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Automatic warning of track maintenance gangs

Système d'alerte automatique des brigades de la voie

Automatisches Warnsystem für im Gleis arbeitende Personen



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Contents

Summary	1
1 - Introduction	2
2 - Operating conditions	3
2.1 - Operating conditions for the complete warning system	3
2.2 - Operating conditions for the detector	4
2.3 - Operating conditions for the announcement transmitter	4
2.4 - Operating conditions for the warning centre (including announcement receiver and warning transmitter)	5
2.5 - Operating conditions for the warning receiver	5
2.6 - Operating conditions for the warning signal generator	5
3 - Safety and reliability requirements	6
3.1 - Safety	6
3.2 - Reliability	6
3.3 - Proof of safety and reliability	6
4 - Technical requirements	7
4.1 - Requirements for the complete warning system	7
4.1.1 - Staff protection	7
4.1.2 - Power supply	7
4.1.3 - Electrical environment	7
4.1.4 - Construction	8
4.2 - Requirements for the detector	8
4.2.1 - Operating principles	8
4.2.2 - General requirements	9
4.3 - Requirements for the announcement transmitter	9
4.3.1 - Principles of operation	9
4.3.2 - General requirements	9
4.3.3 - Technical requirements for the radio system	10
4.3.4 - Technical requirements for the cable	11

4.4 - Requirements for the cables of the announcement transmission line and the warning transmission line	11
4.5 - Requirements for the centre (including the announcement receiver and warning transmitter)	11
4.5.1 - Principles of operation	11
4.5.2 - General requirements	12
4.5.3 - Technical requirements for the radio	12
4.5.4 - Requirements for the cables	13
4.6 - Requirements for the warning receiver with acoustic warning signal	13
4.6.1 - Principles of operation	13
4.6.2 - General requirements	13
4.6.3 - Technical requirements for the radio	13
4.6.4 - Requirements for the cables	13
4.7 - Requirements for the warning receiver with optical warning signals	14
4.7.1 - Principles of operation	14
4.7.2 - General requirements	14
4.7.3 - Requirements for cables	14
4.8 - Requirements for the acoustic warning signal generator.....	14
4.8.1 - General requirements	14
4.8.2 - Acoustic requirements	14
4.9 - Requirements for the optical warning signal generator	15
4.9.1 - General requirements	15
4.9.2 - Requirements for brightness	16
4.10 -Requirements for continuous warning lights (optical installations for continuous warning)	16
4.10.1 - General requirements	16
4.10.2 - Optical requirements	16
5 - Documentation	17
Appendix A - Concepts and definitions.....	18
A.1 - Concepts relating to the functions and components of the automatic track gang warning system	18
A.1.1 - Automatic track gang warning system	18
A.1.2 - Announcement.....	18
A.1.3 - Warning.....	18
A.1.4 - Announcement installation	18
A.1.5 - Warning installation.....	18
A.1.6 - Centre	18
A.1.7 - Centre location	19
A.1.8 - Work site	19

A.1.9 - Detector (or train detector)	19
A.1.10 - Detection point	19
A.1.11 - Warning signal	19
A.1.12 - Failure signal	19
A.1.13 - Continuous warning	19
A.1.14 - Warning signal generator	19
A.1.15 - Continuous warning light (optical equipment for continuous warning)	19
A.1.16 - Warning signal point	20
A.1.17 - Warning zone	20
A.1.18 - Announcement transmission path	20
A.1.19 - Announcement transmitter	20
A.1.20 - Announcement receiver	20
A.1.21 - Warning transmission path	20
A.1.22 - Warning transmitter	20
A.1.23 - Warning receiver	20
A.2 - Concepts related to the safety and reliability of the automatic warning systems.....	21
A.2.1 - Safety of the system	21
A.2.2 - Reliability of the system	21
A.2.3 - Proof of safety	21
A.2.4 - Proof of reliability	22
A.3 - Automatic track gang warning system - Block diagram	23
A.4 - Graphical representation of the warning signal	24
Bibliography	25

Summary

The goal of the leaflet is to specify the requirements for an automatic warning system.

Such a system aims at:

- automatic warning of approaching rail vehicles in adequate time, with a high degree of safety, for staff working on or near tracks,
- reduction of the staff needed for track-gang warning.

The leaflet is based on Report, Part 1, of the ORE¹ A 124 Specialists Committee.

The system consists in an announcement part and a warning part, so designed that each part can operate separately.

The system is specified for operation till 200 km/h.

It is based on a radio transmission in the 160 MHz and 460 MHz frequency ranges.

A system based on the GSM-R frequency range is out of the scope of the present leaflet.

The leaflet is specified in a very detailed way. It includes:

- Operating conditions:
for the complete warning system, detector, announcement transmitter, warning centre - including announcement receiver and warning transmitter, warning receiver, warning signal generator,
- Safety and reliability requirements,
- Technical requirements - including environment and design:
for the complete warning system, detector, announcement transmitter, cables for the announcement transmission line and warning transmission line, centre - including announcement receiver and warning transmitter, warning receiver with acoustic warning signal, warning receiver with optical warning signals, acoustic warning signal generator, optical warning signal generator and continuous warning light.
- Concepts, definitions, block diagram and warning signal are given in Appendix A.

1. ORE became ERRI (European Rail Research Institute) in January 1992.

1 - Introduction

This Leaflet contains the requirements for automatic warning systems for persons working in the dangerous zone on or near tracks. It is based on the specifications relating to "Automatic track gang warning systems" laid down in Report 10, Part 1, of the ORE¹ A 124 Specialists Committee.

The aim of the system is to warn personnel working on or near tracks of approaching rail vehicles in adequate time.

The aim of the automatic warning is to ensure a high degree of safety for staff working on or near tracks and reduce the number of staff needed for track-gang warning.

The system should consist basically of an announcement section and a warning section (see Appendix A.3 - page 23), and be so designed that each of these sections can function separately.

The "announcement" section detects approaching rail vehicles and announces them. The rail vehicles are identified by means of a detector and reported by an announcement transmitter to an announcement receiver via an announcement transmission path which is either wireless or by cable. With cable transmission, some components may not be needed.

The "warning" section warns the endangered personnel after the announcement. A warning transmitter sends the warning signal to one or more warning receivers via a warning transmission path which is either wireless or by cable. The warning receiver(s) then actuate(s) the warning signal generators, which emit the warning signal. With cable transmission, some components may not be needed.

The most important concepts and definitions used in this Leaflet are listed in Appendix A - page 18.

1. ORE became ERRI (European Rail Research Institute) in January 1992.

2 - Operating conditions

2.1 - Operating conditions for the complete warning system

2.1.1 - It should be possible to use the warning system for all work in the track danger zone, on both stationary and moving work sites.

2.1.2 - It should be possible to use the automatic warning system on:

- single track lines with two-way traffic,
- double track lines on which each track can be worked in one or both directions,
- electrified lines operating on direct current from 600 V to 3 kV or on alternating current from 6 kV to 25 kV with 16 2/3 Hz and 50 Hz,
- lines running parallel to electric power supply lines,
- lines with diesel traction and electric train heating,
- lines worker at speeds from 3 to 200 km/h.

2.1.3 - The equipment should be designed on a modular principle so that systems can be provided for the different types of work site and operating conditions (e.g. for lines with one or more tracks, fast-moving, slow-moving and stationary work sites).

2.1.4 - The announcement device of the automatic warning system should be able to indicate approaching rail vehicles by track and direction of travel.

Rail vehicles travelling from a detection point towards the work site should be detected and announced.

Rail vehicles travelling from the work site towards a detection point should not actuate a warning signal.

2.1.5 - The automatic warning system should be capable of emitting automatically two different warning signals:

- warning signal 1 (Wa 1); meaning: withdraw to worked track (used when a rail vehicle is approaching on the track adjacent to the worked track under possession),
- warning signal 2 (Wa 2); meaning: withdraw from all tracks (used when a railway vehicle is approaching on the worked track not under possession and/or on the adjacent track).

In automatic operation, only one of these signals is used. The person responsible for work site safety switches on Wa 1 or Wa 2 depending on the type of work site.

2.1.6 - It should be possible to actuate manually from the centre warning signals Wa 1, Wa 2 or the acoustic danger signal Wa 3 as required (Wa 3 means: maximum danger ! clear all tracks immediately !).

2.1.7 - Warning Wa 3 has priority over Wa 2 and Wa 1.

2.1.8 - Together with the warning signals Wa 1 or Wa 2, a continuous optical warning should be given. The continuous optical warning will be switched off only when the last rail vehicle has left the system's zone of operation.

2.1.9 - The warning signal is given only when the first rail vehicle crosses one of the detection points. The work site remains on alert as long as the continuous optical warning is switched on. Between the arrival of the first rail vehicle at the detection point and the "all clear", it should be possible to store at least four vehicle entries per detection point. The failure warning signal should be actuated if the memory overloads.

It should be ensured that one train is not recorded by the recorder as being several trains and that several trains are not recorded as being one single train.

2.1.10 - In the case of a failure, the prearranged warning signal (Wa 1 or Wa 2) should be used. The optical warning signal should be switched on at the same time. In the event of a failure of one of the power supply sources or of the functional groups, as well as in case of component or transmission breakdown, the failure signal shall be emitted until the person responsible switches off the system manually, after safeguarding the work site by taking appropriate measures.

2.1.11 - The warning zone covered by an automatic warning system should be at least 300 m long.

2.2 - Operating conditions for the detector

2.2.1 - Detectors should reliably detect rail vehicles at speeds of between 3 and 200 km/h. It is also desirable for rail vehicles to be detected at speeds of less than 3 km/h.

2.2.2 - It should be possible to mount the detectors on various rail profiles (see point [4.2.2.6 - page 9](#)).

2.3 - Operating conditions for the announcement transmitter

General conditions:

1. One announcement transmitter for each direction of travel should suffice to serve the number of detection points needed on one two-track line or two single-track lines.
2. The distance (Appendix [A.3 - page 23](#)) between detection point and warning centre should correspond to the minimum warning time. This distance may be up to 4 km long.
3. At the announcement transmitter level, it should be possible to relay information on an approaching rail vehicle not only via the detector but also, if necessary, by a manually-operated equipment or through signalling devices.

2.4 - Operating conditions for the warning centre (including announcement receiver and warning transmitter)

(See Appendix [A.3 - page 23](#)).

After analysing the information, the centre or announcement receiver should actuate the warning, either through directly-connected warning signal generators and/or controlling indirectly one or more warning receivers via a warning transmitter.

It should be possible to use the "warning" section of the warning system on its own. Point [2.1.6 - page 3](#) applies in this case.

The centre should meet the following conditions:

2.4.1 - The track and direction of approaching rail vehicles should be displayed clearly.

2.4.2 - Any failure in the system should lead to the failure signal being actuated and to optical and acoustic signals being issued to the centre. These signals are purely for the information of supervisory staff.

2.4.3 - Cancellation of a failure alarm should only be possible after elimination of the fault or shutdown of the system.

2.4.4 - It should be possible to record all warnings and faults together with the time they occurred.

2.5 - Operating conditions for the warning receiver

It should also be possible to actuate the warning signal generators manually from the warning signal receiver.

2.6 - Operating conditions for the warning signal generator

2.6.1 - It should be possible to issue different warning signals (see points [2.1.5 - page 3](#) and [2.1.6](#)).

2.6.2 - It should be possible to use the warning signal generators freestanding or mounted on track machines.

2.6.3 - The optical warning signal may replace the acoustic one in the dark. Optical warning is given by reducing the work site light intensity.

2.6.4 - The continuous warning described in point [2.1.8 - page 4](#) is given by continuous warning lights (e.g. revolving lights) preceded by a short acoustic (see Appendix [A.4 - page 24](#)) or optical warning. The continuous warning lights should be available in addition to the warning signal generators.