

ANNEXES

to

COMMISSION DELEGATED REGULATION (EU) .../...

**supplementing Directive (EU) 2016/798 of the European Parliament and of the Council
by establishing common safety methods for assessing the safety level and the safety
performance of railway operators at national and Union level and amending
Commission Decision 2009/460/EC**

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ANNEX I

REPORTING OF OCCURRENCES

1. REPORTING DATASETS

1.1. Initial/complete notification of accidents

Data items	Applicable parameter/values
<i>Initial notification</i>	
Reporting reason	<i>Legal obligation or voluntary reporting</i>
Type of operation performed	Operation code
Occurrence type	Event type code <i>Reported type will belong to accidents as per Table 31 of Annex IV</i> Dangerous Goods occurrence in accordance with applicable legislation <i>(Yes/No) If Yes, the report must be completed in accordance with applicable 'Transport of Dangerous Goods' legislation</i>
Occurrence location	Geographical coordinates <i>Latitude and longitude under norm WGS 84</i>
Date and time of occurrence	dd.mm.yyyy hh:mm:ss <i>At occurrence location</i>
Involved train or vehicle(s) (as applicable)	Train number(s) Vehicle number(s)
<i>Complete notification</i>	
Estimation of fatalities, injuries and damages <i>Not applicable to reporting of Direct causes</i>	Fatalities: Total number of persons for the occurrence Serious injuries: Total number of persons for the occurrence Light injuries: Total number of persons for the occurrence Damages: Estimated total in euros for the reported occurrence Damages: Total in euros for the reporting entity

	<i>For notification those elements must be considered as first estimations</i>
Deemed direct cause(s) of the reported occurrence	Event type code <i>Reported type will belong to the list of direct causes as per Table 32 of Annex IV.</i>

Table 1 - Initial/complete notification of accidents

1.2. Final report on accidents

The final report of accidents must contain the occurrence context, consequences and scenario as provided for in this section, including any new risk control measures adopted.

Table 2 – Occurrence context

Data items	Applicable parameter/values
Location details	In tunnel (<i>Yes/No</i>) On a bridge (<i>Yes/No</i>) At a level crossing (<i>Yes/No</i>) - If Yes, Level crossing type
Operation – Speed of train, vehicle or cargo as applicable	<i>For each involved train, vehicle or cargo at the moment of the reported impact</i> Train number Train speed (<i>km/h</i>) Vehicle number Vehicle speed (<i>km/h</i>) Cargo number Cargo speed (<i>km/h</i>) <i>Speed = 0 if stationary</i>
Meteo <i>Weather</i>	Air temperature (<i>In °C</i>) Ambient conditions: – Dry – Clear – Fog, mist, smog – Rain – Snow – Sleet, hail – High winds

	<ul style="list-style-type: none"> – Storm – Lightnings – Unknown <p>Track surface conditions:</p> <ul style="list-style-type: none"> – Dry – Slippery – Leaves – Snow – Slush – Frost – Ice – Wet/damp – Flooded – Unknown
Light conditions	<ul style="list-style-type: none"> Daylight Twilight Sunrise Sunset Darkness Light lit Light unlit

Table 3 – Occurrence consequences

Data items	Applicable parameter/values
Human consequences	<p>Total number of persons in each category of railway users (<i>passenger, employee, trespasser, level-crossing user, other</i>) and consequences:</p> <ul style="list-style-type: none"> – Death – Serious injury – Minor injury – (Optional) Reporting according to AIS <ul style="list-style-type: none"> – Serious injury (AIS ≥ 3) – Light injury (AIS < 3)

<p>Human consequences due to dangerous goods' substances</p> <p><i>If applicable</i></p>	<p>Total number of persons in each category of railway users (<i>passenger, employee, trespasser, level-crossing user, other</i>), causes (<i>traumatic, intoxicated, burned, radiation</i>), and consequences:</p> <ul style="list-style-type: none"> – Death – Serious injury – Minor injury – (Optional) Reporting according to AIS <ul style="list-style-type: none"> – Serious injury (AIS ≥ 3) – Light injury (AIS < 3)
<p>Damage to the environment (natural or built)</p>	<p>Air pollution Water pollution Soil pollution</p> <p><i>For all above estimated volume of pollutant released</i></p> <p>Estimated cost of depollution (if applicable) (<i>in EUR</i>) Damage to built surroundings (<i>in EUR</i>)</p>
<p>Damage to the rolling stock</p>	<p>EVN</p> <p>Total number of damaged vehicles:</p> <ul style="list-style-type: none"> – Coaches – Wagons – Traction vehicles – Special vehicles <hr/> <p>EVN</p> <p>Total number of overturned vehicles:</p> <ul style="list-style-type: none"> – Coaches – Wagons – Traction vehicles – Special vehicles <hr/> <p>Total cost of damage (<i>in EUR</i>)</p>

	<p>EVN</p> <p>Total number of wagons leaking</p> <p><i>Only applicable in case of TDG wagons</i></p>
Damage to the railway infrastructure	<p>Total length of track damaged (<i>m</i>)</p> <p>Length of track (rails) damaged (<i>m</i>)</p> <p>Length of track substructure damaged (<i>m</i>)</p> <p>Length of track superstructure damaged (<i>m</i>)</p> <p>Number of (switches, points) damaged</p> <p>Total cost of damage (<i>in EUR</i>)</p>
Damage to operating services	<p>Delayed passenger trains</p> <ul style="list-style-type: none"> – Number of trains – Minutes <p>Delayed freight trains</p> <ul style="list-style-type: none"> – Number of trains – Minutes <p>Estimated cost of operation disruption (<i>in EUR</i>)</p> <ul style="list-style-type: none"> – Passenger service – Freight service – TDG service – Terminal service

1.3. Reporting of incidents

Data items	Applicable parameter/values
Type of operation performed	Operation code
Occurrence type	<p>Event type code</p> <p><i>Reported type will belong to direct causes as per Table 32 of Annex IV.</i></p> <p>Dangerous Goods occurrence in accordance with applicable legislation</p> <p><i>(Yes/No) If Yes, the report must be completed in accordance with applicable 'Transport of Dangerous Goods' legislation</i></p>

Occurrence location	Geographical coordinates <i>Latitude and longitude under norm WGS 84</i>
Date and time of occurrence	dd.mm.yyyy hh:mm:ss <i>At occurrence location</i>
Involved train or vehicle(s) (as applicable)	Train number(s) Vehicle number(s)
Estimation of damages	Damages: Estimated total in euros for the reported occurrence Damages: Total in euros for the reporting entity
Deemed cause(s) of the reported occurrence	<i>Reported type will belong to indirect causes as per Annex IV Table 33 of Annex IV.</i>
New risk control measures (if any)	<i>Any new risk control measure should be reported as per Annex III Table 8.</i>

Table 4 - Reporting of incidents

2. REPORTING OF OCCURRENCE SCENARIOS

2.1. Generalities

When reporting an occurrence scenario, reporters must follow the following rules:

- (1) An occurrence scenario must be described with of one or more building blocks. A building block is a *contextually meaningful* combination of casual factors which provides a unique output. If a series of casual factors has been identified with high certainty, these will be grouped through a *logical AND*; in the case where there are doubts on the involvement of certain casual factors, they must be reported as such and must be grouped through a *logical OR*, in accordance with Figure 1.

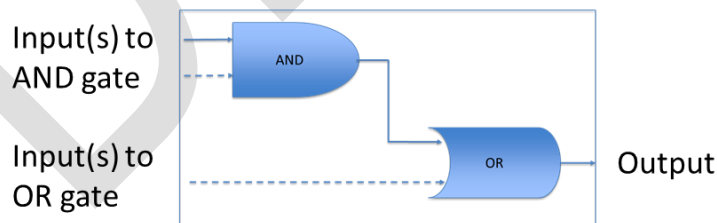


Figure 1 – Building block

- (2) The links between each building block composing the reported occurrence scenario must be reported either as *matching event* where the outcome of one building block is an event to be used as the input to another event; or as *neutral link* when different building blocks are used to codify more complex relationships than the ones allowed by a single building block, in accordance with Figures 2 and 3.

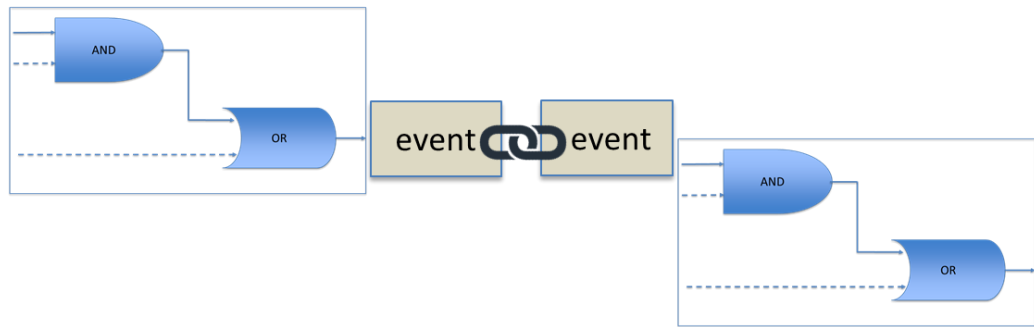


Figure 2 – Matching event

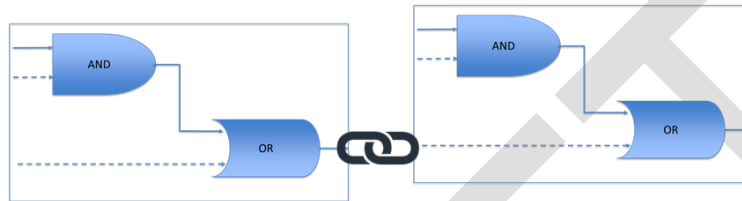


Figure 3 – Neutral link

- (3) A building block can be linked to one or several other building blocks.
- (4) A given event type can be used in one or several building blocks.

2.2. Dataset for reporting an occurrence scenario

Occurrence scenarios will contain the list the *building blocks datasets* composing the scenario plus *failed risk control measures datasets* for each reported building block, as applicable.

Table 5 – Building blocks dataset

Data items	Applicable parameter/values
Inputs to the <i>AND</i> gate	<i>As per Annex IV Table 32 and Table 33 and linked building blocks if any</i>
Inputs to the <i>OR</i> gate	<i>As per Annex IV Table 32 and Table 33 and linked building blocks if any</i>
Output event type	<i>As per Annex IV Table 31, Table 32 and Table 33 and linked building blocks if any</i>
List of contributing and systemic factors	<i>As per Annex IV Table 34 and Table 35</i>

When reporting the failure of a risk control measure, the position of that risk control measure in the corresponding building block should be indicated, in accordance with Figure 4.

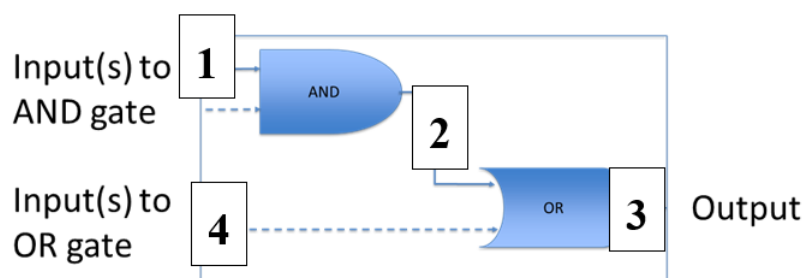


Figure 4 – Positions in a building block

Table 6 – Failed risk control measures dataset

Data items	Applicable parameter/values
Building block	
Position in the building block	
Causal factor of the RCM failure (if applicable)	Event types as per Annex IV
Failure mode	<i>Free text on how the risk control measure failed</i>
Failure analysis	<i>Free text on why the risk control measure failed</i>
List of contributing and systemic factors	<i>As per Annex IV Table 34 and Table 35</i>

ANNEX II

1. ERA REPORTING

1.1. Preliminary analysis

The contents of the preliminary analysis (Article 3(5)) must contain the following:

- (1) Reference;
- (2) Date;
- (3) Issue short description (title);
- (4) Scope;
- (5) Issue description;
- (6) Recommendations (optional).

When transmitting the information in the first subparagraph to the Group of Analyst, any information already in the ISS must be just referenced.

1.2. Full analysis

The contents of the full analysis (Article 3(5)) must contain the following:

- (1) Reference;
- (2) Date;
- (3) Short description (title);
- (4) Introduction:
 - (a) Background;
 - (b) Risk to be tackled;
 - (c) Current safety measures taken;
 - (d) (Optional) Occurrences linked to the report.
- (5) Outcome:
 - (a) Summary;
 - (b) Findings (*Including the suspected and/or proven causes*);
 - (c) Scope;
 - (d) Risk control measures;
 - (e) Identification of possible affected assets;
 - (f) Risk control measures;
 - (g) Proposed changes to legislation and standards;
 - (h) Impact assessment;
 - (i) Related ongoing work and research needs.

2. ALERT REPORTING

Table 7 – Dataset for alert reporting

Data items	Applicable parameter/values
<i>Record</i>	
Date	
Alert title	
Alert general description (optional)	
Concerned occurrence (if applicable)	<i>Reference of the relevant complete notification(s)</i>
<i>Functional alert (if appropriate)</i>	
Concerned railway subsystem	
Concerned function	<i>Including interoperability constituents and/or critical components</i>
Functional issue description	
Performance issue description	
<i>Product alert (if appropriate)</i>	
Concerned product	
Commercial name	
Serial number	
Product type certificate	
Product certificate	
Product applied standards	
Product functional issue description	
Product performance issue description	

ANNEX III

SELF-ESTIMATION OF SAFETY PERFORMANCE

1. PROCESS FOR SELF-ESTIMATION OF SAFETY PERFORMANCE

Pursuant to Article 11(1), the railway operator must self-estimate its maturity level using the self-estimation tables provided in point 2 of this Annex for each of the following risk management area:

- (a) Area P: Planning of risk control measures;
- (b) Area D: Setting up and operating of risk control measures;
- (c) Area C: Monitoring of risk control measures;
- (d) Area A: Reviewing and adjusting of risk control measures.

For each area referred to in points (a) to (d), the railway operator must report the level for which it is able to provide immediately the supporting evidence corresponding to all the elements of proof corresponding to that level and the levels below the one achieved.

2. COLLECTION OF DATA AND INFORMATION FOR SELF-ESTIMATION OF SAFETY PERFORMANCE

2.1. Applicable datasets

2.1.1. Dataset for reporting self-estimation and supporting evidence

The dataset for reporting self-estimation and supporting evidence must contain the risk control measures reported as supporting evidence for relevant elements.

Self-estimation of levels and the determination of the relevant evidence to be reported must be based on: point 3.2.1 for Area P, point 3.2.2 for Area D, point 3.2.3 for Area C, and point 3.2.4 for Area A.

For each area, the railways operator must report the self-estimated level for the area between one and five and the supporting evidence. The reporting of the supporting evidence must consist of a reference to and the version and date of the evidence.

2.1.2. Dataset for reporting risk control measures

1. General information	
RCM name	
General description of aims and expected functioning	Type of RCM: <ul style="list-style-type: none">- reduction of the frequency of occurrence,- reduction of occurrence severity, or- both reduction of the frequency and severity of occurrence. Aim of the risk control measure (narrative)

	<p><i>In accordance with Table 33, the applicable codes and a summary description of the applicable functions</i></p> <p>Per applicable function</p> <ul style="list-style-type: none"> • Code of applicable functions • Name • Short description • Technical documentation (optional) <p><i>Reporters must describe the applicable functions. Optionally, a more detailed description of the subsystems containing the different functions can be provided using a reference to technical documentation.</i></p> <p>Other technical documentation reference (optional)</p>
2. Possible resulting events	
Normal functioning (prevented or mitigated resulting occurrences)	References of each possible resulting occurrence type <i>If not referenced yet: name, definition and category of the occurrence</i>
New threats introduced by the RCM (if applicable)	References of each possible resulting occurrence type (both in case of normal functioning or in case of failure) <i>If not referenced yet: name, definition and category of the occurrence</i>
3. Expected effectiveness	
Expected effectiveness ratio	Expected number of successful RCM interventions per number of RCM triggering
4. Management of Risk Control Measures	
Provision	<i>Description how provision is realized</i>
Risk analysis	<i>References of relevant risk assessments in the Safety Management System</i>
Measuring/Monitoring	<i>Leading and/or lagging indicators</i>
Expected life cycle costs	<i>Disclose by setting-up cost plus operation and maintenance yearly costs.</i>

Table 8 - Reporting a risk control measure

3. SELF-ESTIMATION OF SAFETY PERFORMANCE

3.1. Safety performance maturity levels

The maturity of a railway operator in the different stages of managing risk control measures are expressed in levels. The maturity levels for each of these stages are expressed on a scale ranging from maturity level one to maturity level five.

The performance expected for each maturity level contains a description of the expected performance and reference elements of proof a railway operator needs to provide, as evidence, to demonstrate achieving the corresponding level of maturity.

The provision of equivalent elements of proof justifying the achievement of a level may be accepted but for elements of proof number 9, 14, 18 and 21 which cannot be replaced.

The railway operators must use the tables set out in point 5 to self-estimate its maturity level.

No description will be provided for any *Maturity Level 1* as it is the default level allocated when a railway operator is unable to claim a higher level.

3.2. Per area self-estimation

3.2.1. Self-estimation of the 'Planning risk control measures' (Area P)

The purpose of 'Planning of risk control measures' is to identify the risk control measures that will allow to control the serious risks for safety posed by an organisation's railway operations whether they are carried out by the organisation itself, or by contractors, partners or suppliers under its control.

Table 9 - Description of Maturity level 2

Description of expected performance for maturity level 2 in 'Planning of risk control measures' area
(a) Risk control measures are identified and for safety critical risk control measures the expected performance is indicated to support monitoring
(b) Assumptions and constraints (including Human and Organisational Factors) are considered when identifying the risk scenarios
(c) Interfaces between the involved parties are identified to ensure both effective communication and exchange of expertise for the identification of risk scenarios
(d) Staff are trained in the identification of risks.

Reference elements of proof for level 2

- (a) The hazard record includes all hazards, together with all related risk control measures and system assumptions identified during the risk assessment process. It contains a clear reference to the origin of the hazards and to the selected risk acceptance principles
- (b) Process for risk assessment documented
- (c) Overview of training of staff members with regard to risk assessment
- (d) Process for change management documented
- (e) Overview of assessed risk scenarios (serious risks for safety)
- (f) Risk assessment of operational processes is performed by staff together knowledgeable of risk assessment as well as the assessed operational procedures
- (g) The company deploys staff with knowledge of Human and Organisational Factors concepts that can be mobilized in risk management processes
- (h) Evidence that the change management process systematically involves a risk management process
- (i) The 10 most important risk control measures described in accordance with the part 1 and the part 2 of the applicable dataset in section 2.2 of Appendix B – Part B and limited to the prevented events

Note: For the reference elements (a) to (h), the provision of equivalent elements of proof justifying the achievement of the level may be accepted. Reference element (i) cannot be replaced by another element.

Table 10 - Description of Maturity level 3**Description of expected performance for maturity level 3 in ‘Planning of risk control measures’ area**

- (a) Establishing a standard process, including appropriate tailoring guidelines, that describes the fundamental elements that must be incorporated into the planning of all relevant risk control measures and which contains the following elements:
 - (i) a system definition
 - (ii) the identification and analysis of operational, organisational and technical risks relevant to the type, extent and area of operations carried out by the organisation
 - (iii) the identification of appropriate risk control measures that make the risk(s) of the system acceptable
- (b) Required competencies and roles for performing the ‘planning of risk control measures’ activity are identified as part of the standard process
- (c) Required means (facilities, tools, methods, etc.) for performing the ‘planning of risk control measures’ activity are identified as part of the standard process
- (d) The sequence and interaction between the ‘planning of risk control measures’ activity and the other risk control measures processes in this CSM (resp. ‘setting up and operating of risk control measures’, ‘monitoring of risk control

<p>measures’, ‘reviewing and adjusting of risk control measures’) is determined</p> <p>(e) Risk control measures are planned based upon the standard process, ensuring that:</p> <ul style="list-style-type: none"> (i) personnel planning risk control measures are competent based on appropriate education, training, and experience (ii) required resources, means and information necessary for planning risk control measures are made available, allocated and used
<p>Reference elements of proof for level 3</p>
<ul style="list-style-type: none"> (a) Operator uses acceptance criteria in risk-based decision-making (b) Process for the identification of risks associated with human and organisational factors during the risk assessment process (c) Elements exist that human and organisational factors are taken into consideration in the risk assessment process and the change management process (evidence of application of process – see b) (d) Overview of assessed risk scenario’s concerning all the risks for safety that are identified the railway operator (e) The 10 most important risk control measures described in accordance with the parts 1, 2 and 3 of the applicable dataset in section 2.2 of Appendix B – Part B

Note: For the reference elements (a) to (d), the provision of equivalent elements of proof justifying the achievement of the level may be accepted. Reference element (e) cannot be replaced by another element.

Table 11 - Description of Maturity level 4

<p>Description of expected performance for maturity level 4 in ‘Planning of risk control measures’ area</p>
<ul style="list-style-type: none"> (a) Information needs/ indicators to support the measurement of the correct planning of risk control measures (b) Measurement objectives for the established information needs/indicators are derived (c) Measurement techniques and frequency of measurement, in line with measurement objectives and quantitative objectives for performance of the risk control measures, are identified (d) Control limits are re-established (as necessary) following corrective action
<p>Reference elements of proof for level 4</p>
<ul style="list-style-type: none"> (a) Performance indicators are measured regarding the risk assessment process (b) Periodic review meetings regarding the risk assessment process take place (c) Reviews are undertaken of the expertise present during risk analyses with respect to the topics under analysis (d) The 10 most important risk control measures described in accordance with Annex III point 2.1

Note: For the reference elements (a) to (c), the provision of equivalent elements of proof justifying the achievement of the level may be accepted. Reference element (d) cannot be replaced by another element.

Table 12 - Description of Maturity level 5

Description of expected performance for maturity level 5 in ‘Planning of risk control measures’ area
<ul style="list-style-type: none"> (a) New business visions and goals are analysed to give guidance for new risk control measures objectives and potential areas of change (b) Emergent risks are considered when identifying risk control measures improvement opportunities
Reference elements of proof for level 5
<ul style="list-style-type: none"> (a) The railway operator regularly conducts in-depth reviews of its risk assessment methods and adapts them in function of these findings (b) Human and organisational factors issues are fully integrated in the risk assessment process and the change management process and are continuously reviewed (c) The 20 most important risk control measures described in accordance with Annex III point 2.1.

Note: For the reference elements (a) and (b), the provision of equivalent elements of proof justifying the achievement of the level may be accepted. Reference element (c) cannot be replaced by another element.

3.2.2. *Self-estimation of the ‘Setting up and operating’ of risk control measures (Area D)*

The purpose of ‘Setting up and operating of risk control measures’ is to implement the risk control measures, with demonstration that it fulfils the specified requirements, and to operate and maintain the risk control measures during its entire life cycle.

Table 13 - Description of Maturity level 2

<p>Description of expected performance for maturity level 2 in ‘Setting up and operating of risk control measures’ area</p> <p>(a) Responsibilities and authorities for setting up and operating the risk control measures are assigned and communicated</p> <p>(b) The human and technological means necessary for setting up and operating the risk control measures are made available, allocated and used, this covers:</p> <ul style="list-style-type: none"> (i) the design, manufacturing and set up of risk control measures (ii) the safe integration of the risk control measures (iii) the operation and maintenance of the risk control measures, throughout their lifecycle <p>(c) Information necessary for setting up and operating the risk control measures are made available, allocated and used</p> <p>(d) Communication between the involved parties is assured and is effective</p> <p>(e) Requirements for the documentation of the work products (i.e., supporting tools/techniques, intermediate actions, etc. that must be used and/or produced to set up and operate a risk control measure) are defined. Such requirements may include requirements for (1) distribution, (2) identification of work products and their components (3) traceability</p> <p>(f) The work products are made available through appropriate access mechanisms and documented</p> <p>(g) The performance of the risk control measures to fulfil the identified objectives is achieved as planned (activities, tasks and work products are defined, required resources and information are identified)</p> <p>(h) Responsibilities and authorities for operating the risk control measures are defined</p>
<p>Reference elements of proof for level 2</p> <p>(a) The railway operator informs its staff (and external staff concerned) of the risks and risk control measures relevant for their activities</p> <p>(b) The demonstration is made that the risk control measures in place have an assigned responsible(s) in charge of operating and maintaining them</p> <p>(c) The competence management system ensures staff has the competences needed to implement, operate and maintain risk control measures</p> <p>(d) The operation of risk control measures and expected performance refers clearly to the system assumptions identified during the risk assessment process and contains a clear reference to the origin of the hazards</p> <p>(e) The demonstration is made that records of decisions taken by the railway operator take safety into consideration.</p>

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 14 - Description of Maturity level 3

<p>Description of expected performance for maturity level 3 in ‘Setting up and operating of risk control measures’ area</p>
<p>(a) A standard process, including appropriate tailoring guidelines, is defined that describes the fundamental elements that must be incorporated into the setting up and operating of all relevant risk control measures; this contains:</p> <ul style="list-style-type: none"> (i) the design of risk control measures and their technical, operational and organisational components according to the allocated requirements (ii) the manufacturing and preparation of risk control measures subsystems and components (iii) the assembling and installation of subsystems and components to integrate the risk control measures in the wider railway system (iv) validation of the risk control measures, confirming that it is suitable for the intended specific use (v) acceptance of the risk control measures before entry in service (vi) the operation, maintenance and supporting of the risk control measures such that compliance with requirements is maintained <p>(b) Required competencies and roles for ‘setting up and operating of risk control measures’ are identified as part of the standard process</p> <p>(c) Required means (facilities, tools, methods, etc.) for ‘setting up and operating of risk control measures’ are identified as part of the standard process</p> <p>(d) Risk control measures are set up and operated based upon the standard process; ensuring that:</p> <ul style="list-style-type: none"> (i) personnel setting up and operating risk control measures are competent on the basis of appropriate education, training, and experience (ii) required resources, means and information necessary for setting up and operating risk control measures are made available, allocated and used <p>(e) Appropriate data for understanding the behaviour of, and to demonstrate the suitability and effectiveness of the risk control measures is collected</p> <p>(f) Appropriate data and suitable methods for understanding the behaviour of, and to demonstrate the suitability and effectiveness of the risk control measures is identified</p>
<p>Reference elements of proof for level 3</p>
<ul style="list-style-type: none"> (a) Arrangements exist on managing shared risks and responsibilities (b) A distinction is made between the type of risk control measure: risk control measures that prevent occurrences, risk control measures that reduce the severity of consequences (c) A method exists that considers both the effort as well as the benefits of the risk control measures to be able to prioritize measures based on resource-effectiveness. (Goal: Resources for risk reduction are allocated to maximize the resulting risk reduction)

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 15 - Description of Maturity level 4

Description of expected performance for maturity level 4 in ‘Setting up and operating of risk control measures’ area
<ul style="list-style-type: none"> (a) Measurement results of risk control measures performance are reported to those responsible for monitoring the extent to which qualitative objectives are met defined (b) Analysis and control techniques, appropriate to control the risk control measures performance, are defined and validated against process control objectives (c) Control limits for selected base and derived risk control measures performance are defined
Reference elements of proof for level 4
<ul style="list-style-type: none"> (a) There is evidence to estimate the effects of risk control measures across multiple risks (e.g. risks identified in multiple risk assessments) (b) The method for assessing the resource effectiveness of risk control measures is systematically applied (c) Management systems for different topics (such as safety) are integrated

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 16 - Description of Maturity level 5

Description of expected performance for maturity level 5 in ‘Setting up and operating of risk control measures’ area
<ul style="list-style-type: none"> (a) Quantitative and qualitative process improvement objectives are documented (b) A mechanism is established for implementing accepted risk control measures changes effectively and completely (c) The factors that impact the effectiveness and full deployment of the risk control measures change are identified and managed (d) Risk control measures changes are effectively communicated, and training is provided to all affected parties (e) Records of the change implementation are maintained
Reference elements of proof for level 5
<ul style="list-style-type: none"> (a) Description of the decision making process at strategic level that includes a risk-based approach

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

3.2.3. *Self-estimation of the 'Monitoring' of risk control measures (Area C)*

The purpose of 'Monitoring of risk control measures' is to collect and analyse data relating to the functioning of individual risk control measures in order to make sure they are in place, working correctly and achieving the organisation's objectives and to objectively demonstrate their effectiveness.

Table 17 - Description of Maturity level 2

Description of expected performance for maturity level 2 in 'Monitoring of risk control measures' area
<ul style="list-style-type: none"> (a) Objectives/priorities/needs for the monitoring of risk control measures are identified, taking into account information from areas that give rise to the greatest risks (b) Risk control measures performance is monitored to ensure planned results are achieved (c) Work products are reviewed against the defined requirements in accordance with planned arrangements and issues arising from work product reviews are resolved
Reference elements of proof for level 2
<ul style="list-style-type: none"> (a) The monitoring plan considers the risk control measures in areas that give rise to serious risks and if these measures are not monitored effectively, this could lead to adverse consequences for safety

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 18 - Description of Maturity level 3

Description of expected performance for maturity level 3 in ‘Monitoring of risk control measures’ area
<p>(a) A standard process, including appropriate tailoring guidelines, is defined that describes the fundamental elements that must be incorporated into the monitoring of all relevant risk control measures; this contains:</p> <ul style="list-style-type: none">(i) the collection and analysis of measurement data(ii) an evaluation as to whether risk control measures are correctly implemented <p>(b) Required competencies and roles for ‘monitoring of risk control measures’ are identified as part of the standard process</p> <p>(c) Required means (facilities, tools, methods, etc.) for ‘monitoring of risk control measures’ are identified as part of the standard process</p> <p>(d) Risk control measures are monitored based upon the standard process; ensuring that:</p> <ul style="list-style-type: none">(i) personnel monitoring risk control measures are competent on the basis of appropriate education, training, and experience(ii) required resources, means and information necessary for monitoring risk control measures are made available, allocated and used <p>(e) Conformance of the risk control measures operation with standard requirements is verified</p> <p>(f) Collected data are analysed to understand the behaviour, suitability and effectiveness of the defined risk control measures</p>
Reference elements of proof for level 3
<p>(a) The monitoring plan considers all monitorable and necessary risk control measures. The monitoring plan yields robust and reproducible results</p> <p>(b) The performance of each risk control measures is monitored using pre-defined indicators that give information regarding its effectiveness</p>

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 19 - Description of Maturity level 4

Description of expected performance for maturity level 4 in ‘Monitoring of risk control measures’ area
<p>(a) Required data is collected in an effective and reliable manner</p> <p>(b) Measurement results are created from the collected data within defined frequency</p> <p>(c) Analysis of measurement results is performed within defined frequency</p>

<p>(d) Statistical or similar techniques are used to quantitatively understand risk control measures performance and capability within defined control limits and trends of risk control measures behaviour are identified</p> <p>(e) All situations are recorded when defined control limits are exceeded and each out-of-control case is analysed to identify potential cause(s) of variation</p> <p>(f) Monitoring results are provided to those responsible for taking action</p>
<p>Reference elements of proof for level 4</p>
<p>(a) The railway operator systematically monitors the risk control measures and identifies their weaknesses</p> <p>(b) The management supports a culture in which both positive and negative experiences on the perception of risk levels are openly shared and discussed for learning</p> <p>(c) The majority of important risks are monitored using leading indicators</p> <p>(d) Reporting is available on the coherent and correct application of the risk assessment process and the change management process</p> <p>(e) Best practices stemming from other industries are sought after and incorporated, if relevant</p>

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 20 - Description of Maturity level 5

<p>Description of expected performance for maturity level 5 in ‘Monitoring of risk control measures’ area</p>
<p>(a) Measurement data are analysed and made available</p> <p>(b) Causes of variation in risk control measures performance are identified and classified</p> <p>(c) Measurement data are analysed to determine whether results are due to common or special causes</p> <p>(d) Common causes of variation are analysed to get quantitative understanding of their impact</p> <p>(e) Other feedback is recorded, such as opportunities for further improvement of the standard risk control measures</p> <p>(f) Performance of changed risk control measures are measured and compared with historical data</p> <p>(g) A mechanism is available for documenting and reporting analysis results to management and risk control measures owners</p>
<p>Reference elements of proof for level 5</p>
<p>(a) Where possible, the railway operator has put in place a system for real-time automated data collection and monitoring with regard to monitoring of risk control measures</p>

- (b) The system ensures that the data is available when needed
- (c) The railway operator proactively organizes the sharing of lessons learned on the efficiency or effectiveness of risk control measures with external stakeholders (such as peers)
- (d) Reporting is available on the coherent and systematic application of risk based decision making criteria and decision making process

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

3.2.4. *Self-estimation of the 'Reviewing and adjusting' of risk control measures (Area A)*

The purpose of 'Reviewing and adjusting of risk control measures' is to continually improve the effectiveness and efficiency of the technical, operational and organisational risk control measures and maintaining them aligned with the business need.

Table 21 - Description of Maturity level 2

Description of expected performance for maturity level 2 in 'Reviewing and adjusting of risk control measures' area
<ul style="list-style-type: none"> (a) Objectives/priorities/needs for the adjusting of risk control measures are identified, taking into account information from areas that give rise to the greatest risks - this must lead to: <ul style="list-style-type: none"> (i) the enforcement of correctly implemented risk control measures; or (ii) the improvement of existing risk control measures; or (iii) the identification and implementation of additional risk control measures (b) Risk control measures performance issues are identified (c) Appropriate areas of improvement are identified when planned results and objectives of risk control measures are not achieved (d) Plan(s) are adjusted and rescheduling is performed as necessary, taking into account risk control measures effectiveness
Reference elements of proof for level 2
<ul style="list-style-type: none"> (a) Reports of ad-hoc reviews of risk assessments following the results of the monitoring activities (b) Reports showing that relevant incidents and accidents are taken into account in the review (of risk assessment). (c) The interface between the process(es) for risk assessment and the process(es) decision-making is documented.

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 22 - Description of Maturity level 3

<p>Description of expected performance for maturity level 3 in ‘Reviewing and adjusting of risk control measures’ area</p>
<p>(a) A standard process, including appropriate tailoring guidelines, is defined that describes the fundamental elements that must be incorporated into the adjusting of all relevant risk control measures; this contains:</p> <ul style="list-style-type: none"> (i) the drawing up of an action plan (ii) the implementation of the action plan (iii) the evaluation of the effectiveness of the action plan measures <p>(b) Required competencies and roles for ‘reviewing and adjusting of risk control measures’ are identified as part of the standard process</p> <p>(c) Required means (facilities, tools, methods, etc.) for ‘reviewing and adjusting of risk control measures’ are identified as part of the standard process</p> <p>(d) Risk control measures are reviewed and adjusted based upon the standard process, ensuring that:</p> <ul style="list-style-type: none"> (i) personnel reviewing and adjusting risk control measures are competent based on appropriate education, training, and experience (ii) required resources, means and information necessary for reviewing and adjusting risk control measures are made available, allocated and used <p>(e) Results of the analysis are used to identify where continual improvement of the risk control measures can be made</p>
<p>Reference elements of proof for level 3</p>
<p>(a) Planning of review of risk assessments</p> <p>(b) Records of top level management decisions clearly show the risks involved and the decision whether to accept/mitigate them</p> <p>(c) Learnings from monitoring process are used in the risk analyses. Risk analyses (risk calculations and/or risk identification) are updated in function of the learnings from monitoring</p>

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 23 - Description of Maturity level 4

<p>Description of expected performance for maturity level 4 in ‘Reviewing and adjusting of risk control measures’ area</p>
<p>(a) Results of corrective actions are monitored and evaluated to determine their effectiveness</p>
<p>Reference elements of proof for level 4</p>

- (a) Planning of reviews of risk assessments is risk-based and considers reported accident and incident occurrences rates
- (b) The interface between the monitoring processes and the risk assessment processes guarantees a quick adjustment in the operational processes in case of predictive trends pointing towards a decline in safety performance

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

Table 24 - Description of Maturity level 5

Description of expected performance for maturity level 5 in ‘Reviewing and adjusting of risk control measures’ area
<ul style="list-style-type: none"> (a) Industry best practices are identified and evaluated (b) Feedback on opportunities for improvement is actively sought and improvement opportunities are identified (c) Impact of new risk control measures concepts are identified and evaluated and emergent risks are considered in identifying improvement opportunities (d) Proposed changes to risk control measures are evaluated and prioritised to determine their benefits and expected impact on defined business objectives (e) The factors that impact the effectiveness and full deployment of the risk control measures change are identified and managed (f) Measures that validate the results of risk control measures changes are defined to determine expected effectiveness of the change (g) The implementation plan of risk control measures changes and impact on business goals are discussed and reviewed by the management
Reference elements of proof for level 5
<ul style="list-style-type: none"> (a) The organisation tracks continuously the evolution of its risk profile, which shows continuous improvement (b) The top management takes a proactive role in developing, maintaining and improving the Safety Management System through regular review of internal measures, including staff communication as well as horizon scanning to identify new improvement opportunities (c) The way risks are managed is constantly challenged. The interface between the monitoring processes and the risk assessment processes ensures an improvement initiative in the applied risk management methods (continuous improvement of risk management activities)

Note: The provision of equivalent elements of proof justifying the achievement of the level may be accepted.

ASSESSMENT OF SAFETY PERFORMANCE

1. GENERAL ELEMENTS

The method described in this Annex applies for the assessment of each railway operator.

The safety performance assessments must establish whether the safety performance estimated for a railway operator:

- (a) is stable, has improved or has deteriorated between two consecutive periods;
- (b) is similar, higher or lower than the level of similar railway operators in the assessed period;
- (c) is stable, has improved or has deteriorated compared to the five years prior to the assessed period.

Safety performance indicators of a single railway operator are corresponding to the self-estimations reported by the concerned railway operator, including any possible review.

2. SAFETY PERFORMANCE ASSESSMENT OF RAILWAY OPERATORS

2.1. Methodology for the safety level assessment of operators

The method applies a two-stepped approach. First, separately for assessment 1(a), 1(b) and 1(c), each of the four Safety Performance Areas is assessed. Second, the combined area results are assessed.

The criteria for assessing each area are specified in the table below:

Area assessment result	Assessment 1(a) area test criteria	Assessment 1(b) area test criteria	Assessment 1(c) area test criteria
Lower	Maturity level in assessed period < maturity level in reference period	50% of operators in the group have a higher maturity level in than the operator in the assessed period	Maturity level in assessed period < maturity level mode in reference period
Stable/Average	Maturity level in assessed period = maturity level in reference period	The result of the assessment is neither lower nor higher	Maturity level in assessed period = maturity level mode in reference period
Higher	Maturity level in assessed period > maturity level in reference period	50% of operators in the group have a lower maturity level than the operator in the assessed period	Maturity level in assessed period > maturity level mode in reference period

Table 25 – Area assessment criteria

The following additional rules apply:

- (a) for assessment 1(b): the assessment must be applied separately for each group to which the railway operator belongs in the assessed period;
- (b) for assessment 1(c): in absence of a single maturity level mode in the reference period, the mode must be determined by including the maturity level in the assessed period. If there is still no mode, the highest most frequently reported maturity level will be selected.

The overall assessment must be performed using the combined area results as per the table below. The SP Class is determined by establishing the number of times a certain result has been obtained.

Number of areas results	1	2	3	4
Lower	SP3	SP2	SP1	SP1
Stable/Average	SP3	SP3	SP3	SP3
Higher	SP3	SP4	SP5	SP5

Table 26 - SP Class

The following additional rules apply to determine the final SP Class:

- (a) If SP Class 1, 2, 4, or 5 are noted, the safety performance assessment will never be SP Class 3.
- (b) If SP Class 2 and SP Class 4 are both noted, the safety performance assessment must be both classes.

The SP classes must be interpreted as specified in the following table:

Class	Safety performance self-referenced (1 a and c)	Safety performance versus peers (1 b)
SP1	Strong evidence for deterioration	Strong evidence for lower performance
SP2	Moderate evidence for deterioration	Moderate evidence for lower performance
SP3	No evidence for improvement or deterioration	No evidence for lower or higher performance
SP4	Moderate evidence for improvement	Moderate evidence for higher performance
SP5	Strong evidence for improvement	Strong evidence for higher

		performance
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Table 27 – Safety performance assessment reference criteria

2.2. Aggregation of Operators’ safety performance at national and Union levels

All railway operators that reported operations in a country must be included in the aggregation at national levels.

The aggregation must be performed for three groups as shown in the table below. There must be a weighted and unweighted assessment for each of the three groups. The respective weighting factors are shown in the table below.

Aggregation group	Weighting factor (Volume)
IM	Number of train-kilometres
RU	Number of train-kilometres
Terminal operator	Number of railway vehicles processed in terminals

Table 28 - Aggregation weighting factors

The following formula must be applied to determine the unweighted proportion of railway operators with maturity level i of the total number of operators n per country:

$$Share_i = \frac{\sum Operators_i}{\sum Operators_n}$$

The following formula must be applied to determine the weighted proportion of railway operators with maturity level i of the group total n per country. It does so by taking the sum of the volumes of all railway operators with maturity level i , divided by the sum of the weighting factor for all railway operators within the group:

$$Share_i = \frac{\sum Volume_i}{\sum Volume_n}$$

The same method must be applied to determine the values on the Union level.

ASSESSMENT OF SAFETY LEVELS

1. GENERAL ELEMENTS

The safety level assessments must use Bayesian statistical inference, considering different levels of probability, to establish whether the safety level of a railway operator:

- (a) is stable, has improved or has deteriorated compared to the three-year period prior to the assessed period;
- (b) is similar, higher or lower than the level of similar railway operators in the assessed period.

For (a) and (b) the safety level assessment considers the frequency of occurrences for each type of accident and direct cause (as per the ANNEX III) and the severity of each type of accident.

The assessments must be performed for each type of operation which the railway operator performs.

2. SAFETY LEVEL ASSESSMENT OF RAILWAY OPERATORS

2.1. Allocation of occurrences to involved railway operators

Safety level assessments must be based on the reporting of occurrences.

To reflect correctly the safety levels, occurrences are allocated to operators taking into account the part of the railway system which is reported as cause(s). The following allocation rules apply:

- (a) where only one deemed cause of an occurrence is identified, the occurrence is allocated for the purpose of the safety level estimation to the railway operator involved in the occurrence that is responsible for the part of the system which is deemed to have caused the occurrence;
- (b) where several combined causes of an occurrence are identified, the occurrence is allocated for the purpose of the safety level estimation once to each railway operator involved in a cause;
- (c) where the causes are not identified or there is a disagreement between the involved operators, the occurrence is allocated for the purpose of the safety level estimation to all involved railway operators.

2.2. Methodology for the safety level assessment of operators

2.2.1. Assessment on the frequency of events

The total number of events is denoted as n_a for the assessed period and n_r for the reference period.

The shape parameter values are set as $\alpha = 1$, $\beta = (\log_2(1 - \eta))^{-1}$, where the exposure η is determined by formula

$$\eta = \frac{\text{operational volumes in the assessed period}}{\text{operational volumes in the assessed and reference periods}}$$

The prior $f(p)$ is set by a gamma distribution:

$$f(p) = \frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)} p^{\alpha-1} (1 - p)^{\beta-1}$$

the posterior probability density function is

$$f(p|n_a, n_r) = \frac{P(n_a, n_r|p)f(p)}{Z}$$

The likelihood function is

$$P(n_a, n_r|p) = \binom{n_a + n_r}{n_a} p^{n_a} (1 - p)^{n_r}$$

and the normalizing constant

$$Z = \int_0^1 P(n_a, n_r | p) f(p) dp$$

The posterior probability density function is used to calculate the following probability

$$P(p > \eta | n_a, n_r) = \int_{\eta}^1 f(p | n_a, n_r) dp.$$

Finally, the degree of the change, called the minimal change of frequency (MCF), can be determined by the formula:

$$P(p > \tau(k, \eta) | n_a, n_r) = \int_{\tau(k, \eta)}^1 f(p | n_a, n_r) dp$$

where $\tau(k, \eta) = \frac{k\eta}{1+(k-1)\eta}$ which is valid for any factor $k > 0$.

The probabilities must be assessed using the following table:

Class	$P(p > \eta n_a, n_r)$	Safety level self-referenced (1 a)	Safety level versus peers (1 b)
SL1	90% - 100%	Strong evidence for deterioration	Strong evidence for a lower level
SL2	75% - 90%	Moderate evidence for deterioration	Moderate evidence for a lower level
SL3	25% - 75%	No evidence for improvement or deterioration	No evidence for a lower or higher level
SL4	10% - 25%	Moderate evidence for improvement	Moderate evidence for a higher level
SL5	0% - 10%	Strong evidence for improvement	Strong evidence for a higher level

Table 29 – Safety level assessment reference criteria

The degree of the change (i.e. MCF) must be provided for each assessment where moderate or strong evidence is noted. In case there is strong evidence for a safety level class, the MCF must also be provided for the moderate evidence safety level classes.

2.2.2. Assessment on the severity of accidents

The estimation on the severity of accidents is performed in two steps: First, for each railway operator a *DTS test* must be performed to determine whether there is a significant difference between the severity of the accidents in the reference and assessed period. Second, for those cases where a significant difference was detected

by the DTS test, the bootstrap approach must be used to classify the direction and evaluate the degree of the change.

The severity distributions are denoted as F_a for the assessed period, F_r for the reference period, and F_c for the combined distribution of F_a and F_r ; n stands for the total number of events for F_c .

Step 1

For each event type a DTS test must be performed on the count of fatalities and weighted serious injuries (FWSI).

$$DTS = \int_{x \in R} \left(\frac{|F_a(x) - F_r(x)|}{\sqrt{\frac{2F_c(x)(1 - F_c(x))}{n}}} \right)^p$$

If the *p-value* of the DTS test is greater than or equal to 0.05, no further test must be performed, and it will be concluded that no evidence is found for a change in the severity of accidents for the assessed event type. If the *p-value* is below 0.05 then the next step will be taken.

Step 2

The bootstrap approach must be conducted to estimate the probability that the FWSI median in the assessed period is greater than the FWSI median in the reference period. This involves repeated resampling with replacement from the original data and calculating the difference in medians for each resample.

For each bootstrap iteration, the following three steps are performed:

- (1) Randomly sample n_a observations with replacement from the assessed period. Calculate the median of this resampled data.
- (2) Randomly sample n_r observations with replacement from the reference period. Calculate the median of this resampled data.
- (3) Calculate the difference between the two resampled medians.

Repeating the above steps for a large number of times and collecting the calculated differences provides the bootstrap distribution of the difference in the medians. Subsequently the probabilities can be estimated:

$$P(m_a - m_r > 0 | \text{Data}) = \frac{\text{number of positive differences}}{\text{number of bootstrap iterations}}$$

and

$$P(m_a - m_r > \delta | \text{Data}) = \frac{\text{number of differences greater than } \delta}{\text{number of bootstrap iterations}}$$

where m_a and m_r are medians of FWSI in the assessed and reference periods, respectively, and *Data* stands for the combined dataset from both the assessed and reference periods.

The probability $P(m_a - m_r > 0 | \text{Data})$ must be classified according to the table *Table 29* providing the safety level class. The degree of the change, called the

minimal change of severity (MCS), must be evaluated through the probability $P(m_a - m_r > \delta | \text{Data})$ by employing a root-finding procedure.

The degree of the change (i.e. MCS) must be provided for each assessment where moderate or strong evidence is noted. In case there is strong evidence for a safety level class, the MCS must also be provided for the moderate evidence safety level classes.

2.2.3. Safety level score

For each event type a safety level score must be determined to support the identification of safety-related improvement needs and opportunities. The safety level score equally facilitates the comparison of safety levels between railway operators and countries.

A safety level score must be determined separately for (serious) accidents and direct causes, and for the safety level assessment only for (serious) accidents. In case a railway operator performs multiple types of operations safety level scores must be determined per type of operation.

The safety level score for the assessment on the frequency of events is performed as

$$SLS_{F_{SL\ class}} = MCF_{SL\ class} \times \frac{N_{RP}}{V_{RP}} \times S$$

The safety level score for the assessment on the severity of accidents is performed as

$$SLS_{S_{SL\ class}} = MCS_{SL\ class} \times \frac{N_{RP}}{V_{RP}} \times S$$

With:

- (a) $MCF_{SL\ class}$ – Minimal Change of Frequency for a given credibility level CL [%] derived from the assessment on the frequency of events;
- (b) $MCS_{SL\ class}$ – Minimal Change of Severity for a given credibility level CL [%] derived from the assessment on the severity of accidents;
- (c) N_{RP} – Number of events in Reference Period;
- (d) V_{RP} – Volume of transport of the railway operator in the Reference Period;
- (e) S – Severity factor derived from mean severity (in FWSI) per event, considering all reported events in ISS of the last available three years.

The safety level score must be determined for the safety level classes 1, 2, 4, and 5 as defined in Table 29, providing an overview of safety level scores for each event and sub event type. For SL1 and SL2 the safety level score must be turned into a negative number.

Subsequently, the safety level score per event type is determined by selecting the score that is highest, either (a) the safety level score of the event type or (b) the sum of the safety level score of all related subevents.

The safety level score for the railway operator is set as the highest value after the following calculations:

- (a) the sum of the safety level scores for all event types for frequency (ESF) and severity (ESS) per safety level class;
- (b) the overall safety level score for the operator for frequency (ESF) and severity (ESS) per safety level class (i.e., without calculating safety level

scores per event type). In this situation, *S* is set as the mean severity of all accidents in the reference period.

2.3. Assessment of safety level at national and Union levels

The methodology for the safety level assessment of railway operators must also be applied to each country and to the Union as a whole applying the same methodology described above *mutatis mutandis*.

2.4. Information on the implementation of the safety level assessments

A script that implements the assessments under this Part must be made publicly available by the Agency.

3. REPORTING OF THE VOLUMES OF OPERATION PERFORMED

The reporting of the *volumes of operations performed* must be implemented using the following dataset. One dataset must be reported for each country of operation.

Table 30 - Dataset for reporting the volumes of operation performed

Data items	Applicable value
Country of operation	Country code
Operation of railway lines (including sidings and stations operations)	IMs on the total of the infrastructure managed in the country of operation: <ul style="list-style-type: none"> - Number of passenger train-kilometers - Number of freight train-kilometers - Number of freight ton-kilometers - Number of dangerous goods freight ton-kilometers - Number of track-kilometers operated
Operation of terminals	IMs on the total of the infrastructure managed in the country of operation: <ul style="list-style-type: none"> - Number of operated terminals - Number of railway vehicle processed in terminals - Number of dangerous goods railway vehicle processed in terminals - Number of operating hours in terminals - Number of track-kilometers operated in terminals
Operation of passenger trains	RUs on the number of passenger train kilometers
Operation of high speed passenger trains	RUs on the number of passenger train kilometers for high speed services
Operation of freight trains	RUs on:

	<ul style="list-style-type: none"> - Number of freight train kilometers - Number of freight ton kilometers
Operation of dangerous goods freight trains	<p>RUs on:</p> <ul style="list-style-type: none"> - Number of dangerous goods freight train kilometers - Number of dangerous goods freight ton kilometers
Operation of freight terminals	<p>RUs on:</p> <ul style="list-style-type: none"> - Number of railway vehicle processed in freight terminals - Number of dangerous goods railway vehicle processed in terminals

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ANNEX IV

REFERENCE LISTS FOR REPORTING

Table 31 - Reference list for accidents

Code	Name of the event type	Definitions	Allocation of related occurrences
A.1	Collisions	A collision event falling within the A.1 sub-categories for which detailed information is not (yet) available.	Point 2.1 of Annex III
A.1.1	Collision of train with train/rail vehicle	A front to front, front to end or a side collision between a part of a train and a part of another train or rail vehicle, or with shunting rolling stock	Point 2.1 of Annex III
A.1.2	Collision of train with obstacle within the clearance gauge	A collision between a part of a train and objects fixed or temporarily present on or near the track (except at level crossings if lost by a crossing vehicle or user), including collision with overhead contact lines	Point 2.1 of Annex III
A.1.3	Collision of one or more rail vehicles with another rail vehicle	Same as A1.1 but concerning more rails vehicle not forming a train.	Point 2.1 of Annex III
A.1.4	Collision of one or more rail vehicles with obstacle within the clearance gauge	Same as A1.2 but concerning one or more rail vehicle not forming a train.	Point 2.1 of Annex III
A.2	Derailments	A derailment event falling within the A.2 sub-categories for which detailed information is not (yet) available.	Point 2.1 of Annex III

Code	Name of the event type	Definitions	Allocation of related occurrences
A.2.1	Derailment of train	Any case in which at least one wheel of a train leaves the rails	Point 2.1 of Annex III
A.2.2	Derailment of one or more rail vehicle	Same as A2.1 but concerning one or more rail vehicle not forming a train.	Point 2.1 of Annex III
A.3	Level Crossing Accident	A level crossing accident falling within the A.3 sub-categories for which detailed information is not (yet) available.	Point 2.1 of Annex III
A.3.1	Level Crossing Accident involving a train	A level crossing accident involving a train and falling within the A.3.1 sub-categories for which detailed information is not (yet) available.	Point 2.1 of Annex III
A.3.1.1	Level Crossing Accident involving a train and pedestrians	Any accident at level crossings involving at least one train and crossing pedestrians. Note: pedestrians also include people crossing with bicycles (or other similar small vehicles normally allowed on pedestrian/bike paths)	Point 2.1 of Annex III
A.3.1.2	Level Crossing Accident involving a train and crossing vehicles	Any accident at level crossings involving at least one train and one or more crossing vehicles or objects temporarily present on or near the track if lost by a crossing vehicle or user.	Point 2.1 of Annex III
A.3.2	Level Crossing Accident involving one or more rail vehicles	Any accident at level crossings involving one or more rail vehicles and one or more crossing vehicles, crossing users such as pedestrians or objects temporarily present on or near the track if lost by a crossing vehicle or user	Point 2.1 of Annex III
A.4	Accidents to persons involving rolling stock in motion	An accident to persons involving rolling stock in motion falling within the A.4 sub-categories for which detailed information is not (yet) available.	Point 2.1 of Annex III

Code	Name of the event type	Definitions	Allocation of related occurrences
A.4.1	Accidents to persons involving a train in motion	Accidents to one or more persons who are either hit by a train or by an object attached to, or that has become detached from the train; this includes persons who fall from trains as well as persons who fall or are hit by loose objects when travelling on board trains.	Point 2.1 of Annex III
A.4.2	Accidents to persons involving rail vehicle in motion	Accidents to one or more persons who are either hit by a railway vehicle or by an object attached to, or that has become detached from the vehicle; this includes persons who fall from railway vehicles as well as persons who fall or are hit by loose objects when travelling on board vehicles.	Point 2.1 of Annex III
A.5	Fire (or explosion) in rolling stock	A fire or explosion that occurs in a railway vehicle (including its load) when it is running between the departure station and the destination, including when stopped at the departure station, the destination or intermediate stops, as well as during re-marmusting operations	Point 2.1 of Annex III
A.5.1	Fire (or explosion) in a train	A fire or explosion that occurs in a train (including its load).	Point 2.1 of Annex III
A.5.2	Fire (or explosion) involving one or more rail vehicle	A fire or explosion that occurs in a rail vehicle (including its load).	Point 2.1 of Annex III
A.6	Other accident	Any accident other than a collision, derailment, level crossing accident, an accident to person involving rolling stock in motion or a fire in rolling stock, not falling within any other category and for which detailed information is not (yet) available	Point 2.1 of Annex III

Code	Name of the event type	Definitions	Allocation of related occurrences
A.6.1	Electric shock	Any accident caused by electric current passing through the body	Point 2.1 of Annex III
A.6.2	Cargo/freight falling from a height	Any accident caused by cargo/freight falling from a height, including during loading and unloading operations.	Point 2.1 of Annex III
A.6.3	Dangerous goods accident not covered by another accident type	Any accident involving dangerous goods to be reported in accordance with section 1.8.5 of 'RID' (as referred to in Annex II.1 to Directive 2008/68/EC, as amended) and not covered by another accident type.	Point 2.1 of Annex III
A.7	Suicides and attempted suicides (voluntary reporting)	A suicide or attempted suicide falling within the A.6 sub-categories for which detailed information is not (yet) available.	Not applicable
A.7.1	Suicide (voluntary reporting)	An act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority	Not applicable
A.7.2	Attempted suicide (voluntary reporting)	An act to deliberately injure oneself resulting in serious injury, as recorded and classified by the competent national authority	Not applicable

Table 32 - Reference list for direct causes

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.1	Operation failures	An operation failure event falling within the B.1 sub-categories for which detailed information is not (yet) available.	Point 2.1.c of Annex III
B.1.1	Failure to operate the infrastructure	A failure to operate the infrastructure falling within the B.1.1 sub-categories for which detailed information is not (yet) available.	Point 2.1.c of Annex III
B.1.1.1	Improper routing	Any occasion when a train/vehicle is directed on a route that was not planned.	IM or RU if responsible of the routing
B.1.1.2	On track plant incorrectly outside possession	On track machine(s) or other object(s) used during infrastructure activities positioned outside the authorised area	IM
B.1.1.3	Pushed switch	Any occasion when a switch in a wrong position is run over in trailing direction (converging points) unintentionally.	Point 2.1.c of Annex III
B.1.1.4	Long stop in tunnel	Any occasion when a passenger train is stopped in a tunnel for more than 10 minutes. Stops in underground stations should be excluded.	IM
B.1.2	Failure to operate a train or rail vehicle(s)	A failure to operate a train or rail vehicle falling within the B.1.2 sub-categories for which detailed information is not (yet) available.	RU
B.1.2.1	Signal passed at danger with passing of a danger point	Any occasion when any part of a train or rail vehicle proceeds beyond its authorised movement and travels beyond the danger point.	RU

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.1.2.2	Signal passed at danger without passing a danger point	Any occasion when any part of a train or rail vehicle proceeds beyond its authorised movement but does not travel beyond the danger point	RU
B.1.2.3	Runaway	Any uncontrolled movement of a train or rail vehicle over a distance of at least one meter.	RU
B.1.2.4	Over-speeding	Any occasion when a train runs with a speed higher than the maximum authorized speed or design speed.	RU
B.1.2.5	Loading irregularity	Any situation in which goods are improperly loaded (not in accordance with the applicable safety requirements)	RU
B.1.2.6	Train composition Failure	Any situation in which a train composition does not respect the applicable safety requirements. It excludes all direct causes already covered by other entry (e.g. 'Brake not correctly set for load' or 'Failure of the braking system').	RU
B.1.2.7	Train available for boarding or alignment outside platform	When this situation is taking place unintentionally or without specific RU procedure to be followed	RU
B.1.2.8	Person entrapment in door	Any situation in which a person is entrapped in door(s) of a railway vehicle	RU
B.1.2.9	Train running with open door	Any situation in which a train departs or runs with an unsupervised open door	RU

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.1.2.10	Long stop in tunnel	Any occasion when a passenger train is stopped in a tunnel for more than 10 minutes. Stops in underground stations should be excluded.	RU
B.1.2.11	Severe brake	Any situation in which a brake application by the driver is exceeding applicable limits	RU
B.1.2.12	Brake not correctly set for load	Any situation in which the brake system is not set correctly in relation with the load	RU
B.2	Technical Failure of the rolling stocks	A technical failure of the rolling stock falling within the B.2 sub-categories for which detailed information is not (yet) available.	RU
B.2.1	Failure of the wheelset	A failure of the wheelset falling within the B.2.1 sub-categories for which detailed information is not (yet) available.	RU
B.2.1.1	Broken wheel on rolling stock	A crack/defect affecting the wheel and exceeding the applicable limits Note: this category excludes broken wheels resulting from hot wheels	RU
B.2.1.2	Broken axle on rolling stock	A crack/defect affecting the axle and exceeding the applicable limits Note: this category excludes broken axles resulting from hot axles boxes.	RU
B.2.1.3	Hot axle box and/or hot wheel	Any situation in which the axle and/or the wheel temperature goes outside the defined range for normal operations (including when it results in damage to the wheel or axle).	RU

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.2.1.4	Failure of the bogie	Any situation in which a failure of the bogie is detected Note: this category excludes failure of the suspension system	RU
B.2.1.5	Suspension system failure	Any situation in which a failure of the suspension system is detected Note: this category excludes failure of the bogie	RU
B.2.2	Failure of the braking system	A failure of the braking system event falling within the B.2.2 sub-categories for which detailed information is not (yet) available..	RU
B.2.2.1	Brake not operating with the planned performance	Any situation when the brake system is not operating with in accordance with the planned performance	RU
B.2.3	Other failures of the rolling stock	Other failure of the rolling stock falling within the B.2.0 sub-categories for which detailed information is not (yet) available.	RU
B.2.3.1	Wrong side signalling (on-board) failure	Any technical failure of a signalling system (on-board), resulting in signalling a safety related information less restrictive than that demanded.	RU
B.2.3.2	Odometry error	Any technical failure of the on-board system to estimate changes in train position over time	RU
B.2.3.3	Train detection equipment failure (on-board)	Any situation involving a failure of the on-board side of the train detection system	RU
B.2.3.4	Losing of rolling stock parts	Any situation when a rolling stock part detaches and falls on the ground.	RU

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.2.3.5	Traction motor failure (electrical)	Any situation involving a technical failure of the – electrical motor - traction	RU
B.2.3.6	Diesel engine failure	Any situation involving a technical failure of the – diesel engine - traction	RU
B.2.3.7	Coupling failure	Any situation in which the railway vehicles detach as a result of a technical failure.	RU
B.2.3.8	Doors failure	Any situation involving a technical malfunctioning of the doors	RU
B.2.3.9	Loss of ventilation	Any situation involving a technical malfunctioning of the on-board ventilation system. Note: for example, a loss of ventilation in a train compromising fire management plan, potentially leading to victims or damage	RU
B.2.3.10	Twisted underframe	Any situation in which the underframe is twisted in excess of the operating design tolerance	RU
B.3	Technical Failure of the infrastructure	A technical failure of the infrastructure falling within the B.3 sub-categories for which detailed information is not (yet) available.	IM
B.3.1	Failure of the track	A failure of the track falling within the B.3.1 sub-categories for which detailed information is not (yet) available.	IM
B.3.1.1	Broken rail	Any rail which is separated in two or more pieces, or any rail from which a piece of metal becomes detached, causing a gap of more than 50 mm in length and more than 10 mm in depth on the running surface.	IM

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.3.1.2	Track buckle and other track misalignment	Any fault related to the continuum and the geometry of track, requiring track to be placed out of service or immediate restriction of permitted speed	IM
B.3.1.2.1	Gauge spread	Any situation in which the gauge spread is outside of the accepted tolerance	IM
B.3.1.2.2	Track twist	Any situation in which the track twist is outside of the accepted tolerance	IM
B.3.1.2.3	Improper rail fastening and joints	Any situation in which the rail fastening or joint is outside of the accepted tolerance	IM
B.3.1.3	Wrong side signalling (infrastructure) failure	Any technical failure of a signalling system (infrastructure), resulting in signalling safety related information less restrictive than that demanded.	IM
B.3.1.4	Switch and crossing failure	Any situation in which a switch or a crossing is not operating as expected	IM
B.3.1.5	Failure of the level crossing equipment	Any occasion when a train or rail vehicle passes over a level crossing with lower protection level than required.	IM
B.3.2	Structures failure	A structures failure event falling within the B.3.2 sub-categories for which detailed information is not (yet) available.	IM
B.3.2.1	Tunnel failure	Any situation in which a tunnel structure is not operating as expected	IM
B.3.2.2	Viaduct failure	Any situation in which a viaduct structure is not operating as expected	IM
B.3.2.3	Culvert failures	Any situation in which a culvert structure is not operating as expected	IM

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.3.2.4	Rail bridge structural failure	Any situation in which a rail bridge structure is not operating as expected	IM
B.3.2.5	Over line bridge (e.g. pedestrian) failure	Any situation in which an over line bridge structure is not operating as expected	IM
B.3.2.6	Station (building) Structure failure	Any situation in which a station structure is not operating as expected	IM
B.3.2.7	Platform failure	Any situation in which a platform structure is not operating as expected	IM
B.3.2.8	Disorder of earthworks/embankment failure	Any situation in which an earthwork/embankment structure is not operating as expected	IM
B.3.3	Other failures of the infrastructure	Other failure of the infrastructure falling within the B.3.3 sub-categories for which detailed information is not (yet) available.	IM
B.3.3.1	Power supply equipment failure	Any situation in which a power supply equipment is not operating as expected	IM
B.3.3.2	Train detection equipment failure (trackside)	Any situation in which a – track side – train detection equipment is not operating as expected	IM
B.3.3.3	Overhead contact line failure	Any situation in which an overhead contact line is not operating as expected	IM
B.3.3.4	Loss of ventilation	Any situation involving a technical malfunctioning of the ventilation system in a tunnel or in a station. Note: for example, a loss of tunnel ventilation compromising fire management plan, potentially leading to victims or damage	IM

Code	Name of the event type	Definitions	By default allocation of related occurrences
B.4	Other direct causes	Other direct causes event falling within the B.4 sub-categories for which detailed information is not (yet) available	Point 2.1.c of Annex III
B.4.1	Fire in proximity of rail infrastructure	Any occasion in which a fire is taking place in proximity of rail infrastructure, affecting the integrity of the infrastructure or the operations.	Point 2.1.c of Annex III
B.4.2	Unauthorised presence of staff/employees on railway system	Any occasion in which the unauthorised presence of staff/employees (i.e. not in accordance with the applicable requirements) is detected. This also includes sub-contractor staff.	Point 2.1.c of Annex III
B.4.3	Unauthorised presence of other third parties on the railway system	Any occasion in which the unauthorised presence of third parties on the railway system (i.e. not in accordance with the applicable requirements) is detected.	Point 2.1.c of Annex III
B.4.4	Improper or incautious use of authorised passages between platforms in the stations	Any occasion in which the improper or incautious use by persons of authorised passages between platforms in the stations is detected	Point 2.1.c of Annex III
B.4.5	Dangerous goods incidents not related to another type B event	Any incident involving dangerous goods to be reported in accordance with section 1.8.5 of 'RID' (as referred to in Annex II.1 to Directive 2008/68/EC, as amended) and not covered by another type B event.	Point 2.1.c of Annex III

Table 33 - Reference list for indirect causes

Note: In this table, indirect causes are mainly formulated as a variation in the performance of a railway function or the action of external events with the potential to directly or indirectly trigger a direct cause.

Code	Name of the event type	Definitions
C.1	Railway system performance variation	An event falling within the C.1 sub-categories for which detailed information is not (yet) available. This category covers both human and technical variations
C.1.1	Performance variation to provide power for train (or vehicle) operations in normal operations, or situations where there are disruptions or engineering work	An event falling within the C.1.1 sub-categories for which detailed information is not (yet) available.
C.1.1.1	Variation in function 'Take up power control duties'	Any variation leading to the non or partial achievement of the goal of ensuring continuity at handover so that the incoming and outgoing controllers in the control room have a similar understanding of a situation.
C.1.1.2	Variation in function 'Monitor power'	Any variation leading to the non or partial achievement of the goal of assessing the status of power sources in order to ensure that they are safe and available to provide optimum power to train services.
C.1.1.3	Variation in function 'Provision of traction supply'	Any variation leading to the non or partial achievement of the goal of maintaining the smooth provision of traction supply.
C.1.1.4	Variation in function 'Detect irregularity'	Any variation leading to the non or partial achievement of the goal of ensuring that the power supply provision is achieved without any abnormality and ensuring continuity despite irregularities. The controller needs to identify and prioritise irregularity as presented as alarms via control systems.

Code	Name of the event type	Definitions
C.1.1.5	Variation in function 'Agreement of isolation'	Any variation leading to the non or partial achievement of the goal of ensuring that track isolations are conducted in a safe and timely manner.
C.1.1.6	Variation in function 'Formal agreement for control of the line'	Any variation leading to the non or partial achievement of the goal of enabling the power supply to be switched off to safeguard staff or others who may be in the vicinity of electrical power conductors. This also includes to specifically confirm with trackwork when/where they will have formal control of the line, and manage isolation accordingly
C.1.1.7	Variation in function 'Apply isolation'	Any variation leading to the non or partial achievement of the goal of cutting off the electrical power in a specific location, for an agreed period of time, in circumstances where work or third parties intervention is to be carried out in the vicinity of the electrical power sources and there is a risk of injury to staff
C.1.1.8	Variation in function 'Return of power / remove isolation'	Any variation leading to the non or partial achievement of the goal of returning power at a specific location at the completion of the work or after an incident.
C.1.2	Performance variation to respond to incidents and occurrences, including arrangements for safety and initiation of remedial actions	An event falling within the C.1.2 sub-categories for which detailed information is not (yet) available.
C.1.2.1	Variation in function 'Detect irregularity'	Any variation leading to the non or partial achievement of the goal of enabling staff to achieve timely and accurate detection of irregularities or an incident, minimising the response time and harm to passengers or staff.
C.1.2.2	Variation in function 'Conduct immediate mitigation, containment'	Any variation leading to the non or partial achievement of the goal of initiating on-the-ground incident response and containment.

Code	Name of the event type	Definitions
C.1.2.3	Variation in function 'Gather and communicate incident information'	Any variation leading to the non or partial achievement of the goal of identifying the most relevant and current information and establish a shared understanding of the incident, the location and potential implications of the incident, across all relevant operational staff.
C.1.2.4	Variation in function 'Protect incident/event area'	Any variation leading to the non or partial achievement of the goal of protecting an area from traffic movement and power, in order to maintain safety during an incident or unexpected event.
C.1.2.5	Variation in function 'Verify work arrangements'	Any variation leading to the non or partial achievement of the goal of exchanging information, in order to establish a shared understanding between different parties (of location and timing of work and protection, in case of remedial actions) through communication and documentation.
C.1.2.6	Variation in function 'Ensure status of infrastructure'	Any variation leading to the non or partial achievement of the goal of monitoring the locations of trains and supply of power to specific parts of the network.
C.1.2.7	Variation in function 'Formal agreement for control of the line'	Any variation leading to the non or partial achievement of the goal of transferring the control of an agreed part of the railway line for movement of traffic or other activities (requiring shared understanding of location and responsibilities). It covers also the return of the line for normal operational use.
C.1.2.8	Variation in function 'Coordinating failure and incident response'	Any variation leading to the non or partial achievement of the goal of minimising the time delay in response to an incident.
C.1.2.9	Variation in function 'Anticipate delay'	Any variation leading to the non or partial achievement of the goal of anticipating delays and being proactive in decision making.

Code	Name of the event type	Definitions
C.1.2.10	Variation in function 'Re-planning train service'	Any variation leading to the non or partial achievement of the goal of ensuring safety while re-planning traffic flow after an incident or other disruption.
C.1.2.11	Variation in function 'Ensure passenger and personnel safety'	Any variation leading to the non or partial achievement of the goal of ensuring that passengers are safe in their current location, or that they can be moved safely to another location (e.g. calculate trade-off between remaining in vehicle and evacuation).
C.1.2.12	Variation in function 'Rectifying the incident'	Any variation leading to the non or partial achievement of the goal of ensuring that an incident cause and any secondary damage is rectified.
C.1.2.13	Variation in function 'Protect evidence'	Any variation leading to the non or partial achievement of the goal of ensuring that evidence is preserved for future detection, diagnosis and prevention.
C.1.3	Performance variation to maintain, repair and extend the infrastructure	An event falling within the C.1.3 sub-categories for which detailed information is not (yet) available.
C.1.3.1	Variation in function 'Identify engineering work requirements'	Any variation leading to the non or partial achievement of the goal of identifying what engineering works are needed, in order to prioritise and determine the arrangements for carrying them out.
C.1.3.2	Variation in function 'Establish network access'	Any variation leading to the non or partial achievement of the goal of establishing a sufficient period of time, potentially free from train movements, to carry out the proposed engineering work.
C.1.3.3	Variation in function 'Formulate work plans'	Any variation leading to the non or partial achievement of the goal of producing detailed work plans for the successful completion of the work.

Code	Name of the event type	Definitions
C.1.3.4	Variation in function 'Allocate resources'	Any variation leading to the non or partial achievement of the goal of ensuring that appropriate resources (people, equipment, materials, plant) are available for the completion of the work that is required.
C.1.3.5	Variation in function 'Formal agreement for control of the line'	Any variation leading to the non or partial achievement of the goal of transferring the control of the line (i) from the control of the signaller to the engineering function for the purpose of engineering work; (ii) from the engineering function back to the signaller at the completion of the work, to return the railway to operational use.
C.1.3.6	Variation in function 'Verify work arrangements'	Any variation leading to the non or partial achievement of the goal of exchanging information, in order to establish a shared understanding between different parties on the work arrangements, local circumstances and operational context of the work.
C.1.3.7	Variation in function 'Protect work area'	Any variation leading to the non or partial achievement of the goal of protecting the work area from trains and power sources in order to maintain safety (through signalling, isolation, physical barriers, or human barriers).
C.1.3.8	Variation in function 'Supply of resources to work site'	Any variation leading to the non or partial achievement of the goal of supplying materials, tools, equipment to the site of work, in a timely manner, with minimal interference to the work at the site, other work sites in the vicinity or other train services.
C.1.3.9	Variation in function 'Establish safe working environment'	Any variation leading to the non or partial achievement of the goal of identifying site related hazards and setting up safe systems of working to minimise the risk of injury to staff and impacts on the operational train service.

Code	Name of the event type	Definitions
C.1.3.10	Variation in function 'Using trains, plant and machinery for engineering work'	Any variation leading to the non or partial achievement of the goal of ensuring safe movement of engineering trains, machines and plant on the track, within and outside areas that are protected for work.
C.1.3.11	Variation in function 'Close down site on completion of work'	Any variation leading to the non or partial achievement of the goal of preparing the site of work for return to operational use, including all relevant checks on the work and integrity of the railway and removal of all protection in readiness for transfer of the site back to the control of operational staff.
C.1.3.12	Variation in function 'Supervision of teams and individuals'	Any variation leading to the non or partial achievement of the goal of ensuring that work and workers are supervised in a range of different circumstances.
C.1.3.13	Variation in function 'Carrying out trackside work'	Any variation leading to the non or partial achievement of the goal of completing a wide range of work items during the trackside work, in a changing work environment, with various influencing factors and pressures.
C.1.4	Performance variation to operate a train in normal operational situations and situations where disruption or problems occur	An event falling within the C.1.4 sub-categories for which detailed information is not (yet) available.
C.1.4.1	Variation in function 'Ensure authority'	Any variation leading to the non or partial achievement of the goal of confirming that there is authority to proceed (typically given through the signaller though may be given by other members of staff, e.g. during engineering)
C.1.4.2	Variation in function 'Despatch train'	Any variation leading to the non or partial achievement of the goal of despatching a train from the platform, safely and on-time.

Code	Name of the event type	Definitions
C.1.4.3	Variation in function 'Maintain appropriate speed'	Any variation leading to the non or partial achievement of the goal of ensuring movements at a speed that is safe for the vehicle in the current conditions and in accordance with the timetable.
C.1.4.4	Variation in function 'Ensure train integrity and load integrity on journey'	Any variation leading to the non or partial achievement of the goal of ensuring that the integrity is maintained for the train and the load, without any detached vehicles (greater relevance for freight trains and loco-hauled passenger services)
C.1.4.5	Variation in function 'Stopping train'	Any variation leading to the non or partial achievement of the goal of bringing the train to a safe standpoint, either in a planned or unplanned manner.
C.1.4.6	Variation in function 'Management of train control systems'	Any variation leading to the non or partial achievement of the goal of achieving safe and timely operation of control systems (includes responding to automatic warning system and train protection warning system and may also involve interaction with ERTMS).
C.1.4.7	Variation in function 'Ensure status of infrastructure'	Any variation leading to the non or partial achievement of the goal of ensuring that the infrastructure is open and safe for own use and for others (e.g. identifying faults such as signal failures or line blockages on own or adjacent track).
C.1.4.8	Variation in function 'Operate level crossing'	Any variation leading to the non or partial achievement of the goal of operating level crossings manually on site, to maintain separation between road and rail traffic.
C.1.4.9	Variation in function 'Warnings to other rail users'	Any variation leading to the non or partial achievement of the goal of alerting people to potential risks from trains.

Code	Name of the event type	Definitions
C.1.4.10	Variation in function 'Stabling of vehicles'	Any variation leading to the non or partial achievement of the goal of enabling safe stabling of a vehicle (train needs to be stopped at an appropriate place in an appropriate condition).
C.1.4.11	Variation in function 'Provide information and support to passengers'	Any variation leading to the non or partial achievement of the goal of ensuring that passengers are safe and kept informed of relevant safety information on their journey (applicable to passenger services during driver only operation, or in conjunction with train crew; it includes door operation).
C.1.5	Performance variation to control train movements in all operational circumstances	An event falling within the C.1.5 sub-categories for which detailed information is not (yet) available.
C.1.5.1	Variation in function 'Take up control of train movement duties'	Any variation leading to the non or partial achievement of the goal of developing an understanding of the area that will be under the signallers' control and assure staff awareness of relevant information on change of control of train movement duties.
C.1.5.2	Variation in function 'Handover of responsibility'	Any variation leading to the non or partial achievement of the goal of responding to scenarios that require the handing over of responsibility for the control of movements (could include engineering, or to regional control centre).
C.1.5.3	Variation in function 'Monitor rail network'	Any variation leading to the non or partial achievement of the goal of obtaining, recalling and regularly updating information, to maintain an accurate overview of the railway system status.
C.1.5.4	Variation in function 'Authorise train movements'	Any variation leading to the non or partial achievement of the goal of giving permission to the operator of a train (or rail vehicle) to move within the infrastructure.

Code	Name of the event type	Definitions
C.1.5.5	Variation in function 'Route / re-route passenger or freight service'	Any variation leading to the non or partial achievement of the goal of responding to scenarios that require trains to be re-routed or travel to a different (unplanned) destination.
C.1.5.6	Variation in function 'Record train movements'	Any variation leading to the non or partial achievement of the goal of keeping track of/recording train movements, in order to help updating a person's awareness of a situation, location, traffic, delays and disruptions and providing formal documentation of relevant details
C.1.5.7	Variation in function 'Anticipate delays or poor traffic flow'	Any variation leading to the non or partial achievement of the goal of anticipating and being proactive regarding decision making, in order to minimise time pressure and ensure decision making is effective.
C.1.5.8	Variation in function 'Deal with irregular train movements'	Any variation leading to the non or partial achievement of the goal of managing train movements in circumstances in which they fall outside of typical or routine patterns (includes scenarios such as requiring train to pass signal at danger, movements not protected by standard safety systems or train rescue)
C.1.5.9	Variation in function 'Provide train identification'	Any variation leading to the non or partial achievement of the goal of enabling operational staff to identify operational characteristics of a train. This is achieved through provision of an identification number, which may need to be entered or altered in signalling / control systems in certain scenarios
C.1.5.10	Variation in function 'Manage implementation of emergency / temporary speed restrictions'	Any variation leading to the non or partial achievement of the goal of imposing speed restrictions in a number of operating scenarios.

Code	Name of the event type	Definitions
C.1.5.11	Variation in function 'Gather and communicate information'	Any variation leading to the non or partial achievement of the goal of assimilating and sharing incoming information so that relevant staff have a common understanding of the network and the control of traffic.
C.1.5.12	Variation in function 'Control level crossing'	Any variation leading to the non or partial achievement of the goal of controlling level crossings, to separate road and rail traffic, ensure safety of the public and safety of the railway service.
C.1.5.13	Variation in function 'Supervision of teams and individuals'	Any variation leading to the non or partial achievement of the goal of ensuring that a second person (e.g. team member) can have an overview of the status of the system and the decisions/actions of individuals who are controlling the system (so that a team member can provide support if necessary, also supervisors)
C.1.6	Performance variation to prepare trains for service	An event falling within the C.1.6 sub-categories for which detailed information is not (yet) available.
C.1.6.1	Variation in function 'Assembling vehicle formation'	Any variation leading to the non or partial achievement of the goal of ensuring that the correct vehicle configuration has been built (can apply to any type of vehicle (loco hauled, EMU, DMU) and to passenger or freight).
C.1.6.2	Variation in function 'Preparation of vehicles'	Any variation leading to the non or partial achievement of the goal of ensuring that the train is ready for service (checking by those responsible for vehicle, e.g. driver, particularly doors to ensure ready for service).
C.1.6.3	Variation in function 'Take up driving duties'	Any variation leading to the non or partial achievement of the goal of confirming that drivers are aware of service requirements and conditions that can affect service (drivers need to understand local or temporary operating conditions).

Code	Name of the event type	Definitions
C.1.6.4	Variation to prepare trains for service	An event falling within the C.1.6 sub-categories for which detailed information is not (yet) available.
C.1.7	Performance variation to support passenger movements and well-being at stations	An event falling within the C.1.7 sub-categories for which detailed information is not (yet) available.
C.1.7.1	Variation in function 'to support preparing stations for use by passengers'	Any variation leading to the non or partial achievement of the goal of preparing the station and provide a clean and safe environment for passengers.
C.1.7.2	Variation in function 'to support assisting passengers'	Any variation leading to the non or partial achievement of the goal of facilitating timely despatch of the train by assisting passengers (platform-train interface can be hazardous particularly for mobility impaired and / or high capacity / short dwell-time stations).
C.1.7.3	Variation in function 'to support control of crowds'	Any variation leading to the non or partial achievement of the goal of maintaining safe movement of crowds in a range of operational circumstances.
C.1.8	Performance variation to check, inspect, maintain and repair rolling stock for service	An event falling within the C.1.8 sub-categories for which detailed information is not (yet) available.
C.1.8.1	Variation in function 'Identify rolling stock maintenance/repair requirements'	Any variation leading to the non or partial achievement of the goal of determining the work that is needed.

Code	Name of the event type	Definitions
C.1.8.2	Variation in function 'Allocate resources'	Any variation leading to the non or partial achievement of the goal of ensuring that appropriate resources (people, equipment, materials, plant) are available for inspection/maintenance/repair of rolling stock.
C.1.8.3	Variation in function 'Prepare rolling stock for inspection/intervention and return rolling stock after inspections/intervention'	Any variation leading to the non or partial achievement of the goal of preparing to undertake inspection/maintenance/repair of rolling stock (it includes for example dismantling to gain access for inspection, lifting and recovery of rolling stock). It also includes returning rolling stock after inspections/maintenance/repair.
C.1.8.4	Variation in function 'Inspect rolling stock'	Any variation leading to the non or partial achievement of the goal of carrying out inspection of rolling stock.
C.1.8.5	Variation in function 'Handover of responsibility'	Any variation leading to the non or partial achievement of the goal of ensuring that appropriate action is taken on the basis of findings from an inspection.
C.1.8.6	Variation in function 'Installation of components onto vehicles normally in service'	Any variation leading to the non or partial achievement of the goal of installing components onto rolling stock.
C.1.8.7	Variation in function 'Maintenance/repair of components on vehicles normally in service'	Any variation leading to the non or partial achievement of the goal of undertaking maintenance/repair of components on rolling stock.
C.1.8.8	Variation in function 'Servicing of rolling stock'	Any variation leading to the non or partial achievement of the goal of undertaking service of rolling stock. This includes fuelling, cleaning, restocking of consumables, providing water, examination, emptying of controlled emissions e.g. toilets, loading/unloading of commodities for vehicles.

Code	Name of the event type	Definitions
C.1.9	Performance variation to design a structural subsystem	An event falling within the C.1.9 sub-categories for which detailed information is not (yet) available.
C.1.9.1	Variation in function 'Define scope and purpose'	Any variation leading to the non or partial achievement of the goal of developing a sufficient understanding of the system to ensure a proper performance of all subsequent safety life cycle activities.
C.1.9.2	Variation in function 'Establish system definition and application conditions '	Any variation leading to the non or partial achievement of the goals of the function: a) define the system, its mission profile and b) its boundary; c) establish the operational requirements influencing its characteristics; d) define the functions to be provided by the system; e) define the scope of system risk analysis; f) the initial Safety plan and g) the organisation for safety management of the system.
C.1.9.3	Variation in function 'Identify risks'	Any variation leading to the non or partial achievement of the goals of the function: a) identify and classify hazards associated with the system; b) select risk acceptance principles (RAP); c) define and apply risk acceptance criteria (RAC); d) assess risks; e) establish a process for on-going risk management.
C.1.9.4	Variation in function 'Specify system requirements'	Any variation leading to the non or partial achievement of the goals of the function: a) specify the overall safety requirements for the system under consideration; b) specify the overall demonstration process and criteria for acceptance of safety of the system; c) provide a comprehensive and identified set of requirements for the subsequent life cycle phases; d) specify necessary monitoring requirements according to the process for analysing operation and maintenance performance arranged in the Safety Plan.

Code	Name of the event type	Definitions
C.1.9.5	Variation in function 'Apportion system requirements (sub-system and component level)'	Any variation leading to the non or partial achievement of the goals of the function: a) apportion the system safety requirements to the designated subsystems and/or components; b) design subsystems and components that work together as a system which fulfils the required functions at the system level; c) describe the safety requirements and specify the interfaces for all subsystems and components derived from the safety requirements; d) define the acceptance criteria to demonstrate fulfilment of the safety requirements for the system, subsystem, equipment in subsequent lifecycle phases; e) identify and evaluate the significance of the interactions between the subsystems.
C.1.10	Performance variation to Install a structural subsystem	An event falling within the C.1.10 sub-categories for which detailed information is not (yet) available.
C.1.10.1	Variation in function 'Manufacture'	Any variation leading to the non or partial achievement of the goals of the function: a) manufacture the subsystems and components; b) establish and apply safety-centred assurance arrangements.
C.1.10.2	Variation in function 'Integration'	Any variation leading to the non or partial achievement of the goals of the function: a) assemble and install the integrated system, total combination of subsystems and components required to form the complete system; b) demonstrate that integrated system, subsystems and components work together as defined by the interfaces; c) demonstrate that integrated system, subsystems and components meet their safety requirements; d) initiate system support arrangements.

Code	Name of the event type	Definitions
C.1.10.3	Variation in function 'Validate (incl. safety acceptance and commissioning)'	Any variation leading to the non or partial achievement of the goals of the function: a) confirm by examination and provision of objective evidence that the system under consideration in combination with its Safety-Related Application Conditions complies with the safety requirements; b) confirm or update the safety case for the system under consideration, according to the results of the validation.
C.1.10.4	Variation in function 'Accept system (incl. entry in service)'	Any variation leading to the non or partial achievement of the goals of the function: a) assess compliance of the total combination of subsystems, components, their interfaces and Safety-Related Application Conditions with the overall safety requirements; b) accept the system for entry into service.
C.1.10.5	Variation in function 'Decommissioning'	Any variation leading to the non or partial achievement of the goal of controlling safety implication of system decommissioning and disposal tasks.
C.2	External events - Environmental	An event falling within the C.2 sub-categories for which detailed information is not (yet) available Note: This category and its subtypes are allowed to be used as direct causes in the case there is no other possibility to describe properly the scenario which took place.
C.2.1	Earthquake	
C.2.2	Flooding	
C.2.3	Landslide	
C.2.4	Vegetation	
C.2.5	Crosswinds	

Code	Name of the event type	Definitions
C.2.6	Extreme temperatures	
C.2.7	Snow	
C.3	External events - Security	<p>An event falling within the C.3 sub-categories for which detailed information is not (yet) available.</p> <p>Note: This category and its subtypes are allowed to be used as direct causes in the case there is no other possibility to describe properly the scenario which took place.</p>
C.3.1	Terrorism	
C.3.2	Assault	
C.3.3	Theft	
C.3.4	Arson	
C.3.5	Vandalism	
C.3.6	Cyber attack	

REFERENCE LIST FOR CONTRIBUTING FACTORS

Note: For the purposes of this Appendix, *contributing factor* means a contributing factor as defined in Article 2(2) of Commission Implementing Regulation (EU) 2020/572¹, i.e., means any action, omission, event or condition that affects an occurrence by increasing its likelihood, accelerating the effect in time or increasing the severity of the consequences, but the elimination of which would not have prevented the occurrence.

Code	Name of the contributing factor	Description
CF.1	Performance relevant factor	
CF.1.1	Dynamic situational factors	Temporary or very short-term characteristics of the situation that can influence individuals and the teams or the course of the situation.
CF.1.1.1	Pressure	Refers to two different aspects of the time available (both real or perceived): the pressure generated by uncertainties, changes and the results to be achieved sometimes on competing objectives; and the pressure generated by the time available to analyse, anticipate, coordinate, communicate decide, act or react, check, report, etc.
CF.1.1.2	Complexity	Refers to two different aspects of the complexity of the situation. First, it refers to the amount and ambiguity of information and its timing, the interacting activities and actors, and their dynamic evolution from one moment to another, forcing the update or refresh of the memory. Second, it refers to the autonomy left in controlling the situation, in making decisions, in carrying out actions and recovering them, with the eventual delays, before their consequences and their visibility.

¹ Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports (OJ L 132, 27.4.2020, p. 10).

Code	Name of the contributing factor	Description
CF.1.1.3	Monotony	Refers to two different aspects of the monotony within situations. Firstly, the repetition of the situation, and the habit of acting or thinking in a particular way (more mechanical, more automatic). Secondly, boredom due to lack of change in the environment. Both situations induce a challenge to get out of the largely dominant work logic at the right time, and to act differently, considering elements that are maybe rarer or surprising, and somehow temporarily undetected. Because of boredom or repetition, thoughts may deviate from the situation being treated more automatically and may need more time to adapt to change.
CF.1.1.4	Work-rhythms	Refers to the hours or periods of work actually worked with two aspects: the distribution of physical and mental workloads during these periods of work (quality and quantity of the work repartition within the time of work); and, the sequence of the actual work periods, with beginning and end time, the effective breaks, organised in 1/2/3 teams over 24 hours and during the last 3 weeks to 3 months (quality of the work shifts or patterns as experienced by the individuals).
CF.1.1.5	Environment	Refers to the temporary physical characteristics of the workplace that can have an influence on the physical, mental and emotional state of the worker, including cognitive and social activities in general. It relates to e.g.: visibility and light, noise, vibrations, accessibility, working positions, static and dynamic physical loads, distances to be covered, and variable weather conditions; as they interact with railways activities or decision-making processes.
CF.1.2	Dynamic staff factors	Temporary or very short-term characteristics of individuals and teams that can influence the course of the situation or other concerned staff.

Code	Name of the contributing factor	Description
CF.1.2.1	Intentions	Refers to the persons' intentions which in the situation guide them to decide and act as they do. It covers three aspects: the intention before and during the actions (for which purpose they do what they do); the reasoning in a situation (taking into account how the persons considered the situation at the action time or just before); and when useful, the categorisation of the type of variability or deviation from the intended action (e.g. involuntary – voluntary, positive – negative, type of error, type of violation).
CF.1.2.2	Attention	Refers to two aspects that create the conditions for concentration: an external one that regards the different professional activities that influence the capacity for attention because they force this capacity to be divided and therefore reduced; and, an internal one that is more psychological or personal because the flow of thoughts can split the capacity of attention between what or why to do, how to do, when to do and other professional or personal life thoughts.
CF.1.2.3	Fatigue	Refers to sleep-related fatigue (in quality, in quantity, at night-time), regardless of the reasons, which is a temporary state that can lead to variations in behaviour or decisions, i.e. deviation, error or violation, e.g. due to missed information, inadequate analysis or unanticipated action. Fatigue is a decreased capacity to perform mental or physical work, with involuntary physiological performance decrements (e.g. hypo-vigilance, micro-sleeps), mood disorders and cognitive impairment, due to inadequate restorative sleep, time of day, length of the waking period, or due to the interaction between the lack of breaks and some characteristics of the activities, etc.
CF.1.2.4	Stress	Refers to specific emotions, due to chronic or shocking stimulation and, in its basic meaning, to any type of change that causes physical, emotional or psychological strain. A common reference situation for stress is when staff (individuals, groups) feel an imbalance between what they are asked to do professionally and the resources they have to do it (time, instructions, skills, support, tools, etc.).

Code	Name of the contributing factor	Description
CF.1.2.5	Awareness	Refers to both situational awareness and self-awareness. This factor covers the three stages of situational awareness: perception of information, understanding of what is perceived, and projection of how to react on the basis of the perceptions and their understood meaning (including risks). This factor also covers self-awareness: of a person's own state of mind and health, of a person's own limitations, of a person's own past decisions and actions, as well as their past outcomes and (risk of) consequences.
CF.1.3	Static situational factors	Lasting characteristics or repetitive elements of a situation that can influence the individuals and the teams or the course of the situation.
CF.1.3.1	Design	Refers to the relative end-user-based approach when designing or changing procedures and instructions, tools and equipment (incl. human-machine/computer interfaces), processes and the levels of automation in them. This requires the definition of the user-experience view and use of what is to be designed or modified, considering tasks allocation, workload fluctuation, interactions between humans to be defined - and with the IT interfaces, anticipated variabilities (deviations, errors, etc.) and their consequences, residual risks left to end-users, levels of autonomy, the remaining purpose of the work when reduced or automated, etc.
CF.1.3.2	Instructions	Refers to the directives and regulations from all levels, and the rules, procedures, and instructions produced for a standardised performance of all the tasks (in a broad sense). This includes not only their existence (or not) and availability, but also their quality to enable the work to be carried out properly (e.g. resources defined) while controlling the related risks. This factor also covers the interactions between tasks, and with other processes (e.g. monitoring).
CF.1.3.3	Communication Means	Refers both to the communication technical means and tools as well as to the verbal or visual standards and protocols, at all levels of working conditions or degraded situations, and including their influences on (and how they are experienced by) the individuals and teams concerned.

Code	Name of the contributing factor	Description
CF.1.3.4	Tools	Refers to how the tools and equipment are used and maintained (or calibrated) to support performance, to facilitate the detections of the deviations and their recovery, or reduce their consequences. It covers the adequate planning, working order and maintenance, the availability and suitability of the tools to be used for the planned tasks and actual activities in situ. This also includes the checking of the equipment and devices made available to the staff concerned before and/or after the work is carried out.
CF.1.3.5	Context	Refers to the influences the societal and institutional contexts may have on the staff concerned (staff and leaders) and their work situations (incl. projects, resources and budgets, etc.). This covers the influences of the regulation of the sector (national, EU), the influences of the economy, politics, media, and of the societal events (sabotage, terrorism, social climate, security climate, health crisis, etc.).
CF.1.4	Static staff factors	Lasting characteristics or repetitive elements in the concerned individuals and teams that can influence the course of the situation or other concerned staff.
CF.1.4.1	Experience	Refers primarily to levels of familiarity with the activities and of specific working conditions (in a broad sense), which also provide implicit knowledge and/or incidental learning. Expertise can sometimes be detrimental, e.g. after introduction of changes or the occurrence of less practiced patterns. Beginners may need years of varied practice before they are comfortable with more difficult or rare cases. Also refers to career paths linked to varied work activities or circumstances or diversified tools, which career paths provide a wider range of practices.

Code	Name of the contributing factor	Description
CF.1.4.2	Personal	Refers to the psychological and physiological characteristics of the concerned staff, including health. This includes psychological attitudes that influence behaviour at work such as self-confidence, openness to experience, conscientiousness, extraversion, agreeableness, emotional stability. Health criteria can also be linked with aging, physiological needs or evolving characteristics. It also includes the necessary periodic checks and monitoring of the relevant personal characteristics for safety, depending on the person's responsibilities.
CF.1.4.3	Motivation	Refers to the commitment and adherence of the concerned staff to the company's objectives, values and priorities. It also refers to motivation management, and to the balance between extrinsic (salaries, bonuses, pressure, etc.) and intrinsic (fulfilment, autonomy, challenge, etc.) type of motivation. Specific to safety, it also refers to the task's important rules and how they make sense, and to the way the organisation manages risks, changes, improvements; and communicates on them.
CF.1.4.4	Competencies	Refers to the point at which staff concerned meets the requirements of the roles, activities, responsibilities and situations to be managed, in terms of qualifications and competencies (attitudes, awareness, knowledge, skills, including non-technical skills) as demonstrated during the review sessions, adjustments and periodic checks. Sufficient is not always enough: sometimes assessed out of context, theoretical questions–answers are not sufficiently broad, diverse or practical to prepare for dangerous or rare or unregulated situations.
CF.1.4.5	Decision-making	Refers to the capability to make decisions based on information, its interpretation, the context, the nature of the issue to solve: e.g. ability to interpret situations, quality of memory processes, tendency to follow more or less the procedures or to reconsider the competing objectives, ability to be creative, tendency to be of service for others, or ability to interact with others about the decision-making process, etc..

Code	Name of the contributing factor	Description
CF.1.5	Relational factors	Relational factors between the concerned staff, or between several concerned groups of staff (incl. hierarchy levels), which can influence the course of the situation, or influence the people themselves in their reactions, attitudes, beliefs and perceptions.
CF.1.5.1	Communication	Refers to the message and content of the communication, the way in which the interlocutors understand each other and coordinate to reach an efficient level of communication: it can be between staff members within a team, between teams, with or between contractors, with or between the line manager(s), etc..
CF.1.5.2	Relationships	Refers to the management of the power dynamics inherent in any social relationship between people organised in small or larger groups, in particular with issues or influences from: sharing resources, achieving opposing objectives, competing for promotion or career management (with some detrimental effect on individuals and on processes, e.g. hidden agendas or issues, pressure to achieve personal goals). It also refers to the influential relationship to one's own leaders as well as with own collaborators if any.
CF.1.5.3	Trust	Refers to the level of (reciprocal) confidence with which the staff concerned (individuals or groups) can rely on colleagues and on management, and on rules, procedures, and also on technical means such as the (partially) automated tools... in order to carry out their tasks, produce an efficient activity, while fully assuming their responsibilities; even when a failure or an improvement area appears or is to be reported or raised, being sure to be treated fairly.

Code	Name of the contributing factor	Description
CF.1.5.4	Reinforcement	Refers to anything that strengthens (positively or negatively) professional practices, particularly in relation to safety. Taking the example of a given behaviour: positive reinforcement increases its probability of occurrence; negative reinforcement decreases it. This may be through the presence or absence of feedback or examples (especially the feedback or examples given by managers or instructors, intentionally or not). They can also be incentives or promotion, on the contrary, threats of sanctions or of non-promotion. It can even be about the choice of words, of messages, in official or unofficial communications. And it may concern a wide range of behaviours, referring to past variabilities, to habitual or tolerated deviations, to well-known residual risks, to weak or good monitoring or reporting, etc.
CF.1.5.5	Involvement	Refers to the consultation and the participation of staff in decision-making processes. It includes the involvement, the inclusion of staff throughout the organisation, for example in projects, actions or meetings. It is about how the organisation involves end-users and their representatives in reviewing or monitoring safety processes and in their continuous improvement.

Table 34 - Reference list for contributing factors

REFERENCE LIST FOR SYSTEMIC FACTORS

Note: For the purposes of this Appendix, *systemic factor* means a systemic factor as defined in Article 2(3) of Implementing Regulation (EU) 2020/572, i.e., means any causal or contributing factor of an organisational, managerial, societal or regulatory nature that is likely to affect similar and related occurrences in the future, including, in particular the regulatory framework conditions, the design and application of the safety management system, skills of the staff, procedures and maintenance

Code	Name of the event type	Definitions
SF.1	Leadership	Category with systemic factors that set and maintain the direction in which all the staff are engaged in achieving the organisation's objectives.
SF.1.1	Leadership and commitment	Refers to the need for leaders at all levels to establish unity of purpose and create the conditions of people's engagement, enabling an organisation to align its strategies, policies, processes and resources to achieve its objectives. You can think of leadership as a relationship through which one person influences the behaviour or actions of other people. And the same when taken at the level of an organisation: influencing how it evolves, develops, etc. In order to manage an organisation effectively and efficiently, it is important to respect and involve all people at all levels: it will facilitate the commitment of people in achieving the organisations' objectives. In the context of a safety management system, leaders must also demonstrate their own commitment to safety, promoting a positive safety culture, ensuring that the safety risks are under control and the resources needed are made available.
SF.1.2	Safety Policy	Refers to an official single document describing and communicating the organisation's safety commitments and principles (ex. legal requirements, continual improvement), together with a series of described practices to actively implement them in the daily operations. This document is established by Top management, appropriate to the organisation's type and extent of railway operations, approved by the organisation's chief executive (or a representative(s) of the Top-management), communicated and made available to all staff. It provides a framework for setting safety objectives and evaluating the organisation's safety performance against these objectives. It has to be maintained in accordance with the business strategy and the evaluation of the safety performance of the organisation.

Code	Name of the event type	Definitions
SF.1.3	Organizational roles, responsibilities, accountabilities and authorities	Refers to the safety-related tasks, and decision-making powers that are assigned to different individuals or groups within the organisation. These have to be defined at all levels, documented and communicated. The organisation must ensure that staff with delegated responsibilities for safety-related tasks have the authority, competence and appropriate resources to perform their activities. It also covers the allocation of roles to business functions outside the organisation, where appropriate.
SF.1.4	Consultation of staff and other parties	Refers to the organisation's facilitation of the consultation of staff by providing the methods and means for involving staff, recording staff's opinion and providing feedback. Staff, their representatives and external interested parties, as appropriate and where relevant, must be consulted in developing, maintaining and improving the safety management system in the relevant parts for which they are responsible, including the safety aspects of operational procedures.
SF.2	Planning	Category with systemic factors that identify risks and opportunities, establish safety objectives and identify processes and measures necessary to deliver results in accordance with the organisation's safety policy.
SF.2.1	Actions to address risks	Refers to the steps taken to identify, evaluate, and manage all the operational, organisational and technical risks relevant to the type, extent and area of operations carried out by the organisation. It includes the appropriate risk control measures to eliminate or minimize the risks. It includes the continual monitoring of the risk control measures that have been implemented, and the review of their effectiveness. It includes an effective communication to ensure that all stakeholders are aware of the risks and the measures that have been implemented to manage them. It covers the need to determine, provide and sustain a safe working environment (linked to Directive 89/391/EEC). It also covers the potential safety risks before the implementation of a change, in accordance with the Regulation (EU) 402/2013.

Code	Name of the event type	Definitions
SF.2.2	Safety objectives and planning	Refers to the need to establish safety objectives for relevant functions at relevant levels to maintain and, where reasonably practicable, to improve its safety performance. The safety objectives must be consistent with the safety policy, be linked to the priority risks, be measurable, be revised, be communicated, etc. Plans are needed to describe how the organisation will achieve its safety objectives, and to describe how this is to be monitored.
SF.3	Support	Category with systemic factors that provide the necessary supports for the establishment, implementation, maintenance and continual improvement of the whole safety management system, incl. the management of the safety-related tasks.
SF.3.1	Resources	Refers to all the resources, including competent staff and effective and useable equipment, needed for the establishment, implementation, maintenance and continual improvement of the safety management system. The organisation also ensures that the necessary resources are provided to its staff to carry out their daily activities safely. This also includes staffing, equipment and documentation. It also refers to all the processes the organisation put in place to identify and provide the adequate resources in time in accordance with safety objectives and planning.

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Code	Name of the event type	Definitions
SF.3.2	Competence	Refers to the dedicated management system in place to manage the ability of staff to perform activities to the standards expected in employment; with a combination of practical and thinking skills, experience and knowledge. Competency means the skills (technical, functional and non-technical) and underpinning knowledge that enable someone to demonstrate a certain level of competence. A competence management system covers the identification of the competencies required for safety-related tasks, the selection principles (basic educational level, psychological and physical fitness required), the initial training, experience and qualification; and the ongoing training and periodic update of existing competencies, the periodic assessment of competence and checks of psychological and physical, fitness, to ensure that qualifications and skills are maintained over time. It also includes any specific training in relevant parts of the safety management system in order to deliver safety-related tasks. The organisation must provide training and all the records, regularly review, audit, and change the training when necessary. Back to work arrangements must also be in place.
SF.3.3	Awareness	Refers both what is awareness and how it is organised. Awareness is attained when staff understand their responsibilities and how their actions contribute to the achievement of the organisation's objectives. It is organised by the top management who must ensure that they and their staff having a role that affects safety are aware of the relevance, importance and consequences of their activities and how they contribute to the correct application and the effectiveness of the safety management system, including the achievement of safety objectives.
SF.3.4	Information and communication	Refers to the safety related information at different levels, communicated at the right time and to the right people including the external interested parties, with adequate channels, and with several quality criteria (relevant, complete, understandable, understood, etc.). It includes the management of this activity with the identification, receipt, processing, etc. of safety-related information.

Code	Name of the event type	Definitions
SF.3.5	Documented information	Refers to all the safety-related information required to be created, controlled, updated and maintained by an organisation, its formats, and the media on which it is contained. It concerns the description of the safety management system: processes and activities related to safety of rail operations and associated responsibilities, their interaction, the description of how they are implemented, including all contractual arrangements, etc. It also concerns the submission of an annual safety report to the relevant authorities.
SF.3.6	Integration of human and organizational factors	Refers to a systematic approach to integrating human and organisational factors within the safety management system. It includes the development of a strategy and the use of expertise and recognised methods from the field of human and organisational factors. It includes addressing the risks associated with the design and use of equipment, tasks, working conditions and organisational arrangements, taking into account human capabilities as well as limitations, and the influences on human performance. The human and organisational factors are all the human performance characteristics and organisational aspects that must be considered to ensure the lifelong safety and effectiveness of a system or organisation.
SF.4	Operation	Category with systemic factors that develop, implement and apply the processes and measures as planned, in accordance with the organisation's safety policy and the organisation's objectives.
SF.4.1	Operational planning and control	Refers to the ultimate aim to plan safe operation: the relevant processes of the safety management system should support the control of operational risks including making sure that staff understand their roles, the risks they face, what the control measures are and that they have the appropriate competence and training to perform their tasks, consistently with the applicable procedures for the service to be delivered, in normal, degraded and emergency conditions.. It also specifically refers to the assurance that the vehicles or the infrastructure is/are operated safely in accordance with the applicable requirements under different operating conditions (i.e. normal, degraded and emergency), including the use of assets for testing purposes (e.g. testing of running behaviours of vehicles before authorisation is granted) and in exceptional circumstances.

Code	Name of the event type	Definitions
SF.4.2	Asset Management	Refers to the approach used by an organisation to ensure that physical assets remain safe, fit-for-purpose, and commercially viable from design and construction, throughout its life cycle, to decommissioning, and fulfil the human factors requirements in all phases of its life cycle. It also covers where relevant the supply of maintenance, the control of information and communication for the safe management of the assets within the organisation or with external entities, and the traceability of all necessary information.
SF.4.3	Contractors, partners and suppliers	Refers to the identification and control safety risks arising from outsourced activities, including operations or cooperation with contractors, partners and suppliers. It includes the need for defining the criteria for the selection of the contractors, partners and suppliers and the contract requirements they have to meet. It also includes the need for monitoring the safety performance of all activities and operations of contractors, partners and suppliers to ensure that they comply with the requirements set out in the contract; and their awareness of safety risks they have for the organisation's operations.
SF.4.4	Management of change	Refers to the need for an organisation to implement and control the changes it makes to the safety management system to maintain or improve the safety performance. This includes decisions at the different stages of the change management and the subsequent review of safety risks.
SF.4.5	Emergency management	Refers to the identification of the emergency situations and associated timely measures to be taken to manage them and to re-establish normal operating conditions. It includes all the plans, information and alerts being prepared, updated and continuously available, by internal and other external interested parties. It includes that tests or simulation regularly made, among other to ensure that competent staff are in charge with adequate communication and language skills, and to ensure a rapid and efficient coordination between all RUs, IMs and emergency services.
SF.5	Performance evaluation	A category of systemic factors that allow the monitoring and auditing of implemented processes in relation to objectives, planning and resources, and the reporting of their results, thus making managerial review possible.

Code	Name of the event type	Definitions
SF.5.1	Monitoring	Refers to the arrangements put in place by railway undertakings, infrastructure managers or entities in charge of maintenance to check if their management system is correctly applied and effective. When it is not the case, the organisation must identify, implement and evaluate the effectiveness of the corrective measures. It must also regularly monitor at all levels within the organisation the performance of safety-related tasks and intervene if these tasks are not being properly performed.
SF.5.2	Internal auditing	Refers to the independent, impartial and transparent way of collecting and analysing information for the purpose of an organisation's control activities. It is a systematic and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled. Among other requirements, the organisation needs to put in place a schedule of planned audits, an identification – selection – and training of competent auditors, and for each audit an identification of the need for corrective or improvement measures and their completion and effectiveness.
SF.5.3	Management review	Refers to a specific and regular series of top management activities which consist in reviewing the continuing adequacy and effectiveness of the safety management system. It needs among others to consider the outputs of previous review, the changing internal and external contexts, the organisation's safety performance, and any recommendations for improvement. Based on the outputs of its management review, the top management must take overall responsibility for the planning and implementation of needed changes to the safety management system.
SF.6	Improvement	Category with systemic factors that makes recurrent the activities enhancing the safety performance and ensuring an improvement of the safety management system.

Code	Name of the event type	Definitions
SF.6.1	Learning from accidents and incidents	Refers to the organisation's use of investigation information to review risk assessment, to learn lessons to improve safety and, where appropriate, to take corrective and/or improvement action. This includes the need to report, record, investigate and analyse to determine the causes of accidents and incidents related to the organisation's railway operations. These causes refer to causal factors, contributing factors and systemic factors. This factor also refers to the evaluation and implementation (if appropriate or mandated) of recommendations from the national safety authority, the national investigating body, and from other industry/internal investigations, or relevant reports from other interested parties such as railway undertakings, infrastructure managers, entities in charge of maintenance and railway vehicle keepers.
SF.6.2	Continual improvement	Refers to three series of activities in the context of a safety management system. First, the organisation must continually improve the adequacy and effectiveness of its safety management system. Second, the organisation must provide means to motivating staff and other interested parties to be active in improving safety as part of its organisational learning. And third, it must provide a strategy to continually improve its safety culture, relying on the use of expertise and recognised methods to identify behavioural issues affecting the different parts of the safety management system and to put in place measures to address these.

Table 35 - Reference list for systemic factors

REFERENCE LIST FOR RISK CONTROL MEASURE FUNCTIONS

Code	Name	Definition
<i>Detect</i>		
RCMF.1.0.	None	The risk control measure does not incorporate a detect function.
RCMF.1.1.	Technical system	The risk control measure incorporates a detect function. The detect function consists of an automated system that does not require human intervention in order to operate.
RCMF.1.2.	Human	The risk control measure incorporates a detect function. The detect function consists of an activity to be performed by a human.
<i>Diagnose</i>		
RCMF.2.0.	None	The risk control measure does not incorporate a diagnose function.
RCMF.2.1.	Technical system	The risk control measure incorporates a decision-taking process, to be handled by a technical system.
RCMF.2.2.	Human	The risk control measure incorporates a decision-taking process, to be handled by a human.
<i>Act</i>		

RCMF.3.1.	Technical system	Risk reduction is the direct result of a function assured by a technical system. This does not always need to involve an initiated action. It could also be the case that the mere presence of the technical system results in a risk reduction.
RCMF.3.2.	Human	Risk reduction is the direct result of a function assured by a human.

Table 36 - Reference list for risk control measure functions

Note: If a risk control measure does not contain a detect function, the operator must confirm that fact by reporting *RCMF.1.0. – None* in the required dataset; respectively for the diagnose function and code *RCMF.2.0. – None*. There is no category *None* for the act function, since it is assumed that any risk control measure should at least contain a function acting on the event to which the risk control measure is linked.