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**Aircraft, Maritime and Railway Accident Investigation Directorate
Maritime Accident Investigation Unit**

FINAL REPORT

**Investigation of a very serious marine casualty –
DEATH OF A PORT WORKER IN A FALLING IN THE CARGO
HOLD OF *M/V “SANTANA”* AT BURGAS PORT ON 05.11.2016**



2018

FOREWORD:

Extract from the Merchant Shipping Code:

Art. 79. (Amended, SG № 41/2001, amended, SG № 113/2002, amended, SG № 87/2005, in force since 01.01.2006., amend., SG № 92/2011, amend., SG № 93/2017)

(1) Investigation of marine accidents and incidents shall be carried out by investigating officers in the specialized unit for investigation of marine accidents and incidents at the Ministry of Transport, Information Technology and Communications.

(2) The investigation under para. 1 aims to contribute to enhancing the safety of maritime transport and preventing marine casualties by identifying the causes and circumstances of the occurrence of a particular accident without making any conclusions about the existence of fault or liability. The investigation under par. (1) shall be carried out separately and irrespectively of the criminal administrative penal or civil proceedings conducted in respect of the same marine accident and shall not be prevented, suspended or delayed by reasons of the conduct of such proceedings.

Note: Investigation materials should not be used in litigation and/or settlement of trade disputes, and the specialized unit, or the Ministry of Transport, Information Technology and Communications, can neither be a party to nor involved in such proceedings and disputes.

The report is published on the Internet at the official website of the Ministry of Transport, Information Technology and Communications: <https://www.mtitc.government.bg/>.

All times stated are local time(UTC +2 hours).

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SUMMARY



On 05.11.2016, at 1400, a port worker was found in a severe condition at cargo hold № 2 bottom of *m/v "SANTANA"*, near the vertical ladder leading down the hold. Immediately before the accident, the worker was seen going down the ladder in the hold to resume work after a lunch break. There was no direct eyewitness to the accident, but the injuries on the body indicated about a falling from a big height and a strike in the metal floor of the hold. As a result of the received injuries, the suffered worker died on the way to the hospital.

The worker was a part of a brigade, employees of "NMB Port Burgas" SJC - "Burgas West" Terminal, unloading billets/metal profiles/ from the ship.

The conclusion of the commission, investigating the very serious marine casualty was that the main cause for its admitting had been the non-observance of the safety rules by the injured worker, when descending the vertical ladder.

After the accident, the management of "NMB Port Burgas" SJC undertook a set of measures aimed at preventing, minimizing and eliminating the risks of such serious and fatal accidents.

The Commission made one safety recommendation to the management of "NMB Port Burgas" SJC.



Fig. 1 *m/v Santana*

1. FACTUAL INFORMATION.

1.1. VESSEL'S DATA	
Name	<i>SANTANA</i>
Flag/nationality	Liberia
IMO №	9449388
Ship owner	SANTANA MARITIME LTD-LIB, IMO 5785042
Port of registration	Monrovia
Manager and Operator	INTRESCO LTD-UKE 24/02/2014
Classification authority	Russian Maritime Register of Shipping (IACS) 23/05/2013
Type	General cargo ship
Date of built	2007
Shipyard	ZHEJIANG DONGHONG SHIPYARD NINGBO
Gross tonnage	7 345 t
Length (max)	126,6 m
Width (max)	18,6 m
Deadweight	10 860 t

1.2. VOYAGE INFORMATION		
Last visited ports	Burgas, Bulgaria	03.11.2016
	Berdyansk, Ukraine	28.10 - 30.10.2016
	Venice, Italy	02.10 - 05.10.2016
Sail Port	Berdyansk, Ukraine	
Destination	Burgas, Bulgaria	
Type of voyage	International	
Load Information	STEEL PRODUCTS /BILLETS/ 10 053.850 mts	
Crew	17, Ukrainian citizens	
Working language	Ukrainian	

1.3. INFORMATION ABOUT THE MARINE CASUALTY	
Date and time	05.11.2016, 14:00 h.
Type of incident	Very serious marine casualty
Position and coordinates	22 ship place, Terminal-West, Burgas Port
Inner and outer conditions	Good visibility – 6-8 NM, day, Wind-1 BN ¹ from S, waves -1 BN. Clouds - clear
Place on board	Cargo hold № 2
Consequences	A died port worker
Consequences for the ship and load	None
Consequences for the Environment	None

1.4. INFORMATION ABOUT THE DIED PORT WORKER.

The died port worker was a 44 years old Bulgarian citizen. The employee had a long-term professional length of service - 21 years and a total length of service over 25 years. His last position as a "port worker-mechanic" in "NMB Port Burgas" SJC - Terminal "Burgas West" he had occupied since 10.07. 2014. He was in a good physical condition.

The latest periodic medical examination, carried out ten months before the accident, confirmed his ability to perform that service.

The physicochemical expertise assigned after the accident did not detect the presence of alcohol in his blood.

¹ BN - Beaufort number from Beaufort wind force and wave height scale

1.5. PORT SAFETY SYSTEM.

The Risk Assessment System of "NMB Port Burgas" SJC - "Burgas West" Terminal determines the risk for the specific workplace (risk factor: "3.3 Levels - work at height, poor security, difficult access") as "admissible". The recommended risk mitigation measure is "Safety Control of the stairs and workplaces".

The safety requirements for the use of ship's ladders are regulated in:

- "Regulations on Occupational Safety at Ports" B-05-03-20 ":

Art. 277 (1) The structure of the ship's communication routes, its vertical, inclined and backboard ladders, stair platforms and accommodation ladders, as well as their use, shall comply with the requirements of the Labor Safety Regulations during vessels operation, Chapter Two, points 38 to 117.

- "Labor Safety Regulations during vessels operation "B-05-03-01:

p. 38 The following ladders and passageways shall be provided on board the ships:

(a) Vertical ladders - vertical communication devices using stairs or staples(wall staples).

p.92 In front of the exit of the vertical ladders at their upper part, they shall have sturdy handles (short handrails) or other devices ensuring safety and convenience for entry and exit.

p.94 The length of vertical ladders without the platforms shall not exceed 9 m except for ladders to masts and escape routes. For longer ladders, they should be provided with intermediate platforms of the appropriate size.

p.95 The spacing between the staples or stairs of the vertical ladder shall be in the range 280-350 mm. The distance (depth) from the middle of the stairs of these ladders to the barriers or other planes parallel to the ladders shall be not less than 150 mm.

In places where it is structurally impossible to form staples of the required width, such as some masts and other narrow structures, staples' width may be reduced to 250 mm.

p.99 The responsibility for the technical condition of the ship ladders, storm-ladders, accommodation ladders is borne by the chief officer.

- Instruction № 162/2016 on safe communication roads operation - accommodation ladders, stairs and stair platforms.

page.1, line 12 "When climbing or descending out/in a ship hold by a ladder which is structurally unprotected with a safety ring, at least 3 strong points shall be used throughout the descent and climbing."

The port staff is familiar with the above-mentioned documents.

1.6 SHIP'S SAFETY MANAGEMENT SYSTEM.

The *m/v "SANTANA"*, built in 2007, was certified, technically tested and with proper construction and equipment, documented by Liberia Flag administration. The SMS system /safety management procedures/ was available on board the ship and had been prepared in accordance with the requirements of the International Safety Management Code as well as with the Maritime Labor Convention under International and National Standards 2006. The ship had a certificate of a safe cargo ship construction, hull and machines, International Safety Management Certificate, Maritime Labor Certificate, as well as all other IMO Certificates confirming navigability, safety and ship's compliance with the international safety requirements for shipping.

The ship does not fall within the scope of the ship ladders' construction requirements laid down in SOLAS 1974 (Regulation II-1/3-6 "*Access to and from the cargo spaces of oil tankers and bulk carriers*"), since they relate to oil tankers over 500 gt and bulk carriers exceeding 20 000 gt.

1.7 CARGO HOLD № 2 VERTICAL LADDER.

The vertical ladder (Fig. 2) for entering the cargo hold № 2 has a total height of 9.10 m. The ladder is firmly attached to the hull of the ship without visible deformation of its steps. It

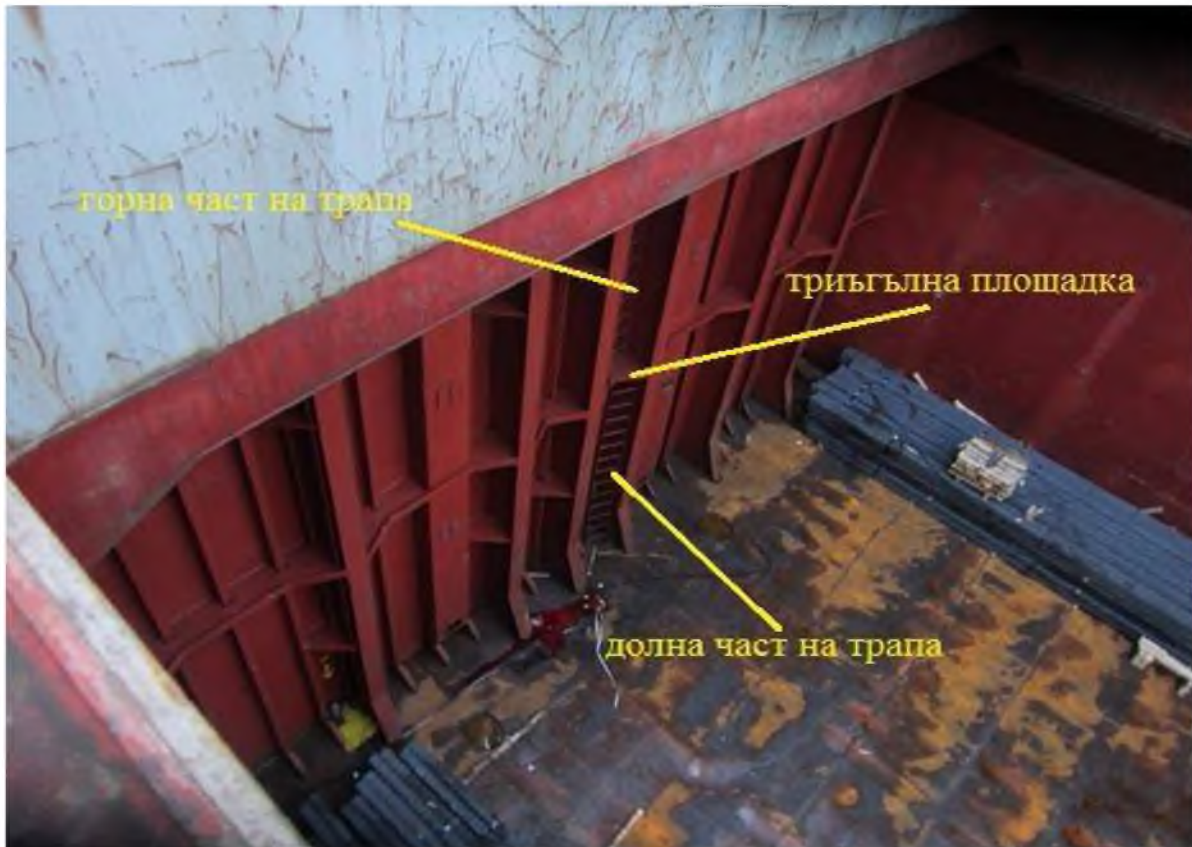


Fig. 2 A view to hold № 2 and the vertical ladder.

consist of two parts, with an intermediate platform, which is a part of the ship's structure set. The platform has a triangular shape at a height of 5.10 m from the floor. The two parts of the ladder as well as the



Fig. 3 Entry to the vertical ladder, upper part.

intermediate platform between them have no safety rails or staples. The steps are square bars, 0.40 m wide, with a distance of 0.30 m between each other. The lower part of the ladder is not a continuation of the upper one, with the steps of the that part being at an angle of 45° to the steps of the upper one (**Fig. 2**)

2. DESCRIPTION.

The *m/v "SANTANA"*, sailing under Liberian flag, was moored at 0800 on 03.11.2016 at berth № 22 of Port "NMB Port Burgas" SJC - Terminal "Burgas West" (**Fig. 4** and **Fig. 5**).



Fig. 4



Fig. 5

The cargo - 10 000 mts metal billets, loaded in Berdyansk, Ukraine, was stored in the three cargo holds of the ship (Fig. 6).

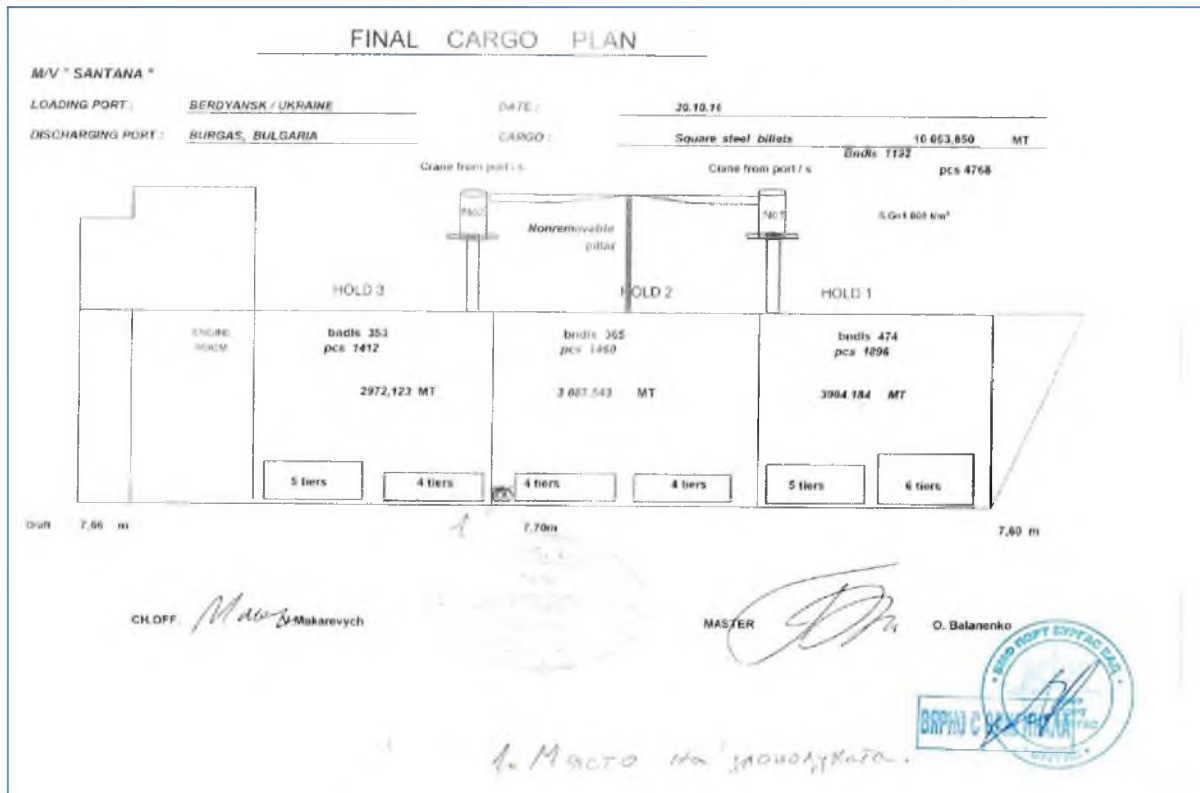


Fig. 6 Cargo plan.

The brigade in which the injured worker had worked was summoned to work to help the on-duty brigade in the unloading operations of the ship. According to an approved schedule for the total working time accounting of employees in "Burgas-West" Terminal, the group consisting of 6 workers had worked in 12-hour shifts, one day working daily from 0800 to 2000, one night from 2000 to 0800, followed by a 2 days-rest. On 03.11.2016 the brigade worked on a night shift from 2000 till 0800 on the next day, 04.11.2016. During both days - 04 and 05.11.2016 the workers had to take a rest. Due to the large workload at the terminal, resting workers were asked if possible to go out extraordinarily to work on 05.11.2016. Job

appearances had not been compulsory and a possible refusal would have no effect. All, except the head of the shift who had a personal commitment, had given their consent. For the change in the work schedule of the six workers an order of the Chief Director of the port was issued.

At 0800 on 05.11.2016, following a daily preliminary stevedore's briefing on the safety measures, the brigade began working on unloading the metal products from the ship's first cargo hold, into trucks on the quay. The distribution of the workers by occupations was as follows: two loading machine operator operating on the truck on which the metal profiles had been loaded, one crane-operator, one signaller and two mechanics - off loaders, including the injured worker, working on hanging the cargo in the hold for its subsequent unloading on the shore.

At 1300, the first cargo hold was unloaded and the brigade used a lunch break.

At 1400, the rest finished, and the group had gone to occupy their workplaces for unloading cargo hold № 2.

The first of the workers assigned to work in the hold(the injured person) started descending on the vertical ladder to hold № 2 while the second one, according to the safety rules, was waiting on the deck for the first to reach the bottom of the hold. The second worker, looking through the hatch of the ladder, had seen that the first one already reached the ladder's middle and also started to prepare for descent. Immediately afterwards, the crane operator, stepping up the crane stairs heard a dull, muted sound of hit from a falling coming from the bottom of hold № 2. Entering the crane cabin, the crane operator saw an immovable human body lying on its stomach on the hold floor. He signaled the other workers about the accident by the crane horn and shouting. The descended brigade workers found their colleague unconscious, with slow breathing and pulse. On the floor, around the head of the injured, there was a stain of blood that had been growing. The called Emergency Assistance team arrived in about 20 minutes and the injured person was transported for medical assistance, but on the way to the hospital he died.

The appointed forensic-medical expertise identified as a direct cause of the death the received severe cranial brain injury. The latter, as well as the other injuries (a chest trauma, ribs fractures, etc.), are characteristic of falling from a big height. There had been no disabilities that could not be explained by a falling from a big height.

3. ANALYSIS.

3.1. ANALYSIS OF HUMAN FACTOR.

There were no immediate eyewitnesses to the accident with the worker, but by the testimony of the witnesses, seeing him on his way to descent to the ship's hold, and the nature of the injuries could be concluded that the cause of the accident was a falling from the vertical ladder. For the height from which the worker had fallen, one can judge the testimony of the second worker (middle of the upper part of the ladder) and the severity of the resulting injuries. Falling from a lower height would not cause the serious damages found in forensic-medical expertise.

The injured person had a long-term service on the mentioned position, he had passed all necessary instructions on safe working conditions, he was physically healthy. Despite the extraordinarily appearance to work, from the last /night/ shift of the brigade to the beginning of the last one 24 hours were passed, enough to recovery. Consequently, it could be concluded that the cause for the falling was not a lack of experience, poor physical condition or accumulated fatigue.

3.2. SAFETY MEASURES OBSERVING.

The organization of the work of the brigade suggests that effective preventive measures had been taken to prevent such incidents.

3.3. ACCESS TO CARGO HOLD № 2.

The vertical ladder to access cargo hold № 2 is made up of two parts separated by a platform. No safety rails or staples are provided. The lower part of the ladder is not a continuation of the upper one, but is beaked for about 50 cm and the steps are at an angle of 45° according to the upper ones. Undertaking a descent on the lower half of the ladder requires an initial grip on the steps of the upper one. The construction of the ladder requires a higher attention for to prevent from falling, but cannot be the immediate cause of the accident.

4. CONCLUSIONS

4.1. MAIN CAUSE OF THE ACCIDENT.

The main cause leading to the very serious accident was the non-observance of the safety rules by the injured person and, in particular, of the requirement of Instruction №162 *"When climbing or descending out/in a ship hold by a ladder which is structurally unprotected with a safety ring, at least 3 strong points shall be used throughout the descent and climbing"*.

4.2. MAIN CONTRIBUTING CAUSES OF THE ACCIDENT.

Probable immediate causes of the accident (falling) could be: distraction due to side factors - telephone call, unusual noise in the hold, etc. as well as tripping, slipping, etc.

4.3. CONTRIBUTING CAUSE LEADING TO THE ACCIDENT.

A contributing cause of the accident was related to the structural design of the vertical ladder to hold № 2 of the ship, which implies increased caution in its use.

5. ACTIONS UNDERTAKEN.

Immediately after the incident, on the grounds of Art. 404 of the Labor Code, to prevent such accidents, the management of "NMB Port Burgas" SJC organized and commissioned extraordinary briefing to the operational personnel for providing of healthy and safe working conditions in metal processing at "West" Terminal, with an accent on the attention to the safety of movement on board the ships - decks, accommodation ladders, stairs, holds etc.

The complete set of measures taken by the administration of "NMB Port Burgas" SJC and in particular by the "Safety and Health at Work" Department for prevention, minimization and elimination of the risks of serious and fatal accidents is set out in Appendix 1 - " Report for the Activities in SHW Department 2016, 2017, 2018".

6. SAFETY RECOMMENDATIONS

On the basis of the investigation and the analysis of the very serious casualty as well as of the conclusions reached on the main and the accompanying causes for its occurrence, the Commission, in the light of the action taken by port management after the accident, recommended:

6.1. To the management of "NMB Port Burgas" SJC:

In Instruction № 162/2016 on safe communication routes operation - accommodation ladders, stairs and stair platforms, the following requirement to be added: *"For ship loading and unloading operations, where ladders are constructively potentially dangerous, according to the specific case, additional measures for their safe use to be undertaken."*

APPENDIX 1

Report on the Activities in SHW Department (2016, 2017, 2018)

I. Measures taken under SHW on entry and exit the hold, directly related to the work accident on Santana m/v

Accident-related actions:

- Immediate reply was sent to "Labor Inspection" Directorate, Burgas.
- Measures for working at heights - Consultation from top-level working at heights experts in order to minimize and eliminate the risks of work in the holds.

In connection with the above mentioned experts' opinion, a decision has been taken to purchase whole body harnesses, self-winding reels and cages for transporting people. Two cells, completed with portable stretchers, as well as whole body harnesses and self-winding reels, have been purchased. These are used to descend workers into the ship's holds.

After the purchase of the cages, Instruction № 175 has been issued for working with a cage when entering / exiting a hold of a ship.

At the same time, Instruction № 180 has been issued on entering and exiting the hold at a wind speed of over 7 m/s and Order № 223 on procedures during a Force Majeure.

- In January 2017 a contract was concluded with a new office on occupational medicine, which in turn prepared a new complete risk assessment of "NMB Port Burgas".

II. Expanding the structure of the Safety and Health at Work:

1. In December 2016, four new employees were appointed to SHW - two SHW Inspectors and two SHW Experts. Thus, the unit composition of two experts increased to six inspectors and experts.

The SHW and Environment Department consists of the following sectors:

SHW sector - 6 employees

Sector VTC (Vocational Training Center) - 2 employees

Sector FS (Fire Safety) -1 employee

Environment Sector - 5 employees and workers.

2. In the second half of 2017, a new reorganization of the SHW department with new appointments took place. An SHW Coordinator was appointed, a new departmental restructuring was carried out in the part of SHW (total SHW-11 persons), as follows:

Common Port Activities Unit - SHW Coordinator, one SHW Expert and one SHW Inspector;

Projects Unit - 5 SHW Experts, 2 SHW inspectors

A Dangerous Goods Consultant and a SHW expert positions were opened in November 2017 at Common Port Activities Unit.

Also in November 2017, a new training specialist was appointed to VTC.

3. At present, SHW and Environment department has 19 people, as follows: SHW -11; Environment-5; VTC-2;FS-1. ППО-1.

III. Trainings:

1. In 2017, all the compulsory training courses were conducted concerning the employees of SHW department. Trainings of other employees and workers for PPE was also carried out - innovations, changes in the regulatory framework, others.

2. In September 2017 two groups were sent for theoretical and practical training at the Crisis Headquarters in Montana town in connection with the commissioning of "Sulphur Acid" Complex.

3. In September 2017, a group of four people from the department passed a training for internal auditors on Health and Environment, at Bureau Veritas office in Sofia.

4. In November 2017, a SHW expert underwent an ADR and RID training in connection with the operation of terminals serving dangerous goods. The same was assigned to a dangerous goods consultant .

5. In December 2017, three SHW experts underwent NEBOSH Oil & Gas training.

6. In January 2018, SHW package trainings were launched, consisting of 15 modules. The purpose of

these trainings was to increase the technical and technological level of the specialists in the department, which will serve to investigate incidents and situations with and without consequences. The main themes were: Machine building, electric machines, apparatuses and furniture, basic concepts for technical supervision, height and cradle work, welding and material science, fire and accident safety, investigation of incidents, dangerous goods, auto and railway transport, on board ship works safety, statutory safety requirements at work, personal and collective protective equipment, the basics of the port equipment - operation and repair. Trainings are conducted by external and port lecturers.

The main objective of all trainings was to increase the qualification of SHW employees in order to prevent, minimize and eliminate the risks of serious and fatal accidents with human factor and heavy and non-removable equipment and infrastructure damages.

IV. Activity of VTC::

The main objective of the Center for Vocational Training is to increase the qualification of "NMB Port Burgas" SJC staff in the implementation of the activities directly related to the processes of rendering the services offered. It is going to expand the license and complement the professions that are used in the operational activities in the port area. The material base is expanded and the existing one is improved.

V. Activities related to the documentary part of SHW department. SHW instructions and orders issued:

Main objective - Maintenance and proper form of the company documents related to safety and health at work, as well as the documentation required by the normative acts in SHW department.

- Drawing up new documents and updating of old ones, according to the requirements of the normative acts.
- Keeping and distributing documents and records related to SHW activities.
- Preparation of orders, programs and other documents for SHW department activities.
- Participation in drawing up risk minimization measures.
- Creating and developing an entirely new information portal
- Compilation and filing of documents for the formation of a committee on vocational rehabilitation and determination of certain places for vocational rehabilitated persons.
- Gathering offers for the selection of suppliers for PPE and CPE. Consultation on the selection of appropriate parameters and levels of protection.

VI. Documents created in 2017 and 2018:

1. Part of the Technical Instructions and Orders prepared in SHW Department are:

TI - 174 SW for safe operation and fire safety during filling, transport and refueling the machinery by means of a mobile "HIPOTANK" tank.

TI -175 Working with an Entry / Exit Cage on a ship's hold.

IT -177 - For working in limited space.

TI - 179 - For safe operation and fire safety during filling, transport and refueling, by a truck tank.

TI-180 SW when entering a ship's hold when wind is over 7 meters per second.

TI - 181 rev. 1 - Issuing and filling in the Order for work in a limited space.

TI - 182 rev. 1 - For work with orders and responsibilities of people working under order in ST for storage of sulphuric acid.

TI -183 rev. 1 - For work with orders and responsibilities of people working under order.

TI-184 - Order for repair.

TI - 186 rev. 1 - for actions in case of an incident and event with or without consequence on the territory of "NMB Port Burgas" SJC.

Order № 223 upon Force Majeure Situation Actions.

2. Work on procedures related to the activity of the department according to the IMS:

Procedure P-06 in force since August 2017. The purpose of P-06 is to provide a systematic training, documentation and analysis of potential hazards at "NMB Port Burgas" SJC.

Procedures under development:

P-20 - SHW Order System

P-21-Policies, rules and work on SHW

P-22 - Personal Protective Equipment and working clothes.

VII. Conclusions of the annual audit according to the requirements of the Integrated Management System (IMS) of the company for 2017:

Documentation of the integrated quality management system, environment and health and safety at work has been partially modified in connection with the transition to the new versions of ISO 9001: 2015 and ISO 14001: 2015. The activities of hazard identification and risk assessment in the company are regulated in item 3.2. from Procedure P-06 "Methodology for Systematic Monitoring and Measurement of the Implementation of Activities related to SHW", Issue №1 of 22.08.2017 Documentation of the risk assessment shall be done in accordance with Art. 20, para. 1, 2 and 3 of Ordinance № 5 / 11.05.1999. The evaluation process and all the related documents are regulated in a separate document - "Risk assessment" developed by the Occupational Medicine Service, adopted by "NMB Port Burgas" SJC and is applicable to each individual risk assessment.

Hazard identification and risk assessment is carried out by the Occupational Medicine Service on the basis of a contractual relationship with the participation of the established Working Group of "NMB Port Burgas" SJC. The definition of the applicable legal and other requirements and the conformity assessment under the Health and Safety Working Conditions is carried out according to the Regulation in the documentation of IMS.

Conformity assessment is carried out to determine to what extent the applicable regulatory and corporate requirements on occupational health and safety are met as the results are documented in F-06.01. "Table for compliance with the statutory acts under the SHW ". The applicable regulatory and corporate requirements are documented in the same form. The form provides an opportunity to document further actions in case of non-compliance. If a non-compliance is detected, it is governed under the regulation in procedure P-03 "Corrective actions and continuous improvement".

VIII. Conclusion

SHW specialists carry out daily and continuous monitoring of compliance with the safety rules as well as the wearing of personal protective equipment, with reports on findings being made on a daily basis. In the event of inconsistencies, these are immediately managed and directed to the line managers and departments within the company.

Over the past eight months, there have been no mild, medium, severe and fatal incidents, as well as non-removable damages to the equipment and the infrastructure.

08.03.
2018
Burgas

Elena Uzunova
SHW and Environment Manager



