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Category A + C passage in the light of applicable regulations

Abstract: Modern crossing systems made in computer technology, thanks to their modular structure and configuration flexibility, fully meet the requirements set for them. Their implementation is possible on all categories of railroad crossings with safety devices in typical and non-standard configurations. Computer technology makes their operation easy and ensures the highest security standards

Keywords: A category crossing; BUES 2000

Category A rail-road crossings equipped with automatic crossing signaling have been used on the Polish railway network for many years. However, their operation was not specifically enshrined in legal regulations. Only the regulation of the Ministry of Infrastructure and Development of October 20, 2015, item 1744 with its subsequent supplement (Journal of Laws of 2018, item 1876) changed this state and thanks to this, infrastructure managers received clear guidelines for the use of crossing systems operating in the so-called configuration A + C.

At category A level crossings, traffic is managed by authorized employees of the railway manager or railway undertaking who have the required qualifications. Traffic is conducted using hand signals, systems, or crossing devices equipped with barriers closing the entire width of the roadway with an appropriate number of traffic signals and TOP crossing warning discs.

The condition for qualifying a rail-road crossing to category A is meeting the following conditions:

- a) a public road crosses more than 3 tracks,
- b) wagons rolled down or rejected during timing pass or
- c) the conditions specified for category B, C or D are not met, e.g. traffic product.

At category A rail-road crossings, semi-automatic crossing systems are installed, which are manually controlled by an operator. They can be equipped with train approach control systems, operator vigilance control, a safe and quick exchange of information and commands regarding train movement and operational events, and registration of all transmitted information and commands.

To shorten the required minimum closing time of at least 120 seconds to 60 seconds, the post of an employee servicing a rail-road crossing is equipped with, among others, automatic crossing signaling with crossing warning discs, which serve as a warning to the driver about the condition of the crossing devices, regardless of the position of the tollgates. A rail-road crossing equipped in this way is usually called category A+C.

Based on the requirements presented above, the following possible configurations for crossing systems installed on rail-road crossings of category A+C can be distinguished:

- a) semi-automatic crossing system category A without TOP with or without approach information
- b) category A semi-automatic crossing system with TOP with or without approach information

- c) semi-automatic crossing system of category A (with or without TOP) associated with RTC with or without approach information

Information about the approach is made based on data from the station vacancy control sections, and line or axle sensors of the crossing system. If a rail-road crossing is located in a traffic control post or its vicinity (usually at a distance less than or equal to the braking distance on a given railway line), then such a system must be associated with the devices of this control post.

Newly built semi-automatic crossing systems installed on trails or near traffic posts are obligatorily equipped with crossing warning discs.

Thanks to the use of automatic crossing signaling, linkage, and crossing warning discs, traffic safety is much higher than on rail-road crossings not equipped with the above-mentioned elements. This is because based on additional data, it is possible:

- a) indication to the driver with accuracy for the track and direction of information about securing the crossing,
- b) informing the rail-road crossing operator about the appearance of the train in the crossing zone
- c) activating traffic warnings even if the operator fails to do so in advance required for a given location.

In the situation of full efficiency of the crossing system, when the train hits the sensor located in front of the crossing warning shield for a given direction, the Osp-2 signal will be displayed, which means that all barriers have efficient continuity control and their operation was not disturbed in at least the previous cycle. Traffic lights are on and do not report a category one fault, and track-vehicle interaction devices, e.g. axle counters, are on and working properly. The efficiency of the drive-through system also includes information on the risk of fire in the drive-through container. Any defect, defined as dangerous in accordance with the Ie-119 instruction, of one of the listed elements causes the display on the crossing warning disc for a given direction or all the designed TOP signal Osp-1, i.e. "crossing system out of order".

An employee operating the crossing system is informed by the devices of this system about the approaching train by re-activating the acoustic signal at the crossing in the case of full protection of the rail-road crossing or by an alarm signal when the train enters the crossing zone and the crossing has not been secured. In the second case, additionally, all designed TOPs display the Osp-1 signal.

In order to meet unexpected traffic situations at rail-road crossings, the legislator has provided the following special functions:

- emergency closing consisting in the immediate closing of all barriers without pre-warning time and switching on traffic signals and acoustic signals,
- emergency activation of traffic signals and crossing warning shields on the Osp-1 signal, regardless of the location of the tollgates.

An additional security feature is an inability to open the barriers with an ordinary command if there is a train in the approaching zone.

One example of the use of the required functionality is the BUES 2000 computer system manufactured by Scheidt & Bachmann Polska, installed on a category A rail-road crossing at km 44.141 of the railway line No. 353 Poznań Wschód - Skandawa in Gniezno at Gajowa Street.

The system has been designed as category A with additional automatic crossing signaling. It has 4 traffic signals, two entry barriers, and two exit barriers. From the side of the Pierzyska station, it is protected by TOP crossing shields, and from the side of the Gniezno station, it has a full connection in the exit routes. The train is detected by the AZSB300 axle counting system. Due to the connection, the entry gates are locked in the lower position. The

described passage is a stop. The relatively large distance from the entry semaphores forced the designers to use the sensors that disable the crossing system to release the restraint of the crossing for drives from the station side. The crossing system designed in this way meets all the requirements of the applicable legal regulations.

The crossing is serviced from a distance from the auxiliary position of the traffic controller at the signal box with GnA. The employee, based on the data from the TvU, supports the passage from the BUES/ZSB type digital control panel, having all the required commands at his/her disposal:

- closing
- stopping the turnpike movement
- opening
- emergency closing
- emergency opening
- emergency activation of traffic lights
- emergency switching off of traffic lights and sensor commands:
 - activation of sensors in a given track
 - deactivation of sensors in a given track

The screenshot displays the control interface for UZK Gniezno (GnA) 01. The main area shows a grid with track status indicators (Y and I symbols) and sensor numbers (156,052, 158,481, 43,141). The interface is divided into sections for Czerniejewo, Linia 281, Pierzyska, and Linia 353. Below the grid, there are control fields for PB, POL, PK, and PW, along with buttons for 'Potwierdź', 'Wykonaj', and 'Anuluj'. The bottom status bar shows the date and time (Wt 03.03.2021 12:33:25), the user name (UZK Rsp Dyżurny), and the system name (L_GnA).

1. Magnifying view of the setting panel

Source materials

- [1] BUES 2000 Dokumentacja techniczno – ruchowa wersja D, Scheidt & Bachmann Polska styczeń 2021
- [2] Dz. U. 2015 poz. 1744 Rozporządzenie Ministra Infrastruktury i Rozwoju z dnia 20.10.2015r. w sprawie warunków technicznych, jakim powinny odpowiadać skrzyżowania linii kolejowych oraz bocznic kolejowych z drogami i ich usytuowanie
- [3] Dz. U. 2018 poz. 1876 Rozporządzenie Ministra Infrastruktury z dnia 13.09.2018r. w sprawie warunków technicznych, jakim powinny odpowiadać skrzyżowania linii kolejowych oraz bocznic kolejowych z drogami i ich usytuowanie
- [4] Urządzenie zdalnej kontroli BUES/ZSB Dokumentacja techniczno – ruchowa wersja 2.0, Scheidt & Bachmann Polska, styczeń 2020
- [5] Wymagania na systemy zabezpieczenia ruchu na przejazdach kolejowo – drogowych i przejściach Ie-119 PKP PLK S.A 29.01.2019r.