

DIN EN 16704-1:2022-01 (E)

Railway applications - Track - Safety protection on the track during work - Part 1: Railway risks and common principles for protection of fixed and mobile work sites (includes Amendment A1:2021)

Contents		Page
European foreword.....		6
1	Scope	8
2	Normative references	8
3	Terms and definitions	9
4	Common principles.....	18
4.1	General.....	18
4.2	Work done by 3rd party.....	19
5	Principles of risk assessment.....	19
5.1	General.....	19
5.2	Decision about safety measures	20
5.3	Lines with more than one track	21
5.4	Supervision.....	21
5.5	Documentation.....	21
5.6	Consideration of human behaviour	21
5.7	Actualization of risk assessment	22
5.8	Remote controlled equipment of the track.....	22
6	Hierarchy of Safety Measures and parameters for the five railway risks.....	22
6.1	General.....	22
6.2	Risk 1 – Personnel being struck by a train or injured due to wind drag on open working track (safety of the worker).....	23
6.2.1	General.....	23
6.2.2	Blocking	24
6.2.3	Warning	25
6.3	Risk 2 – Personnel being struck by a train or injured due to wind drag from a train on adjacent track (safety of the worker)	26
6.3.1	General.....	26
6.3.2	Blocking	28
6.3.3	Separation.....	29
6.3.4	Warning	30
6.3.5	Additional measures	31
6.3.6	Exceptional circumstances	32
6.4	Risk 3 – Personnel being struck by machine or rail vehicle on blocked track (safety of the worker in the work site)	32
6.4.1	Measures	32
6.4.2	Process on the work site.....	32
6.4.3	Organization.....	33
6.5	Risk 4 – Machines, material or equipment being struck by a train on the adjacent track (safety of the operation/safety of the worker).....	33
6.5.1	General.....	33
6.5.2	Blocking (of the adjacent track).....	34
6.5.3	Separation.....	34
6.5.4	Warning with influence on train circulation).....	35
6.5.5	Additional measures	35

6.6	Risk 5 – Personnel being affected by electric shock/electrocuted (safety of the worker).....	35
6.6.1	General.....	35
6.6.2	Measures for work near fixed electrical equipment.....	35
6.6.3	Disconnection of power	37
6.6.4	Induction.....	37
6.6.5	Working procedures.....	37
6.6.6	Traction returning current in rail	38
6.6.7	Risk by broken overhead line	38
7	Working in tunnels.....	39
7.1	General.....	39
7.2	Safety measures for staff working in tunnels	40
8	Designing infrastructure.....	42
8.1	General.....	42
8.2	Designing new infrastructure	42
8.3	Designing modifications of the infrastructure	42
9	Safety documentation and information.....	43
9.1	General.....	43
9.2	Safety document for planning (safety plan).....	43
9.2.1	General requirements	43
9.2.2	Necessary information for the safety document for planning.....	44
9.3	Safety information for briefing.....	45
9.3.1	General.....	45
9.3.2	Content of safety briefing.....	45
9.3.3	Traceability.....	46
9.4	Access to and egress from the work site.....	46
10	Use of personal protective equipment.....	46
Annex A	(normative) Requirements and conditions to manage safety measures	47
A.1	Blocking.....	47
A.1.1	Conditions/requirements for blocking:	47
A.1.2	Procedure for blocking/de-blocking	47
A.1.2.1	Procedure before starting the work	47
A.1.2.2	Procedure after completion of the work.....	48
A.2	Separation	48
A.2.1	Risk assessment for installation/de-installation of a barrier	48
A.2.2	Specific requirements/conditions for using barriers as a separation	49
A.2.3	Surveillance of workers (without warning, without barrier)	49
A.2.4	Visual demarcation line.....	50
A.3	Warning.....	50
A.3.1	Warning process	50
A.3.2	Hierarchy in warning systems	50
A.3.3	Announcement distance for approaching trains.....	52
A.3.4	Type of signals.....	53
A.3.5	Acoustic planning.....	53

A.3.6 Working with/on (noisy) track working machines:	55
A.3.7 Visual signalling devices	56
A.3.8 Controlling the reaction of workers	56
A.3.9 Specific requirements for LOWS	57
A.3.9.1 General	57
A.3.9.2 Chain of lookouts	57
A.3.9.3 Transmission of the warning by radio	57
A.4 Additional measures	58
Annex B (normative) Parameters in risk assessment	59
Annex C (informative) Matrix of main responsibilities	61
Annex D (informative) Noise levels of machines	66
Annex E (informative) Warning and remembering devices	68
E.1 Collective warning device vs. individual warning device	68
E.2 Combination of acoustic warning and visual signalling devices	68
Annex F (informative) National speed limits for trains approaching work sites	69
Annex G (informative) Functions within the process “warning”	72
Annex H (informative) Model for safety plan on railway risks	74
H.1 General	74
H.2 Safety document for the railway risks 1 to 4	74
H.3 Decision about the safety measures	76
H.3.1 General	76
H.3.2 Decision about the safety measure for the working track (risk 1 and 3)	76
H.3.2.1 Stopping distances machines	76
H.3.2.2 Blocking (hierarchy step 1)	76
H.3.2.3 Warning	77
H.3.3 Decision about the safety measure for the adjacent track (risk 2 and 4)	78
H.3.3.1 Blocking (hierarchy step 1)	78
H.3.3.2 Separation by technical measures	79
H.3.3.3 Warning	79
H.3.3.4 Surveillance of workers without warning	80
H.3.4 Safety measures for access	80
H.3.5 Train circulation, track distance, dangerous zone	80
H.4 Planning of the safety measures	81
H.5 Handing out of the safety document and instructions on the site	83
H.5.1 General	83
H.5.2 Safety supervision	83
H.5.3 Safety execution	83

H.5.4 Contractor / sub-contractor(s)	83
Annex I (informative) Guideline for the decision of blocking the working track in relation to the use of portable equipment	85
Annex J (informative) Process and documentation about disconnection of fixed electrical equipment	87
J.1 Process of the decision about disconnection of fixed electrical equipment	87
J.2 Minimum contents for the documentation of the decision about disconnection of fixed electrical equipment	87
J.2.1 Information by the contractor	87
J.2.2 Nominated person in control of the electrical equipment	88
J.2.3 Documentation of the decision about the disconnection	89
J.3 Documentation of disconnection/reconnection of power for work near fixed electrical equipment	89
J.3.1 General	89
J.3.2 Instructions for the routeing of the document	89
J.3.3 Notice of working cessation	90
Annex K (informative) Examples for the possibility of intruding into the vicinity zone of the fixed electrical equipment	92
Annex L (informative) Key aspects of relevant EU Directives	93
L.1 Directive 89/391/EEC	93
L.2 Directive 2004/49/EEC	93
L.3 Directive 92/57/EEC	93
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of Directive (EU) 2016/797/EC aimed to be covered	94
Bibliography	96