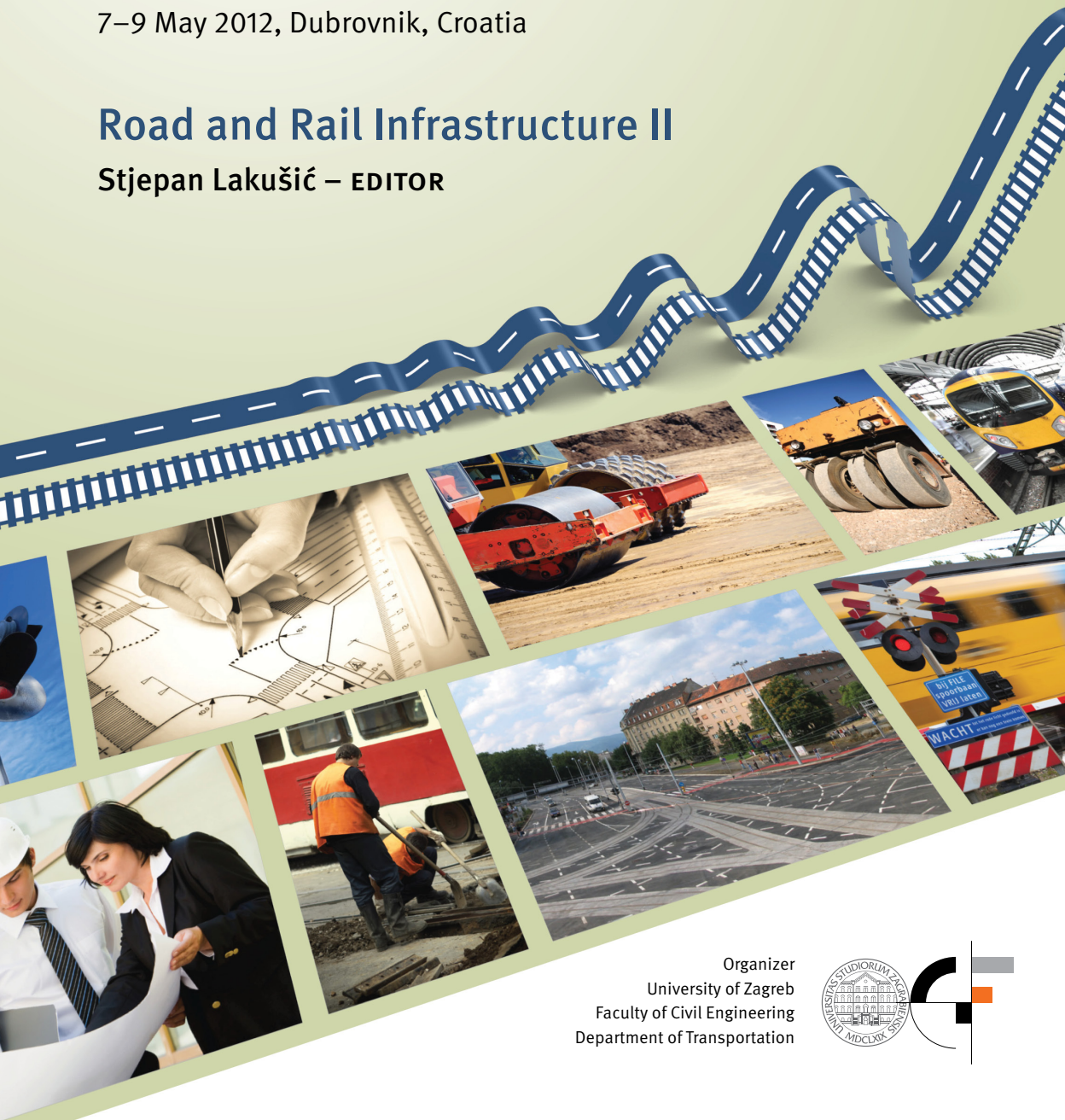
CETRA 2012

2nd International Conference on Road and Rail Infrastructure
7–9 May 2012, Dubrovnik, Croatia

Road and Rail Infrastructure II

Stjepan Lakušić – EDITOR



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ANTI–SLIP RUBBER BASE FOR PEDESTRIAN CROSSINGS

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Abstract

On the HŽ–Infrastructure network there are 242 stations, 338 train stops, or a total of over 600 pedestrian communications for the movement of passengers and railway staff. If we add this 71 pedestrian crossing on the open line – we get the total number of spaces for movement and pedestrians crossing the tracks.
The footpath in the track is mainly performed as a wooden construction of railway sleepers. Such a surface is already slippery from the impregnation of sleepers, but under the influence of rain, snow and ice also very dangerous for pedestrians.
In order to ensure the safe movement of pedestrians across the track and extend the lifespan of wooden construction of railway sleepers – in this paper is proposed simple and inexpensive solution of 'rubbed' of new or already used pedestrian communications with a special rubber elements attached to the upper surface of the wooden structure.

Keywords: pedestrian cross–communications, railway track, anti–slip modular elements, rubberized

1 Introduction

Places for movement pedestrian over the railway track in the same level are called pedestrian crossings. In the railway station those are pedestrian cross–communications for the movement of passengers and railway staff. They connect station building with the railway tracks and platforms for the reception of travelers, so they are equally in use from railway workers and passengers. On the open line there are singly pedestrian crossings, or connected with a railway–crossing.
The footpath in the track is mainly performed as a wooden construction of railway sleepers. Such a surface is already slippery from the impregnation of sleepers, but under the influence of rain, snow and ice also very dangerous for pedestrians. Since the movement of pedestrians on the station tracks is only possible over such wooden structures it is inevitably that a lot of falls with mild or severe injuries of railway staff and passengers happens in railway traffic. Therefore it is necessary to upgrade an existing solution so the movement of pedestrians across the track is safer, and the wooden construction more durable.

2 Improvement proposal

On the HŽ–Infrastructure network there are 242 stations, 338 train stops and 71 pedestrian crossings on the open line. Because several of them are in every station, in total there are over 1000 pedestrian communications for the movement of passengers and railway staff. Almost all were made as wooden construction of railway sleepers.
Current legislation in this area is very poor. 'HŽ–Rulebook for permanent way track maintenance' (Rulebook 314, article 26. paragraph 2.) referred only to wooden construction of railway

sleepers with the prescribed statutory breadth and depth of groove for passage of railway vehicle wheel rim.
In order to ensure the safe movement of pedestrians across the track and extend the lifespan of wooden construction of railway sleepers – in this paper is proposed solution of 'rubberized' of new or used pedestrian communications with a special modular rubber elements attached to the upper surface of the wooden structure.

3 Technical solution of improvement

As a technical solution 'rubberized' the existing wooden construction it is proposed creating modular rubber–metal anti–slip elements that are tightened with screws to the existing structure. So fixed they are a compact solution to the problem of extremely slippery trampling surfaces of pedestrian communications.
In geometric terms anti–slip modular elements on its upper surface are striated in a manner that provides increased adhesion tread surface. Area between the grooves is covered with micro–roughness which further increases the friction of tread surface. Hardness of the rubber body is chosen in the range 55–65 ShA (Shore A), which enhances the feeling when using 'rubberized' pedestrian cross–communication.

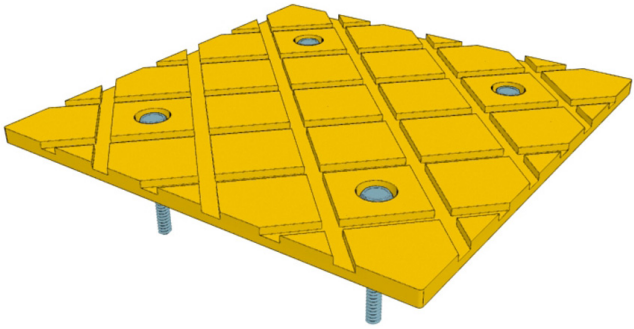

Figure 1 Anti–slip element

Single anti–slip modular element is very small (26×26 cm) what we consider the advantage of the larger elements, since in case of mechanical or other damage, one can be replaced very easily and without major cost.
During manufacturing (vulcanization) of elements in their body are built–in four steel rings for receiving bolts for attach to the substrate, which creates a virtually unbreakable bond between the metal inserts and rubber body of anti–slip element, which results in extremely high durability. Additionally, steel rings are galvanized which leads to high resistance to corrosion. Rubber body of elements should be made of Chloroprene rubber due to its extremely compliant properties.

3.1 CR – Chloroprene rubber – features and benefits

Among the large number of specialized elastomers – CR chloroprene rubber occupies an important place in world rubber consumption with the annual needs of around 300,000 t worldwide. CR was first produced 1932nd in DuPont company (responsible for the invention of Kevlar), and since then CR, widely known as Neoprene®, thanks to combination of very good technical characteristics, ranks high in world practice.

CR by its characteristics does not belong at the top among elastomers because CR is not characterized by one outstanding property, but its balance combination of properties is unique among the synthetic elastomers. It has:
· Good mechanical strength
· High ozone and weather resistance
· Good aging resistance
· Low combustibility (one of the rare elastomers with self–extinguishing properties)
· Good resistance toward chemicals
· Moderate oil and fuel resistance
· Excellent adhesion to metals
Because of all these positive characteristics we believe that the chloroprene is ideal choice for use in making anti–slip trampling surfaces of pedestrian communications.

4 Installation of modular anti–slip elements

Installation of modular anti–slip elements is essentially a very simple process that requires no highly skilled labor nor sophisticated or expensive machinery and equipment.
Installation consists of the following five stages:
· Preparation of the existing wooden construction
· Tentative laying of anti–slip elements
· Marking the position of the fixing screws
· Drilling screws holes in the wooden base
· Finally screws fixing

4.1 Preparation of the existing wooden construction

Surface preparation consists mainly from visual inspection of the existing wooden structure, followed by removal any of foreign matter that could interfere with installation. If visual inspection determines that certain elements of wooden structures are so dilapidated that they are not suitable for screw fixing of anti–slip elements, such parts must be replaced with the new or appropriate wooden structure.

4.2 Tentative laying of anti–slip elements

The objective of this phase is to determine the final layout of all elements, to avoid the possibility of overlapping the position of screws for fixing elements with the position of the screw for fixing wooden surface to the railway sleepers. During this phase it is necessary to slightly move anti–slip elements in the direction of the axis of the track until they come to a suitable position.

4.3 Marking the position of the fixing screws

Marking the position of the screws to attach anti–slip elements performed using simple handy tool, and aims to precise positioning of future holes for mounting screws in order schedule anti–slip elements remain exactly as defined in the previous phase.

4.4 Drilling screws holes in the wooden base

Drilling holes appropriate diameter and depth is performed with drill for wood using simple hand–held electric drill. During this operation is necessary to pay attention to the perpendicular of holes in relation to the upper surface of the wooden structure. Allowed a deviation

is up to 10° because construction of the fastening place of anti–slip elements is such to compensate this discrepancy.

4.5 Finally screws fixing

The purpose of this operation is finalizing of installation anti–slip modular elements. For this operation also uses standard electric power drill which is equipped with an adequate key for hexagon head bolts.

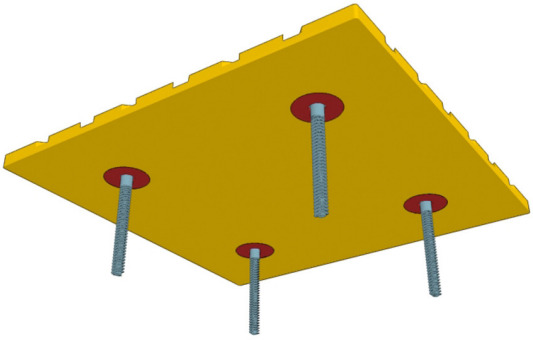

Figure 2 Anti–slip element fixation

5 Conclusion

In order to ensure the safe movement of pedestrians across the track, avoid falls with mild or severe injuries, and extend the lifespan of wooden construction of railway sleepers – in this paper is proposed solution of 'rubberized' of new or used pedestrian communications with a special modular rubber elements attached to the upper surface of the wooden structure.
Based on the above we consider that an acceptable solution is described primarily as an efficient, simple, fast and relatively inexpensive way of solving problems of extreme slippery pedestrian cross–communications made of wood.
Although today there are other solutions to this problem, in conditions of global recession and stagnation of investment, we believe that the proposed solution could be bridge between the current situation and the future, witch certainly belongs to comprehensive, sophisticated and demanding financial–technical solutions.

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