

Moving Europe towards a sustainable and safe railway system without frontiers.

IMPLEMENTATION GUIDANCE FOR CSIs

ANNEX I OF DIRECTIVE (EU) 2016/798

Document History

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4	21.05.2015	Implementation guidance to CSIs as in Directive 2014/88/EU endorsed by the Safety Performance WP members on 20.05.2015 (CSIs in 2014/88/EC).
5	18.06.2015	Implementation Guidance on CSIs ERA-GUI-02-2015
6	24.05.2023	Update of the Implementation Guidance on CSIs as agreed within the ERA ESG Task Force on data quality – CSI subgroup (and presented to the CSM ASLP SGA)

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References

<i>N°</i>	<i>Description</i>	<i>Reference</i>	<i>Version</i>
[1]	Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety, as amended.	Directive (EU) 2016/798 (Railway Safety Directive)	Consolidated version 23/10/2020. Amended by Directive (EU) 2020/700 of the European Parliament and of the Council of 25 May 2020 and by Regulation (EU) 2020/1530 of the European Parliament and of the Council of 21 October 2020
[2]	Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004	Regulation (EU) 2016/796 (Agency Regulation)	26 May 2016, repealing Regulation (EC) No 881/2004
[3]	Regulation (EU) 2018/643 of the European Parliament and of the Council of 18 April 2018 on rail transport statistics (recast)	Regulation (EU) 2018/643	2 May 2018
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Table of abbreviations

<i>Abbreviation</i>	<i>Meaning</i>
ATP	Automatic Train Protection
CSIs	Common Safety Indicators
CSTs	Common Safety Targets
EC	European Community
ECM	Entity in charge of maintenance
ERA	European Union Agency for Railways
IMs	Infrastructure Manager(s)
NIBs	National Investigation Body(s)
NSAs	National Safety Authority(s)
NRVs	National Reference Value(s)
RP	Revealed Preference
RUs	Railway Undertaking(s)
SMS	Safety Management System
SP	Stated Preference
SPAD	Signal Passed at Danger
TPS	Train Protection System
TSI	Technical Specification for Interoperability
VPC	Value of Preventing a Casualty
WTP	Willingness to Pay

Table of terms

<i>Term</i>	<i>Definition</i>
Agency	European Union Agency for Railways (ERA)
Glossary	Glossary for transport statistics (ITF, Eurostat, UNECE)
Guidance	the present implementation guidance for Annex 1 and Appendix to Directive (EU) 2016/798 [1]

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0. Introduction

0.1. Purpose

This guidance is not binding as a legal act adopted by the Community. It is intended to neither replace nor complement the legislation in force.

It is intended to be a reference manual for all parties directly or indirectly concerned by the Annex I to the Directive (EU) 2016/798 (and its appendix) [1] (further referred to as “Annex I”), providing further information and examples to facilitate a harmonised collection of CSIs data across the European Union.

The content of this guidance was prepared by the European Union Agency for Railways with the support and endorsement of the expert members of the working group on Safety Performance and was updated with the support of the subgroup on CSIs of the Agency’s Economic Steering Group Task Force on data quality. This document is to be read and used as guidance for the application of Annex I in Member States and is not to be used as their substitute. The guidance aims to facilitate the understanding of the definitions and methodologies described in the Annex I, offering further support by giving additional explanations and examples to NSAs and sector’s players reporting CSIs data to NSAs, as IMs and RUs.

It is to remind, that CSIs primarily concern significant accidents as opposed to the serious accidents reported by National Investigation Bodies (NIBs). Significant accident covers a wider range of events than serious accidents.

Serious accident	Significant accident
(EU) 2016/798	(EU) 2016/798
'serious accident' means any train collision or derailment of trains resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other accident with the same consequences which has an obvious impact on railway safety regulation or the management of safety; 'extensive damage' means damage that can immediately be assessed by the investigating body to cost at least EUR 2 million in total (art. 3.12).	'significant accident' means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots (Appendix of Annex I, section 1.1). Significant damage to stock, track, other installations or environment means damage that is equivalent to EUR 150 000 or more (Appendix of Annex I, section 1.2).
Accident investigation by NIBs (art. 20 and 25)	Reporting of CSIs by NSAs (art. 5 and 19, Annex I)
Within 7 days of the decision to open an investigation, the investigating body shall inform the Agency thereof The investigating body shall send the Agency a copy of the final report referred to in Article 24(2)... (art. 25) The investigating body shall make public the final report in the shortest possible time and normally not later than 12 months after the date of the occurrence (art. 24.2).	National safety authorities shall publish an annual report concerning their activities in the preceding year and send them to the Agency by 30 September. The report shall contain information on: (a) the development of railway safety, including an aggregation at Member State level of the CSIs, in accordance with Article 5(1); (art. 19)

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The guidance is a living document that will be reviewed and, if necessary, updated to reflect the progress of the European legal acts and standards, as well as to reflect the experience derived from the collection of CSIs data over time. The user is invited to consult the website of the Agency for information about the latest available edition of the guidance (www.era.europa.eu).

0.2. Principles for the Guidance

This guidance is prepared with a view to be a single, self-contained document assisting NSAs and CSI practitioners in CSI data classification and reporting. Therefore, to assure usability and to facilitate the reading of this guidance, the Guidance has a specific structure defined as follows:

First, the recital of the legal definition of the given CSI is introduced in a double framed text box (as below).

'CSI name and its definition from Directive (EU) 2016/798'.

Second, any other available relevant legal definition (e.g. TSI) is given in a simple frame text box (as below).

Any other supplementary definition other than Eurostat Glossary on Transport Statistics [3].

Any other supplementary definition available at ITF/Eurostat/UNECE Glossary on Transport Statistics [3].

Third, the text of the guidance is given in a normal text format (as below).

Text of the Guidance to the given CSI.

0.3. Purpose of CSIs reporting

Overall purpose

CSIs are statistics collected at European level with the purpose specified in the Directive (EU) 2016/798 [1]:

"In order to facilitate assessment of the achievement of the CSTs and to provide for the monitoring of the general development of railway safety, Member States shall collect information on CSIs through the annual reports of the national safety authorities referred to in Article 19" (Article 5 of Directive (EU) 2016/798).

CSIs have to provide for the monitoring of the 'general' development of railway safety in the EU Member States. They are not expected to provide the same level of detail as the safety indicators used by NSAs, RUs, IMs, ECMs and other actors at operational level which are tailored to other specific needs.

The purpose of all groups of CSIs (as in Annex I) is explained below:

Indicators relating to accidents

This set of indicators measures railway safety performance in Member States and provides an objective evidence of the development over time within Member States. Accidents data are also used for estimating NRVs, setting CSTs and assessing their achievement.

Taking into account article 35(2) of the Agency Regulation (Regulation EU 2016/796) which provides that ERA 'shall also draw on the data collected by Eurostat and shall cooperate with Eurostat to prevent any duplication of work and to ensure methodological consistency between the CSIs and the indicators used in other modes of transport', on 12/05/2016 a Memorandum of Understanding for the cooperation in Rail Transport Safety Statistics was signed by the Agency and Eurostat. Based on it, every year Common Safety

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Indicators (CSIs) reported by National Safety Authorities are transmitted by ERA to Eurostat (which disseminates them with a clear indication of the source).

Indicators relating to dangerous goods

This set of indicators is used for monitoring the accidents involving transport of dangerous goods that also allows for cross-modal comparison.

It uses the reporting approach and scope adopted in the RID (Regulations concerning the International Carriage of Dangerous Goods by Rail).

Indicators relating to suicides and attempted suicides

Accident statistics are used for setting CSTs, which are expressed in risk acceptance criteria for categories of persons. One of these categories is “trespassers”. Experience in railway statistics shows that data for this category has often been dominated by suicides. A separate collection of data on “suicides” and “trespassers” provides more reliable data and facilitates a fair setting of the CST for the latter category of persons.

Indicators related to precursors of accidents

This set of CSIs is intended to measure at Member State level the number of precursors that may result in the type of accidents “collisions” and “derailments”. The use of this set of CSIs for comparing Member States is judged inappropriate, since a higher number of a certain type of precursor in a Member State might be explained by a better detection of this type of events than in other Member States.

Indicators to calculate the economic impact of accidents

Facilitating the optimisation of safety investments

Railway safety is one aspect of transport service quality delivered to passengers, employees and third parties. When managing safety, railways have to live with the fact that economic resources are limited. In order to maximise the effectiveness of actions, it is therefore essential to be aware of the economic impact of accidents on society, as well as of costs and benefits to reduce this impact. The cost of accident prevention is a benefit of this reasoning; the proposed CSIs will allow calculation of this benefit since they represent the economic impact of accidents on society.

This set of indicators will also facilitate the economic impact assessment of CSTs.

Towards a sustainable safety performance

Customers of the railway system consider safety as one of the elements (together with price, travelling time, punctuality, comfort, etc.) to be taken into account when choosing a transport mode for their travels. There is a safety performance that society is willing to pay for and which we can define as a “safety performance economically sustainable for society”. The CSIs for the calculation of the economic impact of accidents facilitate the identification of this safety performance, which represents a sort of economic optimum for society.

Indicators related to technical safety of infrastructure and its implementation

This set of indicators is a support for understanding safety performance in Member States with reference to collisions of trains, derailments and level crossing accidents.

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0.4. Reporting of CSIs

General requirements on reporting CSI statistics are described in the Directive (EU) 2016/798 [1], Art.5(1): *“Member States shall collect information on CSIs through the annual reports of the national safety authorities referred to in Article 19”*. According to Art. 19.1, then, *“the report shall contain information on: (a) the development of railway safety, including an aggregation at Member State level of the CSIs, in accordance with Article 5(1).”*

This should be understood as “reported as part of the annual reports of NSAs”, since the specific delivery document format makes it more practicable to deliver the CSI data report and NSA annual report separately in practice.

Specific requirements on CSI statistics reported are defined in the Annex I to the Directive (EU) 2016/798 [1].

The scope of CSI data reporting corresponds to the geographical scope of the reporting NSA. This means that RUs and IMs must report to NSAs the CSI data related to the operation of railway vehicles at the national level.

Whenever the Annex I lists several values for reporting, then those values should be reported separately.

Example: *“Total and relative (to train-kilometres) number of suicides and attempted suicides”* means that the two values should be reported separately.

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Guidance for Common Safety Indicators in Appendix of the Annex I to the Directive (EU) 2016/798,

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1. Indicators relating to accidents

RSD Art.3 (11) ‘accident’ means an unwanted or unintended sudden event or a specific chain of such events which have harmful consequences; accidents are divided into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others;

1.1 Significant accident

RSD Appendix point 1.1. “significant accident” means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots;

The events to be reported under the group of CSIs “Indicators relating to accidents” shall meet the definition of the significant accident, which is legally determined as follows:

- ‘accident’, laid down in Article 3 of Directive (EU) 2016/798;
- ‘significant accident’, laid down in the Appendix to Annex I (section 1.1);
- ‘significant damage to stock, track, other installations or environment’, laid down in the Appendix to Annex I (section 1.2)
- ‘extensive disruptions to traffic’, laid down in the Appendix to Annex I (section 1.3);

According to these definitions, an event to be reported under the “Indicators relating to accidents”:

- ✓ is to be unwanted or unintended; this excludes vandalism and terrorism acts. For the specific case of suicide please see 3.1.
- ✓ is related to a railway vehicle “in motion”;
- ✓ has to cause at least:
 - one killed person;
 - or seriously injured person,
 - or damage to stock, track, other installations or environment that is equivalent to EUR 150 000 or more;
 - or train services on a main railway line suspended for six hours or more;
- ✓ has not to occur in workshops, warehouses and depots.

A rolling stock is in motion when its absolute speed is different than 0 m/s. CSIs statistics are related to rolling stock in motion only, the exceptions to this criterion are laid down in the definition of “accident involving the transport of dangerous goods” (see the Appendix to Annex I, section 1.9) and “fires to rolling stock” (see the Appendix to Annex I, section 1.10).

Significant damage: any costs incurred in connection with the material damage should be considered, even if covered by a third party such as insurance company. All damages incurred to third parties should be included.

Even if an accident or a precursor to it that occurs within workshops, warehouses and depots creates a danger to vehicles on the mainline, it should be excluded from reporting (e.g. SPAD).

Boundary of the workshop, warehouses, depots and sidings (1.1)

The boundary is the point at which the railway vehicle leaving the workshop/warehouse/depot/sidings cannot pass without having an authorization to access the mainline or other similar line. This point is usually identified by a signal. Accidents in freight terminals are only included if they involve running trains.

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1.2 Significant damage

RSD Appendix point 1.2 “significant damage to stock, track, other installations or environment” means damage that is equivalent to EUR 150 000 or more;

If the accident results in a material damage only, its estimated amount should be based only on those elements consequential to the accident involving rolling stock in motion. (E.g.: A train running into a landslip at low speed causing little damage and no casualties; the costs associated with the clearing and re-opening of the line can be high, but they are not associated with the collision itself, therefore they should not be included.)

1.3 Extensive disruption to traffic

RSD Appendix point 1.3 “extensive disruptions to traffic” means that train services on a main railway line are suspended for six hours or more.

The section of the main railway line must be closed to normal operation for a continued period of six hours or more, even if trains are diverted via other lines.

Main railway lines comprise the high speed railway lines and important major conventional railway lines as defined by national or international authorities.

It is however recommended to consider here all railway lines on the national territory used for running trains.

Operation of railway vehicles for the purpose of either rescuing people or restoring service does not affect the threshold. If only one track of a multiple-track line is closed and train services on the other track(s) can continue, this event shall not be included.

Suspension of traffic not due to the accident should be excluded.

1.4 Train

RSD Appendix point 1.4 “train” means one or more railway vehicles hauled by one or more locomotives or railcars, or one railcar travelling alone, running under a given number or specific designation from an initial fixed point to a terminal fixed point, including a light engine, i.e. a locomotive travelling on its own

Also maintenance vehicles such as road-rail vehicle, on-track machine, tamper, rail-mounted maintenance machine shall be considered as a train if they comply with the requirements above.

1.5 Collision of train with rail vehicle

RSD Appendix point 1.5 “collision of train with rail vehicle” means 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;

A collision that results in a derailment is counted as a collision. Collisions between shunting rolling stock/maintenance machines are classified as type of accident “others”.

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Note: For the CSIs, the classification of an event may depend on whether the train or other rail vehicle is involved, as summarized in the table below.

Where a <u>train</u> is involved	Where the accident involves <u>other rail vehicles</u>
Derailment	Other
Collision	Other
Level crossing accident	Level crossing accident
Person hit by rolling stock in motion	Person hit by rolling stock in motion
Fire	Fire
Other	Other
SPAD	(not reported)

1.6 Collision of train with obstacle within the clearance gauge

RSD Appendix point 1.6 “collision of train with obstacle within the clearance gauge” means 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;

For the purpose of these statistics, animals are counted as objects. Collisions against objects lost by a crossing vehicle/user at a level crossing are classified as a level crossing accident. Collisions purposefully caused by applying safety procedures in response to an emergency are to be classified as “others”.

Non-exhaustive list of fixed objects:

- *buffer stops;*
- *(part of) infrastructure (equipment) within clearance gauge*

All tear-downs of overhead contact lines by a train should be regarded as collisions with overhead contact lines.

Non exhaustive list of temporarily present objects:

- *rocks;*
- *landslides;*
- *trees;*
- *lost parts of railway vehicles;*
- *lost or displaced loads;*
- *vehicles and machines or equipment for track maintenance.*

1.7 Derailment of train

RSD Appendix point 1.7 “derailment of train” means any case in which at least one wheel of a train leaves the rails;

Re-rail cases (if the accidents are significant) are to be included; derailments purposefully caused by applying safety procedures in response to an emergency are to be classified as “others”. Derailment of shunting rolling stock/maintenance machines/vehicles are classified as “others”. Collisions against rolling stock/obstacles followed by a derailment are not included, these events are classified as collisions.

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1.8 Level crossing accident

RSD Appendix point 1.8 “level crossing accident” means any accident at level crossings involving at least one railway vehicle and one or more crossing vehicles, other crossing users such as pedestrians or other objects temporarily present on or near the track if lost by a crossing vehicle or user;

Collisions with objects on level crossings are classified as collisions, not as level crossing accidents, except when the obstacle has been lost by a crossing user or has fallen from a non-railway vehicle using the crossing.

Collisions with animals under supervision at a level crossing should be included. Collision with wild animals and animals not under supervision occurring on a level crossing should be included under train collisions or other accidents (depending on the rail vehicle involved).

Crossing users include all persons in or on vehicles, motorized or not, and pedestrians. For definition of level crossing see 6.3 and for the definition of passage see 6.5.

1.9 Accident to person involving rolling stock in motion

RSD Appendix point 1.9 “accident to persons involving rolling stock in motion” means 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;

The following non exhaustive list of events is included:

- *Persons using passages between platforms and struck by a train;*
- *Persons falling from trains*

In addition, the following cases are excluded:

- *Events at level crossings related to the use of the crossing (which are classified as level crossing accidents);*
- *Persons travelling on trains that are seriously injured or die due to natural causes (e.g. heart attack);*
- *Persons travelling on trains that are seriously injured or killed when the vehicle is not in motion*

Persons hit by a train on a passage between platforms are classified as “others not at a platform” if authorised, otherwise as “trespasser”.

1.10 Fire in rolling stock

RSD Appendix point 1.10 “fire in rolling stock” means 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-marshalling operations;

Fires that started when a rail vehicle was not in motion are included.

Re-marshalling operations are operations carried out between the departure station and the destination.

Smoke, heat or blast resulting from fire or explosions leading to a significant accident should also be included.

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1.11 Other (accident)

RSD Appendix point 1.11 “other (accident)” means any accident other than a collision of train with rail vehicle, collision of train with obstacle within the clearance gauge, derailment of train, level crossing accident, an accident to person involving rolling stock in motion or a fire in rolling stock;

The main cases belonging to this category should be:

- Collisions and derailments of shunting rolling stock/maintenance machines; including those on tracks closed for maintenance operations;
- Collisions and derailments purposefully caused by applying safety procedures in response to an emergency (e.g. application of a derailer in an emergency case);
- Dangerous goods release during transport;
- Objects projected by trains, like ballast, ice, etc.;
- Electrocuting related to rolling stock in motion

1.12 Passenger

RSD Appendix point 1.12 “passenger” means any person, excluding a member of the train crew, who makes a trip by rail, including a passenger trying to embark onto or disembark from a moving train for accident statistics only.

A passenger is a person, other than workforce, who is on board a train or in the act of boarding or alighting from a train. A passenger dying after jumping from a running train, with the intention to commit a suicide should be classified as a suicide.

Where involved in accidents, people other than workforce crossing the track at stations are classified as follows:

- “trespassers” if they are not authorised to cross;
- as “others” if authorised.

In addition, the following cases are classified as passengers:

- persons who fall between the train and the platform while boarding or alighting from a ‘standing train’ and the train departs unaware of their presence;
- persons other than workforce in driving cabs without authorisation.

1.13 Employee or contractor

RSD Appendix point 1.13 “employee or contractor” means any person whose employment is in connection with a railway and is at work at the time of the accident, including the staff of contractors, self-employed contractors, the crew of the train and persons handling rolling stock and infrastructure installations;

Sub-contractors should be regarded as contractors.

1.14 Level crossing user

RSD Appendix point 1.14 “level crossing user” means any person using a level crossing to cross the railway line by any means of transport or by foot;

Pedestrians are included.

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Pedestrian: Included are occupants or persons pushing or pulling a child's carriage, an invalid chair, or any other small vehicle without an engine. Also included are persons pushing a cycle, moped, roller-skating, skateboarding, skiing or using a similar device.

1.15 Trespasser

RSD Appendix point 1.15 "trespasser" means any person present on railway premises where such presence is forbidden, with the exception of a level crossing user;

The definition makes reference to persons other than workforce trespassing on the railway, both at platforms and not at platforms, where this is forbidden. Train surfers are included (train surfer is a person intentionally riding or climbing on the outside of the train). Persons referred to in section 1.14 are excluded.

1.16 Other person at platform

RSD Appendix point 1.16 "other person at a platform" means any person at a railway platform who is not defined as "passenger", "employee or contractor", "level crossing user", "other person not at a platform" or "trespasser";

Cases included:

- *Person standing on a platform:*
 - *Struck by an open train door or other out of gauge item;*
 - *Struck by an item fallen from a train;*
 - *Infringing the normal kinematic envelope of a train and struck by the train;*
- *Person who falls from a platform and is struck by a train;*
- *Person other than workforce authorised to cross railways between platforms and struck by a train*

Please note that persons boarding or alighting from moving trains are classified as passengers. Events related to persons boarding or alighting from standing trains are not to be reported.

1.17 Other person not at a platform

RSD Appendix point 1.17 "other person not at a platform" means any person not at a railway platform who is not defined as "passenger", "employee or contractor", "level crossing user", "other person at a platform" or "trespasser";

Cases included:

- *Person in a road vehicle that impinges on the railway (not a level crossings) and is struck by a train;*
- *Person outside the railway struck by*
 - *a derailed train;*
 - *an object fallen from a train;*

1.18 Death (killed person)

RSD Appendix point 1.18 "death (killed person)" means any person killed immediately or dying within 30 days as a result of an accident, excluding any suicide.

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1.19 Injury (seriously injured person)

RSD Appendix point 1.19 “serious injury (seriously injured person)” means any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding any attempted suicide.

All admissions to the hospital when the person does not leave the hospital within at least 24 hours should be included.

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2 Indicators relating to dangerous goods

RSD Annex I point 2 Indicators relating to dangerous goods

Total and relative (to train-kilometres) number of accidents involving the transport of dangerous goods divided into the following categories:

- accidents involving at least one railway vehicle transporting dangerous goods, as defined in the Appendix,*
- number of such accidents in which dangerous goods are released.*

2.1 Accident involving the transport of dangerous goods

RSD Appendix point 2.1 “accident involving the transport of dangerous goods” means any accident or incident that is subject to reporting in accordance with RID/ADR section 1.8.5.

As a result of the application of the RID/ADR, the occurrences (accidents and incidents) meeting the criteria specified thereafter are subject of reporting. This means that accidents not meeting the definition/criteria of a significant accident may also have to be included.

By application of RID 1.8.5, only accidents and incidents “with imminent risk of loss of product” are reported under “accidents involving at least one railway vehicle transporting dangerous goods” in which dangerous goods were not released.

2.2 Dangerous goods

RSD Appendix point 2.2 “dangerous goods” means those substances and articles the carriage of which is prohibited by RID, or authorised only under the conditions prescribed therein.

Accidents subject to report according to the RID (1.8.5: Notifications of occurrences involving dangerous goods)

An occurrence subject to report in accordance with 1.8.5.1 has occurred if dangerous goods were released or if there was an imminent risk of loss of product, if personal injury, material or environmental damage occurred, or if the authorities were involved and one or more of the following criteria has/have been met:

Personal injury means an occurrence in which death or injury directly relating to the dangerous goods carried has occurred, and where the injury

- (a) requires intensive medical treatment,*
- (b) requires a stay in hospital of at least one day, or*
- (c) results in the inability to work for at least three consecutive days.*

Loss of product means the release of dangerous goods

- (a) of transport category 0* or 1* in quantities of 50 kg / 50 l or more,*
- (b) of transport category 2* in quantities of 333 kg / 333 l or more, or*
- (c) of transport category 3* or 4* in quantities of 1 000 kg / 1 000 l or more.*

**) see RID 1.1.3.6.3 for more guidance.*

The loss of product criterion also applies if there was an imminent risk of loss of product in the above-mentioned quantities. As a rule, this has to be assumed if, owing to structural damage, the means of containment is no longer suitable for further carriage or if, for any other reason, a sufficient level of safety is no longer ensured (e.g. owing to distortion of tanks or containers, overturning of a tank or fire in the immediate vicinity).

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If dangerous goods of Class 6.2 are involved, the obligation to report applies without quantity limitation.

In occurrences involving radioactive material, the criteria for loss of product are:

- (a) Any release of radioactive material from the packages;*
- (b) Exposure leading to a breach of the limits set out in the regulations for protection of workers and members of the public against ionizing radiation ("Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards", IAEA Safety Standard Series No. GSR Part 3, IAEA, Vienna (2014)); or*
- (c) Where there is reason to believe that there has been a significant degradation in any package safety function (containment, shielding, thermal protection or criticality) that may have rendered the package unsuitable for continued carriage without additional safety measures.*

NOTE: See the requirements of 7.5.11 CW33 (6) for undeliverable consignments.

Material damage or environmental damage means the release of dangerous goods, irrespective of the quantity, where the estimated amount of damage exceeds 50,000 Euros. Damage to any directly involved means of carriage containing dangerous goods and to the modal infrastructure shall not be taken into account for this purpose.

Involvement of authorities means the direct involvement of the authorities or emergency services during the occurrence involving dangerous goods and the evacuation of persons or closure of public traffic routes (roads/railways) for at least three hours owing to the danger posed by the dangerous goods.

Note that the RSD threshold for the significant damage is 150,000€ (both internal and external damage).

An accident involving dangerous goods resulting in external damage of less than 50,000€, is not reported. An accident involving dangerous goods with external damage between 50,000€ to 150,000€, is reported as an accident involving dangerous goods. A significant accident involving dangerous goods with external damage over 150,000€ should be reported twice: as a significant accident and as an accident involving dangerous goods. Each accident with damage (both internal and external) exceeding 150,000€ is to be reported as significant accident.

Reportable under / Damage value (external damage)	Release or imminent loss of product (RID)	Accident involving DG (Annex I - 2)	Significant accident (Annex I - 1.1)
less than 50,000 €	Yes	No	No
	No	No	No
between 50,000 and 150,000 €	Yes	Yes	No
	No	No	No
over 150,000€	Yes	Yes	Yes
	No	No	Yes

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3 Indicators relating to suicides and attempted suicides

3.1 Suicide

RSD Appendix point 3.1 "suicide" means an act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority.

Designation of individual suicide must be determined by a coroner, public police officer or other public authority independent from RU/IM. In the absence of above, the Ovenstone criteria should be applied (see open verdicts below).

Attempted suicide as an act of deliberately injuring oneself (not leading to the death) is excluded.

Only the death of the individual(s) who committed suicide is to be reported as suicide. Therefore, a fatality caused to a person by another person who committed suicide or who attempted to commit suicide is not to be reported as a suicide.

Involuntary victims

Should suicides or attempted suicides result in the injury/death of other people not wishing to commit suicide, such deaths and injuries will be reported within the CSIs under indicators relating to accidents, according to the categories of persons involved. The exception to this rule is a passenger of a vehicle driven by a person committing suicide at level crossing. Suicides and suicide attempts are to be reported under the suicide events.

For the years when at least one suicide or attempted suicide resulted in involuntary victims, the National Safety Authorities are invited to:

- Report the occurrences under persons killed or seriously injured in accidents;
- Classify them as collisions, derailments, level crossing accidents, accidents caused by rolling stock in motion, fires or others;
- Specify in a footnote to their annual report on safety how many events were due to suicides.

E.g.: should a suicide by car at a level crossing result in the death/injury of people on board a train, these will be classified as killed/injured passengers or employees in a level crossing accident. The car driver will be classified as a suicide. However, other occupants of the car not wanting to commit suicide will not be reported in the CSI statistics; this event is to be considered a murder and outside the scope of the CSIs, even if it meets the cost or disruption criteria for a significant accident.

Open verdicts

Every year, the competent national authority will classify N_s number of suicides, N_u killed trespassers and leave N_x open verdicts, the latter when they appraise there was insufficient evidence to conclude that an event was a suicide or not.

One of the following three methods should be used to classify open verdicts:

1) The Ovenstone criteria (recommended):

Each of the following, on its own, may be treated as evidence of suspected suicide:

- *Suicide note;*
- *Clear statement of suicidal intent to an informant;*

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- *Behaviour demonstrates suicidal intent;*
- *Previous suicide attempts;*
- *Prolonged depression;*
- *Instability; that is, a marked emotional reaction to recent stress or evidence of failure to cope (such as a breakdown).*

2) N_x are to be considered as trespassers

NSAs would report to ERA:

- *Number of killed trespassers = $N_u + N_x$*
- *Number of suicides = N_s*

3) The ratio N_s / N_u applies to N_x

NSAs would report to ERA:

- *Number of killed trespassers = $N_u + N_x * [N_u / (N_u + N_s)]$*
- *Number of suicides = $N_s + N_x * [N_s / (N_u + N_s)]$*

3.2 Attempted suicide

RSD Appendix point 3.2 "Attempted suicide" means an act to deliberately injure oneself resulting in serious injury.

The same methods and criteria apply as for suicides with the difference of the outcome (serious injury instead of fatality).

The number of attempted suicides shall be reported separately from the number of suicides (see 0.4).

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4 Indicators related to precursors of accidents

All precursors are to be reported, both resulting and not resulting in accidents. Precursors resulting in an accident shall be reported under the CSIs on precursors; the accidents that occurred, if significant, shall be reported under the CSIs on accidents referred to in heading 1.

The geographical scope of reporting is identical to that of significant accidents, as described under 1.1.

Broken wheels, axles identified as a part of a planned maintenance (diagnosis) should not be included. Broken rails and track buckles should always be included regardless the detection mode and time.

4.1 Broken rail

RSD Appendix point 4.1 "broken rail" means 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.

Fracture of a rail, failure of a weld and failure of a fish-plate assembly are included.

Both track rails and rails in switches and crossing noses (frogs) are included.

Failures at fishplate are also included.

4.2 Track buckles and other track misalignment

RSD Appendix point 4.2 "track buckles and other track misalignment" means any fault related to the continuum and the geometry of track, requiring track to be placed out of service or immediate reduction of permitted speed.

If the decision is taken to reduce the speed in a section with several consecutive buckles, one track buckle should be counted.

4.3 Wrong side signalling failure

RSD Appendix point 4.3 "wrong side signalling failure" means any technical failure of a signalling system (either to infrastructure or to rolling stock), resulting in signalling information less restrictive than that demanded.

Wrong side signalling failure refers to signalling system technical failures. It describes a failure condition in a piece of railway signalling equipment that results in an unsafe state.

The following non-exhaustive list of events is to be included (if related to the technical failure of a signalling system):

- ✓ a green light aspect presented instead of an indication at danger, signal warning to slow down, caution signal announcing a stop signal or a speed restriction signal;
- ✓ any signal less restrictive than a stop signal that is presented instead of a stop signal;
- ✓ the presentation failure of a distant signal announcing a stop signal or a speed restriction signal;
- ✓ speed restriction signals/panels wrongly removed and not replaced after maintenance works;
- ✓ Incorrect detection of points;
- ✓ Less restrictive information transmitted to driver cab via train-protection-system.

The following events are to be excluded:

- ✓ Malfunctions of the interlocking which do not lead to information less restrictive than a stop; e.g.

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automatic release of route locking before the train has left the section concerned;

- ✓ *Malfunctions related to degraded modes.*
- ✓ *Track circuits not operating (e.g. due to leaf mulch/contamination)*

4.4 Signal passed at danger (SPAD) when passing a danger point

RSD Appendix point 4.4 "Signal Passed at Danger when passing a danger point" means any occasion when any part of a train proceeds beyond its authorised movement and travels beyond the danger point;

Danger point is a point at which the train will be in a danger of an accident (collision, level-crossing accident, accident to person caused by rolling stock in motion or derailment). It is usually defined in the specifications of the Train Protection System.

A failure to stop a train at a station where prescribed in the timetable does not itself qualify for a SPAD, since it does not constitute an obstacle for an authorized movement of a train.

4.5 Signal passed at danger (SPAD) without passing a danger point

RSD Appendix point 4.5 "Signal Passed at Danger without passing a danger point" means any occasion when any part of a train proceeds beyond its authorised movement but does not travel beyond the danger point.

Unauthorised movement as referred to in points 4.4 and 4.5 above means to pass:

- *a trackside colour light signal or semaphore at danger, or an order to STOP where a Train Protection system (TPS) is not operational,*
- *the end of a safety related movement authority provided in a TPS,*
- *a point communicated by verbal or written authorisation laid down in regulations,*
- *stop boards (buffer stops are not included) or hand signals.*

Any case in which a vehicle without any traction unit attached or a train that is unattended runs away past a signal at danger is not included. Any case in which, for any reason, the signal is not turned to danger in time to allow the driver to stop the train before the signal is not included.

National safety authorities may report separately on the four indices of unauthorised movement listed in the indents in this point and shall report at least an aggregate indicator containing data on all four items indices.

If the signal on an ATP line is at the same time the end of the safety related movement authority, the SPAD occurring on that line should be counted.

Stop markers (see Annex 2) only indicating where to stop within the boundaries of authorized movement, typically introduced for the convenience of passengers, should not be considered as stop boards.

4.6 Broken wheel on rolling stock in service

RSD Appendix point 4.6 "broken wheel on rolling stock in service" means a break affecting the wheel and creating a risk of accident (derailment or collision).

The number of broken wheels should include:

- ✓ Defects - Fractures (complete separation of the material) having caused an accident;
- ✓ Defects - Fractures or cracks identified during pre-departure checks of a severity to exclude the rolling stock from running;
- ✓ Defects - Fractures or cracks detected on the wheel of train-sets in operation of a severity to exclude the rolling stock from running;

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Defects - Fractures or cracks detected in workshops during planned maintenance operations should be excluded.

4.7 Broken axle on rolling stock in service

RSD Appendix point 4.7 "broken axle on rolling stock in service" means a break affecting the axle and creating a risk of accident (derailment or collision).

The number of broken axle should include:

- ✓ Defects - Fractures (complete separation of the material) having caused an accident;
- ✓ Defects - Fractures or cracks identified during pre-departure checks of a severity to exclude the rolling stock from running;
- ✓ Defects - Fractures or cracks detected on the essential parts of the axle of train-sets in operation of a severity to exclude the rolling stock from running;

Defects - Fractures or cracks detected in workshops during planned maintenance operations should be excluded.

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5 Common methodologies to calculate the economic impact of accidents

Indicators to calculate the economic impact of accidents

National safety authorities shall report the economic impact of significant accidents.

Unit of measurement

All values of indicators allowing for calculation of economic impacts of accidents should be given in EUR. For conversion from national currencies, a cumulative annual average exchange rate produced by the European or National Central bank should be used.¹

5.1 Value of Preventing a Casualty (VPC)

RSD Appendix point 5.1 The Value of Preventing a Casualty (VPC) is composed of:

- 1) Value of safety per se: Willingness to Pay (WTP) values based on stated preference studies carried out in the Member State for which they are applied.*
 - 2) Direct and indirect economic costs: cost values appraised in the Member State, composed of:*
 - medical and rehabilitation cost,*
 - legal court cost, cost for police, private crash investigations, the emergency service and administrative costs of insurance,*
 - production losses: value to society of goods and services that could have been produced by the person if the accident had not occurred.*
- When calculating the costs of casualties, fatalities and serious injuries shall be considered separately (different VPC for fatality and serious injury).*

Definition

By VPC we mean the value of preventing a fatality or a serious injury.

The Value of Preventing a Fatality (VPF) is a common concept in economic analysis, the Oxford University has provided the following definition:

“The VPF is aggregate willingness to pay for typically very small reductions in individual risk of death (which, realistically, is what most safety improvements actually offer at the individual level). This reflects people’s normal approach to risks which they face in everyday life, where they trade off cost or convenience against real, but very small, risks”.²

This definition also applies to the value of preventing a serious injury, which is therefore the willingness to pay for typically very small reductions in individual risk of serious injury.

Relevance to public policy

The relevance of valuing improved safety should be seen in the context of formulation of public policy actions with limited budget resources. In this case it becomes necessary to prioritise across the different actions in order to select those initiatives that ensure value for money and efficient allocation of resources. This process can be aided by using a common metric for the impacts (positive and negative) of each action and one pertinent metric is monetary based values. In this context, safety improvements, notably reduced

¹ See also Eurostat, Conversion factors for euro fixed series into euro/ECU - Annual data (ert_bil_conv_a)

² Definition of VPF & the Impact of Societal Concerns, by Oxford Risk Research and Analysis – Rail Safety Standards Board, 30 January 2006.

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risk of mortality, requires a monetary value. This monetary value of mortality risk reduction is commonly referred as the 'VPF'. Indeed this value reflects the monetary value of a small reduction in mortality risk among a population that would prevent one statistical death. It does not reflect the value assigned to saving one identified life.

The need for monetary values of mortality risk reductions in the case of public transport safety is put forward in the aforementioned research report by Oxford Risk Research and Analysis for the UK Rail Safety Standards Board (ORRA, 2006):

“Given that members of the public not only stand to benefit from an improved level of public transport safety, but also ultimately have to pay for it (e.g. through fares and/or taxation) – and therefore have to forego some alternative goods that they could otherwise spend that money on – what is needed is a monetary measure of the value of the benefit which can be compared with the costs of providing it”.

Fall back values for the VPC

Same text as reported under 5.1

National values should be used where possible, provided that they have been developed using the Stated Preference (SP) methodology depicted in § 5.2. If such values are not available, the values provided in values in Table 1 and Table 3 may be used. Table 3 values are reported from the 'Handbook on the External Costs of Transport' 2019³; these are WTP values based on studies carried out in the country for which they are applied.

Table 1 below reports the total external accident costs per casualty in € for 2016 (i.e. sum of the four costs components in the columns of Table 3). These values should not be used as given but updated annually with (real) GDP per capita values. The values are to be updated by Member States annually by linear increase of the growth of (real) Gross Domestic Product (GDP) per capita (reference year 2016).

Table 1 - Fall back values for the Value of Preventing a Casualty (€ 2016)

Country	Fatality	Serious Injury	Slight injury
Austria	3,601,014	569,387	43,974
Belgium	3,582,968	550,056	42,488
Bulgaria	1,728,479	242,133	18,703
Croatia	2,541,972	355,636	27,459
Czech Republic	3,028,481	428,346	33,055
Denmark	3,988,844	622,286	48,084
Estonia	2,921,585	416,085	32,124
Finland	3,248,716	517,252	39,987
France	3,122,352	486,856	37,628
Germany	3,455,179	539,346	41,660
Greece	2,326,951	356,127	27,527

³ CE DELFT for European Commission, Directorate-General for Mobility and Transport. Essen, H., Fiorello, D., El Beyrouty, K., et al., "Handbook on the external costs of transport : version 2019 – 1.1", Publications Office, 2020. NB: The definition of 'severe injury' in that report/study is equivalent to 'serious injury' according to the Appendix to Annex I, section 1.19.

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Hungary	2,761,351	383,034	29,559
Ireland	5,085,099	747,910	57,709
Italy	3,248,106	501,498	38,735
Latvia	2,338,370	337,234	26,049
Lithuania	2,697,114	389,643	30,071
Luxembourg	6,491,289	996,412	76,843
Netherlands	3,550,348	543,938	42,020
Norway	3,402,766	573,324	44,341
Poland	2,412,823	341,458	26,356
Portugal	2,541,032	385,934	29,815
Romania	2,443,038	339,588	26,203
Slovakia	2,846,309	404,481	31,222
Slovenia	2,425,302	364,655	28,182
Spain	3,019,875	458,207	35,392
Sweden	3,296,192	520,782	40,270
Switzerland	4,422,265	759,440	58,666
United Kingdom	2,873,899	481,459	37,222
EU average	3,273,910	498,591	38,514

Note that these values should not be used as given but updated annually with (real) GDP per capita values. They should be taken from the EUROSTAT database of EU statistics.

5.2 Methods to calculate the VPC

RSD Appendix point 5.2 Common principles to appraise value of safety per se and direct/indirect economic costs:

For the value of safety per se, the assessment of whether available estimates are appropriate or not shall be based on the following considerations:

- *estimates shall relate to a system for valuation of mortality risk reduction in the transport sector and follow a WTP approach according to stated preference methods,*
- *the respondent sample used for the values shall be representative of the population concerned. In particular, the sample has to reflect the age/income distribution along with other relevant socioeconomic and/or demographic characteristics of the population,*
- *method for eliciting WTP values: survey design shall be such that questions are clear/meaningful to respondents.*

Direct and indirect economic costs shall be appraised on the basis of the real costs borne by society.

Various approaches to derive values for VPC are available; it is usually described the safety situation for a given transport mode and then it is asked for the WTP of the respondents with respect to a public action or a product that changes the level of safety by a given percentage.

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It is advised to apply the so called Stated Preference (SP) methods⁴, which use hypothetical market scenarios and are appropriate to apply when information about decision alternatives and their consequences on individuals is limited, or data from existing markets are not available.

In SP methods, questionnaires are presented to individuals, in which they are asked directly or indirectly how much they are willing to pay for safety. One of the main advantages is that the SP method is not dependent on information on actual consumer behaviour. Consumers are usually not fully aware of the risk reduction resulting from safety devices and SP allows for the provision of this information, helping respondents to understand (small) risk reductions in the correct manner.

The main advantage of this approach is its flexibility to allow the analysis to be tailored to the specific information requirements, regarding the risk area involved and the policy action in question.

The main disadvantage is that the SP methods are all based on hypothetical choices. This highlights the requirement to assure that the choices presented to the respondents are meaningful and understandable. Otherwise, the risk is that WTP values do not reflect preferences but rather guesses, given the hypothetical character of the analysis. Survey design and information correctly perceived by the participants in such surveys are critical. One particular problem mentioned in the literature is the so-called scale insensitivity. In this case respondents would report the same WTP for a larger safety improvement as for a smaller improvement. By using effective visual aids and by training the respondents in trading wealth for safety, scale sensitivity in line with the theoretical predictions can be reached⁵.

Advice to identify a representative sample to calculate the VPC

Same text as reported under 5.2

The sample of respondents to be used for establishing the values should be representative of the population concerned. In particular, the sample should reflect the age / income distribution along with other relevant socio-economic / demographic characteristics of the population. This aspect is of importance in order to avoid biases in the estimated VPC value.

The identification of a representative sample of a population can be based on available state-of-the-art approaches for sampling statistics⁶. Key issues in the process to obtain a representative sample are:

- Defining the population of concern
- Sampling method
- Sample size

For the calculation of VPC the population of concern is the entire population as each person is at risk of being involved in a railway accident. From the entire population the representative sample should be drawn to ensure that the sample reflects all ages and socio economic groups.

⁴ Empirical VPC estimates have been derived using another methodology as well, the Revealed Preference (RP) methods, which derive the estimates on the basis of the actual choices by individuals in existing markets (i.e. valuing risk reductions on the basis of actual behaviour, such as through the purchasing decisions of safety provisions e.g. airbags, seatbelts). As consumers are usually not fully aware of the risk reduction resulting from safety devices, SP provides an edge over RP. A disadvantage with revealed preference studies is the difficulty to find a distinctive traffic safety product on the market; this means that those markets where safety may enter into the consumer choice decision, other non-safety related factors will also be taken into consideration.

⁵ Andersson (2007)

⁶ see e.g. Sampling of Populations: Methods and Applications (Wiley Series in Survey Methodology), by Paul S. Levy and Stanley Lemeshow, 2008 edition.

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For the calculation of VPC based on SP surveys, the sampling method may be based on different approaches. In particular, random sampling, also known as probability sampling, is a useful approach to ensure representativeness. For sample size determination, statistical theory yields exact recommendations on sample size if the population and frame is identical. In particular, with a decision on the desired sampling error the sample size can be calculated. Generally, the lower the desired sampling error is the larger the sample.

5.3 Definition of ‘cost of damages to environment’

RSD Appendix point 5.3.1 “Cost of damages to environment” means costs that are to be met by Railway Undertakings and Infrastructure Managers, appraised on the basis of their experience, in order to restore the damaged area to its state before the railway accident.

The main cases belonging to this category should be:

- Pollution of an area by liquid, solid or gas release of goods.
- Material damages to an area (e.g. trees pulled down by rolling stock in motion)
- Fires in an area inside or outside the railway premises (e.g. fires of trees caused by rolling stock in motion)

5.4 Cost of material damage to rolling stock or infrastructure

RSD Appendix point 5.3.2 “Cost of material damage to rolling stock or infrastructure” means the cost of providing new rolling stock or infrastructure, with the same functionalities and technical parameters as that damaged beyond repair, and the cost of restoring repairable rolling stock or infrastructure to its state before the accident, to be estimated by Railway Undertakings and Infrastructure Managers on the basis of their experience, including also costs related to the leasing rolling stock, as a consequence of non-availability due to damaged vehicles.

5.5 Cost of delays as a consequence of accidents and methods to calculate the Value of Time (VT)

RSD Appendix point 5.3.3 “Cost of delays as a consequence of accidents” means the monetary value of delays incurred by users of rail transport (passengers and freight customers) as a consequence of accidents, calculated by the following model:

VT = monetary value of travel time savings

Value of time for a passenger of a train (an hour)

*$VT_P = [VT \text{ of work passengers}] * [\text{Average percentage of work passengers per year}] + [VT \text{ of non-work passengers}] * [\text{Average percentage of non-work passengers per year}]$*

VT_P is measured in EUR per passenger per hour

‘Work passenger’ means a passenger travelling in connection with professional activities excluding commuting.

Value of time for a freight train (an hour)

*$VT_F = [VT \text{ of freight trains}] * [(Tonne-Km) / (Freight Train-Km)]$*

VT is measured in EUR per freight tonne per hour

Average tonnes of goods transported per train in one year = (Tonne-Km) / (Freight Train-Km)

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CM = Cost of 1 minute of delay of a train

Passenger train:

$$CM_P = K1 * (VT_P / 60) * [(Passenger-Km) / (Passenger Train-Km)]$$

Average number of passengers per train in one year = $(Passenger-Km) / (Passenger Train-Km)$

Freight train:

$$CM_F = K2 * (VTF / 60)$$

Factors K1 and K2 are between the value of time and the value of delay, as estimated by stated preference studies, to take into account that the time lost as a result of delays is perceived significantly more negative than normal travel time.

Cost of delays of an accident = $CM_P * (Minutes\ of\ delay\ of\ passenger\ trains) + CM_F * (Minutes\ of\ delay\ of\ freight\ trains)$

Scope of the model

Cost of delays is to be calculated for significant accidents, as follows:

- real delays on the railway lines where accidents occurred as measured at terminal station
- real delays or, if not possible, estimated delays on the other affected lines.

The HEATCO project⁷ reports the following methodologies to calculate the Value of Time (VT).

Trip category	Minimum approach ¹	More sophisticated approach ²
Passenger – work	Cost saving	Hensher approach
Passenger – non-work	Willingness-to-pay	
Commercial Goods traffic	Cost saving	Willingness-to-pay

¹ In the absence of sufficient resources to survey VTTS using the minimum approach the mathematical relationships derived from the HEATCO VTTS meta-analysis should be used.

² The more sophisticated approaches are for illustration.

The following methods are advised for calculating the VT:

- “Cost saving” for work passengers and commercial goods traffic;
- “Willingness to pay” for non-work passengers

HEATCO provides an overview of these methodologies:

“The cost saving approach is based on a theoretical argument regarding the marginal productivity of labour. Such an approach assumes that there is no utility impact on the worker and that all travel time savings can be transferred to productive output.”

“For commercial goods traffic a pure willingness-to-pay approach has also been used. Theoretically such an approach encapsulates all the cost savings that can be utilised by the firm from a reduction in the time associated with the transportation of goods – including vehicle operating costs and whether or not the time saved can be transferred to other productive output.”

“Whilst this WTP approach may seem more appealing than the cost saving approach a key issue in

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underlying its reliability is a robust survey design. This is because it is absolutely critical that interviewees have a complete overview of the total impact of time savings, within the logistics chain, on the overall operations of the business. This is a challenging requirement and therefore the WTP approach is more sophisticated than the cost saving approach for deriving a value of travel time savings (VTTS) for commercial goods traffic. For an application see de Jong et al. (2004).”

“There is no economic basis for saying that non work passenger time savings vary directly proportionately with the wage rate. Consequently the minimum recommended approach to valuing non-work passenger time savings is some form of willingness-to-pay survey drawn from revealed and/or stated preference.”

Fall back values for the calculation of cost of delays as a consequence of accidents

Same text as reported under 5.5

Fall back values

National values should be used where possible, provided that they have been developed using the methodology depicted in 5.5; if such values are not available, the values provided by the HEATCO project may be used:

- [The Value of Time (VT) of work passengers] is measured in € per passenger and hour and is reported in Table 4, column “Work (business)”
- [VT of non-work passengers] is approximately 1/3 of the values reported in Table 4, column “Work (business)”
- [VT of freight trains] is measured in € per freight ton per hour and is reported in Table 5.
- Factors $K_1 = 2.5$ and $K_2 = 2.15$, between VT and the value of delay are to take into account that the time lost as a result of delays is perceived significantly more negative than normal travel time. These values are based on the findings of SP studies.

The values shown in tables 4 and 5 are in € for 2002. These values should not be used as given but updated annually with (real) GDP per capita values. The values are to be updated by Member States annually by linear increase of the growth of (real) Gross Domestic Product (GDP) per capita (reference year 2002).

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6 Guidance for “Indicators related to technical safety of infrastructure and its implementation”

6.1 Train Protection Systems (TPS)

RSD Appendix point 6.1 “Train Protection System (TPS)” means a system that helps to enforce obedience to signals and speed restrictions.

Systems where track signalling information is substituted and/or supplemented by cab signalling are included.

The part of the definition relating to “automatic stop at signals” is intended to include also automatic stops at conflict points between clearance gauges.

6.2 On board systems

RSD Appendix point 6.2 “On-board systems” mean systems assisting the driver to observe line-side signalling and in cab signalling and thus providing protection of danger points and enforcement of speed limits. On-board TPSs are described as follows:

- a) *Warning, providing automatic warning to driver.*
- b) *Warning and automatic stop, providing automatic warning to driver and automatic stop when passing a signal at danger.*
- c) *Warning and automatic stop and discrete supervision of speed, providing protection of danger points, where “discrete supervision of speed” means supervision of speed at certain locations (speed traps) at the approach of a signal.*
- d) *Warning and automatic stop and continuous supervision of speed, providing protection of danger points and continuous supervision of the speed limits of the line, where “continuous supervision of speed” means continuous indication and enforcement of the maximal allowed target speed on all sections of the line.*

Type (d) is regarded as Automatic Train Protection (ATP) system.

6.3 Level crossing

RSD Appendix point 6.3 “level crossing” means any level intersection between a road or a passage and a railway, as recognised by the infrastructure manager and open to public or private users. Passages between platforms within stations are excluded, as well as passages over tracks for the sole use of employees.

6.4 Road

RSD Appendix point 6.4 “road” means, for the purpose of railway accident statistics, any public or private road, street or highway, including adjacent footpaths and bicycle lanes.

6.5 Passage

RSD Appendix point 6.5 “passage” means any route, other than a road, provided for the passage of people, animals, vehicles or machinery.

6.6 Passive level crossing

RSD Appendix point 6.6 “passive level crossing” means a level crossing without any form of warning system or protection activated when it is unsafe for the user to traverse the crossing.

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These may be pedestrian only and/or vehicle crossings. The main examples of level crossings suitable for vehicle use, which fall into this category, include:

- i. user-worked crossings
- ii. user-worked crossings with a telephone
- iii. open crossings

Crossings with user side road traffic signs / information signs are included.

User-Worked Crossings

These crossings have gates or full lifting barriers, which the user must operate prior to crossing. The user is responsible for ensuring that it is safe to cross. These crossings are usually found in rural areas, providing access between a farm and fields, but can also be found on small roads. They often have a defined user, some of whom keep the crossing gates padlocked to prevent unauthorised access.

User-Worked Crossing with Telephone

These are similar to the standard user worked crossing, but a telephone is provided and the crossing user must contact the signaller for permission to cross.

Open Crossings

At open crossings, the interface between road and rail is completely open. Signs might warn passage users to give way to trains.

6.7 Active level crossing

RSD Appendix point 6.7 "active level crossing" means a level crossing where the crossing users are protected from or warned of the approaching train by devices activated when it is unsafe for the user to traverse the crossing.

- Protection by the use of physical devices includes:
 - half or full barriers,
 - gates.
- Warning by the use of fixed equipment at level crossings:
 - visible devices: lights,
 - audible devices: bells, horns, klaxons, etc.

Active level crossings are classified as:

- (a) *Manual: a level crossing where user-side protection or warning is manually activated by a railway employee.*
- (b) *Automatic with user-side warning: a level crossing where user-side warning is activated by the approaching train.*
- (c) *Automatic with user-side protection: a level crossing where user-side protection is activated by the approaching train. This shall include a level crossing with both user-side protection and warning.*
- (d) *Rail-side protected: a level crossing where a signal or other train protection system permits a train to proceed once the level crossing is fully user-side protected and is free from incursion.*

The categorization of active level crossings is not meant to provide a hierarchy of safety levels.

Level crossing operated manually is only 'active' if the railway employee manually activates the warning or protection.

Rail-side protected

A railway protecting signal or train protection system shall display a 'proceed' aspect once the line ahead is clear and safe and there is assurance that there is no incursion onto the route.

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On this basis, “rail-side protected” would imply:

- a) When trains are expected, the railway must be completely fenced by barriers or gates at the level crossing to protect against incursion from outside the railway in order to assure full user side protection and
- b) supervision must have confirmed freedom from incursion before an unconditional authority to proceed can be given.

Rail side warning devices or signals that indicate the status of user-side protection and/or warning systems cannot be regarded as assuring rail side protection.

Barrier systems at level crossings that do not completely fence the level crossing (e.g. automatic half-barrier systems) do not provide full user side protection and therefore cannot be classified as rail-side protected.

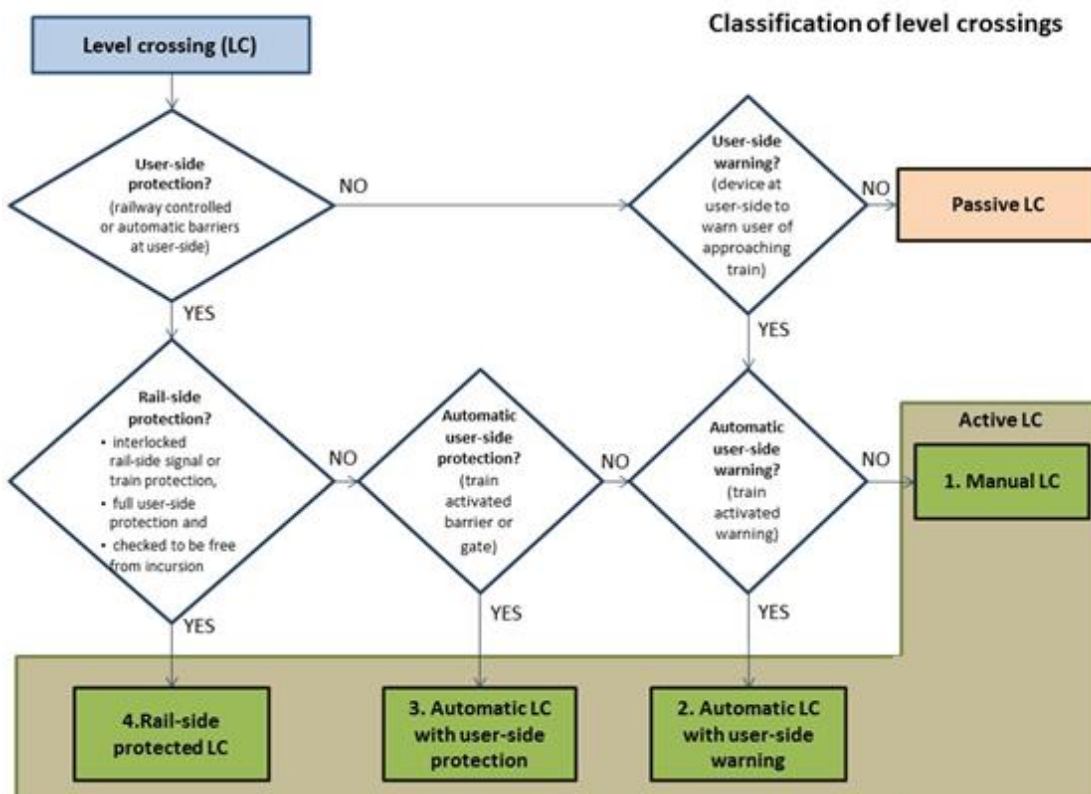
Rail side warning devices, interlocked rail side signals or other train protection systems:

- which only indicate the status of user-side protection and/or warning systems, or
- which permit a train to proceed if the level crossing user-side protection and warning systems are activated but without checking that the level crossing is free from incursion,

cannot be regarded as assuring rail side protection.

A level crossing where user-side protection and/or warning is manually activated by railway employee and there is rail-side protection (i.e. rail-side interlocked signal or train protection system allowing the train to proceed once the LC is fully user-side protected and free from incursion).

Classification of level crossings



Note: Railway controlled means operated by a railway employee.

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Table 2 - Level crossing types classification matrix

Automatic system	Active warning to user	Active (barrier) protection of user	Rail-side protection		Type (N/A or 'not applicable' indicates that the indicated logical conditions do not agree with each other)
			interlocked signal or train protection	full barrier protection & free from user incursion	
-	-	-	-	-	1. Passive
-	-	-	-	√	1. Passive
-	-	-	√	-	N/A
-	-	-	√	√	N/A
-	-	√	-	-	2. Manual
-	-	√	-	√	2. Manual
-	-	√	√	-	2. Manual
-	-	√	√	√	5. Rail side protected
-	√	-	-	-	2. Manual
-	√	-	-	√	N/A
-	√	-	√	-	2. Manual
-	√	-	√	√	N/A
-	√	√	-	-	2. Manual
-	√	√	-	√	2. Manual
-	√	√	√	-	2. Manual
-	√	√	√	√	5. Rail side protected
√	-	-	-	-	N/A
√	-	-	-	√	N/A
√	-	-	√	-	N/A
√	-	-	√	√	N/A
√	-	√	-	-	4. Automatic with user-side protection
√	-	√	-	√	4. Automatic with user-side protection
√	-	√	√	-	4. Automatic with user-side protection
√	-	√	√	√	5. Rail side protected
√	√	-	-	-	3. Automatic with user-side warning
√	√	-	-	√	N/A
√	√	-	√	-	3. Automatic with user-side warning
√	√	-	√	√	N/A
√	√	√	-	-	4. Automatic with user-side protection
√	√	√	-	√	4. Automatic with user-side protection
√	√	√	√	-	4. Automatic with user-side protection
√	√	√	√	√	5. Rail side protected

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7 Reference data traffic and infrastructure

Passenger and freight trains⁸

Freight (Goods) train: Train for the carriage of goods composed of one or more wagons and, possibly, vans moving either empty or under load.⁸

Passenger train: Train for the carriage of passengers composed of one or more passenger railway vehicles and, possibly, vans moving either empty or under load.⁸

Passenger railway vehicle is a vehicle for the conveyance of passengers, even if it comprises one or more compartments with spaces specially reserved for luggage, parcels, mail, etc.. These vehicles include special vehicles such as sleeping cars, saloon cars, dining cars, ambulance cars and vans carrying accompanied road passenger vehicles. Each separate vehicle of an indivisible set for the conveyance of passengers is counted as a passenger railway vehicle. Included are railcars if they are designed for passenger transport.⁸

7.1 Train-km

RSD Appendix point 7.1 “train-km” means the unit of measure representing the movement of a train over one kilometre. The distance used is the distance actually run, if available, otherwise the standard network distance between the origin and destination shall be used. Only the distance on the national territory of the reporting country shall be taken into account.

For the definition of train see 1.4.

7.2 Passenger-km

RSD Appendix point 7.2 “passenger-km” means the unit of measure representing the transport of one passenger by rail over a distance of one kilometre. Only the distance on the national territory of the reporting country shall be taken into account.

For the definition of passenger, see 1.12.

7.3 Line-km

RSD Appendix point 7.3 “line km” means the length measured in kilometres of the railway network in Member States, whose scope is laid down in Article 2. For multiple-track railway lines, only the distance between origin and destination is to be counted.

Line: One or more adjacent running tracks forming a route between two points. Where a section of network comprises two or more lines running alongside one another, there are as many lines as routes to which tracks are allotted exclusively.

7.4 Track-km

RSD Appendix point 7.4 “track km” means the length measured in kilometres of the railway network in Member States, whose scope is laid down in Article 2. Each track of a multiple-track railway line is to be counted.

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Track length should include tracks which are used for train operations; sidings at stations which are used for train operations are included. Private sidings are excluded.

Tracks at warehouses/depots/workshops should be excluded. The boundary of the workshop/warehouse/depot is the point at which the railway vehicle leaving the depot/warehouse/depot cannot pass without having an authorization to access the mainline or other similar line. This point is usually identified by a signal.

Tracks of the marshalling yards and freight terminals are excluded apart from tracks used for train operations.

Marshalling yard (classification yard): Station or part of a station especially equipped with a number of tracks or other equipment for railway vehicle marshalling (switching) operations. It is sometimes referred to as classification yard.

Sidings: Tracks branching off running tracks. The length of sidings is included in the length of tracks if the sidings are managed by the infrastructure manager, private sidings being excluded.

Private sidings: Track or set of tracks which are not managed by the infrastructure manager but are linked up with the track of an infrastructure manager so that:

- a) Railway transport operators or supportive functions can perform necessary activities.
- b) Industrial, commercial or port, etc. establishment or group of establishments can be served by rail without transshipment.

7.5 Tonne-km

“tonne-km” means the unit of measure representing the transport by rail of one tonne of goods over a distance of one kilometre. It refers to the total weight of goods carried, including packaging and also the tare weight of the carried transport unit (e.g. containers, swap bodies and pallets for containing goods as well as road goods vehicles carrying goods).

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Annex 1: Values for economic indicators

Table 3 - External accident costs components per casualty (€ 2016)

Country	Human cost			Production loss			Medical costs			Administrative costs		
	Fatality	Serious injury	Slight injury	Fatality	Serious injury	Slight injury	Fatality	Serious injury	Slight injury	Fatality	Serious injury	Slight injury
Austria	3,202,976	532,685	40,976	393,002	26,161	1,600	2,960	9,114	784	2,076	1,427	614
Belgium	3,183,342	513,206	39,477	394,570	26,266	1,607	2,972	9,151	788	2,084	1,433	616
Bulgaria	1,553,981	226,042	17,388	172,290	11,469	702	1,298	3,996	344	910	626	269
Czechia	2,789,348	406,295	31,253	236,108	15,717	962	1,778	5,476	471	1,247	858	369
Denmark	3,497,489	576,978	44,383	485,139	32,295	1,976	3,654	11,251	968	2,562	1,762	757
Estonia	2,653,497	391,365	30,105	264,696	17,620	1,078	1,994	6,139	528	1,398	961	413
Finland	2,798,583	475,746	36,596	444,438	29,585	1,810	3,348	10,307	887	2,347	1,614	694
France	2,721,569	449,900	34,608	395,712	26,342	1,612	2,981	9,177	790	2,090	1,437	618
Germany	3,067,253	503,575	38,737	383,018	25,497	1,560	2,885	8,883	765	2,023	1,391	598
Greece	2,026,599	328,432	25,264	296,552	19,741	1,208	2,234	6,877	592	1,566	1,077	463
Hungary	2,545,519	363,132	27,933	213,101	14,186	868	1,605	4,942	425	1,126	774	333
Ireland	4,681,432	710,688	54,668	398,560	26,531	1,623	3,002	9,243	796	2,105	1,448	622
Italy	2,888,866	468,373	36,029	354,695	23,611	1,444	2,672	8,226	708	1,873	1,288	554
Latvia	2,091,145	314,437	24,187	244,097	16,249	994	1,839	5,661	487	1,289	887	381
Lithuania	2,472,609	368,941	28,380	221,664	14,756	903	1,670	5,141	442	1,171	805	346
Luxembourg	6,048,974	955,627	73,510	436,719	29,071	1,779	3,289	10,128	872	2,307	1,586	682
Netherlands	3,144,379	506,503	38,962	400,833	26,683	1,632	3,019	9,296	800	2,117	1,456	626
Norway	2,860,780	523,348	40,258	535,129	35,622	2,179	4,031	12,410	1,068	2,826	1,944	836
Poland	2,209,087	322,671	24,821	201,159	13,391	819	1,515	4,665	402	1,062	731	314
Portugal	2,249,642	359,065	27,620	287,703	19,152	1,172	2,167	6,672	574	1,520	1,045	449
Romania	2,257,137	322,445	24,803	183,549	12,219	747	1,383	4,257	366	969	667	287
Slovakia	2,602,350	381,986	29,384	240,873	16,034	981	1,814	5,586	481	1,272	875	376
Slovenia	2,127,862	337,228	25,941	293,677	19,549	1,196	2,212	6,811	586	1,551	1,067	459
Spain	2,690,282	427,815	32,909	325,423	21,663	1,325	2,451	7,547	650	1,719	1,182	508
Sweden	2,819,502	476,827	36,679	470,659	31,331	1,917	3,545	10,915	939	2,486	1,709	735
UK	2,448,105	442,196	34,015	420,407	27,986	1,712	3,167	9,750	839	2,220	1,527	656

Note that these values should not be used as given but updated annually the (real) GDP per capita values. They should be taken from the EUROSTAT database of EU statistics.

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Table 4 - Work passenger trips – Value of Time

(2002 in € per passenger per hour)

Country	Work
Austria	28.40
Belgium	27.44
Cyprus	21.08
Czech Republic	14.27
Denmark	31.54
Estonia	12.82
Finland	28.15
France	27.70
Germany	27.86
Greece	19.42
Hungary	13.52
Ireland	29.87
Italy	25.63
Latvia	11.73
Lithuania	11.58
Luxembourg	38.02
Malta	18.64
Netherlands	28.00
Poland	12.87
Portugal	19.34
Slovakia	12.36
Slovenia	18.80
Spain	22.34
Sweden	30.30
United Kingdom	29.02
EU (25 Countries)	23.82

Note that these values should not be used as given but updated annually with (real) GDP per capita values. They should be taken from the EUROSTAT database of EU statistics.

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Table 5 - Freight trips Value of Time

(2002 in € per freight tonne per hour)

Country	Per tonne of freight carried	
	Road	Rail
Austria	3.37	1.38
Belgium	3.29	1.35
Cyprus	2.73	1.12
Czech Republic	2.06	0.84
Denmark	3.63	1.49
Estonia	1.90	0.78
Finland	3.34	1.37
France	3.32	1.36
Germany	3.34	1.37
Greece	2.55	1.05
Hungary	1.99	0.82
Ireland	3.48	1.43
Italy	3.14	1.30
Latvia	1.78	0.73
Lithuania	1.76	0.72
Luxembourg	4.14	1.70
Malta	2.52	1.04
Netherlands	3.35	1.38
Poland	1.92	0.78
Portugal	2.58	1.06
Slovakia	1.86	0.77
Slovenia	2.51	1.03
Spain	2.84	1.17
Sweden	3.53	1.45
United Kingdom	3.42	1.40
EU (25 Countries)	2.98	1.22

Please note that these values should not be used as given but updated annually with (real) GDP per capita values.

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Values of tables 4 and 5 for other countries

The values provided in Tables 4 and 5 are limited to 25 EU countries - a limitation rising from the scope of the HEATCO project. Nominative values for other countries had to be artificially attributed as follows:

Bulgaria	Average of values for Hungary and Slovakia
Channel Tunnel	Average of values for France and United Kingdom
Romania	Average of values for Hungary and Slovakia
Croatia	Average of values for Hungary and Slovenia
Norway	Average of values for Sweden and Finland
Switzerland	Average of values for France, Germany and Italy

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Table 6 – Percentage of work passengers

If no national data are available, the estimates from the [Flash Eurobarometer 463](#) on Survey on Europeans' satisfaction with passenger rail services (Jan-Feb 2018) can be used instead.

Country	Value
AT	9%
BE	6%
BG	7%
CZ	8%
DE	10%
DK	10%
EE	4%
EL	12%
ES	4%
FI	5%
FR	8%
HR	11%
HU	3%
IE	7%
IT	15%
LT	7%
LU	8%
LV	14%
NL	4%
PL	13%
PT	4%
RO	5%
SE	15%
SI	5%
SK	7%
UK	8%

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Annex 2: Illustrative glossary of selected railway terms

Term	Definition	Example
Stop marker	a sign indicating to a train driver where to stop the train (depending on its length – used typically at a station).	
Stop board	a sign ordering a train driver to stop the train at the sign in any case (end of authorized movement).	