rails (if yes, please smoothen)	X		

Abbreviation - Full name

G = General	CP = Control Panel	TM = Traction Machine
CB = Call buttons	CT = Car Top	FS = Free Space
SW = Steel wires	CW = Counter weight	LD = Landing Door
P = Pit	CD = Car doors	S = Shaft
LT = Load test	SG = Safety gear	

Remarks by Mr Elevator technician

Elevator safe to use: No Yes
 Can a certificate be issued? No Yes
 clearly state reason per item below Fill out temporarily certificate
 Stickers affixed in COP

Item #	Remark
1.	ANNUAL SAFETY INSPECTION FOR ELEVATOR

Remarks by client:

Satisfaction level with service provided

☹ unsatisfied ☺ normal ☺ satisfied

Date: 16th MAY, 2017

Place: LIANTUN GROUP, CHINA

Mr Elevator technician

Name:

Title:

Signature



Vessel representative:

Name:

Title:

Stamp:



Advisory instructions for Class Surveyors if present

The elevator can be checked without dismantling major parts (traction machine, brakes etc.), though the Class surveyor can request parts to be opened. Alternatively he may note "as far as could be seen on visual examinations". The Class Surveyor should be accompanied by a competent elevator technician or qualified crew member when carrying out examination in the elevator shaft at all times.

Suggested checks and advise for Class surveyor

1. Check if the machine can be moved by hand
2. Check door and lock contacts, stop switches and car safety gear contact
3. Phase relay testing by unscrewing main fuses or by breaking each phase
4. Never dismantle parts of the brake system during inspection
5. Test locking contacts from the car roof, emergency unlocking from the landing

Name Class Surveyor:

Stamp/signature:

Class Bureau:

Other comments:

WORK ORDER



Project number	J-38400	ETA	ETD	
Name vessel	Abyo Audrey	15-May-2017	16-May-2017	<--Date
Port	LIANYUNGANG			<--Time
Terminal		Port No:		
Info ETA	86 13701960677 86 21 6086 3933			
Job Description:	Troubleshooting in SMERI elevator Annual Safety Inspection			
Mechanic notes:				

Day	Date	Start Travel	Start Work	Stop Work	Travel Stop	Total Work	Total Travel	
Monday	/ /	:	:	:	:			
Tuesday	16/05/2017	12:00	20:00	22:30	23:30	2.5 HRS		
Wednesday	17/05/2017	08:00	:	:	13:00		14 HRS	
Thursday	/ /	:	:	:	:			
Friday	/ /	:	:	:	:			
Saturday	/ /	:	:	:	:			
Sunday	/ /	:	:	:	:			
Delay time:	/ /	Caused by:						

Work actually performed (clearly state problems and solutions)

1	ANNUAL SAFETY INSPECTION FOR ELEVATOR
2	THE CWT GUIDE SHOES BROKEN, NEED REPLACEMENT. SUGGEST REPLACEMENT THE CAGE SIDE ALSO, AND DON'T USE ELEVATOR BEFORE GUIDE SHOES REPLACEMENT.
4	
5	

Work still outstanding

1	
2	
3	
4	
5	

Parts / service needed (take photographs if possible)

description	number of	maker	part number	notes

How was this service provided by Mr. Elevator: Satisfied Normal Dissatisfied

Remarks client:

Captain / Chief engineer		Mr. Elevator Technician	
Name		Name	
Rank		Position	
Signature & Ship Stamp		Signature	

Rotterdam: Walenburgerplein 106, 3039 AN, Rotterdam, The Netherlands
 Miami: 6365 Collins Ave. (#3809), 33141 Miami Beach, Florida, USA
 Shanghai: 34 Fengpuyuan (#402), Nanqiao Town, Shanghai, China



Annex H Elevator Instruction Manual

3. People Responsible for the Lift / Emergencies

3.1 Taking Care of the Lift

3.1.1 Regular Inspections

The person responsible for the lift must regularly, at least once a week, check that:

- The lift car cannot move if a lift shaft door is open,*
- All lift shaft doors are shut if the lift car is not on the right floor, or a shaft door will not open if the lift car is not behind this door,*
- The lift car cannot move if the lift car door is open,*
- The stopping precision that is usual for the lift at the individual stops is still as it should be.*
- The emergency call device works and the instructions on the main point of access are legible and up-to-date,*
- The emergency brake switch or the door open switch work,*
- The lift car is lit up as long as the lift is in operation,*
- The panes of glazed lift shaft walls and lift shaft doors are not damaged,*

3.1.2 Supervision Duty

The person responsible for the lift must ensure that:

- In the lift shaft, in the power unit room and in the pulley room there are no objects installed or stored that are not connected to the lift operation,*
- Maintenance and emergency entrances to the lift shaft as well as entrances to the power unit room and pulley room are not disguised,*
- Keys to all entrances of the lift shaft, the operation rooms of the lift, the control of the lift and the emergency unlocking of the lift shaft doors are within reach and not given to unauthorised persons.*

3.1.3 Instruction of Lift Operators

Furthermore, when instructing lift operators, the person responsible for the lift must point out that:

- *Emergency brake switch and emergency call device are to be activated in case of danger,*
- *The lift car must be evenly loaded, not overloaded. Loads must be secured to stop them from sliding.*
- *The operating personnel, particularly when transporting loads, must stand in the control device area and between loads and the side wall of the lift car,*
- *Safety and control devices must not be used improperly.*

3.1.4 Trouble-shooting

Furthermore, the person responsible for the lift must ensure that any technical faults ascertained during inspections by experts of the responsible supervisory organisation and entered in the lift book are to be remedied.

3.1.5 Limitations of the Authority of the Person Responsible for the Lift

The tasks of the person responsible for the lift are limited to what is described in Points 3.1.1 to 3.1.4 (regular inspections, supervision duty, instruction of lift operation, as well as registration of trouble-shooting). The person responsible for the lift must limit himself to these tasks. He must, under no circumstances, carry out technical repairs or maintenance work on the lift.

Annex I SMS Extract – Maintenance, Inspection and Test Procedures

<i>Issued by</i> AUGUSTEA TECNOSERVICE SRL	<i>Approved by</i> Fleet Director	<i>Issuing date</i> 01.12.2013	<i>Rev. 01/16</i> <i>Date</i> 01.01.2016	Page 81 of 85
SAFETY MANAGEMENT MANUAL				Manual 02 A
MAINTENANCE , INSPECTION AND TEST OPERATIONAL PROCEDURES				Section 01
<i>Ref: IMO A.741(18) Resolution, as amended</i>				

SHIPBOARD OPERATIONAL PROCEDURES	OPS. ACC 2
General Description: PERSONNEL LIFTS AND ELEVATORS	
<p>Personnel lift and elevators when fitted have to be subjected to periodical inspection, maintenance and testing as per Maker's instructions and recommendations as well as the relevant survey requirements of the RO (Recognized Organization) must be taken into account.</p> <p>Periodic inspection, maintenance and testing has been carried out by a lift/elevator service provider that is approved/recognized by the Maker or by RO. The ship's personnel cannot be nominated for such task/s.</p> <p>In case the shore lift/elevator service provider is not available on site, the Company will notify the RO in order to ask to nominate another suitable service provider.</p> <p>Records of inspections, maintenance and testing must be duly maintained and be available on board.</p> <p>In case of any malfunction detected, the use of the elevator has to be forbidden and noticed by signboards on each deck/entry.</p>	
FREQUENCY:	
Reference : Class Requirements	

Annex J HSEQ Manual – Risk Assessment

Augustea Tecnoservice Srl	HSQE MANUAL	APPROVED BY
ID: Eng. 6	APPENDIX "R"	Fleet Director
	RISK ASSESSMENT	Status: VALID

Crew Activity: Elevator Maintenance

Area: Engine department

Context:
- Electrical workshop activities on Elevator Cage

STEP 1 - ANALYSIS

Ref.	Possible hazards	Potential consequences	Damages (D)*	Probability (P)*	Risk R* = D x P
Eng. 6.a.1	a) Accidents(Serious)	.1 Accidents, injuries	3	1	3
Eng. 6.b.1	b) Accidents(Minor)	.1 Accidents, injuries	3	1	3
Eng. 6.c.1	c) Slippery Area	.1 Accidents, injuries	3	1	3

STEP 2 - ACTION

Ref.	Possible hazards	Risk control	Score	Protective actions	Score
Eng. 6.a.1	a) Accidents(Serious)	M2 Sec. II OPS. ELE. 1 to 6 M3 C2 EMP 5.3	1	Use of PPE	- 0.5
Eng. 6.b.1	b) Accidents(Minor)	M2 Sec. II OPS. ELE. 1 to 6 M3 C2 EMP 5.3	- 0.5	Use of PPE	- 0.5
Eng. 6.c.1	c) Slippery Area	M2 Sec. II OPS. ELE. 1 to 6 M3 C2 EMP 5.3	-1	Use of PPE	- 0.5

Final risk level (after enforcing of Risk Control Actions & Protective Actions):

Ref.	Possible hazards	Risk (R)	Risk control (A)	Protective actions (B)	Risk after Action R = (A + B)
Eng. 6.a.1	a) Accidents(Serious)	3	1	- 0.5	2.5
Eng. 6.b.1	b) Accidents(Minor)	3	- 0.5	- 0.5	2
Eng. 6.c.1	c) Slippery Area	3	1	- 0.5	2.5

Final remarks:

Adequate safety warnings have to be posted.

DPA

*Damages (D):	
Low	1
Medium	2
High	3
Very high	4

*Probability (P):	
Not probably	1
Rare	2
High	3
Very high	4

*Risk: R = D x P	
R = 1, 2	
2 < R ≤ 4	
4 < R ≤ 8	
R > 8	

Annex K Procedure, OPS. ACC 2

<i>Issued by</i> AUGUSTEA TECNOSERVICE SRL	<i>Approved by</i> Fleet Director	<i>Issuing date</i> 01.12.2013	<i>Rev. 01/16</i> <i>Date 01.01.2016</i>	<i>Page</i> 81 of 85
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FREQUENCY:	
Reference : Class Requirements	