

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

Annex IV to TO 2026-8

Operations and traffic management system TSI

Acceptable means of compliance on checks and tests before departure, including brakes and checks during operation

	<i>Drafted by</i>	<i>Verified by</i>	<i>Approved by</i>
<i>Name</i>	Roberto Mele, Beatrijs Claeys	Bart Accou	Pio Guido
<i>Position</i>	Project Officers	Head of Unit	Head of Department
<i>Date</i>	06/05/2026	06/05/2026	06/05/2026
<i>Signature</i>			

The present document is a non-legally binding opinion of the European Union Agency for Railways. The purpose of this document is to define ways of establishing compliance with the essential requirements of the relevant EU legislation. It is without prejudice to the decision-making processes foreseen by the applicable EU legislation. Furthermore, a binding interpretation of EU law is the sole competence of the Court of Justice of the European Union.

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Part 1

1.1. Introduction

RUs and IMs shall manage their operations and the traffic among others in accordance with the TSI OPE.

According to Article 2(33) of the Directive on the interoperability of the rail system within the European Union (Directive (EU) 2016/797, as amended), Acceptable Means of Compliance (AMOCs) are “*non-binding opinions issued by the Agency to define ways of establishing compliance with the essential requirements*”. Therefore, AMOCs define good practices also by referring to available standards, which the actors of the railway sector can use in their safety management system as evidence that their operational procedures comply with high-level requirements set out in EU legislation (in this case the TSI OPE and the Common Safety Method on requirements for safety management systems – CSM on SMS (Commission delegated Regulation (EU) 2018/762).

1.2. Legal basis

The basis for the development of AMOCs is the TSI OPE, and more precisely section 4.4.3 which gives the Agency the possibility to define AMOCs by means of technical opinions¹.

This AMOC covers the topic “checks and tests before train departure, including brakes and checks during operation”.

The AMOC itself constitutes a non-legally binding opinion and its use is strictly voluntary.

1.3. Concept

As a general concept, the RUs and/or IMs are responsible to manage their specific operational and traffic management requirements in their SMS.

Article 4(1) (d) of the Railway Safety Directive (Directive (EU) 2016/798) states as follows:

“With the aim of developing and improving railway safety, Member States, within the limits of their competences shall:

d) ensure that the responsibility for the safe operation of the Union rail system and the control of risks associated with it is laid upon the infrastructure managers and railway undertakings, each for its part of the system, obliging them to:

(i) implement necessary risk control measures as referred to in point (a) of Article 6(1), where appropriate in cooperation with each other;

(ii) apply Union and national rules;

(iii) establish safety management systems in accordance with this Directive”.

Article 4(3) (a) and (b) of the Railway Safety Directive states as follows:

“Railway undertakings and infrastructure managers shall:

¹ In accordance with Article 10 of Regulation (EU) 2016/796.

- a) *implement the necessary risk control measures referred to in point (a) of Article 6(1), where appropriate in cooperation with each other and with other actors;*
- b) *take account in their safety management systems of the risks associated with the activities of other actors and third parties;”*

The same concept has been detailed in the CSM on SMS, ANNEX I Point 3.1.1.1 (for RUs) and ANNEX II point 3.1.1.1 (for IMs):

According to these provisions, the organisation shall:

- a) identify and analyse all operational, organisational and technical risks relevant to the type, extent and area of operations carried out by the organisation. Such risks shall include those arising from human and organisational factors such as workload, job design, fatigue or suitability of procedures, and the activities of other interested parties (see Annex I, Section 1. Context of the organisation);
- b) evaluate the risks referred to in point (a) by applying appropriate risk assessment methods;
- c) develop and put in place safety measures, with identification of associated responsibilities (see Annex I, Section 2.3. Organisational roles, responsibilities, accountabilities and authorities);
- d) develop a system to monitor the effectiveness of safety measures (see Annex I, Section 6.1. Monitoring);
- e) recognise the need to collaborate with other interested parties (such as railway undertakings, infrastructure managers, manufacturer, maintenance supplier, entity in charge of maintenance, railway vehicle keeper, service provider and procurement entity), where appropriate, on shared risks and the putting in place of adequate safety measures;
- f) communicate risks to staff and involved external parties (see Annex I, Section 4.4. Information and communication).

Therefore, it is the responsibility of RUs and/or IMs to identify, assess, eventually mitigate, monitor and review continually their own operational risks.

Based on that, the AMOC is a proposed way addressed to the RUs and/or IMs to demonstrate compliance with the TSI OPE as a mean to manage operational risks, taking into account that the provisions of the TSI OPE cover the entire operational and traffic management subsystem, whilst every single RU or IM manages only part(s) of the subsystem.

RUs and/or IMs should in compliance with the EU and national legal requirements define their operational context and consequently they should identify the risks occurring in their activities.

Then, on a voluntary basis, RUs and IMs, acting accordingly to the cooperation agreement they have, are free to assess and decide for themselves whether an AMOC is applicable to the part of the subsystem they are supposed to manage each their parts of the agreed risk mitigation measures. An AMOC could be entirely or partially applicable to the RU's and or IM's operational context, for example an RU could be involved in the freight transport, but without the transport of dangerous goods, whilst an AMOC could deal with both.

If an RU and/or IM evaluates an AMOC as applicable to the operational context and decides to use it, the RU and/or IM should assess the risks the AMOC could cover within the operational activities to be performed. For example, initially and according to the applicable legislation, risks relating to inadequate tests and checks should be identified and mitigated – then the relevant part of the good practice in the AMOCs should be cross-referenced with the risk in the RU's and/or IM's' risk assessment processes. This should regularly be kept up to date as part of the monitoring activities for their operations.

As AMOCs are non-binding opinions issued by the Agency to define ways of establishing compliance with the essential requirements, the RUs and/or IMs are free to decide whether to apply the AMOC/part of the AMOC, or not. Nevertheless, the RUs and IMs are responsible for managing their operational risks.

AMOCs should be accepted throughout the EU by Member States and National Safety Authorities as examples of good practice.

According to TSI OPE point 4.4.2 and Appendix I, national rules² on the defined AMOC topics are generally not permitted. Therefore, if a Member State (MS) and/or a NSA/ or any other entity requires an RU and/or IM to comply with additional national requirements, then that MS or NSA or the other entity will have to provide, in line with Article 8 of Railway Safety Directive, evidence as to why their national requirements provide a higher degree of risk control than that set out in the AMOC. However, AMOCs are not national rules and if a RU and/or IM decides not to apply the AMOC and develop their own processes, it may do this and does not have to prove that its processes are as good or better than the good practice set out in the AMOC but it should ensure that its processes are adequate in controlling/mitigating the risks that it has identified.

As a result, the substantiated use of this AMOC should be taken into consideration by the Agency or the NSAs when an RU and/or IM applies for a safety certificate or authorisation, when the certification body assesses compliance of the applicant with the requirements of the CSM on SMS and the TSI OPE.

The certification body will check the sufficiency of the RU's and/or IM's processes in controlling the risks and will check how the AMOC is used, if it is the case, by assessing the risk assessment process of the RU and/or IM to ensure that the AMOC good practice has been identified as a relevant control measure for the identified risk.

1.4. Responsibility

Each RU and/or IM remains responsible for how this AMOC is used in their SMSs. They should ensure that they can identify the risks for which the AMOC provides control. The AMOC should not just be included in the SMS without the RU and/or IM justifying its use through their risk management procedures and their document management system.

Each RU and/or IM should analyse which part of the AMOC is applicable to its operational context and determine, based on the outcome of a risk assessment, how the AMOC or part of it should be integrated into its own SMS.

The Agency is not responsible for how the AMOC is used. It is particularly important that when the RU and/or IM use this AMOC, return of experience and/or information resulting from accidents and incidents investigations is considered to ensure that the content of the AMOC remains relevant and up to date.

The Agency should be informed of any return of experience which should be used to update the AMOC.

The majority of this AMOC is specifically applicable for RUs and how they ensure that the train, including all its vehicles and their load, is technically fit for the journey to be undertaken and remains so throughout the journey, including braking. Additionally, some details of this AMOC may cover part of the interface with the IM.

There are other areas of responsibility in relation to the design of the vehicles, the maintenance of the vehicles and exchange of information (Entities in Charge of maintenance – ECMs) and the planning of the route (communication between the RU and IM) which are not included but need to be managed by those with the relevant responsibilities.

1.5. List of acronyms used in this text

- AMOC: Acceptable Means of Compliance
- ATTI: Agreement on freight Train Transfer Inspection

² With the meaning of Article 8 of Directive (EU) 2016/798.

- CSM: Common safety method
- ECM: Entity in Charge of Maintenance
- ERA: European Union Agency for Railways or the Agency
- EU: European Union
- FOP: Fundamental Operational Principles
- GCU: General Contract of Use for Wagons
- IM: Infrastructure Manager
- NSA: National Safety Authority
- RU: Railway Undertaking
- SMS: safety Management System
- TSI: Technical Specification for Interoperability
- TSI OPE: Technical Specification for interoperability relating to the operation and traffic management subsystem (Commission Implementing Regulation (EU) 2019/773)
- UIC: Union Internationale des Chemins de fer
- VDV: Verband Deutscher Verkehrsunternehmen

Part 2

2.1. Introduction to the relevant part of the TSI OPE

The relevant TSI OPE requirement to this AMOC is:

- 4.2.3.3.1. *Checks and tests before departure*

This AMOC also relates with other topics as defined in the scope (ref. to paragraph 2.2) therefore there are interfaces with other TSI OPE requirements, mainly:

- 4.2.2.5.2. Train composition
- 4.2.2.6.1. Minimum requirements of the braking system
- 4.2.2.6.2. Braking performance and maximum speed allowed
- 4.2.2.7.1. General requirement on ensuring that the train is in running order
- 4.2.3.4.3. Dangerous goods
- 4.2.1.2. Documentation for drivers
- 4.2.1.3. Documentation for railway undertaking staff other than drivers

2.2. Information on the scope of the AMOC

Vehicles are exposed to influences during railway operations, freight wagons are also exposed to influences during loading and unloading; those can lead to wear and tear and damage that cannot be detected exclusively by the maintenance measures carried out by the ECM within the scope of its obligations.

Within its own role and responsibilities, the RU should identify which inspections, checks and tests are necessary in order to run their trains safely.

To the end of this AMOC, the following definitions apply:

- An inspection is a critical examination to formally determine if a device or system is fit for purpose (or fit to perform in accordance with its intended function). An example is “verify for handbrake release”.
- A check is a visual observation to ensure the device or system is in place and is not obviously damaged or obstructed. An example is “visual verification of a manometer”.
- A test is a deliberate action or experiment to find out how well something works in accordance with its intended operation or function. An example is “test of the fire detection system”.

The RU, within its role and responsibilities, defines inspections, checks and tests of freely visible parts of vehicles including its load. These should ensure that damages are detected and the operations are carried out safely. The RU defines the content and the frequency and/or places of these inspections, checks and test.

This includes the risk of a train starts moving while transported goods or the vehicles themselves may pose an intolerable risk to personnel, passengers, third parties or environment. Although not all scenarios are covered, as this depends strongly on the specific context where the RU intends to operate. The RU needs to consider all the risks of their operational context, if necessary together with all relevant stakeholders. The RU should draw up rules for the application cases occurring in the company and the types of vehicles; in case of freight wagons, including loads and loading units used.

It is essential that RUs consider the train brake performance before the train departure. In case of a change in the train composition during the journey (technical problem, etc.) the RU should be able to make the recalculation of train brake performance done before continuation of its journey.

The safety of load is a key part of the checking process however, this is covered by the AMOC on Safety of Load. The particular aspects in relation to checking safe boarding and leaving of passengers are covered by the AMOC on safety of passengers. It is for the RU/IM to decide whether they wish to apply any of the AMOCs or part of them.

This AMOC provides guidance for RUs on:

- 1) the check of all the freely visible parts of freight wagons (also loaded with dangerous goods), including their freely visible loads and loading units during railway operations, in order to detect damage, assess it and decide whether and under what conditions safe transport can be carried out.
- 2) the inspection of the integrity of the train in order to assure that all the vehicles are properly coupled and connected to the brake pipe.
- 3) the definition of train braking sheet & wagon list and brake position rules for freight trains.
- 4) performing air brake tests.
- 5) the use of composite brake blocks.
- 6) safe alighting of staff performing checks on the tracks or outside platforms.

This AMOC does not cover items such as

- 1) competences and who is responsible for undertaking the tasks, they should be covered as part of the RU's SMS.
- 2) health & safety of passengers and personnel, cross over with other TSI's (INF, PRM, Loc&Pas).
- 3) how the train brake performance calculation is done.
- 4) the route compatibility check process.
- 5) inspections, checks and tests of the active locomotives/traction units, non-active locomotives are to be considered as wagons.
- 6) shunting.
- 7) degraded and emergency operations.

This AMOC refers to the following good practices:

1. Freight Trains
 - a. ATTI refers to GCU
 - i. Inspections, tests and checks before train movement;
 - ii. Quality assurance procedure;
 - iii. Managing defects and irregularities.
 - b. VDV 758 refers to GCU
 - i. Test before shunting (not relevant for this AMOC)
 - ii. Test after stabling/parking;
 - iii. Test before train movement; iv. Inspection before train movement with specific freight wagons or loads.

2. Freight trains with dangerous goods
 - a. RID refers to UIC IRS 40471-3
 - i. Inspections and checks before train movement.
3. Train “braking sheet & wagon list” and brake position rules for Freight trains
 - a. Braking sheet and wagons list
 - b. Brake settings for different freight train types
4. Air brakes test
 - a. UIC IRS 40453
5. Use of composite brake blocks
6. Tests during the train journey:
 - a. Brake test while driving

2.3. Links to existing legislation on risk assessment

Fundamental operational principle (FOP)

The fundamental operational principle most relevant to the activity of safety of passengers is FOP 3:

Before a train begins or continues its journey, it shall be ensured that passengers, staff and goods are carried safely.

This principle concerns the train and its readiness for movement. It includes, as examples: the braking capacity of the train, the speed that the train is permitted to travel, the formation and coupling of the train, identification, loading and securing of freight, safe passengers boarding and alighting of passengers, adequate control of crowding on trains and platforms, the provision of adequate information to train preparation and operational staff and the effective execution of their safety tasks. The aim is to prevent collisions, derailments and any other accident due to a number of risks.

Risk assessment

The Safety management system operational process shall cover how, when and where inspections, tests and checks before train departure including braking and checks during normal operations will be ensured.

Requirement 5.1.3 – ANNEX I of Regulation 2018/762 states:

To control risks where relevant for the safety of operational activities (see 3.1.1. Risk assessment), at least the following shall be taken into account:

- (c) *preparation of trains or vehicles before movement, including pre-departure checks and train composition;*
- (d) *running trains or movement of vehicles in the different operating conditions (normal, degraded and emergency);*

Requirement 5.1.3 – ANNEX II of Regulation 2018/762 states:

To control risks where relevant for the safety of operational activities (see 3.1.1. Risk assessment), at least the following shall be taken into account:

- (c) *real-time traffic management in normal mode and in degraded modes with the application of traffic restrictions of use and the management of traffic disruptions;*
- (d) *setting of conditions for running exceptional consignments;*

Information from the output of the risk assessment should set out how the risk that a running train can create intolerable consequences on people, infrastructure and environment is managed. It should include information for staff performing inspections, checks and tests, for staff performing train preparation activities and other staff including the driver. This information should form the basis of SMS processes, procedures and instructions for staff.

The RU and/or IM is responsible for integrating this AMOC into its own SMS by the means of its risk management procedures.

2.4. Safety Requirements

1. The departure of a train needs confirmation that the checks and/or tests and/or inspections of the train has demonstrated the existence of conditions ensuring safe movement.
2. The checks and/or tests and/or inspections of a train should cover the safety devices of the vehicles, as well as the loads, the markings on the vehicles and compliance with the allowed mass and gauge.
3. The checks and/or tests and/or inspections should also include checking the train's composition and braking characteristics, the train's head and tail signals and that the brake test has been performed.
4. Each train may only run after the presence and proper functioning of the devices and parts associated with traffic safety have been checked.
5. The train should run within the constraints imposed by its composition and, in particular:
 - a. the number of traction units and their distribution in the train,
 - b. the characteristics of the vehicles in the train and of their load,
 - c. the mass and length of the train,
 - d. the way loaded and empty vehicles are distributed in the train,
 - e. the characteristics of the coupling and buffering devices on the vehicles in the train,taking into account the parameters and characteristics of the lines to be travelled, in order to prevent the train from dividing, derailling or otherwise being subjected to transverse and longitudinal forces on the train that would compromise its safe operation.
6. All vehicles in a train should be connected to the continuous automatic braking system as defined in the LOC&PAS and WAG TSIs.
7. The railway undertaking should ensure that during operations each train achieves at least the necessary braking performance.
8. By means of the braking system, the train, running at its maximum permitted speed, should be able to stop within the residual space of the section granted in exclusive use.
9. The train must be able to stop also in specific conditions. Therefore, the RU can also do inspections, checks and tests during the journey (E.g. bad weather conditions – heavy snow, icing; exceptional infrastructures – steep slopes, etc.)
10. The first and last vehicles (including any traction units) in any train should have the automatic brake operative.
11. In the case of a train becoming accidentally divided into two parts, both sets of detached vehicles should come automatically to a standstill as a result of a maximum application of the brake. The RU should define and put into practice all necessary actions in order to prevent uncontrolled movements of vehicles.

2.5. Freight trains

2.5.1. ATTI

The Agreement on freight Train Transfer Inspection (ATTI) sets the rules governing the transfer of wagons between RUs based on the GCU (General Contract of Use for Wagons). The objective of the ATTI is to enhance cooperation between RUs, harmonising and developing the relevant rules accordingly. It aims to allow better forward planning as well as to increase the quality and safety of trains subject to the agreement.

The GCU is a multilateral contract based on the Uniform Rules concerning Contracts of Use of Vehicles in international rail traffic (CUV - Appendix D to COTIF 1999³). The GCU specifies the mutual rights and obligations of Wagon Keepers and Railway Undertakings with regard to the use of rail freight wagons as a means of transport throughout Europe and beyond.

This contract, including its appendices, sets out the conditions for the provision of wagons for use as a means of transport by RUs in national and international traffic.

It sets out provisions governing the technical condition of wagons exchanged between two or more RUs, as established during a transfer inspection. It describes also a quality assurance procedure to be applied by RUs and the way to manage defects and irregularities.

[<https://uic.org/special-groups/atti>]

2.5.2. VDV 758

VDV Recommendation 758 describes a cross-company standard for the tests of freight wagons in railway operations. It requires the application of the GCU.

The VDV Recommendation 758 is addressed to the Railway Undertaking. It provides framework conditions and uniform methods but does not make any organisational arrangements for the implementation of this VDV Recommendation. The Railway Undertakings should define operational procedures according to their own safety management system.

VDV Recommendation 758 is a basis for the creation of internal company rules for the testing of freight wagons in railway operations. It describes the minimum requirements for these tests and thus reinforces the responsibilities of the Railway Undertakings.

VDV Recommendation 758 does not deal with the obligation to provide information on safety-relevant vehicle damage and defects in accordance with the Commission Delegated Regulation (EU) 2018/762. These should be identified and implemented by the Railway Undertaking.

VDV Recommendation 758 describes four stages of tests of freight wagons in railway operations:

- Level 1 - Test before shunting; (not relevant for this AMOC)
- Level 2 - Test after stabling/parking;
- Level 3 - Test before train movement;
- Level 4 - Inspection before train movement with specific freight wagons or loads.

It is important to note that the VDV recommendations are developed and produced by the German rail sector for their use. However, many of the principles may be of use to RUs who operate throughout Europe. If the

³ See http://otif.org/en/?page_id=172

RU decides to apply them, it has to be done by using the RU's operational risk assessment (ref back to paragraph 2.3) and SMS procedures. The recommendations are voluntary and it is up to the RU to decide if they are relevant to them. If they are used, it is important to note that any reference to German law is not applicable unless the RU operates in Germany.

2.6. Freight trains with dangerous goods

2.6.1. IRS 40471-3

UIC IRS 40471-3 (Inspections of dangerous goods consignments) published by UIC is applied as a means of conformity to the Regulation concerning the International carriage of Dangerous goods by rail (RID – Appendix C to COTIF 1999)⁴ requirements for Safety obligations of the carrier.

The purpose of RID point 1.4.2.2 is to ensure that the carrier (the RU in the scope of this AMOC) who takes over the dangerous goods at the point of departure should perform inspections, tests and checks before train departure that mainly relates with:

- Goods' authorization for carriage,
- Provision of relevant information and instructions,
- Absence of defects, leakages or cracks, missing equipment, etc.,
- Respect of deadlines for inspections of tank-wagons, battery-wagons, wagons with demountable tanks, portable tanks, tank-containers and MEGCs,
- Respect of loading limits,
- Presence of relevant placarding & marking.

The purpose of IRS40471-3 is to:

- Set out the safety obligations required of carriers in accordance with RID 1.4.2.2.1,
- Control the risks arising from violations of the carrier obligations according to RID 1.4.2.2.1, -
Maintain consistently high-quality inspections.

2.7. Train “braking sheet & wagon list” and brake position rules for Freight trains

Annex I sets out example of good practice that can be applied by the RU.

Annex I defines specific practices for freight train brake settings as well as the content and format of the brake sheet and wagon list for use in freight traffic.

⁴ Implemented by Annex II to Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods.

2.8. Air brakes test

2.8.1. UIC IRS 40453

UIC IRS 40453 defines procedures for air brake tests effected with a powered unit.

The text specifies the type of tests to be carried out in the event of various changes being made to the train composition.

It indicates four different types of air brake tests:

- Type A test: Complete test,
- Type B test: Partial test,
- Type C test: Attachment test,
- Type D test: continuity test.

The text also describes cases when a brake test must be carried out and type of brake test to be effected. It describes as well the way to carry out them and the cases where there is no need to effect a brake test.

2.9. Use of composite brake blocks

The use of composite brake blocks (LL) has been deeply analysed during the JNS urgent procedure “Extreme effects of thermal overload in special cases of freight operation” and during the JNS normal procedure “Consequences of unintended brake applications with LL blocks”.

The final report of the normal procedure also includes conclusions from the urgent procedure, and it is available on the ERA website:

https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en

In chapter 1 of Part II of the final report above mentioned, risk control measures relevant for the RU are defined.

The Swedish Transport Agency carried out extensive tests during winters of 2018-2019, 2019-2020 and 2020-2021 in order to examine the braking performance of the composite brake blocks **during severe winter conditions** in the north of Sweden, following reported cases of loss of braking performance under such conditions. The link below provides:

- Safety Analysis from Swedish Transport Agency
- Results of the tests carried out
- Recommendations in operation and maintenance from one Swedish freight RU
- Reports.

[\[LINK to the Swedish NSA website\]](#)

2.10. Tests during train journey

The RU should define its own operational context and should identify, assess and eventually mitigate all risks relating with the defined context. By assessing those risks, the RU should define which type of inspections, checks and tests are needed and when they have to be performed in order to ensure that trains run safely.

The scope of the inspections, tests and checks, together with “when” these are to be performed, should be determined by the risk assessment and the operational characteristics (weight/length of the train and compatibility with the routes over which it will travel). It also needs to take into account specific requirements on dangerous goods and how these risks are managed particularly in relation to train composition.

2.10.1. Brake tests while driving

Brake tests while driving does not replace inspections, tests and checks that are to be performed before train departure.

The RU should define procedures to be applied whenever train composition operations are carried out or operating conditions arise that may compromise the proper functioning of the braking system:

- for checking the effectiveness of the brake system;
 - This may be performed:
 - after train departure,
 - at the first favourable opportunity,
 - before reaching maximum speed,
 - before engaging in downhill sections,
 - before approaching a buffer stop, by undertaking a test of the normal braking of the train;
- for reacting when the driver detects insufficient braking;
- for checking whether that the braking system is not providing any unwanted resistance to the free running of the train;
 - This may be performed by cutting the traction and observing the running behaviour of the train;
- for reacting when the driver detects unwanted resistance.

2.10.2. Checks during journey requiring alighting from the train

When on-board staff (i.e. the driver) has to alight from the train to perform a check during the journey, at a location where it is not safe to do so (e.g. operations on the adjacent track, tunnel, bridges), RUs should provide instructions to their on-board staff, taking into account the procedure in place on a network to ensure staff safety.

In this operational scenario, RUs and IMs should collaborate and agree on the adoption of adequate safety measures and the IM has the responsibility to coordinate the process.

RU on-board staff (i.e. the driver) should:

- inform the signaller on:
 - the stop at or outside of a platform while a rolling stock check is necessary, specifying the train’s location,
 - if necessary for the rolling stock check, the track(s) adjacent to the train where an interruption of railway operations is required for the safe alighting and/or rolling stock check, e.g. specified by means of the track(s) identification, or by means of ‘track to the left of the train’, ‘track to the right of the train’, or ‘on track to the left and right of the train’ together with the direction of travel to determine the left and right side of the train,
 - the expected duration, if available, of the checks to be performed,

- the available communication means (e.g. the number of the driver's mobile phone) to reach the driver after having alighted.
- not start any alighting until staff safety has been ensured in accordance with the procedure in place on a network (e.g. confirmation from the signaller that railway operations have been interrupted and no train will pass on the adjacent track(s))
- follow the instructions given by the signaller when applicable;
- ensure that the train remains at standstill during the alighting and the rolling stock check, including the prevention of any train movement by other RU staff members;
- inform the signaller when the checks have ended and staff is on-board.

IM staff (e.g. the signaller) should apply the relevant SMS procedure (s).

ANNEX I

Train brake settings, content and format of the brake sheet and wagon list for use in freight traffic

1. Introduction

The present Annex I has been drafted with the input of the experts of the “UBS – Unified Braking Schema” project, it is based on existing UIC solutions, current operational best practices as well as on dedicated research done by the TrainDY⁵ SW special group by considering varying infrastructure conditions in different countries, wherever relevant.

This annex defines good practices for freight train brake settings as well as the content and format of the brake sheet and wagon list for use in freight traffic, that for reading purposes are named in this text rules or ruleset. For freight train brake settings, a harmonized ruleset defines which rail vehicle brake positions are to be applied dependent on train parameters. In addition, the allowance of deviating brake settings is described.

2. Scope and objective

The objective is to implement an approach to how brake settings of different freight train types are applied to be compliant with the TSI OPE requirements. This AMOC defines a common ruleset for vehicle brake positions and related requirements depending on train weight, vehicle sequence in train consist and train brake setting.

In addition, specific changes to the approach commonly used have been proposed to develop rules that meet the practical requirements of railway operations in Europe. In some cases, research was required because the current practice in Europe varies greatly and thus does not enable adoption of a single ruleset without studying their comparable safety. Therefore, the TrainDY study group has performed scientific analysis to provide evidence that the new rules are not introducing any additional risks for vehicle derailment in operations.

This document also defines a common brake sheet and wagon list format and content description. The format has been developed to facilitate international freight train traffic without the need to use individual formats for each country or region. Therefore, it is possible to run a train through several countries by only using one document.

3. Train brake settings

The rules defined are intended to mitigate derailment but also specific train integrity loss risks that are related to the brake positions used in G- and P-braked trains. The evaluation criteria are the longitudinal compressive forces (LCF) occurring in a train consist during braking. Under unfavorable conditions, too high forces can cause a vehicle to derail. For train integrity loss also the risks of excessive longitudinal tensile forces (LTF) have been considered for scenarios where a train accelerates immediately after brake release. This may result in coupling breakage.

As a general principle already explained in the part 1 of this AMOC, RUs can deviate from the requirements set out in this Annex by the means of their SMS.

⁵ 1. P/CIM CAB2/2020-1536 v3 (2021) CEF-PSA UBS Action

4. 24-74349-TVE31-BE-V1-Zukunftsprojekt-XLL (2025) Analysis of Brake Regime XLL with respect to Potential Derailment Probability
120 Rue Marc Lefrancq | BP 20392 | FR-59307 Valenciennes Cedex
Tel. +33 (0)327 09 65 00 | era.europa.eu

3.1. General rules for all freight trains

The following rules have been defined based on currently common operational practices on European railways (according to IRS 40421, TrainDy studies or selected best practices assuring the highest level of safety)

- Trains shall not exceed a vehicle rake length of 700 meters (excluding the active locomotives).
- Active locomotives shall be located at the front of the train.
- The first and last vehicle of the vehicle rake shall have an operational automatic brake (in case of wagon with more than one distributor valve, there shall not be any isolated brake). This ensures that, in the event of an unintended train separation, both resulting parts contain vehicles with fully operational automatic brakes, preventing uncontrolled movements. Moreover, this implies that there will not be any need for changing train composition when the train may have to change direction.
- The brake sheet should reflect the actual brake settings of the train. In ERTMS the actual brake settings of the train are to be entered in the on-board system.
- No more than 3 consecutive unbraked vehicles (vehicles with isolated brakes) shall be permitted in the vehicle rake. This requirement is ultimately about service brake acceleration, which makes it necessary to maintain a maximum distance between two operating control valves of no more than 3 vehicles in the brake pipe. 3 is not the maximum number of vehicles that can be isolated in the vehicles rake but it is the maximum number of consecutive vehicles that can be isolated.

3.2. G-braked trains

The following rules have been defined based on currently common operational practices on European railways (according to IRS 40421, TrainDy studies or selected best practices assuring the highest level of safety).

- G-braked trains shall not exceed the maximum tonnage of 4000 t
- G-braked trains shall have all vehicles in the vehicle rake in brake position G but may have up to 12 axles in brake position P.
- If a vehicle that is to be placed in G according to the rules described above cannot be set into G, the brake shall be switched off (isolated).

Trains may also run in position P even if the path used was foreseen for a G-train (e.g. to avoid change of brake position on the border) – no additional risks are introduced by allowing a train with a shorter braking distance to use a path of a train that may have a longer braking distance. In this case P-train shall be compliant with the following point 3.3.

3.3. P-braked trains

The following rules have been defined based on currently common operational practices on European railways (according to IRS 40421, a TrainDY studies or selected best practices assuring the highest level of safety).

- P-braked trains with a vehicle rake (weight in the range of 0...800 t (any leading active locomotives of the train shall not be considered for the purpose of the weight range calculation) shall have all vehicles in brake position P. This is to ensure highest possible brake performance.
- P-braked trains with a vehicle rake weight in the range of 801...1200 t shall have the leading active locomotives in brake position G and all other vehicles in brake position P. This is to alleviate longitudinal compressive forces in such trains.
- P-braked trains with a vehicle rake weight in the range of 1201...1600 t shall have the leading active locomotives and the first five vehicles thereafter in brake position G and all other vehicles in brake position P (the “Long Locomotive” concept (LL)). This is to alleviate longitudinal compressive forces in such trains.

- P-braked trains with a vehicle rake weight in the range of 1601...1900 t shall have the leading active locomotives and the first seven vehicles thereafter in brake position G and all other vehicles in brake position P (the “Extended Long Locomotive” concept (XLL)) . This is to alleviate longitudinal compressive forces in such trains.

Furthermore, the following rules shall be applied:

- If a vehicle that is to be placed in G according to the rules described above cannot be set into G, the brake must be isolated. Even if one of the first five vehicles of the vehicle rake in the LL concept or one of the first seven vehicles in the vehicle rake in the XLL concept has got an isolated brake it should nevertheless be counted as part of the vehicles after the leading active locomotive(s) to be set into brake position G according to the rules described above.
- If a vehicle that is to be placed in P according to the rules described above cannot be set into P, the brake shall be isolated. The usage of G-brakes for these vehicles is not allowed due to the longer release time of the brakes, which could cause excessive longitudinal tensile forces in a train in scenarios where a train is accelerating shortly after releasing the brakes.
- If multiple wagon (permanently coupled wagons) or articulated wagons with bogies or more than 3 individual wheel sets, which cannot be separated in service, are part of LL or XLL, the parts of the wagon unit or articulated wagon are counted individually as wagons. Moreover, all wagons of any single multiple wagon (or all elements of any articulated wagon) shall be set into the same brake position (P or G according to the rules described above).
- P-braked trains using the XLL concept shall be normally operated in single traction (**single traction refers to the use of one active locomotive at the front of the train**).

3.4. Summary table

In summary, the full ruleset for P- and G-trains is shown in the following tables.

Vehicles rake weight (excl. active locos)	P-braked trains			What if required brake position not possible?	Allowance of unbraked vehicles (vehicles with isolated brakes)
	Brake position of leading active locomotives	Brake position of the first vehicles thereafter and their count	Brake position of all following vehicles		
0...800 t	P	P	P	Turn brake off (to isolate brakes)	Any train may have up to 3 consecutive unbraked vehicles (isolated brakes), but the first and the last vehicle of the vehicle rake shall have active brakes
801...1200 t	G	P	P		
1201...1600 t (LL)	G	5 x G	P		
1601...1900 t (XLL)	G	7 x G	P		
1901...4000 t	No harmonization*				

* IRS 40421, TrainDY studies and selected best practices do not cover such a weight range therefore, harmonization is not possible. Individual RUs may still apply their own rules to allow such trains within their safety management systems.

G-braked trains			
Vehicles rake weight (excl. active locos)	Brake position of all vehicles	Maximum allowance of brake position P	Allowance of unbraked vehicles (vehicles with isolated brakes)
0...4000 t	G	12 axles, for the rest brakes are to be turned off if brake position G is not possible (to isolate brake)	Any train may have up to 3 consecutive unbraked vehicles (isolated brakes), but the first and the last vehicle of the vehicle rake shall have active brakes

4. AMOC content – international brake sheet and wagon list

The international brake sheet and wagon list defines a standard format and content for the document that is to be provided to a locomotive driver before train departure. It can be used for international as well as domestic freight trains. The language of the document can vary but the format and fields (numbers and description) must remain the same. The specification can be found in the Appendix A.

5. Area of application

The defined rules can be applied when composing and preparing international (and possibly domestic) freight trains for departure at its origin and intermediate stations.

ANNEX I – *Appendix A*

International brake sheet and wagon list

International brake sheet and wagon list is published on the ERA website.