

## THE USE OF THE ADDITIONAL LIGHTING OF THE SEMI TRAILERS FOR THEIR SAFETY EXPLOATATION

*The report has pointed out the need to provide the truck driver with a semi trailer, the ability to see the contour of the semi trailer and road illumination in the insufficient lighting conditions. The need for equipping the vehicle with additional contour light and lamps illuminating the section of the road overrun by the semi trailer wheels has been assessed.*

*This is particularly important during manoeuvring with such truck – semi trailer unit at night to ensure safety, as the semi trailer has a different tracking circle than the towing truck. Current regulations are too (categorical) restrictive and limiting possibility of introducing additional lights. The proposal for technically solving this problem as well as amending the regulations, has been presented. The existing technical requirements included in current regulations on lighting do not take into account the need to ensure the visibility of these areas for the truck driver with a semi trailer.*

**Keywords:** lighting, semi trailer, visibility, safety.

### 1. Introduction

The analysis of the reasons of collisions and accidents indicates the limited visibility as the essential cause of their occurrence. The tests were made and the drivers driving the trucks with trailers and semitrailers at night were interviewed. It appears from them that on the roads and in the manoeuvring areas which are not lit up by the street lamps, the drivers have the invisible areas on the right and left sides of the vehicle along all its entire length. The reason is the lack of the lighting of the above mentioned areas. If the area is not illuminated by the street lamps, in the darkness they are also not illuminated by the lamps of the own vehicle. Besides these vehicles have unilluminated side edges and they are not visible for their drivers. The driver is unable to observe the shifting of his own vehicle and its position against the other objects, so to avoid the collision or accident.

In Poland at night there are also unilluminated pedestrians on the roads, cyclists, horse carriages etc.

While passing the unilluminated objects, the driver is unable to define the position of the side of the driven truck in relation to the unilluminated objects.

The similar situation takes place when manoeuvres are carried out in none lit up place and there are unilluminated objects either side of the vehicle.

### 2. The estimation of the situation and changes proposed

The driver of the vehicle or group of vehicles should have the possibility to observe the surroundings of the vehicle together with the elements of the contour of this vehicle – see Figure 1 [1, 2]. The drawing presented below shows these areas around the vehicle.

The driver should have the ability to observe them during driving, both during a day and at night. It should be possible under the street lighting and without it.

The possible directions of relocation of the vehicle were studied: forwards, backwards and sideways. During the day light, the vehicle driver does not receive the direct or indirect visual information transfer from the part of the area surrounding the vehicle, although they are very important for collision free movement. This is a result of obscuring visibility by the none transparent elements of the vehicle cab and vehicle body.

The area not visible around the vehicle at night becomes considerably bigger. The front headlights light the road ahead.

The reverse lamps light the road during driving backwards. If there are no street lamps, the rest of the vehicle surrounding (if it does not emit the light itself) is dark. The obstacles that find themselves in these areas are not visible to the driver.

Besides, the vehicle without the trailer while movement around the curve has insignificantly widened corridor of the movement. But the vehicle with the semitrailer moves in the other (wider) corridor than the vehicle without the semitrailer – Figure 2.

During driving round the curves, the wheels of the semitrailer move along quite another track than the wheels of the truck tractor – Figure 3. In this situation at night (without the street lighting) the driver has the unilluminated area, which the wheels of semitrailer run on. Although the driver can look at the mirrors, he cannot see the side of his vehicle; where and what the wheels of the semitrailer run over [3]. The tractor and semitrailer are not equipped with the lamps which could light up the area which their wheels run over during driving round the curve.

Minimum two typical cases of this situation can be isolated.

1. The driving of the group of the vehicles for example: on the crossing and turning right or left.
2. Avoiding pedestrians or cyclists who move on the road at night and are not illuminated. Additionally at night in the darkness the driver cannot see the side of the semitrailer.

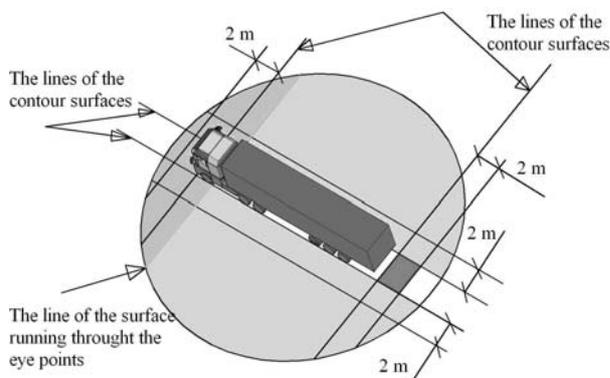


Fig. 1. Extensibility and spacing of the areas around the vehicle which should be seen by the driver

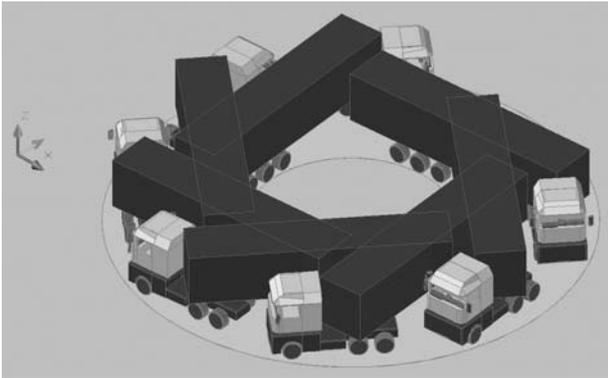


Fig. 2. The tracks of the tractor wheels' movement and those of the semitrailer running around the curve

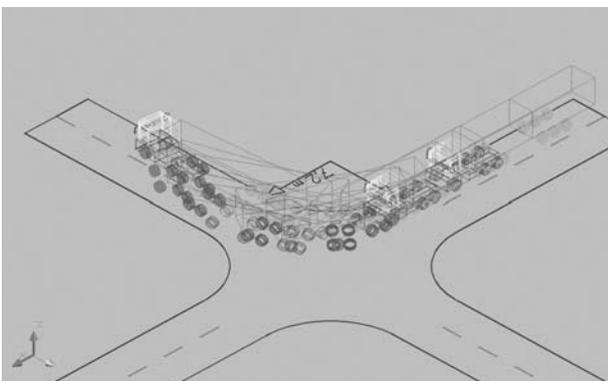


Fig. 3. The movement tracks of the vehicle with semitrailer during turning at the crossing

In the first case, the driver „feeling his way” drives the tractor on around such a curve as to avoid wheels overrunning the kerb or other obstacles. In the second case the situation is similar, but on the narrow road the vehicle coming from the opposite side forces the driver of the group of the vehicles, to return earlier on to his traffic lane. This can cause the collision of his semitrailer with the pedestrian or cyclist who is in the unilluminated area.

The driver is not able to observe the relative position of his vehicle against pedestrian or cyclist.

In such a situation, the unilluminated area, in which the collision took place, does not give the driver any information about the accident.

He drives away from the place of the accident, unaware that he should give help.

To avoid such a situation, the experiment to select and add the additional lighting of the semitrailer was conducted:

- this additional lighting should show the driver where the contour of the vehicle is – the additional white contour lights,
- the headlamps mounted on the sides of the semitrailer to light the road which the wheels of the semitrailer run on, when the group of the vehicles is moving round the curve.

The fulfilment of these assumptions contradicts the rules of Regulation 48 ECE UN, which are currently in force, regarding this matter, in Europe. The authors of these rules did not take into account the need of more lighting of these areas to enable the driver to watch the road there and see what his vehicle runs over on it.

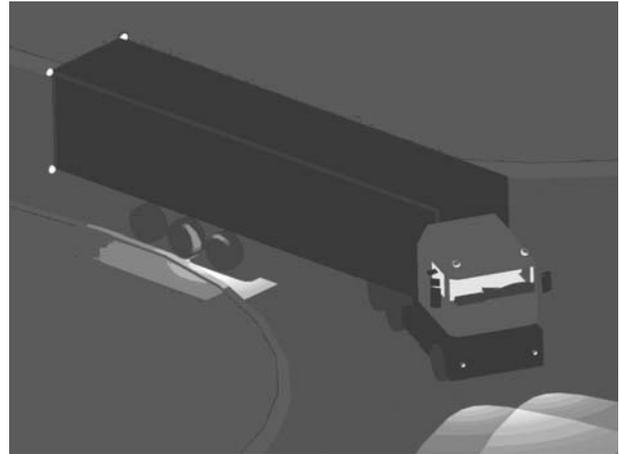


Fig. 4. The view of semitrailer and the placement of the additional lights

In the experiment conducted, the additional white contour lights were used. They were placed at the end of semitrailer, at upper and lower parts. Additionally, the white light was mounted, directed downwards at the road. One lamp being placed on either side of the semitrailer around wheel arches, Figure 4.

Functionally, the additional lamps illuminating the road around the wheels of the semitrailer are connected with the position lights. They are switched on when the position lights are also on. Similarly, the additional contour lights are connected. Photo Figure 5 shows the effect of the additional semitrailer side lighting, on the right hand side, around the wheels.

Additionally, the view of this situation in the darkness is shown, when photos were illuminated by the flash light. When the same area is not lit up by the additional lamp of the vehicle, the driver is not able to observe it in the darkness, during the manoeuvre and to avoid, for example, a pedestrian.

In the light of the gained experiences, actual state of the knowledge, technical progress and the development of the devices for indirect visibility and lighting, it is possible to assist the driver of the group of the vehicles to receive the information from the hitherto invisible areas. In the future, it may be necessary to extend some requirements, concerning the vehicles equipment with regards above mentioned issue.



Fig. 5. The photo of the man on the road side, shown in the additional lights of the semitrailer and the view of the same area in the lighting of the flash light

### 3. Conclusion and recommendations

The aim of these considerations was to obtain the answers to the questions:

- is the need to introduce the additional lighting, justifiable?
- what should it be like
- should this lighting be nonobligatory or obligatory,
- should it be constantly on or only when it is necessary,
- is it necessary to attempt to change the regulations in this field.

The additional lighting in the above mentioned situations is necessary.

To remedy the above mentioned flaw, it is necessary to act for the benefit of the safety system improvement and introduce the additional lighting of the vehicle. It will enable the increase of the areas around the vehicle, which driver should have possibility to observe.

The research programme is being prepared to evaluate this solution in the normal road conditions and to obtain answers to the questions asked.

Problems indicated, allow to understand the scale of the projects with the objective of road traffic safety system improvement. Significant part of these projects may provide measurable effects – decrease of dangers to the population and of serious accidents indicators.

### 4. References

- [1] Olejnik K.: *Operating problems of buses and trucks – safe reversing*. Journal of 17<sup>th</sup> European Maintenance Congress, 11<sup>th</sup>– 13<sup>th</sup> of May 2004 Barcelona – Spain, 343–348.
- [2] Olejnik K.: *Critical analysis of the current traffic regulations concerning visibility from the position of a vehicle driver*. Quarterly Motor Transport 2/2003 distributed by Motor Transport Institute, Warsaw, Poland, 69–80.
- [3] Regulation no. 46 ECE UN. Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices.
- [4] Regulation no. 48 ECE UN. Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signalling devices.

---

**Dr inż. Krzysztof OLEJNIK**

Instytut Transportu Samochodowego  
ul. Jagiellońska 80  
03-301 Warszawa, Poland  
tel. (+48 22) 811-32-31 w. 303  
e-mail: krzysztof.olejnik@its.waw.pl

---