

TEMPORARY STORAGE OF CONTAINERS CONTAINING DANGEROUS GOODS IN A RIVER PORT AREA

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Review Article

Abstract: Portworkers are exposed to many hazards, especially during reloading of dangerous goods. Nevertheless, there is no specific legal regulation governing safe conditions for the operation of a temporary terminal of containers in the river port of Czech Republic. The aim of this paper is to processing a brief overview of regulations dealing with reloading of containers with dangerous goods. Furthermore, solutions of some specific problems related to safety measures are proposed and issue of safety in port is discussed briefly in this text. The following text is the first input to assess the safety of the temporary storage of containers in a river port area.

Keywords: Storage, dangerous goods, port, legislation, occupational safety.

Introduction

In recent years, a number of fires and explosions have occurred during manipulation and storage of hazardous chemicals. One of the most serious accidents occurred on August 12, 2015 in the port of Tianjin, China. The explosion of a container stored in the port warehouse killed 173 people and hundreds of people were injured. The first explosion caused the second major explosion, which caused the detonation of 800 tonnes of ammonium nitrate, and therefore the consequences of the explosions were so severe. According to the investigation, the first explosion was caused by overheating of dry nitrocellulose located in the transport container. Fig. 1 shows that containers of the same type are used for storage of dangerous goods in the Czech Republic too. Therefore, it is not excluded that accidents could also occur in our country. However, given the size of the ports in the Czech Republic, the consequences of the accident would not be so great.

Some accidents involving dangerous goods are specific in that they occurred in connection with temporary storage or during their reloading at port area or marshalling yards. In these areas transported dangerous goods are situated temporarily before their further transport, when changing the type of transport or changing the means of transport. There is a change of operating personnel, a change of

competencies and safety measures. This specific situation can lead to insufficient identification and control of the safety requirements resulting from the hazardous properties of the transported materials.



Fig. 1 Explosion in Tianjin, China 2015
(Improper Chemicals Storage Blamed for Fatal China Explosion, 2019)

The evaluation of such situation must be based on a risk analysis by means of verified methods to identify the source of the risk, determination of the probabilistic model of combustion or explosion, eventually leakage of the dangerous substance. This risk analysis is the basis for designing measures aimed at risks preventing and reducing of their consequences. Furthermore, it is also necessary

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to respect the valid regulations, which are related, for example, to the protection of the environment, especially with regard to pollution of watercourses. The large scale of the accident in Tianjin also signals the need to assess the situation with respect to regulations concerning the major accident.

The open area in the river ports intended for the temporary storage of containers is marked as a „container terminal”. In order to ensure the safe operation of the terminal in the open port area, the requirements applicable to the temporary storage of containers must be intended. The most important safety requirements are:

- quality of storage area surface,
- separate location of containers with dangerous goods,
- sufficient distance from each other and from other containers or other objects,
- security of the containers with dangerous goods.

Related legislation

All activities related to materials and objects with dangerous properties are subject of two comprehensive group of regulations, namely regulations related to the so-called Chemical Act and regulations for transport. The resolve, which regulations apply to the issue, is based on the wording of Act 258/2000 Coll., on protection of public health, as amended (Act 258/2000; Act 267/2015), in subsection 1 § 44a:

„The handling of hazardous chemicals and chemical mixtures is their manufacture, import, distribution, sale, use, storage, packaging, labelling and in-house transport.“

The above-mentioned definition does not include the transport or carriage of goods, i.e. road, rail, air, sea and river transport.

The application of specific regulations is prescribe for activities defined as „handling“ in subsection 2 § 44a:

„During handling of hazardous chemicals and chemical mixtures, everyone is required to protect the health of individuals and the environment and to abide by hazard pictograms, standard phrases indicating specific riskiness and hazards, and standard precautionary statements for safety treatment according to the Chemicals Act and directly applicable EU regulations on chemicals substances and chemical mixtures.“

Act (Act 350/2011) is cited as the „Chemical Act“ and EU Directives known as REACH (Regulation (EC) 1907/2006) and CLP (Regulation (EC) 1272/2008) are presented as directly applicable

regulations. These regulations (Chemical Act and related regulations) do not apply to transport or carriage, i. e. road, rail, air, sea and river transport, because transport or carriage is not „handling” according to Act 258/2000 Coll. (Act 258/2000), as amended.

According to the above-mentioned definitions, the transport of dangerous goods is not covered by the Chemical Act. However, these definitions are not sufficient, to determine whether reloading of containers and temporary storage are exempted from the Chemical Act.

This issue is addressed by the transport regulations published in the form of international treaties on the transport of dangerous goods. These regulations are always intended for a specific mode of transport; these are rail transport (RID), road transport (ADR), air transport (IATA), sea transport (IMDG) and river transport (ADN).

The international treaty „European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways”, which the Czech Republic acceded in 2000, covers the transport of dangerous goods by rivers. It has been in force for the shortest time compared to other regulations.

The text of the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways was promulgated as Communication of the Ministry of Foreign Affairs No. 102/2011 Coll. (Communication of the Ministry of Foreign Affairs 102/2011) and has a number of amendments and additions. At present, the valid consolidated version of this regulation only exists in the English version. (European Agreement concerning International Carriage of Dangerous Goods by Inland Waterways, 2017)

In this English version, a definition of the term „carriage“ is given in chapter 1.2 „Definitions and Units of Measurement“:

„Carriage means the change of place of dangerous goods, including stops made necessary by transport conditions and including any period spent by the dangerous goods in vessels, vehicles, wagons, tanks and containers made necessary by traffic condition before, during and after change of place.“

„This definition also covers the intermediate temporary storage of dangerous goods in order to change the mode or means of transport (transshipment). This shall apply provided that transport documents showing the place of dispatch and the place of reception are presented on request and provided that packages and tank are not opened during intermediate storage, except to be checked by the competent authorities.“

The term „carriage“ refers to activities referred to as transport and also to activities described as reloading of containers. It follows that this activity is also subject to regulations for the transport of dangerous goods. In the case of combined transport, e.g. ADN - ADR, the containers must meet the requirements of both regulations.

This definition shows that the reloading of containers and their temporary storage related to a change of the type of transport or means of transport are part of the carriage - transport and therefore they are subject to the regulations for the transport of dangerous goods. Other regulations must also be respected. Some of them are mentioned in the continuation of this text.

Legislation for inland waterway transport

Act No. 114/1995 Coll. (Act 114/1995), as amended, governs other regulations applicable to inland waterway transport, including the transport of dangerous goods. The Act has a number of amendments and its unofficial valid version is available for example from www pages (<https://www.zakonyprolidi.cz/cs/1995-114/zneni-20180101>). In its wording, there are also requirements related to the safety of the operation of the container terminal, its marking and arrangement. Some of the obligations of the port operator are also specified in this Act. Some of the requirements related to the most important safety requirements (mentioned above) are listed in the following text:

Subsection 5) § 6 states:

„The navigation authority permit the operation of the land part of a port if its construction and the facilities which is equipped with allow safe operation of the port and do not threaten safety of navigation.“

The safe operation of the container terminal, referred to in the Certificate of Occupancy should be guaranteed by this decision. The quality of the storage area (solidified, drained) should be in compliance with the requirements for safe operation already in the phase of approval process.

Amongst other things, subsection 1) § 7 states:

(1) *„The operator of the land part of port is obliged to....*

(c) indicate in an appropriate way

- 1. places for manipulation with flammable or dangerous goods,*
- 2. places for storage of solid and liquid waste from vessels,*
- 3. places for extracting water and electricity, ... “*

It is apparent from that subsection that places for the manipulation with flammable and dangerous goods must be indicated, just like places for waste and extracting water, and thus distinguished from places for manipulation with other goods.

The all section 36 of Act No. 114/1995 Coll. (Act 114/1995), as amended, relates to transport of dangerous goods. This section provides a definition of dangerous goods with a list of endangered interests applies to transport of dangerous goods and refers to the valid international agreement ADN:

„§ 36

Transport of dangerous goods

(1) *Dangerous goods are articles and substances, which are capable to endanger safety of persons, animals and things or environment when transported because of their nature, properties or condition.*

(2) *Dangerous goods specified by the international treaty concerning the carriage of dangerous goods by inland waterways, which is the part of the legal order, is only allowed to carry by inland waterways, and namely under the conditions specified in this treaty.“*

The obligation to appoint safety adviser is mentioned in the following part of this section.

„§ 36a

Safety adviser for transport of dangerous goods

(1) *Every natural or legal person carrying out activities related to the loading, unloading or transport of dangerous goods by inland waterways has an obligation to appoint a safety adviser for the transport of dangerous goods (hereinafter referred to as "safety adviser").“*

Safety adviser obligations are mentioned in the next parts of this section and the ensuring of transport safety, including draft measures and monitoring of regulations observance belong to its responsibilities.

Operator of land part of port on inland waterways has an obligation to indicate a place for the handling with dangerous goods (Act 114/1995). Containers marked according to ADN undoubtedly belong to dangerous goods.

Furthermore, there is an obligation to appoint a safety adviser. According to the wording of § 36a, this obligation has „persons performing activities related to loading, unloading or transport of dangerous goods“. It probably means carrier, i.e. legal or natural person who provides the transport.

Organizations providing the services of safety adviser can be found on the website. Among other things, these organizations design working procedures and processes related to the transport of dangerous goods (including hazardous waste) according to the requirements of international regulations ADR, RID and SMGS, ADN, IMDG Code and IATA DGR. Therefore, these organizations should be able to propose conditions for the safe storage of containers containing hazardous substances under specified conditions.

The Act 114/1995 Coll. (Act 114/1995), as amended, implies that the transport of dangerous goods must take place in accordance with the international agreement ADN. Except hazard that is connected with the dangerous properties of the transported goods, there is a hazard of possible theft or misuse of these goods with the consequent endangering persons, property or the environment. The measures to ensure security (security means) are given in chapter 1.10. of ADN. One measure is the provision of article 1.10.1.3, which states:

„Holding areas in trans-shipment zones for dangerous goods shall be secured, well lit and, where possible and appropriate, not accessible to general public.“

Provided consecutive combination of river and car transport, an international ADR agreement, article 1.10.1.3, can be used to specify these security measures, for the requirements of both regulations, ADR and ADN, must be met in this case:

„Areas within temporary storage terminals, temporary storage sites, vehicle depots, berthing areas and marshalling yards used for the temporary storage during carriage of dangerous goods shall be properly secured, well lit and, where possible and appropriate, not accessible to the general public.“

It follows from the above that the article 1.10.1.3 determines a minimum requirements for terminal of dangerous goods. These general requirements are security and lighting. The increased requirements ensuring a higher level of security apply to high-risk goods are listed in table 1.10.5, chapter 1.10., agreement ADN.

Foreign documents for inland transport

In the wording of the above mentioned act of the Czech Republic No. 114/1995 Coll. (Act 114/1995), as amended, and international agreement ADN, published as Communication of the Ministry of Foreign Affairs No. 102/2011 Coll. (Communication of the Ministry of Foreign

Affairs 102/2011), further data were searched for the storage of specific dangerous goods in containers, and/or other information were searched for specific handling of containers during their temporary storage, reloading or unloading. This issue is solved in chapter 7.1 of the international agreement ADN, which provides data for particular dangerous goods.

No other text was found in the Czech language to specify safe handling of containers containing dangerous goods, therefore the searching was extended to foreign sources.

Foreign texts indicate that reloading of dangerous goods in ports is regulated by regulations, which are usually created by the management of ports independently, in the form of their own decrees taking into account national legislation and also international treaties on the transport of dangerous goods. These are mainly seaports. This is why the regulation IMDG Code is cited in many documents, and it is can be used both at sea and river ports to evaluate the intensity of property of dangerous goods and determine the conditions for safe manipulation.

An example is the Dangerous Goods Management Guidelines for DP World Terminal Port Botany (2015), which contains specific instructions for each type of dangerous goods classified according to IMDG codes. The guidelines also include the determination of safe distances between containers containing dangerous goods (Appendix 3: Separation Distances Between Closed Containers Carrying Dangerous Goods Distances). The document also contains permitted times of delay of various dangerous goods in the port. Times depend on the quantity of dangerous goods and their classification.

A special act (Government Decree 251/2005) has been issued in Finland, which is directly intended for the temporary storage of dangerous goods in seaports. A table is provided in the appendix, which lists the safe distances for the various types of packaging, including containers according to requirement of regulation IMDG Code.

Data presented in foreign publications cannot be used as binding in the Czech Republic; firstly, they are not Czech regulations and secondly, they concern seaports. However, they can be used as guidelines or proposing of measures for the safe reloading of containers.

Since there is no special regulation in the Czech Republic, which would focus on safe conditions for the operation of temporary terminals of containers, it would be appropriate to create own safety regulation for every container storage area, based on a risk analysis in a specific location.

Safety in port

Except compliance with the requirements of local operating regulations and the legislation applicable to the temporary storage of containers, another essential part of ensuring safety is to acquaint portworkers with relevant risks, results of risk assessment and preventive measures against such risks relating to their type of work and workplace.

Risk management is an integral part of any corporate management. Organizations manage risks by identifying, analysing and further evaluation them to determine whether these risks are at an acceptable level. It is necessary to communicate and consult about risks and measures with stakeholders and continuously improve framework, policy and the risk management plan based on the results of monitoring and review (ISO 31000, 2010).

Any specific sector, including terminals, brings individual needs in terms of risk management. Different methods can be used for risk assessment. Many of them were not developed for occupational risk issues, but mostly for technological risk assessment (e.g. What- If Analysis, Failure Mode and Effect Analysis, Fault Tree Analysis, etc.) Some use a numerical weighting system to determine priorities for action. In occupational safety and health, point methods are most often used, because these methods often involve risk identification, risk analysis, risk evaluation and proposals for risk control measures.

According to (Safe working in docks and freight areas, 2012), ports rank amongst the potentially most hazardous areas that customs staff have to work in. As well as the obvious hazards associated with working near water, ports invariably contain many other things which could cause harm, including:

- moving vehicles and vessels,
- overhead cranes and container-lifting machinery,
- hazardous substances,
- heavy machinery,
- slippery surfaces,
- tripping hazards (e.g. mooring ropes, pallets, etc.),
- people (tourists, etc.).

One of the important documents that deals, among other things, the risks of working in ports is publications of the International Labour Office - ILO code of practice: Safety and health in ports (Revised 2016) (ILO code of practice, 2018). This code provides current recommendations to make positive impacts on the reduction of hazards and risks, the health of workers and on productivity. This publication identifies these major health risks that occur from port operations:

- physical hazards (extreme temperatures, noise, vibrations, radiation, lighting, etc.),
- ergonomic hazards (repetition of movements, extreme postures, etc.),
- chemical hazards (inflammables, irritatives, toxics, exhaust emissions, explosive substances, etc.),
- biological hazards (animals, microorganisms, bacteria, viruses, fungi, etc.),
- psychosocial hazards (work-related stress, violence and harassment at the workplace, fatigue, night work, shift work, etc.).

The above information is a list of the general risks that the workers can encounter when working in ports. During risk identification at a specific terminal, it is necessary to come from specific conditions, i.e. to take into account: all activities performed at terminal, used tools and equipment, dangerous properties of stored goods, persons who may be exposed to risks, past injuries and diseases, etc. The risk identification is followed by a risk evaluation, which expresses the hazard level of the individual risks and in this way the need to take measures to reduce the individual risks is determined.

In order to elimination of identified risks as low as possible, it is important these risks should be effectively controlled by proposing of appropriate preventive measures to be carried out based on the prioritization of measures aimed at improving safety. Legislation, identified and assessed risks are used to determine measures for safe reloading of containers. Publications dealing with storage of containers in port area can also be used. E.g. The ILO Code of practice (ILO Code of practice, 2018) states, inter alia, that portworkers exposed to hazardous substances should be trained (e.g. relevant legal requirements, familiarity with the general hazards of the dangerous cargoes handled, knowledge of IMDG Code, documentation, emergency response procedures), provided with safety data sheets and undergo periodic medical monitoring. The substances should be adequately labelled with the contents, with reference to the globally harmonized system of classification and labelling of chemicals or according to existing safety data sheets. Workers should be advised about the precautions to be taken to prevent exposure to these substances.

If preventive measures are set out, it is also necessary to verify the accuracy of the identification and risk evaluation and to consider the suitability of the given measures. Risk assessment is important to repeat over time because risks can change due various changes (e.g. use of new devices, type of dangerous substance). This step ensures that risk assessment help to management risks.

Conclusion

The port accidents that have occurred in the context of the reloading of dangerous goods show that more attention should be paid to this issue.

In order to ensure the safe operation of the port terminal, the legal requirements applicable to the temporary storage of containers must be observed. Nevertheless, the unified regulation is not processed for this issue in the Czech Republic and so it can be quite problematic for the port operators to meet all the requirements of the legal regulations and thereby ensuring, sufficiently, the safety of natural persons who are present at his workplaces (terminals) with his knowledge. For increase safety operation in port, it would therefore be desirable to create a unified legislative regulation for all container terminals within the Czech Republic, which would cover a comprehensive approach to the issue of safe storage of dangerous goods in river ports.

Requirements for ensuring occupational safety and health in a particular port should be set up following the risk identification and risk evaluation at work. On the basis of the results of the risk assessment, effective measures must be set to limit or eliminate the identified risks.

For increase occupational safety and also to prevent accidents at terminals, it is beneficial for each terminals to have its own internal regulation, which regulates the conditions of occupational safety based on the risk assessment at a specific terminal. According to the Labor Code (Act 262/2006, 2006), the employer, including the port operator, is obliged to keep documentation on identification and risk evaluation and measures. He is obliged to acquaint all persons, who are endangering by risks, with documentation.

This paper contains information that could increase the safety of workers when reloading containers.

Acknowledgments

This article has been created within the project No. CZ.01.1.02/0.0/0.0/17_107/001 2408, entitled: "New generation of control system for fuel distribution" under Operational Programme Enterprise and Innovations for Competitiveness of the Ministry of Industry and Trade.

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