

## **THE ROAD SAFETY INSPECTION PROCESS AND ITS INFLUENCE ON ROAD SAFETY**

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**Abstract:** *The paper presents the main notions related to the road safety inspection process and how it is carried out in Romania. Road accidents are events that have a very strong socio-economic impact on society as a whole and directly on its members. A road safety system aims to prevent road accidents and, if they do occur, to minimize their consequences. This system is based on the idea that people make mistakes and are physically vulnerable. The vision of sustainable safety has a considerable influence on the practical work on road safety.*

*Road safety has been seen as a problem of the transport system, a disastrous consequence of it, without taking into account the fact that road accidents involve direct costs that are borne by the health sector, business and the families of those involved.*

**Keywords:** *Road safety, Road transport, Safety management, Road safety audit, Road safety inspection.*

### **1. Introductory notes**

During the last decades, in the European Union, road safety has been seen as a problem of the transport system, an unfortunate consequence of it, without considering the fact that road accidents involve direct costs that are borne by the health sector, the business sector and by the families of those involved.

According to statistics, of all modes of transport, road transport is the most dangerous and expensive in terms of human lives and related costs. Thus, road safety represents a problem of individual, national, European, and global interest, and its approach must be appropriate for each individual level, with shared responsibility among all the actors involved.

Therefore, as a response to the increasing number of road accidents involving loss of human life, the European Union developed Directive 2008/96/EC of the European Parliament and of the Council of November 19, 2008 on the management of road infrastructure safety.

In 2019, the European Parliament adopted DIRECTIVE (EU) 2019/1936 amending Directive 2008/96/EC on the management of road infrastructure safety, which is based on the following actions:

- Limited extension of the scope of Directive 2008/96/EC to motorways and other main roads outside the TEN-T network;
- The road safety performance of existing roads should be improved by targeting investments to road sections with the highest concentration of accidents and where there is the highest potential to reduce the number of accidents.
- Network-wide road safety risk-based assessment has proven to be an efficient and effective tool to identify network sections that should be targeted by more detailed road safety inspections and to prioritize investments according to their potential to improve network-wide security. For these reasons, the entire road network covered by this directive should be systematically assessed, including through data collected by electronic and digital means, with a view to improving road safety throughout the Union.

The trans-European road network defined in Decision no. 1692/96/EC of the European Parliament and of the Council of July 23, 1996 regarding the Community guidelines for the development of the trans-European transport network is of particular importance in the context

of the support given to integration and cohesion in Europe, as well as guaranteeing an increased level of well-being. In particular, a high level of safety must be ensured.

The degree of road safety, in the current conditions, should be increased by directing investments to the road sections where the highest concentration of accidents and/or the highest potential for reducing the number of accidents are registered. In order to adapt the behavior of drivers and to ensure an increased degree of compliance with traffic rules, especially speed limits, they should be warned about road sections with a high concentration of accidents.

The network security classification has high potential in the period immediately following its implementation. After remediation of road sections with a high concentration of accidents and taking corrective measures, the focus should fall on preventive measures consisting of carrying out safety inspections. These regular inspections are essential to prevent the dangers to which all road users, including the vulnerable, can be exposed, as well as in the case of road works. Training and certification of safety personnel through training programs and qualification tools approved by Member States should ensure that professionals in the field acquire the necessary up-to-date knowledge.

## **2. The concept of road safety in Romania**

The process of driving a vehicle is considered by researchers as a task with a high degree of complexity, which continuously requires an adaptation to the needs and requirements of road traffic.

An efficient, safe, and reliable road network is of fundamental importance for the success of the Romanian economy and, ultimately, for the identification of development potential. The main problems related to the road sector can be classified according to the following aspects: safety, infrastructure, maintenance, policies, and regulations.

The road network in Romania is structured in five categories:

- Motorways;
- National and European roads;
- National Roads;
- County Roads;
- Communal Roads.

The road environment is a basic component of the road safety system, being represented by the road and its adjacent area, which influences the development of the road. Practically, the driver visualizes the road environment and based on this information adopts the mode of behavior, mainly the speed of travel.

The traffic arteries must be designed in such a way that the traffic participants perceive, understand and use them as the road network administrators and designers proposed, that is, by creating a friendly road environment that transmits clear messages. Traffic planning and infrastructure design have a particular impact on road safety, reflected for example both in the case of the appearance of streets in residential areas for accidents involving pedestrians, as well as in the case of an urban traffic network with many intersections, which implies a danger high number of accidents due to the lack of separation of traffic for all categories of traffic participants.

Therefore, the road environment-man-vehicle system is the conceptual framework in which road traffic, with all its components, must be understood and analyzed. These three factors do not work in isolation, they are always present in the chain of road events that compete to cause an accident.

In choosing the traffic speed, drivers are influenced by the main geometric characteristics of the road. The speed of a vehicle traveling on a public road may vary depending on the type of vehicle, the character of the driver, the route followed, the weather conditions, as well as the presence of other traffic participants or the speed control measures present on that sector. Unfortunately, in Romania, according to statistics, there are an average of 1200 serious accidents.

The vast majority of these accidents happen on roads of local interest, in linear villages.

As a response to the growing number of road accidents resulting in loss of human life in Romania, Law no. 265 / 2008 on the management of traffic safety on the road infrastructure was implemented, with subsequent amendments and additions transposing Directive 2008/96 / EC, which establishes the implementation of road safety audits, road safety inspections, as well as the training and certification of road safety auditors.

**Road safety inspection** represents the periodic verification of the road network in operation, from the point of view of traffic safety, with the identification of possible malfunctions or deficiencies in the design, construction, operation and/or maintenance of the road, which may lead to the occurrence of road accidents

The road safety inspection is carried out by teams made up of road safety auditors.

The road safety inspection must be based on the experience of specialists during the field study and be structured on a list of necessary elements. The result of the road safety inspection is a detailed analysis of the problems and the proposal of remedial measures. The road safety inspection aims to identify any potential future accident risk so that remedial measures can be implemented before accidents occur.

Road safety inspection does not require data on road accidents, but it can be used in prioritizing the roads to be inspected!

The road accident database can provide additional help in prioritizing roads to inspect. Information on the number and type of accidents can help to effectively organize the road safety inspection. For example, when the road manager requests road safety inspection, it is recommended to start on the riskiest road section with a history of accidents. On the other hand, if the data reveals that a certain type of accident occurs very often, the road safety inspection can focus on the circumstances of the occurrence of that type of accident. Some examples: a high number of accidents in residential areas involving pedestrians can be the result of the lack of sidewalks and special facilities for pedestrians, as well as the speeding of motorists. The inspection team should focus on local conditions.

### **3. The influence of the characteristics of the running surface on traffic safety**

The quality of the road surface essentially influences traffic conditions. The development of traffic in safe conditions is influenced by the way in which the tire-car body contact is made. The lack of permanent contact of the tires with the running surface reduces the possibilities of maneuvering and braking and can generate unwanted road events.

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#### **Roughness**

Roughness is the property of the road surface to present asperities. In this way, the stability of moving vehicles is ensured, by achieving the best possible adhesion between the tire and the road. The problem of creating rough surfaces and maintaining this roughness for as long as possible becomes more and more important, as traffic intensity and traffic speed increase. It is known that there are several factors related to the texture of the road surface, factors that play different roles in the process of improving skid resistance. What differentiates these factors is the texture scale: microtexture (roughness less than 0.5 mm), macrotexture (roughness between 0.5-50 mm), megastructure (roughness between 50-500 mm) and non-uniformity (roughness greater than 0.5 mm). The presence of water on clothing reduces the contact surface between the tire and the road. In the case of certain combinations of surface textures, tire characteristics, vehicle speeds and water film thicknesses, total loss of contact between tires and surface may occur.

An important aspect is the relationship between the rolling resistance and the sand content of the tread. Therefore, the higher the sand content, the higher the sliding resistance. The sand content determines the degree of micro-roughness on the road surface.

In order to ensure an appropriate roughness of the running surface, it is necessary that the asperities are maintained for a long time, so that the granules in the composition of the asphalt mixture do not grind. Grinding the aggregates diminishes the non-slip properties of the coating by gradually removing the original microtexture and macrotexture.

#### **Flatness**

Flatness is a characteristic of the running surface and represents the uniformity of the running path. Its quality can be affected by different types of cracks, deformations or disintegration problems.

The components of the flatness of the running surface are:

- Longitudinal flatness - is generally measured in terms of IRI. IRI (International Roughness Index) is an international indicator, that measures the vertical displacements of a vehicle's suspension along a road, under standard conditions;
- Transverse flatness - allows the detection of different types of problems such as the depth of the grooves.

Defects related to the flatness of the road surface directly influence the level of comfort for the occupants of a vehicle, and the operating cost of the road and may also have adverse effects on the safety of road traffic.

#### **Impermeability**

Impermeability is a quality parameter of the road surface and has special importance on the behavior of the road structure in operation. If the wear layer of the roadway does not ensure the road's impermeability, the water from rain or from melting snow penetrates through infiltration into the layers road structure.

In this situation, a series of deficiencies appear at the level of each road layer, which is influenced by the presence of water in its material structure.

Following the completion of a number of 50 Periodic Road Safety Inspection Reports, representing a number of 2000 km of national road inspected, approximate cataloging of the deficiencies found was carried out as follows:

- 40% are vertical signaling problems;
- 22% parapets, whether metal, concrete, or pedestrian;
- 17% horizontal signage;
- 7% problems ensuring visibility;
- 5% repair of damaged approaches;
- 3% damaged areas of the roadway.

The reports resulting from periodic road safety inspections as well as those resulting from additional accident inspections aim to significantly reduce the number of accidents.

#### **4. The benefits and costs of the Road Safety Inspection**

The purpose of the road safety inspection is the proactive management of road safety, by identifying and attacking risks associated with infrastructure deficiencies.

The advantages of road safety inspection can be summarized as follows:

- Potential dangers for traffic participants are identified, dangers that can affect their safety in traffic;
- Minimize the risk and severity of road accidents that may be due to an existing situation on a road section;
- Unsustainable health and economic losses are minimized.

To be effective, remedial measures must be identified and implemented as a result of the road safety inspection. Research conducted by Rune Elvik reveals a significant reduction in the

potential for traffic accidents due to road safety inspection and associated remedial measures. They are given as an example:

- Correction of inadequate road signs: Reduction by 5 - 10%,
- Provision of protective parapets along embankments: reduction by 40 - 50%,
- The provision of free safety zones: Reduction by 10 - 40%,
- Removal of obstacles obstructing visibility: reduction by 0 - 5%,

As noted, the listed "low-cost remedial measures", normally included in road safety inspection report proposals to be implemented in the short and medium term, are effective in reducing the risk of accidents.

### **5. Conclusions**

As can be seen, there is a close relationship between road characteristics and the risk of accidents, through the combined road-driver effect.

The human factor is the most important, representing 57-67% of the causes. Combined with the elements of the road and the vehicle, it can end up being the cause of 95% of accidents. The elements of the road must be based on the fact that while traveling a route at the wheel of the vehicle, the driver must perform a wide variety of tasks and decide in an extremely short time what is the optimal course of action.

Since human typology is very varied and reaction times differ from person to person, road elements must be designed in such a way as to help drivers make the best decision in the shortest time, without adding negative stimuli. Thus, the curves in the plan, as well as the vertical ones, the widths of the carriageway, the characteristics of the running surface, properly designed and made, can contribute to the creation of more friendly roads for the traffic participants.

Clarifying the actions taken at the level of each basic component of the road safety system (man, road and vehicle) and the actions taken at the interfaces between these components can have a significant impact on reducing human error and therefore the number of accidents.

In the future, it would be desirable to implement in road construction and design regulations many elements that allow reducing the rate of human errors or minimizing their impact, which can lead to an improvement in the level of road safety.

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