

Safety of Traffic Participants During Construction of Road Infrastructure Facilities

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Abstract – Traffic safety is one of the most important priorities in our country and in the world. Respecting and implementing on-site laws and regulations on traffic and construction, will reduce traffic accidents and accidents on construction sites. The whole point is for the activities to pass without any consequences on human life, as well as to complete the project successfully and on time.

Keywords – Construction, road infrastructure, traffic safety.

I. INTRODUCTION

Traffic safety is one of the most important priorities in our country and in the world. In order to achieve this goal, it is necessary to continuously work on improving the conditions affecting traffic safety. Road infrastructure facilities also contribute to increased security. That is why new, safer roads are being designed daily, the old ones are being reconstructed and the existing ones are being upgraded.

At the start of this kind of construction activities the safety of road users and construction site workers is at the forefront. Some of them include taking appropriate safety and security measures, securing the site from other activities, setting up temporary traffic regimes with appropriate traffic signs and markings, etc.

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II. CONSTRUCTION SITE WHEN BUILDING A ROAD INFRASTRUCTURAL OBJECT

Prior to the commencement of construction works for road infrastructure facilities, preparatory activities are undertaken at the site where construction operations are planned to be carried out. For this purpose, with every start of construction, reconstruction or rehabilitation of road infrastructure facilities, it is mandatory to mark the projected construction on the

ground and to enclose it to prevent uncontrolled access to the site with appropriate fencing so that the work on the site will not jeopardize the safety of traffic participants. While construction sites that extend to a larger area that cannot be fenced off, must be protected by certain traffic signs or marked otherwise.

Each construction site must be marked with an information board which must include a name, ie the name of the participants in the construction, the name and type of the construction being constructed, the number and date of the issued building permit and other data relating to the building being builds.



Fig. 1. Incomplete information board on construction site

When working on a construction site, employees are exposed to various risks such as: landfill; immersion; falling from a height; risk of mechanization; risk of chemical and biological substances etc. Therefore, in every construction site the following basic requirements must be met:

- stability and firmness;
- movement paths and emergency exits;
- temperature;
- loading rooms and ramps;
- fire detectors and firefighting equipment;
- ventilation;
- job lighting;
- sanitary equipment;
- rest rooms and more.

The safety of the participants at the construction site is in question. Not only here, but throughout the world, there have been injuries and even casualties in road construction or rehabilitation. Thus, in the Netherlands 20 and in Turkey 80 people are killed annually. while in our country there is no information.

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Fig. 2. Construction site of road infrastructure facility, express road Prilep-Gradsko, R. North Macedonia

III. SAFETY OF TRAFFIC PARTICIPANTS WHEN BUILDING ROAD INFRASTRUCTURE FACILITIES

The most important thing in traffic is to get to the desired place safely, but not always. And there are unforeseen events: a traffic accident, landslides and mudslides, a construction site, a strike, and so on. Although it is not possible to completely prevent and reduce them to zero, the results of unwanted consequences can be mitigated by taking security measures.

When building road infrastructure facilities, besides the safety of the participants at the construction site, the safety of the participants in the traffic is also of great importance. Certain safety measures should be taken to increase security. They depend on: the type of facility, the type and size of activities, the interval of time, etc.



Fig. 3. Improper signage in front of the construction site

Traffic safety of road users during construction or reconstruction of road infrastructure is reduced due to:

- not having a person diverting traffic;
- insufficient signaling;
- insufficiently lit before and after the construction site;

- negligent employees at the construction site who do not comply with traffic rules and regulations;
- failure to enter and exit a construction site
- exceeding the permitted speeds of movement etc.

Research shows that one of the biggest cause that endangers the safety of road users are the drivers themselves. By disregarding traffic signs and excessive speeding near a construction site might cause traffic accidents that can even be fatal. However, not only that, the construction sites are also a safety hazard, with no appropriate safety precautions taken, unmarked hazardous areas, not marked construction sites in accordance with the rules prescribed by the Contractor himself.

Traveling along the roads we often encounter these influencers especially in our Macedonia. Disobeying traffic safety rules and regulations and building regulations, endangers the safety of participants on a daily basis. An example of this is the construction site located on the A3 motorway, near the Technological Industrial Zone Prilep. Although the section Prilep-Bitola connects the Pelagonija region with the capital, the measures taken during the construction activities are minimal and the safety of each participant using that road is very reduced, especially at night.



Fig. 4. Insufficient signaling construction site, section Prilep – Bitola, R. North Macedonia

In order to increase traffic safety when building or rehabilitating road infrastructure facilities, safety regulations need to be respected. Regulations depend on the category of road, construction period, distance between the construction site and the traffic network and others. To avoid jeopardizing the safety of the participants during the road construction works, adequate synchronization should be used before and after the construction site:

- conical plastic barriers;
- traffic barriers;
- traffic controllers;
- flashing and audible signaling;
- warning signaling;
- obstacles to speed reduction;
- horizontal signaling;



Fig. 5. „Contemporary“ traffic signalization(R. North Macedonia)



Fig. 6. Traffic signalization (R. Germany)

Conical plastic barriers are used to divert or change traffic flow. The cones are made of lightweight materials, hard-breaking, weather-resistant (rain, sun, ice) and are in red and purple color. Traffic barriers have similar characteristics.



Fig. 7. Reckless operation of a construction site

Traffic controllers are people who control and direct the movement of vehicles before and at the construction site. They do it with a red and green flags, and can also use special traffic signs. They should be well trained and have the following skills:

- know how to use signaling equipment;
- give clear and understandable instructions to the traffic participants;
- to warn the drivers of dangerous vehicles;
- be able to identify dangerous traffic situations and the ability to prevent unwanted accidents, etc.

Due to insufficient lighting during the night work, the hazard level of high-risk road construction sites is further increased. Light signalization should be set on plastic traffic cones or some other traffic equipment at a height of 1.20 meters, and It is used mainly in night conditions to increase visibility especially before the construction site. They can be red and yellow and should blink 60-75 times a minute. Inadequate lighting during night work increases accident rates for both construction site workers and drivers involved in traffic. Excessive and improperly applied lighting is also the cause of many accidents.



Fig. 8. Light signalization

Alert signalization plays a major role in road infrastructure construction activities. They can be fixed but also movable mounted on special vehicles. Attention should be taken to ensure that the warning signal is not misplaced, intentionally damaged or damaged by supernatural forces. Therefore, this signaling is often fastened to the substrate, or mounted using other objects. The mobile alert signal is luminous and audible, thereby enhancing the safety of traffic participants. It is used in places where there is high traffic frequency. The warning length during the rehabilitation of one lane of a section has a longitude depending on the category of road (Table 1).

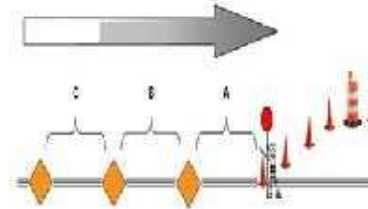


Fig. 9. Warning Zone Plan

TABLE I
REQUIRED WARNING DUTY UNDER THE ROAD CATEGORY

Road Category	Length		
	C (m)	B (m)	A (m)
City streets with limited movement speed	30,48	30,48	30,48
City streets with higher speed of movement	106,68	106,68	106,68
Local roads	152,40	152,40	152,40
Motorway	804,67	457,20	304,80



Fig. 10 Warning Zone (Urban)

Although there are global standards that we have implemented in our country for lengths of warning and other road safety measures, it remains only on paper. Almost no Contractor applies them, and the Supervisor does not control the security measures taken.



Fig. 11. Insufficient security measures taken in R. North Macedonia

Because reckless drivers disregard traffic signs, they risk their lives, as well as those around them, so there are obstacles (ramps) to slow down the speed of vehicles using that section. Hog policemen are a good measure for reducing speed, which also increases the safety of drivers and people working on the site.

The horizontal signalization to be used in front of the construction site directs drivers to the direction of movement and increases safety. The material marking this signaling should be such that it will not create additional risks.

Finally, as a proposal for resolving the safety of traffic participants in the construction of road infrastructure facilities, it is necessary to undertake appropriate activities and comply with prescribed measures in accordance with regulations. Thus, in order to avoid unintended consequences and victims during the construction and reconstruction of roads, we need:

- to mark the construction sites in accordance with the Rulebook for marking a construction site for a building (information board, signaling, lighting, etc.);

- to respect the set signalization and the speed adjustment by the drivers of the vehicles that participate in the traffic;
- to respect the regulations prescribed for the participants who are included in the construction or reconstruction of roads, etc.

IV. CONCLUSION

Several conclusions can be drawn from this paper:

- prior to the commencement of construction works for road infrastructure facilities, preparatory activities are undertaken on the spot marking the projected construction on the ground;
- each construction site must be marked with an information board which must contain a name, i.e. the name of the participants in the construction, the name and type of the construction being constructed, number and date of the issued building permit;
- to increase the safety of traffic participants, certain security measures should be taken depending on: the type of facility, the type and size of activities, the interval of time, etc.;
- the safety of traffic participants in the construction or reconstruction of road infrastructure facilities is reduced due to: lack of person diverting traffic; insufficient signalization; insufficient light before and after construction site; negligent construction site; employees who do not comply with traffic rules and regulations; disregarding entry and exit to the construction site; exceeding the permitted speeds of movement etc.;
- research shows that one of the major causes that endanger the safety of road users is the drivers involved in traffic, disregarding traffic signs, speeding near a construction site, disregarding distance between vehicles;
- to avoid endangering the safety of the participants during the construction work on the road, adequate signalization should be used before and after the construction site: conical plastic barriers; traffic barriers; traffic controllers; flashing and audible alert; alerting; to reduce speed; horizontal signalization.

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