

Safety at Work of Participants in the Railway Transport of Dangerous Goods

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The transport of dangerous goods always represents a potential risk to life, human health, property, and environmental protection. For this reason and in order to preserve the lives and health of the participants in the transport process, adequate protection measures must be taken before, during, and after the transport of dangerous goods. Since the railway itself is a recipient of dangerous goods that are essential for its own operation, and is also a carrier of large quantities of various dangerous goods, these measures are of paramount importance. This paper examines, from a point of view of the protection of lives and health of the participants in the transport process and the safe transport of dangerous goods, the conditions of shipment and transport of dangerous goods, the obligations of the participants, and the essential ways for their proper handling. Proper application of safety at work prevents impromptu and indolent attitude in transporting dangerous goods, thus contributing to protection of people lives and health. Finally, this paper includes preventive measures and basic principles for implementation of safety at work in the transport of dangerous goods.

Keywords: dangerous goods, railway transport, health and safety, participants

Introduction

The transport of dangerous goods represents a high risk process including a number of potential risks for people, material goods, and environment. Dangers arise from the load itself which often consists of dangerous substances of physical and chemical properties. Such dangers are particularly evident if they are inadequately treated in the course of the transport process. There are numerous possibilities of occurrence of certain omissions in transport, which often result in appearance of fire and explosion releasing inflammable, toxic, and oxidizing gasses, destructively high temperatures and pressure, the formation of dangerous compounds, and the like.

Risks and threats to the life or health of employees who, in any way, come in contact with or are involved

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in the work with dangerous materials are numerous and, respectively, extremely high. Having this in mind, and primarily in order to preserve the lives and health of staff dealing with dangerous substances (included into the transport process), it is necessary to undertake Occupational Health and Safety Measures.

Safety at work includes measures and means aimed at creating safe working conditions in order to protect the physical and moral integrity of workers.

The duties, obligations, and responsibilities of the participants in the preparation and execution of the transport of dangerous goods consisting of the preparation for transport, loading, transshipment, transport itself, incidental manipulation and storage of cargo during transport, are regulated by international and national regulations.

Conditions for the Transport of Dangerous Goods

Dangerous goods are substances that can cause injuries to people, material damage or endanger the environment. They are classified according to their basic characteristics into nine classes (in accordance with the Regulations for International Rail Transport of Dangerous Goods, i.e., RID Rules).

For each class, there are rules that set out the transport performance, and there might be additional instructions for specific substances. Many substances have such qualities that can be classified in more than one class, and in such case, they will be subject to the rules applicable to various classes.

Classes of dangerous substances (Rulebook on International Railway Transport of Dangerous Goods—RID):

- Class 1: Explosive substances and objects with explosive substances;
- Class 2: Gasses;
- Class 3: Flammable liquid substances;
- Class 4.1: Flammable solid substances, self-reactive substances, and explosive solid substances of reduced sensitivity;
- Class 4.2: Self-inflammable substances;
- Class 4.3: Materials that, in contact with water, develop flammable gasses;
- Class 5.1: Oxidizing substances;
- Class 5.2: Organic peroxides;
- Class 6.1: Toxic substances;
- Class 6.2 Infectious substances;
- Class 7: Radioactive substances;
- Class 8: Corrosive substances;
- Class 9: Other dangerous substances and objects.

An absolutely safe railway transport of dangerous goods, in order to minimize the risk of an accident, imposes a large number of restrictions and conditional procedures for the railways. The railway has to adapt to such restrictions and conditions in order to protect and preserve health, life, environment, and material goods. In order to achieve this, certain conditions of shipping and transport of dangerous goods must be met (Jovanović & Eror, 2010).

Each consignment of dangerous goods transported by rail must be accompanied, in addition to the bill of lading, with a document on the transport of dangerous goods, the instructions on special safety measures, as well as a document on the insurance of RID material and, in the case of explosive, radioactive or toxic

substances, the approval for transportation, issued by the competent authority.

Shipments of dangerous goods are operatively monitored and, before the commencement of the journey, all official places of the transport route are informed about the transport of dangerous goods.

Explosive substances and goods filled with explosive substances of Class 1 to 1.5 RID are transported by cargo cars with rolling bearings on shafts, anti-spillage sheets and elastic buffers and barge (Traffic Regulations). These materials may be loaded and transported only in a correctly functioning and closed cargo car. No smoking, fire, or flame should be allowed near the car where loading, unloading or transshipment of explosives is to be carried out. During driving or maneuvering, it is forbidden to approach with an open flame lamp.

Cars marked with RID Classes 1 to 1.5 must be separated by at least one four-axle or two double-axle cars from those of RID Classes 3, 4, and 5. They are considered as protective cars, empty cars, or cars that do not carry any materials falling into one of the RID classes (Traffic Regulations)

A maximum 10 wagons with materials of Classes 1 to 1.5 within one group can be transported by one train. If more than one such group is included in the train, four protective cars are inserted between them. The cars containing these dangerous goods must be separated from each working locomotive by at least one protective car (Traffic Regulations)

When transporting bottles with gasses, they must be placed in wagons with good ventilation and must be protected against direct sunlight. In railway stations and other places where loading, unloading, transshipment and discharge of gasses are carried out, a special place must be identified for carrying out these operations.

Self-inflammable substances shall not be placed in the same wagon as other flammable substances and aggressive chemicals. Loading and unloading of flammable liquids must be carried out only during the day.

Participants' Obligations in the Transport of Dangerous Goods

In order to perform transport of dangerous goods without unwanted accidents and thus ensure a protection of people, material goods, and environment, it is necessary that the participants in the transport process fulfill obligations in their domain, in addition to all undertaken Occupational Health and Safety Measures. Participants in the transport of dangerous goods can be divided into two groups: main participants and other participants in the transport process. The main participants are the shipper, the carrier, and the recipient, and the group of other participants consists of the loader, the packer, the filler, the user of container and portable tank, and the person in charge for unloading the goods (Jovanović, Vujanović, & Milošević, 2015).

The shipper as one of the main participants in the transport process of dangerous goods shall, as part of his task in the process, fulfill the following obligations:

- Provide information that the dangerous goods are classified and allowed to be transported according to RID rules,
- Provide the carrier with the necessary data and information in a form that can be proved and, if needed, the necessary transport and accompanying documents,
- Adhere to and comply with the requirements related to the mode of shipment and the shipping restrictions,
- Ensure that both unclean and non-disinfected tanks or unclean empty cars, large containers, and small containers for bulk cargo are appropriately labeled and marked,
- Ensure that unclean empty tanks are closed and sealed in the same way as if they were loaded,

- Undertake appropriate measures when using the services of other participants to ensure that the shipment meets the RID requirements,

- Warn the shipper in writing that the transport concerns dangerous goods and make available the necessary information and documents required for the execution of his tasks (in the case of a shipper acting in accordance with the order of a third party).

The carrier of dangerous goods shall fulfill the following obligations:

- Determine whether the dangerous goods to be transported are allowed for transport according to the RID rules,

- Ensure that the shipper has, before the transport, made available all the information prescribed by the RID rules in relation to the goods transported,

- Ensure that the prescribed documents are in the transport unit,

- If the working procedure of electronic data processing or electronic data exchange is used,

- Instead of hard copy documents, ensure that the data provided in the course of transport are available in a manner that has a value at least equal to that of hard copy documentation,

- Determine by visual checks that the car or cargo does not have obvious flaws, leaks, or cracks that parts of the equipment are missing, etc.,

- Ensure that the period of the next test has not been exceeded in the tank,

- Check that the car does not exceed the permitted load,

- Ensure that high-risk markers are placed on the car,

- When the failure to meet RID rules is established, ensure that the shipment is carried out only after the requirements have been met,

- Ensure that the train containing the consignment stops as soon as possible when failure to meet the regulations during transport is established, where such failure could endanger the transport safety,

- Undertake measures of safe postponement of the consignment when the train stops, when a failure to meet the regulations during transport is established,

- Continue the transport only after the requirements have been observed,

- Continue the transport only after the competent authority (authorities) has issued approval, etc.

The recipient of dangerous goods shall fulfill the following obligations:

- Timely receipt of cargo,

- Check, after unloading, the compliance with the RID requirements,

- Return the container to the carrier only after the violation of the RID requirements has been corrected,

- Undertake appropriate measures to require that the request for postponement of the receipt of the goods for no compelling reasons be respected in case the services of other participants are used,

- Undertake appropriate measures to verify, after unloading, the compliance with the RID requirements in case of using the services of other participants.

If one of the participants does not fulfill his obligations, this could potentially pose real risks that could impair the safety of the dangerous goods transport.

Measures for Protection of the Dangerous Goods

Bearing in mind the risks resulting from the transport of dangerous goods and the consequences that may result from their uncontrolled release during transport, as well as the causes of extraordinary events, such as

accidents in the transport of dangerous goods, it is primarily necessary to insist on the implementation of preventive measures that reduce the risk of occurrence of accidents to a minimum.

Some preventive measures that reduce the risk of accidents, and hence the possibility of injuries to participants in the transport of dangerous goods, are (Jovanović & Eror, 2010).

- It is strictly forbidden to dispose materials that can easily cause fire, burning fire, the use of ignition devices, smoking, the use of appliances and burners, and the operation of tools or devices that protect them, in the places where the handling of dangerous goods (loading, unloading, transshipment) is carried out;
- During the loading, unloading, or transshipment of dangerous goods, the voltage in the electrical line (if located above the manipulation position) must be switched off, the motor operation in the road vehicle that is in the handling area shall be switched off and, in case a diesel locomotive is passing by a neighboring track, the regulator should be closed;
- Means for transporting flammable liquids and flammable gasses in liquid state must be, prior to loading or unloading, particularly grounded, unless direct grounding is provided;
- The time delay of dangerous goods during transport should be reduced to the minimum possible. By increasing the time of transport of dangerous goods, from the moment of receipt for loading, to the receipt in the receiving station, the degree of risk of accidents is also increased;
- The time required for technical and commercial inspection and other formalities of state administration in border stations as well as the delay time due to change of towing vehicle, shall be reduced;
- When ordering a car for the transport of dangerous goods, the provisions of the railway regulations must be respected and, depending on the type of dangerous goods to be transported, cars by which they will be transported shall be selected, bearing in mind that such cars must be equipped with appropriate protective means, equipment, and tool.

Also, for the user of train and for the railway as a carrier, the preventive measures against accidents in the transport of dangerous goods are reflected in strict compliance with the provisions of the RID Rules and its existing regulations.

Nevertheless, if accidents occur when transporting dangerous goods, the most important is the coordinated action of professional teams on the railway and outside it, which enables adequate, efficient, and quick intervention with clearly defined tasks in order to protect people, material goods, and the environment.

Safety at work is provided and implemented through the application of modern, technical, health (medical), environmental, social, organizational and other measures and means of Occupational Health and Safety, eliminating the risks of injuries and treats to the health of employees or their reduction to the prescribed extent.

The basic principles for the effective implementation of safety at work are (Kostadinović, Jovanović, & Stojanović, 1989):

- The principle of prevention,
- The principle of mandatory application and implementation of safety at work,
- The principle of humanity and economy.

The prevention principle is achieved through the application of the following preventive measures:

- Designing safety measures at work,
- Technological process,
- Previous and periodic medical examinations of employees,
- Previous and periodical reviews of the means of work,

- Previous and periodical inspections of the working environment,
- Planning and education,
- Procurement of means for work and means and equipment of personal protection at work.

Applicable laws and bylaws stipulate unequivocally that the protection at work is an obligation without exception for all participants in the work process and in all activities.

Occupational Health and Safety Measures should ensure the psychological and physical balance of the employee, i.e., the human working conditions and a comfortable working environment. Safety at work is therefore based on human principles that are reflected in the creation of conditions favorable to work, and relate to the quality of the working atmosphere, the working space, microclimate, the weight and intensity of work, the length of working time, etc.

Conclusion

When transporting dangerous goods by rail, starting from loading, transport, unloading, including temporary storage and transshipment, there are numerous potential risks to people and the environment. In order to safely carry out the railway transport of dangerous goods, special attention should be given to safety at work, which implies taking adequate measures that will enable the creation of safe working conditions in order to protect the physical and moral integrity of the workers.

These measures include a set of concrete and precisely defined preventive measures, procedures, and activities to reduce the likelihood of accidents occurrence and possible consequences, with an aim of preserving the life and health of participants in the transport of dangerous goods.

One of the important assumptions for the safe transport of dangerous goods is that all transport participants comply with the relevant RID requirements. Participants in the transport process of dangerous goods must take appropriate measures, in accordance with the type and scope of the predicted risks, in order to avoid adverse events-accidents.

Occupational Health and Safety also contributes to greater employee satisfaction, greater productivity, and greater interest in achieving organizational goals and interests. Low level of Occupational Health and Safety affects: lowering motivation, reducing work performance, increasing fluctuations, increasing the number of injuries at work, increasing the rate of sickness, and increasing the rate of disability.

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