



SAFETY OF RAILWAY TRANSPORTATION IN BULGARIA

Borislav Arnaudov
barnaudov@unwe.bg

*University of National and World Economy
Sofia, Studentski grad, 8th December, Blvd
BULGARIA*

Key words: *security, safety, sustainable transport, railway infrastructure, ecology, railway crossings.*

Abstract: *Safety in rail transport is the first and most important condition for the transport process. Rail transport is the safest mode of transport in terms of transport safety, it has minimal negative impact on the environment due to the use of electric traction. While the train is running, the risks of accidents are minimized due to the presence of security installations at railway stations, section between stations and locomotives. Unlike all other modes of transport, the railways are the least affected by poor weather conditions - rain, snow, fog.*

Keeping in mind that features of its operation, fatal incidents are rare, but on the other hand, the number of victims is usually much larger compared, for example, to the car. That is why it is especially important to have a high degree of coordination between every employee involved in the processes - from the locomotive driver to the traffic manager, switch-men, the dispatchers, and so on.

Rail transport is the second highest level of safety for all modes of transport. Given the peculiarities of its operation, fatal incidents are rare, but the number of victims is usually much more compared to the road. Therefore, it is very important that there is a high level of coordination between each official involved in the processes - from the train driver to the traffic manager, switchmans, dispatchers, and so on. The high level of security is guaranteed mainly by means of security equipment and signaling at the stations and systems deployed in the rolling stock. An important element of railway safety is also the protection of the passengers in the traffic areas in the form of overpasses, bridges over the rail for safe passage of the road. Frequently, this mode of transport is the subject of attacks in the form of railroad theft, stones thrown on passenger trains, that seriously puts in danger passengers and workers. Measures to address the problem are taken through coordinated action with the Transport Police. We should not overlook the many suicides. All this affects the psychological state of the staff involved mostly in the actual exploitation as drivers and transport brigades. For this reason, all employees go through periodic detailed psycho tests to determine their lability and stability in the conditions of such a service environment.

The most important element of railway transport safety is the state of the railway infrastructure. Every day the sections that are known to be the most problematic are checked. Checking the condition of the connecting elements, the ballast prism, and train

traverses. Prophylactic removal of plants near the gauge of the railway line is carried out. Checking activated landslides and, if necessary, reducing the speed of movement and / or ordering to repair the plot at a convenient time. The last one is difficult to synchronize because the sections of the rail network are interconnected and it is often impossible for certain two sections to be closed for repair at the same time even if it is necessary as they are alternative to one another in a certain direction. These reductions in speed are signaled with warning signs approaching the front of the reduction itself. Correspondingly two more signs stay at the start and end of the respective reduction.

Types of restrictions are temporary and permanent. Permanent restrictions represent a speed limitation in a given area, which is caused by the engineering specificity of a part of the section, such as small radius curves. Temporary restrictions represent a speed limit most often caused by slowed repairs, after which the speed returns back to normal according to a booklet schedule which is valid for the rest of the interconnection.

Locomotive staff must strictly monitor for the so-called "unprotected train cross overs" where the maximum speed allowed is 15 km / h. When entering a station, the signals on the entrance and warning lights must be carefully monitored. Accordingly, the train should enter the main track at the station or in the diversion (40 km / h for Bulgaria). This monitoring is carried out by the assistant driver in the locomotive cabin. The signals of a train leaving a station are also monitored by the assistant driver. According to the fact that rail transport is not highly affected by the weather, the locomotive and transport brigades should stay alert at all times. In order to prevent the locomotive brigade from falling asleep, the locomotives are equipped with the so-called alertness devices known as "toman".

The transport brigade (conductor/s and train-supervisor) should, in turn, monitor boarding / descending passengers at stations and stops, people who are in danger of being near the train, and so on. The doors of the passenger wagons are automatically closed when the train departs from the station. It is assumed that each wagon should have an active automatic locking on the doors to be triggered when starting the train, but in reality not every wagon has a working one. This, in turn, is a serious prerequisite for incidents, as trains also are used by young children, whom are often difficult to control, and a moment of distraction can be fatal when the door is opened. Fortunately, there is no information about often incidents. When stopping in the so-called „prophystations" the train-supervisor manages brakes tests to check their sustainability for an upcoming part of a long descent.

An important element for the safety of the railway infrastructure is the maintenance of artificial facilities (tunnels, bridges, drainages). For all of them throughout their lifetime, it is necessary to organize and implement systematic supervision, including:

- current inspection - carried out by the cantoners during their daily check in on the railway track and the facilities;
- ongoing inspections - are carried out by the facility and road supervisors, the railway section managers and the group managers according to the "Instruction for the construction and maintenance of the upper construction of the railway track and the railway switches";
- Periodic inspections (revisions) - annual - are obligatory carried out by the head of the sector that tracks the construction and maintenance of the railway section, with the participation of the road and equipment controllers, depending on the condition of the facilities; - the general inspection of the facilities is subject to a separate instruction;
- research and tests - are carried out by specialized research units or organizations, with the participation of the facility supervisor;
- special verifications and observations - are carried out under special programs developed by research units or organizations with the participation of the facility supervisor.

When carrying out the checks, particular attention must be paid to the weak elements of the equipment, where the probability of occurrence of faults is greatest and to the components and connections having defects and damage significantly affecting their normal function.

To the weak and faulty facilities to which special observations have to be made, refer;

➤ to the weak - artificial structures, including pedestrian and motor overpasses, which due to their condition and their load-bearing capacity (strength and durability) do not ensure the passage of the train and motor traffic without limitation of speed and load, as well as facilities with a load bearing capacity equal to the weight of passing loads; structures with destabilized parts or elements (sinking, tilting and cracking of the supports, failure of individual rings of the gutter), increased sagging and differences in the high of the top supporting structures and constructions (including pedestrian bridges) in busy condition.

➤ to the defective - equipment with damage, the increase of which can reduce their bearing capacity (distortions, cracks, curved elements, corrosion of the metal, exposed work lining, washing the supports, etc.); Pedestrian bridges with a load-bearing structure of welded rack packages; Bridges with peaked constructions are reinforced by welding; bridges and culverts with insufficient water-tightness and subjected to washing; Ballast-overloaded facilities due to an increased ballast prism.

The main tasks on the ongoing maintenance of the artificial facilities are:

- cleaning the elements of the bridge against contamination;
- changing the seasonal equality rails, strengthening the road against landslide;
- tightening and replacement of bolts and partial replacement of bridge parts;
- protection of bridging sleepers from rotting and mechanical wear by filling the cracks with suitable pastes and chemicals (plastering of traverses);
- cleaning against contamination of structures, bearings and bearings sites;
- cleaning of the drainage, the inflow and the outflow of sediment and plants;
- preparation for spring water leakage, cleaning of the drainage bottom from snow and ice accumulation around the supports;
- observations for the levels of spring water and the amounts of ice;
- change of single rivets and bolts, stopping the development (by drilling) and reinforcing cracks with lamellas (joints) in the steel structures of the bridges;
- grouting of stone masonry and repair of cracks in the tunnels and massive structures, repair of the water drainage devices, restoration of fallen and displaced stones from the masonry;
- Repair of pedestrian walkways and railings.

When a significant decrease in the quality of technical condition of the track is identified depending on the degree and possibility of complete or partial closure of a section, different types of repairs are chosen.

The mechanized average repair consists mostly of sifting of the ballast and partial replacement of rails and sleepers. These kinds of repairs are done in interruptions most often on weekdays between 8:00 and 16:00 (also known as windows).

In case of a bigger repair involving a mechanized renewal in a rail section, a complete track replacement is provided, that often happens in the conditions of a complete break in the train movement. Alternative freight routes, international passenger trains and buses for domestic transport are also provided in cases of repairs.

Conclusion

In recent years, the European Union's rail system is mandatory to apply all the safety requirements in passenger wagons to make passengers being safety and feel safe when

traveling. An obligatory condition is that all wagons are fitted with an automatic door lock that prevents them from opening during the train movement. In addition, it is a mandatory requirement that the interior lining of wagons be made of non-flammable materials to prevent serious fires. The transport sector policy on a global and especially European scale is aimed at an increasing share of rail transport and its gradual transformation into the most used land-based one with a focus on air transport competition. All this requires new, flexible and improved systems for regulating and managing rail traffic. An example in this regard is the European ERTMS (European Railway Traffic Management System), which is still being developed. As traffic increases, the risks of accidents are also inevitably increasing, but technology is capable of responding to these challenges and minimizing the dangers of fatal accidents by rail. At a time when everyone uses a private car, the levels of poisonous gases in the atmosphere are historically high and the massive introduction of electric cars seems to be still far away, we should reorient to the use of safe and much greener transport whether urban, interurban, or long-distance.

References:

- [1] European union strategy for the railway transport
- [2] Commission Regulation (EU) No 1078/2012 of 16 November 2012
- [3] Regulation 13
- [4] http://ec.europa.eu/represent_en
- [5] <http://bookshop.europa.eu>
- [6] <http://eca.europa.eu>

БЕЗОПАСНОСТ НА ПРЕВОЗИТЕ С ЖЕЛЕЗОПЪТЕН ТРАНСПОРТ В БЪЛГАРИЯ

Борислав Арnaudов
barnaudov@unwe.bg

Университет за национално и световно стопанство
София, Студентски град, ул. „8-ми декември”
БЪЛГАРИЯ

***Ключови думи:** сигурност, безопасност, устойчив транспорт, железопътна инфраструктура, екология, жп прелези.*

***Резюме:** Безопасността на превозите с железопътен транспорт е първото и най-важно условие за транспортния процес. Железопътният транспорт е най-безопасният вид транспорт, има минимално отрицателно въздействие върху околната среда поради използването на електрическа тяга. При движението на влаковете, рисковете от възникване на инцидент се свеждат до минимум поради наличието на инсталации за сигурност в железопътни гари, разстояния между прелезите и локомотивите. За разлика от останалите видове, железопътният транспорт е най-малко засегнат от лоши метеорологични условия - дъжд, сняг, мъгла.*

Като се имат предвид характерните черти на превозите с железопътен транспорт, фаталните инциденти са рядкост, но от друга страна броят на жертвите обикновено е много по-голям в сравнение с тези при автомобилния транспорт. Ето защо е особено важно да има висока степен на координация между всеки служител, участващ в процесите - от машинистите на локомотивите, до ръководител движението, кантонери, диспечерите и т.н.