

Requirements for the On-Board Part of the Stop-on-Request System in Rolling Stock

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Summary

The article presents technical and functional assumptions concerning the on-board stop-on-request system, which should be taken into account by railway operators and rolling stock manufacturers when placing this system into operation.

Keywords: railway transport, rolling stock, stop on request

1. Introduction

In December 2019, railway operator Koleje Dolnośląskie S.A., in cooperation with infrastructure manager PKP Polskie Linie Kolejowe S.A., introduced the possibility of stopping trains at the request of passengers at two stops in Nowa Wieś Legnicka and Krzyżowa, on the regional line Legnica – Jaworzyna Śląska – Dzierżoniów Śląski. Over time, the number of stops has increased. Currently, after the timetable revision in March 2022, there are 31 such stops on the entire railway network. Apart from those listed above, they also include Batowice Lubańskie, Bierkowice, Błażkowa, Bolesławice Świdnickie, Czarna Mała, Doboszowice, Gierałów, Gorzelin, Gorzuchów Kłodzki, Górzyniec, Jedlina Górna, Kłodzko Książek, Kłodzko Zagórze, Kopalina, Kulin Kłodzki, Kwieciszowice, Lewin Kłodzki, Minkowice Oławskie, Młyńsko, Nowa Ruda Przedmieście, Nowa Ruda Zdrojowisko, Piechowice Dolne, Solniki Wielkie, Stary Wielisław, Studzianka, Suszka, Uboczne, Unisław Śląski, Wierzchowice and Zabrzeg Czarnolesie.

An exemplary marking of a stop on request is shown in Figure 1. Information on the possibility of stopping the train at the request of a passenger can be found, i.a., on the information board (on the departures board and a separate pictogram), as well as on a separate pole and the stop shelter.

As the stop-on-request system (SO/R) links the areas of railway operation, infrastructure (stops) and rolling stock, it is necessary to assess, among other things, what requirements should be met by the part

of this system scheduled for introduction in passenger railway vehicles intended to cover these stops. Due to the lack of direct regulations concerning this issue, the article aims to define the technical and functional requirements of the system with regard to railway vehicles. For this purpose, the currently available requirements of railway regulations and solutions used in other modes of transport, such as urban bus transport, were applied.



Fig. 1. Example of a stop on request – Krzyżowa [photo by the author]

As the SO/R system is essentially designed for and operated by passengers, its basic guidelines should be the rules applied in the design of the passenger space, taking into account the regulations for persons with

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reduced mobility (PRMs). Such guidelines will not only enable the removal of barriers for PRMs but also contribute to increasing the comfort of public spaces for all users. The legislation addressing the issue of PRMs in railway transport includes standards from the EN 16584, EN 16585 and EN 16586 series, which were referred to in this article. These standards cover such areas of the vehicle as passenger information, seating, standing and moving equipment, clearways, doors, steps and boarding aids, to name a few.

2. On-board stop-on-request system

The SO/R system implemented in a vehicle should be studied, at least, in such areas as:

- devices for passengers activating the SO/R system and their location,
- visual, audible and tactile information available to passengers,
- communication between passengers and on-board staff,
- information received by on-board staff.

3. Devices for passengers

Devices activating the SO/R system should take the form of buttons that are clearly visible and easily accessible to passengers. Such buttons should:

- bear visual and tactile markings indicating their purpose,
- be capable of being activated by the palm of a the hand with a force not greater than 15 N,
- contrast with the surface on which they are mounted.

Examples of buttons and their parts, analysed in the subsequent sections of the article, are provided in Figure 2.

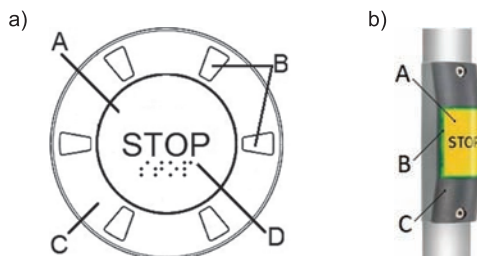


Fig. 2. Examples of buttons and their parts: a) button mounted on flat surfaces, b) button mounted on a handrail, A – part pressed by a passenger, B – lighting, C – casing, D – visual and tactile information; own study based on [2]

The part pressed by the passenger should include visual and tactile information. Visual information

may represent, for example, “STOP”, “O/R” or a drawing of a person getting off the train. In turn, tactile information can take the form of raised or Braille lettering with the same message, etc. Raised lettering must comply with the EN 16584-2 standard [5], with a raised Braille dot size of 0.3 to 0.5 mm above the surface. Figures 2 and 3 illustrate examples of tactile and visual information that can be placed on a button.



Fig. 3. Examples of visual and tactile information on a push button; own study based on [2]

Once the button is pressed by the passenger, i.e. after activating the SO/R system, the button should generate visual and audible signalling. The visual signalling should be carried out by switching on the button’s lighting or changing its colour until the door is unlocked at the stop or the driver switches the SO/R system back to standby, i.e. to the state before the activation of the SO/R system. Audible signalling may take the form of a single, short “beep” sound generated each time the button is pressed. The visual indication of the system’s activation should apply to all SO/R buttons in the vehicle. The colour of the button casing should contrast with the surface on which it is mounted.

In the case of flat buttons (Fig. 2a), the contrasting background should cover a minimum of 20,000 mm² and extend 100 mm above and below the button, separated by 90°. An example of such a surface is depicted in Figure 4.

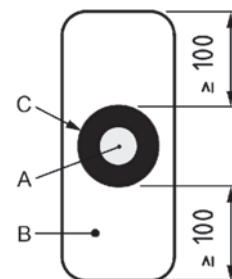


Fig. 4. Example of a solution designed to create contrast between a button and a flat surface: A – pressed part, B – contrasting surface (min. 20,000 mm², min. 100 mm above and below the button), C – casing; own study based on [4]

In the case of buttons mounted on handrails (Fig. 2b), a surface contrasting with the button casing should cover at least 100 mm above and below the button, around the entire handrail. An example of such a solution is presented in Figure 5.

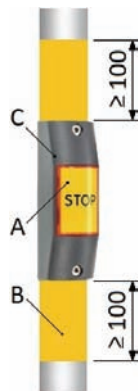


Fig. 5. Example of a solution designed to create contrast between a button and a handrail: A – pressed part, B – contrasting surface (min. 100 mm above and below the button), C – casing; own study based on [2]

Buttons should not be placed in a casing or positioned in a manner that makes them difficult to press using a clenched hand or fist.

Location of buttons

SO/R system buttons should be located in visible and accessible areas of the vehicle. They should be built into the walls at each vehicle exit door. Additionally, at least one button should be mounted on a handrail or similar item in each seating area, which may be separated by an interior or exterior door, a partition (e.g. adjacent to the driver's cab) or an gangway.

Similarly to door controls inside the vehicle, according to EN 16585-3 6, the centre of each button should be positioned at a height of no less than 800 mm and no more than 1,100 mm from the floor. Handrail-mounted buttons should face towards the aisle but in a manner that does not interfere with the free passage area along the vehicle. SO/R system buttons should not be used to open the exit door.

4. Visual, audible and tactile information for passengers

The most common doubt about the structure and operation of the SO/R system is area of information addressed to passengers. Properly designed and implemented information should be in the form of fixed pictograms, visual and audible dynamic information taking into account the current position of the train on the route and permanent tactile signage for people with visual disabilities

Visual information – pictograms

SO/R system buttons located in the vicinity of exit doors should be marked with a pictogram illustrating the purpose of the button or contain the “stop on

request” information – at least in Polish and English. The picture or lettering and the border of the pictogram should be black and contrast with the white background. The pictogram should not be smaller than 70 × 70 mm.

Examples of pictograms representing the purpose of a SO/R system button are shown in Figures 6 and 7. They result from a combination of two symbols from the ISO 7001 standard and a modified version of the markings used by PKP Polskie Linie Kolejowe S.A., which can be found on the timetable of trains departing from a stop on request.



Fig. 6. Example of a pictogram indicating the purpose of a SO/R system button – modified pictograms from the ISO 7001 standard; own study based on [1]



Fig. 7. Example of a pictogram indicating the purpose of a SO/R system button – a modified pictogram used by PKP PLK S.A.; own study based on [3]

Visual information – displays

Internal displays presenting the route and next train stops should display the “O/R” information after the name of the stop listed in the timetable as a “stop on request”.

After the train enters the area of the stop on request, the “O/R” information should be displayed as long as the train is within the area of this stop if the train does not stop there, or until the doors are unlocked if it does. An example of on-board information indicating Krzyżowa as a stop on request is shown in Figure 8.

| | |
|--|----------------------------------|
| Trasa: Świdnica Miasto p. 20:15 - Krzyżowa (N/Ż) p. 20:25 - Mościsk | |
| Następny przystanek: | Krzyżowa (N/Ż) p. 20:25 o. 20:26 |
| Przystanek: | Krzyżowa (N/Ż) p. 20:25 o. 20:26 |
| KD 69205 WROCLAW GLOWNY Miasto p. 20:15 - Krzyżowa (N/Ż) p. 20:25 BIELAWA ZACHODNIA | |

Fig. 8. Examples of information presented on on-board displays [own study]

Audible information

The public address system that provides the passengers with information about the route and the next stop of the train should indicate the stops on request after specifying their names. Such announcement should be made:

- for the first time after the train has departed from the area of the previous stop or station,
- for the second time after the train has arrived at the area of the stop on request,
- for the third time in the platform area of the stop on request.

Tactile information

The pictogram illustrating the SO/R system button, as described in point 2.3.1, should include tactile information in the form of “STOP” or “stop on request” in Braille or raised lettering. Raised lettering must comply with the EN 16584-2 standard [5], with a raised Braille dot size of 0.3 to 0.5 mm above the surface.

5. Visual and audible information received by on-board staff

The on-board staff who immediately and directly receives the passenger-initiated signals generated by the SO/R system should be the driver of the train. Conductor staff must complement the duties of the driver by supervising the correct operation of the system in the passenger areas. The activation of the SO/R system button must generate signals transmitted to the driver, which inform him of the need to stop the train at the next stop.

The driver should receive visual information about the stop-on-request system’s activation. Such information should:

- be displayed on the driver’s desk or in the desk area,
- allow the deactivation of the system by the driver.

The driver should also receive audible information regarding the activation of the stop-on-request system. Such information should:

- be generated in the driver’s cab,
- be at least 6 dB(A) above the cab noise level,
- allow the deactivation of the system by the driver.

6. Conclusion

The analysis of the technical and functional assumptions concerning the stop-on-request system at the rolling stock level and the current legislation allow developing minimum system requirements to be implemented in passenger railway vehicles. The railway operator responsible for the safe and correct work of the system should, amongst other things, install additional buttons in the vehicle, update the dynamic information system with supplementary functions, introduce additional visual and tactile signalling and extend the communication between passengers and the driver.

References

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